MAC050-MAC141x Technical Data

General	**All data are specified for the MAC motor only, i.e. without any expansion module mounted.**				
Technology	AC-servomotor (brushless) with built-in 1024 PPR encoder, hall sensors and 3-phase servo amplifier/controller				
Controller capacity		MAC050	MAC095	MAC140	MAC141
	Rated output @4000 RPM	46W	92W	134W	134W
	Rated Torque RMS Nm/(oz-in)	0.11 / (15.6)	0.22 / (31.2)	0.32 / (45.3)	0.48 / (68)
	Peak Torque Nm/(oz-in)	0.32 / (45.3)	0.62 / (88)	0.90 / (127.5)	1.59 / (225.2)
	Torque @200RPM with 20:1 gear. Nm/(oz-in)	2.0 / (283)	4.1/ (581)	6.0 / (850)	9.0 / (1275)
	Inertia kgcm^2 / (oz-in-sec^2)	0.075(0.0011)	0.119(0.0017)	0.173(0.0025)	0.227(0.0032)
	Maximum angular acceleration	85300rad/sec^2	85300rad/sec^2	85300rad/sec^2	85300rad/sec^2
	Length mm/(inch)	112/(4.409)	131/(5.157)	153/(6.024)	172/(6.772)
	Weight (kg) (without expansion module)	0.60	0.85	1.10	1.33
Speed range	0-4000RPM with full torque @48VDC. Max 4000 RPM (0-2700RPM for MAC141)				
Amplifier control system	Sinusoidal wave PWM control. 15.75kHz switching				
Filter	4.th. order filter with only one inertia load factor parameter to be adjusted. Expert tuning also available				
Feedback	Incremental A and B encoder 4096 CPR. (Physical 1024 PPR)				
Input power supply	Single supply 8-48VDC (absolute max=50VDC. Power consumption with no load: Active/not active = 10/8W				
Current consumption		MAC050	MAC095	MAC140	MAC141
	Avg. current consump. @ 48VDC/Nom. load (ADC)	2 (4000RPM)	4 (4000RPM)	6 (4000RPM)	6 (2700RPM)
	Avg. current consump. @ 24VDC/Nom. load (ADC)	2 (2000RPM)	4 (2000RPM)	6 (2000RPM)	6 (1350RPM)
	Peak supply current (worst case)	6A peak	12A peak	16A peak	16A peak
Control modes	* ±10V Speed and Torque. A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS232 (5V) position and parameter commands * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing*				
Flange and shaft dimension	NEMA23 compatible. Front: 58 x 58mm. Rear: Ø58. Shaft Ø6.35mm				
POSITION (pulse inputs)					
Command input pulse	Pulse/direction or 90° phase shifted A+B. RS422. Logic 0=<2.0V. Logic 1=>3.0V. Max voltage at A+, A-, B+ and B- = 5.5V.				
Input frequency	0-2.5MHz or 0-150kHz with input filter				
Electronic gear	A/B: A=-10000 to 10000, B=1 to 10000. Simulation of all step resolutions for easy replacement of step motor systems.				
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, PC etc via RS422 or asynchronous serial port RS232 with special cable. MacTalk JVL commands, special commands with high security.				
Communication Baud-rate	19200 bit/sec. (19.2kBaud)				
Position range	±67.000.000				
Speed range	0-4000 RPM. Digital resolution 0.477 RPM				
Acceleration range	248 - 397.364 RPM/sec				
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.	9 bit + sign. Nom. input voltage ±10V. 10kOhm input resistance. Voltage range max. -10 to +32VDC. Offset typical ±50mV.				
Analogue input tolerance	Typical ±1%. Max. 5% (Possible to make software adjustment to minimize gain and offset errors)				
Sampling rate at analogue input	521 Hz				
Encoder output signals	A+,A-,B+,B-, RS422. Line driver 5V outputs (SN75176). 90° Phase shifted.				
Analogue speed input	+voltage -> CW rotation. Shaft view				
Zero speed determination.	0 - rated speed.				
Speed variance at rated speed	Initial error @20°C: ±0,5%	Power Supply: ±10%: 0.0%			
	Load 0-300%: ±0.0%	Ambient temperature 0-40°C: ±0,1%			
Torque limit in speed mode	0-300% by parameter				
Analogue torque input	+voltage (positive torque) -> CW rotation. Shaft view				
Torque control accuracy	±10% @ 20°C (Reproducibility)				
VARIOUS					
Electromechanical brake	This option is not available on these motor sizes. Use the MAB23x - see *Brakes and shaft reinforcement, page 452*				
Regenerative	Integrated power dump. 3W can be absorbed continuously. External attachment is possible				
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.				
LED functions	Power (Green LED), Error (Red LED). Note that the LED's are only visible when no module is mounted.				
Output signals	2 general purpose NPN <32V/25 mA outputs. Error and In position.				
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)				
Shaft load maximum	Radial load: 75N (20mm from flange). Axial load: 15N.				
Leakage current to earth	Not relevant. Supply ground (P-) is hard-wired to earth and motor housing				
Standards	CE approved / UL pending				
Protection	IP42 or IP67				
Usage / Storage Temperature	Ambient 0 to +40°C (32-104°F)/ -20 to +85°C. (-4 to 185 °F) (Humidity 90%).				

MAC400x Technical Data

General	**All data are specified for the MAC motor only, i.e. without any expansion module mounted.**			
Technology	AC-servomotor (brushless) with built-in 2048 PPR encoder, hall sensors and 3 phase servo amplifier/controller			
Controller capacity		-	MAC400-D2 & -D3	MAC400-D5 & -D6 (w/brake)
	Rated output @3000 RPM	-	400W	400W
	Rated Torque RMS / Peak Torque	-	1.27Nm / 3.8Nm	1.27Nm / 3.8Nm
	Inertia ($kgcm^2$)	-	0.34 ($kgcm^2$)	0.36 ($kgcm^2$)
	Maximum angular acceleration	-	114706 rad/sec^2 (1095361 RPM/sec)	108333 rad/sec^2 (1034504 RPM/sec)
	Length	-	191mm	225mm
	Weight (without expansion module)	-	2.3kg	2.8kg
	Audible noise level (measured in 30cm 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 >4300RPM. Motor will shut down.			
Amplifier control system	Sinusoidal wave PWM control. 20kHz switching, optional 10kHz			
Filter	6.th. order filter with only one inertia load factor parameter to be adjusted.			
Feedback	Incremental A and B encoder 8192 CPR. (Physical 2048 PPR). Optional multiturn absolute encoder.			
Input power supply	115/230AC (±10%), 47-63Hz for main power circuit. 18-32VDC for control circuit. Consumption at 115-230VAC - see power supply section. Control circuitry consumption: MAC400D2 and 3 (wo/brake) = Typical 0.22A @ 24VDC(5.3W). Control circuitry consumption: MAC400D5 and 6 (w/brake) = Typical 0.58A @ 24VDC(14W).			
Control modes	* ±10V Speed and Torque. A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS232 (5V) position and parameter commands * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing*			
Flange and shaft dimension	Front: 60x60mm. Rear: 63x115mm. 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, PC etc via RS422 or asynchronous serial port RS232 with special cable. MacTalk JVL commands, special commands with high security.			
Communication Baud-rate	19200 bit/sec. (19.2kBaud)			
Position range	±67 000 000			
Speed range	0-3000 RPM.			
Digital resolution	0.3606 RPM			
Acceleration range	250 - 444.675 RPM/sec			
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.	11bit + sign. Nom. input voltage ±10V. 10kOhm input resistance. Voltage range max. -10 to +32VDC. Offset typical ±50mV.			
Sampling rate at analogue input	750 Hz			
Encoder output signals	A+,A-,B+,B-, RS422. Line driver Typical 1.1 - 3.7 Volt outputs (SN75176). 90° Phase shifted.			
Analogue speed input	+voltage -> CW rotation. Shaft view			
Zero speed determination.	0 - rated speed.			
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% by parameter			
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. External attachment is possible			
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.			
LED functions	Power (Green LED), Error (Red LED). Note that the LED's are only visible when no module is mounted.			
Output signals	3 general purpose NPN 32V/25 mA outputs. Error and In position.			
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)			
Shaft load maximum	Radial load: 24.5kg (13.5mm from flange). Axial load: 9.8kg.			
Optional brake(-D5 and -D6 option)	Controlled automatic or from input. 1.3Nm, inertia 0.22cm2, turn on time: 50ms, turn off time: 15ms			
Rated power rate. (motor)	50.0 kW/s			
Mechanical time constant. (motor)	0.59±10% ms			
Electrical time constant. (motor)	3.5±10% ms			
Leakage current to earth	Less than 3 mA @ 50 Hz			
Standards	CE approved / UL File: E254947			
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).			

MAC404x Technical Data

General	**All data are specified for the MAC motor only, i.e. without any expansion module mounted.**			
Technology	AC-servomotor (brushless) with built-in 2048 PPR encoder, hall sensors and 3 phase servo amplifier/controller			
Controller capacity		-	MAC400-D2 & -D3	MAC400-D5 & -D6 (w/brake)
	Rated output @3000 RPM	-	400W	400W
	Rated Torque RMS / Peak Torque	-	1.27Nm / 3.8Nm	1.27Nm / 3.8Nm
	Inertia (kgcm²)	-	0.52 (kgcm²)	0.54 (kgcm²)
	Maximum angular acceleration	-	114706 rad/sec² (1095361 RPM/sec)	108333 rad/sec² (1034504 RPM/sec)
	Length	-	191mm	225mm
	Weight (without expansion module)		2.3kg	2.8kg
	Audible noise level (measured in 30cm 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 >4300RPM. Motor will shut down.			
Amplifier control system	Sinusoidal wave PWM control. 20kHz switching, optional 10kHz			
Filter	6.th. order filter with only one inertia load factor parameter to be adjusted.			
Feedback	Incremental A and B encoder 8192 CPR. (Physical 2048 PPR). Optional multiturn absolute encoder.			
Input power supply	115/230AC (±10%), 47-63Hz for main power circuit. 18-32VDC for control circuit. Consumption at 115-230VAC - see power supply section. Control circuitry consumption: MAC400D2 and 3 (wo/brake) = Typical 0.22A @ 24VDC(5.3W). Control circuitry consumption: MAC400D5 and 6 (w/brake) = Typical 0.58A @ 24VDC(14W).			
Control modes	* ±10V Speed and Torque. A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS232 (5V) position and parameter commands * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing*			
Flange and shaft dimension	Front: 60x60mm. Rear: 63x115mm. 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, PC etc via RS422 or asynchronous serial port RS232 with special cable. MacTalk JVL commands, special commands with high security.			
Communication Baud-rate	19200 bit/sec. (19.2kBaud)			
Position range	±67 000 000			
Speed range	0-3000 RPM.			
Digital resolution	0.3606 RPM			
Acceleration range	250 - 444.675 RPM/sec			
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.	11bit + sign. Nom. input voltage ±10V. 10kOhm input resistance. Voltage range max. -10 to +32VDC. Offset typical ±50mV.			
Sampling rate at analogue input	750 Hz			
Encoder output signals	A+,A-,B+,B-, RS422. Line driver Typical 1.1 - 3.7 Volt outputs (SN75176). 90° Phase shifted.			
Analogue speed input	+voltage -> CW rotation. Shaft view			
Zero speed determination.	0 - rated speed.			
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% by parameter			
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. External attachment is possible			
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.			
LED functions	Power (Green LED), Error (Red LED). Note that the LED's are only visible when no module is mounted.			
Output signals	3 general purpose NPN 32V/25 mA outputs. Error and In position.			
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)			
Shaft load maximum	Radial load: 24.5kg (13.5mm from flange). Axial load: 9.8kg.			
Optional brake(-D5 and -D6 option)	Controlled automatic or from input. 1.3Nm, inertia 0.22cm2, turn on time: 50ms, turn off time: 15ms			
Rated power rate. (motor)	50.0 kW/s			
Mechanical time constant. (motor)	0.59±10% ms			
Electrical time constant. (motor)	3.5±10% ms			
Leakage current to earth	Less than 3 mA @ 50 Hz			
Standards	CE approved / UL File: E254947			
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).			

MAC402 Technical Data

General	**All data are specified for the MAC motor only, i.e. without any expansion module mounted.**			
Technology	AC-servomotor (brushless) with built-in 2048 PPR encoder, hall sensors and 3 phase servo amplifier/controller			
Controller capacity		-	MAC402-D2 & -D3	MAC402-D5 & -D6 (w/brake)
	Rated output @3000 RPM	-	400W	400W
	Rated Torque RMS / Peak Torque	-	1.27Nm / 3.8Nm	1.27Nm / 3.8Nm
	Inertia ($kgcm^2$)	-	0.34 ($kgcm^2$)	0.36 ($kgcm^2$)
	Maximum angular acceleration	-	114359 rad/sec^2 (1092048 RPM/sec)	102053 rad/sec^2 (974534 RPM/sec)
	Length	-	191mm	225mm
	Weight (without expansion module)	-	2.3kg	2.8kg
	Audible noise level (measured in 30cm distance)	-	-	(to be defined) dB(A)
	Backlash (when brake is activated)	-	-	< ±1 degree
Speed range	0-3000RPM with nom. torque. (max 3500RPM short-term). O.Speed protection trips at >4300RPM. Motor will shut down.			
Amplifier control system	Sinusoidal wave PWM control. 20kHz switching			
Filter	6.th. order filter with only one inertia load factor parameter to be adjusted. Expert tuning also available for professionals.			
Feedback	Incremental A and B encoder 8192 CPR. (Physical 2048 PPR). Optional multiturn absolute encoder.			
Input power supply	Nominal 8-48VDC (max 53VDC) for main power circuit. Recommended also for 12V battery applications. Consumption at 12-48VDC - see power supply section. 18-32VDC for control circuit. Control circuitry consumption: MAC402D2 and 3 (wo/brake) = Typical 0.22A @ 24VDC(5.3W). Control circuitry consumption: MAC402D5 and 6 (w/brake) = Typical 0.58A @ 24VDC(14W).			
Control modes	* ±10V Speed and Torque. A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS232 (5V) position and parameter commands * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing*			
Flange and shaft dimension	Front: 60x60mm. Rear: 63x115mm. 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, PC etc via RS422 or asynchronous serial port RS232 with special cable. MacTalk JVL commands, special commands with high security.			
Communication Baud-rate	19200 bit/sec. (19.2kBaud)			
Position range	±67 000 000			
Speed range	0-3000 RPM.			
Digital resolution	0.3606 RPM			
Acceleration range	250 - 444.675 RPM/sec			
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.	11bit+sign. nom. input voltage ±10V. 10kOhm input resistance. Voltage range max. -10 to +32VDC. Offset typical ±50mV.			
Sampling rate at analogue input	750 Hz			
Encoder output signals	A+,A-,B+,B-, RS422. Line driver Typical 1.1 - 3.7 Volt outputs (SN75176). 90° Phase shifted.			
Analogue speed input	+voltage -> CW rotation. Shaft view			
Zero speed determination.	0 - rated speed.			
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% by parameter			
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. External attachment is possible			
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.			
LED functions	Power (Green LED), Error (Red LED). Note that the LED's are only visible when no module is mounted.			
Output signals	3 general purpose NPN 32V/25 mA outputs. Error and In position.			
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)			
Shaft load maximum	Radial load: 24.5kg (13.5mm from flange). Axial load: 9.8kg.			
Optional brake(-D4 option)	Controlled automatic or from input. 1.3Nm, inertia 0.22cm2, turn on time: 50ms, turn off time: 15ms			
Rated power rate. (motor)	50.0 kW/s			
Mechanical time constant. (motor)	0.59±10% ms			
Electrical time constant. (motor)	3.5±10% ms			
Leakage current to earth	Not relevant. Supply ground is hard-wired to earth and motor housing			
Standards	CE approved / UL File: E254947			
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).			

MAC800x Technical Data

General	**All data are specified for the MAC motor only, i.e. without any expansion module mounted.**			
Technology	AC-servomotor (brushless) with built-in 2000 PPR encoder, hall sensors and 3 phase servo amplifier/controller			
Controller capacity		-	MAC800-D2/-D3	MAC800-D5/-D6 (w. brake)
	Rated output @3000 RPM	-	746W	746W
	Rated Torque RMS / Peak Torque	-	2.38Nm / 6.8Nm	2.38Nm / 6.8Nm
	Inertia ($kgcm^2$)	-	0.91 ($kgcm^2$)	1.13 ($kgcm^2$)
	Maximum angular acceleration	-	(TBD) rad/sec^2	(TBD) rad/sec^2
	Length	-	170mm	210mm
	Weight (without expansion module)	-	3.5kg	4.3kg
	Audible noise level (measured in 30cm distance)	-	-	65 dB(A)
	Backlash (when brake is activated)	-	-	±0.5 degree
Speed range	0-3000RPM with full torque. Max 3500 RPM. Overspeed protection if speed >3600 = Motor will go in passive mode			
Amplifier control system	Sinusoidal wave PWM control. 20kHz switching			
Filter	6.th. order filter with only one inertia load factor parameter to be adjusted. Expert tuning also available for professionals.			
Feedback	Incremental A and B encoder 8000 CPR. (Physical 2000 PPR). Optional multiturn absolute encoder (8192 CPR).			
Input power supply	115/230VAC (±10%), 47-63Hz for main power circuit. 18-32VDC for control circuit. Consumption at 115-230VAC - see power supply section. Control circuitry consumption: MAC800D2 and 3 (wo/brake) =0.25A @ 24VDC(6W). Control circuitry consumption: MAC800D5 and 6 (w/brake) =0.75A @ 24VDC(18W).			
Control modes	* ±10V Speed and Torque. A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS232 (5V) position and parameter commands * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing*			
Flange and shaft dimension	Front: 80x80mm. Rear: 80x113mm. Shaft Ø19mm			
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, PC etc via RS422 or asynchronous serial port RS232 with special cable. MacTalk JVL commands, special commands with high security.			
Communication Baud-rate	19200 bit/sec. (19.2kBaud)			
Position range	±67 000 000			
Speed range	0-3000 RPM.			
Digital resolution	0.3606 RPM			
Acceleration range	250 - 444.675 RPM/sec			
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.	11bit + sign. Nom. input voltage ±10V. 10kOhm input resistance. Voltage range max. -10 to +32VDC. Offset typical ±50mV.			
Sampling rate at analogue input	750 Hz			
Encoder output signals	A+,A-,B+,B-, RS422. Line driver Typical 1.1 - 3.7 Volt outputs (SN75176). 90° Phase shifted.			
Analogue speed input	+voltage -> CW rotation. Shaft view			
Zero speed determination.	0 - rated speed.			
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% by parameter			
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. External attachment is possible			
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.			
LED functions	Power (Green LED), Error (Red LED). Note that the LED's are only visible when no module is mounted.			
Output signals	3 general purpose NPN 32V/25 mA outputs. Error and In position.			
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)			
Shaft load maximum	Radial load: 18kg (20mm from flange). Axial load: 11kg.			
Optional brake(-D4 option)	Controlled automatic or from input. 3.0Nm, inertia 0.22cm2, turn on time: 50ms, turn off time: 15ms			
Rated power rate. (motor)	62.8 kW/s			
Mechanical time constant. (motor)	0.428±10% ms			
Electrical time constant. (motor)	4.122±10% ms			
Leakage current to earth	Less than 3 mA @ 50 Hz			
Standards	CE approved / UL File: E254947			
Protection	IP55 or IP66			
Usage / Storage Temperature	Ambient 0 to +40°C (32-104°F)/ -20 to +85°C. (-4 to 185°F) (Humidity 90%). Error on 75°C (167°F) Temperature shut down and error message generated at 73°C (163F). The heatsink fan starts at 55°C (131F).			

MAC1200x Technical Data

General	**All data are specified for the MAC motor only, i.e. without any expansion module mounted.**			
Technology	AC-servomotor (brushless) with built-in 2000 PPR encoder, hall sensors and 3 phase servo amplifier/controller			
Controller capacity		-	MAC1200-D2/-D3	MAC1200-D5/-D6 (w. brake)
	Rated output @3000 RPM	-	1200W	1200W
	Rated Torque RMS / Peak Torque	-	3.82Nm / 11.46Nm	3.82Nm / 11.46Nm
	Inertia ($kgcm^2$)	-	1.6 ($kgcm^2$)	1.85 ($kgcm^2$)
	Maximum angular acceleration	-	(TBD) rad/sec^2	(TBD) rad/sec^2
	Length	-	203mm	243mm
	Weight (without expansion module)	-	5.02kg	6.1kg
	Audible noise level (measured in 30cm distance)	-	-	65 dB(A)
	Backlash (when brake is activated)	-	-	±0.5 degree
Speed range	0-3000RPM with full torque. Max 3500 RPM. Overspeed protection if speed >3600 = Motor will go in passive mode			
Amplifier control system	Sinusoidal wave PWM control. 20kHz switching			
Filter	6.th. order filter with only one inertia load factor parameter to be adjusted. Expert tuning also available for professionals.			
Feedback	Incremental A and B encoder 8000 CPR. (Physical 2000 PPR). Optional multiturn absolute encoder (8192 CPR).			
Input power supply	115/230VAC (±10%), 47-63Hz for main power circuit. 18-32VDC for control circuit. Consumption at 115-230VAC - see power supply section. Control circuitry consumption: MAC800D2 and 3 (wo/brake) =0.25A @ 24VDC(6W). Control circuitry consumption: MAC800D5 and 6 (w/brake) =0.75A @ 24VDC(18W).			
Control modes	* ±10V Speed and Torque. A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS232 (5V) position and parameter commands * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing*			
Flange and shaft dimension	Front: 80x80mm. Rear: 80x113mm. Shaft Ø19mm			
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, PC etc via RS422 or asynchronous serial port RS232 with special cable. MacTalk JVL commands, special commands with high security.			
Communication Baud-rate	19200 bit/sec. (19.2kBaud)			
Position range	±67 000 000			
Speed range	0-3000 RPM.			
Digital resolution	0.3606 RPM			
Acceleration range	250 - 444.675 RPM/sec			
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.	11bit + sign. Nom. input voltage ±10V. 10kOhm input resistance. Voltage range max. -10 to +32VDC. Offset typical ±50mV.			
Sampling rate at analogue input	750 Hz			
Encoder output signals	A+,A-,B+,B-, RS422. Line driver Typical 1.1 - 3.7 Volt outputs (SN75176). 90° Phase shifted.			
Analogue speed input	+voltage -> CW rotation. Shaft view			
Zero speed determination.	0 - rated speed.			
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% by parameter			
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. External attachment is possible			
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.			
LED functions	Power (Green LED), Error (Red LED). Note that the LED's are only visible when no module is mounted.			
Output signals	3 general purpose NPN 32V/25 mA outputs. Error and In position.			
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)			
Shaft load maximum	Radial load: 18kg (20mm from flange). Axial load: 11kg.			
Optional brake(-D4 option)	Controlled automatic or from input. 3.0Nm, inertia 0.22cm2, turn on time: 50ms, turn off time: 15ms			
Rated power rate. (motor)	62.8 kW/s			
Mechanical time constant. (motor)	0.428±10% ms			
Electrical time constant. (motor)	4.122±10% ms			
Leakage current to earth	Less than 3 mA @ 50 Hz			
Standards	CE approved / UL File: E254947			
Protection	IP55 or IP66			
Usage / Storage Temperature	Ambient 0 to +40°C (32-104°F)/ -20 to +85°C. (-4 to 185°F) (Humidity 90%). Error on 75°C (167°F) Temperature shut down and error message generated at 73°C (163F). The heatsink fan starts at 55°C (131F).			

MAC1500x Technical Data

General	**All data are specified for the MAC motor only, i.e. without any expansion module mounted.**			
Technology	AC-servomotor (brushless) with built-in 2048 PPR encoder, hall sensors and 3 phase servo amplifier/controller			
Controller capacity		-	MAC1500-D2 or D3	MAC1500-D5 or D6 (w. brake)
	Rated output @3000 RPM	-	1500W	1500W
	Rated Torque RMS / Peak Torque	-	4.78Nm / 14.33Nm	4.78Nm / 14.33Nm
	Inertia	-	13.96 kgcm²	14.1 kgcm²
	Maximum angular acceleration	-	(TBD) rad/sec²	(TBD) rad/sec²
	Length	-	250mm / 9.843"	305.86mm / 12.042"
	Weight (without expansion module)	-	10.95kg	13.15kg
	Audible noise level (measured in 30cm distance)	-	-	65 dB(A)
	Backlash (when brake is activated)	-	-	±0.5 degree
Speed range	0-3000RPM with full torque. Max 3500 RPM. Overspeed protection if speed >3600 = Motor will go in passive mode			
Amplifier control system	Sinusoidal wave PWM control. 5kHz switching			
Filter	6.th. order filter with only one inertia load factor parameter to be adjusted. Expert tuning also available for professionals.			
Feedback	Incremental A and B encoder 8192 CPR. (Physical 2048 PPR/lines per rev.). Optional multiturn absolute encoder.			
Input power supply	3 phase supply 400 to 480AC, 47-63Hz for driver circuit. Absolute max 550VAC! 18-32VDC for control circuit. Control circuitry consumption: MAC1500-D2 and 3 (wo/brake) =0.3A @ 24VDC(8W). Control circuitry consumption: MAC1500-D5 and 6 (w/brake) =1.2A @ 24VDC(24W).			
Control modes	* ±10V Speed and Torque. A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS232 (5V) position and parameter commands * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing*			
Flange and shaft dimension	Front: 130x130mm. Rear: 130x203mm(excl. connectors). Shaft Ø24.0mm +0/-0.013mm			
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, PC etc via RS422 or asynchronous serial port RS232 with special cable. MacTalk JVL commands, special commands with high security.			
Communication Baud-rate	19200 bit/sec. (19.2kBaud)			
Position range	±67 000 000			
Speed range	0-3000 RPM.			
Digital resolution	0.3606 RPM			
Acceleration range	250 - 444.675 RPM/sec			
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.	11bit + sign. Nom. input voltage ±10V. 10kOhm input resistance. Voltage range max. -10 to +32VDC. Offset typical ±50mV.			
Sampling rate at analogue input	750 Hz			
Encoder output signals	A+,A-,B+,B-, RS422. Line driver Typical 1.1 - 3.7 Volt outputs (Driver: SN75176). 90° Phase shifted.			
Analogue speed input	+voltage -> CW rotation. Shaft view			
Zero speed determination.	0 - rated speed.			
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% by parameter			
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. External attachment is possible			
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.			
LED functions	Power (Green LED), Error (Red LED). Note that the LED's are only visible when no module is mounted.			
Output signals	3 general purpose NPN 32V/25 mA outputs. Error and In position.			
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)			
Shaft load maximum	Radial load: xxN (xxmm from flange). Axial load: xxkg.			
Optional brake (-D5 or D6 option)	Controlled automatic or from input. xxNm, turn on time: 50ms, turn off time: 15ms			
Leakage current to earth	Less than 3 mA @ 50 Hz			
Standards	CE approved / UL recognized -Pending (file number E254947)			
Protection	IP55 (-D2 or D5 version). IP66 (D3 or D6 version)			
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).			

MAC3000x Technical Data

General	**All data are specified for the MAC motor only, i.e. without any expansion module mounted.**			
Technology	AC-servomotor (brushless) with built-in 2048 PPR encoder, hall sensors and 3 phase servo amplifier/controller			
Controller capacity		-	MAC3000-D2 or D3	MAC3000-D5 or D6 (w. brake)
	Rated output @3000 RPM	-	3000W	3000W
	Rated Torque RMS / Peak Torque	-	9.55Nm / 28.7Nm	9.55Nm / 28.7Nm
	Inertia (kgcm²)	-	27.83 kgcm²	27.98 kgcm²
	Maximum angular acceleration	-	(TBD) rad/sec²	(TBD) rad/sec²
	Length	-	312mm / 12.276”	366mm / 14.439”
	Weight (without expansion module)	-	13.2kg	17.1kg
	Audible noise level (measured in 30cm distance)	-	-	65 dB(A)
	Backlash (when brake is activated)	-	-	±0.5 degree
Speed range	0-3000RPM with full torque. Max 3500 RPM. Overspeed protection if speed >3600 = Motor will go in passive mode			
Amplifier control system	Sinusoidal wave PWM control. 5kHz switching			
Filter	6.th. order filter with only one inertia load factor parameter to be adjusted. Expert tuning also available for professionals.			
Feedback	Incremental A and B encoder 8192 CPR. (Physical 2048 PPR/lines per rev.). Optional multiturn absolute encoder.			
Input power supply	3 phase supply 400 to 480AC, 47-63Hz for driver circuit. Absolute max 550VAC! 18-32VDC for control circuit. Control circuitry consumption: MAC3000-D2 and 3 (wo/brake) =0.3A @ 24VDC(8W). Control circuitry consumption: MAC3000-D5 and 6 (w/brake) =1.2A @ 24VDC(24W).			
Control modes	* ±10V Speed and Torque. A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS232 (5V) position and parameter commands * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing*			
Flange and shaft dimension	Front: 130x130mm. Rear: 130x203mm(excl. connectors). Shaft Ø24.0mm +0/-0.013mm			
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, PC etc via RS422 or asynchronous serial port RS232 with special cable. MacTalk JVL commands, special commands with high security.			
Communication Baud-rate	19200 bit/sec. (19.2kBaud)			
Position range	±67 000 000			
Speed range	0-3000 RPM.			
Digital resolution	0.3606 RPM			
Acceleration range	250 - 444.675 RPM/sec			
Addressing	Point to point on RS422. Up to 32 units on the same serial RS232/RS485 interface with built-in expansion module. Ad - dress 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.	11bit + sign. Nom. input voltage ±10V. 10kOhm input resistance. Voltage range max. -10 to +32VDC. Offset typical ±50mV.			
Sampling rate at analogue input	750 Hz			
Encoder output signals	A+,A-,B+,B-, RS422. Line driver Typical 1.1 - 3.7 Volt outputs (Driver: SN75176). 90° Phase shifted.			
Analogue speed input	+voltage -> CW rotation. Shaft view			
Zero speed determination.	0 - rated speed.			
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% by parameter			
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. External attachment is possible			
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.			
LED functions	Power (Green LED), Error (Red LED). Note that the LED’s are only visible when no module is mounted.			
Output signals	3 general purpose NPN 32V/25 mA outputs. Error and In position.			
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)			
Shaft load maximum	Radial load: xxN (xxmm from flange). Axial load: xxkg.			
Optional brake (-D5 or D6 option)	Controlled automatic or from input. Brake torque: 16Nm, turn on time: 16ms, turn off time (motor released): 55ms			
Leakage current to earth	Less than 3 mA @ 50 Hz			
Standards	CE approved / UL recognized -Pending (file number E254947)			
Protection	IP55 (-D2 or D5 version). IP66 (D3 or D6 version)			
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).			

MAC4500x Technical Data

General	**All data are specified for the MAC motor only, i.e. without any expansion module mounted.**			
Technology	AC-servomotor (brushless) with built-in 2048 PPR encoder, hall sensors and 3 phase servo amplifier/controller			
Controller capacity		-	MAC4500-G2 or G3	MAC4500-G5 or G6 (w. brake)
	Rated output @3000 RPM	-	4500W	4500W
	Rated Torque RMS / Peak Torque	-	14.33Nm* / 43Nm	14.33Nm* / 43Nm
	Inertia (kgcm²)	-	40.5 kgcm²	(TBD) kgcm²
	Maximum angular acceleration	-	(TBD) rad/sec²	(TBD) rad/sec²
	Length	-	312mm / 12.276"	366mm / 14.439"
	Weight (without expansion module)	-	13.2kg	17.1kg
	Audible noise level (measured in 30cm distance)	-	-	65 dB(A)
	Backlash (when brake is activated)	-	-	±0.5 degree
Speed range	0-3000 RPM with full torque. Max 3500 RPM. Overspeed protection if speed >3600 = Motor will go in passive mode			
Amplifier control system	Sinusoidal wave PWM control. 5kHz switching			
Filter	6.th. order filter with only one inertia load factor parameter to be adjusted. Expert tuning also available for professionals.			
Feedback	Incremental A and B encoder 8192 CPR. (Physical 2048 PPR/lines per rev.). Optional multiturn absolute encoder.			
Input power supply	3 phase supply 400 to 480AC, 47-63Hz for driver circuit. Absolute max 550VAC! 18-32VDC for control circuit. Control circuitry consumption: MAC4500-G2 and G3 (wo/brake) =0.3A @ 24VDC(8W). Control circuitry consumption: MAC4500-G5 and G6 (w/brake) =1.2A @ 24VDC(24W).			
Control modes	* ±10V Speed and Torque. A+B encoder outputs * Pulse/direction and 90° phase shifted A++B (Incremental) * RS422 or RS232 (5V) position and parameter commands * Gear mode with analogue input speed offset + different options * Sensor *Homing* or mechanical *Homing*			
Flange and shaft dimension	Front: 130x130mm. Rear: 130x203mm(excl. connectors). Shaft Ø24.0mm +0/-0.013mm			
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, PC etc via RS422 or asynchronous serial port RS232 with special cable. MacTalk JVL commands, special commands with high security.			
Communication Baud-rate	19200 bit/sec. (19.2kBaud)			
Position range	±67 000 000			
Speed range	0-3000 RPM.			
Digital resolution	0.3606 RPM			
Acceleration range	250 - 444.675 RPM/sec			
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.	11bit + sign. Nom. input voltage ±10V. 10kOhm input resistance. Voltage range max. -10 to +32VDC. Offset typical ±50mV.			
Sampling rate at analogue input	750 Hz			
Encoder output signals	A+,A-,B+,B-, RS422. Line driver Typical 1.1 - 3.7 Volt outputs (Driver: SN75176). 90° Phase shifted.			
Analogue speed input	+voltage -> CW rotation. Shaft view			
Zero speed determination.	0 - rated speed.			
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% by parameter			
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. External attachment is possible			
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.			
LED functions	Power (Green LED), Error (Red LED). Note that the LED's are only visible when no module is mounted.			
Output signals	3 general purpose NPN 32V/25 mA outputs. Error and In position.			
Homing	1: Automatic *Homing* with sensor connected to input (2 formats) 2: Mechanical *Homing* without sensor. (Torque controlled)			
Shaft load maximum	Radial load: xxN (xxmm from flange). Axial load: xxkg.			
Optional brake (-D5 or D6 option)	Controlled automatic or from input. Brake torque: 16Nm, turn on time: 16ms, turn off time (motor released): 55ms			
Leakage current to earth	Less than 3 mA @ 50 Hz			
Standards	CE approved / UL recognized -Pending (file number E254947)			
Protection	IP55 (-D2 or D5 version). IP66 (D3 or D6 version)			
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).			

Notes: * = Only continuous above 2000 RPM if the motor is with fan (MAC4500-Gx-xTxx). See also torque curves.