

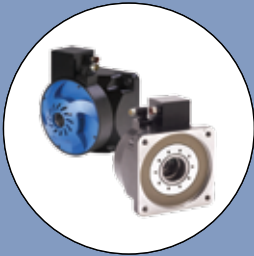
Kollmorgen PiCPro Integrated Solution IEC61131 Machine and Motion Control



Exter HMI Panels



MMC Smart Drives



Direct Drive Motors



Slice I/O



AKM Motors



MMC Controls

Kollmorgen. Every solution comes from a real understanding of OEM challenges.

The ever-escalating demands of the marketplace mean increased pressure on OEMs at every turn. Time constraints. Demands for better performance. Having to think about the next-generation machine even before the current one is built. While expectations are enormous, budgets are not. Kollmorgen's innovative motion solutions and broad range of quality products help engineers not only overcome these challenges but also build truly differentiated machines.

Because motion matters, it's our focus. Motion can distinctly differentiate a machine and deliver a marketplace advantage by improving its performance. This translates to overall increased efficiency for your application. Perfectly deployed machine motion can make your customer's machine more reliable and efficient, enhance accuracy and improve operator safety. Motion also represents endless possibilities for innovation. We've always understood this potential, and thus have kept motion at our core, relentlessly developing products that offer precision control of speed, accuracy and position in machines that rely on complex motion.

Removing the Barriers of Design, Sourcing, and Time

At Kollmorgen, we know that OEM engineers can achieve a lot more when obstacles aren't in the way. So, we knock them down in three important ways:

Integrating Standard and Custom Products

The optimal solution is often not clear-cut. Our application expertise allows us to modify standard products or develop totally custom solutions across our whole product portfolio so that designs can take flight.

Providing Motion Solutions, Not Just Components

As companies reduce their supplier base and have less engineering manpower, they need a total system supplier with a wide range of integrated solutions. Kollmorgen is in full response mode with complete solutions that combine programming software, engineering services and best-in-class motion components.

Global Footprint

With direct sales, engineering support, manufacturing facilities, and distributors across North America, South America, Europe, Middle East, and Asia, we're close to OEMs worldwide. Our proximity helps speed delivery and lend support where and when they're needed.

Product Manuals

All of our product manuals are available in PDF format for viewing, downloading or printing at www.gcontrols.com

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Machine and Motion Control Systems

Designers and engineers have come to count on Kollmorgen, for motion control components that help them build a better machine faster. By combining system processing power, a high-speed integrated Ethernet network, the class-leading capabilities of the conventional AKM servo motor series, and the optimized control of the direct drive technology, the PiCPro Integrated Solution can offer repeatable and reliable break-through performance representing a well-integrated, powerful, yet cost-effective solution suitable to a wide-range of applications.

Introducing the Kollmorgen PiCPro Integrated Solution – a total IEC61131 based machine and motion control solution providing a proven, yet innovative, motion control technology

Expertise in the Packaging, Printing and Converting Industries

For over two decades, PiCPro has been the controls leader in the most difficult of control requirements in industries such as printing, packaging and converting.

PiCPro's processing power and sophisticated control tools for Machine and Motion Control such as Registration enable complex control requirements to be implemented efficiently reducing engineering development time.

Kollmorgen with PiCPro's Integrated Solution offers a complete Machine and Motion Control System with the controls and application experience ready to help you ...

... *Because Motion Matters.*



MMC Control Systems

Solutions for Factory Automation, Material Handling and Metal Fabrication Industries



3-Axis Cartesian Robotic Palletizing Machine

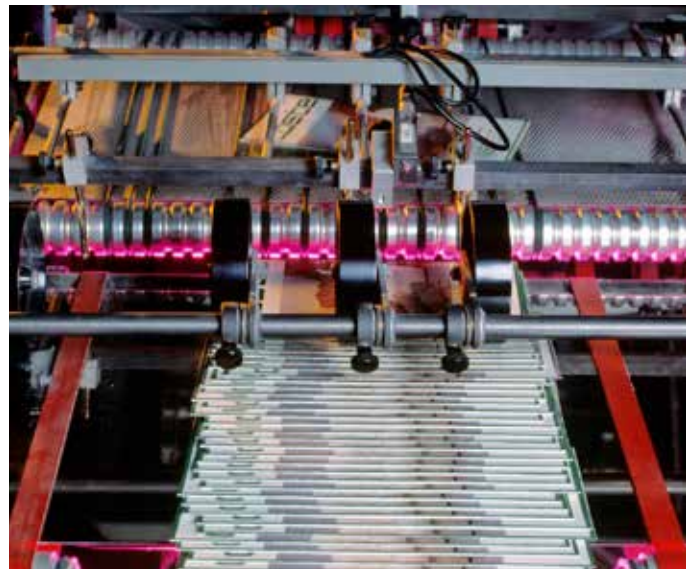
A Palletizer utilizes PiCPro's integrated multi-axis servo and close coupled machine control.

Linear interpolation is supported and simplifies the application software

Circular interpolation and tangential-path following for applications common in Glass Manufacturing are also supported.



PiCPro's camming and high-speed interrupt capability (0.25 msec) deliver exceptional performance for demanding applications such as press feed and high-speed labeling.



PiCPro's flexible motion control allows for the superimposing of motion profiles that are calculated on the fly, to the existing profiles.



A Strong Foundation for Innovation

“Why Kollmorgen? Their unique ability to understand and apply electronics, mechanics and control is a real advantage for us.”

Control Your World

A powerful IEC61131 based solution for factory automation applications where performance, ease of use, interoperability and extensibility are critical.

The PiCPro Intergrated Solution is an IEC61131 based Machine and Motion Control solution designed for factory automation applications including packaging, printing, converting, metal fabrication, industrial robotics, and textile production.

Kollmorgen helps customers worldwide build better machines faster by uniquely offering the entire electromechanical spectrum and the advanced controls that are designed and proven to work together and are designed to optimize system performance.

From over 200 standard function blocks that imbed decades of experience in an easy to use tool, to an observer, an advanced control algorithm that optimizes performance gains from Kollmorgen's industry leading direct drive motor technology, Kollmorgen understands what it takes to help you build a better machine faster.

The building blocks provide an integrated architecture which can form the basis of your next generation machine, and beyond.

Core Motion Control Technologies

- Three levels of expertise form the core foundation and drive everything we do. When combined, they result in true customer solutions.
- Kollmorgen leverages its vast experience in the magnetic, mechanics, and control technologies to develop products and systems.



Electromagnetics

Kollmorgen is skilled at harnessing and controlling electrified magnetic fields to precisely create speed and torque.



Mechanics

We are known for optimizing the science of various sliding actions between materials to provide linear or rotary motion.



Control

Our advanced technologies provide precise regulation of speed, torque, position and direction of magnetic and mechanical devices.

MMC Control Systems

A complete IEC61131 Machine & Motion Control Solution

The MMC Family contains everything you need for a complete, high performance machine and motion control solution.

MMC Controls – MMC Digital Controls – The MMC family of digital controls includes both a Drive Resident control and a Stand-alone control. The drive resident version supports 1, 2, 4, 8, or 16 axes of control for applications up to 16 axes and the stand-alone version supports 2, 4, 8, 16, 32, and 64 axes of control for applications up to 64 axes.

The MMC control is easily daisy-chained to the MMC Smart Drive using shielded CAT5 Ethernet cable providing a deterministic real time command and drive data exchange Digital Link digital network.

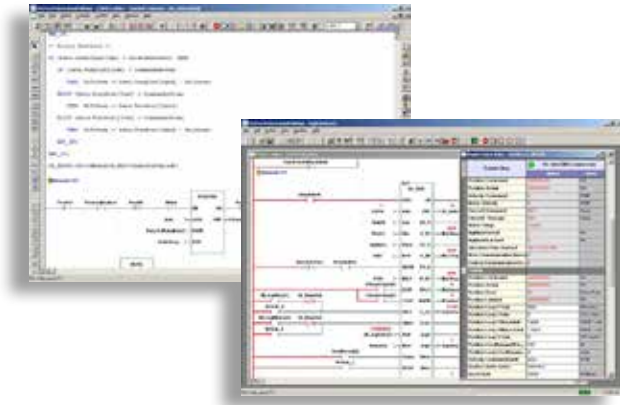


Servo Amplifiers – The MMC Smart Drive family of amplifiers provide 250 W to 65 kW continuous output power in a compact, easy-to-apply package. Available in 24 Vdc, 230 Vac single and three phase, and 460 Vac three phase versions, the MMC Smart Drives feature an integral power supply, Safe Torque Off option, and plug and play power and feedback cables to standard Kollmorgen motors.

Standard auxiliary feedback supports 1 1/2 axis control for each drive in the network. Dual-Loop feedback capability is also standard. Flexible feedback options of incremental encoder, resolver, BiSS, EnDat2.1, sine-encoder and SFD.

Servomotors - MMC Smart Drives connect with plug-and-play power and feedback cables to Kollmorgen's AKM, Housed DDR and Cartridge DDR motor families. Use Motion Solutions Sizing Software to select a motor and drive combination for your machine's mechanical configuration.





PiCPro Software – PiCPro is used for IEC61131 application program development, and drive setup and tuning. Through a single point connection to the MMC Control, a virtual connection is made to every drive on the Digital network. Use the PiCPro oscilloscope and drive list to monitor and tune the drives on the network. Download parameters and firmware to all drives at once with a single click of the mouse. At the same time, use PiCPro for application program development with IEC61131 ladder logic, function block and structured text languages. PiCPro provides all of the tools you need for high-performance integrated machine and motion control applications.

Digital Link Drive Interface Unit

The Digital Link network interface capability can be expanded to control analog drives and devices via the Digital Link Drive Interface Unit (DL-DIU). The DL-DIU features a +/-10 Vdc analog output, an incremental encoder feedback input and 24 Vdc I/O.



Expand Via Our Remote I/O

Applications that require I/O beyond what is available on the MMC control and MMC Smart Drive are easily expanded using Slice I/O and/or Block I/O. The Slice I/O resides on the MMC control/drive Ethernet network while the Block I/O provides access via a four-wire connection both allowing decentralized I/O placement where it is needed.

Select from our family of I/O modules including discrete I/O, analog I/O and motion I/O.

Operator Interfaces – A complete family of HMI terminals from the cost effective H-Series to the feature rich Exter are offered including compact 2-line monochrome displays up to 15.1" TFT color touch screens. With a tag-name database scheme simplifying programming and integration with the MMC Controls, the operator interface terminals are the final piece to form a complete PiCPro Integrated System.



MMC Control Systems

MMC Controls - for applications

PiCPro Drive Setup and Motion Programming

PiCPro provides single point programming for logic, motion, drive commissioning, tuning, process, data management and communications. A virtual connection is established through this single point to allow you to access all of the drives on the network.

Safe Torque Off (Optional)

Integrated Safety feature to prevent unwanted motion.



Motor Feedback

Use Kollmorgen's AKM conventional rotary servomotors, or direct drive Housed DDR or Cartridge DDR motors.

Auxiliary Feedback

Wire your master encoder to this connector for use in 1 1/2 axis master/slave motion applications. Or use the dual-loop feedback capability to improve control.

Drive I/O

Each MMC Smart Drive has 8 DC inputs, 4 DC outputs and 1 analog input that can be used in the application program. Two of the inputs are high speed for position capture and registration. The states of the drive I/O are available to the application program over the Digital Network.

Digital Controls



MMC D32-D64



MMC DSA 2-16



Drive Resident 1-16

Machine Control I/O

Drive-Resident MMC controller has 8 DC Inputs and 8 DC Outputs for use in your application program. The outputs may be used as PLS outputs.

Options from 1 to 64 axes of control

MMC Controller

The MMC Drive Resident Control can control up to 16 servo axes of motion. The control card is installed in a MMC Smart Drive and can be connected up to 15 additional axes through a deterministic RJ45 CAT5 Digital Link interface. Drive Resident controllers are available in 1, 2, 4, 8 and 16 axes versions.



Block I/O Options

Applications that require I/O beyond what is available on the control and the drives are easily expanded using Block I/O. A simple four-wire connection provides access to up to 77 I/O blocks that can be mounted locally or up to 200 feet apart. Select from our family of Block I/O modules including discrete I/O, analog I/O and motion I/O.

MMC Multi-Smart Drive Control Scheme

Up to 16 nodes can be connected on the Digital Link digital network in any combination of the MMC Smart Drive, Slice I/O coupler, or Digital Link Drive Interface Unit (DL-DIU). Real-time data, such as torque, current and fault history is available to the application program over the Digital Link. Download firmware or parameters to all of the drives on the network at once with a single click of the mouse using PicPro.



HMI Serial Port Connection

The serial port allows you to connect to our operator interfaces, or a third-party serial device.



10/100 Ethernet for Device Connectivity

The built-in 10/100 Ethernet port provides a wide variety of connectivity options. Connect to our Exter or H-Series HMI's, third-party devices using our OPC Server, ModbusTCP or other control protocols, transfer recipe or data files to and from the RAMDISK using TFTP file transfer, share data between controls using UDP packets, and access your plant network. You can also simultaneously run PicPro over Ethernet either directly or remotely.

MMC Control Systems

MMC-Dx Control Specifications

Feature	MMC-D1	MMC-D2	MMC-D4	MMC-D8	MMC-D16	MMC-D32	MMC-D64
Closed Loop Axes	1	2	4	16	16	32	64
Digitizing (Read-Only or Half) Axes	1	2	4	16	16	32	64
Processor Speed	64 MHz	64 MHz	64 MHz	96 MHz	96 MHz	400 MHz	400 MHz
Application Memory	1.3 MBytes	1.3 MBytes	1.3 MBytes	1.3 MBytes	1.3 MBytes	3 MBytes	3 MBytes
RAMDISK Memory	256 kBytes	256 kBytes	256 kBytes	256 kBytes	256 kBytes	960 kBytes	960 kBytes
General Purpose Inputs (24 Vdc)	8	8	8	8	8	0	0
General Purpose Outputs (24 Vdc)	8	8	8	8	8	0	0
Drive I/O	8 Input; 4 Outputs, 1 Analog Input (12-bit) per drive in the system						
User Serial Port	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Block I/O Capability	No	Yes	Yes	Yes	Yes	Yes	Yes
On-Board Ethernet Capability	No	Yes	Yes	Yes	Yes	Yes	Yes
Option Module Support	No	No	No	No	No	Yes - up to 4	Yes - up to 4
32 I/O, DeviceNet, Profibus	N/A	N/A	N/A	N/A	N/A	Optional	Optional

MMC-DSAx Control Specifications

Feature	MMC-DSA2	MMC-DSA4	MMC-DSA8	MMC-DSA16
Closed Loop Axes	2	4	8	16
Digitizing (Read-Only or Half) Axes	2	4	8	16
Processor Speed	64 MHz	64 MHz	96 MHz	96 MHz
Application Memory	1.3 MBytes	1.3 MBytes	1.3 MBytes	1.3 MBytes
RAMDISK Memory	256 kBytes	256 kBytes	256 kBytes	256 kBytes
General Purpose Inputs (24 Vdc)	8	8	8	8
General Purpose Outputs (24 Vdc)	7	7	7	7
Drive I/O	8 Input; 4 Outputs, 1 Analog Input (12-bit) per drive in the system			
User Serial Port	Yes	Yes	Yes	Yes
Block I/O Capability	No	Yes	Yes	Yes
On-Board Ethernet Capability	No	Yes	Yes	Yes
Option Module Support	Yes - up to 4	Yes - up to 4	Yes - up to 4	Yes - up to 4
32 I/O, DeviceNet, Profibus	Optional	Optional	Optional	Optional

MMC Control Products

	Family Member	Description	Dimensions: Inches (mm) W x H x D
Drive Resident	MMC-D1	1 1/2 Axis	Installs inside MMC Smart Drive
	MMC-D2	2 Axis	Installs inside MMC Smart Drive
	MMC-D4	4 Axis	Installs inside MMC Smart Drive
	MMC-D8	8 Axis	Installs inside MMC Smart Drive
	MMC-D16	16 Axis	Installs inside MMC Smart Drive
Stand Alone	MMC-DSA2	2 Axis	2.25" (57.15) x 9.6" (243.84) x 5.3" (134.52)
	MMC-DSA4	4 Axis	2.25" (57.15) x 9.6" (243.84) x 5.3" (134.52)
	MMC-DSA8	8 Axis	2.25" (57.15) x 9.6" (243.84) x 5.3" (134.52)
	MMC-DSA16	16 Axis	2.25" (57.15) x 9.6" (243.84) x 5.3" (134.52)
	MMC-D32	32 Axis	2.25" (57.15) x 9.6" (243.84) x 5.3" (134.52)
	MMC-D64	64 Axis	2.25" (57.15) x 9.6" (243.84) x 5.3" (134.52)
Options	MMC-32 in / 32 Out	32 - 24 Vdc Inputs and 32 - 24 Vdc Outputs	1.28" (35.21) x 9.59" (243.59) x 5.25" (133.3)
	MMC-AIO	4 1/2 Axis Interface Expansion Module	1.28" (35.21) x 9.59" (243.59) x 5.25" (133.3)
	MMC-D	DeviceNet Master Module	1.28" (35.21) x 9.59" (243.59) x 5.25" (133.3)
	MMC-P	Profibus-DP Master Module	1.28" (35.21) x 9.59" (243.59) x 5.25" (133.3)

MMC Control Systems

MMC Controller

Drive Resident Version (1 to 16 Axis)

The MMC Controller is available in drive resident version in a single axis (1 Axis) controller up to 16 axis controller.

The Single-Axis Controller MMC-D1 includes onboard Digital 24 Volt I/O (12 Inputs/12 Outputs), and User Port(Serial)

The 2 Axis through 16 Axis Drive Resident Controllers adds a user ethernet port and block I/O to the Drive Resident Version.

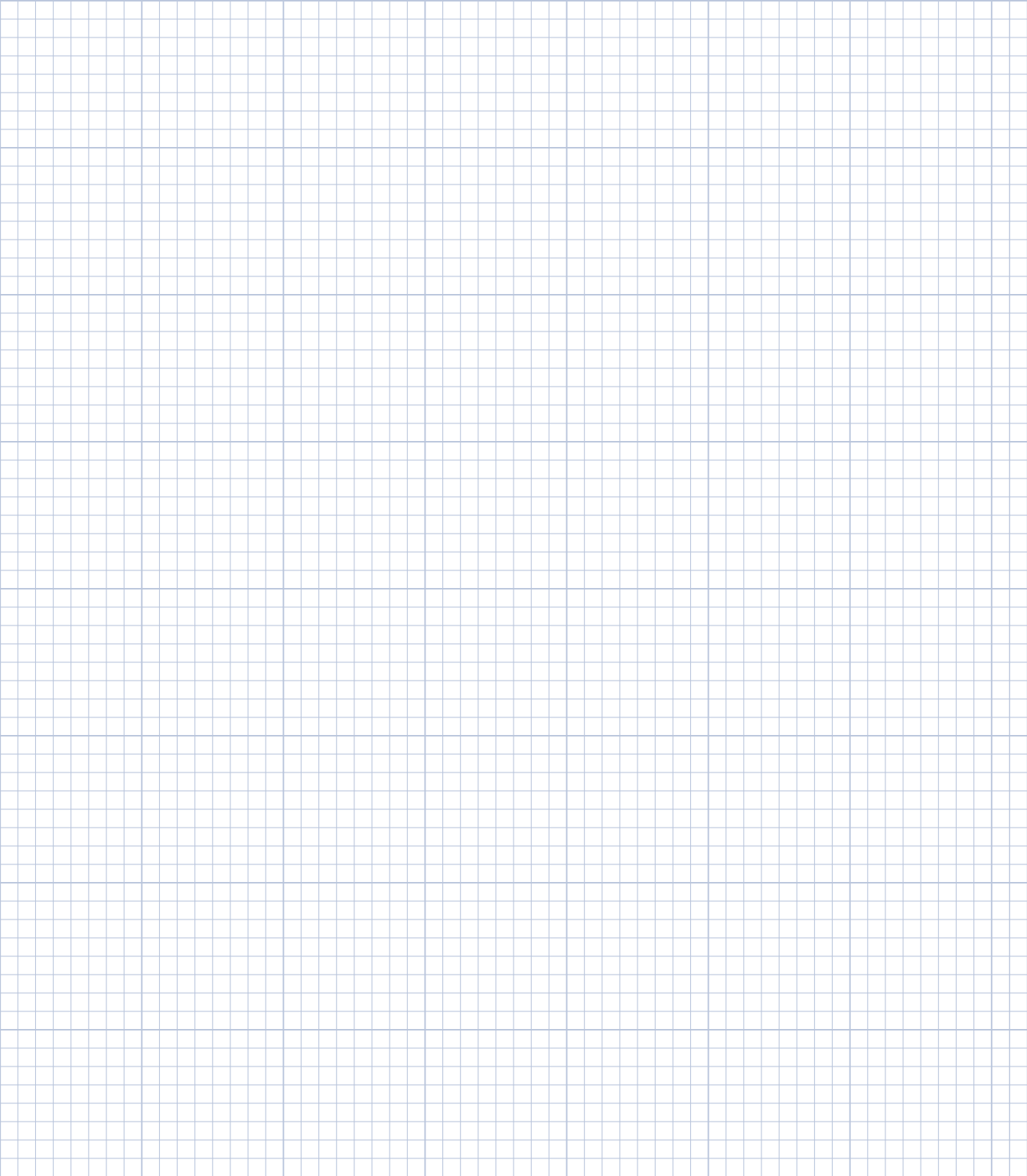
The Drive Resident MMC Controller cannot reside in a narrow version of the MMC Drive.

Standalone Version (2 to 64 Axis)

The standalone MMC Controller is available in 2 thru 64 axis versions. The Controller includes a User Port(Serial), User Ethernet Port and support for Block I/O and Slice I/O.

Model Number	Description	Control Type	Part Number
MMC-D1	Digital MMC Controller, 1 Axis, Digital I/O (8 IN/8 OUT) User port(Serial RS232/422/485)	Drive Resident	M.3000.0164
MMC-D2	Digital MMC Controller, 2 Axis, Digital I/O (8 IN/8 OUT) User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Drive Resident	M.3000.0165
MMC-D4	Digital MMC Controller, 4 Axis, Digital I/O (8 IN/8 OUT) User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Drive Resident	M.3000.0166
MMC-D8	Digital MMC Controller, 8 Axis, Digital I/O (8 IN/8 OUT) User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Drive Resident	M.3000.0518
MMC-D16	Digital MMC Controller, 16 Axis, Digital I/O (8 IN/8 OUT) User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Drive Resident	M.3000.0167
MMC-DSA2	Digital MMC Controller, 2 Axis, Digital I/O (8 IN/7 OUT) User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Stand-Alone	M.3000.0652
MMC-DSA4	Digital MMC Controller, 4 Axis, Digital I/O (8 IN/7 OUT) User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Stand-Alone	M.3000.0653
MMC-DSA8	Digital MMC Controller, 8 Axis, Digital I/O (8 IN/7OUT) User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Stand-Alone	M.3000.0654
MMC-DSA16	Digital MMC Controller, 16 Axis, Digital I/O (8 IN/7 OUT) User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Stand-Alone	M.3000.0655
MMC-D32	Digital MMC Controller, 32 Axis, User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Stand-Alone	M.1302.5109
MMC-D64	Digital MMC Controller, 64 Axis, User port(Serial RS232/422/485), Ethernet, Block I/O, Slice I/O	Stand-Alone	M.1302.5110

Notes



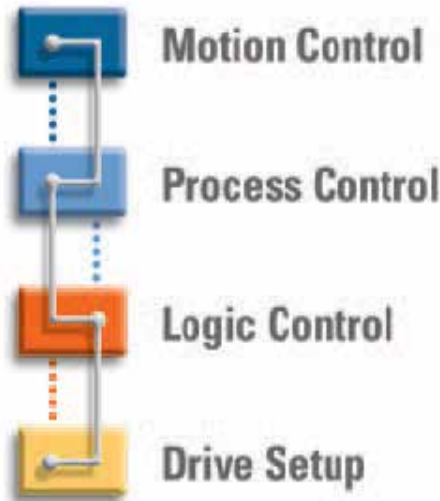
The PiCPro Integrated Solution

The PiCPro solution offers the most flexible tool for motion programming available providing a fully integrated environment for your entire application. Combining motion, logic and process control coupled with servo drive setup and tuning, PiCPro truly provides a single-point solution.

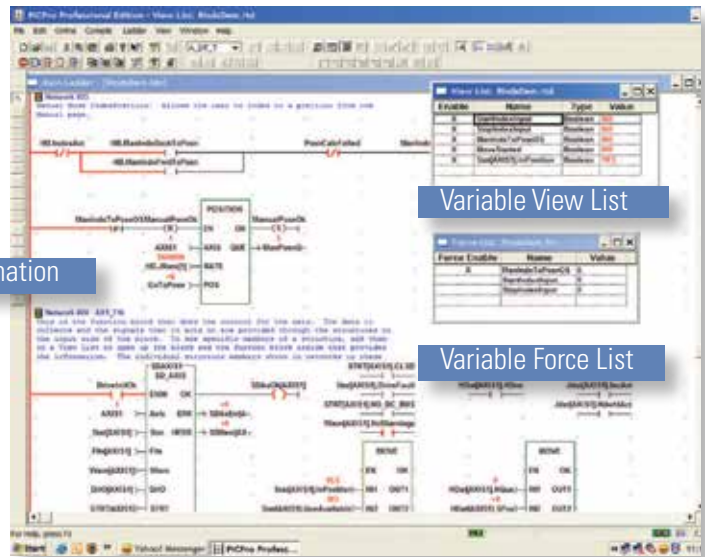
Powerful tools for the application engineer include over 200 standard functions, the ability to develop your own functions as well as time-tick event driven and servo-synchronous task. Put it all together and you have the motion capabilities to handle the application challenge.

Totally Integrated Machine and Motion Control

PiCPro's IEC61131 Solution Provides a Tightly Integrated Solution



PiCPro IEC61131 Software

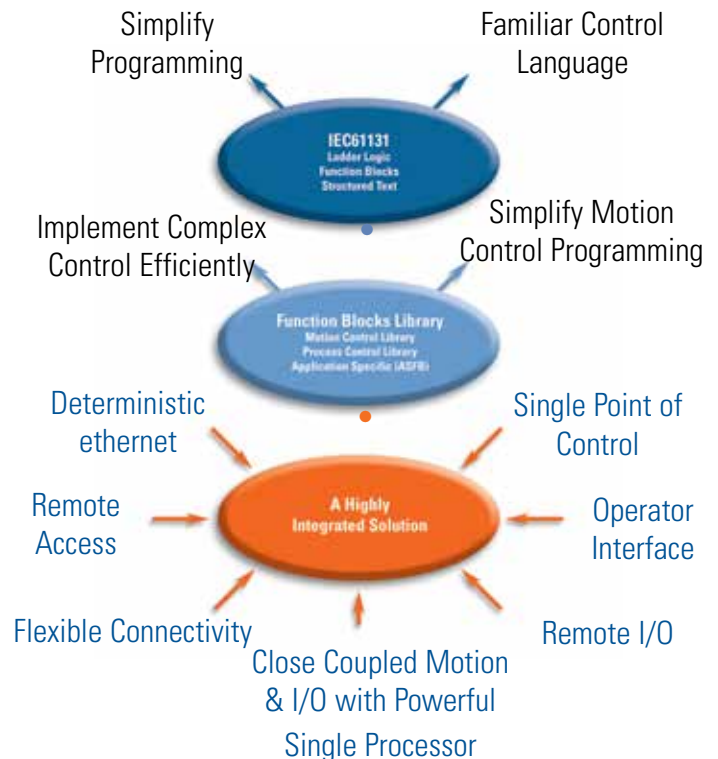


Online animation illustrating rung power-flow

PiCPro provides tools to:

- Minimize Development Time
- Simplify Installation
- Remotely Monitor Complete System
- Maximize System Performance
- Commission Drives

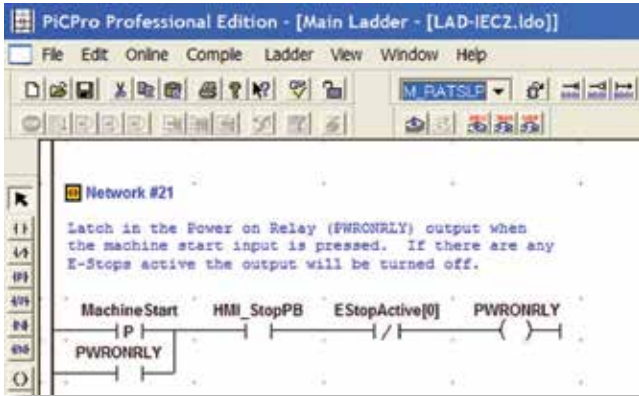
- Optimize servo axes performance.
- Remote Access Capability
- Access to nearly any servo drive parameter
- Scope traces can be saved and also formatted for MS excel



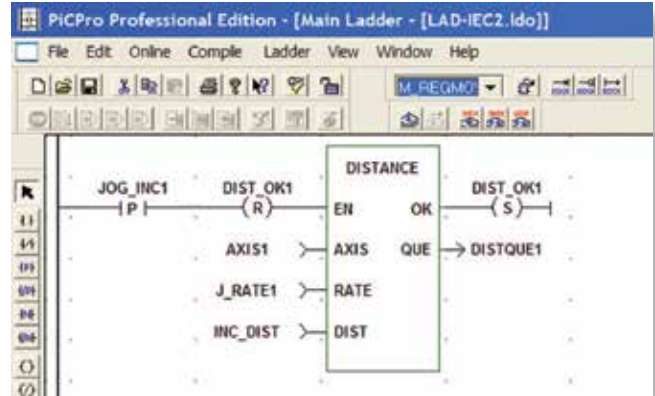
PiCPro Integrated Solution

The Power of PiCPro

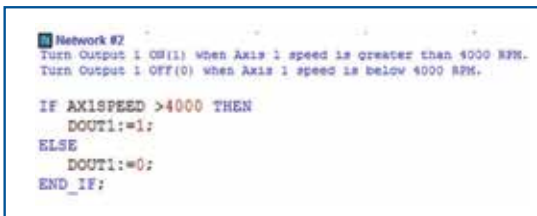
Program in IEC61131 using Ladder Logic, Function Blocks and Structured Text.
All three formats can be used interchangeably to create the most efficient program.



Ladder Logic for machine sequencing



Function Blocks for Simple to Complex Motion

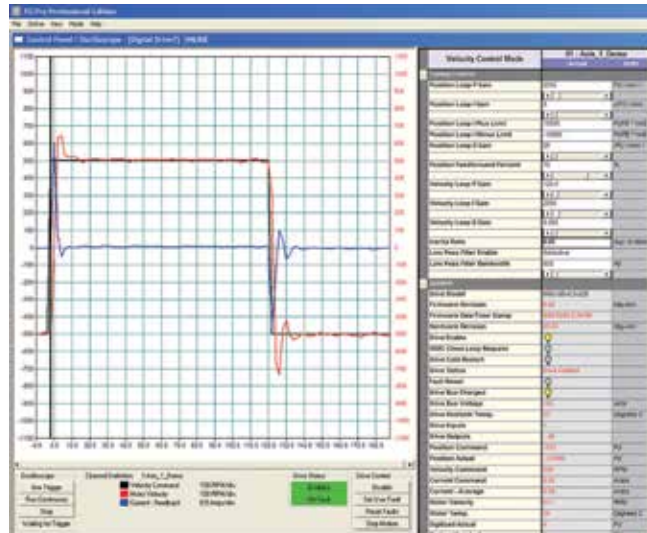


Structured text for data manipulation and mathematical calculations

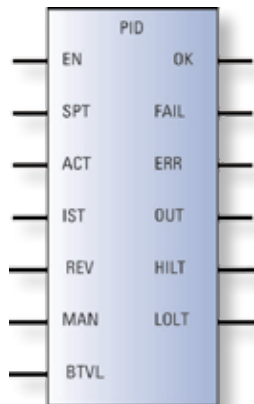
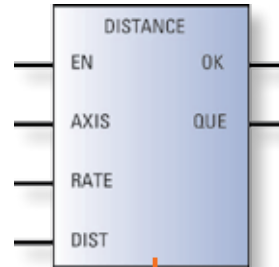
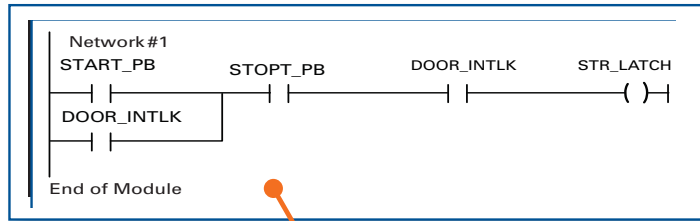
Integrated Drive Maintenance Screen and Oscilloscope

- The Drive Maintenance Screen enables the monitoring and optimization of all the drives in the Network.
- The Control panel enables the servo axes to be operated independently from application program to allow for quick commissioning of servo axes.
- The four channel Oscilloscope enables the optimization and monitor axis performance real-time
- The software tools for Oscilloscope allows the saving and exporting of scope data

Expert View	01: Axis_1_Demo (connected)	
	Actual	Units
Custom Motor	Standard	
Firmware Revision	8.00	Major-min
Firmware Date/Time Stamp	8/25/2008 2:24 PM	
Hardware Revision	05.00	Major-min
Drive Enable		
MISC Close Loop Request		
Cold Restart Required		
Drive Status	Drive Ready	
Drive Cold Restart		
Fault Reset		
Drive Bus Charged		
Drive Bus Voltage	183	Volts
Drive Heatsink Temp.	33	Degrees C
Drive Inputs	1	
Drive Outputs	4	
Active Operating Mode	Velocity Control	
Position Command	-212	Pu
Position Actual	-148233	Pu
Velocity Command	0	APU
Motor Velocity	0	APU
Current Command	0.00	Amps
Current - Average	0.01	Amps
Motor Temp.	33	Degrees C

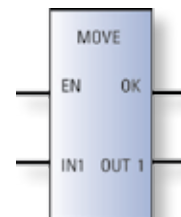
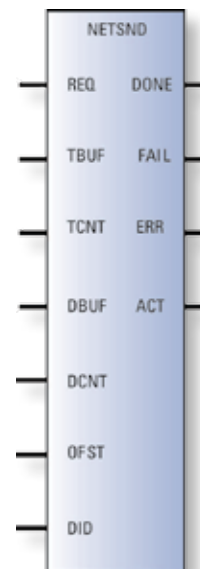
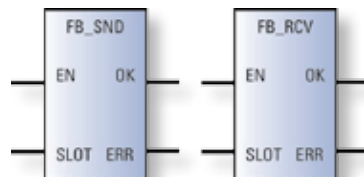
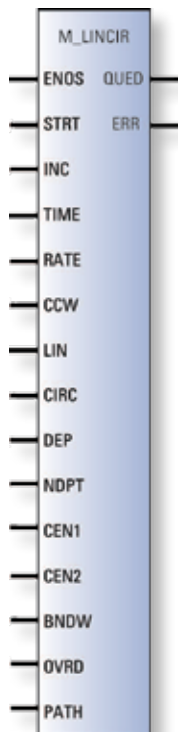
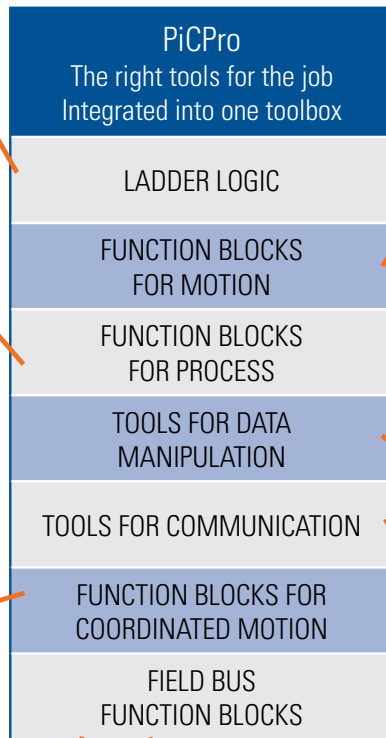


PiCPro - The Right Tool for the Job



Motion Control Function Blocks

- Position Mode
 - Absolute and Incremental
- Velocity Mode Operation - Jog
- Current (Torque) Mode Operation
- S-Curve control
- Switch Modes on-the-fly with bumpless transfer
- Master Slave/Electronic Gearing
- Electronic Camming
- PLS (Programmable Limit Switch)



PiCPro Integrated Solution

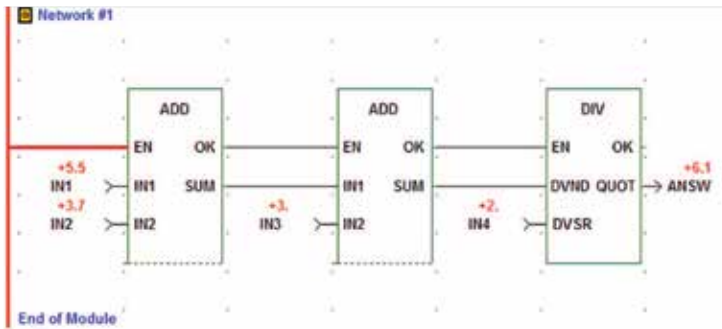
The Flexibility of the UDFB

What is a UDFB?

UDFB stands for User Defined Function Block and is a function block created by the user to simplify programming and software development. It can also be used to protect intellectual property. An UDFB can be stored in the user's library to be used in future programs.

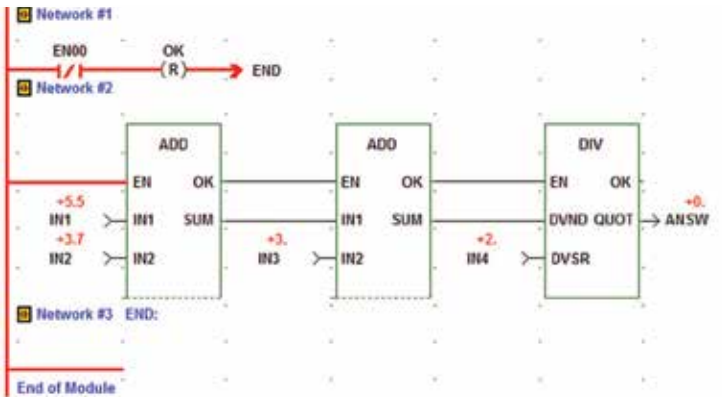
How does a user create an UDFB?

In order to create an UDFB, the user starts with a new ladder and builds the functionality desired. In our example, we will create a function block that adds two numbers, subtracts a third number and divides that value by a fourth number.



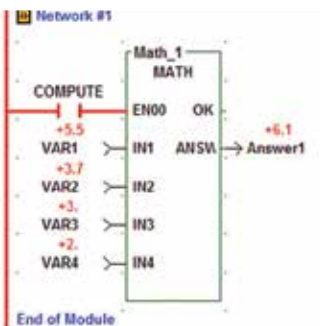
The ladder to the left Adds IN1 to IN2, Subtracts IN3 from this sum and divides it by IN4. The solution is held in the variable which has the tag ANSW.

If we want to turn this into a UDFB, first we need to add two new networks to the program that would control the execution of the ladder. The revised ladder and the associated software declarations are shown below. Unless the EN00 input is energized, the calculation logic is jumped.



Name	Type	A.	I/O Point	Initial Value	Long Name
EN00	BOOL	I			
OK	BOOL	O			
#I1	REAL	I		+5.5	
#I2	REAL	I		+3.7	
#I3	REAL	I		+3	
#I4	REAL	I		+2	
ANSW	REAL	O			
End List	void				

The first input and output are assigned to Enable and the OK. Other inputs and outputs should be declared in the order they will appear on the UDFB template. Once this is complete it can be compiled into a function block.



The compiled UDFB at the left obtains the same results as the original ladder, but is easier to read. It is also re-usable since it now resides in the users UDFB library.

The example chosen was rather simple, but there are essentially very few limitations as to what can be placed inside a UDFB. It can be a combination of ladder logic, function blocks or structured text.

It is an ideal way to simplify troubleshooting because the maintenance technician does not have to be concerned with what goes on inside the UDFB.

It is also an excellent way to protect intellectual property. Unless the source code used to develop the original ladder is provided to the customer, the UDFB cannot be opened.

Designed for Performance - PicPro's IEC61131 Machine & Motion Control

Single Processor Design

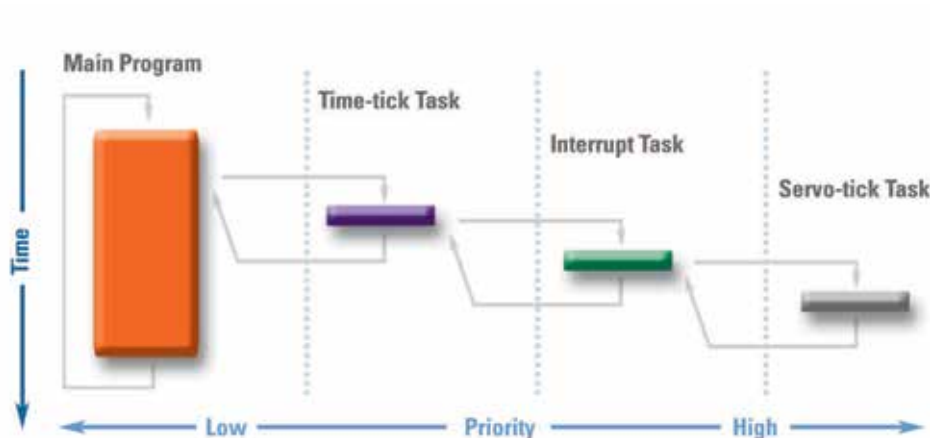
Kollmorgen's single processor design does not have the inherent latencies associated with dual-processor designs. Don't be fooled thinking that more processors in the system will result in a faster machine operation. While other systems are transferring information between processors, PicPro is attending to time critical events.

Aren't you tired of paying for multi-processor systems to get the performance your machine requires?

Since the Kollmorgen processor is not burdened by waiting for information to be passed to it; it can respond quickly and initiate action to asynchronous events.

High Speed Interrupts

Event Driven Interrupts – 0.25 msec interrupts allows for rapid response and event coordination resulting in tighter system synchronization capability and increased precision.



Pre-Compiled Code

Kollmorgen's PicPro runs pre-compiled code. Once again, the inherent design approach to run pre-compiled code eliminates natural system latencies. Interpreted code creates one-more layer of CPU processing and again, more delays. It is no wonder many other systems use multiple-processors to try and increase performance.

How do you access the program you ask?

Yes, we thought through this functionality and to address this provided in every controller has an on-board user accessible RAM disk to allow for storage of the source code to allow immediate access to the program, that is, at the programmers discretion.

PiCPro Integrated Solution

PiCPro's IEC61131 Advanced Motion Control Software

Sophisticated Controls derived from decades of application experience in the Converting, Printing, Packaging and Metal Fabrication industries:

- Electronic Lineshaft
- Unwind/Rewind
- Rotary Knife
- Flying Shear
- Press Feed
- High-Speed Labeling
- Linear and Circular Interpolation
- Registration Control



PiCPro has you covered
From Basic to the most Complex Control

Electronic Lineshaft Control

- Implement Electronic Lineshaft Control with an easy to use function block (RATIO GEAR)
- Synchronize 1 to 64 axes with a Virtual Master, Servo Axis, or Auxiliary Feedback
- Change Master-Slave Ratio on the fly by calling function block (NEWRATIO)



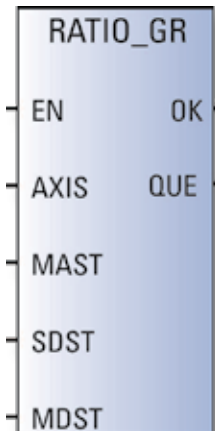
RATIO GEAR Function Block

Slave Axis under Servo Control

Master Axis

Slave distance to move

Master distance to follow



Electronic CAMMING

Simple Electronic CAM based function blocks are provided for complex control for applications such as Rotary Knife and Flying Shear. A CAM Table is used to define the Master-Slave relationship. A flexible data structure coupled with on-board memory allows for storing multiple CAM profiles and supports changes to CAM table on-the-fly. Changes can be made from the application or received from an external controller, computer or HMI without stopping.

Based on application requirements, varying levels of control and sophistication are available:

- | | |
|-------------|--|
| RATIO CAM | Master-Slave segments defined by constant ratio |
| RATIO SLOPE | Master-Slave relationship defined by constant or linear (slope) ratio <ul style="list-style-type: none"> • Allows for a gradual transition between ratio changes |
| RATIO REAL | Master-Slave relationship defined by polynomial or trig equation <ul style="list-style-type: none"> • Most sophisticated and optimum position based control • Maintain phase synchronization with jerk control |

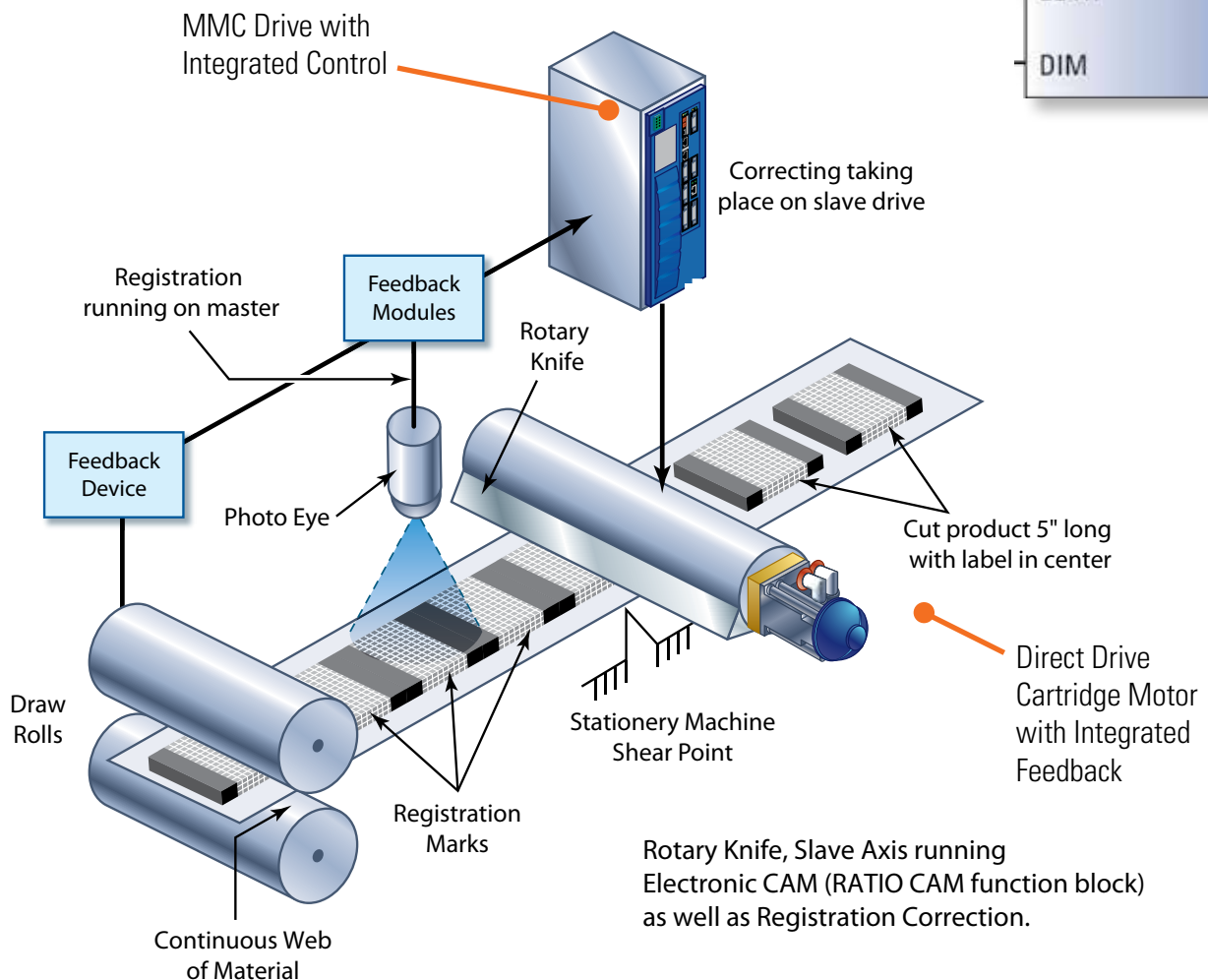
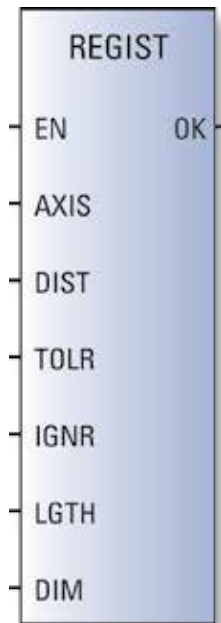
PiCPro's IEC61131 Machine & Motion Control

Registration Control

Contained in a single Registration function block is years of application experience for Mark-to-Mark registration control featuring:

- Use "Ignore" to define the active window for mark-detection allowing for register control on webs with printing inline with registration marks
- Automatic "registration" correction
- Use "Tolerance" to define criterion for a "good-mark" to eliminate an unwanted correction due to a process failure such as a mark-detection failure
- Registration correction can be phased in over multiple cycles to minimize web disturbances

Basic single Mark Registration Control is also supported.
Upon detecting mark, move a pre-defined distance and stop.



Mark-to-Mark Registration Control

MMC Smart Drive Servo Amplifiers

Kollmorgen's MMC Smart Drive servo amplifiers provide 250 W to 65 kW continuous output power in a compact, easy-to-apply package. Available in 24 Vdc, 230 Vac single and three phase, and 460 Vac three phase systems, MMC Smart Drives operate over wide line voltage ranges.

Application of the MMC Smart Drives is simple. The integral power supply, many feedback types supported, Safe Torque Off option, and plug-and-play cable sets simplify installation. Configuration, tuning and maintenance are intuitive using PiCPro software with features including basic and expert parameter views, a software storage oscilloscope and auto-tune.

Use PiCPro's ladder logic, function block and structured text programming languages to develop complete multi-axis motion control solutions using the MMC Family of Controls.

The Benefits of MMC Smart Drives

A robust design power stage design combined with the Digital network provides a reliable system with powerful data, diagnostic and remote monitoring capability.

Includes two feedback signals per drive and flexible feedback options, the drives series can support a broad range of applications from harsh environments suitable with resolver feedback to high-precision requirements where the sine-encoder technology excels.

The MMC Smart Drive also supports the new emerging standard for sine-encoder technology, the BiSS feedback, which is the industries' first open and fully 100% digital sine-encoder based feedback.

Digital Network – High Speed & Deterministic

Axis Update Rate from 0.25 msec to 8.0 msec

Axis Update Rate is Independently Selected by Servo Axis

Servo Loop Update Rates

Position Loop 250 usec

Velocity Loop 250 usec

Current Loop 125 usec

Servo Loop Control

Position Loop PID control with Velocity Feed-forward gain

Velocity Loop PID control with Acceleration Feed-forward gain

Current Loop PI Control

Commutation 3 Phase Sinusoidal, Space Vector Modulated

Advanced Control Algorithms

Observer Provides outstanding servo system "stiffness", critical for direct drive systems

Bi-Quad filter Allows flexibility in addressing machine resonance conditions



MMC Smart Drive Servo Amplifiers

MMC-S200-DLS Smart Drive 230 Vac

- Compliments Digital MMC Smart Drive Family
- Connects directly to the Digital Link motion bus
- Available in either AC or DC input voltages
- Base drive support SFD feedback devices
- DLS Option Card supports feedback types:
 - incremental encoder
 - BiSS
 - EnDat

MMC Smart Drive 230 Vac

- The 230 Vac MMC Smart Drive offers a power range from 0.5 kW to 3.0 kW.
- The voltage range is for use with 115 Vac through 230 Vac single phase systems.
- A narrow version (N) of the 230 Vac drive is offered for multi-axis applications by eliminating the space used by the drive resident controller.
- Safe Torque Off

MMC Smart Drive 460 Vac

- The 460 Vac MMC Smart Drive offers a wide-power range from 1.3 kW to 65 kW.
- The voltage range is for use with 230 Vac through 480 Vac three phase systems.
- Safe Torque Off
- Analog Input

MMC SDN Smart Drive 230 and 460 Vac

- The 230 and 460 Vac MMC SDN Smart Drives offer a power range from 0.9 kW to 14.4.kW.
- Smaller footprint
- Expanded feedback options
- Built in Regen resistor
- Safe Torque Off
- Analog Input and Output

MMC Smart Drive

Product Specifications Hardware Interfaces

Interface	MMC-SD	MMC-SDN	S200-DLS	Description
Digital Inputs (User I/O)	8	6	4	Fully Programmable Optically Isolated 24 Vdc (30 Vdc max) Configurable for Specific Function and/or Use in Application Logic <ul style="list-style-type: none"> • Hardware Enable, Fault Reset • Position End-of-travel limit (Plus and Minus) • Current Limit (Plus and Minus) • Velocity Loop Integrator Inhibit and Hold • (2) High-Speed Position Latch (50 usec)
Digital Outputs (User I/O)	4	4	2	Optically Isolated 24 Vdc (27.6 Vdc max) Source only (50 mA) Short-circuit and overload protected Fully Programmable Configurable for Specific Function and/or Use in Application Logic <ul style="list-style-type: none"> • Drive Ready, Drive Enabled, Drive Bus Charged • Fault, Warning, • Current Limit Indicator (Plus and Minus) • Programmable Limit Switch (PLS) • In-Position • Up to Speed, At Speed, In Speed Window
Safe Torque Off	1	1		Enable/Disable Drive Current to the Motor
Analog Input (User I/O)	1	1	1	+/- 10 Vdc analog signal 12 bit resolution MMC-SD, 14 bit S200-DLS, 16 bit MMC-SDN Read access in application code
Analog Output (User I/O)		1		12 bit resolution Write access in application code
Relay Output	1	1	1	Motor Brake Control, Screw Terminals BR+, BR-
Feedback One (F1)	1	1	1	Incremental Encoder with Commutation Signals, BiSS, Endat 2.1, Stegman, SFD. Resolver on MMC-SD and MMC-SDN only,
Feedback Two (F2)	1	1	1	Incremental Encoder with Commutation Signals, SFD
Logic Power	1	1	1	24 Vdc Input for Logic Power independent of Main AC Voltage Supply

MMC Smart Drive Servo Amplifiers

MMC SMART DRIVE SERVO AMPLIFIERS

Model Numbers and Current Ratings

MMC S200 DLS Smart Drive

S2 02 6 0-DLS

Product Family

Current Rating

Nominal Line Voltage

3 = 20-90 Vdc

6 = 120/240 Vac

No Electrical Options

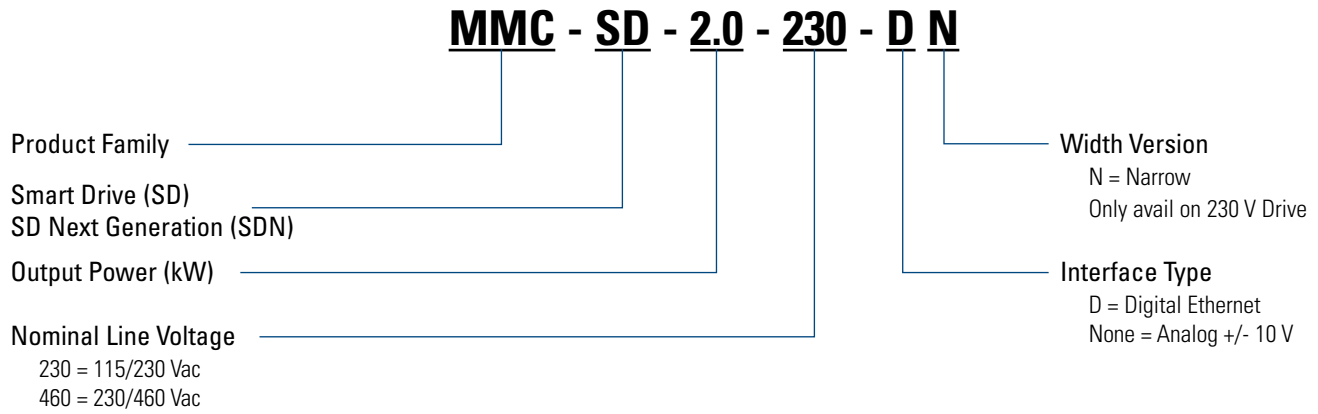
Interface Type

D = Digital Ethernet

None = Analog +/- 10 V

Model Number	Voltage	I cont		I peak		Part Number
		A rms	0-peak	A rms	0-peak	
S20330-DLS	90 Vdc	3	4.2	9	12.7	S20330-DLS
S20630-DLS		6	8.5	18	25.5	S20630-DLS
S20260-DLS	115/230 Vac	1.5	2.1	4.5	6.4	S20260-DLS
S20360-DLS		3	4.2	9	12.7	S20360-DLS
S20660-DLS		6	8.5	18	25.5	S20660-DLS
S21260-DLS		12	17	30	42.4	S21260-DLS
S22460-DLS		24	33.9	48	67.8	S22460-DLS

Model Numbers and Current Ratings



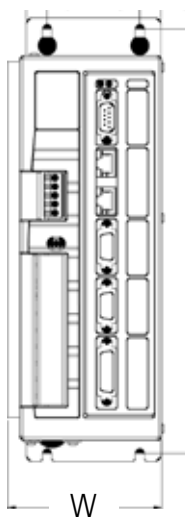
Model Number	Voltage Vac	I cont		I peak		Part Number
		A rms	0-peak	A rms	0-peak	
MMC-SD-0.5-230-DN	115/230	1.8	2.5	5.3	7	M.3000.0458
MMC-SD-0.5-230-D						M.3000.0461
MMC-SDN-0.9-230-D		3	4.2	9	12.7	M.3000.1425
MMC-SD-1.0-230-DN		3.5	5	10.6	15	M.3000.0459
MMC-SD-1.0-230-D						M.3000.0462
MMC-SDN-1.8-230-D		6	8.5	18	25.4	M.3000.1426
MMC-SD-2.0-230-DN		7	9.9	21.2	30	M.3000.0460
MMC-SD-2.0-230-D						M.3000.0463
MMC-SDN-3.6-230-D		12	17	30	42.4	M.3000.1427
MMC-SDN-7.2-230-D		24	34	48	67.8	M.3000.1428
MMC-SD-1.3-460-D	230/460	2.1	3	4.2	5.9	M.3000.0464
MMC-SDN-1.8-460-D		3	4.2	9	12.7	M.3000.1300
MMC-SD-2.4-460-D		3.9	5.5	7.8	11	M.3000.0465
MMC-SDN-3.6-460-D		6	8.5	18	25.5	M.3000.1301
MMC-SD-4.0-460-D		6.3	8.9	12.7	18	M.3000.0466
MMC-SD-6.0-460-D		9.5	14	19.0	26.9	M.3000.0467
MMC-SDN-7.2-460-D		12	17	30	42.4	M.3000.1302
MMC-SD-8.0-460-D		12.7	18	25.4	35.9	M.3000.0468
MMC-SD-12.0-460-D		19.4	27.4	38.9	55	M.3000.0469
MMC-SDN-14.4-460-D		24	33.9	48	67.8	M.3000.1303
MMC-SD-16.0-460-D		25.8	36.5	51.6	73	M.3000.0470
MMC-SD-24.0-460-D		38.9	55	77.8	110	M.3000.0471
MMC-SD-30.0-460-D		49.0	69.3	77.8	110	M.3000.0021
MMC-SD-42.0-460-D		66.0	93.3	103.9	147	M.3000.0022
MMC-SD-51.0-460-D		83.0	117.4	133.6	189	M.3000.0023
MMC-SD-65.0-460-D		108.0	152.7	147.8	209	M.3000.0024

MMC Smart Drive Servo Amplifiers

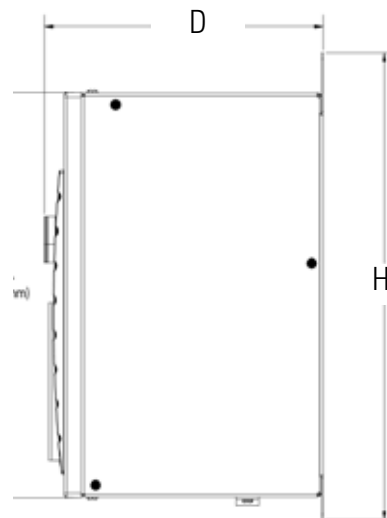
Drive Dimensions

Model Number	Dimensions			Dimensions		
	W	H	D	W	H	D
	inch			mm		
S20260-DLS	2.16	6.9	5.18	54.8	175	131.6
S20360-DLS						
S20330-DLS	1.9	6.0	3.97	48.3	152.4	100.8
S20660-DLS	2.52	6.9	5.18	64	175	131.6
S20630-DLS	1.9	6.0	3.97	48.3	152.4	100.8
S21260-DLS	3.0	6.97	5.98	76	177	152
S22460-DLS	3.8	8.39	6.12	96.4	213	192

Model Number	Dimensions			Dimensions		
	W	H	D	W	H	D
	inch			mm		
MMC-SD-0.5-230-DN	2.96	10.1	6.12	75	257	156
MMC-SD-0.5-230-D	3.69			94		
MMC-SDN-0.9-230-D	2.32	6.6	6.12	59	168	156
MMC-SD-1.0-230-DN	3.96	10.1	6.12	100	257	156
MMC-SD-1.0-230-D	4.69			119		
MMC-SDN-1.8-230-D	2.32	6.6	6.12	59	168	156
MMC-SD-2.0-230-DN	3.96	10.1	6.12	100	257	156
MMC-SD-2.0-230-D	4.69			119		
MMC-SDN-3.6-230-D	3.07	7.75	7.36	78	197	187
MMC-SDN-7.2-230-D	3.96	9.72	8.97	100	247	228



Front View



Side View

Drive Dimensions

Model Number	Dimensions (inch)			Dimensions (mm)		
	W	H	D	W	H	D
MMC-SD-1.3-460-D	4.14	13.66	8.35	105	347	212
MMC-SDN-1.8-460-D	2.76	10.08	7.375	70	256	188
MMC-SD-2.4-460-D	4.14	13.66	8.35	105	347	212
MMC-SDN-3.6-460-D	2.76	10.08	7.375	70	256	188
MMC-SD-4.0-460-D	4.15	16.85	11.35	106	428	288
MMC-SD-6.0-460-D						
MMC-SDN-7.2-460-D	2.76	10.08	7.375	70	256	188
MMC-SD-8.0-460-D	4.15	16.85	11.35	106	428	288
MMC-SD-12.0-460-D	6.1	21.65	11.36	155	550	288
MMC-SDN-14.4-460-D	4.14	12.05	9.125	105	306	233
MMC-SD-16.0-460-D	6.1	21.65	11.36	155	550	288
MMC-SD-24.0-460-D						
MMC-SD-30.0-460-D	7.5	26.18	12.71	190	665	322.6
MMC-SD-42.0-460-D						
MMC-SD-51.0-460-D						
MMC-SD-65.0-460-D						

Operating Temperature Range

Drive Voltage Range	Power Range	Operating Temp Range
115/230 Vac Drives	0.5, 1.0, 2.0, 3.0 kW	7° C to 55° C
230/460 Vac Drives	1.3, 2.4, 4.0, 6.0, 8.0, 12.0, 16.0, 24.0 kW	7° C to 50° C
230/460 Vac Drives	30.0, 42.0, 51.0, 65.0	7° C to 55° C ₁
All S200-DLS	All	0° C to 50° C ₁
All MMC-SDN	All	7° C to 55° C ₂

Note 1) Derate 3% per ° C above 40° C

Note 2) Derate 4% per ° C above 40° C



MMC Smart Drive Servo Amplifiers

MMC Smart Drive

Drive Amplifier, Motor & Feedback Technology

The MMC Smart Drive Amplifier offers an unprecedented option of standard drive and motor technology combinations. The Smart Drive is combined with Kollmorgen's AKM, an industry leading conventional servomotor in terms of torque density and flexibility of feedback and mounting options.

The MMC Smart Drive solution also offers the broadest range of direct drive motor solutions available. Direct drive solutions include the DDR Direct Drive Rotary Motor for standalone systems. While the Cartridge DDR™ allows an integrated direct drive solution by providing a load interface /coupling integral to the motor.

The MMC Smart Drive amplifier accepts multiple feedback types to allow the selection of the best feedback device based on application or performance requirements. Feedback types supported are incremental encoder, resolver and sine-encoder.

MMC Smart Drive System			Feedback Specifications		Features / Application Considerations				
Motor Technology	Motor & Frame Size	Feedback Types	Resolution (Counts/Rev)	Accuracy (arc min)	Single-Turn Absolute	Multi-Turn Absolute Eliminate Homing	Rapid Indexing Minimized Phase Lag	High Resolution Precision and Reduced Settling Times	Shock & Vibration Tolerance
Conventional Servo	AKM 1-7	Resolver	4096	16	YES	NO	Good	Good	Best
	AKM 1-7	Incremental Encoder	8192	2.5	NO	NO	Better	Better	Good
	AKM 2-4	BiSS Sine-encoder	524,288	0.6	YES	YES	Best	Best	Good
	AKM 5-8	BiSS Sine-encoder	2,097,152	0.6	YES	YES	Best	Best	Good
Cartridge DDR™ Direct Drive Rotary	CDDR™ 04-06	BiSS Sine-encoder	524,288	0.6	YES	NO	Best	Best	Good
	CDDR™ 09-13	Sine-encoder	2,097,152	0.5	YES	NO	Best	Best	Good

The chart provides a comparison of the various feedback technologies supported by the MMC Smart Drive amplifier and highlights some of the key features and application advantages of each of the feedback technologies.



Stepper Drive

Stepper Motor Drive			
Module Type	Type	Description	Part Number
Stepper Controller, Drive (5)	Stepper Command, Stepper Drive, SSI feedback	Five Axis Stepper Controller/Drive, Programmable 0.4 to 4.0 amps Peak Drive Current per Axis, 32 Vac Drive, 24 Vdc Logic, with SSI encoder feedback - 5 Axes	M.1302.7612



FAISM Stepper Controller Drive

AKM™ Servomotors

Kollmorgen's AKM family of servomotors gives you unprecedented choice and flexibility from a wide range of standard products so you can select the best servomotor for your application. By pairing AKM servomotors with our family of plug-and-play AKD™ servo drives, selecting the right motion control products has never been easier. Pick from thousands of servomotor/servo drive combinations outlined in this selection guide or go to our website to find the best solution for your application.

Standard AKM servomotors and servo drives offer the best of both worlds – the exact specifications of a custom solution with the faster delivery times and lower cost of a standard catalog product. For your truly unique motion control applications, work with our engineering team to customize a solution for your machine design. Either way, standard product or customized, we can help you choose the motion control solution that meets your exact requirements.

The Benefits of AKM Servomotor

-
- Best-in-Class Performance
 - Industry-leading motor power density
 - Same size AKM/AKD system delivers up to 47% more shaft power than before
 - Compensation for stiff and compliant transmissions and couplings
 - Exceptionally low cogging
-
- Flexibility to Find an Exact-fit Solution in a Standard Product
 - AKM offers 28 frame-stack combinations and 117 standard windings in a single motor line
 - Over 500,000 standard motor variations including a wide range of mounting, connectivity, feedback and other options
 - Simplifies or eliminates mechanical modifications and engineering adaptation
 - New lower cost multi-turn feedback option
 - New IP67 protection class options for AKM
 - New higher torque models up to 180 Nm of continuous torque
-
- Ease-of-Use and Faster Commissioning
 - Plug-and-play motor recognition drive commissioning
 - Reduce cycle time and sensor-and-wiring costs by eliminating traditional homing methods
 - Reduction in set-up time for each servo system

AKM™ Servomotors

AKM Motors Offer Extremely High Torque Density and High Acceleration

The AKM high-performance motor series offers a wide range of mounting, connectivity, feedback and other options. These motors offer superb flexibility to meet application needs with:

- 8 frame sizes (40 to 260 mm)
- 28 frame-stack length combinations
- 117 'standard' windings

Features

Torque

0.16 to 180 Nm continuous stall torque (1.4 to 1590 lb-in) in 28 frame/stack combinations. Specific torques are often available from multiple frame sizes to optimize mounting and inertia matching capabilities.

Speed

Speeds to 8000 rpm meet high speed application requirements. Windings tailored to lower speeds are also available.

Voltage

AKM motors can be applied to all standard global voltages. Windings are specifically tailored to 75 Vdc, 120, 240, 400 and 480 Vac.

Mounting

Multiple mounting standards are available to meet common European, North American, and Japanese standards.

Feedback

AKM motors include resolver, encoder (commutating), Sine-Absolute encoder or SFD (Smart Feedback Device) feedback options to meet specific application requirements.

Smoothness

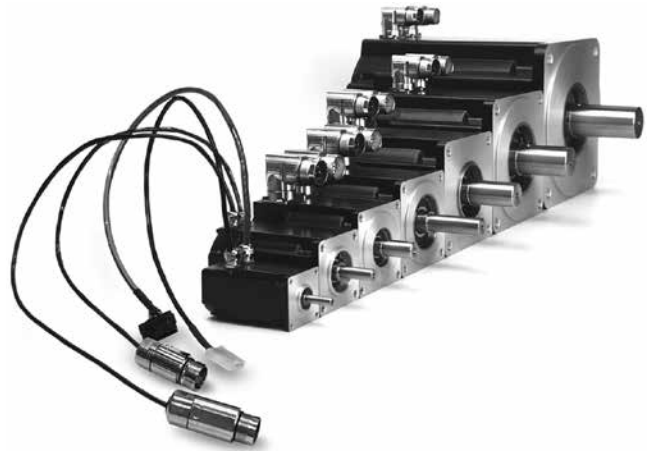
Smooth performance results from low-cog, low-harmonic distortion magnetic designs.

Connectivity

Rugged, rotatable IP65 connectors or low cost IP20 Molex plugs are both available to provide flexibility. Single connectors/plugs (combined power and feedback) are also available to minimize motor and cable cost (SFD only).

Thermal

Windings are rated conservatively at 100°C rise over a 40°C ambient while using 155°C (class F) insulation materials. Motors meet applicable cURus and CE requirements and include thermistors. Thermal ratings at 60°C rise are also provided to meet the needs of specific applications.



Kollmorgen Cables Offer the Complete Solution

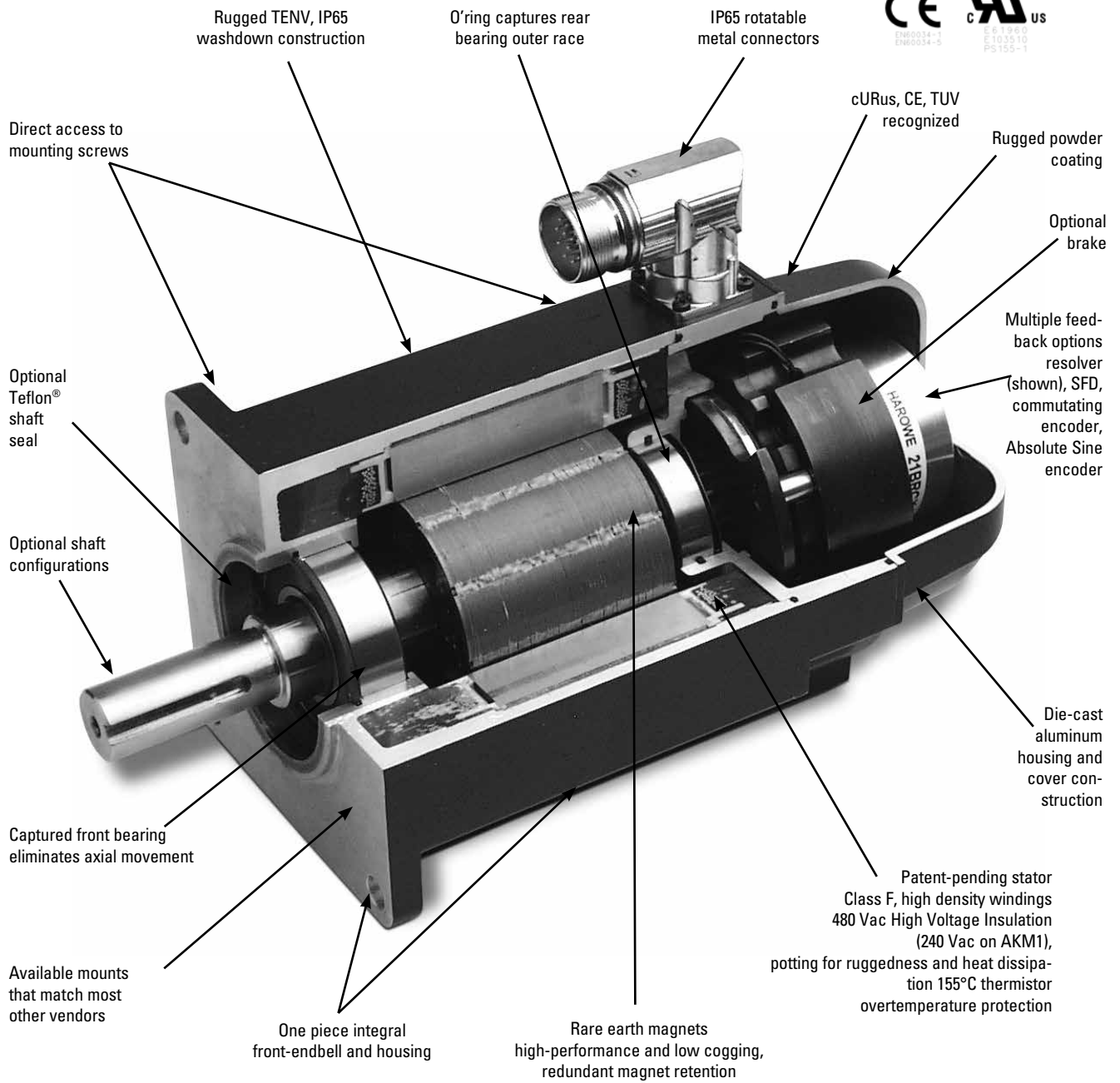
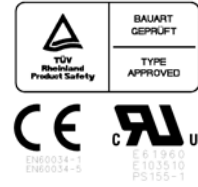
The new Value Line cables provide a cost saving option for applications that don't require long distances or encounter extreme environmental conditions. Value Line cables include dual Intercontec connectors and are available for most feedback types. Contact Kollmorgen Customer Support to identify which cable option is best suited for your application.

Options

Additional options:

- Fail-safe brakes
- New, Teflon® shaft seals
- Feedback devices
- Shaft and mounting variations
- Custom windings
- Connectivity

3-D Model Shows Key Design Features



Cartridge Direct Drive Rotary (DDR) Motors

The Cartridge DDR Motor is the first in the industry to combine the space-saving and performance advantages of frameless DDR technology with the ease of installation of a full-frame motor. Cartridge DDR motors also feature an advanced electromagnetic design that provides up to 50% more torque density than comparably sized conventional servomotors.

Consisting of a rotor, stator, factory-aligned high-resolution feedback device, the Cartridge DDR motor uses the machine's bearings to support the rotor.

An innovative compression coupling secures the Cartridge DDR's rotor to the machine shaft, and the Cartridge DDR's housing is bolted to the machine frame with a bolt circle and pilot – just like a conventional servomotor. Also, mechanical transmission components are eliminated, saving space and design time while simplifying the overall system.

Conventional servo systems commonly have a mechanical transmission which can consist of gears, gearheads, belts/pulleys or cams connected between the motor and the load.

With Direct Drive Technology, the mechanical transmission is eliminated and the motor is coupled directly to the load.

Why Use Direct Drive Technology?

Increased Accuracy and Repeatability

A “precision” planetary gearhead could have a backlash of 1 arc-minute. This can result in the load moving by 1 arc-minute with an absolutely stationary drive motor. Kollmorgen’s standard direct drive rotary (DDR) servomotors have repeatability better than 1 arc-second. Therefore, a direct drive motor can hold a position 60 times better than a conventional motor/gearhead.

The increased accuracy of direct drive technology results in a higher quality product out of the machine:

- Print registration is more accurate
- Cut or feed lengths can be held more precisely
- Coordination with other machine axes is more accurate
- Indexing location is more exact
- Tuning issues due to backlash are eliminated

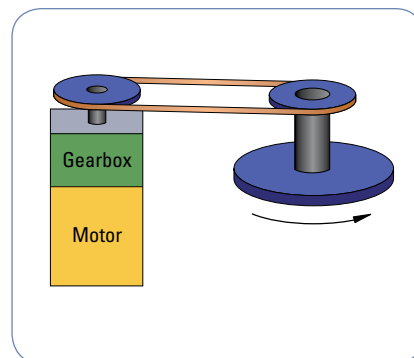
Higher Bandwidth

Mechanical transmission components impose a limit on how fast a machine can start and stop and also extend the required settling time. These factors limit the possible throughput of a machine.

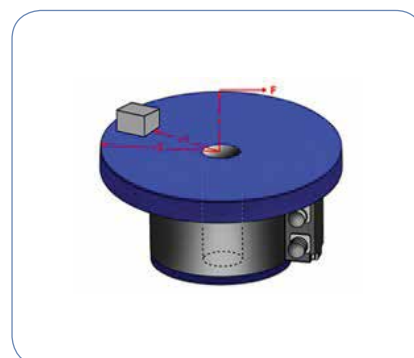
Direct drive technology removes these limitations and allows for much faster start/stop cycles and also provides greatly reduced settling time. This will allow a greater throughput from the machine. Users of direct drive systems have reported up to a 2X increase in throughput.

Improved Reliability and Zero Maintenance

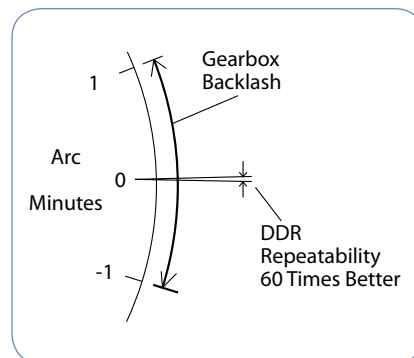
Gears, belts, and other mechanical transmission parts break. By eliminating these parts and using DDR motors, the reliability of the machine is improved. Gearheads require periodic lubrication and/or replacement in aggressive start/stop applications. Belts require periodic tightening. There are no time-wear components in a direct drive motor and consequently they require zero maintenance.



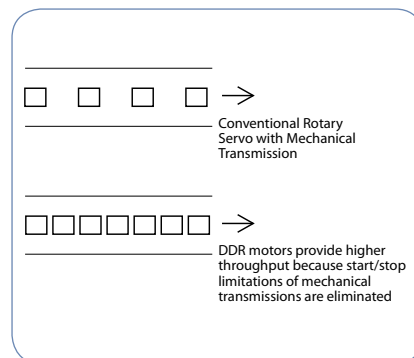
Servomotor and Gearhead



Direct Drive Motor



Improved Repeatability



Increased Throughput

Cartridge Direct Drive Rotary (DDR) Motors

Fewer Parts

With direct drive motors, all you need is the motor and the mounting bolts. This often replaces many parts including brackets, guards, belts, pulleys, tensioners, couplings, and bolts, resulting in:

- Fewer parts on the BOM. Less parts to purchase, schedule, inventory and control, and less parts to assemble.
- Assembly time of the servo drops from several hours with the mechanical transmission to several minutes with the DDR.
- Reduced cost. Although a direct drive motor may carry a small price-premium compared to a motor/gearhead with the same torque, consider that there is an overall cost reduction when eliminating the parts and labor of all the extra components required in a servo system with mechanical transmission.

No Inertia Matching

Servo systems with mechanical transmissions require inertia matching that limits the reflected load inertia at 5 to 10 times the motor inertia. If this limitation is not met, the system becomes difficult to control due to instability issues. Inertia matching limitations of mechanical transmission systems often force machine designers to use a larger motor than would otherwise be required just to satisfy the inertia matching requirement.

Such sizing conventions are not required with direct drive technology. Since the motor is directly connected to the load, the inertia of the motor and the load become a common inertia. Therefore, no inertia matching is required when using DDR. DDR applications have run with inertia ratios greater than 11,000:1.

Reduced Audible Noise

Machines with DDR motors have audible noise levels as low as 20 dB less than the same machine with a mechanical transmission.

Three DDR Product Categories to Choose From

Kollmorgen's 50 years of electromagnetic and electromechanical design experience combined with our quality and service, allowed us to refine and expand DDR technology into three product categories for easy installation, use, and short lead times: [Frameless DDR](#), [Housed DDR](#), and the [Cartridge DDR](#). This allows you to select the right DDR solution for your application.

KBM Series Frameless DDR

Frameless motors include a rotor and stator as separate components which are integrated into, ride on the bearings of, and become a part of the driven load. Frameless motors offer the most compact and lightweight DDR solution available. The "KBM" series is Kollmorgen's latest Frameless DDR product. It provides excellent torque/volume with the use of a proprietary neodymium-iron magnet rotor structure and skewed armature assembly. The KBM series is the first UL recognized parts set available on the market. This provides OEMs with the benefits of UL component ratings for easier agency approval on their machines.

Housed DDR

The Housed DDR is a housed motor assembly featuring a factory aligned high-resolution feedback device and precision bearings, allowing it to function as the core of rotary indexing and rate table applications. The system can also be used as a flexible indexer, providing programmable, rapid indexing far exceeding the throughput and accuracy of conventional mechanical or variable reluctance technology indexers.

Cartridge DDR

This motor is the first in the industry to combine the space-saving and performance advantages of Frameless DDR technology with the ease of installation of a full-frame motor. Consisting of a rotor, stator, and factory-aligned high-resolution feedback device, the motor uses the machine's bearings to support the rotor. An innovative compression coupling engages the rotor to the load and the frame of the motor mounts to the machine with a bolt circle and pilot diameter just like a conventional servomotor, saving space and design time and simplifying the overall system.

DDR Applications

Format	Where Used
Frameless DDR	Application where size and weight must be absolutely minimized
Housed DDR	Applications where the load rides on the motor's bearings such as indexing or rate tables
Cartridge DDR	Any application with existing bearings

Features

- Integrated compression coupling and shipping hardware
-
- 5 frame sizes, multiple lengths
 - 230 / 400 / 480 Vac windings available (high and low)
 - Continuous torque range: 4.57 Nm (3.37 lb-ft) to 510 Nm (373 lb-ft)
 - Speeds up to 2,500 rpm
 - Optimized torque output with high-pole count efficient electromagnetic design
 - Hollow shaft available on C09x and C13x models, provides a 1.26 inch (32mm) through bore to allow process or wiring to run through the center of the motor. Provision for mounting a rotary union to the shaft and housing is included.
-
- Integrated high-resolution sine encoder
 - 134,217,728 counts / rev
 - Low cogging for smooth low-speed rotation
 - Zero backlash and compliance
-
- Direct load connection eliminates gearheads, belts, or pulleys

Benefits

- Eliminate parts and labor for a faster and lower cost machine build
 - Assembles in 5 minutes
-
- Satisfies a wide range of machine requirements and configurations
-
- Increased accuracy and higher throughput
-
- Greater machine reliability and reduced maintenance
 - Reduced audible noise, fewer parts and lower cost of ownership
 - More compact machine and reduced design time

Cartridge Direct Drive Rotary (DDR) Motors

Cartridge DDR Application Considerations

Inertia Matching

Since the Cartridge DDR motor is directly connected to the machine, inertial matching is not required as it is on a conventional motor. With direct drive, inertia miss match of 250 to 1 is common and miss match of 1000 to 1 has been demonstrated.

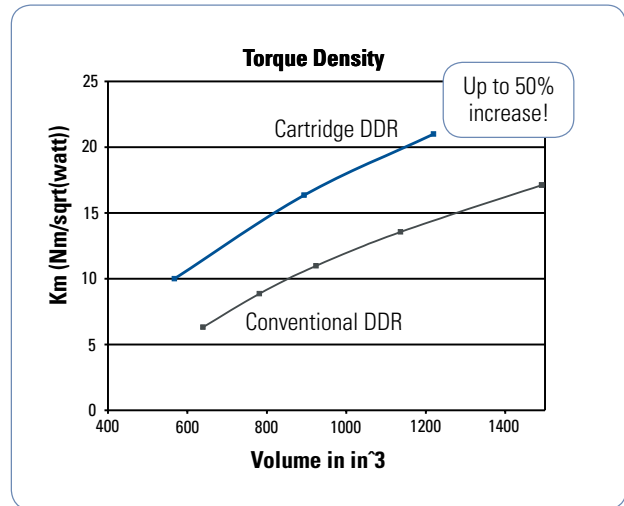
Mounting Orientation

The Cartridge DDR motor can be mounted with any orientation including either a horizontal or vertical shaft.

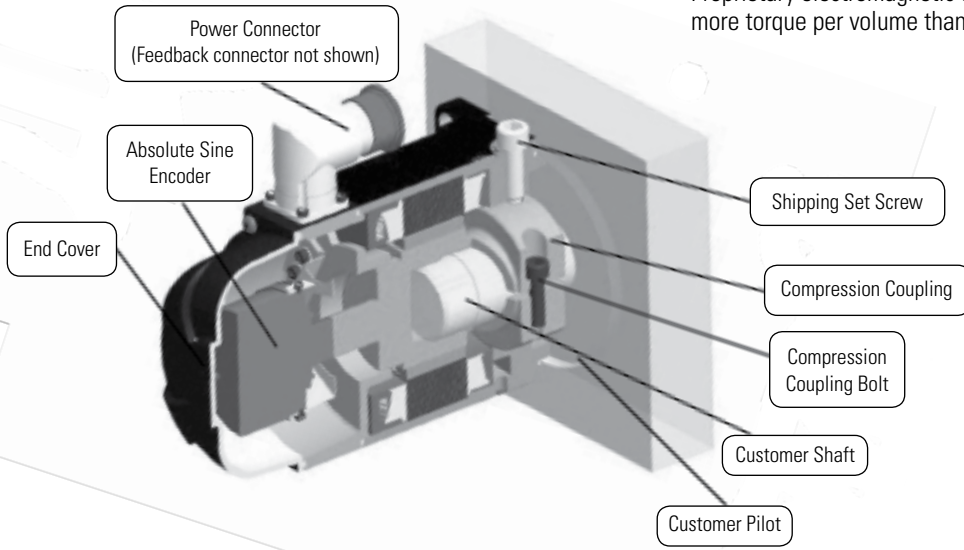
Mounting Cartridge DDR to Machine

Simple and quick procedures to mount:

- Slide the Cartridge DDR motor onto machine shaft
- Bolt Cartridge DDR motor housing to machine frame
- Torque compression coupling
- Remove/store shipping hardware
- Connect cables and run the motor



Proprietary electromagnetic design gives Cartridge DDR motors more torque per volume than conventional DDR technology.



The Cartridge DDR Advantage – Press Feed Machine

Consider how Cartridge DDR technology improves a Press Feed machine:

Reduced Assembly Time

The assembly time for the original mechanical transmission system was 4 hours. In contrast, the Cartridge DDR motor is installed in less than 5 minutes, resulting in a significant cost savings in labor.

Reduced Parts Count

The original mechanical transmission system comprises 2 bracket pieces, 12 bolts, 2 pulleys, 2 set screws, 2 keys, a timing belt, a housing to protect operators from the timing belt, a tension system for the timing belt, and motor/gearhead. With the Cartridge DDR system, this is all replaced by the motor and 4 mounting bolts, resulting in fewer parts to maintain and cost savings.

Improved Accuracy

The best planetary gearheads have a backlash between 1 and 2 arc-minutes. Over the life of the gearhead, the backlash will increase. The Cartridge DDR system has an absolute accuracy of 26 arc-seconds and a repeatability of 0.7 arc-seconds. The Press Feed machine with the Cartridge DDR has a feed accuracy of +/- 0.0005 inch where the Press Feed machine with the mechanical transmission has a feed accuracy of 0.002 inch. Therefore, there was an overall four times improvement in machine accuracy with the Cartridge DDR system.

Increased Throughput

The cycle rate of the Cartridge DDR system is two times better than the mechanical transmission. This results in an increase in throughput of 100 percent.

Improved Reliability and Simplified Maintenance

The Cartridge DDR system eliminates parts that wear, change over time, or fail. Gearheads are prone to wear, and backlash increases over time. Belts and pulleys stretch and require maintenance to maintain proper belt tension. By eliminating these components, the Cartridge DDR system delivers greater system reliability.

Press Feed Example

Gearheads have a finite life span, especially in a demanding cyclic application such as a Press Feed. On this machine, the gearhead must be replaced every 10,000 hours and the belt must be tensioned every 2,000 hours. By contrast, the Cartridge DDR motor has no wear components and requires no maintenance thus simplifying the maintenance schedule for the machine, including operating costs.

Reduced Audible Noise

The Cartridge DDR system has as much as a 20 dB reduction in noise compared to a mechanical transmission servo system. This can dramatically reduce the overall noise level of the machine. A quieter machine gives the perception of quality. This is rightfully so as the noise emitted by gears and belts is caused by the wearing of the parts.

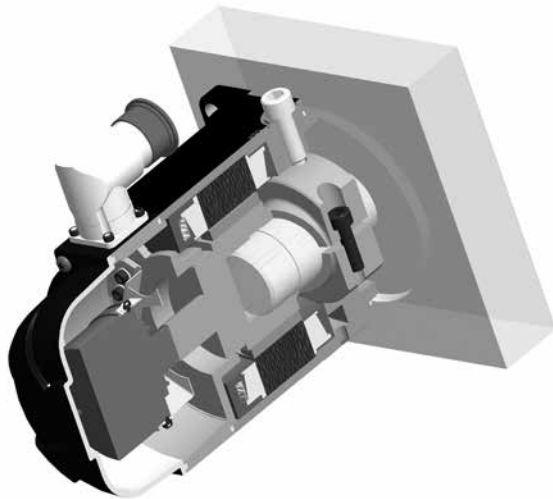
Total Reduced Cost

A Cartridge DDR motor typically costs 20 percent more than a comparable motor/gearhead combination. However, the elimination of parts and assembly time typically results in a lower total cost for the Cartridge DDR solution.

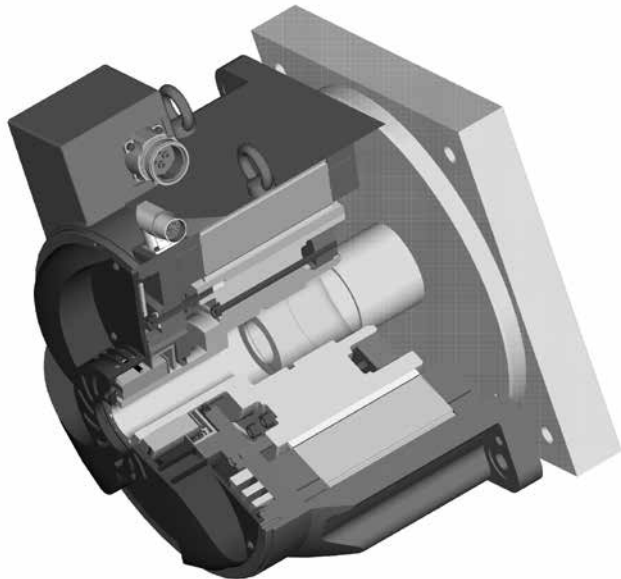


Cartridge DDR System Summary

Due to the large range of continuous and peak torques for the Cartridge DDR series, the mechanical mounting and coupling to the machine varies.



**Cross Section of
C04x, C05x, C06x**



**Cross Section of
C09x, C13x**

Machine Interface Summary

Parameter	C04x, C05x, C06x	C09x, C13x
Coupling Technology	Single bolt split hub, access front motor	Multi-bolt compression, access from rear of motor
Mounting Requirements Shaft TIR	0.005" (0.13 mm)	0.0015" (0.038 mm)
Perpendicularity of Machine Mounting Face	0.004" (0.10 mm)	0.002" (0.051 mm)
Concentricity of Machine Pilot to Shaft	0.004" (0.10 mm)	0.002" (0.051 mm)
Shipping Hardware	Alignment bolt and cap screw	4 set screws and 4 shipping bolts
Mounting Procedure	Procedure # M-RT-S19-07	Procedure # M-RT-019-07

Conventional Servo

AKM Series of Servomotors

- High torque density design
- Highly dynamic in sizes (AKM1-AKM4)
- Multiple frame sizes for torque values to optimize system inertia
- 8 Frame sizes (40 to 260 mm)
- Extensive Voltage Options (75 Vdc, 120, 230, 400, 480 Vac)
- Cont torque range of 0.16 - 180 Nm (0.12 - 133 lb-ft)

Multiple Feedback Options

- Resolver
- Incremental Commutating Encoder
- BiSS 100% Digital Sine-encoder
 - Single-turn absolute
 - Multi-turn(4096 revs) absolute

Flexible Mounting

Availability to meet the needs of the Global marketplace

- NEMA English (NEMA 23, NEMA 34)
- NEMA 56C flange, NEMA Metric
- EN, DIN, IEC standards



AKM motors offer extremely high torque, density and acceleration.

Direct Drive Servo

Cartridge DDR™ Motors

- Pre-Engineered Direct Drive Technology
 - Simplified integration and assembly
 - Integrated load-coupling & feedback
- Eliminate compliance
- Reduce machine complexity & part count
- Improve System response and accuracy
- 5 Frame sizes
- Cont. torque range of 4.57 - 499 Nm (3.37 - 368 lb-ft)
- High-pole count torque motors
- Patented integrated pre-aligned feedback
- High-resolution sine-encoders for high servo stiffness and system accuracy & precision
- Extend machine life and reliability



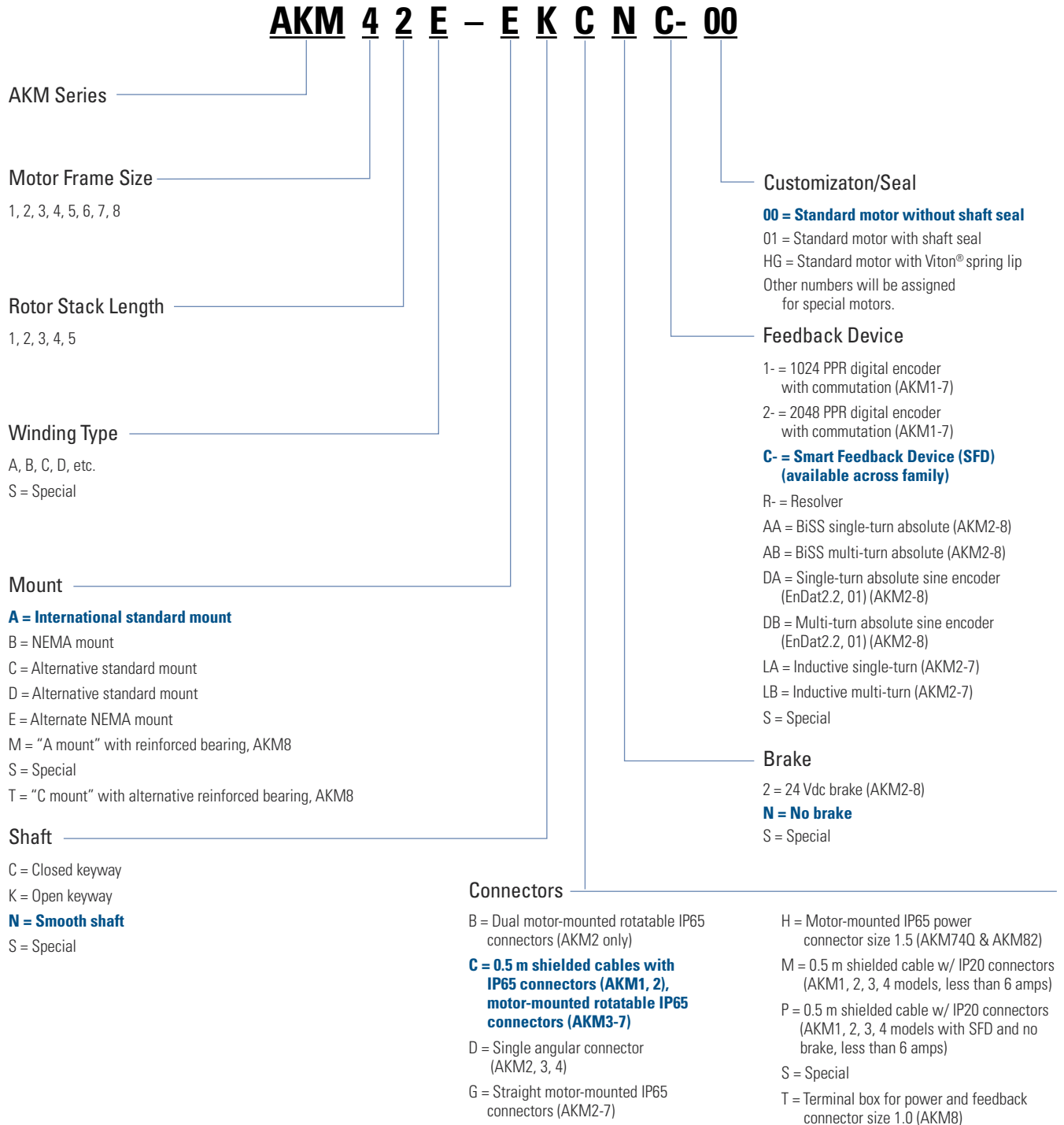
Cartridge DDR™ Motor Series
C06, C13, C05, C09, C04

Shown Left to Right

**Choose the best
servo technology for your
machine requirements.**

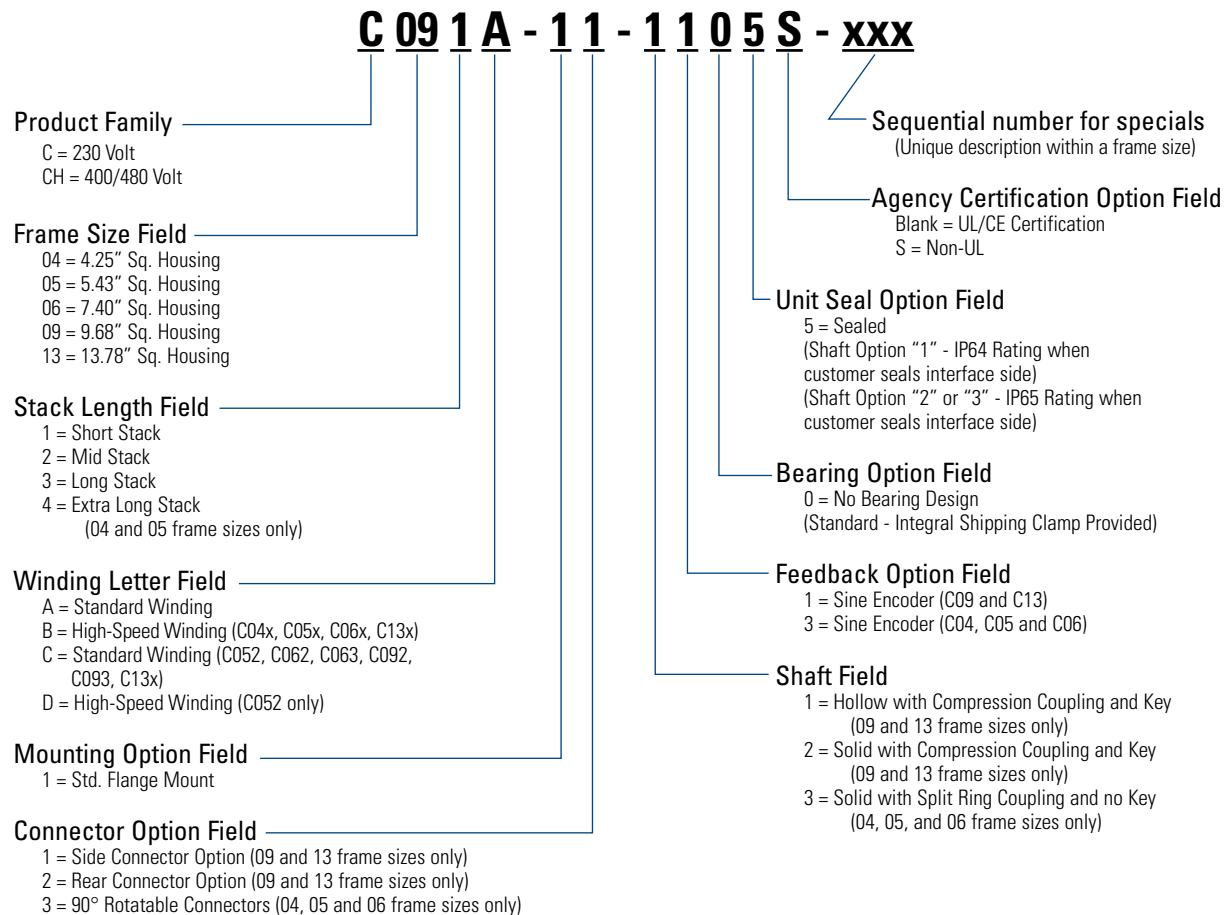
AKM Servomotor/Cartridge DDR[®] Comparison

AKM Brushless Servomotor



Note: Options shown in bold blue text are considered standard.

Cartridge DDR® Motor



MMC Smart Drive Performance Data

Choosing the right components are critical to meet today's demanding applications. By combining MMC Controls and Smart Drives with the class-leading capabilities of the conventional AKM servomotor series and the optimized direct drive technology, the PiCPro Integrated Solution can offer reliable break-through performance.

With a wide range of operating voltages, speed, and torque ratings the MMC Smart Drive coupled with AKM and CDDR motors gives you the right drive/motor options to meet your motion requirements.

Interpreting Performance Data and Torque Speed Curves

Definitions

TCS – Torque Continuous Stall

The torque that the motor drive system will produce continuously at stall (zero speed).

TCR – Torque Continuous Rated

The torque that the motor drive system will produce continuously at the rated speed.

TPS – Torque Peak Stall

The maximum torque that the motor drive system will produce at stall (zero speed).

TPR – Torque Peak Rated

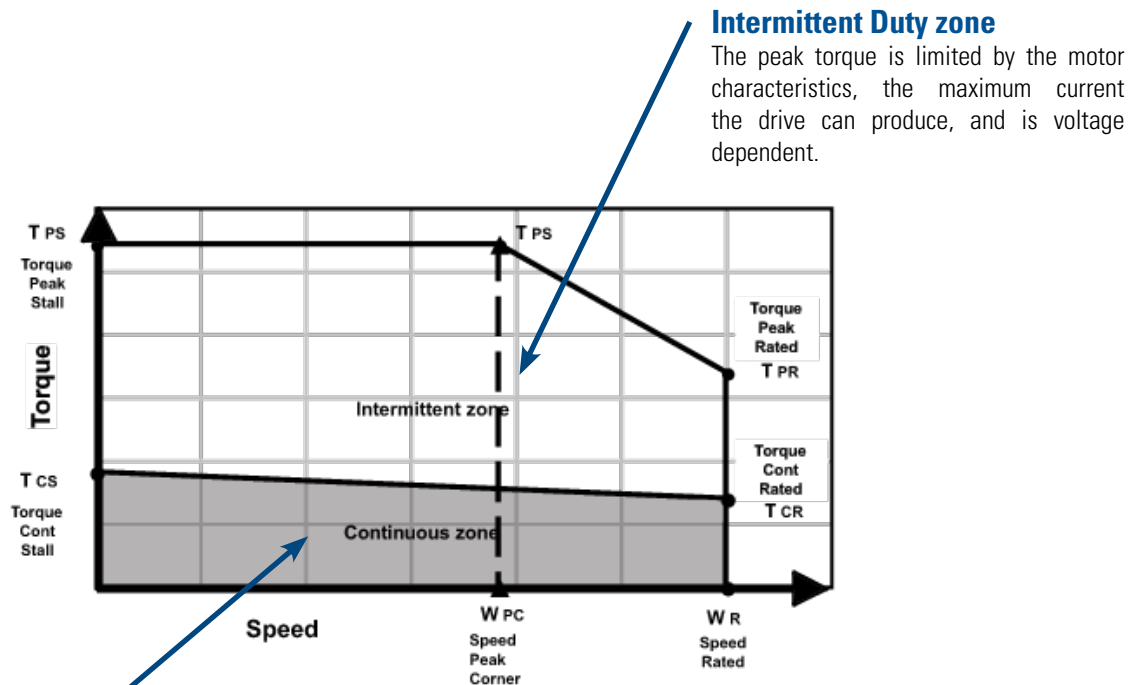
The maximum torque that the motor drive system will produce at rated speed.

WR – Rated Speed

The rated speed of the motor drive system for a given voltage.

WPC – Peak Corner Speed

The system peak torque is constant up to this speed.



Intermittent Duty zone

The peak torque is limited by the motor characteristics, the maximum current the drive can produce, and is voltage dependent.

Continuous Duty zone

The system can operated anywhere within this zone based on ambient temperature of 40° C at the motor and the motor is mounted with specified heat sink.

MMC Smart Drive Performance Data

MMC Smart Drive with AKM Servomotors

115 Vac Systems

Drive Model	Motor Model	Cont. Stall Torque		Cont. Rated Torque		Peak Stall Torque		Peak Rated Torque		Rated Speed	Peak Corner Speed	Cont. Stall Current	Motor Inertia 1		Power Cable Gauge
		TCS		TCR		TPS		TPR		WR	WPC	ICS			
MMC-SD		Nm	lb-in	Nm	lb-in	Nm	lb-in	Nm	lb-in	RPM	RPM	Amps rms	kg cm ²	lb-in-s ² x 10 ³	AWG
-0.5-230-D	AKM11C	0.20	1.60	0.20	1.60	0.60	5.10	0.40	3.60	6000	2900	1.45	0.02	0.02	16
	AKM12C	0.30	2.70	0.30	2.70	1.00	8.60	0.70	6.40	4000	2290	1.51	0.03	0.03	16
	AKM13C	0.40	3.60	0.40	3.60	1.30	11.8	0.90	8.10	3000	1400	1.48	0.05	0.04	16
	AKM21C	0.50	4.30	0.50	4.10	1.30	11.6	1.00	8.50	2500	1270	1.58	0.10	0.09	16
	AKM22C	0.80	7.40	0.80	7.40	2.60	23.3	0.80	7.40	2000	0	1.39	0.16	0.14	16
	AKM23C	1.10	10.0	1.10	9.80	3.60	32.0	1.80	16.00	1000	0	1.41	0.21	0.19	16
-1.0-230-D	AKM12E	0.30	2.70	0.30	2.40	1.00	9.10	0.90	8.00	8000	7000	2.72	0.03	0.03	16
	AKM13D	0.40	3.60	0.40	3.30	1.40	12.7	0.80	7.50	7000	4200	2.40	0.05	0.04	16
	AKM21C	0.50	4.30	0.50	4.10	1.50	13.0	1.00	8.40	2500	630	1.58	0.10	0.09	16
	AKM21E	0.50	4.40	0.40	3.60	1.40	12.0	0.90	7.80	7000	4580	3.11	0.10	0.09	16
	AKM22E	0.90	7.70	0.80	7.20	2.70	24.0	1.60	14.0	3500	1800	2.73	0.16	0.14	16
	AKM23D	1.20	10.3	1.10	9.90	3.80	33.9	2.70	23.8	1500	630	2.19	0.21	0.19	16
	AKM24D	1.40	12.5	1.40	12.0	4.80	42.1	2.80	24.6	1500	530	2.21	0.27	0.24	16
	AKM31E	1.20	10.6	1.10	10.0	3.70	32.4	2.50	22.4	2500	1600	2.99	0.33	0.29	16
	AKM32D	2.10	18.1	2.00	18.0	7.10	62.4	3.90	34.5	1000	165	2.23	0.59	0.52	16
	AKM41E	2.00	17.9	1.90	17.0	6.00	52.9	4.20	37.0	1200	590	2.85	0.81	0.72	16
-2.0-230-D	AKM22G	0.90	7.80	0.70	6.60	2.80	24.7	1.50	13.7	7000	4200	4.82	0.16	0.14	16
	AKM23F	1.20	10.4	1.10	9.50	3.90	34.3	2.20	19.6	4500	2800	4.31	0.21	0.19	16
	AKM24F	1.40	12.6	1.30	11.8	4.80	42.6	3.30	29.3	3000	2060	3.89	0.27	0.24	16
	AKM31H	1.20	10.9	1.00	9.0	3.80	33.6	2.10	18.6	6000	4000	5.85	0.33	0.29	16
	AKM32H	2.10	18.6	1.90	17.0	7.10	62.5	4.80	42.8	3000	2200	5.50	0.59	0.52	16
	AKM33H	2.90	25.5	2.70	24.0	9.80	86.4	5.20	46.3	2500	1650	5.62	0.85	0.75	16
	AKM41H	2.10	18.2	1.80	16.0	6.10	54.3	3.70	32.4	3000	1680	5.60	0.81	0.72	16
	AKM42G	3.50	31.3	3.30	29.0	11.5	101.5	6.70	58.9	1500	800	4.80	1.45	1.28	16
	AKM43G	4.80	42.5	4.50	40.0	16.1	142.5	10.8	95.4	1000	580	4.87	2.09	1.85	16
	AKM51G	4.80	42.1	4.5	40.0	11.7	103.6	9.3	82.7	1000	760	4.84	3.42	3.03	16

1 Motor inertia of motor without brake, see Motion Solutions sizing software or AKM motor brochure for motor inertia that includes brake inertia

MMC Smart Drive with AKM Servomotors

230 Vac Systems

Drive Model	Motor Model	Cont. Stall Torque		Cont. Rated Torque		Peak Stall Torque		Peak Rated Torque		Rated Speed	Peak Corner Speed	Cont. Stall Current	Motor Inertia 1		Power Cable Gauge
		TCS	lb in	TCR	lb in	TPS	lb in	TPR	lb in	WR	WPC	ICS	kg cm ²	lb-in-s ² x 10 ⁻³	AWG
MMC-SD		N m	lb in	N m	lb in	N m	lb in	N m	lb in	RPM	RPM	Amps rms	kg cm ²	lb-in-s ² x 10 ⁻³	AWG
-0.5-230-D	AKM11B	0.20	1.60	0.20	1.50	0.60	5.40	0.60	5.20	8000	7700	1.16	0.023	0.020	16
	AKM12C	0.30	2.70	0.30	2.50	1.00	8.60	1.00	8.60	8000	8000	1.51	0.034	0.030	16
	AKM13C	0.40	3.60	0.40	3.20	1.30	11.8	1.10	9.40	8000	6720	1.48	0.045	0.040	16
	AKM21C	0.50	4.30	0.40	3.50	1.30	11.6	0.70	6.60	8000	5020	1.58	0.102	0.090	16
	AKM22C	0.80	7.40	0.80	6.90	2.60	23.3	1.70	14.8	3500	2000	1.39	0.158	0.140	16
	AKM23C	1.10	10.0	1.10	9.60	3.60	32.0	2.50	22.0	2500	1540	1.41	0.215	0.190	16
	AKM24C	1.40	12.2	1.30	11.7	4.50	39.6	3.30	28.8	2000	1300	1.42	0.271	0.240	16
	AKM31C	1.20	10.2	1.10	10.0	3.80	33.4	2.30	20.4	2500	1290	1.37	0.328	0.290	16
	AKM32C	2.00	17.7	1.90	17.0	6.50	57.9	4.00	35.6	1500	770	1.44	0.588	0.520	16
	AKM41C	2.00	17.3	1.90	17.0	5.80	51.0	4.30	38.2	1200	690	1.46	0.813	0.720	16
-1.0-230-D	AKM21C	0.50	4.3	0.40	3.50	1.50	13.0	0.70	6.60	8000	4200	1.58	0.102	0.090	16
	AKM22E	0.90	7.7	0.70	6.20	2.70	24.0	1.60	14.3	8000	5280	2.73	0.158	0.140	16
	AKM23D	1.20	10.3	1.00	9.10	3.80	33.9	1.90	17.0	5000	3000	2.19	0.215	0.190	16
	AKM24D	1.40	12.5	1.30	11.4	4.80	42.1	2.70	23.7	4000	2610	2.21	0.271	0.240	16
	AKM31E	1.20	10.6	0.90	8.0	3.70	32.4	2.40	21.0	6000	4430	2.99	0.328	0.290	16
	AKM32D	2.10	18.1	1.90	17.0	7.10	62.4	4.60	40.4	2500	1660	2.23	0.588	0.520	16
	AKM41E	2.00	17.9	1.80	16.0	6.00	52.9	3.90	34.3	3000	1840	2.85	0.813	0.720	16
	AKM42E	3.40	30.3	3.20	28.0	11.0	97.2	6.60	58.8	1800	1070	2.74	1.446	1.280	16
	AKM43E	4.70	41.6	4.30	38.0	15.4	136.3	7.30	64.7	1500	790	2.76	2.090	1.850	16
	AKM44E	5.80	51.0	5.20	46.0	18.8	166.4	10.3	90.8	1200	700	2.90	2.734	2.420	16
-2.0-230-D	AKM23F	1.20	10.4	0.90	8.30	3.90	34.3	3.30	29.2	8000	6970	4.31	0.215	0.190	16
	AKM24F	1.40	12.6	1.10	9.90	4.80	42.6	2.50	22.0	8000	5400	3.89	0.271	0.240	16
	AKM32H	2.10	18.6	1.50	13.0	7.10	62.5	4.50	40.1	7000	5370	5.50	0.588	0.520	16
	AKM33H	2.90	25.5	2.30	20.0	9.80	86.4	5.10	45.3	5500	4180	5.62	0.847	0.750	16
	AKM41H	2.10	18.2	1.60	14.0	6.10	54.3	3.80	34.0	6000	3800	5.60	0.813	0.720	16
	AKM42G	3.50	31.3	2.90	26.0	11.5	101.5	5.90	52.0	3500	2070	4.80	1.446	1.280	16
	AKM43G	4.80	42.5	4.00	35.0	16.1	142.5	9.30	82.0	2500	1600	4.87	2.090	1.850	16
	AKM44G	5.90	52.1	4.90	43.0	20.2	178.8	13.1	116.0	2000	1400	5.00	2.734	2.420	16
	AKM51G	4.80	42.1	4.10	36.0	11.7	103.6	7.90	70.2	2500	1900	4.84	3.423	3.030	16
	AKM52G	8.40	74.6	7.70	68.0	21.5	190.3	12.8	112.9	1500	1100	4.72	6.214	5.500	16
AKM53G	11.40	100.7	10.7	95.0	29.7	262.9	23.5	207.8	1000	850	4.77	9.118	8.070	16	

MMC Smart Drive with AKM Servomotors

MMC SMART DRIVE PERFORMANCE DATA

Drive Model	Motor Model	Volt	Cont. Stall Torque		Cont. Rated Torque		Peak Stall Torque		Peak Rated Torque		Rated Speed	Peak Corner Speed	Cont. Stall Current	Motor Inertia 1		Power Cable Gauge
			TCS	lb in	TCR	lb in	TPS	lb in	TPR	WR	WPC	ICS	kgcm ²	lb-in-s ² x 10 ⁻³		
MMC-SD		VAC	N m	lb in	N m	lb in	N m	lb in	N m	lb in	RPM	RPM	Amps rms	kgcm ²	lb-in-s ² x 10 ⁻³	AWG
-1.3-460-D	AKM22C	230	0.80	7.40	0.80	6.90	2.20	19.7	1.70	14.9	3500	2650	1.39	0.16	0.14	16
	AKM22C	400	0.80	7.40	0.70	6.00	2.20	19.7	1.30	11.5	8000	5790	1.39	0.16	0.14	16
	AKM22C	460	0.80	7.40	0.70	6.00	2.20	19.7	1.80	15.6	8000	6820	1.39	0.16	0.14	16
	AKM23C	230	1.10	10.0	1.10	9.60	3.00	26.8	2.50	22.0	2500	2040	1.41	0.21	0.19	16
	AKM23C	400	1.10	10.0	1.00	8.80	3.00	26.8	2.20	19.5	5500	4580	1.41	0.21	0.19	16
	AKM23C	460	1.10	10.0	0.90	8.40	3.00	26.8	1.70	15.3	7000	5420	1.41	0.21	0.19	16
	AKM24C	230	1.40	12.2	1.30	11.7	3.70	32.9	3.30	28.8	2000	1740	1.42	0.27	0.24	16
	AKM24C	400	1.40	12.2	1.30	11.1	3.70	32.9	2.90	26.0	4500	3950	1.42	0.27	0.24	16
	AKM24C	460	1.40	12.2	1.20	10.8	3.70	32.9	2.60	22.8	5500	4680	1.42	0.27	0.24	16
	AKM41C	230	2.00	17.3	1.90	17.0	4.80	42.9	4.20	37.2	1200	950	1.46	0.81	0.72	16
	AKM41C	400	2.00	17.3	1.80	16.0	4.80	42.9	3.30	29.2	3000	2120	1.46	0.81	0.72	16
	AKM41C	460	2.00	17.3	1.70	15.0	4.80	42.9	3.30	29.1	3500	2500	1.46	0.81	0.72	16
-2.4-460-D	AKM24D	230	1.40	12.5	1.30	11.4	4.30	38.4	2.70	23.8	4000	2900	2.21	0.27	0.24	16
	AKM24D	400	1.40	12.5	1.10	9.80	4.30	38.4	2.60	22.8	8000	5970	2.21	0.27	0.24	16
	AKM24D	460	1.40	12.5	1.10	9.80	4.30	38.4	3.50	31.0	8000	6990	2.21	0.27	0.24	16
	AKM41E	230	2.00	17.9	1.80	16.0	4.80	42.3	3.70	33.2	3000	2410	2.85	0.81	0.72	16
	AKM41E	400	2.00	17.9	1.60	14.0	4.80	42.3	3.40	30.0	6000	4570	2.85	0.81	0.72	16
	AKM41E	460	2.00	17.9	1.60	14.0	4.80	42.3	4.10	36.0	6000	5290	2.85	0.81	0.72	16
	AKM42E	230	3.40	30.3	3.20	28.0	8.70	76.8	6.50	57.9	1800	1420	2.74	1.45	1.28	16
	AKM42E	400	3.40	30.3	2.80	25.0	8.70	76.8	6.10	53.8	3500	2820	2.74	1.45	1.28	16
	AKM42E	460	3.40	30.3	2.70	24.0	8.70	76.8	6.20	55.3	4000	3280	2.74	1.45	1.28	16
	AKM44E	230	5.80	51.0	5.20	46.0	14.6	129.2	10.2	89.9	1200	930	2.90	2.73	2.42	16
	AKM44E	400	5.80	51.0	4.70	42.0	14.6	129.2	13.6	120.4	2000	2000	2.90	2.73	2.42	16
	AKM44E	460	5.80	51.0	4.50	40.0	14.6	129.2	11.6	103.1	2500	2240	2.90	2.73	2.42	16
	AKM51E	230	4.70	41.6	4.40	39.0	11.1	98.3	9.20	81.7	1200	1000	2.75	3.42	3.03	16
	AKM51E	400	4.70	41.6	4.00	35.0	11.1	98.3	8.00	70.9	2500	2000	2.75	3.42	3.03	16
	AKM51E	460	4.70	41.6	3.80	34.0	11.1	98.3	7.40	65.3	3000	2350	2.75	3.42	3.03	16
	AKM52E	400	8.30	73.8	7.60	67.0	19.1	169.1	17.2	152.6	1500	1500	2.99	6.21	5.50	16
	AKM52E	460	8.30	73.8	7.20	64.0	19.1	169.1	12.1	107.2	2000	1650	2.99	6.21	5.50	16
	-4.0-460-D	AKM44G	230	5.90	52.1	4.90	43.0	14.0	123.9	13.4	118.4	2000	2000	2.90	2.73	2.42
AKM44G		400	5.90	52.1	3.70	33.0	14.0	123.9	11.1	97.8	4000	3650	2.90	2.73	2.42	16
AKM44G		460	5.90	52.1	3.20	28.0	14.0	123.9	7.70	68.2	5000	4220	2.90	2.73	2.42	16
AKM51G		230	4.80	42.1	4.10	36.0	10.6	93.8	8.00	70.7	2500	2090	4.84	3.42	3.03	16
AKM51G		400	4.80	42.1	2.60	23.0	10.6	93.8	5.90	52.5	5000	3920	4.84	3.42	3.03	16
AKM51G		460	4.80	42.1	1.90	17.0	10.6	93.8	6.00	53.0	6000	4520	4.84	3.42	3.03	16
AKM52G		230	8.40	74.6	7.70	68.0	19.7	174.4	12.8	113.5	1500	1190	4.72	6.21	5.50	16
AKM52G		400	8.40	74.6	7.10	63.0	19.7	174.4	16.5	146.4	2500	2290	4.72	6.21	5.50	16
AKM52G		460	8.40	74.6	6.70	59.0	19.7	174.4	14.8	130.6	3000	2660	4.72	6.21	5.50	16
AKM53G		230	11.4	100.7	10.7	95.0	27.0	239.0	23.7	209.9	1000	920	4.77	9.12	8.07	16
AKM53G		400	11.4	100.7	9.80	87.0	27.0	239.0	20.9	184.6	2000	1800	4.77	9.12	8.07	16
AKM53G		460	11.4	100.7	9.50	84.0	27.0	239.0	18.2	160.7	2400	2100	4.77	9.12	8.07	16
AKM54G		400	14.3	126.2	12.9	114	33.2	293.9	33.2	294.0	1500	1500	5.00	11.92	10.55	16
AKM54G		460	14.3	126.2	12.3	109	33.2	293.9	24.1	213.6	2000	1810	5.00	11.92	10.55	16

MMC Smart Drive with AKM Servomotors

Drive Model	Motor Model	Volt	Cont. Stall Torque		Cont. Rated Torque		Peak Stall Torque		Peak Rated Torque		Rated Speed	Peak Corner Speed	Cont. Stall Current	Motor Inertia 1		Power Cable Gauge
			TCS	lb in	TCR	lb in	TPS	lb in	TPR	lb in	WR	WPC	ICS	kg cm ²	lb.in.s ² x 10 ⁻³	AWG
MMC-SD		VAC	N m	lb in	N m	lb in	N m	lb in	N m	lb in	RPM	RPM	A rms	kg cm ²	lb.in.s ² x 10 ⁻³	AWG
-6.0-460-D	AKM52K	230	8.60	76.0	6.80	60.0	16.2	143	14.2	126	3000	2870	9.4	6.2	5.5	14
	AKM52K	400	8.60	76.0	4.00	35.0	16.2	143	13.3	118	5500	5200	9.4	6.2	5.5	14
	AKM52K	460	8.60	76.0	3.30	29.0	16.2	143	16.2	143	6000	5500	9.4	6.2	5.5	14
	AKM53K	230	11.6	103	10.1	89.0	22.0	195	22.0	195	2000	2000	9.4	9.1	8.1	14
	AKM53K	400	11.6	103	7.70	68.0	22.0	195	22.0	195	4000	4000	9.4	9.1	8.1	14
	AKM53K	460	11.6	103	6.90	61.0	22.0	195	22.0	195	4500	4500	9.4	9.1	8.1	14
	AKM54K	230	13.9	123	12.7	112	27.0	239	27.0	239	1800	1800	9.7	11.9	10.6	14
	AKM54K	400	13.9	123	10.1	89.0	27.0	239	24.9	220	3500	3440	9.7	11.9	10.6	14
	AKM54K	460	13.9	123	9.30	82.0	27.0	239	25.2	223	4000	4960	9.7	11.9	10.6	14
	AKM62K	230	11.8	105	10.4	92.0	21.8	193	19.9	176	2000	2000	9.6	16.9	15.0	14
	AKM62K	400	11.8	105	9.00	80.0	21.8	193	21.5	190	3500	3500	9.6	16.9	15.0	14
	AKM62K	460	11.8	105	8.00	71.0	21.8	193	15.4	137	4500	4000	9.6	16.9	15.0	14
	AKM63K	230	16.8	149	14.9	132	29.7	263	29.7	263	1500	1500	9.9	24.2	21.4	14
	AKM63K	400	16.8	149	12.9	114	29.7	263	23.5	208	3000	2800	9.9	24.2	21.4	14
	AKM63K	460	16.8	149	12.0	106	29.7	263	21.8	193	3500	3230	9.9	24.2	21.4	14
	AKM64K	230	20.8	184	18.8	166	39.6	351	35.2	311	1200	1140	9.2	31.6	28.0	14
	AKM64K	400	20.8	184	17.2	152	39.6	351	39.7	351	2000	2000	9.2	31.6	28.0	14
	AKM64K	460	20.8	184	16.3	144	39.6	351	36.3	321	2500	2400	9.2	31.6	28.0	14
	AKM65K	230	23.5	208	22.8	202	44.9	398	44.9	397	1000	1000	9.8	40.0	35.4	14
	AKM65K	400	23.5	208	20.2	179	44.9	398	43.8	388	2000	1950	9.8	40.0	35.4	14
AKM65K	460	23.5	208	19.7	174	44.9	398	44.9	397	2200	2200	9.8	40.0	35.4	14	
-8.0-460-D	AKM62M	230	11.2	99.0	9.50	84.0	21.0	186	17.4	154	3000	2780	13.4	16.9	15.0	14
	AKM62M	400	11.2	99.0	5.60	50.0	21.0	186	11.5	102	6000	5000	13.4	16.9	15.0	14
	AKM62M	460	11.2	99.0	5.60	50.0	21.0	186	19.0	168	6000	5740	13.4	16.9	15.0	14
	AKM63M	230	15.3	135	14.3	127	29.0	257	29.0	257	2000	2000	13.8	24.2	21.4	14
	AKM63M	400	15.3	135	11.3	100	29.0	257	27.7	245	4000	4000	13.8	24.2	21.4	14
	AKM63M	460	15.3	135	10.5	93.0	29.0	257	29.0	257	4500	4500	13.8	24.2	21.4	14
	AKM64L	230	20.5	182	18.4	163	38.6	342	38.6	342	1500	1500	12.8	31.6	28.0	14
	AKM64L	400	20.5	182	15.6	138	38.6	342	38.2	338	3000	3000	12.8	31.6	28.0	14
	AKM64L	460	20.5	182	14.3	127	38.6	342	36.7	325	3500	3500	12.8	31.6	28.0	14
	AKM65M	230	22.8	202	21.9	194	43.8	388	43.8	388	1500	1500	13.6	40.0	35.4	14
	AKM65M	400	22.8	202	19.2	170	43.8	388	43.8	388	2500	2500	13.6	40.0	35.4	14
	AKM65M	460	22.8	202	18.1	160	43.8	388	43.8	388	3000	3000	13.6	40.0	35.4	14
	AKM72M	230	28.6	253	26.9	238	54.9	486	54.9	486	1000	1000	13.0	64.5	57.1	14
	AKM72M	400	28.6	253	23.6	209	54.9	486	53.8	476	2000	2000	13.0	64.5	57.1	14
	AKM72M	460	28.6	253	22.1	196	54.9	486	40.6	359	2500	2270	13.0	64.5	57.1	14
	AKM73M	400	38.3	339	33.8	299	74.0	655	74.0	655	1500	1500	13.6	92.1	81.5	14
	AKM73M	460	38.3	339	32.1	284	74.0	655	73.3	649	1800	1800	13.6	92.1	81.5	14
	AKM74L	400	52.2	462	43.5	385	98.7	874	90.6	802	1200	1200	12.9	119.7	105.9	14
	AKM74L	460	52.2	462	41.5	367	98.7	874	85.5	757	1400	1340	12.9	119.7	105.9	14

MMC Smart Drive Performance Data

MMC SMART DRIVE PERFORMANCE DATA

MMC Smart Drive with AKM Servomotors

Drive Model	Motor Model	Volt	Cont. Stall Torque		Cont. Rated Torque		Peak Stall Torque		Peak Rated Torque		Rated Speed	Peak Corner Speed	Cont. Stall Current	Motor Inertia 1		Power Cable Gauge
			TCS		TCR		TPS		TPR		WR	WPC	ICS			
MMC-SD		VAC	N m	lb in	N m	lb in	N m	lb in	N m	lb in	RPM	RPM	A rms	kg.cm ²	lb.in.s ² x 10 ⁻³	AWG
-12.0-460-D	AKM64P	230	20.405	181	16.0	142	39.2	347	31.0	278	2500	2000	18.6	31.6	28.0	12
	AKM64P	400	20.405	181	11.863	105	39.2	347	29.0	257	4500	2500	18.6	31.6	28.0	12
	AKM64P	460	20.405	181	9.039	80	39.2	347	30.158	267	5500	4500	18.6	31.6	28.0	12
	AKM65N	230	24.303	215	19.772	175	49.0	434	49.035	434	2000	2000	17.8	40.0	35.4	12
	AKM65N	400	24.303	215	16.0	142	49.0	434	49.035	434	3500	3500	17.8	40.0	35.4	12
	AKM65N	460	24.303	215	14.688	130	49.0	434	49.035	434	4000	4000	17.8	40.0	35.4	12
	AKM72P	230	29.410	260	23.840	211	56.9	504	40.657	360	1800	1610	18.7	64.5	57.1	12
	AKM72P	400	29.410	260	20.111	178	56.9	504	51.499	456	3000	2850	18.7	64.5	57.1	12
	AKM72P	460	29.410	260	18.191	161	56.9	504	48.379	428	3500	3310	18.7	64.5	57.1	12
	AKM73M	400	42.008	372	33.783	299	108.0	956	77.481	686	1500	1270	13.6	92.1	81.5	14
	AKM73M	460	42.008	372	32.088	284	108.0	956	67.064	594	1800	1460	13.6	92.1	81.5	14
	AKM73P	230	40.211	356	34.686	307	77.3	684	70.268	622	1300	1250	19.5	92.1	81.5	12
	AKM73P	400	40.211	356	28.472	252	77.3	684	62.394	552	2400	2260	19.5	92.1	81.5	12
	AKM73P	460	40.211	356	26.326	233	77.3	684	57.403	508	2800	2600	19.5	92.1	81.5	12
	AKM74L	400	53.013	469	43.499	385	143.4	1270	83.831	742	1200	940	12.9	119.7	105.9	14
	AKM74L	460	53.013	469	41.465	367	143.4	1270	78.980	699	1400	1090	12.9	119.7	105.9	14
	AKM74P	400	52.515	465	39.658	351	102.6	908	82.794	733	1800	1700	18.5	119.7	105.9	12
	AKM74P	460	52.515	465	35.929	318	102.6	908	94.718	838	2000	1900	18.5	119.7	105.9	12
-16.0-460-D	AKM64P	230	20.405	181	16.044	142	49.612	439	35.807	317	2500	2190	18.6	31.6	28.0	12
	AKM64P	400	20.405	181	11.863	105	49.612	439	40.851	362	4500	4270	18.6	31.6	28.0	12
	AKM64P	460	20.405	181	9.039	80.0	49.612	439	27.728	245	5500	4570	18.6	31.6	28.0	12
	AKM65N	230	24.303	215	19.772	175	62.017	549	45.108	399	2000	1750	17.8	40.0	35.4	12
	AKM65N	400	24.303	215	16.044	142	62.017	549	48.375	428	3500	3200	17.8	40.0	35.4	12
	AKM65N	460	24.303	215	14.688	130	62.017	549	48.962	433	4000	3680	17.8	40.0	35.4	12
	AKM72P	230	29.410	260	23.840	211	73.011	646	39.107	346	1800	1370	18.7	64.5	57.1	12
	AKM72P	400	29.410	260	20.111	178	73.011	646	48.671	431	3000	2470	18.7	64.5	57.1	12
	AKM72P	460	29.410	260	18.191	161	73.011	646	45.079	399	3500	2840	18.7	64.5	57.1	12
	AKM73P	230	41.612	368	34.686	307	99.619	882	66.786	591	1300	1090	19.5	92.1	81.5	12
	AKM73P	400	41.612	368	28.472	252	99.619	882	58.229	515	2400	1970	19.5	92.1	81.5	12
	AKM73P	460	41.612	368	26.326	233	99.619	882	53.320	472	2800	2260	19.5	92.1	81.5	12
	AKM74P	400	52.515	465	39.658	351	132.927	1177	77.214	683	1800	1480	18.5	119.7	105.9	12
	AKM74P	460	52.515	465	35.929	318	132.927	1177	86.893	769	2000	1700	18.5	119.7	105.9	12

MMC Smart Drive with Cartridge DDR®

Drive Model	Motor	VOLT	Cont Stall Torque		Cont Rated Torque		Peak Stall Torque		Peak Rated Torque		Rated Speed	Peak Corner Speed	Cont Stall Current	Motor Inertia		Power Cable Gauge
			TCS	lb-ft	TCR	lb-ft	TPS	lb-ft	TPR	lb-ft						
MMC-SD		VAC	N m	lb-ft	N m	lb-ft	N m	lb-ft	N m	lb-ft	RPM	RPM	A rms	kg cm ²	lb-ft-s ²	AWG
1.0-230-D	C041A	240	4.50	3.30	4.10	3.00	12.3	9.10	4.00	3.00	1800	1100	2.7	5.9	0.000	16
	C041B	240	3.40	2.50	3.40	2.50	9.00	6.70	9.00	6.70	2500	2500	3.5	5.9	0.000	16
	C042A	240	6.10	4.50	6.10	4.50	16.8	12.4	7.00	5.20	1750	1300	3.5	8.9	0.001	16
	C043A	240	8.20	6.00	8.20	6.00	22.2	16.4	10.0	7.40	1300	900	3.5	11.9	0.001	16
	C044A	240	9.80	7.30	9.80	7.30	26.8	19.8	12.0	8.90	1100	700	3.5	14.9	0.001	16
	C051A	240	8.90	6.60	8.90	6.60	23.9	17.6	12.0	8.90	1200	950	3.5	27.4	0.002	16
2.0-230-D	C041B	240	4.60	3.40	4.00	3.00	12.2	9.00	12.2	9.00	2500	2500	4.8	5.9	0.000	16
	C042A	240	8.20	6.00	7.50	5.50	22.2	16.4	7.0	5.20	1750	1300	4.7	8.9	0.001	16
	C043A	240	11.1	8.20	10.2	7.50	30.0	22.1	10.0	7.40	1300	900	4.8	11.9	0.001	16
	C044A	240	13.8	10.2	12.1	8.90	37.4	27.6	12.0	8.90	1100	700	4.9	14.9	0.001	16
	C051A	240	12.6	9.30	10.0	7.40	30.2	22.3	12.0	8.90	1200	950	5.0	27.4	0.002	16

MMC Smart Drive Performance Data

MMC Smart Drive with Cartridge DDR®

Drive Model	Motor	VAC	Cont Stall Torque		Cont Rated Torque		Peak Stall Torque		Peak Rated Torque		Rated Speed	Peak Corner Speed	Cont Stall Current	Motor Inertia		Power Cable Gauge
			TCS	lb-ft	TCR	lb-ft	TPS	lb-ft	TPR	lb-ft	WR	WPC	ICS	kg cm ²	lb-ft-s ²	AWG
MMC-SD		VAC	N m	lb-ft	N m	lb-ft	N m	lb-ft	N m	lb-ft	RPM	RPM	A rms	kg cm ²	lb-ft-s ²	AWG
2.4-460-D Size 1	C041A	240	4.50	3.3	4.1	3.00	11.8	8.70	4.00	3.00	1800	1100	2.7	5.9	0.000	16
	CH041A	480	4.50	3.3	4.0	3.00	11.8	8.70	11.8	8.70	2500	2500	2.7	5.9	0.000	16
4.0-460-D Size 2	C041B	240	4.60	3.4	4.0	3.00	11.2	8.20	11.2	8.20	2500	2500	4.8	5.9	0.000	16
	C042A	240	8.20	6.00	7.50	5.50	20.8	15.3	7.00	5.20	1750	1300	4.7	8.9	0.001	16
	CH042A	480	8.20	6.00	7.00	5.20	20.8	15.3	20.8	15.3	2500	2500	4.7	8.9	0.001	16
	C043A	240	11.1	8.20	10.2	7.50	26.8	19.8	10.0	7.40	1300	900	4.8	11.9	0.001	16
	CH043A	480	11.1	8.20	8.00	5.90	26.8	19.8	22.9	16.9	2500	2500	4.8	11.9	0.001	16
	C044A	240	13.8	10.2	13.0	9.60	32.3	23.8	12.0	8.90	1100	700	4.9	14.9	0.001	16
	CH044A	480	13.8	10.2	10.0	7.40	32.3	23.8	10.0	7.40	2250	2000	4.9	14.9	0.001	16
	C051A	240	12.6	9.30	10.0	7.40	29.5	21.8	12.0	8.90	1200	950	5.0	27.4	0.002	16
	CH051A	480	12.6	9.30	10.0	7.40	29.5	21.8	15.0	11.1	2500	2250	5.0	27.4	0.002	16
6.0-460-D Size 2	C042B	240	8.30	6.10	7.50	5.50	15.8	11.7	15.8	11.7	2500	2500	9.2	8.9	0.001	14
	C043B	240	11.1	8.20	9.50	7.00	21.0	15.5	14.0	10.3	2500	2250	9.2	11.9	0.001	14
	C044B	240	14.0	10.3	10.3	7.60	25.2	18.6	25.2	18.6	2150	1750	9.6	14.9	0.001	14
	CH044A	480	13.8	10.2	10.0	7.40	30.0	22.1	10.0	7.40	2250	2000	4.9	14.9	0.001	14
	C051B	240	12.6	9.30	10.0	7.40	22.3	16.4	10.0	7.40	2450	2200	9.6	27.4	0.002	14
	C052A	240	16.9	12.5	14.0	10.3	30.8	22.7	15.0	11.1	1850	1600	9.6	35.9	0.003	14
	CH052A	480	16.9	12.5	14.0	10.3	30.8	22.7	30.8	22.7	2500	2500	9.6	35.9	0.003	14
	C053A	240	21.8	16.1	16.0	11.8	41.0	30.2	20.0	14.8	1350	950	9.3	44.3	0.003	14
	CH053A	480	21.8	16.1	16.0	11.8	41.0	30.2	41.0	30.2	2500	2500	9.3	44.3	0.003	14
	C054A	240	25.1	18.5	16.0	11.8	45.6	33.6	20.0	14.8	1200	1000	9.6	52.8	0.004	14
	CH054A	480	25.1	18.5	16.0	11.8	45.6	33.6	30.0	22.1	2500	2250	9.6	52.8	0.004	14
	C061A	240	31.8	23.4	31.0	22.9	63.7	46.9	31.0	22.9	900	770	9.3	94.1	0.007	14
	CH061A	480	31.8	23.4	31.0	22.9	63.7	46.9	31.0	22.9	1900	1700	9.3	94.1	0.007	14

MMC Smart Drive with Cartridge DDR®

Drive Model	Motor	VAC	Cont Stall Torque		Cont Rated Torque		Peak Stall Torque		Peak Rated Torque		Rated Speed	Peak Corner Speed	Cont Stall Current	Motor Inertia		Power Cable Gauge				
			TCS	lb-ft	TCR	lb-ft	TPS	lb-ft	TPR	lb-ft										
MMC-SD		VAC	N m	lb-ft	N m	lb-ft	N m	lb-ft	N m	lb-ft	RPM	RPM	A rms	kg cm ²	lb-ft-s ²	AWG				
8.0-460-D Size 2	C051B	240	12.7	9.40	10.0	7.40	30.5	22.5	10.0	7.4	2450	2200	9.7	27.4	0.002	14				
	C052A	240	17.6	13.0	14.0	10.3	42.0	31.0	15.0	11.1	1850	1600	10.0	35.9	0.003	14				
	CH052A	480	17.6	13.0	14.0	10.3	42.0	31.0	42.0	31.0	2500	2500	10.0	35.9	0.003	14				
	C052B	240	16.6	12.3	14.0	10.3	30.2	22.3	25.0	18.4	2500	2300	12.8	35.9	0.003	14				
	C053A	240	21.8	16.1	16.0	11.8	54.1	39.9	20.0	14.8	1350	950	9.3	44.3	0.003	14				
	CH053A	480	21.8	16.1	16.0	11.8	54.1	39.9	54.1	39.9	2500	2500	9.3	44.3	0.003	14				
	C054A	240	26.0	19.2	21.0	15.5	62.3	46.0	20.0	14.8	1200	1000	9.9	52.8	0.004	14				
	CH054A	480	26.0	19.2	16.0	11.8	62.4	46.0	28.6	21.1	2500	2250	9.9	52.8	0.004	14				
	C061A	240	33.8	24.9	31.6	23.3	84.0	62.0	31.3	23.1	900	775	9.9	94.1	0.007	14				
	CH061A	480	33.8	24.9	27.2	20.1	84.0	62.0	28.0	20.6	1900	1700	9.9	94.1	0.007	14				
	C062A	240	41.6	30.7	41.7	30.7	87.4	64.5	43.6	32.2	950	850	12.8	126.0	0.009	14				
	CH062A	480	41.6	30.7	33.2	24.5	87.4	64.5	37.6	27.8	2000	1800	12.8	126.0	0.009	14				
	C062B	240	29.5	21.7	29.5	21.7	55.5	40.9	40.0	29.5	1450	1300	12.8	126.0	0.009	14				
	C063A	240	57.1	42.1	57.1	42.1	99.9	73.7	60.0	44.3	700	600	12.8	157.0	0.012	14				
	CH063A	480	56.1	41.4	56.1	41.4	99.9	73.7	50.0	36.9	1500	1400	12.8	157.0	0.012	14				
	8.0-460-D Size 2	C091A	230	49.9	36.8	40.0	29.5	100	74	75	55	600	380	12.73	280	0.021	14			
CH091A																				
CH091A		400	49.9	36.8	15.4	11.3	100	74	62	46	1200	660								
CH091A		460	49.9	36.8	15.4	11.3	100	74	62	46	1200	660								
C132A		230	331	244	320	236	660	487	400	295	110	62	12.73	2250	0.166	14				
CH132A																				
CH132A																	400	331	244	305
CH132A	460	331	244	300	221	660	487	360	266	250	150									
12.0-460-D Size 3	C053B	240	20.9	15.4	14.5	10.7	40.7	30.0	40.7	30.0	2500	2500					18.5	44.3	0.003	12
	C054B	240	25.0	18.4	16.0	11.8	49.9	36.8	20.0	14.8	2350	2100					17.6	52.8	0.004	12
	C061B	240	30.8	22.7	26.0	19.2	61.3	45.2	25.0	18.4	1950	1800					18.4	94.1	0.007	12
	C062A	240	47.9	35.3	42.4	31.3	121.7	89.8	43.7	32.2	950	850	14.7	126.0	0.009	14				
	CH062A	480	47.9	35.3	33.2	24.5	121.7	89.8	37.7	27.8	2000	1800	14.7	126.0	0.009	14				
	C062B	240	43.2	31.9	38.0	28.0	83.3	61.4	40.0	29.5	1450	1300	19.2	126.0	0.009	12				
	C063A	240	61.0	45.0	58.0	42.8	157.3	116.0	60.0	44.3	700	600	14.1	157.0	0.012	14				
	CH063A	480	61.0	45.0	54.6	40.3	157.3	116.0	50.0	36.9	1500	1400	14.1	157.0	0.012	14				
	C063B	240	59.0	43.5	50.4	37.2	110.1	81.2	50.0	36.9	1050	950	19.8	157.0	0.012	12				
	CH063B	480	59.0	43.5	38.0	28.0	110.1	81.2	35.0	25.8	2200	2100	19.8	157.0	0.012	12				

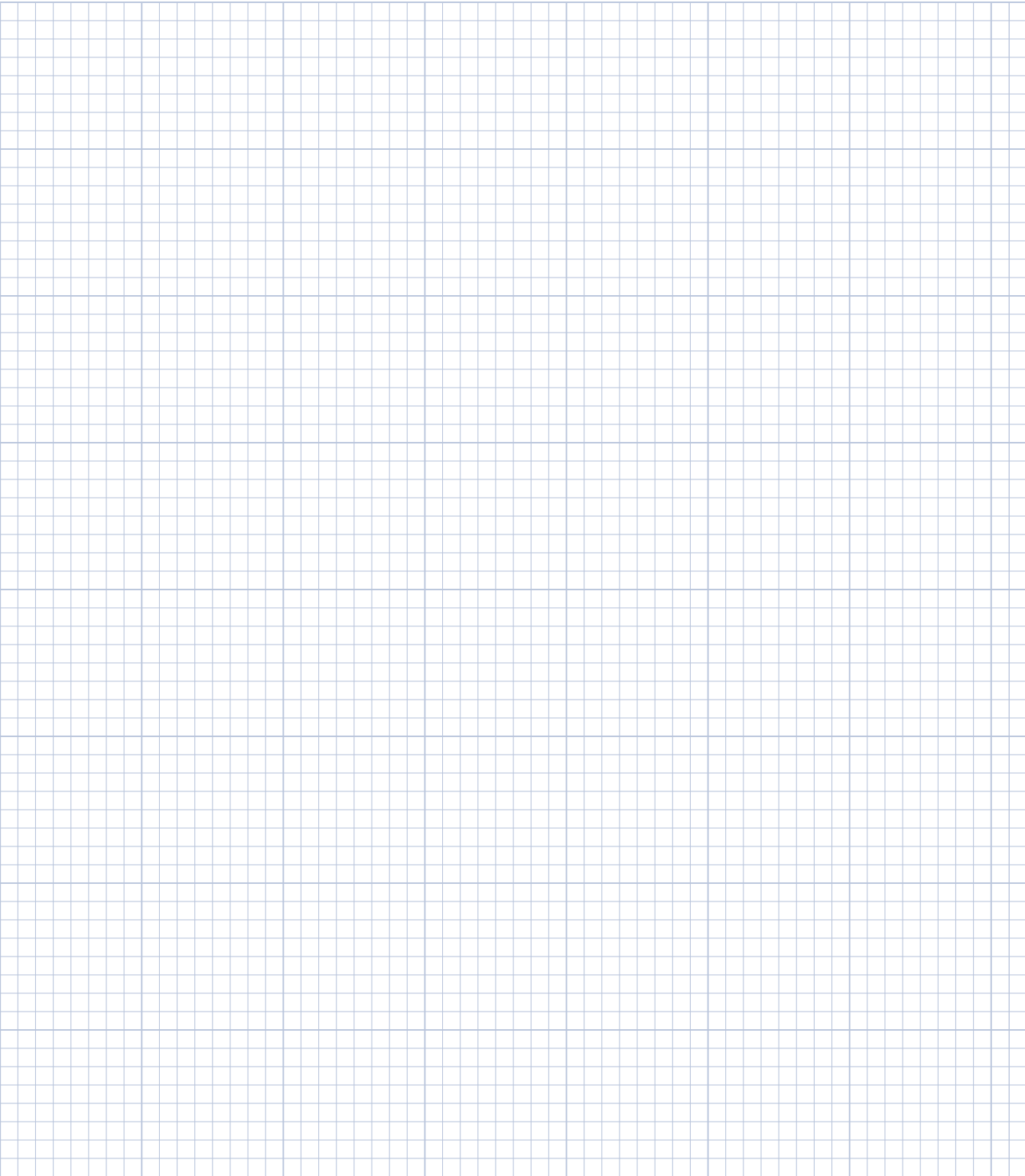
MMC Smart Drive Performance Data

MMC Smart Drive with Cartridge DDR®

Drive	Motor	VAC	Cont. Stall Torque		Cont. Rated Torque		Peak Stall Torque		Peak Rated Torque		Rated Speed	Peak Corner Speed	Cont Stall Current	Motor Inertia		Power Cable Gauge
			TCS	lb ft	TCR	lb ft	TPS	lb ft	TPR	lb ft	WR	WPC	ICS	kg cm ²	lb-ft-s ²	AWG
MMC-SD		VAC	N m	lb ft	N m	lb ft	N m	lb ft	N m	lb ft	RPM	RPM	amps RMS	kg cm ²	lb-ft-s ²	AWG
12.0-460-D	C091A	230	50	37	42	31	117	86	75	55	600	380	12.8	280	0.021	14
	CH091A															
	CH091A															
	CH091A	400	50	37	24.4	18.0	117	86	62	46	1200	660				
	CH091A	460	50	37	15.4	11.3	117	86	55	41	1500	800				
	C092A	230	101	75	90	66	231	170	120	89	400	250	15.3	470	0.035	12
	CH092A															
	CH092A															
	CH092A	400	101	75	70	51	231	170	129	95	700	430				
	CH092A	460	101	75	47	35	231	170	111	82	900	530				
	C093A	230	145	107	135	100	309	228	210	155	300	220	17.4	660	0.049	12
	CH093A															
	CH093A															
	CH093A	400	145	107	109	81	309	228	201	148	550	410				
	CH093A	460	145	107	96	71	309	228	210	155	650	490				
	C131A	230	188	139	169	125	389	287	260	192	225	150	15.6	1230	0.091	12
	CH131A															
	CH131A															
	CH131A	400	188	139	143	105	389	287	269	198	400	290				
	CH131A	460	188	139	121	89	389	287	248	183	500	340				
C132A	230	361	266	340	251	806	595	404	298	110	60	13.9	2250	0.166	14	
CH132A																
CH132A																
CH132A	400	361	266	316	233	806	595	417	307	200	120					
CH132A	460	361	266	299	220	806	595	372	274	250	140					
C133A	230	504	372	475	351	1016	749	667	492	90	60	16.8	3020	0.223	12	
CH133A																
CH133A																
CH133A	400	504	372	445	328	1016	749	750	553	160	130					
CH133A	460	504	372	425	313	1016	749	690	509	200	150					
16.0-460-D	C054B	240	25.0	18.4	16.0	11.8	60.5	44.6	20.0	14.8	2350	2100	17.6	52.8	0.004	12
	C061B	240	30.8	22.7	26.0	19.2	77.9	57.4	25.0	18.4	1950	1800	18.4	94.1	0.007	12
	C062B	240	43.2	31.9	38.0	28.0	110.3	81.4	40.0	29.5	1450	1300	19.2	126.0	0.009	12
24.0-460-D	C131B	230	190	140	133	98	397	292	251	184	450	300	29.2	1230	0.091	12
	CH131B															
	CH131B															
	CH131B	400	190	140	93	69	396	292	360	266	600	600				
	CH131B	460	190	140	93	69	396	292	360	266	600	600				
	C132B	230	362	266	308	226	761	560	537	395	225	160	29.6	2250	0.166	12
	CH132B															
	CH132B															
	CH132B	400	361	266	229	169	759	560	542	400	400	300				
	CH132B	460	361	266	154	114	759	560	497	367	500	360				
C133B	230	511	376	444	327	1019	750	782	575	175	140	32.7	3020	0.223	10	
CH133B																
CH133B																
CH133B	400	510	376	320	236	1017	750	570	421	350	260					
CH133B	460	510	376	266	196	1017	750	685	505	400	310					

MMC SMART DRIVE PERFORMANCE DATA

Notes



MMC Control System Options

With the flexibility and wide range of MMC System options, motion design has never been easier. Choose from accessories to expand the Digital Link, using Analog Drives with the DL-DIU, add additional machine I/O with Slice or Block I/O, or include an Operator Interfaces to complete your design.

Each option is seamlessly integrated into the control system and easily accessed with PiCPro programming software for a truly smart system with little effort.

DL-DIU

- Connects directly to the Digital Link motion bus
- Provides an analog interface in a digital system allowing a mix of digital MMC Smart Drives and analog devices Interface to VFD, Vector VFD, etc.
- +/- 10Vdc analog input and output
- Incremental Encoder A quad B feedback input
- 2 – 24Vdc inputs/outputs
- Stepper Control - Step/Direction



MMC Digital Link Drive Interface Unit

Description	Length	Part Number
DL_DIU with Incremental Feedback and Analog Output		M.3000.0832
Flying Lead Cable	3 Meter	M.3000.1057
Breakout Box (Din-rail mount)For I/O Connector	"Used with Interface Cable below"	M.1016.2529
Breakout Box (Drive mount)For I/O Connector	"Used with Interface Cable below"	M.1302.6970
Interface Cable, From I/O Connector to Breakout Box,HD 15 pin sub D Connector	1 Foot	M.3000.1058
	2 Foot	M.3000.1059
	3 Foot	M.3000.1060

MMC Control System Options

Kollmorgen's Slice I/O System offers a low cost, highly modular solution to system I/O requirements. One Slice I/O Coupler can provide up to 144 input points, and 144 output points, depending on the type of Slice I/O Module installed. Furthermore, a Control System containing a Digital Control can contain from 2 to 64 Slice I/O Couplers, depending on the Control type and other Digital Link devices



Slice I/O

Digital Link Couplers	
Description	Part Number
Digital Link Coupler, Sink In/Source Out	AT2-R833
Digital Link Coupler, Source In/Sink Out	AT2-R834

Discrete Input Modules	
Description	Part Number
Digital Input 4 Point, Sink, Terminal, 5 Vdc	ST-1114
Digital Input 4 Point, Source, Terminal, 5 Vdc	ST-1124
Digital Input 16 Points, Sink, 20P Connector 5 Vdc	ST-111F
Digital Input 16 Points, Source, 20P Connector 5 Vdc	ST-112F
Digital Input 4 Point, Sink, Terminal, 12/24 Vdc	ST-1214
Digital Input 4 Point, Source, Terminal, 12/24 Vdc	ST-1224
Digital Input 8 Point, Sink, Terminal, 12/24 Vdc	ST-1218
Digital Input 8 Point, Source, Terminal, 12/24 Vdc	ST-1228
Digital Input 16 Point, Sink, Terminal, 12/24 Vdc	ST-121F
Digital Input 16 Point, Source, Terminal, 12/24 Vdc	ST-122F
Digital Input 4 Points, Sink, Terminal, 48 Vdc	ST-1314
Digital Input 4 Points, Source, Terminal, 48 Vdc	ST-1324
Digital Input 4 Points, Terminal, 110VAC(AC 85V~132V)	ST-1804
Digital Input 4 Points, Terminal, 220VAC(AC 170V~264V)	ST-1904

Slice I/O Input Modules provide machine data to the Application Program, and Slice I/O Output Modules provide machine control from the Application Program. The Application Program is developed using Kollmorgen's PiCPro integrated Application Development Environment



Slice I/O

Discrete Output Modules	
Description	Part Number
Digital Output 4 Points, TTL Inverting, Terminal, 5 Vdc/20 mA	ST-2114
Digital Output 4 Points, TTL Non-Inverting, Terminal, 5 Vdc/20 mA	ST-2124
Digital Output 4 Points, Sink, Terminal, 24 Vdc/0.5 A	ST-2314
Digital Output 4 Points, Source, Terminal, 24 Vdc/0.5 A	ST-2324
Digital Output 4 Points, Sink, Terminal, Diagnostic, 24 Vdc/0.5 A	ST-2414
Digital Input 4 Point, Source, Terminal, 12/24 Vdc	ST-2424
Digital Output 4 Points, Sink, Terminal, Diagnostic, 24 Vdc/2 A	ST-2514
Digital Output 4 Points, Source, Terminal, Diagnostic, 24 Vdc/2 A	ST-2524
Digital Output 8 Points, Sink, Terminal, 24 Vdc/0.5 A	ST-2318
Digital Output 8 Points, Source, Terminal, 24 Vdc/0.5 A	ST-2328
Digital Output 16 Points, Sink, 20P Connector, 24 Vdc/0.5 A	ST-221F
Digital Output 16 Points, Source, 20P Connector, 24 Vdc/0.5 A	ST-222F
Relay Output 2 Points, Terminal, 230 Vac/2A, 24 Vdc/ 2 A	ST-2742
Relay Output 4 Points, Terminal, 230 Vac/2A, 24 Vdc/ 2 A	ST-2744
Relay Output 8 Points, Terminal, 230 Vac/2A, 24 Vdc/ 2 A	ST-2748
Relay Output 2 Points, Source, Terminal, 250 Vac/2 A, Manual Type	ST-2792
Triac Output 2 Point, Terminal, 120Vac/2A, 24 Vdc/2 A	ST-2852
4DO, Sink, RTB, 24 V DV/2A	ST-2614
4DO, Sourcing, RTB, 24 V DV/2A	ST-2624

MMC Control System Options



Slice I/O

Analog Input Modules	
Description	Part Number
Analog Input 4 Channels, 0~20 mA, 12 Bit, status	ST-3114
Analog Input 8 Channels, 0~20 mA, 12 Bit, status	ST-3118
Analog Input 4 Channels, 0~20 mA, 14 Bit, status	ST-3134
Analog Input 4 Channels, 4~20 mA, 12 Bit, status	ST-3214
Analog Input 4 Channels, 4~20 mA, 14 Bit, status	ST-3234
Analog Input 4 Channels, 0~5 Vdc, 12 Bit, status	ST-3624
Analog Input 4 Channels, 0~5 Vdc, 14 Bit, status	ST-3644
Analog Input 4 Channels, 0~10 Vdc, 12 Bit, status	ST-3424
Analog Input 4 Channels, 0~10 Vdc, 14 Bit, status	ST-3444
Analog Input 4 Channels, 0~10 Vdc, 12 Bit, Sensor Connector	ST-3474
Analog Input 4 Channels, -10~+10 Vdc, 12 Bit, status	ST-3524
Analog Input 4 Channels, -10~+10 Vdc, 14 Bit, status	ST-3544
Analog Input 8 Channels, 0~20 mA, 12 Bit	ST-3218
Analog Input 8 Channels, 0-10 V, 12Bit	ST-3428
Analog Input 2 Channels, RTD, RTB	ST-3702
Analog Input 4 Channels, RTD, 20 Pin Connector	ST-3704
Analog Input 8 Channels, RTD, 20 Pin Connector	ST-3708
Analog Input 2 Channels, Thermocouple, TC	ST-3802
Analog Input 4 Channels, Thermocouple, 20 Pin Connector	ST-3804
Analog Input 8 Channels, Thermocouple, 20 Pin Connecetor	ST-3808

Slice I/O

Analog Output Modules	
Description	Part Number
Analog Output 2 Channels, 0~20 mA, 12 Bit	ST-4112
Analog Output 4 Channels, 0~20 mA, 12 Bit	ST-4114
Analog Output 2 Channels, 4~20 mA, 12 Bit	ST-4212
Analog Output 4 Channels, 4~20 mA, 12 Bit	ST-4214
Analog Output 4 Channels, 4~20 mA, 12 Bit, Sensor Connector	ST-4274
Analog Output 4 Channels, 0~10V, 12Bit, Sensor Connector	ST-4474
Analog Output 1 Channels, 0~10V, 12 Bit, Manual Type, RTB	ST-4491
Analog Output 2 Channels, 0~5V, 12 Bit	ST-4622
Analog Output 2 Channels, 0~10V, 12 Bit	ST-4422
Analog Output 4 Channels, 0~10V, 12 Bit	ST-4424
Analog Output 2 Channels, -10~+10 Vdc, 12 Bit	ST-4522

Slice I/O

Power Modules	
Description	Part Number
Expansion Power Supply (Input 24 Vdc/Output 1.0 A/5 Vdc)	ST-7111
Expansion Field Power Distributor (Arbitrary 5 Vdc, 24 Vdc, 48 Vdc, 110 Vac, 220 Vac)	ST-7241
Potential Distributor, for Shield	ST-7008
Potential Distributor, for Shield	ST-7008
Potential Distributor, for 0 Vdc	ST-7108
Potential Distributor, for 24 Vdc	ST-7118
Potential Distributor, for 24V dc and 0 Vdc	ST-7188

MMC Control System Options

Slice I/O

Special Modules	
Description	Part Number
High Speed Counter 1 Channel, 5 Vdc/24 Vdc	ST-5101/5111
2 Channels High Speed Counter Input, 24 Vdc	ST-5112
4 Channels High Speed Counter Input, 24 Vdc	ST-5114
2 Channels PWM Output, 1.5 A/24 Vdc, Source	ST-5422
2 Channels PWM Output, 0.5 A/24 Vdc, Source	ST-5442
4 Channels PWM Output, 1.5 A/24 Vdc, Source	ST-5444
1 Channel Pulse Output, 0.5 A/24 Vdc, Source	ST-5641
2 Channels Pulse Output, 0.5 A/24 Vdc, Source	ST-5642

Slice I/O

Accessories	
Description	Part Number
End Module, 7EA	ST-8121
Numbering, 0~9, White, 100EA	ST-8371
Numbering, Blank, 100EA	ST-8372
Removable Terminal Block, 9EA	ST-8241
End Module, 1EA	ST-END
Numbering, 0~9, White, 1EA	ST-NUM-0-9
Numbering, Blank, 1EA	ST-NUM-BLNK
Removable Terminal Block, 1EA	ST-RTB

Block I/O

The block I/O modules provide a wide variety of digital, analog and special purpose I/O for extended functionality for the MMC System.



- Simple 4 wire high-speed RS485 network
- Access to 77 block I/O modules
- Mount local to controller or remotely up to 200 feet apart

Block I/O Modules

Discrete Input/Output Modules	
Description	Part Number
15-30 Vdc Isolated Input (Sink or Source) (8) point Input	M.1300.6042
20-30 Vdc Isolated Output 0.5 Amps Per Point (Source) (8) Point Output	

Discrete Input Modules			
Module Type	Type	Description	Part Number
Discrete Inputs (16)	24 Vdc	15-30 Vdc Isolated Input (Sink or Source) (16) Point	M.1300.7372
Discrete Inputs (8)	120 Vac	79-132 Vac Isolated Input - (8) Point	M.1300.4946

Discrete Output Modules			
Module Type	Type	Description	Part Number
Discrete Outputs (16)	24 Vdc	20-30 Vdc Isolated Output 0.5 Amps Per Point (Source) - (16) Point	M.1017.3095
Discrete Outputs (8)	120 Vac	48-132 Vac Isolated Output 0.75 Amps Per Point - (8) Point	M.1300.4948
Discrete Outputs (8)	Relay	Relay Output (Max 132 V) (4) Point Form 1A; (4) Point Form 1C	M.1300.4981

MMC Control System Options

Block I/O

- Wide range analog signal options
- Thermo-couple input couples with PicPro PID controls
- Resolver Interface for harsh environments
- Stepper Control or Integrated 5 Axis Stepper Control/Drive
- Stepper options allows integration of the most suitable technology
- Stepper control does not count as an axis of control

Analog & Special Purpose Modules			
Module Type	Type	Description	Part Number
Analog Output (4)	4-20 mA	Analog Output, 4-20 mA, 15-Bit Resolution - 4 Channel	M.1017.3101
Analog Input (4) Analog Output (4)	see descr	(4) Inputs Voltage or Current 14-Bit (4) Outputs 16-Bit +/- 10 V	M.1301.4145
Analog Output (4)	+/- 10V	Analog Output, ±10 V, 15-Bit Resolution 4 Channel	M.1017.3140
Analog Input (4)	4-20 mA, +/- 10V	Analog Input, ±10 V, 0-20 mA, 4-20 mA, 14-Bit Resolution - 4 Channel	M.1017.3098
Resolver Input (4)	Resolver	Resolver Input, 4000 counts/rev, 6 Channel	M.1017.3138
Thermocouple Input (4)	Thermocouple	Thermocouple Input J/K Type ,14-Bit Resolution, - 8 Channel	M.1301.9806

Stepper Block Modules			
Module Type	Type	Description	Part Number
Step & Direction (2)	Stepper Command, Encoder feedback	Stepper Output - Incremental Encoder Input - 24 Vdc Input - 2 Axes	M.1017.3143
Stepper Controller, Drive (5)	Stepper Command, Stepper Drive, SSI feedback	Five Axis Stepper Controller/Drive, Programmable 0.4 to 4.0 amps Peak Drive Current per Axis, 32 Vac Drive, 24 Vdc Logic, with SSI encoder feedback - 5 Axes	M.1302.7612

Block I/O Connectors	
Description	Part Number
Block I/O Communications Jumper	M.1016.9721
Block I/O 5 Pin Communications Connector	M.1016.1744

Complete Family of Operator Interface Products

Exter Series Operator Interfaces



Type	Description	Part Number
K10m	"Graphic Keypad operator terminal. 160x32 pixels, Backlit black and white LCD display. Line Display. RS232, RS422/RS485. 24 Vdc power supply."	M.3000.0557
K20m	"Graphic Keypad operator terminal. 240x64 pixels, Backlit black and white LCD display. Line Display. RS232, RS422/RS485. 24 Vdc power supply."	M.3000.0558
K30m	Touch terminal. 5.7" Monochrome STN LCD Blue Mode. 320 x 240 pixel resolution and 5 function keys. Standard version.	M.3000.0169
T40m	"Graphic Touch operator terminal. 320x240 pixels, Backlit 3.5" TFT-LCD 16 greyscales display. Built in Ethernet and USB Host. RS232, RS422/RS485. 24 Vdc power supply."	M.3000.0170
T40	"Graphic Touch operator terminal. 320x240 pixels, Backlit 3.5" TFT-LCD 64k color display. Built in Ethernet and USB Host. RS232, RS422/RS485. 24 Vdc power supply."	M.3000.0171
T60m	Graphic Touch operator terminal. 320x240 pixels, Backlit 5.7" TFT-LCD 16 greyscales display. Built in Ethernet and USB Host. RS232, RS422/RS485. 24 Vdc power supply.	M.3000.0172
T60	Graphic Touch operator terminal. 320x240 pixels, Backlit 5.7" TFT-LCD 64k color display. Built in Ethernet and USB Host. RS232, RS422/RS485. 24 Vdc power supply.	M.3000.0173
K60	Graphic Keypad operator terminal. 320x240 pixels, Backlit 5.7" TFT-LCD 64k color display. Built in Ethernet and USB Host. RS232, RS422/RS485. 24 Vdc power supply.	M.3000.0174
K70	"Graphic Keypad operator terminal. 640x480 pixels, Backlit 6.5" TFT-LCD 64k color display. Built in Ethernet, USB Host and device and CompactFlash slot. RS232, RS422/485. 24 Vdc power supply."	M.1302.8205
T70	"Graphic Touch operator terminal. 640x480 pixels, Backlit 6.5" TFT-LCD 64k color display. Built in Ethernet, USB Host and device and CompactFlash slot. RS232, RS422 RS485. 24 Vdc power supply."	M.1302.8206
K100	Graphic Keypad operator terminal. 800x600 pixels, Backlit 10.4" TFT-LCD 64k color display. Built in Ethernet, USB Host and device and CompactFlash slot. RS232, RS422/RS485. 24 Vdc power supply.	M.1302.8207
T100	Graphic Touch operator terminal. 800x600 pixels, Backlit 10.4" TFT-LCD 64k color display. Built in Ethernet, USB Host and device and CompactFlash slot. RS232, RS422/RS485. 24 Vdc power supply.	M.1302.8208
T150	Graphic Touch operator terminal. 1024x768 pixels, Backlit 15.1" TFT-LCD 64k color display. Built in Ethernet, USB Host and device and CompactFlash slot. RS232, RS422/RS485. 24 Vdc power supply.	M.1302.8209

Operator Interface Products



H Series Operator Interfaces

Type	Description	Part Number
H-K30m-S	Alphanumeric keyboard with 10 function keys. 3" monochrome STN LCD. 160 x 80 pixel resolution. 10 function keys.	M.3000.0755
H-T40m-S	Touch terminal. 3.5" monochrome FSTN LCD, 16 shades of gray. 240x240 pixels resolution.	M.3000.0756
H-T40m-P	Touch terminal. 3.5" monochrome FSTN LCD, 16 shades of gray. 240x240 pixels resolution.	M.3000.0757
H-T50b-S	Touch terminal. 4.7" monochrome STN LCD Blue Mode. 240 x 128 pixel resolution.	M.3000.0758
H-T60b-S1	Touch terminal. 5.7" Monochrome STN LCD Blue Mode. 320 x 240 pixel resolution and 5 function keys. Standard version.	M.3000.0759
H-T60b-Pe	Touch terminal. 5.7" Monochrome STN LCD Blue Mode. 320 x 240 pixel resolution and 5 function keys. Plus version with CompactFlash slot and USB port.	M.3000.0760
H-T60b-Ne	Touch terminal. 5.7" Monochrome STN LCD Blue Mode. 320 x 240 pixel resolution and 5 function keys. Network version with Ethernet port, CompactFlash slot and USB port.	M.3000.0761
H-T60c-N1	Touch terminal. 5.7" Color STN LCD. 320 x 240 pixel resolution and 5 function keys. Ethernet Network version.	M.3000.0762
H-T60t-S	Touch terminal. 5.7" 256 Color TFT LCD. 320 x 240 pixel resolution and 5 function keys. Standard version.	M.3000.0763
H-T60t-Pe	Touch terminal. 5.7" 64k Color TFT LCD. 320 x 240 pixel resolution and 5 function keys. Plus version with CompactFlash slot and USB Host and device port.	M.3000.0764
H-T60t-Ne	Touch terminal. 5.7" 64k Color TFT LCD. 320 x 240 pixel resolution and 5 function keys. Network version with Ethernet port, CompactFlash slot and USB Host and device port.	M.3000.0765
H-T70t-Pe	Touch terminal 7.0" 64k Color TFT LCD 800x480 pixel resolution and 5 function keys. Plus version with CompactFlash slot and USB Host and device port.	M.3000.0766
H-T70t-Ne	Touch terminal 7.0" 64k Color TFT LCD 800x480 pixel resolution and 5 function keys. Ethernet port, CompactFlash slot and USB Host and device port.	M.3000.0767
H-T100t-N	Touch terminal. 10.4" 64k Color TFT LCD. 640 x 480 pixel resolution and 7 function keys. Ethernet port, CompactFlash slot, two USB Host ports and one USB Device port.	M.3000.0770





iX Series Operator Interfaces

Type	Description	Part Number
T4A	Graphic Touch operator terminal. 480x272 pixels, LED backlit 4.3" TFT-LCD color display. Ethernet, USB 2.0 full-speed port SD card slot. and four serial ports. Power supply 24 Vdc. Includes iX Runtime.	M.3000.1378
T7A	Graphic Touch operator terminal. 800x480 pixels, LED backlit 7" TFT-LCD color display. Ethernet, USB 2.0 full-speed port SD card slot. and four serial ports. Power supply 24 Vdc. Includes iX Runtime.	M.3000.1379
T10A	"Graphic Touch operator terminal. 640x480 pixels, LED backlit 10.4"" TFT-LCD color display. Ethernet, USB 2.0 full-speed port SD card slot. and four serial ports. Power supply 24 Vdc. Includes iX Runtime. .	M.3000.1380
T7B	Graphic Touch operator terminal. 800x480 pixels, LED backlit 7" TFT-LCD color display. Two Ethernet,three USB 2.0 host ports, SD card slot. and four serial ports. Power supply 24 Vdc. Includes iX Runtime.	M.3000.1381
T12B	Graphic Touch operator terminal. 1280x800 pixels, LED backlit 12.1" TFT-LCD color display. Two Ethernet,three USB 2.0 host ports,SD card slot. and four serial ports. Power supply 24 Vdc. Includes iX Runtime.	M.3000.1382
T15B	Graphic Touch operator terminal. 1280x800 pixels, LED backlit 15.4" TFT-LCD color display. Two Ethernet,three USB 2.0 host ports,SD card slot. and four serial ports. Power supply 24 Vdc. Includes iX Runtime.	M.3000.1383



MMC Control System Accessories

By combining processing power, a high-speed integrated ethernet network, the class-leading capabilities of the conventional AKM servomotor series, and the optimized control of the cartridge direct drive technology, the PiCPro Integrated Solution can offer repeatable and reliable break-through performance.

It also represents a well integrated, powerful, yet cost-effective solution suitable to a wide-range of applications.

MMC Drive Resident Controller (D1, D2, D4, D8, D16) Cabling Options for Controller I/O Connector (C5)

MMC Controller I/O Connector (C5) – Breakout, Flying lead cable		
Description	Length	Part Number
I/O Connector (C5) to Flying Lead Cable (Figure 1)	1 Meter	M.1302.8257
	1.5 Meters	M.3000.1057
	3 Meters	M.1302.8258
	9 Meters	M.1302.8259
	15 Meters	M.1302.8290
	30 Meters	M.1302.8291

MMC Controller I/O Connector (C5) - Breakout, Din-Rail Mounted		
Description	Length	Part Number
Breakout Box (Din-rail mount) For I/O Connector (C5) (Figure 2)	Used with Interface Cable below	M.1302.8253
Interface Cable, From I/O Connector (C5) to Breakout Box, HD 26 pin sub D Connectors (Figure 2)	1 Meter	M.1302.8254
	3 Meters	M.1302.8255
	9 Meters	M.1302.8256



(Figure 1)
I/O Connector (C5) to Flying Lead Cable



(Figure 2)
Interface Cable to Break-Out Box

MMC Control System Accessories

MMC Stand Alone Controller (DSA2, DSA4, DSA8, DSA16) Cabling Options for Controller I/O Connector

MMC Controller I/O Connector – Breakout, Flying lead cable		
Description	Length	Part Number
I/O Connector to Flying Lead Cable	3 Meters	M.1016.2519
Breakout Box (Control mount) For I/O Connector		M.1302.6970
Breakout Box (Din-rail mount) For I/O Connector	Used with Interface Cable below	M.1302.6972
Interface Cable, From I/O Connector to Breakout Box, HD 15 pin sub D Connectors	1 Meter	M.1302.6976
	3 Meters	M.1302.6977
	9 Meters	M.1302.6979
	15 Meters	M.1302.6980

MMC Smart Drive Cabling Options for Drive IO Connector

Drive I/O Connector – Breakout, Flying Lead Cable		
Description	Length	Part Number
Drive I/O Connector (IO) to Flying Lead Cable	1 Meter	M.1302.7032
	3 Meters	M.1302.7034
	9 Meters	M.1302.7035
	15 Meters	M.1302.7036
	30 Meters	M.1302.7037

MMC Smart Drive Cabling Options for Drive IO Connector

Drive I/O Connector - Breakout, Din-Rail Mounted		
Description	Length	Part Number
Breakout Box (Din-rail mount) For I/O Connector (IO)	Used with Interface Cable below	M.1302.6973
Interface Cable, From I/O Connector (IO) to Breakout Box, HD 26 pin sub D Connectors	1 Meter	M.1302.6982
	3 Meters	M.1302.6984
	9 Meters	M.1302.6985

Drive I/O Connector – Screw Terminal Adapter, Drive Mounted		Part Number
Description		
Screw terminal adapter, Drive I/O Connector, Drive mounted	(Figure 3,5)	M.1302.6971

Motor Chokes SDN Drives

MMC-SDN-1.8-460-D MMC-SDN-3.6-460-D	3LYN-06
MMC-SDN-7.2-460-D	3LYN-14
MMC-SDN-14.4-460-D	3LYN-24

* If a motor cable over 25 meters is used, a Motor Choke must be installed.



(Figure 3)
Screw terminal adapter
HD 26 pin Drive I/O

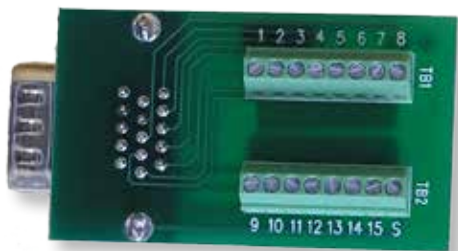
MMC Control System Accessories

MMC Smart Drive

Cabling Options for Drive Feedback (F1 and/or F2) Connector

Drive Feedback (F1/F2) Connector - Breakout, Din-Rail Mounted		
Description	Length	Part Number
Breakout Box (Din-rail mount) For Feedback Connector (F1/F2)	Used with Interface Cable below	M.1302.6972
Interface Cable, From Feedback Connector (F1/F2) to Breakout Box	1 Meter	M.1302.6976
	3 Meters	M.1302.6977
	9 Meters	M.1302.6979
	15 Meters	M.1302.6980

Drive Feedback (F1/F2) Connector – Screw Terminal Adapter, Drive Mounted	
Description	Part Number
Screw terminal adapter , Drive Feedback (F1/F2) Connector, Drive mounted (Figure 4,5)	M.1302.6970



(Figure 4)
Screw terminal adapter
HD 15 pin Feedback (F1, F2 & Aux)



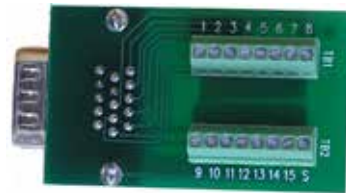
(Figure 5)
Connector mounted on drive

S200-DLS Drive Cabling Options for Drive Aux Feedback Connector

Drive I/O Connector - Breakout, Din-Rail Mounted		
Description	Length	Part Number
Interface Cable, Flying Lead (J8) Aux Feedback Connector	1 Meter	M.3000.0805
	3 Meters	M.3000.0806
	6 Meters	M.3000.0807
	9 Meters	M.3000.0808
Breakout Box (Din-rail mount) For Aux Feedback Connector (J8)	Used with Interface Cable below	M.1302.6972
Interface Cable, From Aux Feedback Connector (J8) to Breakout Box, HD 15 pin sub D Connectors	1 Meter	M.3000.0801
	3 Meters	M.3000.0802
	6 Meters	M.3000.0803
	9 Meters	M.3000.0804
Breakout Box (Drive mount) For Aux Feedback Connector (J8)		M.1302.6970



(Figure 6)
Screw terminal adapter
HD 15 pin Feedback (F1, F2 & Aux)



(Figure 7)
Drive Mounted Connector

MMC Control System Accessories

MMC Smart Drive External Shunt Options

Drive Shunt Resistors		
For Drive:	Description	Part Number
MMC-SD-0.5-230	For Single Phase Drives: 100 Ω , 300 W, 600 V, Dynamic	M.1015.7046
MMC-SD-1.0-230 MMC-SD-2.0-230 MMC-SD-3.0-230	For Three Phase Drives: 30 Ω , 300 W Cont. Power, 215mm(L) x 60mm(W) x 30mm(H)	M.3000.0503
MMC-SD-1.3-460 MMC-SD-2.4-460	145 Ω , 450 W Cont. Power, 5.4 kW Peak Power, 820 V, 240 sec. Time Constant, 121 mm x 93 mm x 605 mm	M.1302.7048
	130 Ω , 150 W, Reduced Size Panel Mount	M.3000.0504
MMC-SD-4.0-460	95 Ω , 700 W Cont. Power, 8 kW Peak Power, 820 V, 250 sec. Time Constant, 121 mm x 93 mm x 705 mm	M.1302.7049
	95 Ω , 300 W, Reduced Size Panel Mount	M.3000.0505
MMC-SD-6.0-460 MMC-SD-8.0-460	50 Ω , 1400 W Cont. Power, 17 kW Peak Power, 850 V, 250 sec. Time Constant, 130 mm x 182 mm x 710 mm	M.1302.7060
	50 Ω , 500 W, Reduced Size Panel Mount	M.3000.0506
MMC-SD-12.0-460 MMC-SD-16.0-460	25 Ω , 2800 W Cont. Power, 3 kW Peak Power, 850 V, 60 sec. Time Constant, 171 mm x 430 mm x 550 mm	M.1302.7061
	25 Ω , 800W, Reduced Size Panel Mount	M.3000.0507
-D -D -D -D -D	Regen Resistor – 18 Ohm, 3900 Watt cont, 70 kW peak	M.1302.7063
MMC-SD-24.0-460 MMC-SD-30.0-460 MMC-SD-42.0-460 MMC-SD-51.0-460 MMC-SD-65.0-460	18 Ω , 3900 W Cont. Power, 70 kW Peak Power, 850 V, 70 sec. Time Constant, 180 mm x 445 mm x 490 mm	M.1302.7063
	18 Ω , 1200 W, Reduced Size Panel Mount	M.3000.0508

MMC Smart Drive SDN External Shunt Options

SDN Drive External Shunt Resistors		
For Drive:	Description	Part Number
MMC-SDN-1.8-460 MMC-SDN-3.6-460 MMC-SDN-7.2-460	33 Ω , 100 W Cont. Power, 160W Peak Power	BAFP-100-33
	33 Ω , 200 W Cont. Power, 320W Peak Power	BAFP-200-33
	33 Ω , 250 W Cont. Power, 400W Peak Power	BAR-250-33
	33 Ω , 500 W Cont. Power, 800W Peak Power	BAR-500-33
	33 Ω , 1.5 kW Cont. Power, 2.4kW Peak Power	BAR-1500-33
	33 Ω , 3 kW Cont. Power, 4.8kW Peak Power	BAR-3000-33
MMC-SDN-14.4-460-D	23 Ω , 600 W Cont. Power, 960W Peak Power	BAR-600-23
	23 Ω , 1 kW Cont. Power, 1.6kW Peak Power	BAR-1000-23
	23 Ω , 2 kW Cont. Power, 3.2W Peak Power	BAS-2000-23
	23 Ω , 3 kW Cont. Power, 4.8kW Peak Power	BAS-3000-23
	23 Ω , 4 kW Cont. Power, 6.3kW Peak Power	BAS-4000-23

DC BUS Sharing for Multi-Axis Applications

The Smart Drive supports DC BUS sharing among multiple 460 V Smart Drives. DC BUS sharing offers an alternative approach for managing system regeneration energy.

DC BUS sharing offers the following benefits:

- The capacitance of all of the drives is pooled or shared
- Power consumption is reduced by utilizing the shared capacitance thus lowering electricity cost.
- Multiple drives are allowed to share one shunt resistor.
- Regenerative energy is shared among multiple storage capacitors and regen resistors.
- Requirement for regen resistors may be reduced or eliminated

Consult with application engineering to review DC BUS sharing scenarios for multi-axis applications

MMC Control System Accessories

MMC Smart Drive AC Line Filters

AC Line Filters		
For Drive:	Description	Part Number
MMC-SD-0.5-230 MMC-SD-1.0-230	6 A, 250 V, 1 Phase	M.1015.6922
MMC-SD-2.0-230 MMC-SD-3.0-230	10 A, 250 V, 1 Phase	M.1015.6917
MMC-SD-0.5-230 MMC-SD-1.0-230 MMC-SD-2.0-230 MMC-SD-3.0-230	16 A, 480 V, 3 Phase	M.1302.5244
MMC-SD-1.3-460 MMC-SD-2.4-460	7 A, 480 V, 3 Phase	M.1302.5241
MMC-SD-4.0-460 MMC-SD-6.0-460 MMC-SD-8.0-460	16 A, 480 V, 3 Phase	M.1302.5244
MMC-SD-12.0-460 MMC-SD-16.0-460	30 A, 480 V, 3 Phase	M.1302.5245
MMC-SD-24.0-460	42 A, 480 V, 3 Phase	M.1302.5246
MMC-SD-30.0-460 MMC-SD-42.0-460	56 A, 480 V, 3 Phase	M.1302.5247
MMC-SD-51.0-460	75 A, 480 V, 3 Phase	M.1302.5248
MMC-SD-65.0-460	100 A, 480 V, 3 Phase	M.3000.0109

MMC-SDN-XXXX drives do not require line filters

MMC Smart Drive Line Reactors

Line Reactors				
For Drive:	Amperage	Power Loss	Inductance	Part Number
MMC-SD-12-460	25 A	52 W	1.2 mH	M.1302.7373
MMC-SD-16-460	35 A	54 W	0.8 mH	M.1302.7374
MMC-SD-24-460	45 A	62 W	0.7 mH	M.1302.7375
MMC-SD-30-460	55 A	67 W	0.5 mH	M.3000.0105
MMC-SD-42-460	80 A	86 W	0.4 mH	M.3000.0106
MMC-SD-51-460	100 A	84 W	0.3 mH	M.3000.0107
MMC-SD-65-460	130 A	180 W	0.2 mH	M.3000.0108

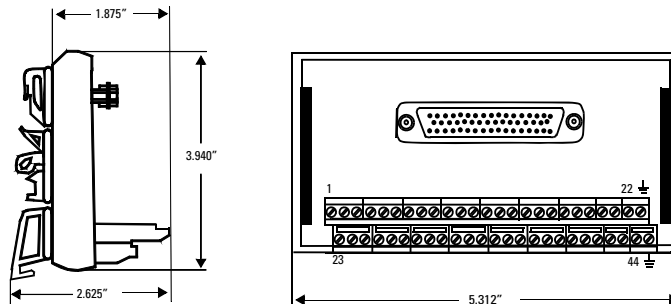
MMC D32/D64 Standalone Controller D32/D64 Options

Fieldbus Options		
Description	Model Number	Part Number
MMC-D DeviceNet Master Expansion Module	MMC-D	M.1017.3889
MMC-P Profibus Master Expansion Module	MMC-P	M.1300.7167

MMC 32 I/O Expansion Module Options		
Description	Model Number	Part Number
MMC 32 I/O Expansion Module, 24 Vdc 32 Inputs Sink/Source (user selectable by groups of 8) 32 Outputs, source only, 250 mA	MMC-32-I/O	M.3000.0043
MMC 32 I/O Gen I/O Connector to Flying Lead, 10 feet		M.1016.2567

MMC 32 I/O Gen I/O Connector - Breakout, Din-Rail Mounted		
Description	Length	Part Number
Breakout Box (Din-rail mount) For Gen I/O Connector on MMC-32-I/O (1 needed per connector, 2 total) Figure 8	Used with Interface Cable below	M.1016.2532
Interface Cable for MMC-32-I/O From Gen I/O Connector to Breakout Box, HD 44 pin sub D Connectors (1 needed per connector, 2 total)	1 foot	M.1016.2539
	2 feet	M.1016.2540
	3 feet	M.1016.2541

(Figure 8)



MMC Control System Accessories

MMC Smart Drive

Power Cables (Non SDN Drives)

Both CDDR & AKM use the same power cable as follows:

PWR - AKM - 001M - MCS - 000 - 16 - 6H

Length in meters

- 001M = 1 meter
- 003M = 3 meters
- 006M = 6 meters
- 009M = 9 meters
- 015M = 15 meters
- 030M = 30 meters

Gauge (AWG)

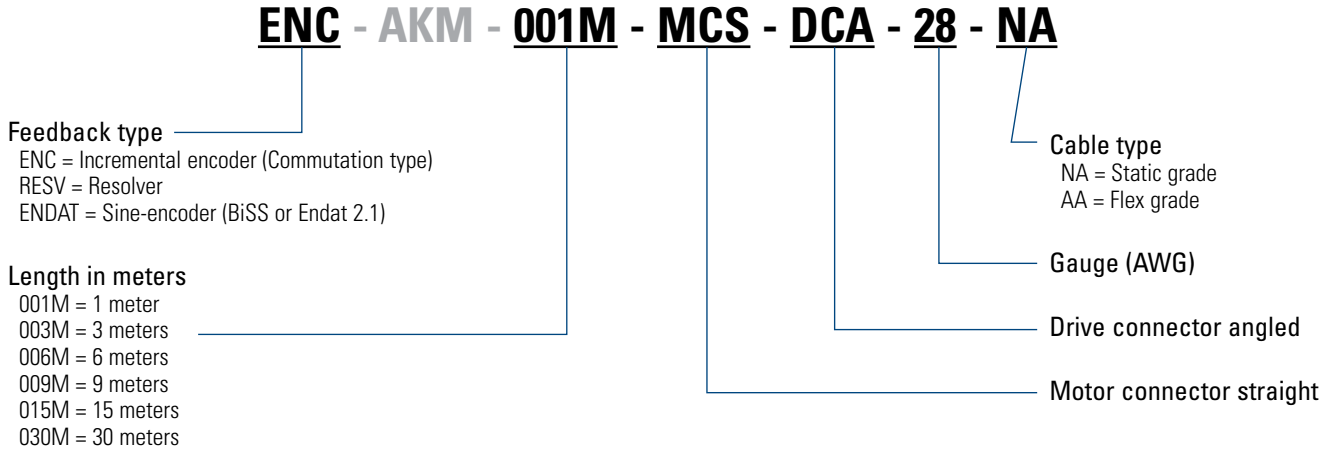
- 16 = 16 AWG
- 14 = 14 AWG
- 12 = 12 AWG

Power Cables – Flex Rated/with brake

Description	AWG	Length	Part Number
PWR-AKM-1.0M-MCS-000-16-6H	16	1 Meter	M.1302.8580
PWR-AKM-3.0M-MCS-000-16-6H		3 Meters	M.1302.8545
PWR-AKM-6.0M-MCS-000-16-6H		6 Meters	M.1302.8581
PWR-AKM-9.0M-MCS-000-16-6H		9 Meters	M.1302.8553
PWR-AKM-15M-MCS-000-16-6H		15 Meters	M.1302.8583
PWR-AKM-30M-MCS-000-16-6H		30 Meters	M.1302.8584
PWR-AKM-1.0M-MCS-000-14-6H	14	1 Meter	M.1302.8585
PWR-AKM-3.0M-MCS-000-14-6H		3 Meters	M.1302.8549
PWR-AKM-6.0M-MCS-000-14-6H		6 Meters	M.1302.8586
PWR-AKM-9.0M-MCS-000-14-6H		9 Meters	M.1302.8554
PWR-AKM-15M-MCS-000-14-6H		15 Meters	M.1302.8588
PWR-AKM-30M-MCS-000-14-6H		30 Meters	M.1302.8589
PWR-AKM-1.0M-MCS-000-12-6H	12	1 Meter	M.1302.8759
PWR-AKM-3.0M-MCS-000-12-6H		3 Meters	M.1302.8760
PWR-AKM-6.0M-MCS-000-12-6H		6 Meters	M.1302.8761
PWR-AKM-9.0M-MCS-000-12-6H		9 Meters	M.1302.8762
PWR-AKM-15M-MCS-000-12-6H		15 Meters	M.1302.8763
PWR-AKM-30M-MCS-000-12-6H		30 Meters	M.1302.8764

Feedback Cables (Non SDN Drives)

Both CDDR & AKM use the same feedback cables as follows:



Note: CDDR motor is only available in sine-encoder feedback

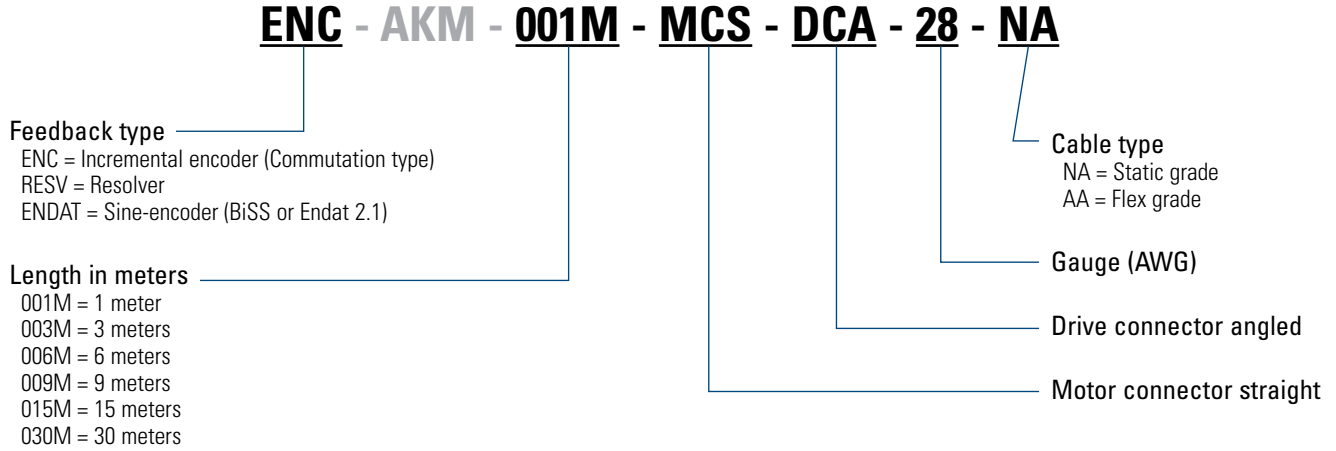
Feedback Cables – Static

Description	Feedback Type	Length	Part Number
ENC-AKM-1.0M-MCS-DCA-28-NA	Incremental Encoder Commutating Type	1 Meter	M.1302.8590
ENC-AKM-3.0M-MCS-DCA-28-NA		3 Meters	M.1302.8447
ENC-AKM-6.0M-MCS-DCA-28-NA		6 Meters	M.1302.8591
ENC-AKM-9.0M-MCS-DCA-28-NA		9 Meters	M.1302.8542
ENC-AKM-15M-MCS-DCA-28-NA		15 Meters	M.1302.8594
ENC-AKM-30M-MCS-DCA-28-NA		30 Meters	M.1302.8595
ENDAT-AKM-1.0M-MCS-DCA-28-NA	Sine-Encoder BiSS or Endat 2.1	1 Meter	M.1302.8605
ENDAT-AKM-3.0M-MCS-DCA-28-NA		3 Meters	M.1302.8437
ENDAT-AKM-6.0M-MCS-DCA-28-NA		6 Meters	M.1302.8606
ENDAT-AKM-9.0M-MCS-DCA-28-NA		9 Meters	M.1302.8607
ENDAT-AKM-15M-MCS-DCA-28-NA		15 Meters	M.1302.8608
ENDAT-AKM-30M-MCS-DCA-28-NA		30 Meters	M.1302.8609
RESV-AKM-1.0M-MCS-DCA-28-NA	Resolver	1 Meter	M.1302.8618
RESV-AKM-3.0M-MCS-DCA-28-NA		3 Meters	M.1302.8439
RESV-AKM-6.0M-MCS-DCA-28-NA		6 Meters	M.1302.8619
RESV-AKM-9.0M-MCS-DCA-28-NA		9 Meters	M.1302.8620
RESV-AKM-15M-MCS-DCA-28-NA		15 Meters	M.1302.8621
RESV-AKM-30M-MCS-DCA-28-NA		30 Meters	M.1302.8622

MMC Control System Accessories

Feedback Cables (Non SDN Drives)

Both CDDR & AKM use the same feedback cables as follows:



Note: CDDR motor is only available in sine-encoder feedback

Feedback Cables – Flex Rated

Description	Feedback Type	Length	Part Number
ENC-AKM-1.0M-MCS-DCA-28-AA	Incremental Encoder Commutating Type	1 Meter	M.1302.8600
ENC-AKM-3.0M-MCS-DCA-28-AA		3 Meters	M.1302.8435
ENC-AKM-6.0M-MCS-DCA-28-AA		6 Meters	M.1302.8601
ENC-AKM-9.0M-MCS-DCA-28-AA		9 Meters	M.1302.8602
ENC-AKM-15M-MCS-DCA-28-AA		15 Meters	M.1302.8603
ENC-AKM-30M-MCS-DCA-28-AA		30 Meters	M.1302.8604
ENDAT-AKM-1.0M-MCS-DCA-28-AA	Sine-Encoder BiSS or Endat 2.1	1 Meter	M.1302.8613
ENDAT-AKM-3.0M-MCS-DCA-28-AA		3 Meters	M.1302.8438
ENDAT-AKM-6.0M-MCS-DCA-28-AA		6 Meters	M.1302.8614
ENDAT-AKM-9.0M-MCS-DCA-28-AA		9 Meters	M.1302.8615
ENDAT-AKM-15M-MCS-DCA-28-AA		15 Meters	M.1302.8616
ENDAT-AKM-30M-MCS-DCA-28-AA		30 Meters	M.1302.8617
RESV-AKM-1.0M-MCS-DCA-28-AA	Resolver	1 Meter	M.1302.8630
RESV-AKM-3.0M-MCS-DCA-28-AA		3 Meters	M.1302.8450
RESV-AKM-6.0M-MCS-DCA-28-AA		6 Meters	M.1302.8631
RESV-AKM-9.0M-MCS-DCA-28-AA		9 Meters	M.1302.8632
RESV-AKM-15M-MCS-DCA-28-AA		15 Meters	M.1302.8633
RESV-AKM-30M-MCS-DCA-28-AA		30 Meters	M.1302.8634

Power Cables (SDN Drives)

For Drive:	Non-Flex	Non-Flex w/brake	Hi-Flex	Hi-Flex w/brake
MMC-SDN-1.8-460-D MMC-SDN-3.6-460-D	VP-507BEAN-XX	VP-508CFAN-XX	VP-507CCAN-XX	VP-507CDAN-XX
MMC-SDN-7.2-460-D	VP-508CEAN-XX	VP-508CFAN-XX	VP-507CCAN-XX	VP-507CDAN-XX
MMC-SDN-14.4-460-D	VP-508DEAN-XX	VP-508DFAN-XX	VP-508EBDN-XX	VP-508EBAN-XX

“XX” in the above table denotes the length of the cable, in meters. Standard lengths are 01, 03, 06, 09 and 12. Hi-Flex cables are available in additional lengths.

Feedback Cables (SDN Drives)

Feedback	Non-Flex Part Number	Hi-Flex Part Number
MMC-SD-12-460	Not Available	CF-CB7374N-XX-0
MMC-SD-16-460	VF-SB4474N-XX	CF-SB7374N-XX-0
MMC-SD-24-460	VF-RA2474N-XX	CF-RA2574N-XX-0
MMC-SD-30-460	VF-DA474N-XX	CF-DA0374N-XX-0

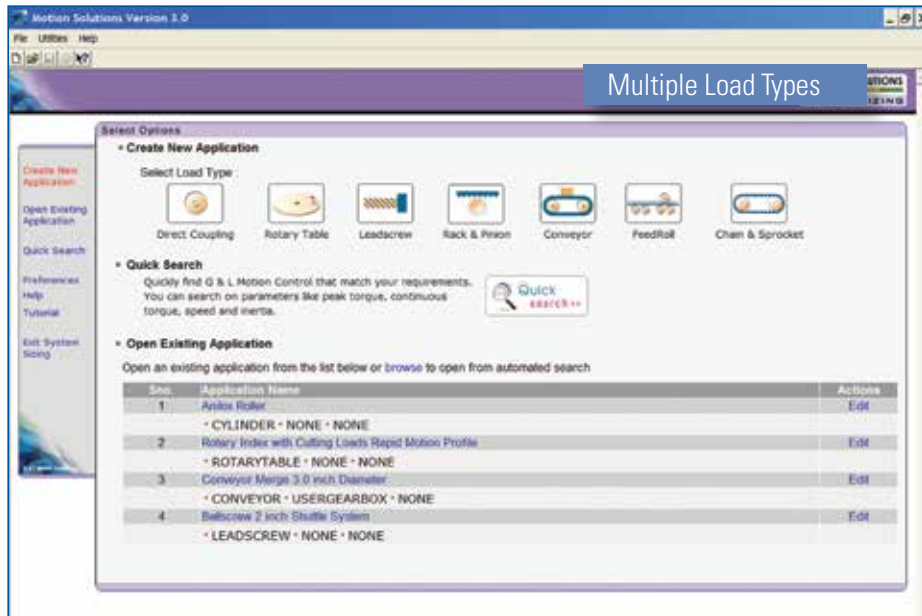
“XX” in the above table denotes the length of the cable, in meters. Standard lengths are 01, 03, 06, 09 and 12. Hi-Flex cables are available in additional lengths.

Motion Solutions - Drive Sizing Software

Motion Solutions provides a convenient method for system sizing your next application. With predefined load types and easy to use motion profiles, take advantage of over 2000 drive and motor combinations to select the right drive and motor combination to size your servo application. Control solutions you can trust.

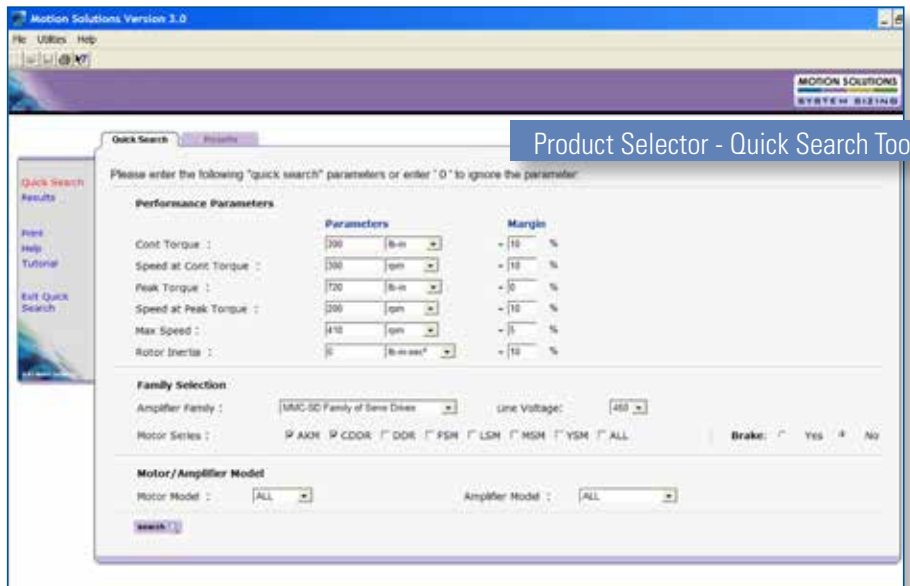
Motion Solutions Software

Motion Solutions Sizing & Selection Software



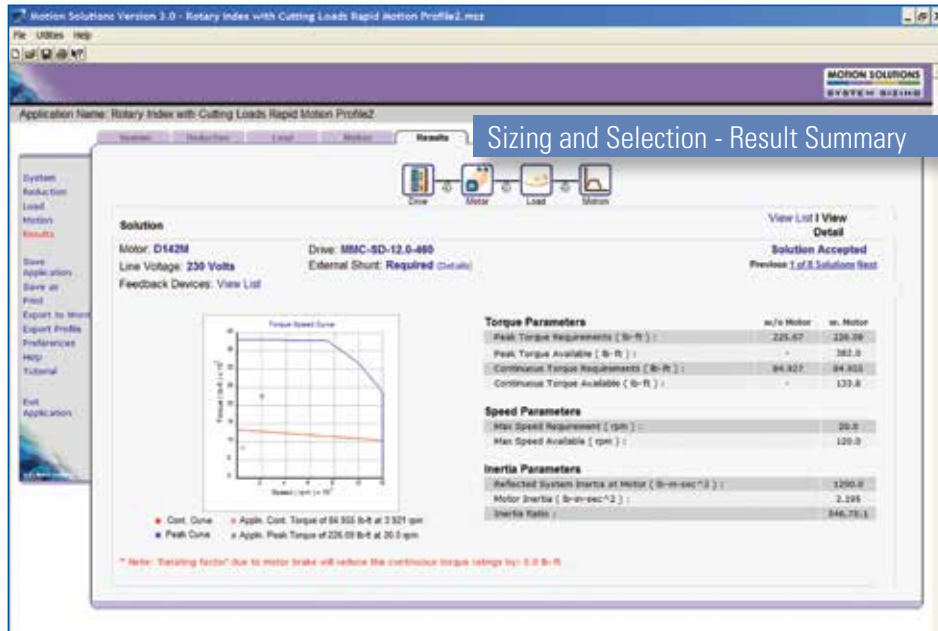
Motion Solutions Software Supports:

- Multiple motor technologies
 - o Conventional Servo AKM & Direct Drive Servo DDR & CDDR
- Motion Profiles
 - o Simple Triangular, Trapezoidal, or custom segmented Profiles
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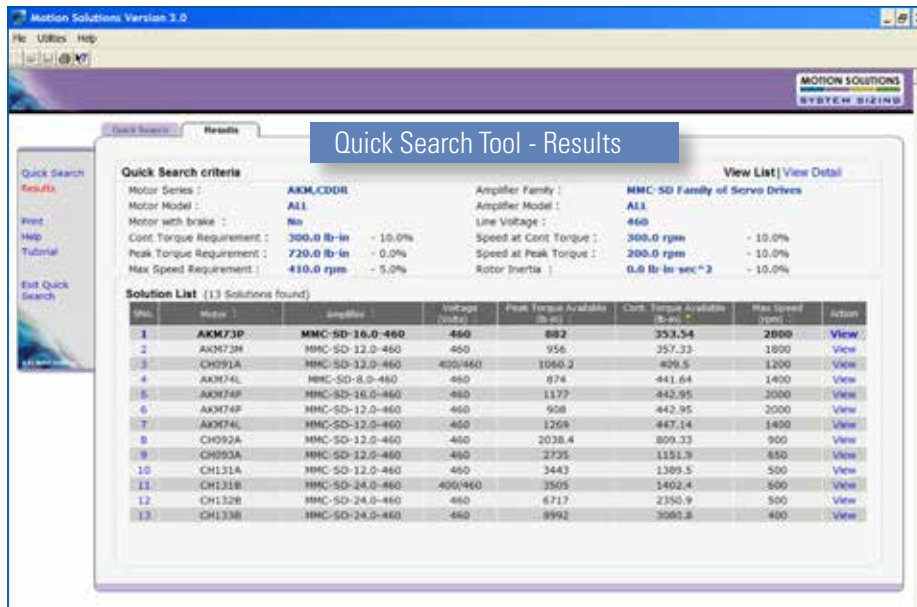
http://www.glcontrols.com/Support/Downloads/dnld_motion_cd.htm

Motion Solution Software

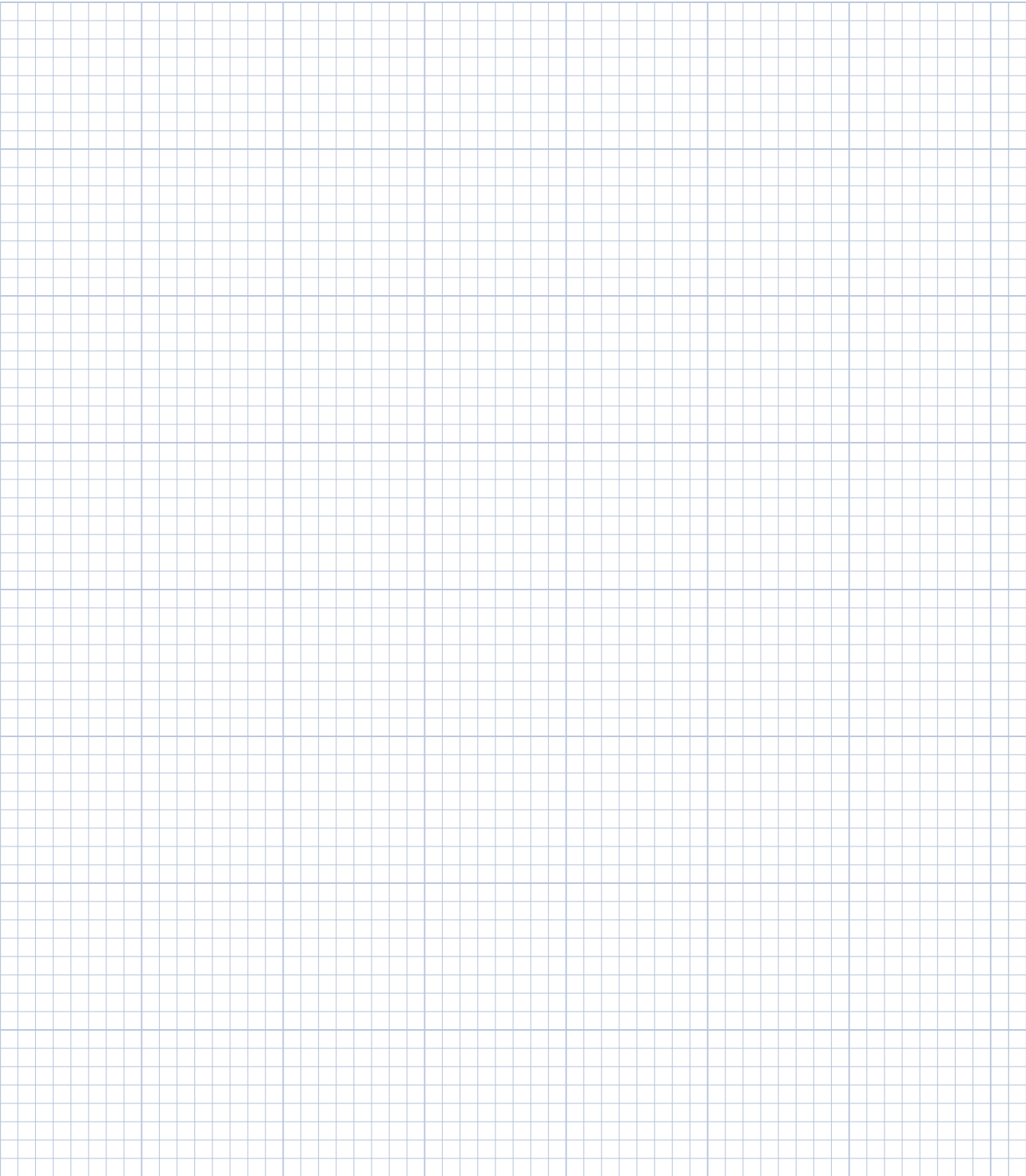


Motion Solutions Software also Includes:

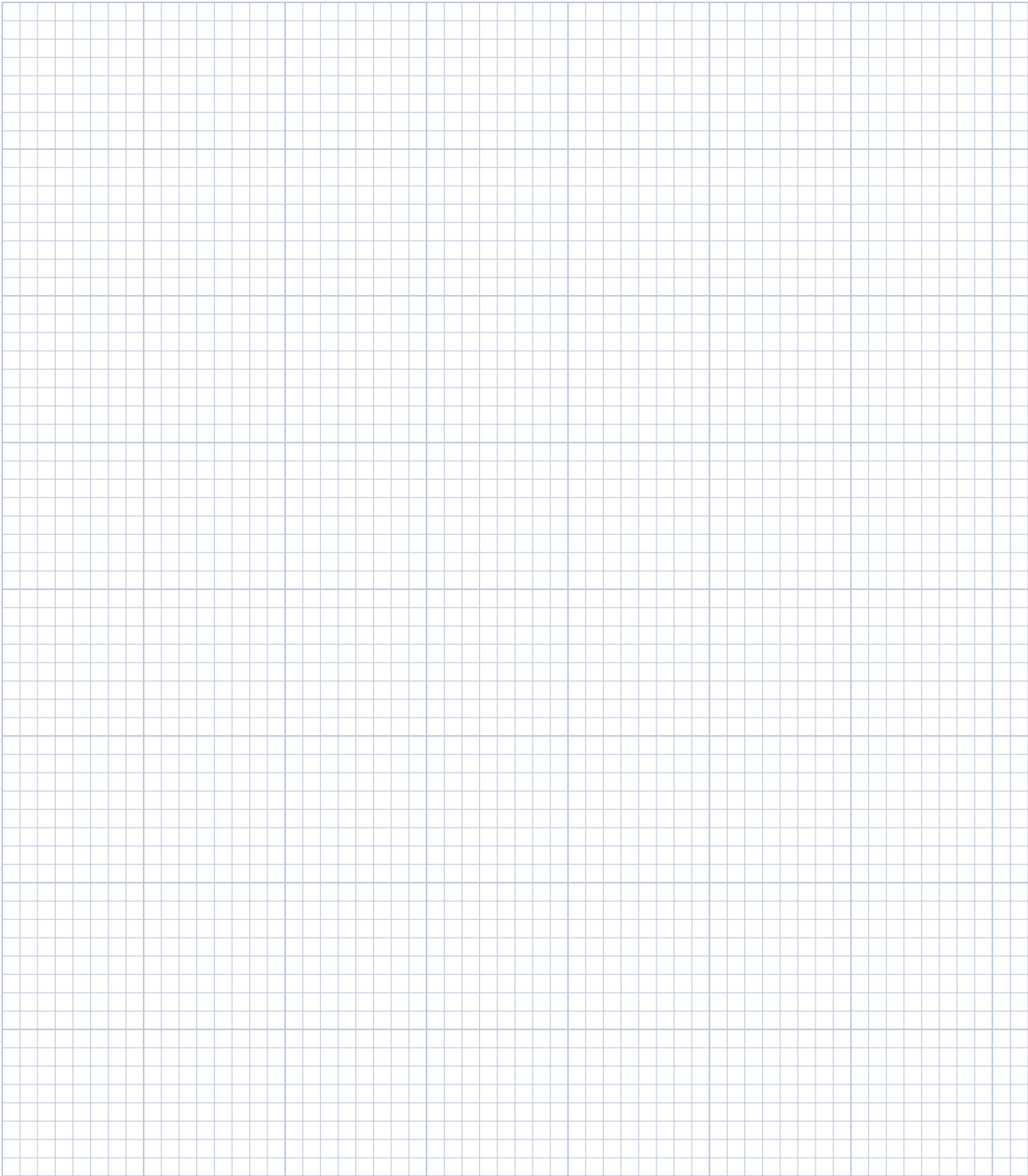
- Product Guides for prior versions of PiCPro Products
- Reference Section with Product Documentation
 - o User Manuals Software and Hardware , Installation Guides
 - o PiCPro Software Tutorials
 - Using Quick Start Guides, Creating User defined Function Blocks,
 - Using the RAMDISK memory, Creating Arrays & Structures, etc..



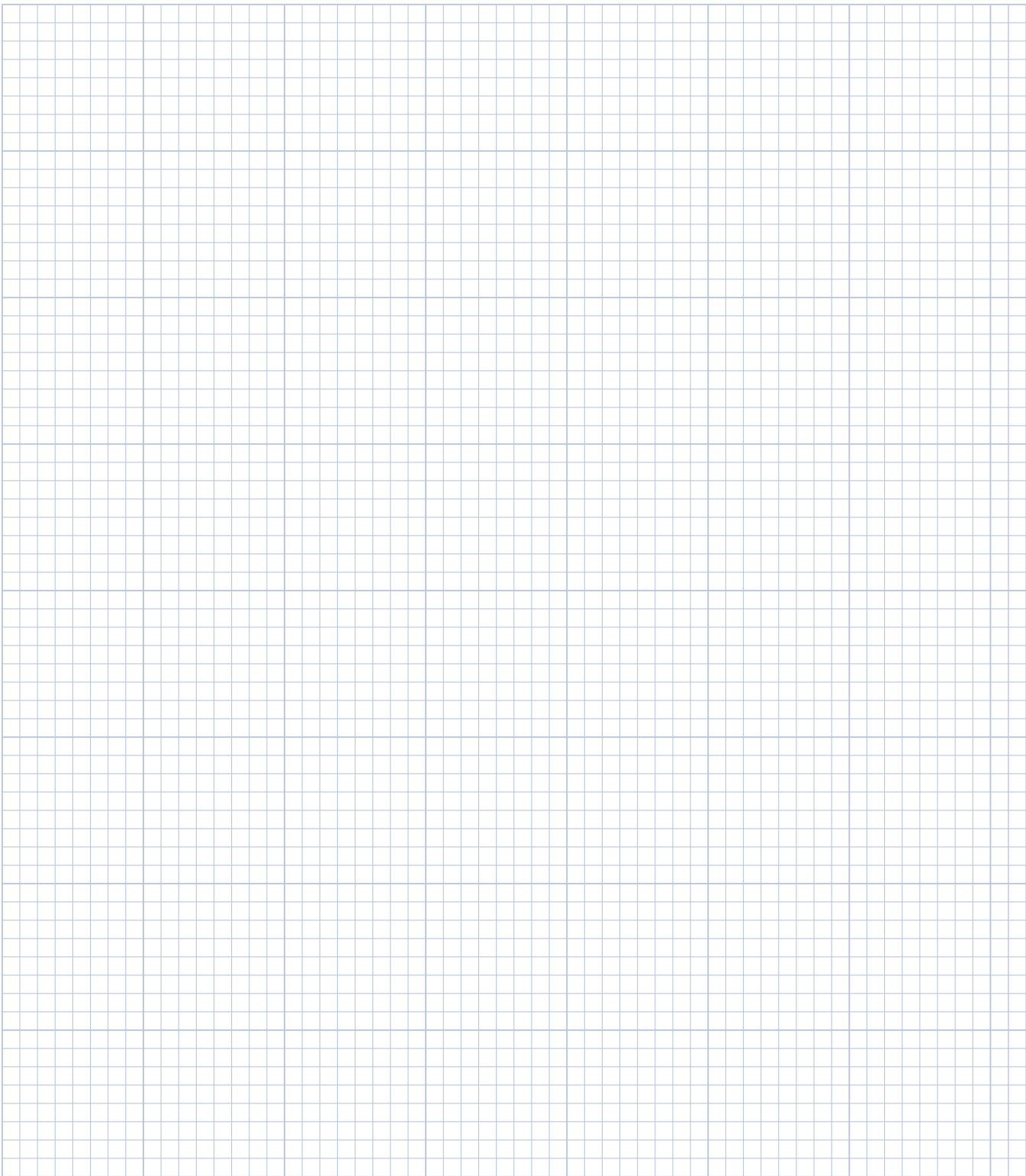
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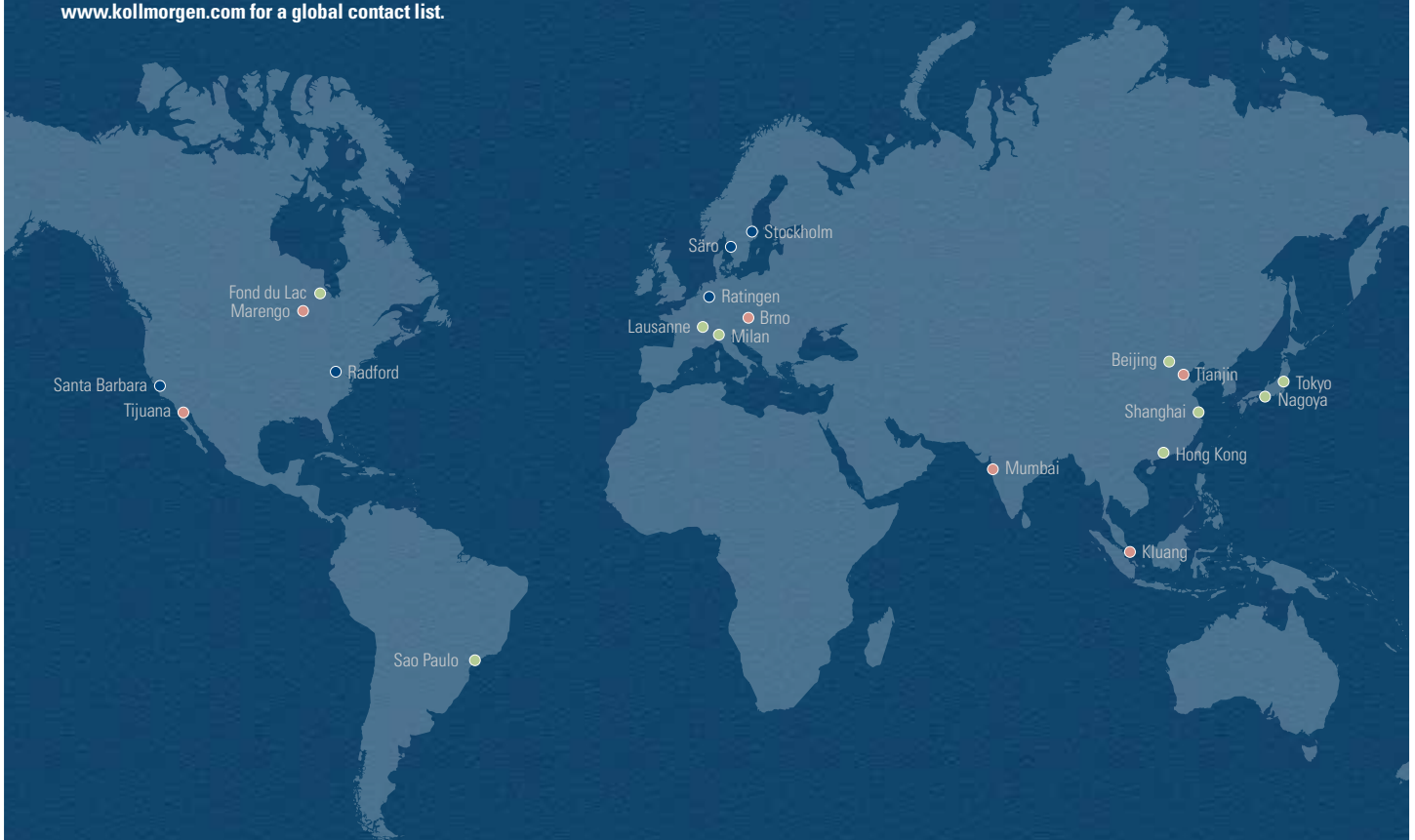


About Kollmorgen

Kollmorgen is a leading provider of motion systems and components for machine builders. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions that are unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

For assistance with your application needs in North America, contact us at: 540-633-3545, support@kollmorgen.com or visit www.kollmorgen.com for a global contact list.

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