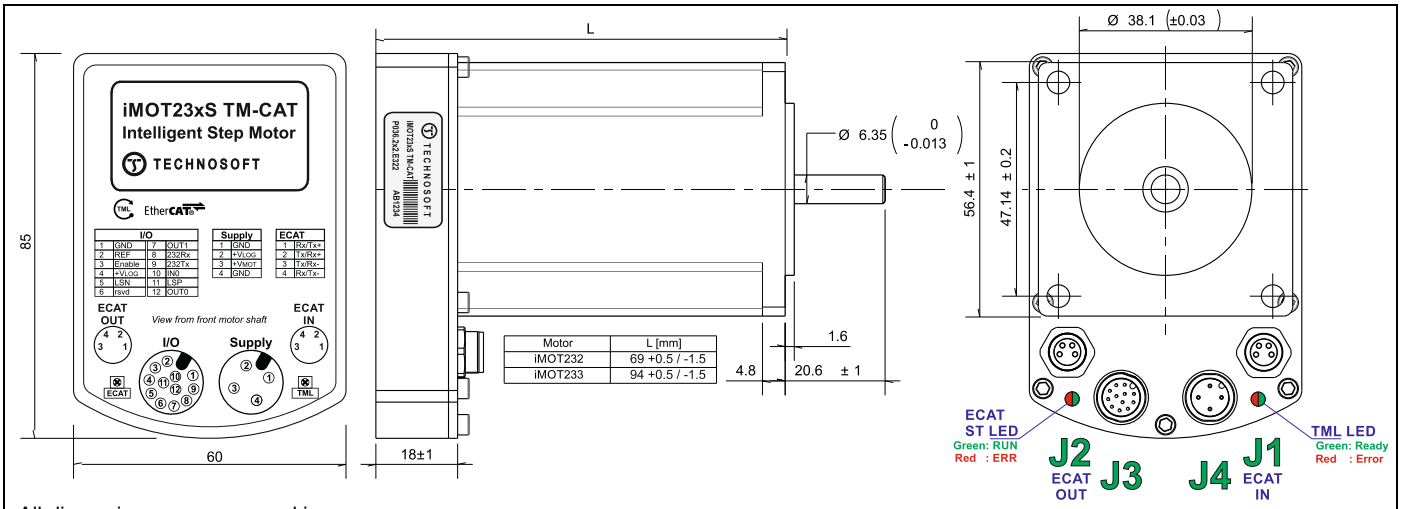


All dimensions are expressed in mm.

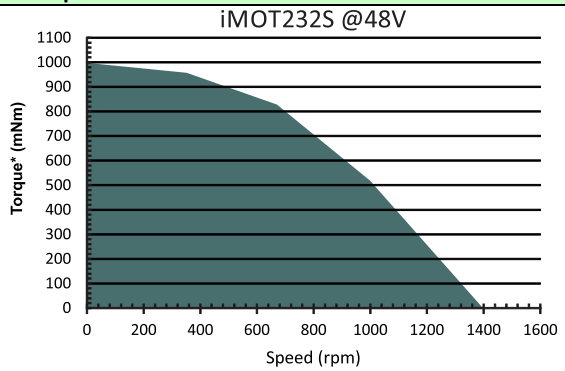
Features

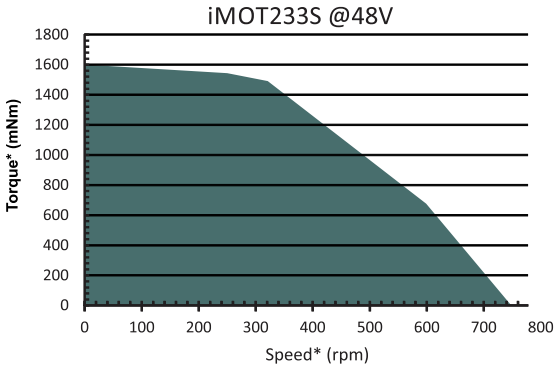
- Fully digital intelligent 2 phase step motor with embedded motion controller, drive and absolute position sensor
- Available in 2 motor lengths, offering 1000 and 1600 mNm of continuous torque
- Motor supply: 12-48V; Logic supply 15-36V; Rated current 2.8 A
- No load speed of 750 and 1400 rpm at 48V
- Advanced motion control capabilities (PVT, S-curve, electronic cam)
- Two control options: stepless closed loop servo using an absolute feedback sensor; stepper open loop using microstepping and step loss detection based on the feedback sensor
- Standalone operation with stored motion sequences
- Communication:
  - RS-232 serial communication for drive commissioning
  - Dual 100Mbps EtherCAT® ports that supports CAN application protocol over EtherCAT® (CoE) in conformance with CiA 402 device profile.
- Digital and analogue I/Os:
  - 4 digital programmable inputs, 5-24V, PNP/NPN *
  - 2 digital outputs, 24V, PNP (0.3A) / NPN (0.4A) *
  - 1 analogue input: 12 bits resolution, 0-5V
- Feedback devices:
  - Integrated absolute position sensor offering a resolution of 4096 bits / revolution
- Protections:
  - Over-current, over-temperature, short circuit
  - Over and undervoltage, i2t, control error
- 2.5K × 16 SRAM for data acquisition
- 4K × 16 E²ROM for TML motion programs and data storage

**PNP/NPN selection is software selectable and applies on both inputs and outputs at the same time*

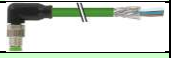
Ordering Information	
Part Number	**Description**
P036.222.E322	iMOT232S TM-CAT Intelligent Step Motor, EtherCAT
P036.232.E322	iMOT233S TM-CAT Intelligent Step Motor, EtherCAT
P034.001.E002	EasyMotion Studio Software
P038.040.C389	Complete cable set for iMOT23x TM-CAT

Torque – Speed characteristic





*** All values ±10% at 20ºC**

Mating Connectors				
Connector	**Producer**	**Part No.**	**Description**	**Image**
J1&J2	**Murr Elektronik**	7000-89771	Motor-to-motor, 4 x pin male connector	
	Murr Elektronik	7000-08821	Motor-to-wire, 4 x pin male connector	
	Murr Elektronik	7000-89781	Motor-to-RJ45, 4 x pin male connector to 8 x pin RJ45	
J3	**Phoenix Contact**	1430161	M12 Single-ended, 12 Poles, Female (90°), 1.5m	
J4	**Phoenix Contact**	1682906	M12 Single-ended, 4 Poles, Female (90°), 1.5m	

Connector J1&J2 Description			IN J1	OUT J2
Pin	**Name**	**Description**		
1	**Rx/Tx+**	Receive/Transmit Positive Corresponds to pin 3 on RJ45/8P8C Ethernet plug		
2	**Tx/Rx+**	Transmit/ Receive Positive Corresponds to pin 1 on RJ45/8P8C Ethernet plug		
3	**Tx/Rx-**	Receive/Transmit Positive Corresponds to pin 2 on RJ45/8P8C Ethernet plug		
4	**Rx/Tx-**	Receive/Transmit Negative Corresponds to pin 6 on RJ45/8P8C Ethernet plug		
SHIELD	**Earth**	Connected to motor chassis Galvanically isolated from GND, up to 200VDC isolation Capacitively coupled to GND for EMC shielding, with discharge resistor		

Connector J3 Description			
Pin	**Name**	**Type**	**Description**
1	**GND**	-	Return ground for I/O pins; Internally connected to all GND pins.
2	**REF**	**I**	Analogue input, 12-bit, 0-5V. Used to read an analogue position/speed reference, or used as general-purpose analogue input
3	**Enable**	**I**	5-36V digital PNP/NPN input. Enable input
4	**+V_{LOG}**	**I**	Positive terminal of the logic supply: 12.5 to 36V_{DC}. Internally connected to the other +V_{LOG} pin.
5	**IN3/LSN**	**I**	5-36V digital PNP/NPN input. Negative limit switch input
6	**rsvd**	**-**	Reserved
7	**OUT1**	-	general-purpose digital output, PNP 0.3A or NPN 0.4A open-collector
8	**232RX**	I	RS-232 Data Reception
9	**232TX**	O	RS-232 Data Transmission
10	**IN0**	**I**	5-36V general-purpose digital PNP/NPN input
11	**IN2/LSP**	**I**	5-36V digital PNP/NPN input. Positive limit switch input
12	**OUT0**	**O**	general-purpose digital output, PNP 0.3A or NPN 0.4A open-collector

Connector J4 Description			
Pin	**Name**	**Type**	**Description**
1	**GND**	-	Return ground for Motor supply; Internally connected to all GND pins.
2	**+V_{LOG}**	**I**	Positive terminal of the logic supply: 12.5 to 36V_{DC}
3	**+V_{MOT}**	**I**	Positive terminal of the motor supply: 12 to 48V_{DC} /
4	**GND**	-	Return ground for Motor supply; Internally connected to all GND pins.

LED indicators		
LED name	**Color**	**Description**
TML LED	**green**	Motor Ready. Lit after power-on when the drive initialization ends. Turned off when an error occurs.
	red	Motor Error. Turned on when the drive detects an error condition or when Error output is set by software.
ECAT LED	**green**	EtherCAT® ERROR and RUN indicators combined. Shows the state of the EtherCAT® Status Machine
	red	

Characteristics

All parameters were measured under the following conditions (unless otherwise specified):

- Tamb = 25°C, logic supply (VLOG) = 24VDC, motor supply (VMOT) =48VDC ;
- Supplies start-up / shutdown sequence: -any-

Motor and feedback sensor parameters		Value	Units
Step angle		1.8	°
Rated torque	iMOT232	1000	mNm
	iMOT233	1600	
Rated current	iMOT232	2.8	A
	iMOT233	2.8	
Microstepping resolution in open loop control		102400	Bits/ rot
Absolute position feedback in closed loop control		4096	Bits/ rot

Rotor inertia	iMOT232	275	gcm^2
	iMOT233	480	
	Axial	Radial	
Shaft play	0.08	0.06	mm
At load	450	450	g

Environmental Characteristics			Min.	Typ.	Max.	Units
Size (Length x Width x Height)		iMOT232		69 x 60 x 85		mm
				~2.71 x 2.36 x 3.35		inch
		iMOT233		94 x 60 x 85		mm
				~3.70 x 2.36 x 3.35		inch
Weight	Without mating connectors	iMOT232		740		g
		iMOT233		1140		
Power dissipation	Idle (no load)			1.5		W
	Operating				TBD	
Efficiency				98		%
Cleaning agents	Dry cleaning is recommended			Only Water- or Alcohol- based		
Protection degree	According to IEC60529, UL508			IP50		-

Operating Conditions		Min.	Typ.	Max.	Units
Ambient temperature[1]		0		+40	°C
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure[2]	Altitude (vs. sea level)	-0.1	0 ÷ 2.5	[2]	Km
	Ambient Pressure	0 [2]	0.75 ÷ 1	10.0	atm
Magnetic field				20	mT

Storage Conditions		Min.	Typ.	Max.	Units
Ambient temperature		-40		+105	°C
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm

Logic Supply Input (+V_{LOG})			Min.	Typ.	Max.	Units
Supply voltage	Nominal values		15	24	36	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters		12.5		39	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms) †		0		+45	V
Supply current	No Load on Digital Outputs	+V_{LOG} = 15V		70	200	mA
		+V_{LOG} = 24V		47	120	
		+V_{LOG} = 36V		36	100	

Motor Supply Input (+V_{MOT})		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	12	24	48	V_{DC}
	Absolute maximum values, continuous	-0.3		50	V_{DC}
	Absolute maximum values, surge (duration ≤ 8s)	-1		55	
Supply current	Idle		1	5	mA
	Operating	-13.6	±3	+13.6	A

[1] Operating temperature can be extended up to **+65ºC** with reduced current and power ratings.

[2] iMOT23xS TM-CAT can be operated in vacuum (no altitude restriction), but at altitudes over 2,500m, current and power rating are reduced due to thermal dissipation efficiency.

Analog reference input (REF)		Min.	Typ.	Max.	Units
Input voltage	Operational range	0		5	V
	Absolute maximum values, continuous	-8		+12	
	Absolute maximum, surge (duration ≤ 1s) †			±24	
Input impedance	To 0.23V		33		kΩ
Resolution			12		bits
Integral linearity				±2	bits
Offset error			±2	±10	bits
Gain error			±1%	±3%	% FS[1]
Bandwidth (-3dB)	Software selectable	0		250	Hz
ESD protection	Human body model	±5			kV

RS-232		Min.	Typ.	Max.	Units
Compliance			TIA/EIA-232-C		
Bit rate	Software selectable	9600		115200	Baud
Short-circuit	232TX short to GND		Guaranteed		
ESD protection	Human body model	±15			kV

Digital Inputs (IN0, IN2/LSP, IN3/LSN, Enable)		Min.	Typ.	Max.	Units
Input voltage	Logic "LOW"		2.2	1.2	V
	Logic "HIGH"	4.8	3.8		
	Hysteresis	0.8	1.6	2.8	
	Absolute maximum, continuous	-36		+36	
	Absolute maximum, surge (duration ≤ 1s) †	-50		50	
	Floating voltage, PNP (not connected)		0		
	Floating voltage, NPN (not connected)		$+V_{LOG}$		
Input frequency		0		400	kHz
Minimum pulse		-15	1.2	0.9	ms
ESD protection	Human body model	±15			kV

Mode compliance	Internal 10kΩ resistor to GND	PNP			
Default state	Input floating (wiring disconnected)	Logic LOW			
Input current	Logic "LOW";			0	mA
	Logic "HIGH"; pulled to +24V		6	8	
	Hysteresis		0.5		

Mode compliance	Internal 10kΩ resistor to $+V_{LOG}$	NPN/ TTL / CMOS / Open-collector			
Default state	Input floating (wiring disconnected)	Logic LOW			
Input current	Logic "HIGH"			0	mA
	Logic "LOW"; pulled to GND		6	8	
	Hysteresis		0.5		

EtherCAT ports J1 and J2		Min.	Typ.	Max.	Units
Compliance		IEEE802.3, IEC61158			
Transmission line specification	According to TIA/EIA-568-5-A	Cat. 5e.UTP			
J1, J2 pinout	EtherCAT® supports MDI/MDI-X auto-crossover	TIA/EIA-568-A or TIA/EIA-568-B			
Software protocols compatibility		CoE, CiA402, IEC61800-7-301			
Node addressing		1 ÷ 255			-
MAC addressing		none			-
ESD protection	Human body model	±15			KV

Digital Outputs (OUT0, OUT1)		Min.	Typ.	Max.	Units
Output voltage	Logic "LOW"; output current = 0.4A, NPN mode		0.5	0.8	V
	Logic "HIGH", output current = 0.3A, PNP mode	V_{LOG}-1.2	V_{LOG}-0.8		
	Absolute maximum, continuous	-0.5		V_{LOG}+0.5	
	Absolute maximum, surge (duration ≤ 1s) †	-1		V_{LOG}+1	
Minimum pulse width		2			µs
ESD protection	Human body model	±15			kV

Mode compliance		PNP			
Default state	Not supplied (+VLOG floating or to GND)	High-Z (floating)			
	Normal operation OUT0, OUT1	Logic "LOW"			
Output current	Logic "HIGH", source current, continuous			0.3	A
	Logic "HIGH", source current, pulse ≤ 5 s			0.6	A
	Logic "LOW", leakage current; external load to $+V_{LOG}$; $V_{OUT} = V_{LOG}$ max = 40V		0.1	0.2	mA

Mode compliance		Open-collector / NPN 24V			
Default state	Not supplied (+VLOG floating or to GND)	High-Z (floating)			
	Normal operation OUT0, OUT1	Logic "HIGH"			
Output current	Logic "LOW", sink current, continuous			0.4	A
	Logic "LOW", sink current, pulse ≤ 5 s			0.8	A
	Logic "HIGH", leakage current; external load to $+V_{LOG}$; $V_{OUT} = V_{LOG}$ max = 40V		0.1	0.2	mA

† Stresses beyond values listed under "absolute maximum ratings" may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

[1] "FS" stands for "Full Scale"