2.2 Technical Data

Only MAC404

General	**All data are specified for the MAC motor only.**			
Technology	AC-servomotor (brushless) with built-in magnetic encoder, and 3 phase servo amplifier/controller			
Controller capacity		-	MAC404-M1 to M3 (no brake)	MAC404-M4 to M6 (w/brake)
	Rated output @3000 RPM cont. in rated temp. range	-	400 W	400 W
	Rated Torque RMS / Peak Torque	-	1.27 Nm / 3.8 Nm	1.27 Nm / 3.8 Nm
	Inertia (kg/cm²)	-	0.52 kg/cm²	0.54 kg/cm²
	Maximum angular acceleration	-	TBD rad/sec²	TBD rad/sec²
	Length	-	170 mm ±2 mm	203 mm ±2 mm
	Weight	-	2 kg	2.4 kg
	Audible noise level (measured in 30 cm distance)	-	-	(to be defined) dB(A)
	Backlash (when brake is activated)	-	-	< ±1 degree
Speed range	0-3000RPM with nom. torque. (max 3500RPM short-term). Speed protection trips at >3600RPM. Motor will shut down.			
Amplifier control system	Sinusoidal wave PWM control. 10kHz switching.			
Filter	6.th. order filter with only one inertia load factor parameter to be adjusted.			
Feedback sensor from motor	Magnetic encoder with 8192 counts per motor revolution. Optional: Multiturn absolute encoder with ±16384 revolutions (default) and ±262144 revolutions (high resolution mode)			
Input power supply	115/230AC (±10%), 47-63Hz for main power circuit. 18-32VDC for control circuit. Inrush current < 5A at 115/230VAC. Consumption at 115-230VAC - see power supply section in the user manual. Control circuitry consumption: MAC404M1, M2 or M3 (wo/brake) = Typical 0.22A @ 24VDC(5.3W). Control circuitry consumption: MAC404M4, M5 or M6 (w/brake) = Typical 0.54A @ 24VDC(13W).			
Control modes	* 0-5V Speed and Torque control with A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS485 Interface for velocity, position or torque commands and other parameters * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing (against hard stop)*			
Flange and shaft dimension	Front: 60x60mm. Rear: 60.2 x 119 mm (excl. connectors). Shaft Ø14mm			
POSITION (pulse inputs)				
Command input pulse	Pulse/direction or 90° phase shifted A+B. RS422			
Input frequency	0-8 MHz. 0-1 MHz with input filter			
Electronic gear	A/B: A= -10000 to 10000, B=1 to10000. Simulation of all step resolutions.			
Follow error register	32 bit			
In position width	0-32767 pulses			
Position range	32 bit. Infinity, Flip over at $\pm 2^{31}$ pulses.			
POSITION (serial communication)				
Communication facility	From PLC or PC via RS422 or RS485 Modbus or via Ethernet (ModbusTCP, ProfiNET, EthernetIP, EtherCAT).			
Communication Baud-rate	115 kbit/sec. (115kBaud)			
Position range	±134.217.728 ($\pm 2^{27}$) counts (default) and ±2.147.483.648 ($\pm 2^{31}$) counts (high resolution mode)			
Speed range	Nominal ±3000 RPM. Can be set up to ±3600 RPM but triggers an over speed error if 3600 RPM is reached.			
Digital resolution	1 internal unit correspond to - **Default: 0.35211 RPM** (1.3ms sample time). **0.45776 RPM** (1.0ms sample time). **0.0055018 RPM** (1.3ms sample time + high res. mode) and **0.0071256 RPM** (1.0ms sample time + high resolution)			
Acceleration range	**Default: 271 - 433353 RPM/s** (1.3ms sample time). **458 - 732422 RPM/s** (1.0ms sample time). **4.23 - 433353 RPM/s** (1.3ms sample time + high res. mode) and **7.15 - 732422 RPM/s** (1.0ms sample time + high resolution)			
Addressing	Point to point on RS422. Up to 32 units on the same serial RS232/RS485 interface with built-in expansion module. Address range 1-254			
Number of parameters.	Standard 85. With MacRegIO software 156 (Only for experts)			
Speed variance	Max ±4 RPM variance between command and actual speed.			
SPEED/ TORQUE				
Analogue speed/torque input.	12bit (no sign). Nom. input voltage IN1 to IN4 (option dependant). 30kOhm input resistance @0-5V. Voltage range max. -10 to +32VDC. Offset typical ±50mV.			
Sampling rate at analogue input	Default 769.23 Hz (1.3 ms) and optional 1000 Hz (1.0 ms)			
Encoder output signals	A+,A-,B+,B-, RS422. Line driver Typical 1.1 - 3.7 Volt outputs (balanced RS422 lines). 90° Phase shifted.			
Analogue speed input	+voltage -> CW rotation. Shaft view			
Zero speed determination.	0 - rated speed (Full scale adjustable).			
Speed variance at rated speed	Initial error @20°C: ±0,0%		Power Supply: ±10%: 0.0%	
	Load 0-300 %: ±0.0 %		Ambient temperature 0-40°C: ±0,0005% (±50ppm)	
Torque limit in speed mode	0-300 % - full scale adjustable			
Analogue torque input	+voltage (positive torque) -> CW rotation. Shaft view			
Torque control accuracy	±10% @ 20°C (Reproducibility)			
VARIOUS				
Electromechanical brake	Optional feature. The brake is activated automatically when an unrecoverable error situation occur.			
Regenerative	Integrated power dump 10W. External attachment is possible. External power dump output rated up to 25 Amp.			
Protective functions.	Error trace back.Overload (I^2T), Regenerative overload, follow error, function error, regenerative overload (over voltage), software position limit. Abnormality in flash memory, under voltage, over current, temperature too high. and many others.			
LED functions	Power (Green LED), Error (Red LED). Running status, Ethernet line activity and status.			
Output signals	Depend at motor type but up to 8 digital outputs handling up to 350 mA per output at 24V.			
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)			
Shaft load maximum	Max radial load: 274N (25mm from flange). Max. axial load: 74N.			
Optional brake (-M4, -M5 or -M6 option)	Controlled automatic or from input. 1.3Nm, inertia 0.22cm2, turn on time: 50ms, turn off time: 15ms			
Rated power rate. (motor)	TBD			
Mechanical time constant. (motor)	1.21±10% ms versions wo/brake and 1.26 ±10% ms in versions w/brake			
Electrical time constant. (motor)	2.03±10% ms			
Leakage current to earth	Less than 3 mA @ 50 Hz			
Standards and product approvals	CE approved - find EU - Declaration of Conformity in appendix of user manual. UL File: Pending			
Protection	IP55 or IP66			
Usage / Storage Temperature	Ambient 0 to +40°C (32-104°F)/ Storage (power not applied): -20 to +85°C. (-4 to 185°F) (Humidity 90%). Temperature warning is given before reaching max. Temperature shut down and error message generated at 84°C (183F).			