motor technology
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ARS2000
servo

openconcepts

Universal servo positioning controller ARS 2000

COOPER Power Tools

The Company

Metronix has developed, produced and distributed innovative drive technology for industrial machines and automotive applications for more than 30 years.

Metronix, as part of Cooper Tools, focusses on intelligent servo drives. Our standard includes high quality products, such as the high performance AC servo positioning controller ARS 2000, as well as customer specific drive solutions.

Cooper Industries, with administrative headquarter in Houston, Texas, is a global manufacturer of electrical products, tools and systems. Cooper has approximately 28,000 employees in over 100 locations around the world selling products to customers in more than 50 countries.

Cooper Power Tools offers a wide range of electrical and pneumatic tools as well as automated tightening and assembly systems for industrial applications in the automotive and aviation industry.

Metronix stands for universal products with open standards. They are flexible and can be easily adapted to a number of different applications.

Metronix – openconcepts

- stands for universal interfaces, open standards and modular extension options for our products which make maximum flexibility in machinery concepts possible.
- Intelligent drive solutions require optimized concepts. Metronix is open for your requirements. Together with you our experts develop the drive solution for your application. We can use our series products or something unique to create the solution that is exactly to your needs.
- for our engineers it means more than just supporting our products, it means being open for your questions. Our experts help you to analyse an application and advise and help with its adjustment and the selection of required components.
  We develop long-lasting business relationships through close and confident co-operation with our customers.

highly dynamic

openconcepts

innovative drive solutions

COOPER Power Tools

Overview ARS 2000

Product description

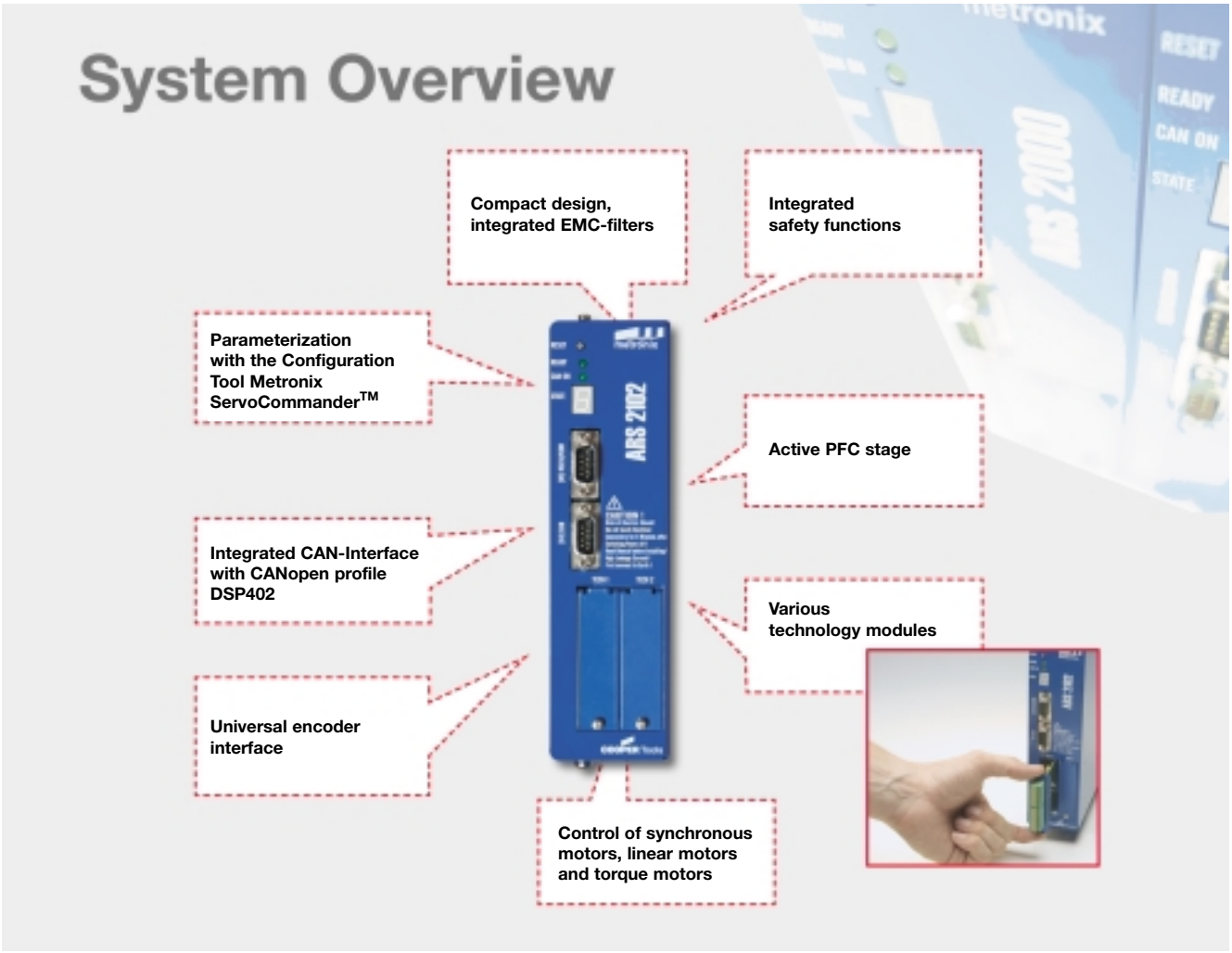
The ARS 2000 servo positioning controllers (ARS servo 2nd generation) are intelligent AC servo inverters with many parameter setting and extension options. They are flexible and can be easily adapted to a number of different applications.

The ARS 2100 series includes types with single-phase supply and the ARS 2300 series types with three-phase supply.

In addition to point-to-point positioning, speed and angle synchronization with electronic gear, the CANopen protocol DSP402 allows the implementation of contouring controls with linear interpolation as well as time-synchronized multi-axis applications. The ARS 2000 communicates with a PLC via fieldbus like the integrated CAN Interface or fieldbus modules, e.g. with PROFIBUS or SERCOS.

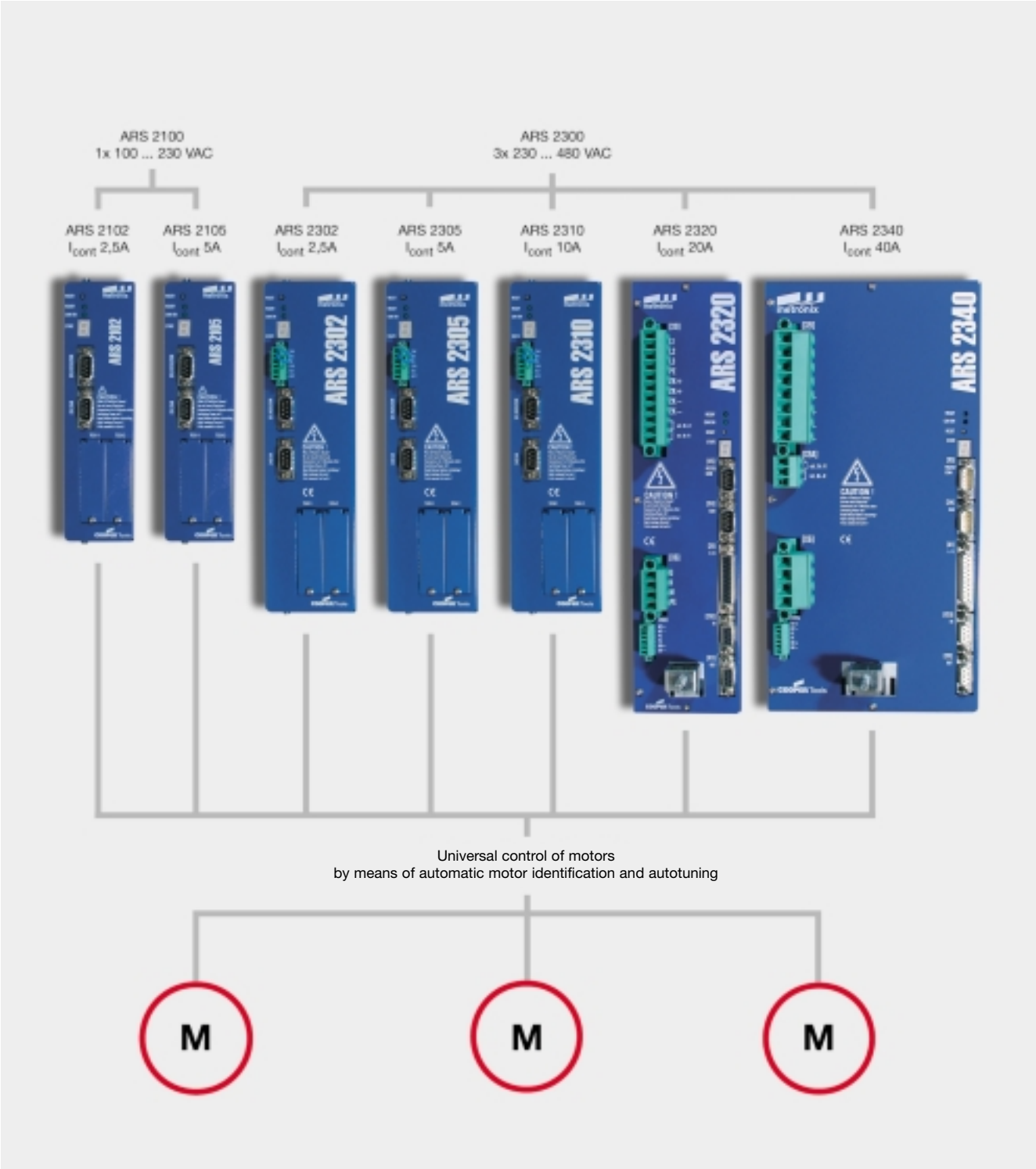
The servo positioning controllers can be used universally since they can be connected to various encoder systems and motor types.

With the menue-driven configuration tool Metronix ServoCommander™ and the automatic motor identification, the ARS 2000 quickly and comfortably adapts to your requirements.



ARS 2000

Universal servo-positioning controller



Features

Compact design

- Small dimensions
- Directly connectable to each other
- Complete integration of all components for controller and power module including RS232 and CAN interface
- Integrated brake chopper
- Integrated EMC filters
- Compliance with current CE and EN standards without additional external measures

Control of different AC motors

- Synchronous motors
- Linear motors
- Torque motors

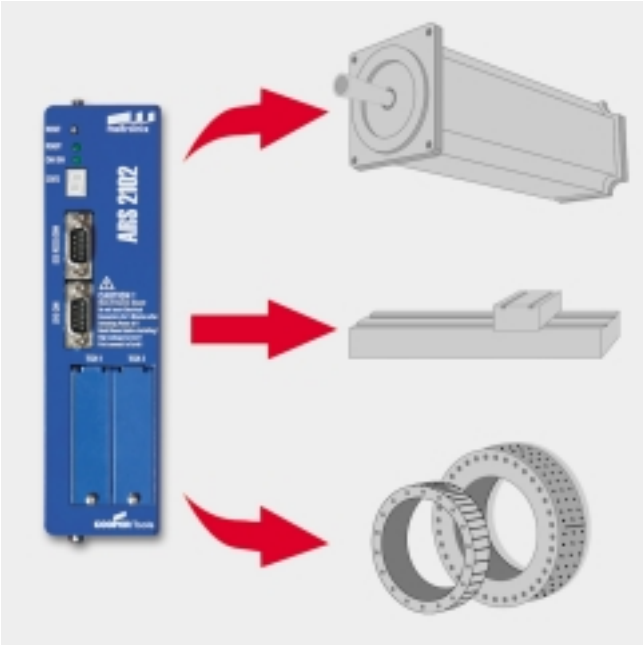
Universal encoder interface

- Integrated universal encoder evaluation for the following encoders:
  - Resolver, high control quality due to extremely good sensor technology
  - Incremental encoder with/without commutation signals
  - High-resolution Stegmann incremental encoders, absolute encoders with HIPERFACE
  - High-resolution Heidenhain incremental encoders, absolute encoders with EnDat

Extension and fieldbus modules

- EA88 I/O extension module
- PROFIBUS-DP
- SERCOS
- Ethernet
- Service flash module

NEW - EtherCAT and DeviceNET



Control of different motor types

Extension and fieldbus modules

Features

Integrated CANopen interface

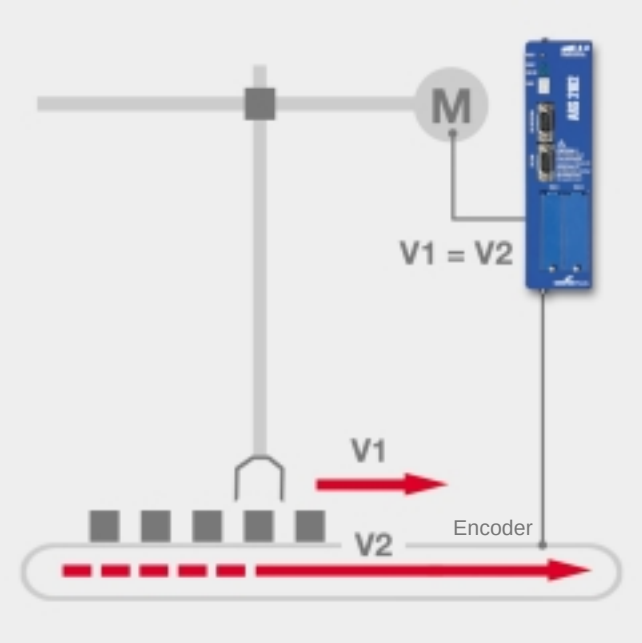
- Open interface with CANopen fieldbus
- Protocol in accordance with CANopen standard DS 301 and DSP 402
- Including “interpolated position mode“ for multi-axis applications

Motion control

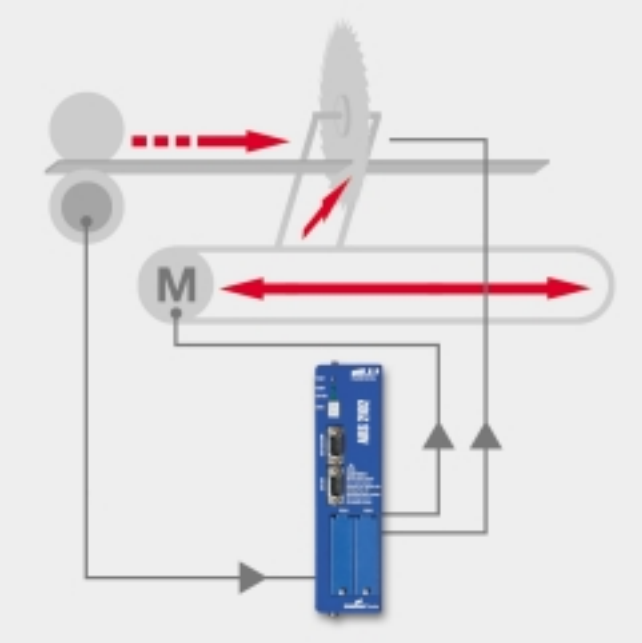
- Operation as speed, torque and positioning controller
- Integrated positioning control
- Time-optimized positioning or jolt-free positioning (S-shape)
- Relative and absolute movements
- Point-to-point positioning with or without active positioning profile
- Speed and angle synchronization
- Electronic gear system
- 256 freely programmable position sets
- Various homing methods
- Flying saw

Integrated sequence control

- Moving position sets without external PLC
- Linear and cyclic position sequences
- Adjustable delay times
- Branches and wait positions
- Freely programmable stop position for safe stop



Synchronization of a Pick and Place station



Flying saw

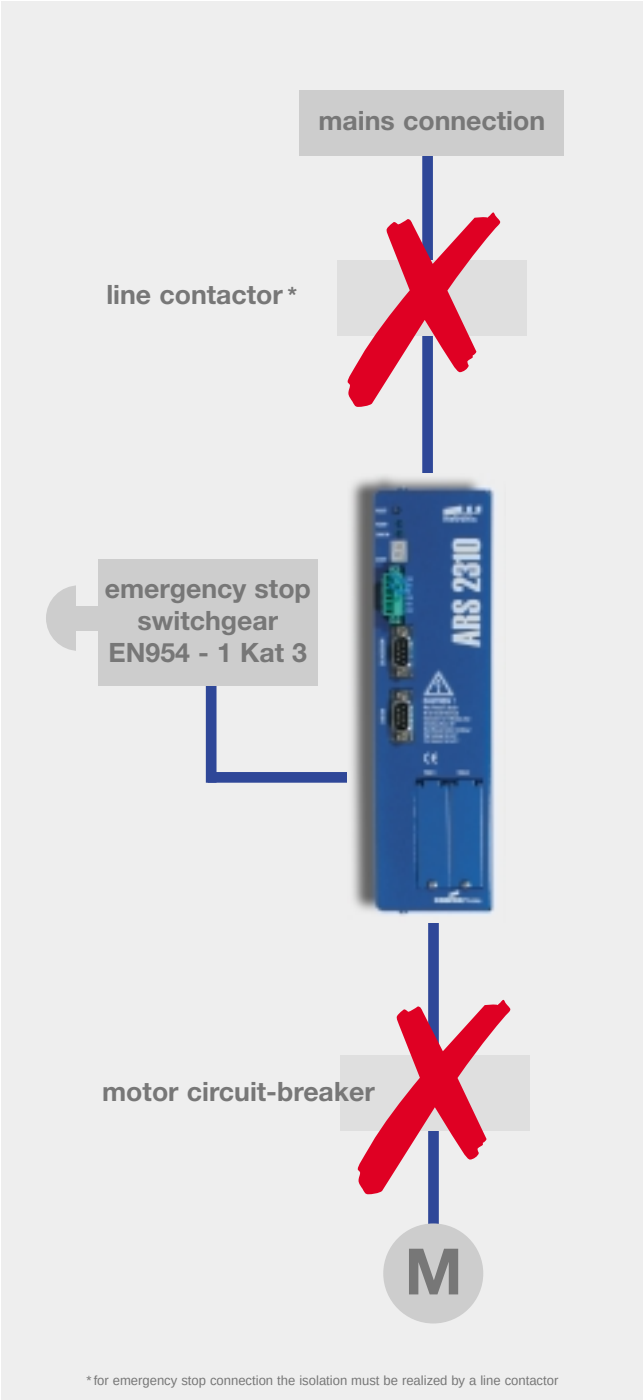
Features

Integrated power factor control (PFC)

- Integrated in ARS 2100 series
- Compliance with current standards regarding mains harmonics (EN 61000-3-2) without external components
- $\cos_\phi$ = 0.97 at rated operation
- Digital control of the DC-bus voltage to an average value of 360 VDC
- Capable to take a certain amount of mains fluctuations
- 30% higher speed values possible
- Use of motors with higher torque constants at identical power ratings

Integrated safety functions

- Integrated safe stop according to EN 954-1 category 3
- Protection against unexpected movements
- Two channel switch off for the power stage
- BGIA certified
- Less external safety components required
- Short response times in case of failure
- Quick restart, DC-link remains loaded
- Extension module with additional safety functions such as active stop, safe reduced speed, etc.



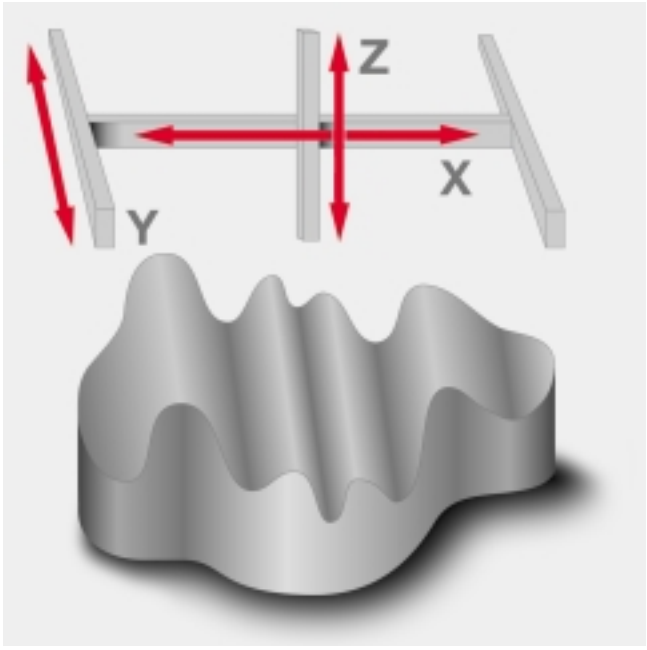
Safe stop: reduced external components

Features

Interpolated multi-axis movements

Due to the implementation of the interpolated position mode via CAN-bus or SERCOS, position setpoints can be set for multi-axis use of the controller.

In this mode, position setpoints are specified by a subordinated control at fixed intervals. If the interval is longer than a position controller cycle, the controller automatically interpolates the data values between two specified position values.



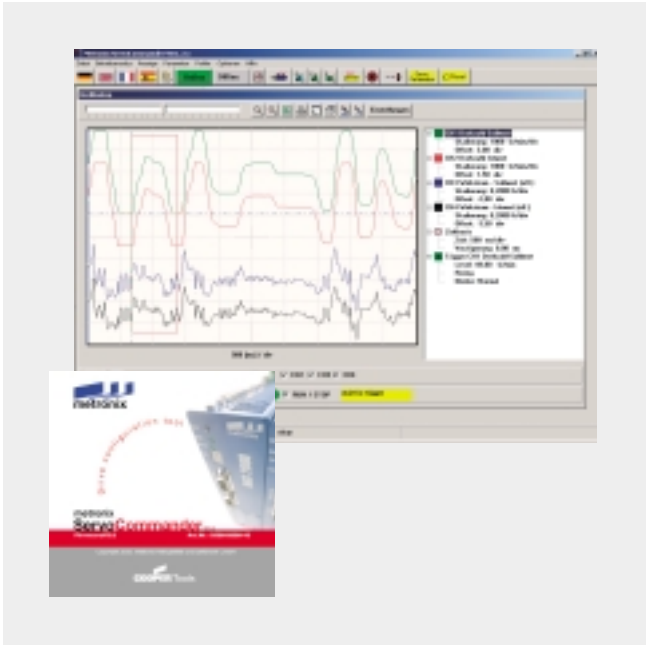
Interpolated multi-axis movements

Input / Output

- Freely programmable I/Os
- High resolution 16 Bit analog input
- Jogging
- Easy connection to a PLC via I/O or fieldbus
- Serial communication via RS 232

"Metronix ServoCommander™" configuration tool

- Easy first commissioning and diagnosis
- Adjustment of all parameters
- 4 channel oscilloscope function
- Multilingual



Metronix ServoCommander ™

Technical data

Range	Values	
Permissible temperature ranges	Storage temperature:	-25 °C to +70 °C
	Operating temperature:	0 °C to +40 °C +40 °C to +50 °C with a power derating of 2,5% /K
Permissible altitude	Up to 1000 m above msl, 1000 to 4000 m above msl with power derating	
Atmospheric humidity	Rel. humidity up to 90 %, non-condensing	
Type of protection	IP20	
Pollution class	1	
CE conformity Low voltage directive: EMC directive: Current harmonics:	 EN 50 178 EN 61 800 - 3 EN 61 000 - 3 - 2	
Other certifications	UL / cUL	
Inputs	10 x digital in (24 V) 3 x analog in (± 10 V, 2 x 10 Bit, 1 x 16 Bit)	
Outputs	4 x digital out (24 V) 1 x digital out (24 V) for brake 2 x analog out (± 10 V, 9 Bit)	
Interfaces	Standard: RS 232 (RS 485), CAN-Bus (CANopen DSP 402) Optional: digital EA88 I/O extension, PROFIBUS-DP, SERCOS, Ethernet NEW - EtherCAT, DeviceNET	
Encoder evaluation	Universal encoder interface for motors with: Resolver, incremental encoder, SinCos-encoder (single-/ multiturn) with HIPERFACE, high resolution Heidenhain encoder as well as multiturn absolute encoder with EnDat-Interface	

Type key:
Example ARS 2305

ARS – 2 3 05

- **05 — RMS output current**
- **3 — Power supply line:**
  - **1 = single-phase**
  - **3 = three-phase**
- **2 — 2nd generation**
- **ARS — Type denomination**

Technical data

Type	ARS 2102	ARS 2105
Supply voltage	1~ 100...230 V AC [± 10%]	
DC-supply voltage	60...380 V DC	
Control voltage	24 V DC [± 20%]	
DC-link voltage	360...380 V DC	
Clock frequency	Variable clock frequency up to 13 kHz	
	Data for operation at 1~ 230 V AC, 50 Hz	
Rated power	0.5 kW	1.0 kW
Maximum power up to 5 s	1.0 kW	2.0 kW
Rated current	2.5 A_{eff}	5 A_{eff}
Peak current up to 5 s	5 A_{eff}	10 A_{eff}
Internal brake resistor Rated / pulse power	165 Ω 10 W / 1.1 kW	110 Ω 20 W / 1.6 kW
External brake resistor Max. rated brake power	≥ 100 Ω ≤ 250 W	≥ 80 Ω ≤ 500 W
Brake	24 V DC, max. 1 A	
Dimensions w x h x d	200 x 54.5 x 200	225 x 54.5 x 200
Weight	2.0 kg	2.1 kg
Order no.	**9200-2102-10**	**9200-2105-10**
Power connector set	**9200-0210-00**	**9200-0210-00**
Signal connector set	**9200-0200-00**	**9200-0200-00**

ARS 2102 and ARS 2105

Technical data

Type	ARS 2302	ARS 2305	ARS 2310
Supply voltage	3~ 230...480 V AC [± 10%]		
DC-supply voltage	60...700 V DC		
Control voltage	24 V DC [± 20%]		
DC-link voltage	560 V DC		
Clock frequency	Variable clock frequency up to 13 kHz		
	Data for operation at 3~ 400 V AC, 50 Hz, f_{clock} = 5 kHz		
Rated power	1.25 kW	2.5 kW	5 kW
Maximum power up to 5 s	3.75 kW	7.5 kW	10 kW
Rated power	2.5 A_{eff}	5 A_{eff}	10 A_{eff}
Maximum power up to 5 s	7.5 A_{eff}	15 A_{eff}	20 A_{eff}
Internal brake resistor Rated / pulse power	68 Ω 110 W / 8.5 kW		
External brake resistor Max. rated brake power	≥ 60 Ω ≤ 5 kW		
Brake	24 V DC, max. 2 A		
Dimensions w x h x d	250 x 69 x 240		
Weight	3.7 kg		
Order no.	**9200-2302-00**	**9200-2305-00**	**9200-2310-00**
Power connector set	**9200-0230-00**	**9200-0230-00**	**9200-0230-00**
Signal connector set	**9200-0200-00**	**9200-0200-00**	**9200-0200-00**

ARS 2302, ARS 2305 and ARS 2310

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Technical data

Type	ARS 2320	ARS 2340
Supply voltage	3~ 230...480 V AC [± 10%]	
DC-supply voltage	60...700 V DC	
Control voltage	24 V DC [± 20%]	
DC-link voltage	560 V DC	
Clock frequency	Variable clock frequency up to 13 kHz	
	Data for operation at 3~ 400 V AC, 50 Hz, f_{clock} = 5 kHz	
Rated power	12 kW	20 kW
Maximum power up to 5 s	25 kW	35 kW
Rated current	20 A_{eff}	40 A_{eff}
Peak current up to 5 s	41.5 A_{eff}	70 A_{eff}
Internal brake resistor Rated / pulse power	47 Ω 110 W / 12 kW	23,5 Ω 220 W / 23 kW
External brake resistor Max. rated brake power	30 Ω ≤ R_{ext} ≤ 100 Ω ≤ 5 kW	18 Ω ≤ R_{ext} ≤ 75 Ω ≤ 10 kW
Brake	24 V DC, max. 2 A	
Dimensions w x h x d	330 x 89 x 242	330 x 164 x 242
Weight	8 kg	13.5 kg
Order no	**9200-2320-00**	**9200-2340-00**
Power connector set	**9003-0280-01**	**9003-0280-02**
Signal connector set	**9200-0200-00**	**9200-0200-00**

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Technology modules

It is possible to extend the ARS 2000 servo positioning controller with additional technology modules by simply plugging them into one of the two technology slots of the device.

By this, you can extend or retrofit the ARS 2000 with up to 16 digital I/Os or several fieldbus modules.

CANopen

ARS 2000 has an integrated CAN interface. A protocol is included in accordance with the CANopen standards DS 301 and DSP 402.

Network topology	Line
CAN-bus participant	Slave
Max. participants amount	128
Communication profile	DS 301 version 4.02 / DSP 402 version 2.0
Baud rate	Up to 1 Mbaud
Amount of PDO	4 RPDO, 4 TPDO

PROFIBUS-DP technology module

The PROFIBUS-interface is a slave fieldbus module including the PROFIBUS-DP communication profile. It is used to network a servo controller with a PROFIBUS master. The module is equipped with terminating resistors which can be activated by switches. S7-function blocks are available to easily integrate the drive into S7-control programs. Additional examples, which are perfectly adjusted to the existing telegram structure of the ARS 2000, are showing the complete integration of the ARS 2000 into S7-projects.
The ARS 2000 family with PROFIBUS module fulfills parts of the PROFIDRIVE specification.

Network topology	Line (plus terminating resistor)
Profibus participant	Slave
Max. no. of participants	126
Communication profile	PROFIBUS-DP V0
Baud rate	9.6 – 12.000 kBit/s (automatic detection)
Order no.	**9200-0002-20**

EA88 technology module

The EA88 is a terminal extension module for the ARS 2000. Up to two EA88 modules can be connected to a servo controller, i.e. a maximum of 16 digital I/Os can be retrofitted.

Technical features:
- 8 digital inputs
- 8 digital outputs
- All inputs and outputs are isolated through optical transmitters
- All inputs und outputs are protected against short circuit, reversed wiring and overload

Technical data inputs:	
Input	Active high switches the input
Rated voltage	24 V DC
Voltage range	-30 V...30 V
“High“ detection	U_{in} > 8 V
“Low“ detection	U_{in} < 2 V
Hysteresis	>1 V
Input impedance	≥ 4.7 kΩ
Polarity reversal protection	Up to -30 V
Switch delay up to Port-pin (Low-High-transition)	< 100 µs
Technical data outputs:	
Switch type	High-side switch
Rated voltage	24 V DC
Voltage range	18 V...30 V DC
Output current (rated)	$I_{L,Nom}$ = 100 mA
Voltage loss at $I_{L,rated}$	≤ 1 V
Residual current at switch off	< 100 mA
Short circuit / Current overload protection	> 500 mA
Temperature protection	Switch off at overload temperature, T_J > 150 °C
Input supply protection	Protection against inductance loads and voltage supply through the output even at switched off power supply
Loads	R > 220 Ω, L any, C < 10nF
Switch delay as of port pin	< 100 µs
Order no.	**9200-0001-20**

SERCOS technology module

The SERCOS interface is a slave fieldbus module which enables the use of the ARS 2000 servo controller in applications such as real time operation for tooling machines.
SERCOS is a worldwide standardized digital interface for the communication between controls and drives. With SERCOS it is possible to have numerically controlled, highly dynamic drive applications in the field of mechanical engineering. It exchange data between the CNC and the ARS 2000 via optical fiber without any interference.

Technical features:
- Transfer of position, speed and torque setpoint
- Display and adjustment of all parameters and diagnostic values
- Optimum solution for fast and precise applications

Network topology	Optical fiber ring
SERCOS participant	Slave
Max. no. of participants	Depending on baud rate
Communication profile	In accordance with Compliance class A and B
Baud rate	2 – 16 MBit/s (adjustable)
Order no.	**9200-0003-00**

Ethernet technology module

The Ethernet Interface is a TCP/IP connection for remote control an fieldbus applications.
It can be used to read and write setpoints and actual values, analyze failures, load and save parameter sets, adjust single parameter and display values via the oscilloscope function.
The industrial Ethernet, an extension of the Ethernet interface, is in preparation. With this module it will be possible to obtain more details via different protocols such as Powerlink, SERCOS 3 or PROFINET.

Order no.	**9200-0004-00**

Service flash module

The Service flash module, available for the ARS 2000, makes it very easy to replace a device, e.g. in the event of maintenance. If the Service module is plugged into a technology slot, the ARS 2000 recognizes it and saves the actual parameter set directly on the module. In the event of a device replacement even untrained personnel can handle this without any further instructions or the Metronix ServoCommander™. Just plug in the Service module and the servo controller will parameterize itself. The drive is ready for operation immediately.
It is also possible to copy the same parameter set with the Service module.

Order no.	**9200-0005-00**

Operator panel for ARS 2000

Drives can be easily tested and run using the ARS 2000. All I/Os can be set through switches. The drive status is indicated by LEDs. Setpoints can be adapted using analog potentiometers, position sets can be selected using a selection switch.

- Easy connection by means of a standard 25-pin D-SUB full parallel-port cable
- 3 analog setpoints, 1 with ± 10 V DC and 2 with 0-10 V DC, 1 setpoint with ± 10 V DC is connected via switch to an external BNC-female connector
- 2 analog monitor outputs with ± 10 V DC via BNC-female connector
- 16-step switch for positioning with active control for binary code through 4 red LEDs
- 8 digital inputs with switch, 6 with optical control by green LEDs
- Active display of the 4 digital outputs by red LEDs

Pin-No.	Denomination	Value	Specification	Service control panel Part
1	AGND	0 V	Shield for analog signals, AGND	
14	AGND	0 V	Reference potential for analog signals	
2	AIN0	U_{On} = ± 10 V $R_1 \geq 20$ kΩ	Setpoint input 0, differential, max. 30 V input voltage	AIN0 setpoint potent. ± 10 V fade left -10 V and fade right +10 V
15	#AIN0			
3	AIN1	U_{On} = ± 10 V $R_1 \geq 20$ kΩ	Setpoint inputs 1+2, single ended, max. 30 V input-voltage	AIN1 setpoint pot. left +10 V to BNC-female by switch AIN2 set-point pot. right +10 V
16	AIN2			
4	+VREF	+10 V	Reference output for set-point potent.	
17	AMON0	± 10 V	Analog monitor output 0	BNC-female
5	AMON1	± 10 V	Analog monitor output 1	BNC-female
18	+24 V	24 V / 100 mA	24 V supply output	
6	GND24	corresponding GND	Reference potential for digital I/O's	
19	DIN0	POS Bit0	Target selection positioning Bit0	16-step switch, 4 red LEDs for optical binary control Bit0 to Bit3
7	DIN1	POS Bit1	Target selection positioning Bit1	
20	DIN2	POS Bit2	Target selection positioning Bit2	
8	DIN3	POS Bit3	Target selection positioning Bit3	
21	DIN4	FG_E	Power stage enable	Switch with green LED
9	DIN5	FG_R	Controller enable	Switch with green LED
22	DIN6	END0	Input end switch 0 (locks n>0)	Switch with green LED
10	DIN7	END1	Input end switch 1 (locks n<0)	Switch with green LED
23	DIN8	START	Input for positioning start	Switch with green LED
11	DIN9	SAMP	High speed input	Switch with green LED
24	DOUT0	24 V / 100 mA	Output ready for operation	Red LED
12	DOUT1	24 V / 100 mA	Output freely programmable	Red LED
25	DOUT2 (DIN10)	24 V / 100 mA	Output freely programmable	Red LED (DIN10 with switch)
13	DOUT3 (DIN11)	24 V / 100 mA	Output freely programmable	Red LED (DIN10 with switch)
Order no.		**9200-0300-00**		

Metronix ServoCommander™ configuration tool

Servo controllers should be set up as quickly as possible. Metronix ServoCommander™ is a parameterizing program which allows fast and user-friendly configuration of the drive using a PC.

Features:
- Easy configuration of all parameters
- Clear display of operational parameters
- Display of values in customer-specific units
- Graphic display of structures
- Extensive online help
- Excellent navigation properties provided by graphic buttons
- Context-sensitive windows
- Use of Wizards
- Multilingual
- Automatic identification of the connected servo positioning controller
- Automatic guidance through the first commissioning
- Automatic motor identification
- 4 channel oscilloscope function
- Simultaneous indication of reference values and actual values
- Offline parameter setting
- Loading and saving of parameter sets

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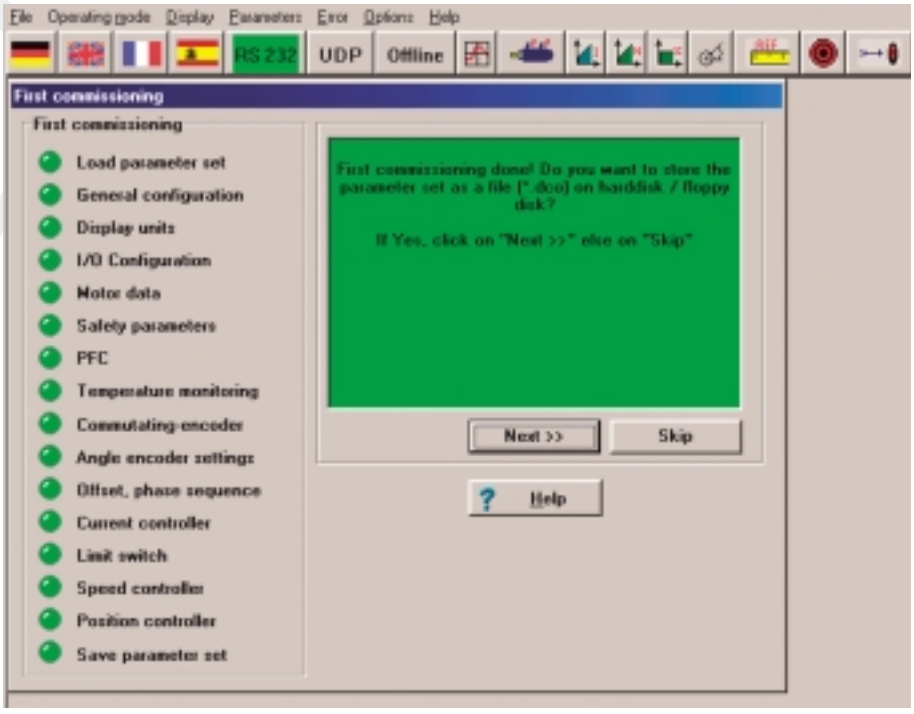
Metronix ServoCommander™ configuration tool

Run the drive within the shortest time possible.

Ready ... Set ... Go !

1 Automatic first commissioning



Run the drive in some minutes without reading the manual.

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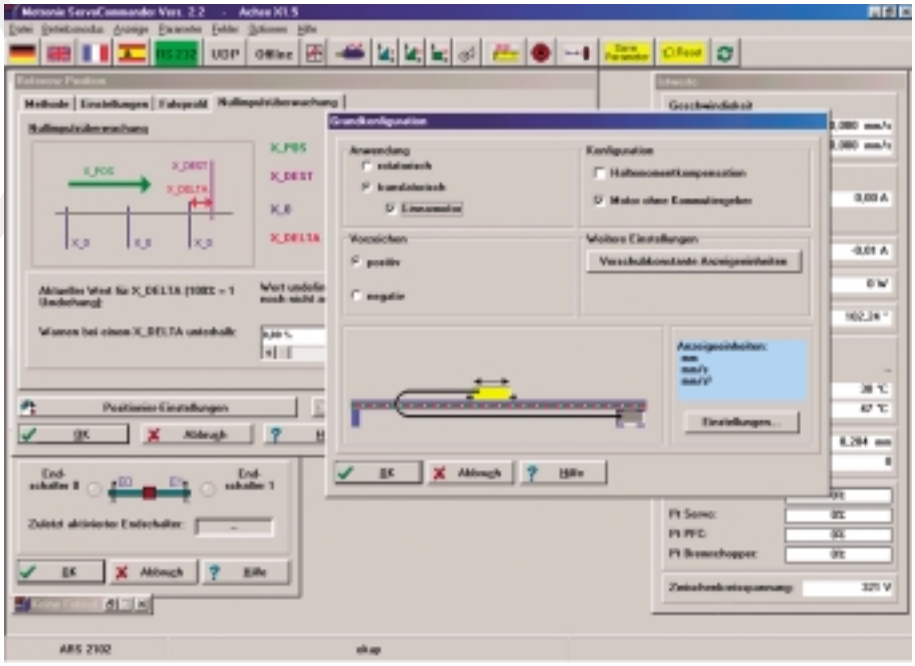
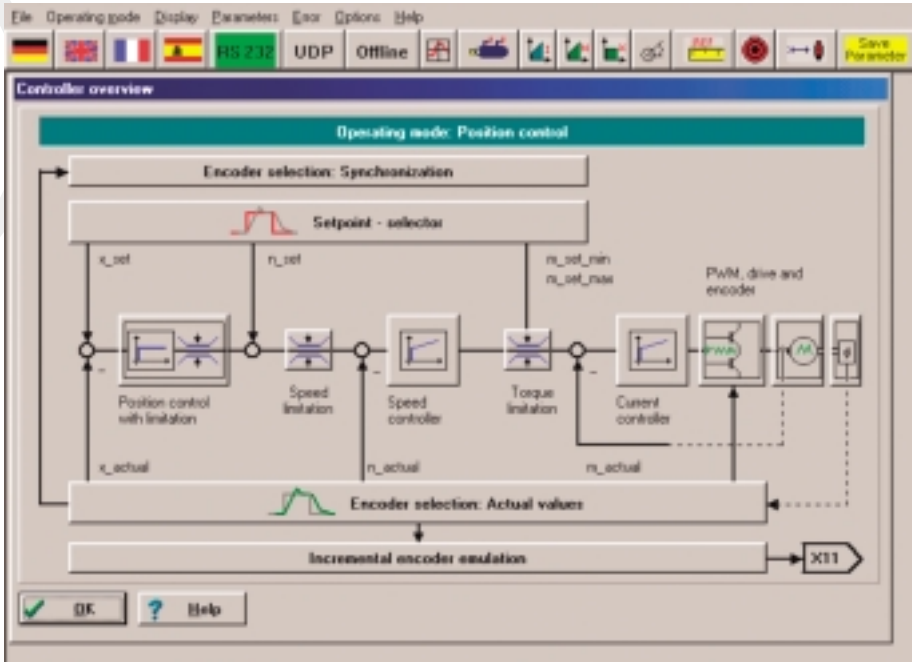
Graphic visualization



Pictures and overview graphics help the user to quickly and easily learn to know the program.
With the central controller cascade all drive-specific settings can be accessed from one menue.

Multilingual plain text



All windows and parameters are described in plain text. The extensive Online help function you get quick knowledge what to do in this menue.

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