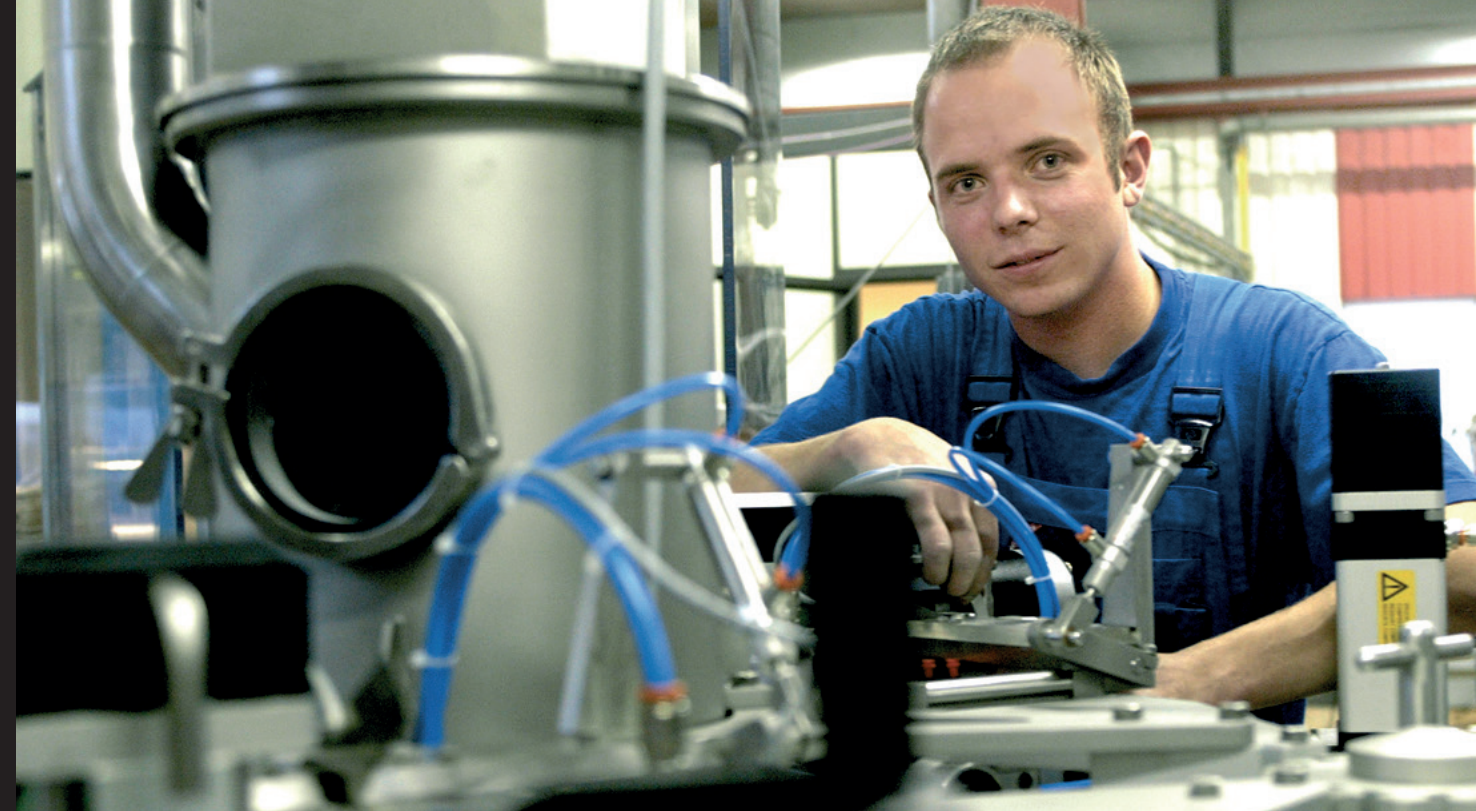


MAC motor® - Integrated Servo Motor



**A new way of saving money
All Electronics Inside**

*Brushless servo motors
with integrated controller*



Save Money and Troubles

In the past building up a motion control system was a complicated affair involving many components:

- PLC
- Indexer/controller
- Driver
- Motor with Encoder and Hall sensor
- A lot of cabling to connect all these items

-and finally complicated software that had to be programmed properly

It required a lot of expertise to make the system function and the installation was very time consuming and involved many sources that could create faults. Electrical noise from the cables carrying the high motor currents added to the problems.

JVL has reduced these problems to a minimum by introducing of the Integrated MAC motor on the motion control market.

In these motors the Indexer/controller, Driver, Encoder and Hall sensor are all built-in into one compact unit.

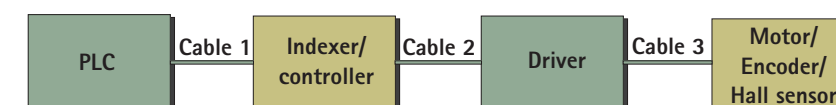
A software package, MacTalk, makes set-up extremely easy and expansion modules mounts directly into the motorhousing to adapt the motor to almost any application.

By investing in a modern integrated MAC motor from JVL you achieve the following benefits:

- Reduced material costs.
Because the drive and controller are in the motor, most cabling to a control panel is eliminated
- Reduced labor costs
With cabling eliminated, assembly time is greatly reduced
- Better quality and reliability
- Fewer connections, less wiring

- Ease of serviceability
Because all electronics are self-contained you simply change the motor
- Double supply facility to ensure that position and parameters are maintained after emergency stop
- Switching noise from the drive due to commutation is contained in the motor
- Reduced setup time
6th order digital filter requires only one tuning parameter for load or reflected inertia
- OEM cost savings, the modular approach means you only pay for the functionality required

Previous system build-up

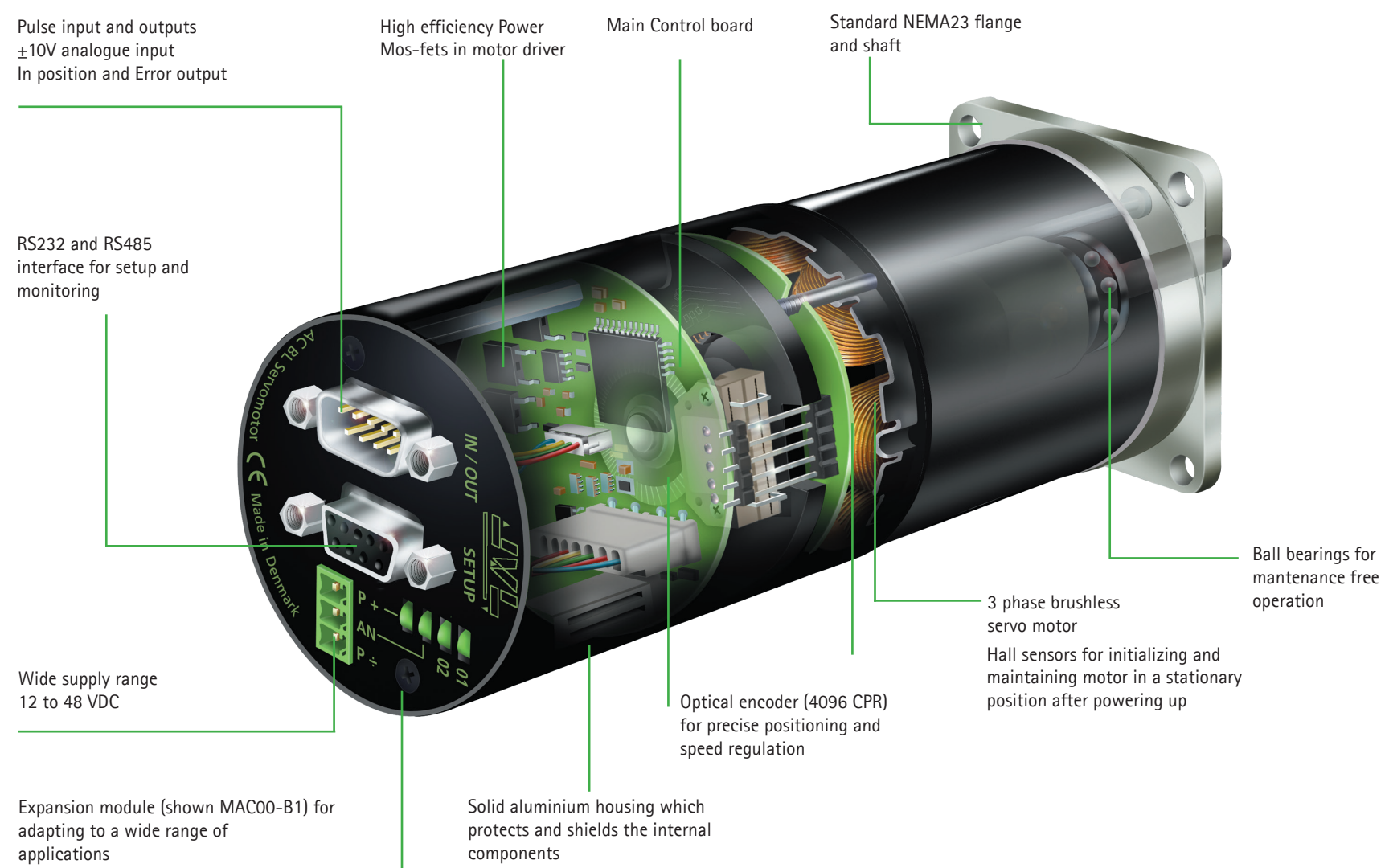


Modern system build-up



The MAC motor - 50 to 134 W - the complete motion solution for smaller powers ratings

Brushless servo motor with integrated controller
everything in one unit, except power supply.



The major advantages of the MAC motors are:

- High performance
- Cost effective
- Decentral intelligence
- Quiet and maintenance free operation
- High efficiency
- Low operational cost
- Less machine space required
- Low installation cost. Shorter and faster installation
- Fewer possibilities for wiring errors
- Minimum positioning error during operation and halt
- Modular flexibility
- New users can easily set up the system

Main features
(basic MAC models)

- Ideal for high volume applications in harsh industrial environments
- Accepts position and velocity commands sent via 2 serial interfaces
- Genuine AC-servomotor with high torque at high speed
- Pulse and direction input makes it possible to replace any step motor
- Quadrature output to master controller when used as a ±10V driver
- Switching technology in motor and power supplies
- High performance serial protocol with addressing facilities
- Easy and simple Windows program available for installation/set-up

Gears

A wide range of planetary, worm and backlash free gears can be provided for the MAC motors

Cables

Cables for all types of application can be delivered as required. In this way installation is fast and easy for our customers

Electronic brake

Optionally an electronic brake, type MAB23x, can be mounted on all motors with a NEMA23 flange. It is usefull for holding the motor shaft fixed at power off or when the motor is used in a vertical application

IP67 Protection

IP67 and stainless steel versions can also be delivered. They are resistant against rough chemicals and ideal for use in food processing, pharmaceutical and chemical industries. A double shaft seal and leak-proof cable entry provide watertight sealing

Power Supplies

JVL can supply a wide range of power supplies for supplying one or several MAC motors. They range from very simple do-it-yourself kits to big switch mode supplies. It should be noted that MAC400 to 4500 include a complete 115/230/400 VAC power supply for driver voltage. Only 24VDC for control circuit is required externally

Adapt your motor to your application

The JVL Integrated motors utilize the unique module concept. Plug-in expansion modules adapt the motor to the application. You can choose freely between Industrial Ethernet, Profibus, DeviceNet, CANopen or nano PLC control. A High Speed and wireless modules

Basic Modules

	MAC00-CS Low cost module, with cable glands. Pulse/dir. ±10V and 5V serial	Pulse/Dir Analog
	MAC00-B1 , General purpose module with Sub-D connectors: Pulse/Dir, ±10V,	RS 232 485
	MAC00-B2 General purpose module w/Cable Glands: otherwise same as -B1	RS 232 485
	MAC00-B4 General purpose module w/M12 connectors. Double supply	RS 232 485
	MAC00-B41 Is a MAC00-B4 module with extended I/O functions and USB	RS 232 485

Programable Modules

	MAC00-R1 Nano-PLC Module w/Sub-D connectors: Stand-alone operation with 8 DI + 4 DO	PLC NANO
	MAC00-R4 Nano-PLC Module w/M12 connectors: otherwise same as -R1	PLC NANO

Process Control Modules

	MAC00-P4 or P5 Process Control modul with analogue 4-20mA input	PROCESS Control
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DSUB 9 or 15-pin DSUB connectors IP42
Cable Shielded cable up to 20 m IP67
M12 M12 screw connector. Cable up to 20 m. IP67
Dual Supp. Position and parameters can be maintained under emergency stop



add to the possibilities. This means that you have possibilities as with no other motors on the market, and also important, you only pay for what you need. Moreover, if you do not find the feature you need please contact us and we will develop a customized module for you.

Industrial Ethernet Modules

Analog
RS232
Dual Supp.
1DI/1DO
M12
L/A IN
L/A OUT

MAC00-EP4 Profinet IO

MAC00-EI4 EtherNET/IP

Module w/M12 connectors: Bus and RS232

Analog
RS232
Dual Supp.
1DI/1DO
M12
L/A IN
L/A OUT

MAC00-EC4 EtherCAT

MAC00-ES4 Sercos III

Module w/M12 connectors: Bus and RS232

Analog
RS232
Dual Supp.
1DI/1DO
M12
L/A IN
L/A OUT

MAC00-EM4 Modbus TCP

MAC00-EL4 Powerlink

Module w/M12 connectors: Bus and RS232

Field Bus Modules

Analog
RS232
4DI/2DO
Dual Supp.
Limit +/-
M12
CANopen

MAC00-FC4 CANopen

MAC00-FD4 DeviceNet

w/M12 connectors: Bus, 4 DI/DO and RS232

Analog
RS232
Dual Supp.
4DI/2DO
Limit +/-
M12
Profibus

MAC00-FP4 Profibus Module

w/M12 connectors: Bus, 4 DI/DO and RS232

Wireless Modules

Analog
RS232
Dual Supp.
5DI/4DO
M12
Wireless

MAC00-FB4 Bluetooth

MAC00-EW4 WLAN

MAC00-FZ4 IEEE802.15.4

High Speed Multi-Axis modules

Analog
RS485
Dual Supp.
4DI+2DO
DSUB

MAC00-FS1 High Speed Multi-axis Module

w/Sub-D connectors

Analog
RS485
Dual Supp.
4DI+2DO
M12

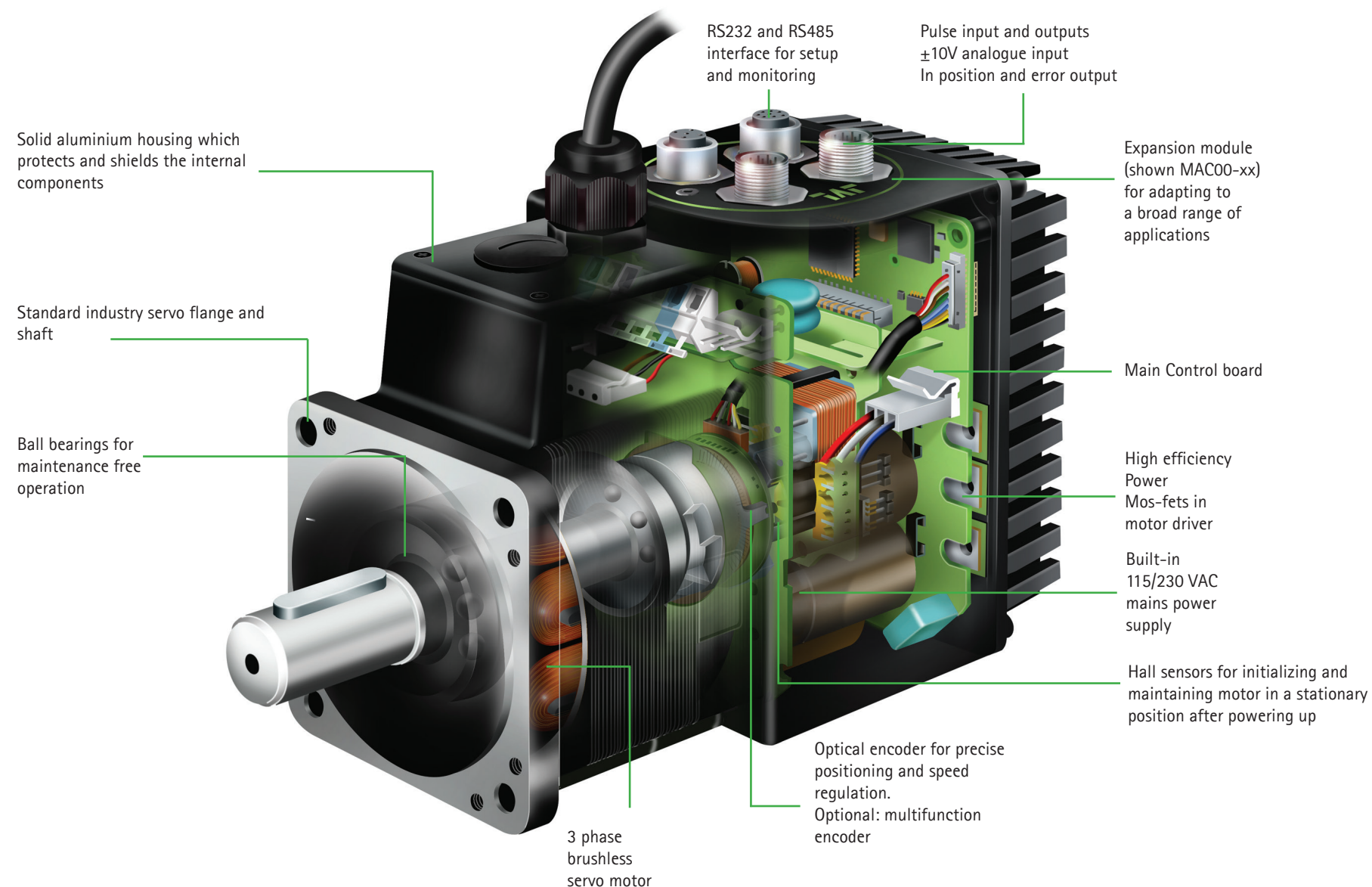
MAC00-FS4 High Speed Multi-axis Module

w/M12 connectors

- Analog** ±10V for speed or torque control or 24V home switch
- Pulse I/O** RS422 balanced inputs for pulse/direction incremental signal or encoder output
- Limit +/-** 2 of the inputs can be used as negative or positive limit switch inputs. = Optocouplers.

The MAC motor - 400 W to 4500 W - the complete solution for medium and larger power ratings

Brushless servo motor with integrated controller everything in one unit including mains power supply

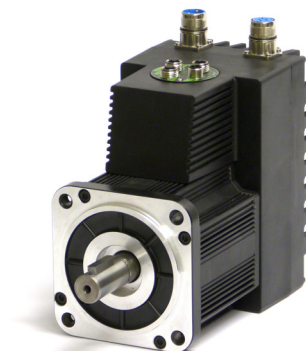


The complete range of MAC motors®

The complete range of JVL AC servo, integrated MAC motors offer you a wide selection of motor sizes adaptable to a wide range of applications

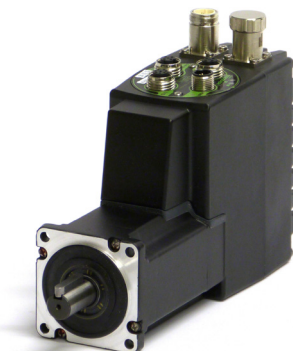
Built-in Brake

For applications in which motor position must be maintained at power-off, or for use in vertical applications, the 400 to 4500 W MAC motors can be supplied with a built-in brake



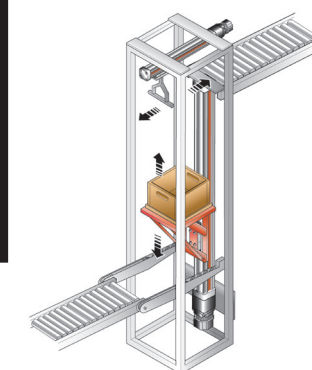
MAC1500 to MAC4500

They extend the MAC motor power range to 4500 W. Present series of expansion modules will still fit in these larger motors

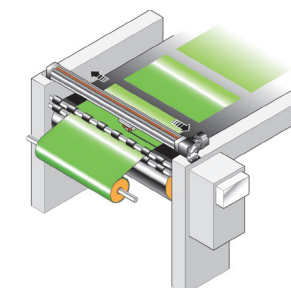


MAC400

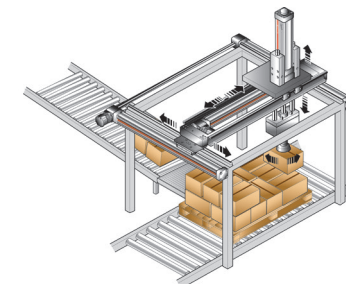
MAC400 24 VDC or 115/230 VAC supply and with incremental encoder or multitrack encoder for precise positioning and speed regulation



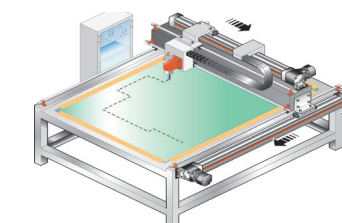
Material Handling Systems vertical and horizontal transfer movements



Slitting Machines. High speed traverse applications for slicing materials



Auto Handling. High speed pick and place movements



Profile Cutting Machines intricate profile movements of water jets and laser cutters

Other applications

- Replacement for pneumatic solutions
- Replacement of step motors offering much faster response and speed
- Conveyor systems
- Printing machines
- 3-D and XY tables
- Replacement for frequency inverters
- ±10V speed/torque driver for external controllers
- Screw and toothed belt pick and place robots
- Labelling dispensers

Software

JVL delivers the software that you need!

MacTalk

For setup, monitoring and diagnostics MacTalk is the preferred choice for most users.

Although advanced functionality is included, all operations are very intuitive and easy to use.

MacTalk allows you to adjust all vital parameters and save them in a file- or load them from a file. It is also possible to monitor parameters and motor status in real time.

When commissioning a system MacTalk even provides a convenient way to test and adjust your system. You can easily set up a test sequence and then adjust parameters like velocity, acceleration and torque. It is possible to select the distance moved and the delay between the moves. The more advanced 6th-order filter used in MAC motors, instead of a simple PID loop, is easily adjusted.

A nice feature is the Update function: if your PC is online you can update the MacTalk software yourself and even the servo system's firmware can be updated both the driver and the expansion module.

Graphical Programming

Alle motors can be programmed from MacTalk using userfriendly, icon-based commands in a graphical programming environment. With 8 inputs 4 outputs, all 5-24VDC, and one $\pm 10V$ analogue input, a small PLC system can be programmed. It is register-based with different kinds of relative or absolute movements, Jump and IF commands, timer and other functions. It is possible to request input conditions and set outputs. All register and parameters in the MAC motor can be accessed and changed if required.

OCX software

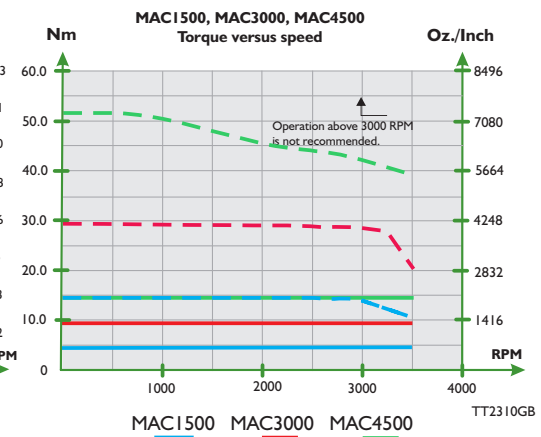
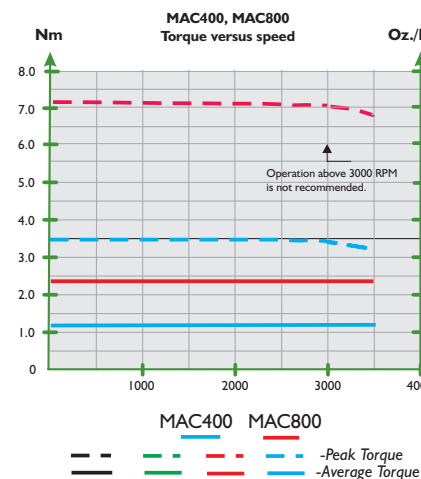
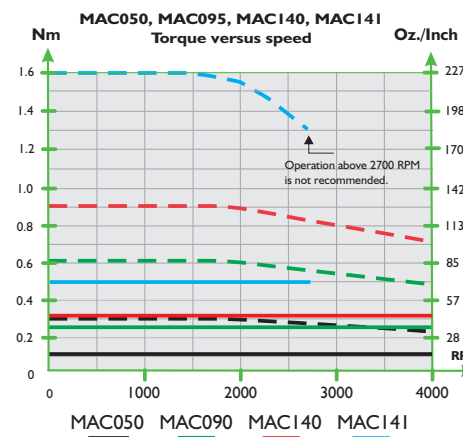
If your application is controlled by a PC you might prefer JVL's OCX software. The OCX (OLE Custom Controls – also known as ActiveX Controls) enables applications to be easily developed in for example:

- Visual Basic
- Visual C++
- Visual .NET
- Delphi
- Borland C++ Builder
- LabView
- Excel

any other environment supporting OCX controls.

Specifications

									
Technical specifications	MAC50-141	MAC402	MAC400	MAC800	MAC1200	MAC1500	MAC3000	MAC4500	Unit
Supply voltage	12-48VDC	12-48VDC	115/230VAC	115/230VAC	115/230VAC	3x400VAC	3x400VAC	3x400VAC	VAC
Speed range (nominal)	0-4000		0-3000	0-3000	0-3000	0-3000	0-3000	0-3000	RPM
Rated power @ 4000/3000 RPM	46/0.062 - 134/0.18	400/0.54		746/1	1140/1.5	1500/2	3000/4	4500/6	W/hp
Cont. torque@Tamb.-25°C	0.11/15.6 - 0.48/68	1.3/184.1		2.38/337.1	3.8/538.1	4.78/677	9.55/1352.4	14.3/2025	Nm/oz-in
Peak torque @Tamb.-25°C	0.32/45.3 - 1.59/225.2	3.8/538		6.8/963	11.4/1614	14.3/2025	28.6/4050	52.3/7406	Nm/oz-in
Rotor inertia	0.075/0.0010 - 0.23/0.0033	0.34/0.0048		0.91/0.0129	1.6/0.0225	6.26/0.0886	12.14/0.1719	27.83/0.394	kgcm ² /oz-in-s ²
Encoder resolution (std.)	4096	8192/(8000)		8000	8000	8192/(8000)	8192/(8000)	8192/(8000)	CPR
Abs. encoder (Single/Turns)		8192/4096		8192/4096	8192/4096	8192/4096	8192/4096	8192/4096	CPR/Rev
Physical dimensions: MAC050-141 (dia x length) MAC400-4500 (W x H x L)	Ø59x111 - 172/ 2.32x4.38 - 6.77	63x115x194/ 2.48x4.53x7.64 with brake 63x115x224.5/ 2.48x4.53x8.84	63x115x191/ 2.48x4.53x7.52 with brake 63x115x224.5/ 2.48x4.53x8.84	84x120x175/ 3.30x4.73x6.89 with brake 84x120x207/ 3.30x4.73x8.15	84x120x203/ 3.30x4.73x7.99 with brake 84x120x238/ 3.30x4.73x9.37	134x205x250/ 5.28x8.05x9.84 with brake 134x205x306/ 5.28x8.05x12.04	134x205x312/ 5.28x8.05x12.28 with brake 134x205x366/ 5.28x8.05x14.44	134x205x350/ 5.28x8.05x13.78 with brake 134x205x406/ 5.28x8.05x15.98	mm/ inch
Weight w/o exp. module (w/brake)	0.6/1.32 - 1.33/2.93	2.3/5.1 (2.8/6.21)		3.0/6.65 (3.7/8.20)	5.1/11.24	11.0/24.39 (13.3/29.49)	15.2/33.70 (17.3/42.80)	17.2/38.13 (19.0/38.41)	kg/lb
Protection class	IP42/IP67 optional	IP55/IP66 optional							
Flange	58.7x58.7/ 2.36x2.31	60x60/ 2.36x2.36		80x80/3.15x3.15		130x130/5.12x5.12			mm/ inch
Shaft	Ø6.35/0.25	Ø14/0.55		Ø19/0.75		Ø24/0.95		Ø24/0.95	mm/ inch



JVL Industri Elektronik A/S

JVL Industri Elektronik A/S is a modern company, located in Birkerød, just north of Copenhagen. The up-to-date development, research and production facilities of JVL employ only the latest technology for the development and production of electronic controls for step and servo motors. More than 50% of the staff are engineers with a very high degree of experience and competence in the field of motion control. We can therefore offer a product

programme that includes all the necessary units and components to build up a complete motor control system. JVL is represented throughout Europe and Asia by independent agents and in the US by a subsidiary, JVL International ApS. In UK, Germany and Turkey we have our own offices. All distributors are carefully selected by JVL to have the necessary knowledge and experience to help our customers in the best possible way in their choice of motion control components.

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