ECS *servo system*
MCS *servo motors*

for multi-axis applications

Lenze

ECS, MCS | dynamic, powerful, compact

The ECS servo system
Servo drives with a high overload capacity designed specifically for multi-axis applications with high dynamics.

MCS servo motors
Synchronous servo motors – compact, reliable and highly dynamic.

The servo system comprises axis modules and power supply modules which can be combined to an optimised unit for multi-axis applications. The control tasks and motion control functions can be split according to the application-specific requirements between a central control, e. g. an industrial PC, and the ECS servo system.

A high degree of precision is achieved when carrying out multi-axis co-ordinated movements by transferring synchronised speed and torque setpoints via the integrated Lenze system bus with microsecond accuracy at cycle times down to 1 ms. The ECS servo system is therefore optimised for gantry systems, robots, packaging machinery or feeding and removal mechanisms in handling technology.

The stator winding has been created by combining individual coils in the new SEpT (Single Element Pole Technology) design. High-quality magnetic materials and specially designed poles provide the required conditions for excellent drive characteristics. The result combines a significant increase in power density with a reduction in mass inertia. Minimal detent torques ensure excellent smooth running and therefore optimum control characteristics. The robust mechanical structure with reinforced bearings and fully encapsulated stator together with the high degree of protection increase operational reliability even in harsh environmental conditions.

Power supply module
as a panel-mounted unit

8 A axis module
as a cold plate device

64 A axis module
in push-through technique

MCS 06 servo motor

Advantages | easy to use, full network capabilities, robust

The advantages of the ECS servo system
- ▶ High dynamics
  - – Axis modules can support overloads of between 200% and 300%
  - – Dynamic energy exchange via DC bus connection
- ▶ Central supply modules
  - – Minimum cabling
  - – Reduced expenditure on switching elements and fuses on the supply side
  - – Built-in mains and DC bus monitoring function
  - – Central interference suppression
- ▶ Couldn't be easier to assemble
  - – Pluggable connection system for power and control terminals which is protected against reverse polarity and is accessible from the front
  - – Choose between wall mounting, push-through technique or cold-plate technique
- ▶ Flexible configuration for adaptation to motion control
- ▶ Full network capabilities
  - – 2 CAN interfaces in the axis module as standard
  - – All popular fieldbus systems are available as optional additional plug-in communication modules

- ▶ "Safe standstill" in accordance with EN 954-1, control category 3
- ▶ UL-approved, CE-compliant
- ▶ Built-in motor brake control
- ▶ Can be combined with synchronous and asynchronous motors
  - – Resolver or encoder as feedback system (TTL, SinCos, SinCos absolute value)
- ▶ Optimum matching to MCS range of highly dynamic motors

Advantages of MCS servo motors
- ▶ Extremely dynamic performance thanks to the low moments of inertia
- ▶ Compact design with high power density
- ▶ Rugged resolver feedback system as standard
  - – Optional SinCos encoder for maximum precision
- ▶ Plug-in connections make installation and servicing much easier
- ▶ Enclosure: IP54, IP65 optional
- ▶ cUЯus and GOST approved, CE-compliant
- ▶ Smooth housing surface
- ▶ Fully encapsulated stator
- ▶ Practically free from detent torque thanks to SEpT* winding

* Single Element Pole Technology

MCS 14 servo motor

System overview | complete automation systems for multi-axis applications

Lenze's automation system components and ECS servo drives make it very straightforward to set up a complete automation system with co-ordinated interfaces.

You can achieve high levels of flexibility in the design of your drive configuration through either freely programmable ECS axis modules complying with IEC 61131-3 or through prepared solution packages.

The ETC Motion Control co-ordinates synchronous motions on multiple axes – ranging from simple positioning tasks to 3D path control – and can be programmed using the IEC61131-3 compliant languages.

The IP20 I/O system can be used to implement additional input and output terminals.

Text displays, graphic displays or touchscreens offer safe and easy ways to operate and monitor the machine. Lenze offers a differentiated range of operating and display units. The standardised integrated development environment optimally integrates displays with the Lenze drives, and so facilitates the project planning process for your particular application.

All of the system components are compatible with the Lenze CAN system bus – which makes it even easier to integrate the system and avoid interface problems.

Of course, a range of power-dependent accessories such as mains chokes and EMC filters is also available.

Motion control
PLC
IPC
Path control system

CAN motion bus

Power supply module

Optional external brake resistor

Optional mains choke

Optional RFI filter

Mains

To factory control,
higher-level systems
- PROFIBUS-DP
- INTERBUS
- DeviceNet
- LECOM-AB
  (RS485, 232, optical
  fibre)

Operating and
service tools

Command Station

Human Machine Interface

Axis modules
– Speed and Torque
– Posi and Shaft
– Motion
– Application

CAN system bus

Decentralised I/O system

MCS servo motors

Controller variants | Axis modules

The ECS servo system comes preconfigured for many different application areas. Axis modules with specially tailored versions are available for simple and efficient configuration and commissioning.

The "safe standstill" function as specified in EN954-1, Category 3 and control of a motor holding brake with monitoring function is built into all four versions of the controller.

▶ **Speed and Torque** for general servo applications
▶ **Posi and Shaft** for positioning applications and electrical shafts or electrical gearboxes
▶ **Motion** for co-ordinated multi-axis applications
▶ **Application** for custom modification of the functionality. Freely programmable in the languages specified in IEC 61131-3.

Speed and Torque

Speed and Torque is tailored to the application areas "speed and torque control". The setpoints can either be selected via analog input signals, via the integrated CAN system bus or via fieldbus systems.

In addition, there are also up to 15 predefined fixed speeds which can be used. The acceleration ramps can be either linear or S-shaped. A drift-free standstill is provided for quick stops.

Posi and Shaft

Up to 15 positioning profiles can be predefined and stored in this version of the controller. Positioning may be specified as absolute, relative, modulo (that is relative and continuous), or as a manually specified fixed speed value, or as a digital frequency follower.

Touch probe positioning in various forms, torque reduction after arrival at the target position and speed override are also implemented. There are eight different options available as referencing modes.

Grinding machine
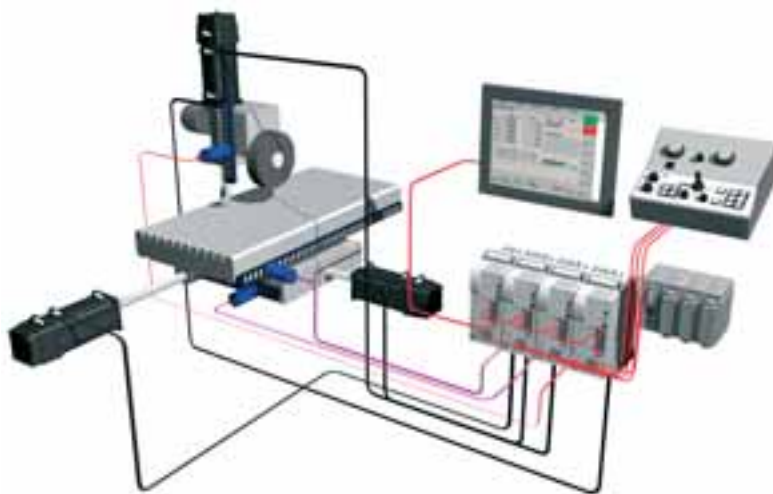
Motion

This version of the controller has been specially designed for co-ordinated movements of several axes under one central motion control system.

Horizontal cardboard box
packing machine H200

The axes are synchronised by a CAN motion bus angle follower. In addition to the
► interpolated position
► velocity
► homing
modes of operation, touch-probe position detection and various referencing modes are also available.

Application

This controller variant provides the greatest degree of flexibility and integration. This is achieved by building a PLC into the ECSxA servo controllers. It is freely programmable in the languages specified in IEC 61131-3. Lenze also provides technology packages so that, despite this great flexibility, you are still able to build on Lenze's tried-and-tested know-how in addition to your own programs. These technology packages are
► Positioner for positioning drives
► Cam for cam drives
► Winder for winding drives

This gives you library functions, prepared solutions and application examples tailored to your task.

System characteristics
► 524 kbyte program memory (flash memory)
► 7 kbyte parameter memory (NVRAM)
► 11 kbyte main memory (flash memory)
► 192 byte RAM with mains failure protection
► 2 x 64 kbyte application data memory (SRAM)
► 1 cyclic task
► 8 time or event-controlled tasks
► Minimum task run-time: 1 ms
► Processing time for bit operations: 0.7 μs

Application software | Technology packages

Positioning drives

Materials transport, gantries, surface machining, rotary tables or robots are applications in which positioning drives are used. Motion control is stored in the controller itself and offers the advantage of high flexibility thanks to free programming of motion sequences.

Optimum travel profiles and jerk-free accelerations ensure lower energy consumption while simultaneously protecting the mechanical system.

Cam drives

Contouring, filling, packing, processing paper or cross-cutting are examples of applications in which electronic cams demonstrate their capability. Mechanical cams that are complex to create belong to the past. The benefits are high dynamic performance with optimum drive management, low wear thanks to smooth acceleration and, not least, significant time saving in retooling. Product changes can be made at the touch of a button, as different motion profiles can be simply loaded into the drive controller through the software.

Properties
- ▶ Up to 48 curves each with 290 interpolation points
- ▶ Forward control of the speed and torque for high dynamic performance
- ▶ Cam group with three tracks each of four cams, a maximum of 48 records
- ▶ Motion profiles may be activated in any sequence; sequence control through a sequencer
- ▶ Stretching, compressing and shifting the current profile on-line
- ▶ 14 homing modes or setting references
- ▶ Virtual master with inching or manual operation, handwheel, cyclic and automatic operation
- ▶ Virtual clutch with position override function
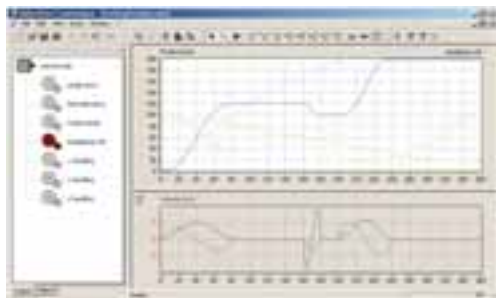
Properties
- ▶ Up to 128 travel profiles freely selectable
- ▶ Activation of the travel profiles in any sequence
- ▶ Sequence control via IEC 61131-3
- ▶ Positioning with jerk limitation, speed override, final speed (velocity changeover) and residual path (touch probe)
- ▶ 16 homing modes or reference setting
- ▶ Manual control, for example for loading positions (teach-in)

CAM Designer

The "CamDesigner" is a software tool which makes it easy to create motion profiles. The program allows you to illustrate and process all motion profiles simultaneously in accordance with the motion plan for all the drives in the machine.

Winding drives

A great number of manufacturing processes use winding drives to pick up materials produced or to pass them on for further processing. Examples include cables, wire, textiles, paper, sheet metal or thin film. In the past, complex control technology, generally implemented in a host PLC, was necessary for this purpose. Intelligent controllers such as Lenze's ECSxA (Application) axis modules are nowadays able to host these functions.

The drive-based solution relieves the load on the master controller and the bus systems. The integration of drive functions directly in the drive clears the way for saving on components previously required in the control cabinet.

Properties
The "Winder" software package offers solutions both for tension setting and control, and also for dancer-controlled winders.

Tension setting and control
► Internal diameter calculation
► Setting tensile force through a ramp generator
► Controlling the tensile force through a characteristic function
► Automatic identification of the actual moment of inertia and the friction present
► Compensation for the acceleration torque and the friction
► Calculation of the material thickness with stop controller

Dancer position control
► Internal diameter calculation with compensation for the dancer movement
► Teaching the dancer end positions
► Controlling the tensile force through characteristic function by means of a dancer device
► Automatic identification of the actual moment of inertia
► Compensation for the acceleration torque
► Calculation of the material thickness with stop controller

Engineering | quick and convenient

Engineering

The "Application" ECSxA axis modules are programmed using a powerful, software-integrated, development environment. Five different editors are provided in the programming languages standardised in IEC 61131-3 for this purpose. This means that the programmer is able to select the language best suited for the application or his knowledge. It is also possible to mix languages. All the values of the variables are indicated in the debugging and monitoring mode.

You can set breakpoints to help you refine your new program quickly.
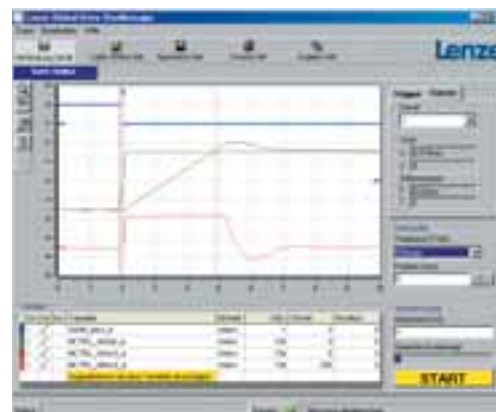
Global Drive Oscilloscope

This software makes the connection or installation of complex measuring instruments superfluous. The servo controller itself is a comprehensive measuring instrument for all the measured variables relating to the drive. The benefits associated with this are clear:

▶ Accurate determination of device-specific process factors using eight channels

▶ No fitting of temporary measuring sensors in the system

▶ Easy-to-use documentation for the fine-tuning of control loops

▶ Simple maintenance and troubleshooting

Global Drive Oscilloscope is supplied together with Drive PLC Developer Studio.
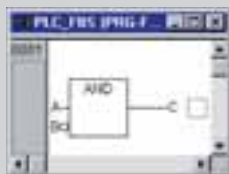
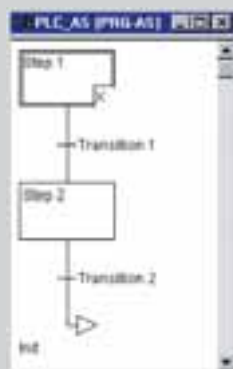**Programming languages for the Drive PLC Developer Studio**
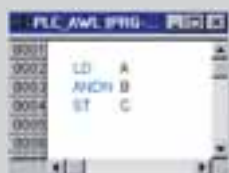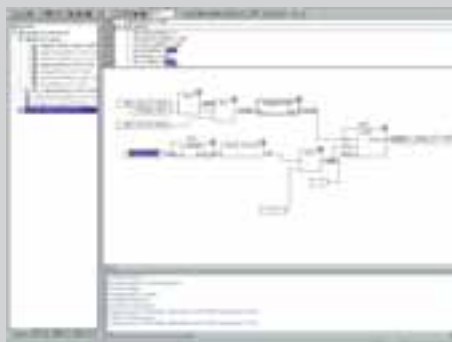

1 Instruction list
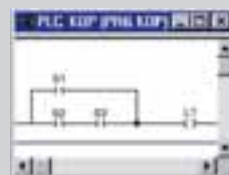
2 Ladder diagram

3 Function block diagram

4 Structured text

5 Sequential function chart

CFC Editor (Continuous Function Chart)

Technical data | from a single source

Axis module		ECS x S004	ECS x S008	ECS x S016	ECS x S032	ECS x S048	ECS x S064
		ECS x P004	ECS x P008	ECS x P016	ECS x P032	ECS x P048	ECS x P064
		ECS x M004	ECS x M008	ECS x M016	ECS x M032	ECS x M048	ECS x M064
		ECS x A004	ECS x A008	ECS x A016	ECS x A032	ECS x A048	ECS x A064
Max. output current	[A]	4.0	8.0	16.0	32.0	48.0	64.0
Rated current*	[A]	2.0	4.0	8.0	12.7	17.0	20.0
Standstill current continuous/short-time	[A$_{rms}$]	2.0/3.0	4.0/6.0	8.0/12.0	16.0/24.0	23.0/36.0	27.0/48.0
DC-bus voltage	[V$_{DC}$]	0 … 770					
Dimensions (W x H x D) [mm] (wall mounting, push-through technique)		88 x 247 x 174				132 x 247 x 174	
Dimensions (W x H x D) [mm] (cold plate)		88 x 282 x 121				132 x 282 x 121	

* Rated current at 3~ 400 V mains voltage

Power supply module		ECS x E012	ECS x E020	ECS x E040
Rated current in DC bus	[A]	12.0	20.0	38.5
Rated mains current	[A]	9.6	15.9	31.9
Max. braking power	[kW]	7.6	16.0	32.0
Continuous braking power - Ext. resistor - Int. resistor *	[kW] [kW]	2.0 0.10	3.0 0.12	6.0 0.15
Mains voltage range	[V$_{AC}$]	3 ~ 180 − 528 ± 0%		
Dimensions (W x H x D) [mm] (wall mounting, push-through technique)		88 x 247 x 176		132 x 247 x 176
Dimensions (cold plate) (W x H x D) [mm]		88 x 282 x 121		132 x 282 x 121

* Not on cold plate design

Motor type	Standstill torque [Nm]	Rated current [A]	Rated torque [Nm]	Maximum torque [Nm]	Rated speed [rpm]	Mass moment of inertia [10^{-4} kg m²]
MCS 06C	0.8	1.3/2.4	0.6/0.5	2.4	4050/6000	0.14
MCS 06F	1.5	1.5/2.5	1.2/0.9	4.4	4050/6000	0.22
MCS 06I	2.0	1.6/2.9	1.5/1.2	6.2	4050/6000	0.3
MCS 09D	3.3	2.3/3.8	2.3/1.8	9.5	4050/6000	1.1
MCS 09F	4.2	2.5/4.5	3.1/2.4	15.0	3750/6000	1.5
MCS 09H	5.5	3.4/6.0	3.8/3.0	20.0	4050/6000	1.9
MCS 09L	7.5	4.2/6.9	4.5/3.6	32.0	4050/5100	2.8
MCS 12D	6.4	2.6/4.5	5.574.3	18.0	1950/4050	4.0
MCS 12H	11.4	3.8/5.7	10.0/7.5	29.0	1500/3525	7.3
MCS 12L	15.0	5.9/10.2	13.5/11.0	56.0	1950/4050	10.6
MCS 14D	11.0	4.5/7.5	9.2/7.5	29.0	1500/3600	8.1
MCS 14H	21.0	6.6/11.9	16.0/14.0	55.0	1500/3225	14.2
MCS 14L	28.0	9.7/15.0	23.0/17.2	77.0	1500/3225	23.4
MCS 14P	37.0	10.8/15.6	30.0/21.0	105.0	1350/3225	34.7
MCS 19F	32.0	8.6/14.0	27.0/21.0	86.0	1425/3000	65.0
MCS 19J	51.0	12.3/18.5	40.0/29.0	129.0	1425/3000	105.0
MCS 19P	64.0	14.3/19.0	51.0/32.0	190.0	1350/3000	160.0

Motors for 3~ 400 V mains voltage, sizes up to MCS 12D are also available for 3~ 230 V supply systems at the same torques.

Motor sizes MCS 12D and larger are available also fan-cooled for up to 58% power increase.

It's good to know | why we are there for you

"Our customers come first. Customer satisfaction is what motivates us. By thinking in terms of how we can add value for our customers we can increase productivity through reliability."

"The world is our marketplace. We develop and manufacture internationally. Wherever you are in the world, we are nearby."

"We will provide you with exactly what you need – perfectly co-ordinated products and solutions with the right functions for your machines and installations. That is what we mean by 'quality'."

"Take advantage of our wealth of expertise. For more than 60 years now we have been gathering experience in various fields and implementing it consistently and rigorously in our products, motion functions and pre-configured solutions for industry."

"We identify with your targets and strive towards a long-term partnership which benefits both sides. Our competent support and consultation process means that we can provide you with tailor-made solutions. We are there for you and can offer assistance in all of the key processes."

You can rely on our service. Expert advice is available 24 hours a day, 365 days a year, in more than 30 countries via our international helpline: 008000 24 Hours (008000 2446877).

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