

# MDLUF EtherCAT Servodrives



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**NUM**   
CNC HighEnd Applications

# MDLUF EtherCAT Servodrives Overview

**The MDLUF is a scalable, modular and powerful drives system suitable for demanding multi-axes applications. MDLUF can pilot whatever motor type, servo, spindle, torque and linear motors and inter-operate with many different encoder types.**

The managed control mode are: "Cyclic sync position mode" and "Cyclic sync velocity mode" compliant to "CiA 402 CANopen device profile for drives and motion" standard.

MDLUF drive is a modular system that is optimized for multi-axes applications. Use of a common power supply unit means that only one mains connection, one line filter and one braking resistor are required per system, reducing cabling and overall costs. The system's modularity also facilitates energy exchange between different axes via the DC bus, offers the possibility of using stored energy for retraction purposes, and – in the case of regenerative power supplies – allows energy to be re-injected into the mains to reduce machine operating cost. Such system conception also leads the way for a greener approach.

MDLUF drive offers a choice of two performance levels:

- Standard-Performance (SP) drives
- High-Performance (HP) drives

Featuring high internal resolution, a short sampling time and specially developed algorithms, the HP versions are designed for sophisticated and complex applications in precision machine tools. The position control loop is closed with a very high bandwidth, achieving exceptional precision and speed at the mechanical interface of the machine (motor axis, linear motor). MDLUF accepts almost all measuring systems and can control a broad range of motors (servo, torque, linear, asynchronous motors) from NUM or other manufacturers. This ensures that a solution can be optimized from the technical and economic perspectives.

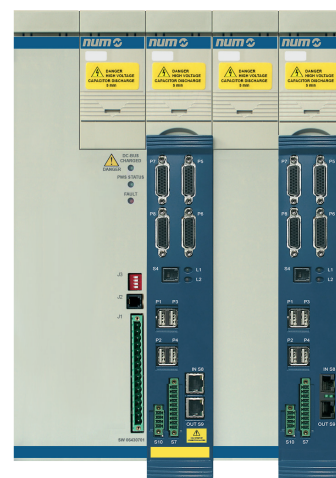
The SP versions of MDLUF are suited to systems and precision machine tools of medium complexity, as well as cost-sensitive applications.

Within a Safe architecture, MDLUF provides the safe motion functionalities by means of two different modules:

- NUM-STOX is the basic module for implementing the Safe Torque Off function certified up to SIL 3 according to IEC 61508. This allows the realization of E-STOP functions category 0 and 1 according to EN60204-1.
- NUM-SAMX is the extended functionality module which provides a huge number of safe motion monitoring functions. STO Safe Torque Off, SLS Safely Limited Speed, SOS Safe Operational Stop, SS1 Safe Stop 1, SS2 Safe Stop 2, SLP Safe Limited Position, SDM Safe Direction Monitoring, SCA Safe CAMs and SSM Safe Speed Monitor.

NUM-SAMX requires a master controller device able to manage FSoE (Fail Safe over EtherCAT) protocol messages.

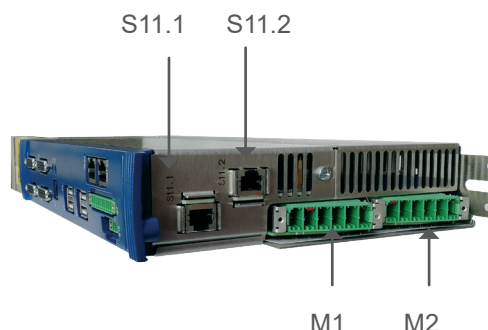
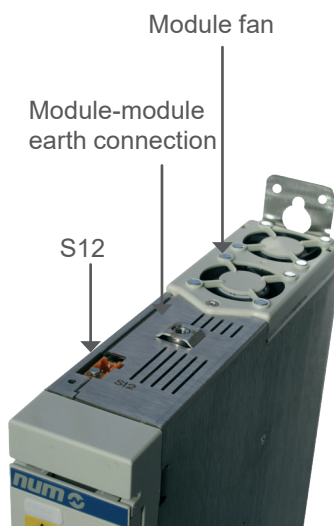
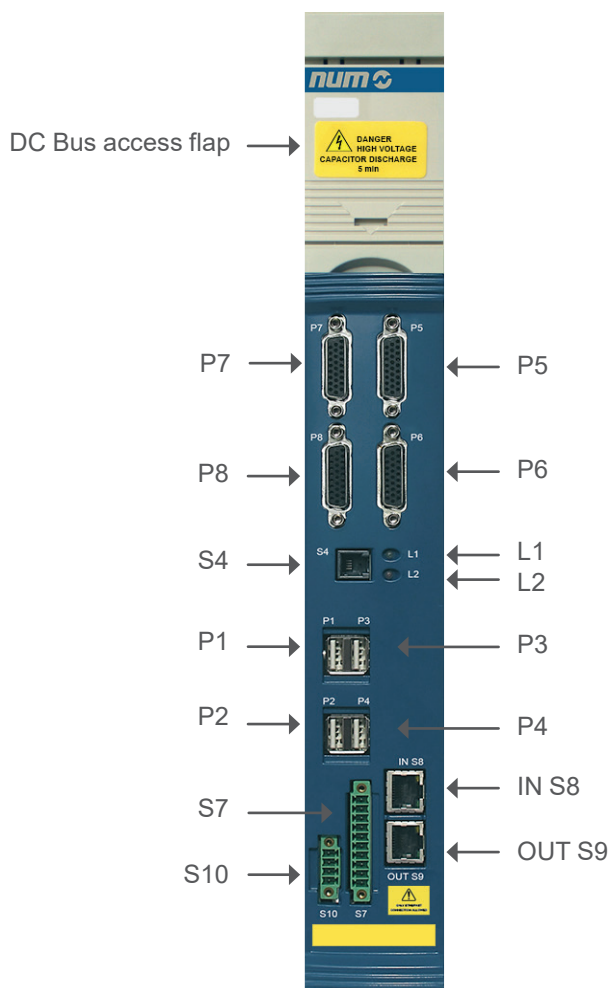
Every machine builder has experienced the complexity of encoder wiring and knows that it takes time and effort to install and debug satisfactorily. NUM MDLUF further improves the integration of the single cable motor; the fully digital encoder interface which uses a two-wires communication protocol has been further engineered by using a new industrial USB connector.



# MDLUF EtherCAT Servodrives

## General Description

i.e. High Performance Bi-Axes module with NUM-SAMX



Connector	Description
L1, L2	L1 = EtherCAT status, L2 = EtherCAT error
P1, P2	Hiperface-DSL 2-wires sensor connections for Motor M1 / M2
P3, P4	Hiperface-DSL 2-wires sensor connections for Motor M3 / M4 for Quad-Axes drive
P5	Sub D HD 26 pins F - Motor sensor / Direct Axis measure sensor / VDR connections
P6	Sub D HD 26 pins F - Motor sensor / Direct Axis measure sensor / VDR connections
P7	Sub D HD 26 pins F - Motor sensor / Direct Axis measure sensor / VDR / Local Link connections
P8	Sub D HD 26 pins F - Motor sensor / Direct Axis measure sensor / VDR / Local Link connections
S4	NUM service
S7	10 screw pins +24VDC programmable IN/OUT
IN S8, OUT S9	RJ45 (8P/8C) Available with NUM-SAMX/NUM-STOX version only
S10	4 screw pins Motors brake control
S11.1, S11.2	RJ45 (8P/8C) Module - module digital bus interconnections
S12	2 screw pins AUX 48VAC input 35kHz Supply connections
M1, M2	6 screw pins for Motor M1 / M2 (power and brake)

# MDLUF EtherCAT Servodrives

## Power Supply

### Power Supply Characteristics (MDLL)

MDLL power supplies are designed to be used in conjunction with MDLUF. MDLLs supply the DC bus voltage and the control voltage (auxiliary voltage). MDLLs are available in various power ratings and with dissipation of the braking energy by external resistor or with reinjection into the mains. MDLQ is an auxiliary power supply used whenever the available built-in auxiliary power of the MDLL isn't sufficient (high number of drives). Refer to the installation manual for more information.

### Power Supply

MDLL3 Power Supplies		MDLL3015N00AN0I	MDLL3030N00AN0I	MDLL3050N00xN0I	MDLL3120N00xN0I
Rated Power (S1)	kW	15	30	50	120
S3 Power (4s ON - 6s OFF)	kW	40	45	97	150
Peak Power	kW	50	50	97	175
Maximum Continuous Braking Power	kW	15	30	20	20
Peak Braking Power	kW	51	61	120	170
Rated Input Voltage	V	400 Vrms -10% to 480 Vrms +6% 50/60Hz ± 5% 3 phases			
Overall Dimensions (WxHxD)	mm	100 x 355 x 206		200 x 355 x 206	300 x 355 x 206
Weight	kg	5.5		11.5	19

### Passive Power Supply single phase 230 Vrms

MDLL3 Power Supplies		MDLL3005M00AN0I
Rated Power (S1)	kW	5
S3 Power (4s ON - 6s OFF)	kW	6
Peak Power	kW	6
Maximum Continuous Braking Power	kW	5
Peak Braking Power	kW	9
Rated Input Voltage	V	230Vrms -10% ÷ 230Vrms +10% (Single-phase)
Rated Input Current	Arms	31
DC Bus Voltage at Rated Power	VDC	300 VDC with 230Vrms input
Dissipation of Braking Energy		On braking resistor
Auxiliary Rated Power	W	200
Protection Degree (EN60529)		IP20
Overall Dimensions (WxHxD)	mm	100 x 355 x 206
Weight	kg	5.5

# MDLUF EtherCAT Servodrives Functions







## MDLUF Interoperability and Functions

		Bi-Axes and Quad-Axes SP (Standard Performance)	Mono-Axis, Bi-Axes and Quad-Axes HP (High Performance)
Interface	EtherCAT with NUM device profile	•	•
Control Performance	Standard performance control loops	•	•
	High performance control loops	-	•
Compatible Motors	Closed loop: synchronous rotary motors	•	•
	Closed loop: synchronous torque and linear motors	-	•
	Closed loop: asynchronous motors	•	•
	Open loop: synchronous or asynchronous rotary motors (V/F mode)	•	•
Compatible Motor Sensor	Single cable motor encoder (SHX, SPX motors)	•	•
	EnDat 2.1 & EnDat 2.2 encoder	•	•
	1 Vpp toothed wheel / encoder	•	•
	Renishaw RESOLUTE™ encoders with BiSS unidirectional interface	•	•
	Magnescale encoders	•	•
Compatible Direct Mea- sure Sensors	EnDat 2.1 & EnDat 2.2 encoder / linear scale	-	•
	Hall sensors	-	•
	1 Vpp encoder / linear scale (also with coded references)	-	•
	Renishaw RESOLUTE™ encoder with BiSS unidirectional interface	-	•
	Magnescale encoders	-	•
Special Functions	Spindle operation for synchronous and asynchronous motors	•	•
	Synchronous motor phasing without movement	•	•
	Spindle-Axis commutation	•	•
	Rotary axis with mechanical ratio not 2 <sup>n</sup> (AP02)	•	•
	Anti-backlash function (AP03)	-	○
	Torque duplication (AP04)	-	○
	Winding duplication (AP05)	-	○
	DEMF (Drive Embedded Macro / AP07)	-	○
	Coherence control between motor and direct measure sensor (AP06)	-	•
	Various active damping functions	-	•
Various freely settable filters (AP11, AP12)	•	•	
Electrical Position Synchronization (EPS)	•	•	
Absolute position with motor's multi-turn encoder and incremental direct measure sensor	-	•	
Safety Functions compliant with EN 61800-5-2	NUM-STO module with Safe Torque Off	○	○
	NUM-SAMX module with	○	○
	• STO Safe Torque Off		
	• SLS Safely Limited Speed		
	• SOS Safe Operational Stop		
	• SS1 Safe Stop 1		
	• SS2 Safe Stop 2		
	• SLP Safe Limited Position		
	• SDM Safe Direction Monitoring		
	• SCA Safe CAMs		
	• SSM Safe Speed Monitor		

# MDLUF EtherCAT Servodrives

## Servo Drive Characteristics

MDLUF are available in 16 ratings as shown below. All MDLUF modules have the same depth and height, and their width varies in standard modular increments (multiples of 50mm), allowing easy mounting in electrical cabinets. A built-in brake management scheme eliminates the need for an external control relay.

MDLUF Module Size	Type	Reference	Rated Current	Maximum Current
Size 1, 50mm 	Mono-Axis	MDLUF007AExxN0I MDLUF014AExxN0I MDLUF021AExxN0I MDLUF034AExxN0I	4.4 Arms 8.9 Arms 13 Arms 14 Arms	5 Arms 10 Arms 15 Arms 24 Arms
	Bi-Axes	MDLUF007BExxN0I MDLUF014BExxN0I MDLUF021BExxN0I	3.1 + 3.1 Arms 6.3 + 6.3 Arms 7 + 7 Arms	5 + 5 Arms 10 + 10 Arms 15 + 15 Arms
Size 2, 100mm 	Mono-Axis	MDLUF050AExxN0I MDLUF075AExxN0I	28 Arms 34 Arms	35 Arms 53 Arms
	Bi-Axes	MDLUF050BExxN0I	20 + 20 Arms	35 + 35 Arms
Size 2, 100mm 	Quad-Axes	MDLUF014DExxN0I	6.3 + 6.3 + 6.3 + 6.3 Arms	10 + 10 + 10 + 10 Arms
Size 3, 150mm 	Mono-Axis	MDLUF100AExxN0I MDLUF150AExxN0I	45 Arms 60 Arms	71 Arms 106 Arms
	Bi-Axes	MDLUF075BExxN0I	29 + 29 Arms	53 + 53 Arms
Size 4, 200mm 	Mono-Axis	MDLUF200AExxN0I	100 Arms	141 Arms
Size 6, 300mm 	Mono-Axis	MDLUF400AExxN0I	200 Arms	282 Arms

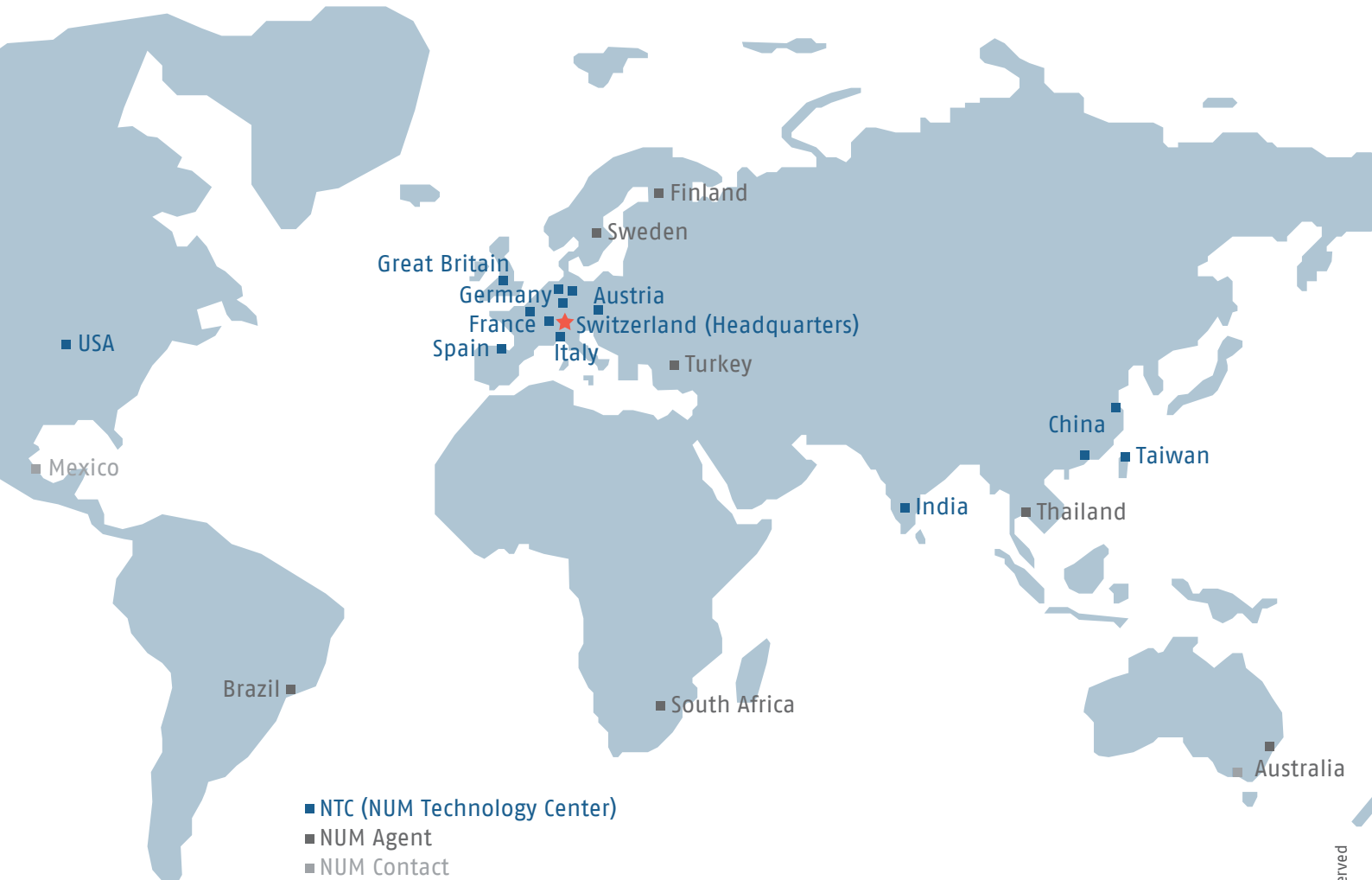
# MDLUF EtherCAT Servodrives

## Product Positioning

The different motor ranges are positioned as shown in the table below:

Motor Range	Main Characteristics	Typical Applications	Cont. Torque / Power Range	Available Sizes	Available Options
<b>SHX</b>	Single cable servomotor with very compact design, medium inertia, IP64	Designed for feeding axes of cost sensitive machine tools	From 1.2 Nm up to 20 Nm	Frame sizes 75 mm 95 mm 126 mm 155 mm	Holding brake Keyed shaft Medium and high resolution single/multi turn encoder High inertia version
<b>SPX</b>	Single cable servomotor with extremely compact design, high peak torques, smooth operation, medium inertia, IP67	Designed for feeding axes of high-end machine tools, grinding machines, robotics and special machines	From 0.5 Nm up to 23 Nm	Frame sizes 75 mm 95 mm 126 mm 155 mm	Holding brake Keyed shaft Medium and high resolution single/multi turn encoder High inertia version
<b>BHX</b>	Very compact design, medium inertia, IP64 servomotor	Designed for feeding axes of cost sensitive machine tools	From 1.2 Nm up to 20 Nm	Frame sizes 75 mm 95 mm 126 mm 155 mm	Holding brake Keyed shaft Medium and high resolution single/multi turn encoder High inertia version
<b>BPX</b>	Extremely compact design, high peak torques, smooth operation, medium inertia, IP67 servomotor	Designed for feeding axes of high-end machine tools, grinding machines, robotics and special machines	From 0.5 Nm up to 23 Nm	Frame sizes 55 mm 75 mm 95 mm 126 mm 155 mm	Holding brake Keyed shaft Medium and high resolution single/multi turn encoder High inertia version
<b>BPH</b>	Compact design, smooth operations, medium inertia, up to IP67 servomotor	Designed for feeding axes of high-end machine tools, grinding machines, robotics and special machines	From 1.3 Nm up to 100 Nm	Frame sizes 75 mm 95 mm 115 mm 142 mm 190 mm	Holding brake Keyed shaft Medium and high resolution single/multi turn encoder IP67 degree of protection
<b>BPG</b>	Compact design, smooth operation, very high inertia, up to IP67 servomotor	Designed for feeding axes of high end machine tools, grinding machines, robotics and special machines	From 1.3 Nm up to 56 Nm	Frame sizes 75 mm 95 mm 115 mm 142 mm 190 mm	Keyed shaft Medium and high resolution single/multi turn encoder IP67 degree of protection
<b>BHL</b>	Very compact design, high inertia, IP64 servomotor	Designed for feeding axes of large machine tools	From 85 Nm up to 160 Nm	Frame sizes 260 mm	Holding brake Keyed shaft Medium and high resolution single/multi turn encoder
<b>TMX</b>	Torque motor	Designed for direct drives	From 33 Nm up to 325 Nm	Stator diameter 140 mm 210 mm 291 mm	None
<b>AMS/IM</b>	Compact fan cooled spindle motor	Designed for main spindles	From 2.2 kW up to 55 kW	Shaft height 100 mm 132 mm 160 mm 180 mm	Keyed shaft High resolution single/multi turn encoder Low vibration level High radial loads

# Complete CNC Solutions Worldwide



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