



smart ideas
for **great** projects

Universal servo drives



metronix
servo drives

metronix

servo drives

Innovation, sustainability and the passion of further improving high-quality products is motivating the company Metronix for more than 30 years. As a pioneer in the field of servo drive technology, Metronix has a host of experience. With our servo drives we deliver an important component for modern factory automation and many other areas.

When applications require highest dynamics, precision and power reserves, the Metronix products are in use. More than 70.000 servo drives are leaving the plant in Braunschweig every year. The focus is on central switch cabinet servo drives and decentral servo drives.

All products are built-up on a main hardware platform and, based on the Metronix standard devices, can be quickly adapted to customer-specific requirements. This customising offers the user a high level of freedom. Motivated teams in all areas ensure the future success. Embedded in the worldwide operating Apex Tool Group with more than 8.000 employees in 30 countries Metronix is supporting its customers with the global sales and service structure.

Our core values are

Customers come first

Our first priority is exceeding customer expectations for quality, delivery, value, and innovation.

Integrity in all we do

Integrity is the key to building strong relationships with co-workers, customers, suppliers, sales channel partners, and our communities.

Continuous improvement

In every aspect of our business. Pareto, implement and sustain safe, lean processes to drive out waste and improve productivity.

Innovation for growth

Creative ideas implemented with speed keep us ahead.

Best talent – one team

Our associates are high performing, entrepreneurial individuals who work collaboratively and know how to win as a team.



Scalability is our DNA

The requirements on excellent drive technology are increasing constantly. Finding the right solution is becoming a key issue for the users in various industries and is a big challenge for all involved in the entire process chain - from the idea to marketing.

Metronix has solved this complex task with the ARS 2000 series as a scalable and functional platform. The result is a fully scalable servo drive with only the functionality on board that is necessary for your application.

Simple applications and tasks require only the cost-effective basic version. The higher the requirements, the more a high-end servo drive can be configured from a basic version.

Available technology functions are adjusted and retrieved via the newest setup software „Metronix ServoCommander®“ with integrated real-time oscilloscope. The various “connectivity variants” of the ARS 2000 series allow the support of different fieldbus systems and multi-feedback systems of different motor manufacturers. Via special technology modules the increasing requirements of the current machinery directive are supported, too. This scalability is a big advantage for your complex applications. You only pay for the functionality you need.

The ARS 2000 is consequently designed for scalability – scalability is the DNA of the ARS 2000.

Smart ideas for great projects

To visualise the extreme performance of the ARS 2000 servo drive, we have chosen an example from nature: The ant can move objects that exceed its own body weight by a multiple.

Just like the compact ARS 2000, that moves for example a machine tool, a packaging machine or a robot precisely, dynamically and controlled. This is an important component for your future and current projects. In this way, together with you, we want to sum up your ideas to big, new projects.





Industry solutions

Universal automation systems

› Factory Automation

Short cycle times, maximum precision and productivity – this is what the machine users require from a servo drive in a modern and innovative "Industry 4.0 factory for the future". With more than 30 years of experience in factory automation in the areas handling, conveyor technology, robotics and production machines Metronix provides the right DRIVE in this increasingly demanding environment.

› Automotive

Generally, in the automotive plants a particularly large number of drives is in use. The production of a car requires reliable drive systems, exact positioning, flexible handling systems, robots and different applications. From the press plant and body shop to final assembly. The Metronix technology perfectly and easily fits into this complex process chain and thus improves productivity, decreases set-up times and increases system availability.

› Packaging

Filling and closing machines, cartoners and re-packagers represent a large share of the packaging machines segment. Servo drives and actuators have to be very efficient to meet these increased demands on flexibility and productivity. Rapid and real-time capable bus systems are the nerve cords of modern packaging solutions. Metronix serves this branch very successfully for many years and has many satisfied customers in this market.



Certified quality

For a quality-conscious manufacturer of high-quality products, professional quality management is a matter of course. That's why the quality management system of Metronix is audited and assessed by Lloyd's Register Quality Assurance since 1996. Since then we yearly prove by audits that our operation complies with the requirements of the European Standard EN ISO 9001:2015. The entire software development process is implemented and secured following SPICE-Level 2 (Software Process Improvement and Capability Determination) and ISO/IEC 15504. The ARS 2000 series is certified according to UL/cUL.

› Energy

Renewable energies, such as wind and solar power are essential for the energy mix of today. Many exciting Metronix applications are in use in this growing and sustainable market segment and are supporting this future market with intelligent and energy saving drive technology. Whether for manufacturing or operation of the systems: we always have the right solution!

› Intralogistics

Lifting, lowering and positioning: the ARS 2000 allows a smooth material flow in modern and efficient conveyor systems with connection to upstream and downstream systems. Intelligent, driverless, autarchic transport systems and industrial trucks that independently carry piece goods from the place of loading to the destination are completing the drive tasks in this marketplace.

› Customising

Besides the standard servo drives, Metronix also offers customer specific developments and produces industrial electronics. Our main focuses are drive applications with the integration of specific drive functionalities on the basis of the in-house development platform in hardware and software solutions. In this way you benefit from our great experience in the quick implementation of your ideas into new products. Talk to us – we will be pleased to advise you.

I/O communication
Incremental encoder (on/off)
Voltage supply

LED status display

Status display

USB interface

Ethernet interface

CANopen

RS232

Optional safety module:

FSM 2.0 - STO

FSM 2.0 - MOV

CAN terminating resistor

SD card slot

2 technology slots

PROFINET

EtherCAT

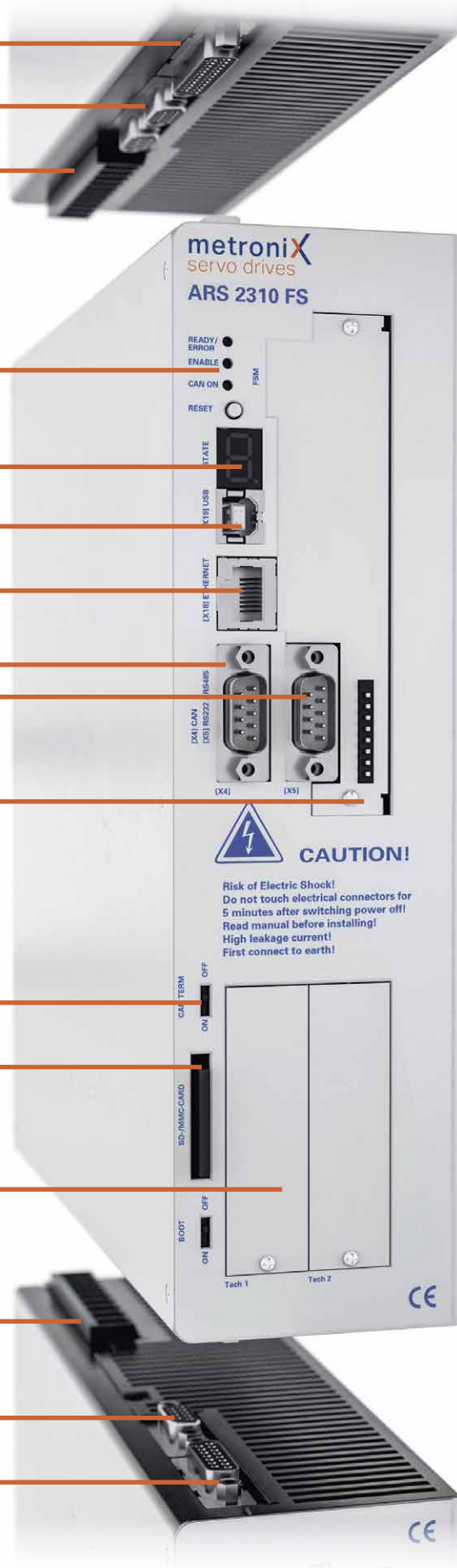
PROFIBUS

IO extension (EA88)

Motor connection

Resolver connection

Multi-encoder connection

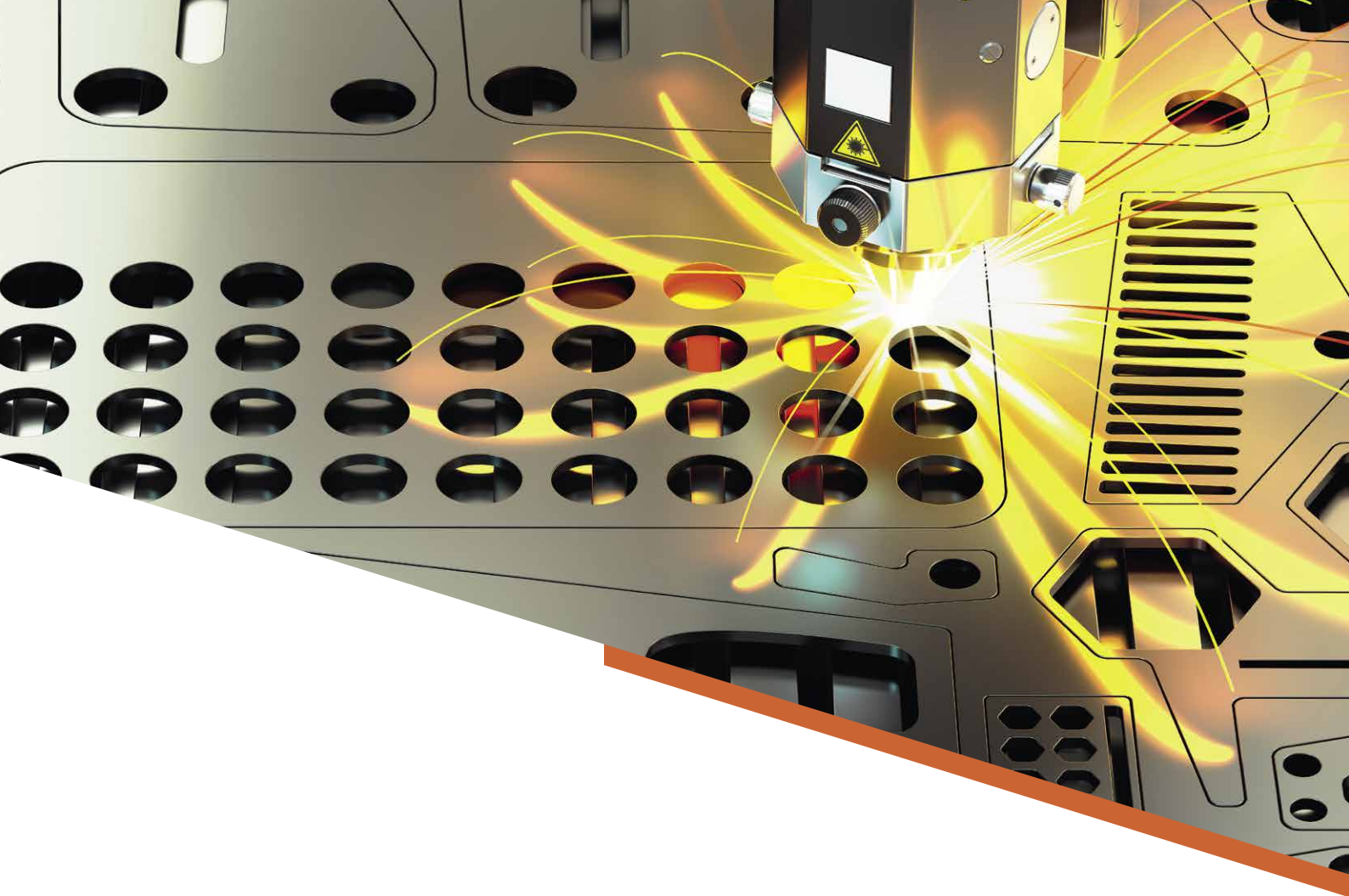


ARS 2000 – our all-rounder

for the right DRIVE of your application

- › **Highest performance and dynamics** due to short cycle time $< 32\mu\text{s}$
- › **High precision for NC applications** due to synchronisation of the entire servo drive clock system with the external control system
- › **USB and Ethernet interface** for parameterisation via PC
- › **On-board CANopen interface** with integrated positioning control according to CAN in Automation DSP402 and with numerous additional application-specific functions
- › **EtherCAT and PROFINET** for real-time communication available
- › **Integrated universal encoder evaluation** for resolver and analogue and digital incremental encoders
- › **High-resolution SICK incremental encoders** with HIPERFACE® and HIPERFACE DSL® - also available as single-cable solution
- › **High-resolution Heidenhain incremental encoders** according to EnDat 2.1/2.2
- › **Parameterisable notch filters** for suppression of inherent frequencies of the control section
- › **Jerk-limited or time-optimal positioning** relative or absolute to a point of reference
- › **Point-to-point positioning** with or without S-ramps
- › **Speed and angle synchronisation** with electronic gear system via incremental encoder input or fieldbus with extensive modes of operation for synchronisation
- › **Encoder emulation and pulse direction interface**
- › **Various methods** for homing and positioning features such as jogging, teach-in mode, linked positioning tasks, torque-limited positioning tasks and much more
- › **Support of multiple cam drives** with switching cams
- › **Position trigger and rotor position trigger**

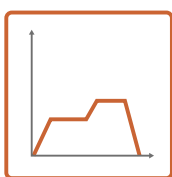




Technology functions on board

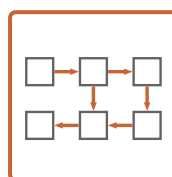
Numerous integrated software functions make the ARS 2000 servo drives real all-rounders in drive technology.

The ARS 2000 servo drives not only support numerous motor types and all common position encoders directly, but also can be adapted very flexible to a variety of applications via simple parameterisation of the integrated technology functions. The high-precise evaluation of external signals in the drive allows shortest possible cycle times.



› Positioning

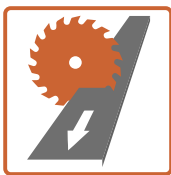
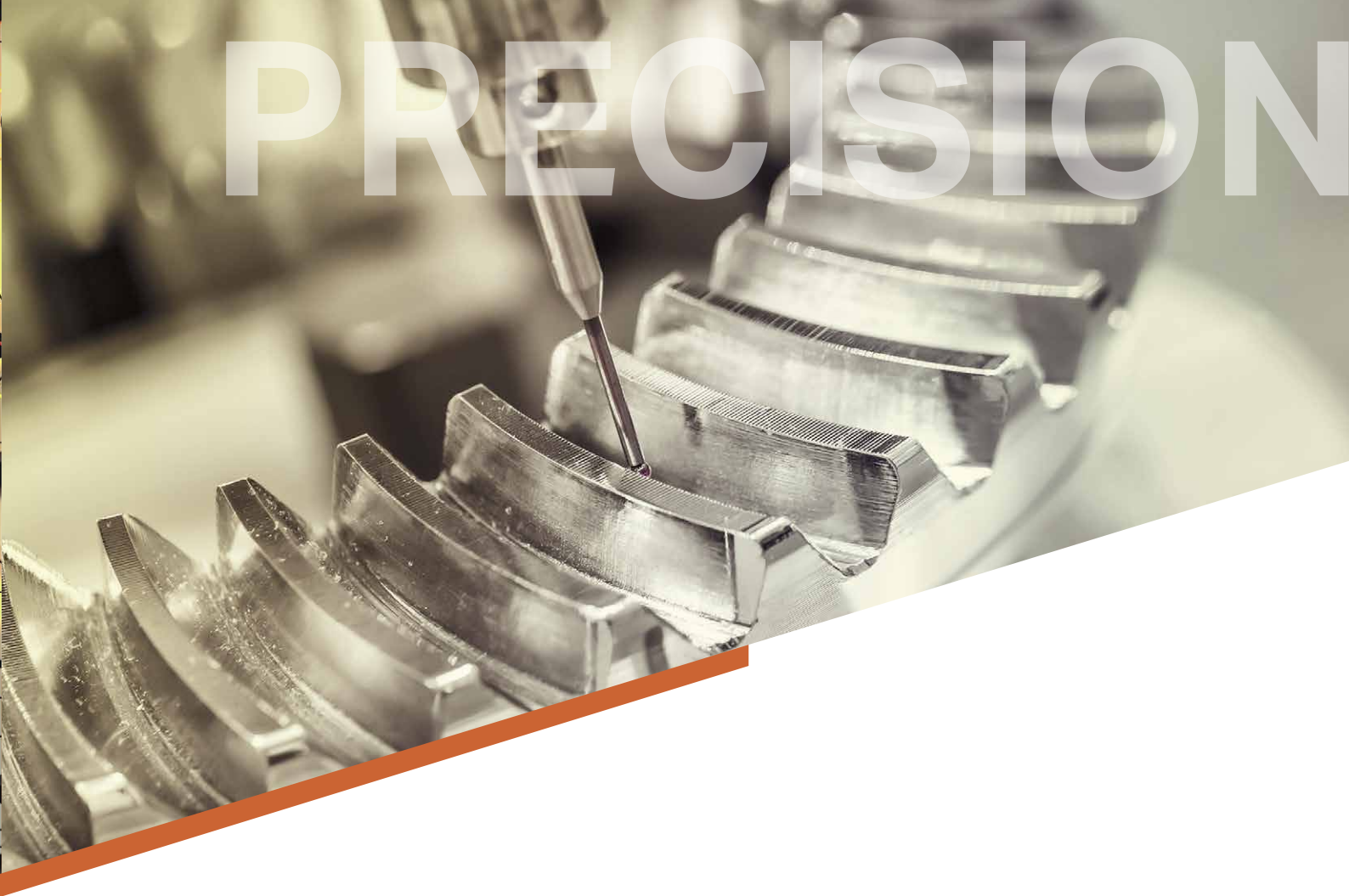
Whether linear, jerk-limited or torque-limited: With the integrated positioning control every motion task can be easily realised.



› Linked positioning tasks

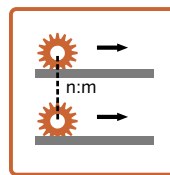
All 256 positioning tasks can be linked to solve complex motion sequences without external control system. Furthermore, digital inputs allow situation-related branching.

PRECISION



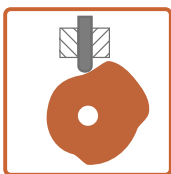
› Flying saw

By integrating a „flying saw“ into the drive, not only short cycle times, but also extremely high accuracies can be reached.



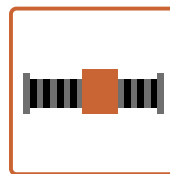
› Electronic gear/ Synchronisation

The position-synchronous or speed-synchronous motion of various drives with variable gear ratios can be quickly parameterised via the software assistant.



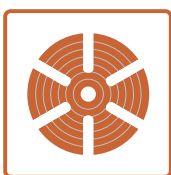
› CAM disk

Together with the integrated virtual master and with the synchronization the electronic cam can be used to coordinate several drives.



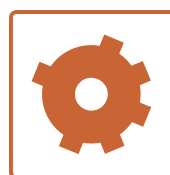
› Linear motors

Special procedures for the determination of the commutation position and corresponding monitoring functions allow the operation of linear motors without commutation information.



› Rotary table

For rotary table applications, several rotary axis modes are available. These can be combined with the cam disk and with the electronic gear.



› Switching cams

Position trigger, rotor position trigger and switching cams in connection with the cam disk can be easily parametrised and connected to digital outputs.

Connectivity options

ARS 2000 ready for IoT



> CANopen

The ARS 2000 servo drives always have on board the field bus system CANopen with the drive profile CiA 402. With the operation modes Profile Torque Mode, Profile Velocity Mode, Profile Position Mode, Homing Mode and Interpolated Position Mode the servo drive can be used in a variety of different applications. Several hundred parameters allow the complete parameterisation of the servo drive via CANopen.



ETHERNET

> Ethernet

The Ethernet interface also is on board and, via a UDP/IP connection, for example can be used for remote maintenance or as fieldbus connection. Here, the transmission of set points and actual values, an error analysis, loading and saving of parameter sets, the adjustment of single parameters and the display of values via the oscilloscope function can be realised.



> EtherCAT

A plug-in module provides the user with the Ethernet-based fieldbus system EtherCAT. With the application protocol CoE (CANopen over EtherCAT) all operation modes and parameters of CANopen can be used also under EtherCAT. In multi-axis applications in the operation mode „Cyclic synchronous position“ in connection with Distributed Clocks (DC) highly synchronous movements can be reached even with high cycle times, as the servo drives run exactly synchronous with the external clock.



> PROFINET

The Ethernet-based fieldbus system PROFINET also is available to the user as a plug-in module. Based on PROFIdrive the Metronix-specific application profile enables easy access to all functions of the servo drive. Ready-made function blocks and a sample project make the integration of the ARS 2000 into the control system a real piece of cake. Further, the plain text display of error messages in the control system simplifies the first set up significantly so that the machine is ready for use more quickly.



> PROFIBUS

Even though in new systems mainly PROFINET is used in the meantime, a PROFIBUS plug-in module will be available further on. As well as for PROFINET the Metronix-specific application profile enables easy access to all functions of the servo drive. Here, too, ready-made function blocks and a sample project make it easy to integrate the ARS 2000 into the control system.

Encoder interfaces

EnDat 2.2

› EnDat 2.1 und 2.2

Heidenhain encoders with EnDat interface have a serial communication channel that is used for the communication between the servo drive and the encoder. Via this channel all relevant information is read out of the electronic nameplate of the encoder. This avoids a cumbersome manual parameterisation. If the used encoder also has an EEPROM, the motor information can be saved in the encoder so that the motor can be connected directly to another servo drive. The ARS 2000 supports EnDat 2.1 as well as EnDat 2.2 encoders, each as single-turn and multi-turn encoder.

HIPERFACE®

› HIPERFACE®

As well as the Heidenhain encoders, the HIPERFACE encoders have a serial communication channel that is used for the communication between the servo drive and the encoder. Here again all relevant information is read out of the encoder and motor information can be saved in the encoder. All common HIPERFACE single-turn and multi-turn encoders are supported..

HIPERFACE® DSL

› HIPERFACE DSL®

The single-cable technique HIPERFACE DSL® transmits the digitalized encoder signal via the motor cable. Thus, a minimum of connecting lines between servo drive and motor is required. Of course, all features of the HIPERFACE encoders (electronic nameplate, information saving in the encoder) are also available in the HIPERFACE DSL® encoder.

~ 1V □ TTL

› Analogue and digital incremental encoders

The universal encoder interface supports a variety of different encoders. 1Vss signals are supported as well as digital track signals including homing tracks and index pulse. In addition to commutation, digital Hall signals can be evaluated and the determination of an error signal can be activated. One of the encoder inputs may also be used as pulse direction input or as forward-backward counting input.

› Resolver

Of course, the ARS 2000 also supports the resolver as a robust and cost-effective position encoder. Due to the outstanding high-quality resolver evaluation, the ARS 2000 together with a resolver can even be used in applications that normally would require a high-order encoder.



INDUSTRIE
4.0



Safety

Scalability for your safety

The integrated safety technology is following the principle of scalability, too and can be adapted to suit any of your requirements. The basic safety function "Safe Torque Off (STO)" can be reached with the module "FSM 2.0 – STO". Safety functions for rotational speed monitoring such as Safety Limited Speed (SLS) or Safe Operating Stop (SOS) are available via the module "FSM 2.0 – MOV".

For speed monitoring a broad range of safe encoders is supported that are connected directly to the servo drive. Cumbersome parallel wiring of the encoder signals is not required. Via safe digital outputs of the FSM 2.0 – MOV safety devices as for example door locks can be controlled. In conjunction with the integrated configurable logic functions this often allows to do without an additional safety PLC.

The request of the safety functions is effected via two-channel digital inputs with integrated short-circuit detection and cross-circuit detection.



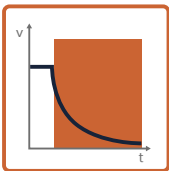
The FSM 2.0 – MOV module is parameterised via a safe parameterisation program using the normal communication interfaces of the servo drive (USB, Ethernet, RS232) without the need for any further wiring.

Via this parameterisation program for example the safety functions of the FSM 2.0 – MOV module can simply be switched from “monitoring” to “controlling”:

If for example the function SSR (Safe State Reached) is required, a limitation of the set point values in the servo drive can be activated. Then the servo drive is controlled by the FSM 2.0 – MOV in such a way that the safe limits are not exceeded. The FSM 2.0 – MOV ensures that the servo drive meets the transmitted limits and switches off the drive in case of error. The dynamic behaviour of the monitoring and controlling can be flexibly configured by dynamic ramps.

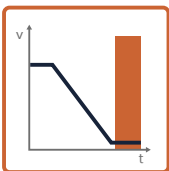
Functions

for safe sequences



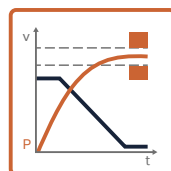
› STO - Safe Torque Off

Disconnection of the energy supply to the drive according to EN 61800-5-2. This safety function ensures that the drive is unable to deliver energy.



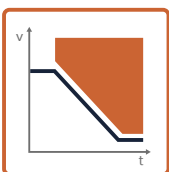
› SS1 - Safe Stop 1

The drive is braked self-sufficiently to idle within a defined time using a defined slowdown ramp and then the energy supply is switched off safely. All three versions described in the standard are supported.



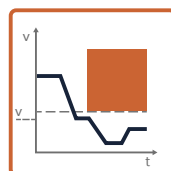
› SOS - Safe Operating Stop

This safety function is used when the motor position or the axis position has to be kept active and must be monitored safely.



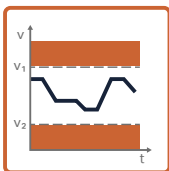
› SS2 - Safe Stop 2

The drive is braked self-sufficiently to idle within a defined time using a defined slowdown ramp. After the defined time has elapsed, SOS is triggered (Safe Operating Stop). All three states described in the standard are supported.



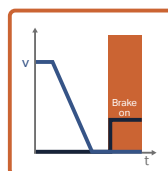
› SLS - Safely Limited Speed

This safety function prevents the motor from exceeding a specified speed limit.



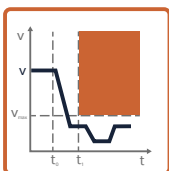
› SSR - Safe Speed Range

This safety function is used when the speed of the drive has to remain within specified limit values.



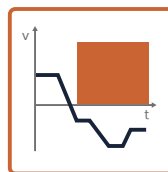
› SBC - Safe Brake Control

This safety function delivers a safe output signal to activate external motor brakes. This prevents an uncontrolled movement in the torque-free state. It is also possible to activate an external holding brake with integrated power electronics via safe outputs.



› SSM - Safe Speed Monitor

This safety function monitors the speed of the drive within specified limit values. If these limits are violated (exceed or fall below) a safety-oriented signal output is triggered.



› SDI - Safe Direction

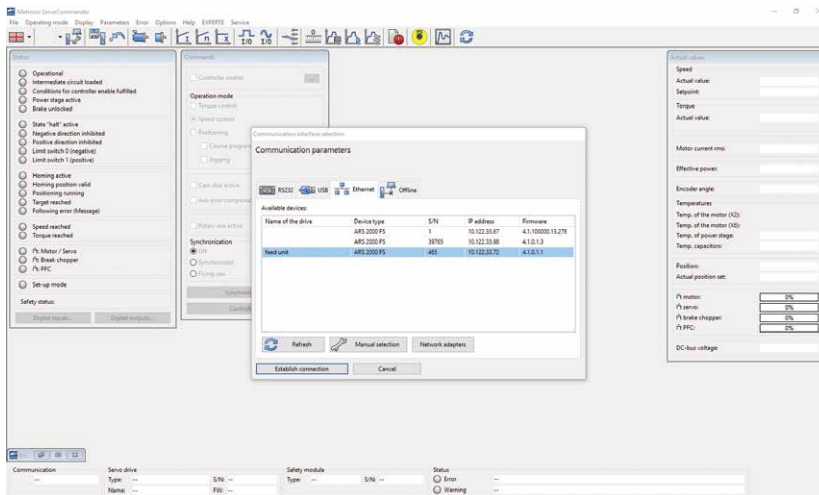
This safety function ensures that the drive can only move in the defined direction.

A close-up photograph of an industrial machine, likely a CNC lathe or mill, featuring a complex arrangement of metal components, including a central spindle, various bearings, and a transparent protective enclosure. The machine is set against a blurred background of a factory floor. An orange geometric line runs diagonally across the right side of the image.

Visualisation

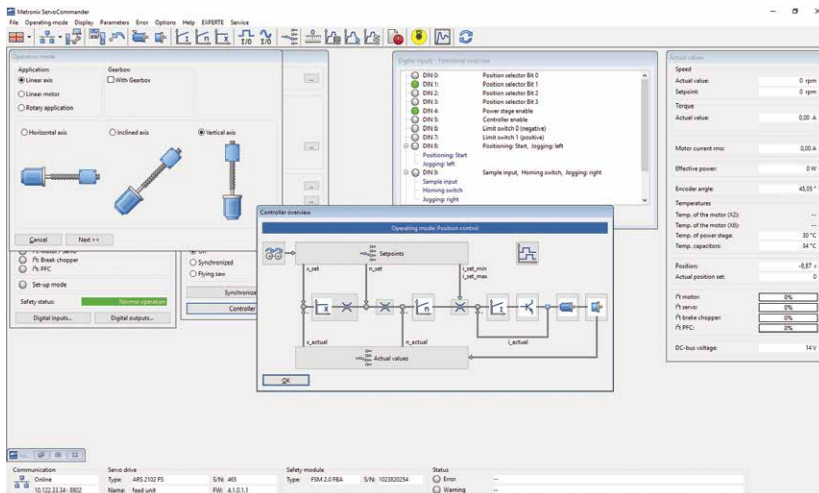
in detail

The setup software Metronix ServoCommander® allows a quick and easy configuration of the servo drive. Automatic commissioning functions and step-by-step wizards allow the parameterisation even without having expert know-how. Thanks to the graphical visualisation of the current operating status of the servo drive also complex correlations can be recognised at a glance.



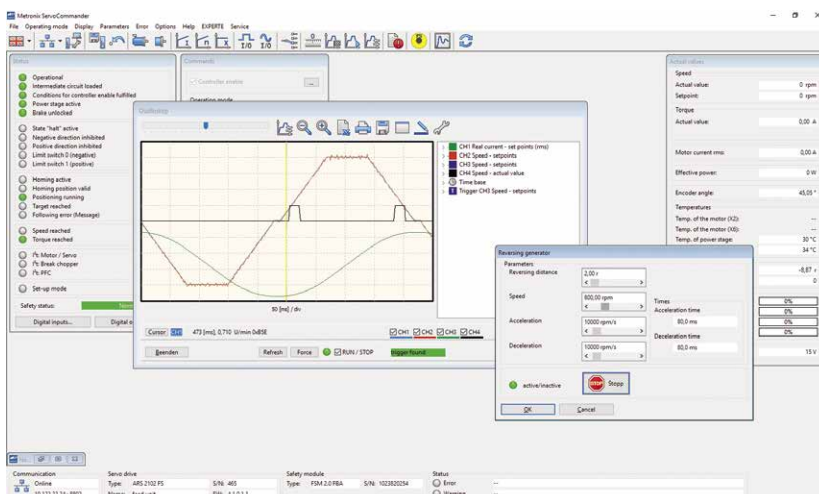
➤ Easy communication

Whether via USB or via Ethernet, the communication with the servo drive is established very quickly: All available devices are clearly listed with their freely selectable name in plain text. Thus, also in a big machine you can keep in view all of your drives.



➤ Graphical visualisation

The menu "controller overview" shows which servo drive blocks are activated and how they are interconnected. The visualisation is adapted dynamically to the current state of the servo drive.



➤ Oscilloscope function

By means of the oscilloscope function you can record up to 8 different items in parallel, save and export them. In this way dynamic processes can be analysed and optimised.

Technical data

Servo drive series ARS 2000

ARS 2100

Features	ARS 2102	ARS 2105	ARS 2108
Supply voltage	1 x 100...230 VAC [$\pm 10\%$], 50...60 Hz		
Alternative DC supply	60...380 VDC		60...320 VDC
Control voltage	24 VDC [$\pm 20\%$] (0,55 A) ¹⁾	24 VDC [$\pm 20\%$] (0,65 A) ¹⁾	
DC link voltage	360...380 VDC ²⁾ / 310...320 VDC ³⁾		310...320 VDC
Clock frequency	Variable clock frequencies up to 20 kHz, data for operation at 1 x 230 VAC [$\pm 10\%$], 50 Hz		
Output power	0,5 kVA	1,0 kVA	1,5 kVA
Max. output power for 5 s	1,0 kVA	2,0 kVA	3,0 kVA
Rated output current	2,5 A _{eff}	5 A _{eff}	8 A _{eff}
Max. output current for 5 s	5 A _{eff}	10 A _{eff}	16 A _{eff}
Max. output current for 0,5 s	10 A _{eff}	20 A _{eff}	32 A _{eff} (f _{el} ≥ 3 Hz) ⁴⁾
Current derating from	12 kHz		10 kHz
Internal brake resistor	60 Ω		37 Ω
Continuous power / pulse power	10 W / 2,8 kW	20 W / 2,8 kW	25 W / 3,9 kW
External brake resistor	$\geq 50 \Omega$		$\geq 25 \Omega$
Holding brake	24 VDC, max. 1 A		
Dimensions servo drive H x W x D ⁵⁾	200 x 54 x 200 mm		
Weight	2,0 kg	2,1 kg	1,8 kg

¹⁾ Plus current consumption of a possibly connected holding brake and I/Os ²⁾ With active PFC ³⁾ Without PFC

⁴⁾ Shorter times for lower electrical rotational frequencies (f_{el}) ⁵⁾ Without mounting plate, fan and connectors

Features	Values
EMC directive	2014/35/EC verified by application of the harmonised standard EN 61800-3
Low-voltage directive	2014/30/EC verified by application of the harmonised standard EN 61800-5-1
cULus certification	UL 508C, C22.2 No. 274-13
Admissible temperature ranges	Storage temperature: -25 °C to +70 °C, operating temperature: 0 °C to +40 °C +40 °C to +50 °C at reduced power 2,5 % / K
Admissible installation height	Mounting height max. 2000 m above msl, above 1000 m above ms with power reduction 1 % per 100 m
Humidity	Relative humidity up to 90 %, not bedewing
Protection degree	IP20
Protection class	I
Pollution degree	2
Inputs	10 x digital in (24 VDC), 3 x analogue in (± 10 VDC, 2 x 10 Bit, 1 x 16 Bit)
Outputs	4 x digital out (24 VDC), 1 x digital out (24 VDC) for holding brake, 2 x analogue out (± 10 VDC, 9 Bit)
Interfaces	Standard: USB 2.0, Ethernet, RS232 / RS485, CAN-Bus (CANopen DSP 402) Optional: EtherCAT, PROFIBUS-DP, PROFINET, digital IO extension module EA88
Encoder evaluation	Universal encoder interface for motors with: resolver, analogue and digital incremental encoder with/without commutation signals, SinCos encoder (single-turn/multi-turn) with HIPERFACE®, HIPERFACE DSL®, high-resolution Heidenhain encoders, absolute encoders with EnDat 2.1 and 2.2



Technical data ARS 2300

Features	ARS 2302	ARS 2305	ARS 2310
Supply voltage	3 x 230...480 VAC [$\pm 10\%$], 50...60 Hz		
Alternative DC supply	60...700 VDC		
Control voltage	24 VDC [$\pm 20\%$] (1 A) ¹⁾		
DC link voltage	560...570 VDC		
Clock frequency	Variable clock frequencies up to 16 kHz, data for operation at 3 x 400 VAC [$\pm 10\%$], 50 Hz		
Output power	1,5 kVA	3,0 kVA	6,0 kVA
Max. output power for 5 s	3,0 kVA	6,0 kVA	12,0 kVA
Rated output current	2,5 A _{eff}	5 A _{eff}	10 A _{eff}
Max. output current for 5 s	5 A _{eff} (7,5 A _{eff} für 2 s)	10 A _{eff} (15 A _{eff} für 2 s)	20 A _{eff}
Max. output current for 0,5 s	10 A _{eff}	20 A _{eff} (f _{el} ≥ 20 Hz) ²⁾	40 A _{eff} (f _{el} ≥ 20 Hz) ²⁾
Current derating from	12,5 kHz		5 kHz
Internal brake resistor	68 Ω		
Continuous power / pulse power	110 W / 8,5 kW		
External brake resistor	$\geq 40 \Omega$		
Holding brake	24 VDC, max. 2 A		
Dimensions servo drive H x W x D ³⁾	250 x 69 x 240 mm		
Weight	3,7 kg		

¹⁾ Plus current consumption of a possibly connected holding brake and I/O S

²⁾ Shorter times for lower electrical rotational frequencies (f_{el}) ³⁾ Without mounting plate, fan and connectors

Features	Values
EMC directive	2014/35/EU verified by application of the harmonised standard EN 61800-3
Low-voltage directive	2014/30/EU verified by application of the harmonised standard EN 61800-5-1
cULus certification	UL 508C, C22.2 No. 274-13, 2320/2340 in prep. acc. to UL 61800-5-1, C22.2 No. 274-13
Admissible temperature ranges	Storage temperature: -25 °C to +70 °C, operating temperature: 0 °C to +40 °C +40 °C to +50 °C at reduced power 2,5 % / K
Admissible installation height	Mounting height max. 2000 m above msl, above 1000 m above msl with power reduction 1 % pro 100 m
Humidity	Relative humidity up to 90 %, not bedewing
Protection degree	IP20
Protection class	I



Features	ARS 2320	ARS 2340
Supply voltage	3 x 230...480 VAC [$\pm 10\%$], 50...60 Hz	
Alternative DC supply	60...700 VDC	
Control voltage	24 VDC [$\pm 20\%$] (1 A) ¹⁾	
DC link voltage	560 VDC	
Clock frequency	Variable clock frequencies up to 16 kHz, data for operation at 3 x 400 VAC [$\pm 10\%$], 50 Hz	
Output power	12 kVA	20 kVA
Max. output power for 3 s	25 kVA	50 kVA
Rated output current	20 A _{eff}	40 A _{eff}
Max. output current for 3 s	50 A _{eff}	100 A _{eff}
Current derating from	5 kHz	
Internal brake resistor	30 Ω	15 Ω
Continuous power / Pulse power	80 W/18 kW	160 W/35 kW
External brake resistor	15 $\Omega \leq R_{\text{Extern}} \leq 50 \Omega$	15 $\Omega \leq R_{\text{Extern}} \leq 50 \Omega$
Holding brake	24 VDC, max. 2 A	
Dimensions servo drive H x W x D ²⁾	350 x 90 x 256 mm	350 x 162 x 256 mm
Weight	8 kg	13,5 kg

¹⁾ Plus current consumption of a possibly connected holding brake and I/Os

²⁾ Without mounting plate, screw heads and connectors

Features	Values
Pollution degree	2
Inputs	10 x digital in (24 VDC), 3 x analogue in (± 10 VDC, 2 x 10 Bit, 1 x 16 Bit)
Outputs	4 x digital out (24 VDC), 1 x digital out (24 VDC) for holding brake, 2 x analogue out (± 10 VDC, 9 Bit)
Interfaces	Standard: USB 2.0, Ethernet, RS232 / RS485, CAN-Bus (CANopen DSP 402) Optional: EtherCAT, PROFIBUS-DP, PROFINET, Digital terminal extension EA88
Encoder evaluation	Universal encoder interface for motors with: resolver, analogue and digital incremental encoder with/without commutation signals, SinCos encoder (single-turn/ multi-turn) with HIPERFACE®, HIPERFACE DSL®, high-resolution Heidenhain encoders, absolute encoder with EnDat 2.1 and 2.2

ENDURANCE

Special diversity

Servo drive ARS 2000 series

ARS 2302, ARS 2305, ARS 2310

ARS 2102, ARS 2105, ARS 2108





The complete ARS 2000 series with an output power from 2 A to 40 A is divided into four types. Each servo drive combines highest power density with smallest space.

ARS 2320

W 93 mm



ARS 2340

W 165 mm





metronix servo drives

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