

**Technical Data**

# 1756 ControlLogix Integrated Motion Modules Specifications

**SERCOS Motion Catalog Numbers** 1756-M03SE, 1756-M08SE, 1756-M16SE, 1756-M08SEG

**Analog Motion Catalog Numbers** 1756-M02AE, 1756-M02AS, 1756-HYD02

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The controller can control servo drives through these motion interfaces.

Application	Catalog Number
Rockwell Automation SERCOS interface drives	1756-M16SE
	1756-M08SE
	1756-M03SE
SERCOS interface drives that are Extended Pack Profile compliant	1756-M08SEG
Analog servo interface drives with quadrature feedback	1756-M02AE
Analog hydraulic servo interface drives LDT feedback	1756-HYD02
Analog servo interface drives with SSI feedback	1756-M02AS

Some servo drives are supported through communication interface modules. The controller can communicate with these servo drives over these networks.

Drives <sup>(1)</sup>	EtherNet/IP	ControlNet	DeviceNet	Universal Remote I/O	RS-232 Serial	DH-485
2098 Ultra3000 DeviceNet servo drive	No	No	Yes	No	No	No
2098 Ultra5000 intelligent positioning	No	No	Yes	No	Yes	No

<sup>(1)</sup> Each drive has different options you order for its supported communication networks. See the appropriate catalog or selection information for a drive to make sure you select the appropriate option when specifying a drive for a specific network.

For more information, see the Motion Analyzer CD to size your motion application and to make final component selection. Download the software from <http://www.ab.com/motion/software/analyzer.html>

## Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication [SGI-1.1](#) available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature/>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

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**WARNING**

Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

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**IMPORTANT**

Identifies information that is critical for successful application and understanding of the product.

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**ATTENTION**

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence

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**SHOCK HAZARD**

Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

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**BURN HAZARD**

Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

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## SERCOS Interface Modules



The SERCOS interface modules use a single, digital fiber-optic link, which eliminates as many as 18 digital wires per axis. Detailed drive-status information can be sent from drive to controller and from controller to drive.

The SERCOS interface modules can connect to these servo drives:

- 2093 Kinetix 2000 multi-axis servo drive
- 2094 Kinetix 6000 multi-axis servo drive
- 2099 Kinetix 7000 high-power servo drive
- 2098 Ultra3000 SERCOS servo drive

### Technical Specifications - 1756 SERCOS Interface Modules

Attribute	1756-M03SE	1756-M08SE	1756-M16SE	1756-M08SEG
Number of drives, max	3	8	16	8 (Extended Pack Profile compliant)
SERCOS data rate	4 Mbps 8 Mbps			
SERCOS cycle time @ 4 Mbps	0.5 ms, up to 2 drives <sup>(1)</sup> 1 ms, up to 4 drives 2 ms, up to 8 drives			
SERCOS cycle time @ 8 Mbps	0.5 ms, up to 4 drives <sup>(1)</sup> 1 ms, up to 8 drives 2 ms, up to 16 drives			
Drive control modes	Position, velocity, and torque			Position only
Current draw @ 5.1V DC	760 mA			
Current draw @ 24V DC	2.5 mA			
Power dissipation	5.0 W			
Slot width	1			
Module location	Chassis-based, any slot			
Chassis	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17			
Power supply, standard	1756-PA72/C, 1756-PA75/B, 1756-PB72/C, 1756-PB75/B, 1756-PC75/B, 1756-PH75/B			
Power supply, redundant	1756-PA75R, 1756-PB75R, 1756-PSCA2			
Plastic fiber-optic cables	2090-SCEPxx-0 non-jacketed, chlorinated polyethylene 2090-SCVPxx-0 standard jacket, polyvinyl chloride 2090-SCNPxx-0 nylon jacket			
Glass fiber-optic cables	2090-SCVGxx-0 standard jacket, polyvinyl chloride			
Enclosure type rating	None (open-style)			

<sup>(1)</sup> Kinetix 6000 drives let you use a 0.5 ms cycle time.

### Environmental Specifications - 1756 SERCOS Interface Modules

Attribute	1756-M03SE, 1756-M08SE, 1756-M16SE, 1756-M08SEG
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0...60 °C (32...140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...85 °C (-40...185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5...95% noncondensing

**Environmental Specifications - 1756 SERCOS Interface Modules**

<b>Attribute</b>	<b>1756-M03SE, 1756-M08SE, 1756-M16SE, 1756-M08SEG</b>
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	4 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz

**Certifications - 1756 SERCOS Interface Modules**

<b>Certification<sup>(1)</sup></b>	<b>1756-M03SE, 1756-M08SE, 1756-M16SE, 1756-M08SEG</b>
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.  UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/IEC EMC Directive, compliant with: <ul style="list-style-type: none"> <li>• EN 61326-1; Meas./Control/Lab., Industrial Requirements</li> <li>• EN 61000-6-2; Industrial Immunity</li> <li>• EN 61000-6-4; Industrial Emissions</li> </ul> EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

<sup>(1)</sup> When marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

## Analog Motion Modules



The ControlLogix family of analog servo modules is a cost effective option for closed-loop or open-loop motion control of devices that support an analog motion interface. The analog servo modules provide a  $\pm 10V$  analog output-command reference and support a variety of position feedback devices. As many as two axes can be controlled per module, and multiple modules can be used to provide as many as 32 axes of control per ControlLogix controller.

### Technical Specifications - 1756 Analog Motion Modules

Attribute	1756-M02AE	1756-HYD02	1756-M02AS
Number of axes per module, max	2		
Servo loop type	Nested PI digital position and velocity servo	Proportional, integral, and differential (PID) with feed-forwards and directional scaling	External drive = torque Position loop: PID with velocity feed-forwards Velocity loop: PI with accel feed-forwards (nested); with directional scaling and friction compensation  External drive = velocity or hydraulic Position loop: PID with velocity feed-forwards and accel feed-forwards with directional scaling and friction compensation Velocity loop: N/A (handled by drive or valve)
Gain resolution	32-bit floating point		
Absolute position range	$\pm 1,000,000,000$ encoder counts	230,000 LDT counts	$2^{32}$ (4,294,967,296) transducer counts
Rate	5 kHz	500 Hz...4 kHz (selectable)	500 Hz, 666.7 Hz, 1 kHz, 2 kHz, 4 kHz (selectable)
Current draw @ 5.1V DC	700 mA		
Current draw @ 24V DC	2.5 mA		
Power dissipation	5.5 W		
Thermal dissipation	—	18.77 BTU/hr	18.77 BTU/hr
Isolation voltage	—	30V continuous, user to system	30V continuous, user to system
Removable terminal block	1756-TBCH 1756-TBS6H		
Slot width	1		
Module location	Chassis-based, any slot		
Chassis	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17		
Power supply, standard	1756-PA72/C, 1756-PA75/B, 1756-PB72/C, 1756-PB75/B, 1756-PC75/B, 1756-PH75/B		
Power supply, redundant	1756-PA75R, 1756-PB75R, 1756-PSCA2		
Wire size	0.324...2.08 mm <sup>2</sup> (22...14 AWG) stranded, 1.2 mm (3/64 in.) insulation max <sup>(1)</sup>		
Wire category	1 <sup>(2)</sup>	2 <sup>(1)</sup>	2 <sup>(1)</sup>
Wire type	Copper	Copper	Copper
Enclosure type rating	None (open-style)		

<sup>(1)</sup> Maximum wire size requires extended housing, catalog number 1756-TBE,

<sup>(2)</sup> Use this conductor category information for planning conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

<b>Input Specifications</b>			
	<b>1756-M02AE</b>	<b>1756-HYD02</b>	<b>1756-M02AS</b>
<b>Input Type</b>	Encoder input: Incremental AB quadrature with marker	LDT input: PWM, Start/Stop rising or falling edge	SSI input: Synchronous Serial Interface
Encoder mode	4X quadrature	—	—
Encoder rate, max	4 MHz counts per second	—	—
Resolution	—	<0.001 in. with single recirculation	8...31 bits
Electrical interface	Optically isolated, 5V differential	Isolated 5V differential (RS-422 signal)	Isolated 5V differential (RS-422 signal)
On-state voltage range	3.4...5.0V	—	—
Off-state voltage range	0...1.8V	—	—
Input impedance	531 $\Omega$ differential	215 $\Omega$ differential	215 $\Omega$ differential
Output load, min	—	100 $\Omega$ min	100 $\Omega$ min
Transducer	—	Must use External Interrogation signal	Binary or gray code
Clock frequency	—	—	208 kHz or 625 kHz
<b>Registration Input Type</b>	Optically isolated, current sinking		
24V on-state voltage, min	18.5V DC		
24V on-state voltage, max	26.4V DC		
24V off-state voltage, max	3.5V DC		
24V input impedance	9.5 k $\Omega$	1.2 k $\Omega$	9.5 k $\Omega$
5V on-state voltage, min	3.7V DC		
5V on-state voltage, max	5.5V DC		
5V off-state voltage, max	1.5V DC		
5V input impedance	1.2 k $\Omega$	9.5 k $\Omega$	1.2 k $\Omega$
Response time (position latched)	1 $\mu$ s	1 servo update period <sup>(1)</sup>	1 servo update period <sup>(1)</sup>
<b>Other Input Type</b>	Optically isolated, current sinking		
Input voltage, nom	24V DC		
On-state voltage, min	17V DC		
On-state voltage, max	26.4V DC		
Off-state voltage, max	8.5V DC		
Input impedance	7.5 k $\Omega$		

<sup>(1)</sup> Servo update period is the period at which the position and/or velocity feedback is sampled and a new servo loop is closed to generate a new servo output. The time of this period is a user-defined setting from 250...2000  $\mu$ s.

<b>Output Specifications</b>			
	<b>1756-M02AE</b>	<b>1756-HYD02</b>	<b>1756-M02AS</b>
<b>Servo Output Type</b>	Analog voltage		
Isolation	200 k $\Omega$	—	—
Voltage range	$\pm 10V$		
Voltage resolution	16 bits		
Output load, min	5.6 k $\Omega$ resistive		
Output offset, max	25 mV		
Output gain error	$\pm 4\%$		
<b>Other Outputs</b>	Solid-state isolated relay contact		
Operating voltage, nom	24V DC (Class 2 source)	24V DC	24V DC
Operating voltage, max	26.4V DC		
Operating current	75 mA		

### Environmental Specifications - 1756 Analog Motion Modules

<b>Attribute</b>	<b>1756-M02AE</b>	<b>1756-HYD02, 1756-M02AS</b>
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0...60 °C (32...140 °F)	0...60 °C (32...140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...85 °C (-40...185 °F)	-40...85 °C (-40...185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5...95% noncondensing	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	—	2 g @ 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	—	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	—	50 g
Emissions	—	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	—	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	—	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz
EFT/B immunity IEC 61000-4-4	—	$\pm 2$ kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	—	$\pm 2$ kV line-line (DM) and $\pm 2$ kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	—	10Vrms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

## Certifications - 1756 Analog Motion Modules

Certification <sup>(1)</sup>	1756-M02AE	1756-HYD02, 1756-M02AS
UL	UL Listed Industrial Control Equipment, certified for US and Canada.	UL Listed Industrial Control Equipment, certified for US and Canada.
CSA	CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D.	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations
CE	Marked for applicable directives.	European Union 89/336/EEC EMC Directive, compliant with: <ul style="list-style-type: none"> <li>EN 50082-2; Industrial Immunity</li> <li>EN 61326; Meas./Control/Lab., Industrial Requirements</li> <li>EN 61000-6-2; Industrial Immunity</li> <li>EN 61000-6-4; Industrial Emissions</li> </ul>
C-Tick	Marked for applicable acts.	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

<sup>(1)</sup> When marked. See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

## 1756 Removable Terminal Blocks

Attribute	1756-TBCH	1756-TBS6H	1756-TBE
Description	36-pin cage-clamp removable terminal block with standard housing	36-pin spring-clamp removable terminal block with standard housing	Extended depth terminal block housing
Screw torque	0.4 N•m (4.4 lb•in)		—
Screwdriver width	8 mm (5/16 in.) max		

**Notes:**

# Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://www.rockwellautomation.com/support/>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://www.rockwellautomation.com/support/>.

## Installation Assistance

If you experience an anomaly within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the <a href="#">Worldwide Locator</a> at <a href="http://www.rockwellautomation.com/support/americas/phone_en.html">http://www.rockwellautomation.com/support/americas/phone_en.html</a> , or contact your local Rockwell Automation representative.

## New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

## Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication [RA-DU002](#), available at <http://www.rockwellautomation.com/literature/>.

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