Delivering powerful control solutions, software tools and application support services for machine control customers worldwide

ACS Motion Control is a global manufacturer of high performance multi-axis motion and machine control systems that combine power and precision to deliver the most flexible, cost-effective and user-friendly control solutions. Established in 1985, ACS Motion Control has its international headquarters in Israel, with North American headquarters in Plymouth, Minnesota and an Asian support center in South Korea. Backed by an ISO9001-certified design and manufacturing capability with an ongoing commitment to quality control and reliability testing, ACS Motion Control delivers its products through an international distribution network that provides sales support and customer service worldwide.

Providing a competitive advantage through superior motion control

Only ACS Motion Control offers customers a unique combination of advanced hardware components, flexible control software and application engineering support that delivers comprehensive motion and machine control solutions from a single source. By developing a specific system for each application built from standard components, ACS Motion Control provides a single point of control responsibility to deliver a complete, reliable system that can be implemented faster and at a lower control cost than using multiple vendors or by specifying a more complex control than is needed.

With proven technical expertise and application experience, ACS Motion Control ensures customers realize a true competitive advantage by enhancing their accuracy and throughput with superior motion and I/O control solutions, user-friendly software and application development support.
• Short settling time for maximum throughput
• Resonance compensation
• Frequency response measurement and optimization
• Dual-loop control
• Minimal standstill jitter
• Smooth constant velocity control
• Motor disturbance rejection
• Vibration compensation
• Flexible control algorithms for optimal performance
• Gantry control
• Gain-scheduling
• Non-linear controls
• Bump-less and automatic switching between feedback devices
• Piezoelectric ceramic motors
• Closed loop step motor control
• Induction motor control with field weakening

Real-world experience in advanced motion and machine control applications

Working closely with customers’ design engineering teams, ACS Motion Control engineers combine decades of multi-discipline experience in motion control, digital and analog circuit design, power electronics, software/algorithm development and machine design with the industry’s most flexible control software suite and advanced hardware to develop innovative solutions for complex motion control and machine automation applications.

ACS Motion Control systems are extensively deployed in semiconductor manufacturing, electronic assembly, automated test equipment, advanced digital printing, medical imaging, robotics and FPD (flat panel display) inspection equipment.
Host-dependent or stand-alone
Whether your application requires a more advanced host-dependent solution to manage all machine processes including motion control and I/Os; or you need the motion controller to function as a stand-alone unit to manage the motion of all axes and I/Os, ACS products offer the flexibility and software architectures you need to support either scenario.

Multi-processor architecture
Unlike other motion control products that use a single, off-the-shelf processor for multi-axis motion control, our robust multi-processor architecture guarantees performance at a fixed update rate of 20kHz with 48-bit calculation accuracy for all axes. The ACS Motion Process Unit (MPU) handles high-level tasks, including axis profile generation, host/controller communication, user-program execution and safety event handling.

SPii (ACS Motion Control Servo Processor generation ii)
The SPii ASIC is based on a high-speed RISC core developed by ACS Motion Control for real time motion control tasks. It combines all the peripherals required to implement a complete, high-performance, all-digital motion control system. The SPii ASIC executes a standard, easy-to-use real time control algorithm, or it can be easily replaced by a dedicated, custom algorithm optimized for your application. Each SPii processor controls two axes at a fixed sampling rate of 20kHz, whether executing the standard control algorithm or a complex custom one.

The SPiiPlus firmware provides these state-of-the-art motion control features:
• Inverse and forward kinematics
• Dynamic error compensation
• Gantry control option
• Input shaping
• Disturbance rejection option
• Virtual axis
• Master-slave operation
• Cam profile control

Each SPii supports the following:
• Up to 60 million counts/second digital encoder interfaces
• Up to 65,536 Sin-Cos encoder multipliers with up to 2.5MHz input frequency
• High speed random and incremental position compare (PEG)
• Position registration (Mark) on input
• 16-bit analog commands for drive control
• 12 high speed, high resolution PWM for direct control of two three-phase bridges
• Pulse-direction stepper control
• High Speed Synchronous Serial Interface (HSSI) for interfacing with laser interferometers, I/O and axis expansion modules

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Integrated multi-axis controller and digital drives for coordinated motion and I/O events

Specifically designed to answer the most demanding needs for present and future machine technology, our integrated designs provide OEMs who develop precision XY stages for multi-axis machines a highly cost-effective solution in a single package. SPiiPlus motion controllers provide on-the-fly modification of any motion variable, highly flexible multi-axis synchronization and I/O event management with sub-microsecond delay. Synchronization between virtual or physical axes can include master-slave, electronic gearing, cam motion, group (vector) motion and more.

Nanometer positioning and high velocity

When high speed and nanometer position resolutions are required, OEMs have been limited to expensive laser interferometer feedback systems. With our 2.5MHz SPiiPlus Sin-Cos encoder multiplier, users now have a much less expensive alternative using analog optical encoders and laser-based ultra fast encoders.

By using an SPiiPlus controller with low-noise linear drives to control an XY table with speeds up to 1 meter per second, a stand-still jitter of 1 nanometer was achieved by using a 250 lines per mm analog Sin-Cos encoder, with an 8,192 multiplication factor.

Fast settling time, minimal jitter, fine constant velocity

The servo performance of an axis can be defined and measured by three main parameters: settling time, jitter (standstill when motor is under servo) and constant velocity quality. With our advanced Frequency Response measurement Function (FRF) and four-channel soft-scope, these three variables are easily monitored, analyzed and optimized. Jitter and settling time can be optimized by implementing special control algorithms and optional Input Shaping function. Constant velocity can be significantly improved, by compensating for cogging of the motor, which is one of the main disturbances affecting the smoothness of velocity at low speeds.

Exceptionally fast and easy setup

With our unique PIV control concept, setting and tuning a servo motor is a quick and simple task. Our menu-driven ACS Adjuster tool guides you through all the steps needed to tune the current loop, followed by velocity and position loops. Axis response performance is monitored by the real-time soft-scope. Stability and bandwidth are measured by the FRF tool. Bandwidth can be further increased to achieve a faster settling time and lower jitter by activating available notch and low pass filters.

Each encoder cycle is divided into up to 2^16 counts.

The Sin-Cos signals are sampled by a 14-bit analog to digital converter.

PES can be triggered at all zero crossings of the square wave.

Position registration can be captured with an accuracy of 1/8 of an encoder cycle (quadrature count).
SPiiPlus: common software tools for all control products

ACS Motion Control’s advanced SPiiPlus software tools provide extraordinarily easy setup, fast application development and quick diagnostics. With one common platform across all ACS control products, the suite of tools allows easy setup, simple application development, fast production integration, powerful remote diagnostics, reduced training costs and error recovery when your system is installed in the field. The SPiiPlus support tools are designed to minimize time to market while providing you the flexibility to meet your specific motion control requirements throughout your product’s life cycle.

Sometimes, the best things are free (www.acsfreesoftware.com)

Unlike other motion control companies, ACS Motion Control develops its own software, ensuring that all software performs across all product platforms. While optimizing operator efficiency by having to learn only one programming language, the greatest benefit is that ACS Motion Control software is free and available for download at: www.acsfreesoftware.com.

Application Development Kit – better tools for faster setup, development and diagnostics

With ACS Motion Control’s Application Development Kit, you will not only control the centralized motion in the application, but also the logic (I/O points), user interface and additional distributed motion.

A comprehensive suite of easy-to-use software tools

- Superior performance
  - Frequency response function (FRF)
  - ACS Adjuster servo tuning wizard
  - Complete automation control software

- User friendly
  - One common software platform for all products
  - Simple to use motion-machine interface
  - Motion manager

- Powerful programming
  - PLC, IEC61131-3 programming in addition to ACSPL+ multi-tasking motion language
  - A reach set of API functions for host programming
  - Communication monitor window
  - Program manager
  - Safety monitor
  - I/O monitor

SPiiPlus software operates on Windows™ 2000/ME/XP/VISTA and is continuously updated to support new available platforms. A full simulator of the SPiiPlus controller is provided with each of the software tools.

Application Development Kit CD

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SPiiPlus MMI – a comprehensive Motion-Machine Interface (MMI)
The MMI provides easy-to-use multi-purpose interactive tools for configuration, servo tuning, programming and viewing parameters. It includes an ACSPL* program manager, a four-channel interactive oscilloscope with FFT capability, a communication terminal, an easy-to-operate motion manager, an I/O monitoring screen, safety monitoring features and a frequency response analyzer (FRF).

Frequency Response Function Analyzer™ (FRF) – advanced machine tuning and optimization
The FRF is a powerful servo analysis tool with graphical interface for ACS motion controllers. It allows mechanical characterization of a machine and enables users to:
- Obtain the mechanical characteristics of the machine
- Identify and compensate for mechanical resonances
- Expand machine bandwidth to achieve faster settling and increased throughput
- Improve machine stability
- Identify differences between similar machines’ behavior

SPiiPlus Simulator – significantly shortens your system time-to-market
All SPiiPlus software tools are provided with a unique built-in controller simulator that allows users to develop applications and logically debug them without attaching any hardware. Develop a virtual simulation of an entire system on the host and use ACSPL* programs to emulate changes of inputs, outputs, safety faults, errors and more. The SPiiPlus Simulator is free and can be downloaded at: www.acsfreesoftware.com

SPiiPlus library – an advanced API for host programming
The SPiiPlus library supports simultaneous communications and multi-threaded applications (up to ten communication channels and interrupts with callback functions). Communication can be between one application and several controllers, or between several applications and one controller. A comprehensive set of drivers, in conjunction with Dynamic Link Library (DLL), are available for host programming in C/C++ and Visual Basic™. The communication link can be via PCI bus, two RS-232 channels, and/or Ethernet. The following libraries are available with continual support being updated for additional operating systems:
- Windows 2000™, Windows XP™, Windows XP™ x64, Windows Vista® x64
- SpiiPlus C and COM Libraries for these platforms

SPiiPlus Utilities
With every controller, users will have access to SPiiPlus Utilities for upgrading firmware, recovering from errors and managing applications.
ACS Motion Control products combine an advanced multi-axis controller and a powerful soft PLC

ACS control products can be programmed by both PLC IEC61131-3 languages (optimized for logic and process sequencing), and by powerful ACSPL+ language (optimized for motion control). As a PLC, it can access all built in motion axes and I/Os; and through the CANopen network, it can control additional nodes of up to 64 axes, I/Os, actuators and sensors. The motion capabilities of the PLC can be enhanced using ACSPL+ programs. Multi-axis motion, arbitrary path generation, gantry control and more.

- PLCopen programming standard - IEC61131-3
- 5 standard languages:
  - Ladder diagram (graphical)
  - Function block diagram (graphical)
  - Structured text (High level Pascal like)
  - IL-instruction list (low level basic language)
  - Sequential Function Chart (SFC)

- SPIIPlus PLC – a unique and dedicated software tool for PLC programming

- Supports CANopen network
  - Program axes in ACSPL+ and/or IEC61131-3 languages
  - Expand IO capability using CANopen compatible devices
  - Expand the number of axes using approved and tested third party CANopen intelligent drives
  - Supports 64 axes of expansion

- Supports Modbus protocol
  - Interface to HMI devices for user interface
  - Communication between two MC4U racks
  - Adding I/O modules

PLCopen function block programming

MMI 4-channel scope tools

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ACSPL+ – advanced motion programming made simple

ACSPL+ is a fully compiled, true multi-tasking, high level language for programming all ACS Motion Control products. The language supports complex motion time events and sequences with accurate positioning and timing, and can run up to ten separate programs simultaneously with programmable execution rates for each program.

General features of ACSPL+:
- Multi-tasking compiled language
- High speed PLC programming
- Parametric programming (axis can be designated as a number)
- Complex mathematical expressions
- 64-bit floating point arithmetic
- Rich set of logical, statistical, arithmetic, trigonometric and signal processing functions (like edge, dead zone and mechanical error mapping)
- User-defined local and global variables: scalar, one and two dimensional array
- Large user-defined memory (>16Mb)
- User-defined autoroutines: triggered when a predefined condition is satisfied
- Extensive safety and diagnostics
- Real time data collection at 1kHz or 20kHz
- User-defined units for faster development and easier adaptation of different feedback devices

Advanced motion control features of ACSPL+:
- Multi-axis point-to-point, jog, tracking and sequential multipoint motion
- Arcs and lines by segmented motion
- Arbitrary path with PVT cubic interpolation
- Third order profiles (S-curve) with jerk, acceleration and deceleration control
- On-the-fly position, velocity and acceleration change
- Inverse kinematics and axes transforms
- Master-slave with position and velocity locking (electronic gear/cam)
- Virtual master axis capability
- Open loop (torque control) motion
- Dynamic error mapping and backlash compensation
- Control of two motors as one axis (gantry) with separate feedback for each motor

PLCopen sequential function chart

Motion Machine Interface
MC4U advanced multi-axis control system
Intended for multi-axis motion control applications that require high performance, flexible drive configuration, PLC motion and logic control, the MC4U provides the flexibility of up to eight integral servo drives and 64 distributed axes via CANopen. The MC4U is a rack-based modular system that provides a cost-effective custom solution made from standard components.

SPiiPlus CM high performance 8-axis control module
The SPiiPlus CM control module is designed for precision gantry systems, flat panel display inspection, semiconductor manufacturing, medical imaging, electronic assembly and testing, and digital printing applications. The CM provides uncompromised accuracy and throughput for the full range of multi-axis motion control, and combines a programmable motion controller, power supply and up to three internal digital drives to control as many as five distributed servo amplifiers.

SPiiPlus LF - 4 Axis Low Cost & Low Footprint Controller
The SPiiPlus-LF 4-axis controller is designed to address the needs of cost sensitive applications where space is at a premium. The SPiiPlus-LF is more than just a motion controller; with its PLC programming and CANopen master capabilities it can actually control your whole machine. Its capabilities can be extended by adding up to 64 CANopen nodes of additional axes and I/Os.

SPiiPlus SA stand-alone motion controller
From basic point-to-point moves to more advanced applications, the SPiiPlus SA is ideal for applications involving high speed pick-and-place, cut-to-length, registration printing, packaging, cam profiling, robotics, semiconductor manufacturing, and flat panel display inspection. The SPiiPlus SA provides sub-nanometer resolution at high speed without compromising accuracy or throughput.

SPiiPlus 3U rack-mounted controller
Built for OEM rack-based systems, the SPiiPlus 3U controller provides all the advantages of the SPiiPlus system in a convenient 3U rack format, delivering smooth, coordinated motion, ease of use, sub-nanometer resolution and high speed.

SPiiPlus PCI multi-axis motion controller
Designed to communicate via the PCI bus, the SPiiPlus PCI motion controller meets a wide range of motion control requirements from robotic control to XY stage point-to-point positioning. The SPiiPlus PCI provides fast, accurate, multi-axis motion control. There is also available PCI-ST economical motion controller for for step motors and servo motor drives with Pulse-Direction interface.

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### Superior Throughput & Accuracy

**High performance: standard features in all ACS Motion Control products**

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<thead>
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<tbody>
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<td>✓</td>
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<td>CANopen master</td>
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<td>✓</td>
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<tr>
<td>Integrated digital servo amplifiers</td>
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<td>✓</td>
<td></td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>Analog servo command</td>
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<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<td>✓</td>
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<tr>
<td>Sin-Cos analog encoder interpolator</td>
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<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<td>✓</td>
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</table>

- Stand-alone or host communications for all motion controllers
- Supports wide range of motion modes, including point-to-point, jog, segmented motion, master-slave and arbitrary path with PVT cubic interpolation on 2, 4, 6, or 8 axes of motion.
- Common set of free software tools for all controllers
- IEC 61131-3 PLCopen motion and logic programming
- 20kHz servo loop updating, fixed for all axes
- Digital I/O expansion with CANopen and optional HSSI interface
- Position Event Generator (PEG) and Registration (MARK) with delay of propagation <0.1ms
- Coordinate system transformation
- Expand system capabilities via HSSI interface
  - I/O (HSSI-IO16)
  - External drives (HSSI-ED2)
  - Absolute encoder (HSSI-HES)
- 2D linear system error correction
- Forward and inverse kinematics
- Advanced axis motion coordination
- Advanced gantry control
- Up to 2.5MHz analog encoder interpolators
- Encoder interpolator range form x4 to x65,536
- Analog Sin-Cos encoder input at 14-bit resolution
- Incremental encoder frequency up to 60 million counts/sec
- Motion trajectory profile generation at 2kHz
- Built-in analog encoder interpolation, x4 to x65,536
- Communications channels, 10/100baseT Ethernet, Ethernet/ModBus and RS-232/RS-422.
- ACSPL+ multi-tasking application language
**MC4U: customized multi-axis control from standard components**

Developed for production, test and inspection equipment involving flat panel displays, solar panels, semiconductors, electronic assembly, general automation or medical applications, the MC4U is the first tailor-made solution that addresses the customized motion control needs of OEMs. The MC4U high performance control system combines controllers, drives, power supplies and additional I/O and networking capability to provide complete control of machine automation functions (motion, logic, power and data). Built from standard components, the MC4U is a panel-or rack-mounted system that addresses all multi-axis motion control needs, resulting in shorter development cycle time, reduced risk and lower costs.

**MC4U: high performance - simple connectivity - modular expansion**

**MC4U features and benefits:**
- Integrated 8-axis controller, drives and power supply
- Supports up to additional 64 CANopen nodes of axes and I/O
- Programming in IEC61131-3, PLCopen and ACSPL*
- Short lead time, normally 1-2 weeks
- Shorter development time, reduced risk, lower cost

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Lower cost through integration
The MC4U is a flexible automation controller that integrates the drives and power supplies with a high performance SPiIiPlus controller. The MC4U lowers the cost of controlling 4 to 8 demanding axes by eliminating the need for an intelligent controller at each axis. The host computer no longer needs to manage the network and can simply interface with the single CM motion controller.

Modular & expandable by design
The MC4U can function as an advanced low- or high-power motion controller with up to 8 integrated digital servo amplifiers and can support expansion with CANopen to 64 additional axes. Designed for panel or rack mounting, all connections are accessible from the front, making the MC4U configurable to meet exact customer specifications.

Ideal for prototyping, low- or high-volume applications, the MC4U consists of the following standard components:
• Controllers
• Drives
• Power supplies
• I/O
• Enclosures

Optimized for machine automation with demanding motion control requirements, the MC4U can be tailored to your specific needs in two ways:

• Shorter time to market
For fast prototype or low volumes, the MC4U consists of:
  - Standard plug-in components
  - Single system motherboards (back panels)
  - External network components
  - Standard rack-mount enclosure
  - Panel-rack-mount, front access
  - Delivery time: 1 to 2 weeks aro

• Lower cost system solution
For integrating specific customer requirements and a lower cost approach, the MC4U consists of:
  - Standard components
  - standard rack mount enclosure
  - Motherboard designed per customer needs
  - Eliminating manual wiring
  - Customer-preferred connectors
  - Customer-preferred mounting and access
  - Rack-mount with front or back access
  - Panel-mount with front access
  - Adding customer’s plug-in cards
  - Delivery time: up to 3 months ARO
Powerful motion controllers

The SPiiPlus powerful controller is at the heart of every MC4U system. The SPiiPlus 3U controllers are designed to address the control requirements of the most demanding applications, such as semiconductors manufacturing, wafer inspection and Flat Panel Display assembly and testing. The SPiiPlus 3U provides outstanding smooth motion, programmability, ease of use, sub-nanometer resolution and high speed without compromising accuracy and throughput.

Two versions are available:
1. SPiiPlus 3U-LT – Economical controller
2. SPiiPlus 3U-HP – High performance controller

Choose the SPiiPlus 3U-HP if you need one of the following features:
• SIN-COS analog encoders
• Using linear drives
• Special (Gantry or other) control algorithm
• Input Shaping for reducing move and settling time

High performance universal drives

Excellent for large table applications, the DDM Series of high performance drives provide a cost-effective solution featuring current loop digital control, low noise, low position jitter and smooth constant velocity. All drives support DC brush, DC brushless, induction and stepper motors.

<table>
<thead>
<tr>
<th>PWM Drive Modules</th>
<th>Model No.</th>
<th>No. of Axes</th>
<th>Bus Voltage (Vdc)</th>
<th>Phase Current Cont. / Peak (Amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDM3U-1-320V-5A</td>
<td>1</td>
<td>24-320</td>
<td>5 / 10</td>
<td></td>
</tr>
<tr>
<td>DDM3U-1-320V-10A</td>
<td>1</td>
<td>24-320</td>
<td>10 / 20</td>
<td></td>
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<tr>
<td>DDM3U-1-320V-20A</td>
<td>1</td>
<td>24-320</td>
<td>20 / 40</td>
<td></td>
</tr>
<tr>
<td>DDM3U-2-60V-2A*</td>
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<td>24-60</td>
<td>2.5 / 5</td>
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<tr>
<td>DDM3U-2-320V-5A</td>
<td>2</td>
<td>24-320</td>
<td>5 / 10</td>
<td></td>
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<tr>
<td>DDM3U-2-320V-10A</td>
<td>2</td>
<td>24-320</td>
<td>10 / 20</td>
<td></td>
</tr>
<tr>
<td>DDM3U-2-320V-20A</td>
<td>2</td>
<td>24-320</td>
<td>20 / 40</td>
<td></td>
</tr>
<tr>
<td>DDM3U-4-60V-2A*</td>
<td>4</td>
<td>24-60</td>
<td>2.5 / 5</td>
<td></td>
</tr>
</tbody>
</table>

* Not UL compliant

Digitally controlled linear drives

The LDM line of digitally controlled universal linear drives are specifically designed for applications with the most demanding specifications for jitter, smoothness and electrical noise. The drive can be programmed to control any type of single, two or three phase motor. With digital control, setup is simple and easy.

<table>
<thead>
<tr>
<th>Motor Drive Modules</th>
<th>Model No.</th>
<th>No. of Axes</th>
<th>Bus Voltage (Vdc)</th>
<th>Phase Current Cont. / Peak (Amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDM3U-55V-8A</td>
<td>1</td>
<td>45-60</td>
<td>4 / 8</td>
<td></td>
</tr>
<tr>
<td>LDM3U-55V-16A</td>
<td>1</td>
<td>45-60</td>
<td>4 / 16</td>
<td></td>
</tr>
</tbody>
</table>
Matching power supplies
A wide range of power supplies are available to match the amplifiers: from 700W, 48Vdc to power the DDM3U-1/2-60-2A drives, up to 11kW supplies to support multiple high voltage (up to 320Vdc), drives. The high voltage supplies include a shunt regulator and a 100W resistor. If more dissipation power is needed, external shunt 300W and 600W resistors are available.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Input Voltage (VAc)</th>
<th>Bus Voltage (Vdc)</th>
<th>Power (motor supply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSM3U-48V-0.7kW</td>
<td>85-265</td>
<td>48</td>
<td>700W</td>
</tr>
<tr>
<td>PSM3U-48V-1.4kW</td>
<td>85-265</td>
<td>48</td>
<td>1400W</td>
</tr>
<tr>
<td>PSM3U-320V-8kW</td>
<td>85-265</td>
<td>120-320</td>
<td>8kW</td>
</tr>
<tr>
<td>PSM3U-320V-11kW</td>
<td>85-265</td>
<td>120-320</td>
<td>11kW</td>
</tr>
<tr>
<td>PSM3U-320/48V-0.7/8kW</td>
<td>85-265</td>
<td>48, 120-320 *</td>
<td>8kW</td>
</tr>
</tbody>
</table>

* Features dual Bus voltage outputs of 48Vdc and up to 320Vdc

Filters for improved motor performance
ACS Motion Control three-phase motor filters deliver increased motor functionality by reducing the common mode and the differential mode noise induced by the drive’s high current switching. For demanding applications with requirements that are extremely sensitive to radiated PWM noise such as stand still jitter and constant velocity, ACS motor filters provide the required protection for optimum motor performance.

Regeneration shunt resistor
MC4U power supply module provides an internal regeneration shunt resistor to absorb the regeneration energy from moving mass. The internal shunt resistor is rated at 100Ω/100W. If required, an external shunt resistor MC4U-REGEN of 600W can be connected in order to absorb higher energy ratings.
Multi-axis Motion Control With

SPiiPlus CM 8-axis control module
For high performance, precision motion control and machine automation functionality involving 1- to 3-axis motion control applications, the SPiiPlus CM (Control Module) delivers unparalleled accuracy, exceptional dynamic tracking, fast settling and superior smoothness of motion at low velocities, all in a low-cost package. Combining an advanced programmable motion controller and power supply with up to three internal digital servo drives, the SPiiPlus CM also supports an HSSI (High Speed Serial Interface) network to control up to an additional five external distributed servo amplifiers to provide complete 8-axis control with excellent throughput.

SPiiPlus CM features & benefits:
• Supports up to eight AC/brush or DC/brushless servomotors, induction motors, or indexed stepper drives
• Operates as a standalone controller, or connected to a programmable interface or host computer
• Digital I/O expansion up to 256 inputs and outputs using the HSSI I/O16 module or Ethernet/ModBus and RS-232/RS-422 connection
• Supports logic control for PLC functions through PLCopen IEC 61131-3 standard
• CE and CSA approvals

SPiiPlus CM integrated drive ratings

<table>
<thead>
<tr>
<th>Model</th>
<th>Continuous current (amps)</th>
<th>Peak current (amps)</th>
<th>Continuous / Peak Power (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM-A</td>
<td>5</td>
<td>10</td>
<td>1370 / 2740</td>
</tr>
<tr>
<td>CM-B</td>
<td>10</td>
<td>20</td>
<td>2740 / 5480</td>
</tr>
<tr>
<td>CM-C</td>
<td>15</td>
<td>30</td>
<td>4110 / 8220</td>
</tr>
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For complete product datasheet and current specifications, visit: www.acsmotioncontrol.com/downloads

acsmotioncontrol.com
Expand the system capabilities via the HSSI

Each SPiiPlus controller supports the High-speed Synchronous Serial Interface (HSSI). The HSSI enables the user to interface to various feedback and IO devices at a 20kHz sampling and update rate.

The user can even define its own specific device to interface with. The following devices are currently available:

- HSSI-IO16 – an I/O module with 16 inputs and 16 outputs. Up to four modules can be connected to each HSSI adding 64/63 I/Os.
- HSSI-ED2 – Interface to two additional axes. Each module includes an interface to two motor drives, two incremental digital encoders, limits and additional 8 inputs and 8 outputs.
- HSSI-HES – Interface to two absolute encoders. It supports HEIDENHAIN EnDat 2.2 and Tamagawa Smart-Abs standards.

SPiiPlus CM - a full range of motion control

Add capabilities with HSSI modules

The High-speed Synchronous Serial Interface enables you to expand your system capabilities.

The HSSI-IO16 adds 16/16 I/O. Up to four units can be connected to each HSSI.

The HSSI-ED2 provides interface to two axes (drives, encoders, limits) and adds 8/8 I/Os.

The HSSI-HES interfaces with two absolute encoders of the following types: EnDat (Heidenhain) and Smart-Abs (Tamagawa). It also supports incremental analog(SIN-COS encoders.)
SPiiPlus SA motion controller
For OEM machinery that requires multi-axis synchronization with various drive types, including linear servo motors, direct drive rotary motors, as well as piezo-ceramic, voice coil and low-EMI linear amplifiers, the SPiiPlus SA provides a simple and convenient interface for servo amplifiers, analog and incremental encoders, and digital & analog I/O using D-type connectors.

SPiiPlus SA operation options

SPiiPlus SA features & benefits:
- Supports both Sin-Cos and high speed incremental encoders with 4x to 65,536x internal programmable interpolator multiplier available for any axis with Sin-Cos feedback
- Standalone operation; or connection to a programmable operator interface or host computer
- Controls any servo drive that accepts ±10Vdc torque command or step-and-direction input
- RS-232 and RS-232/422 serial port protocols are supported, as well as Ethernet 10/100base T, ModBus (master or slave); all ports can be used simultaneously
- Digital I/O expansion to 256 inputs and outputs using the HSSI-IO16 modules, Ethernet ModBus or third-party I/O blocks
- Supports graphical motion and logic programming through OpenPLC IEC 61131-3 standard
- CE approval
- Lower cost SAR-LT Econo version available for applications requiring quadrature feedback only with reduced I/O requirements
**SPiiPlus-LF cost effective 4-axis motion controller**

The SPiiPlus-LF 4-axis controller is designed to address the needs of cost sensitive applications where space is at a premium. The SPiiPlus-LF is more than just a motion controller; with its PLC programming and CANOpen master capabilities it can actually control your whole machine. The SPiiPlus-LF is PLCopen compliant and, in addition to ACSPL+ motion programming language, it can also be programmed in one of IEC61131-3 standard PLC languages. Its capabilities can be extended by adding up to 64 CANOPEN nodes of additional axes and I/Os.

As a member of the SPiiPlus family of products, it is supported by the SPiiPlus free software support package, which includes a rich set of powerful tools with full simulation capabilities for easy setup, tuning, application program development, debugging and diagnostics.

**PCI Bus multi-axis motion control for high speed data transfer**

Based on the same advanced technology as the SPiiPlus CM and SA systems, the SPiiPlus PCI provides motion control functionality via high-speed PCI bus communication or as a stand-alone controller.

The SPiiPlus-PCI line includes three versions: The SPiiPlus-PCI high performance, the SPiiPlus-PCI-LT economical controller and the SPiiPlus-PCI-ST stepper controller, which brings the power and flexibility of the SPiiPlusto systems with step motors and servo motor drives with Pulse-Direction interface.

**SPiiPlus PCI features & benefits:**

- Incremental and analog encoder feedback at input frequency up to 20MHz
- Built-in SIN-COS interpolator (4x to 655,536x)
- Torque or current commutation commands
- Pulse - direction commands (at up to 4 million/second) for step motor drive control
- User-defined 5V to 24VDC digital I/O sink or source
- Programmable standard axis I/O, drive fault, drive enable and over-travel limits SPiiPlus PCI-LT econo version for applications requiring quadrature feedback only with reduced I/O requirements
- SPiiPlus PCI-ST econo version for systems with only step motors or servo motor drives with pulse-direction interface
- True closed-loop servo-control of stepper motors for optimal performance

To simplify the process of prototyping the following accessories are offered: mating connectors’ kit, breakout terminal kit, and din rail mounting kit.
What ACS Motion Control Products Do For You:

• Take your machine design to the next level of performance
• Achieve the highest level of performance possible with commercially-available standard hardware
• Achieve sub-nanometer performance, faster step and settle time, higher throughput
• Enable maximum benefit from your equipment investment
• Shorten your time to market by using proven products and proven software
• Provide the shortest path to your machine control solution with easy-to-use software tools
• Facilitate training and multi-user development with better software tools
• Eliminate the costs and hassles of additional licenses and fees with FREE software that operates across all ACS products
• Enable development and debugging of your machine control software before hardware installation with the FREE simulator available with all ACS software tools

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