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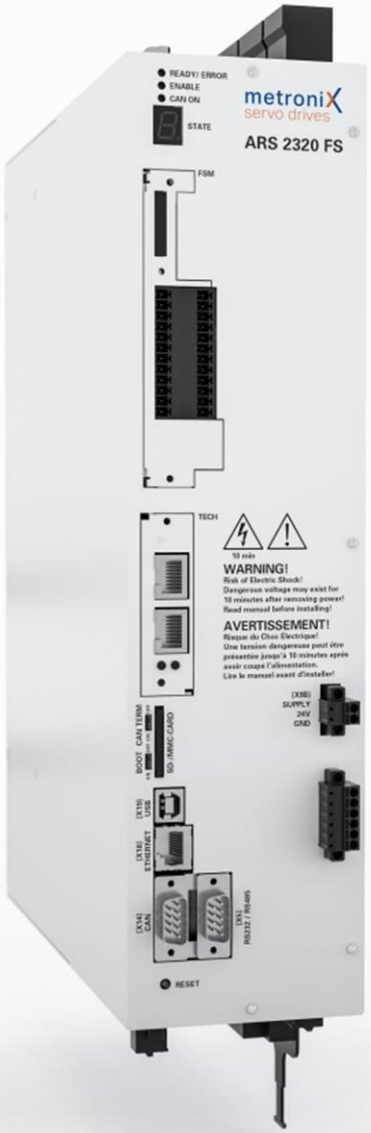
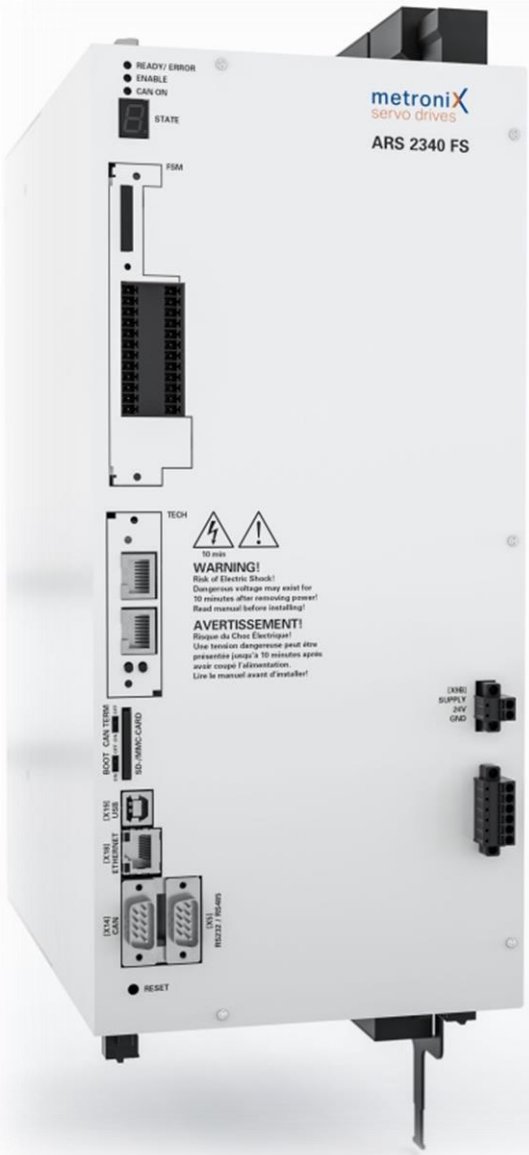
Product Manual / Mounting Instructions





Servo drives ARS 2320 FS, ARS 2340 FS and ARS 2360W FS

designed for Functional Safety

Original instructions

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Contents

1 General

1.1 Documentation

This installation information serves the purpose of a safe use of the ARS 2300 FS series Servo drive. It contains safety notes, which must be complied with.
Further information can be found in the following manuals of the ARS 2000 FS product range:

- **Product Manual "Servo Positioning Controller ARS 2300 FS":** Description of the technical specifications and the device functionality as well as notes on the installation and the operation of the Servo drive ARS 2302 FS, 2305 FS and 2310 FS.
- **Software Manual "Servo Positioning Controller ARS 2000":** Description of the software and firmware functions usable with the parameterisation program Metronix ServoCommander®.
- **CANopen Manual "Servo Positioning Controller ARS 2000":** Description of the implemented CANopen protocol as per DSP402.
- **PROFIBUS/PROFINET Manual "Servo Positioning Controller ARS 2000":** Description of the implemented PROFIBUS-DP protocol and the and of the PROFINET protocol
- **Sercos Manual "Servo Positioning Controller ARS 2000":** Description of the implemented Sercos II protocol.
- **EtherCAT Manual "Servo Positioning Controller ARS 2000":** Description of the implemented EtherCAT (CoE – CANopen over EtherCAT) protocol.
- **Product Manual "FSM 2.0 – STO":** Description of the technical specifications and the device functionality.
- **Product Manual "FSM 2.0 – MOV":** Description of the technical specifications and the device functionality (German version).

You can find all these documents on our homepage at the download area www.metronix.de.
Certificates and declarations of conformity for the products described in this manual can be found at www.metronix.de.

1.2 Nomenclature

The servo drives of the ARS 2000 FS series (**ARS** servo of the 2nd generation for **F**unctional **S**afety) are intelligent AC servo inverters with extensive parameterisation and extension options. Due to their high level of flexibility, they can be adapted to numerous areas of application.
These servo drives are designed for the integration of so-called FSM modules (**F**unctional **S**afety **M**odules). Thanks to their integrated safety features, external monitoring devices can be omitted for numerous applications.
The series includes types with single-phase and three-phase supply.

Type key:
ARS 2320 FS (example)

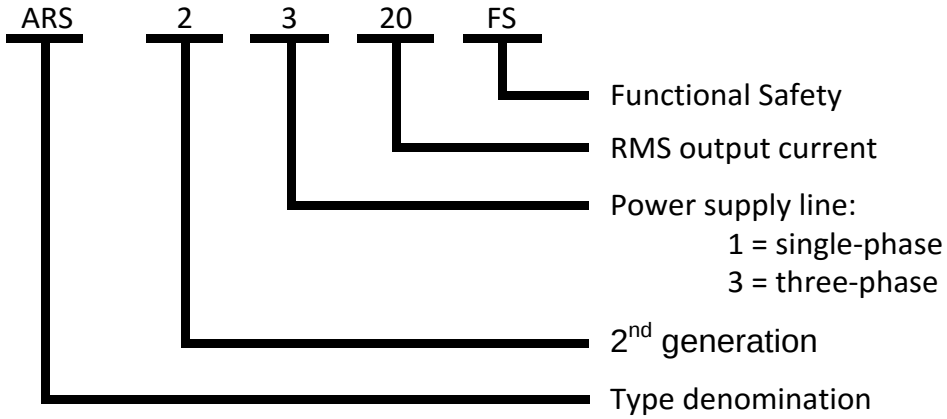


Figure 1: Type key

2 Safety notes for electrical drives and controllers

2.1 Used symbols

INFORMATION

Important information and notes.

CAUTION!

Nonobservance may result in severe property damages.

DANGER!

Nonobservance may result in **property damages** and in **personal injuries**.

CAUTION! DANGEROUS VOLTAGE.

The safety note indicates a possible perilous voltage.

2.2 General notes

In case of damage resulting from non-compliance with the safety notes in this manual, Metronix Meßgeräte und Elektronik GmbH will not assume any liability.

INFORMATION

Prior to the initial use you must read *chapter 2 Safety notes for electrical drives and controllers*, *chapter 8.1* Notes *concerning* the safe and EMC-compliant installation

If the documentation in the language at hand is not understood accurately, please contact and inform your supplier.
Sound and safe operation of the servo drive requires proper and professional transportation, storage, mechanical installation, and project planning – with a consideration of the risks as well as the protective and emergency measures – plus the proper and professional electrical installation, operation, and maintenance of the devices.
Only trained and qualified personnel is authorised to handle electrical devices and systems:

TRAINED AND QUALIFIED PERSONNEL
in the sense of this product manual or the safety notes on the product itself are persons who are sufficiently familiar with the project, the setup, assembly, commissioning and operation of the product as well as all warnings and precautions as per the instructions in this manual and who are sufficiently qualified in their field of expertise:

- Education and instruction concerning the standards and accident prevention regulations for the application, or authorisation to switch devices/systems on and off and to ground them as per the standards of safety engineering and to efficiently label them as per the job demands.
- Additional training concerning ESD protection
- Education and instruction as per the standards of safety engineering regarding the maintenance and use of adequate safety equipment.
- First aid training.

The following notes must be read prior to the initial operation of the system to prevent personal injuries and/or property damages:

INFORMATION

- These safety notes must be complied with at all times.
- Do not try to install or commission the servo drive before carefully reading all safety notes for electrical drives and controllers contained in this document. These safety instructions and all other user notes must be read prior to any work with the servo drive.
- In case you do not have any user notes for the servo drive, please contact your sales representative. Immediately demand these documents to be sent to the person responsible for the safe operation of the servo drive.
- If you sell, rent and/or otherwise make this device available to others, these safety notes must also be included.
- The user must not open the servo drive for safety and warranty reasons.
- Professional control process design is a prerequisite for sound functioning of the servo drive!

DANGER!

Inappropriate handling of the servo drive and non-compliance with the warnings as well as inappropriate intervention in the safety features may result in property damage, personal injuries, electric shock or in extreme cases even death.

2.3 Intendend use

The electronic drive controller (ARS 2300 FS servo drive) is designed for operation with electric motors in the industrial environment.
The use of the servocontroller requires trained and qualified personnel according to the state of the general safety technology and especially the electrical Safety technology.
Proper use also includes compliance with all information in this guide.
Anything beyond the intended use or otherwise use is considered misuse.

2.4 Danger resulting from misuse

CAUTION!

Use the servo drive exclusively in chapter 4 specified environmental conditions.

DANGER!

High electrical voltages and high load currents!
Danger to life or serious personal injury from electrical shock!

DANGER!

High electrical voltage caused by wrong connections!
Danger to life or serious personal injury from electrical shock!

DANGER!

Surfaces of device housing may be hot!
Risk of injury! Risk of burning!

DANGER!

Danger to life, serious personal injury or property damage due to unintentional movements of the motors!

DANGER!

Never use the servo drive outdoors or in the field Explosive areas.

2.5 Personal protective equipment

Wear during transport, installation, commissioning, cleaning, maintenance and disassembly the servocontroller the required personal protective equipment, for example:

- **protective gloves**
  To avoid superficial injuries of the hands.
- **ESD safety shoes**
  To avoid injury to feet when falling parts.
  To avoid electrostatic charge.
- **protective clothing**
  To avoid superficial injuries and soiling.
- **Safety glasses**
  To avoid eye injury from dust or splinters.
- **Lightweight respiratory protection**
  To avoid the inhalation of harmful substances.

2.6 Safety notes

2.6.1 General safety notes

The servo drive corresponds to IP20 degree of protection as well as pollution degree 2. Make sure that the environment corresponds to this degree of protection and pollution degree.

Only use replacement parts and accessories approved by the manufacturer.

The devices must be connected to the mains supply as per EN regulations, so that they can be cut off the mains supply by means of corresponding separation devices (for example main switch, contactor, power switch).

The servo drive may be protected using an AC/DC sensitive 300 mA fault current protection switch, type B (RCD = Residual Current protective Device).

Gold contacts or contacts with a high contact pressure should be used to switch the control contacts.

Preventive interference rejection measures should be taken for control panels, such as connecting contactors and relays using RC elements or diodes.

The safety rules and regulations of the country in which the device will be operated must be complied with.

The environment conditions defined in the product documentation must be kept. Safety-critical applications are not allowed, unless specifically approved by the manufacturer.

For notes on installation corresponding to EMC, please refer to *chapter 8.1.* The compliance with the limits required by national regulations is the responsibility of the manufacturer of the machine or system.

The technical data and the connection and installation conditions for the servo drive are to be found in this product manual and must be met.

DANGER!

The general setup and safety regulations for work on power installations (for example DIN, VDE, EN, IEC or other national and international regulations) must be complied with.

Non-compliance may result in death, personal injury or serious property damages.

Without claiming completeness, the following regulations and others apply:

EN 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 61800-3	Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods
EN 61800-5-1	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy
EN 61800-5-2	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional
EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN ISO 13849-1:2015	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN 62061	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
IEC 61508 Part 1-7	Functional safety of electrical/electronic/programmable electronic safety-related systems
IEC 82079-1	Preparation of information for use (instructions for use) of products - Part 1: Principles and general requirements
EN 50581	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
UL 61800-5-1	Standard for Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements - Electrical, Thermal and Energy
CSA C22.2 No. 274	Adjustable speed drives

2.6.2 Safety notes for assembly and maintenance

The appropriate DIN, VDE, EN and IEC regulations as well as all national and local safety regulations and rules for the prevention of accidents apply for the assembly and maintenance of the system. The plant engineer or the operator is responsible for compliance with these regulations:

The servo drive must only be operated, maintained and/or repaired by personnel trained and qualified for working on or with electrical devices.

Prevention of accidents, injuries and/or damages:

Additionally secure vertical axes against falling down or lowering after the motor has been switched off, for example by means of:

- Mechanical locking of the vertical axle,
- External braking, catching or clamping devices or

- Sufficient balancing of the axle

The motor holding brake supplied by default or an external motor holding brake driven by the servo drive alone is not suitable for personal protection!

Keep the electrical equipment voltage-free using the main switch and protect it from being switched on again until the DC bus circuit is discharged, in the case of:

- Maintenance and repair work
- Cleaning
- long machine shutdowns

Prior to carrying out maintenance work make sure that the power supply has been turned off, locked and the DC bus circuit is discharged.

The external or internal brake resistor carries dangerous DC bus voltages during operation of the servo drive and up to 10 minutes thereafter. Contact may result in death or serious personal injury. Wait for this time prior to performing any work on the affected connections. Measure the voltages for your own protection. Contact with these high DC bus circuit voltages may result in death or serious personal injury.

Be careful during the assembly. During the assembly and also later during operation of the drive, make sure to prevent drill chips, metal dust or assembly parts (screws, nuts, cable sections) from falling into the servo drive.

Also make sure that the external power supply of the servo drive (24 V) is switched off.

The DC bus circuit or the mains supply must always be switched off prior to switching off the 24 V servo drive supply.

Carry out work in the machine area only, if AC and/or DC supplies are switched off. Switched off output stages or servo drive enablings are no suitable means of locking. In the case of a malfunction the drive may accidentally be put into action.

This does not apply to drives with the special “Safe Stop” feature in accordance with EN 954-1 CAT 3 or with the “Safe Torque Off” feature in accordance with EN 61800-5-2.

Initial operation must be carried out with idle motors, to prevent mechanical damages for example due to the wrong direction of rotation.

Electronic devices are never fail-safe. It is the user’s responsibility, in the case an electrical device fails, to make sure the system is transferred into a secure state.

The servo drive and in particular the brake resistor, externally or internally, can assume high temperatures, which may cause serious burns.

2.6.3 Protection against contact with electrical parts

This section only concerns devices and drive components carrying voltages exceeding 50 V. Contact with parts carrying voltages of more than 50 V can be dangerous for people and may cause electrical shock. During operation of electrical devices some parts of these devices will inevitably carry dangerous voltages.

DANGER!

High electrical voltage!

Danger to life, danger due to electrical shock or serious personal injury!

The appropriate DIN, VDE, EN and IEC regulations as well as all national and local safety regulations and rules for the prevention of accidents apply for the assembly and maintenance of the system. The plant engineer or the operator is responsible for compliance with these regulations:

Before switching on the device, install the appropriate covers and protections against accidental contact. Rack-mounted devices must be protected against accidental contact by means of a housing, for example a switch cabinet. The national regulations for safety/accident prevention must be complied with!

Always connect the ground conductor of the electrical equipment and devices securely to the mains supply. Due to the integrated line filter the leakage current exceeds 3.5 mA!

Comply with the minimum copper cross-section for the ground conductor over its entire length (see for example EN 60800-5-1).

Prior to the initial operation, even for short measuring or testing purposes, always connect the ground conductor of all electrical devices as per the terminal diagram or connect it to the ground wire. Otherwise the housing may carry high voltages which can cause electrical shock.

Do not touch electrical connections of the components when switched on.

Prior to accessing electrical parts carrying voltages exceeding 50 Volts, disconnect the device from the mains or power supply. Protect it from being switched on again.

For the installation the amount of DC bus voltage must be considered, particularly regarding insulation and protective measures. Ensure proper grounding, wire dimensioning and corresponding short-circuit protection.

The device comprises a rapid discharge circuit for the DC bus as per EN 60204-1. In certain device constellations, however, mostly in the case of parallel connection of several servo drives in the DC bus or in the case of an unconnected brake resistor, this rapid discharge may be rendered ineffective. The servo drives can carry voltage until up to 10 minutes after being switched off (residual capacitor charge).

2.6.4 Protection against electrical shock by means of protective extra-low voltage (PELV)

All connections and terminals with voltages of up to 50 Volts at the servo drive are protective extra-low voltage, which are designed safe from contact in correspondence with the following standards:

- International: IEC 60364-4-41
- European countries within the EU: EN 61800-5-1

DANGER!

High electrical voltages due to wrong connections!

Danger to life, risk of injury due to electrical shock!

Only devices and electrical components and wires with a protective extra low voltage (PELV) may be connected to connectors and terminals with voltages between 0 to 50 Volts.
Only connect voltages and circuits with protection against dangerous voltages. Such protection may be achieved by means of isolation transformers, safe optocouplers or battery operation.

2.6.5 Protection against dangerous movements

Dangerous movements can be caused by faulty control of connected motors, for different reasons:

- Improper or faulty wiring or cabling
- Error in handling of components
- Error in sensor or transducer
- Defective or non-EMC-compliant components
- Software error in superordinated control system

These errors can occur directly after switching on the device or after an indeterminate time of operation. The monitors in the drive components for the most part rule out malfunctions in the connected drives. In view of personal protection, particularly the danger of personal injury and/or property damage, this may not be relied on exclusively.

Until the built-in monitors come into effect, faulty drive movements must be taken into account; their magnitude depends on the type of control and on the operating state.

DANGER!

Dangerous movements!

Danger to life, risk of injury, serious personal injuries or property damage!

For the reasons mentioned above, personal protection must be ensured by means of monitoring or superordinated measures on the device. These are installed in accordance with the specific data of the system and a danger and error analysis by the manufacturer. The safety regulations applying to the system are also taken into consideration. Random movements or other malfunctions may be caused by switching the safety installations off, by bypassing them or by not activating them.

2.6.6 Protection against contact with hot parts

DANGER!

Housing surfaces may be hot!
Risk of injury! Risk of burning!

Do not touch housing surfaces in the vicinity of heat sources! Danger of burning!

Before accessing devices let them cool down for 10 minutes after switching them off.

Touching hot parts of the equipment such as the housing, which contain heat sinks and resistors, may cause burns!

2.6.7 Protection during handling and assembly

Handling and assembly of certain parts and components in an unsuitable manner may under adverse conditions cause injuries.

DANGER!

Risk of injury due to improper handling!
Personal injury due to pinching, shearing, cutting, crushing!

The following general safety notes apply:

Comply with the general setup and safety regulations on handling and assembly.

Use suitable assembly and transportation devices.

Prevent incarcerations and contusions by means of suitable protective measures.

Use suitable tools only. If specified, use special tools.

Use lifting devices and tools appropriately.

If necessary, use suitable protective equipment (for example goggles, protective footwear, protective gloves).

Do not stand underneath hanging loads.

Remove leaking liquids on the floor immediately to prevent slipping.

3 Product description

Please see documentation of the servo drives ARS 2302 FS – ARS 2310 FS

4 Technical data

4.1 General

Catalog numbers

Feature	ARS 2320 FS	ARS 2340 FS	ARS 2360W FS
Metronix part number with FBA module	9200-2320-20	9200-2340-20	9200-2360-20
Metronix part number with STO module	9200-2320-22	9200-2340-22	9200-2360-22
Metronix part number with MOV module	9200-2320-23	9200-2340-23	9200-2360-23
Power connector set	9200-0220-00	9200-0240-00	9200-0260-00
Signal connector set	9200-0200-00		
FSM 2.0 - FBA	9200-0150-00		
FSM 2.0 - STO	9200-0151-00		
FSM 2.0 - MOV	9200-0152-00		

Ambient conditions and qualification

Feature	Value	
Admissible temperature ranges	Storage temperature:	-25°C to +70°C
	Operating temperature: (Ambient)	0°C to +40°C +40°C to +50°C with power reduction 2.5%/K
	Max. temperature of coldplate:	50 °C (Only for ARS 2360W FS)
Admissible installation height	Mounting height maximum 2000 m above msl, from 1000 m above msl with power reduction 1% per 100 m	
Humidity	Relative humidity up to 90%, no bedewing	
Protection degree	IP20	
Protection class	I	

Ambient conditions and qualification

Feature	Value
Pollution degree	2 The integrated safety equipment requires compliance with pollution degree 2 and thus a protected fitting space (IP54). This must always be ensured through appropriate measures, e.g. through installation in a control cabinet.
CE conformity:	see appendix in chapter 13
Low-voltage directive	2014/30/EU verified by application of the harmonised standard EN 61800-5-1
EMC directive	2014/35/EU verified by application of the harmonised standard EN 61800–3
Machinery directive	2006/42/EG see EC Type-Examination Certificate
cULus certification	Listed according to UL 61800-5-1, C22.2 No. 274-13 (on request)

Dimensions and weight

Feature	ARS 2320 FS	ARS 2340 FS	ARS 2360W FS
Dimensions including the mounting plate and screw heads (H x W x D) *)	390 x 93 x 263 mm^3	390 x 165 x 263 mm^3	390 x 163 x 186 mm^3
Housing dimensions (H x W x D)	351 x 90,5 x 256,5 mm^3	351 x 162,5 x 256,5 mm^3	351 x 161 x 180 mm^3
Weight	ca. 8 kg	ca. 13,5 kg	ca. 9 kg

*) Dimensions without mating plugs

4.2 Mains [X9]

Performance data [X9], [X9B], [X9C]

Feature	ARS 2320 FS	ARS 2340 FS	ARS 2360W FS
Supply voltage X9	3 x 230 ... 480 VAC [+/- 10%], 50…60 Hz		
Max. mains current for continuous operation	18 A_{RMS}	36 A_{RMS}	40 A_{RMS}
Intermediate circuit voltage for a supply voltage of 400 VAC X9C	560 ... 570 VDC		
24VDC supply X9B	24 VDC [± 20%] (max. 1 A) *)		

*) plus current consumption of a possibly connected holding brake and I/Os

Internal brake resistor [X9A]

Feature	ARS 2320 FS	ARS 2340 FS	ARS 2360W FS
Brake resistance	30 Ω	15 Ω	
Pulse power	18 kW	36 kW	
Continuous power	80 W	160 W	
Operating threshold	760 V		

External brake resistor [X9A]

Feature	ARS 2320 FS	ARS 2340 FS	ARS 2360W FS
Brake resistance external	15 Ω ≤ R_{Extern} ≤ 50 Ω		
Continuous power	≤ 5 kW	≤ 10 kW	
Permissible operating voltage	≥ 800 V		

4.3 Motor connector [X6]

Motor connection specifications [X6]

Feature	ARS 2320 FS	ARS 2340 FS	ARS 2360W FS
Specifications for operation with 3x 400 VAC, 50 Hz, with an output stage clock frequency of 8 kHz			
Output power	12 kVA (8 kW)	24 kVA (16 kW)	26 kVA (18 KW)
Max. output power for 3 s	30 kVA	60 kVA	65 kVA
Output current	20 A_{RMS}	40 A_{RMS}	60 A_{RMS}
Max. output current for 3 s	50 A_{RMS}	100 A_{RMS}	150 A_{RMS}
Derating at PWM = 16 kHz: Output current	14 A_{RMS}	28 A_{RMS}	42 A_{RMS}
Derating at PWM = 16 kHz: Max. output current for 3 s	35 A_{RMS}	70 A_{RMS}	105 A_{RMS}
Output stage clock frequency	4…16 kHz (software programmable)		
As a guideline: Power loss/efficiency (with regard to the rated output power)	typical 5% / 95%		

In deviation from the technical motor data, the ARS 2300 FS servo drives have a current derating during nominal operation. The rated current and the duration of the maximum permissible peak current of the ARS 2300 FS servo drive depend on several factors.
These factors are:

- Output current level (the higher the output current is, the shorter the permissible time will be)
- Clock frequency of the power output stage (the higher the clock frequency is, the shorter the permissible time will be)
- Electrical rotational frequency of the motor (speed multiplied by the number of pole pairs) (the higher the rotational frequency is, the longer the permissible time will be)

INFORMATION
Note: The heat sink turn-off temperature is 85 °C. The ARS 2320/40 FS servo drive will be switched off when the temperature reaches or exceeds this value. It will not be ready for operation until after a brief cooling period.

Maximum motor cable length
for interference emission according to EN 61800-3 for PWM ≤ 8 kHz

Feature	Value
Category C3	l ≤ 30 m
Cable capacity of a phase against shield or between two lines	C‘ ≤ 200 pF/m

Motor temperature monitoring [X6A], [X2A], [X2B]

Feature	Value
Digital sensor X6A	Normally closed contact: R_{cold} < 500 Ω R_{hot} > 100 kΩ
Analog sensor X2A, X2B, X6A	Silicon temperature sensor, e.g. KTY81, 82, 84 or similar Parameterisable with Metronix ServoCommander®

Motor holding brake [X6B]

Feature	Value
Holding brake 24 V	Signal level depending on the switching state, high-side/low-side switch / 2 A max.

4.4 Requirements concerning the Water-Cooler

Requirements for the Water-Cooler (only for ARS 2360W FS) :

Feature	Value
Rated Power Loss	ca. 1000 W
Coolant medium temperature	< 30 °C
Flow rate	> 8 l / min
Mounting torque for M6 screws: ARS 2360W FS – Water-Cooler	9 – 10 Nm
Evenness of mounting plane of the cooler	< = 25 µm @ 100 mm
Surface roughness of mounting plane of the cooler	< = 10 µm

4.5 Angle encoder connector [X2A] and [X2B]

Resolver [X2A]

Feature	Value
Transformation ratio	0.5
Carrier frequency	5 to 10 kHz
Excitation voltage	7 V_{RMS}, short circuit-proof
Excitation impedance (at 10 kHz)	≥ (20 + j20) Ω
Stator impedance	≤ (500 + j1000) Ω
Resolution	16 Bit
Delay time signal detection	< 200 µs
Speed resolution	ca. 4 min-1
Absolute accuracy of angle detection	< 5´
Max. rotational speed	16.000 min^{-1}

Encoder evaluation [X2B]

Feature	Value
Parameterisable number of encoder lines	1 – 2^{18} lines/rev
Angular resolution / Interpolation	10 Bit / period
Encoder signals A, B	1 V_{PP} differential; 2.5 V offset
Encoder signal N	0.2 to 1 V_{PP} differential; 2.5 V offset
Commutation track A1, B1 (optional)	1 V_{PP} differential; 2.5 V offset
Input impedance encoder signals	Differential input 120 Ω
Limit frequency	f_{Limit} > 300 kHz (high-res. signal) f_{Limit} ca. 10 kHz (commutation track)
Additional communication interface	EnDat (Heidenhain), HIPERFACE and HIPERFACE DSL (Sick Stegmann)
Output supply	5 V or 12 V; max. 300 mA; currentlimited control via sensor lines Setpoint programmable via software

Listing of supported motor feedback systems

Type	Notes	Protocol
Heidenhain EnDat Encoder		
ROC 400 ECI 1100/1300 ECN 100/400/1100/1300	Single-turn absolute encoder with or without analog signal.	EnDat 2.1 (01/21) EnDat 2.2 (22)
ROQ 400 EQI 1100/1300 EQN 100/400/1100/1300	Multi-turn absolute encoder with or without analog signal.	EnDat 2.1 (01/21) EnDat 2.2 (22)
LC 100 / 400	Absolute linear encoders .	EnDat 2.1 (01) EnDat 2.2 (22)
Sick Stegmann HIPERFACE Encoder		
SCS60/70 SCM60/70	Single- / multi-turn encoder with analog incremental signal. Line count 512 (fix). Number of multi-turn revolutions: +/- 2048 U.	HIPERFACE
SRS50/60/64 SCKxx SRM50/60/64 SCLxx	Single- / multi-turn encoder with analog incremental signal. Line count 1024 (fix). Number of multi-turn revolutions: +/- 2048 U xx = 25 / 35 / 40 / 45 / 50 / 53	HIPERFACE
SKS36 SKM36	Single- / multi-turn encoder with analog incremental signal. Line count 128 (fix). Number of multi-turn revolutions: +/- 2048 U	HIPERFACE
SEK37/52 SEL37/52	Single- / multi-turn encoder with analog incremental signal. Line count 16 (fix). Number of multi-turn revolutions: +/- 2048 U	HIPERFACE
L230	Absolute length measuring system with analog incremental signal. Resolution: 156,25 µm. Measuring length max. ca. 40 m.	HIPERFACE
Yaskawa Σ-Encoder		
Σ (sigma 1)	Digital incremental encoder with zero-pulse	Yaskawa-OEM-protocol

Listing of supported motor feedback systems

Type	Notes	Protocol
Analog incremental Encoder		
ROD 400 ERO 1200/1300/1400 ERN 100/400/1100/1300	Heidenhain, encoder with zero- and reference pulse	
Digital incremental Encoder		
CDD50	Stegmann, encoder with hall sensors	
Resolver		
Standard	transmission ratio typ. 0,5 +- 10 %, Input supply typ. 7 Vrms	

4.6 I/O and communication interfaces

Digital inputs and outputs [X1]

Feature	Value	
Signal level DIN0-9	24V (8V...30V) active high, conforming with EN 61131-2	
Logic outputs general	Galvanically separated, 24V (8V...30V) active high	
DOUT0-3	24 V, max. 100 mA	
DOUT4 [X6B]	Holding brake	24 V, max. 2 A

Analogue inputs and outputs [X1]

Feature	Value	
High-resolution analogue input: AIN0	±10 V input range, 16 Bit, differentially, < 250 µs delay time	
Analogue input: AIN1	Optionally, this input can also be parameterized as digital input DIN AIN1 with a switching threshold at 8 V.	±10 V, 10 Bit, single ended, < 250 µs delay time
Analogue input: AIN2	Optionally, this input can also be parameterized as digital input DIN AIN2 with a switching threshold at 8 V.	±10 V, 10 Bit, single ended, < 250 µs delay time
Analogue outputs: AOUT0 and AOUT1	± 10 V output range, 10 mA, 9 bit resolution, f_{Limit} > 1 kHz	

Incremental encoder input [X10]

Feature	Value
Parameterisable number of encoder lines	$1 – 2^{28}$ lines/rev
Trace signals: A, #A, B, #B, N, #N	As per RS422 specification
Max. input frequency	1000 kHz

Pulse direction interface: CLK, #CLK, DIR, #DIR, RESET, #RESET	As per RS422 specification
Output supply	5 V, max. 100 mA

Incremental encoder output [X11]

Feature	Value
Number of lines	Programmable 1 – 2^{13} and 2^{14} lines/revolution
Connection level	Differential / RS422 specification
Encoder signals A, B, N	As per RS422 specification
speciality	N-Trace disconnectible
Output impedance	$R_{a,diff}$ = 66 Ω
Limit frequency	f_{Limit} > 1,8 MHz (lines/s)
Edge triggering (minimum pulse width)	Can be limited by parameters
Output supply	5 V, max. 100 mA

Communication interfaces

Feature	Value
Ethernet [X18]	RJ 45, 10/100 MBaud, UDP communication, Protocol: TCP/IP
USB [X19]:	According to USB 2.0, USB-B, slave-client, 12 MBaud to 480 MBaud No current consumption from the bus (integrated power supply) Protocol: Metronix specific (generic device)
RS 232 [X5]	As per the RS232 specification, 9600 Baud to 115.2 kBaud
CAN Bus [X4]	As per DS301 and DSP402, ISO/DIS 11898, full CAN controller, 1 MBaud max.
SD-/SDHC-/MMC-Card	SD, SDHC, and MMC, File systems FAT12, FAT16, FAT32
Technology-Module [TECH]	PROFIBUS DP, EtherCAT or PROFINET (please ask for separate manual)

5 Function overview

Please see documentation of the servo drives ARS 2302 FS – ARS 2310 FS.

6 Functional safety technology

6.1 General

With an increasing degree of automation, the protection of persons against dangerous movements becomes increasingly important. Functional safety describes the necessary measures in the form of electrical or electronic devices for the reduction or elimination of hazards caused by malfunctions. Under normal operating conditions, protective devices prevent access of persons to dangerous areas. In certain operating modes, however, for example during the set-up, persons are required to be present in these dangerous areas. In these situations, the machine operator must be protected by drive- and control-internal measures.
The integrated safety technology provides the control- and drive-specific conditions for the optimal realisation of protective functions. Planning and installation become less labour-intensive. Compared to conventional safety technology, the machine functionality and availability can be increased by the use of integrated safety technology.
In their delivery state, the ARS 2000 FS servo drives are not equipped with any integrated functions for safety-related motion monitoring and motion control. However, they have an extension slot for a safety module.
As a standard, the ARS 2000 FS servo drives come supplied with the module FSM 2.0 – FBA (**F**ield**b**us **A**ctivation Module) integrated in the extension slot for safety modules. You can remove this module and replace it with a functional safety module.
If the safety modules of the FSM 2.0 series (**F**unctional **S**afety **M**odule) are used, external monitoring devices are no longer required for numerous applications. The wiring of the entire system is simplified and the number of components as well as the costs of the system solution can be reduced.
The design of the safety modules ensures that they can be simply plugged into the basic device from the outside. As a result, the servo drives can be quickly adapted to the specific safety requirements of the overall system. Retrofitting of these modules (or the later use of a different safety module), thereby, becomes possible. The module is supplied with power via the power supply of the basic device.

6.1.1 DIP switch

The FBA module (**F**ield**b**us **A**ctivation Module) and all of the integrated functional safety modules (FSM 2.0) are equipped with a DIP switch (8 poles). Under certain conditions, substantial parts of the parameters of the fieldbus communication can be configured with the aid of this DIP switch. Depending on the fieldbus that is used, it is possible, for example, to adjust the fieldbus node number, baud rate, etc. This DIP switch does not have a safety-relevant function.

The following applies in order to achieve downward compatibility with the previous ARS 2000 devices:

- If all of the switches on the module are set to zero (factory setting), the fieldbus communication parameters of the parameter data set of the basic device will be used.

INFORMATION

The position of the DIP switch is read in only once after a reset. Modifications of the switch positions during the operation, therefore, do not affect the current operation.

6.1.2 Fieldbus specific functional assignment of the DIP switches

The firmware of the ARS 2000 FS servo drives distinguishes itself by the universal support of various types of fieldbuses. Since every fieldbus requires a specific hardware, the fieldbus is selected based on the fieldbus module that is plugged into one of the technology slots. Depending on the identified technology module, the individual switches have an influence on the activation and, where applicable, also on the configuration of this specific fieldbus. If the system does not find any fieldbus technology module, the switch settings affect the fieldbus CAN whose interface is integrated into the basic device. This means that if, for example, a Profibus module is installed, then the switch positions cannot be used to activate the CAN communication.
The assignment of the individual switch positions to a specific function depends on the fieldbus that is used. As far as this is possible, the function of a switch is the same for all of the fieldbuses such as, for example, switch 8 for activating/deactivating the communication. The functions are listed in the table below.
The following general rules apply to the communication parameterisation of the technology modules that are also listed in the table below.

- Switch position = 0:
  The activation of the communication, baud rate, and fieldbus address will be taken from the parameter data set or – depending on the parameterisation – optionally also by an addition of digital inputs.
- Switch position <> 0:
  The configuration of the communication parameters via the DIP switch takes precedence over the corresponding settings in the parameter data set:
  - Activation of the communication via DIP switch
  - Selection of the baud rate (if it can be adjusted) via DIP switch
  - Setting of the fieldbus address via DIP switch (addition to the basic node number taken from the parameter data set)
- If the communication is deactivated via the DIP switch, it is optionally possible to reactivate or deactivate it via the Metronix ServoCommander® parameterisation software.
- The fieldbus address that is set via the DIP switch is checked internally for validity and, if necessary, it is limited.
- Fieldbus-specific functions (for example CAN: check for double node numbers) are configured via the settings in the parameter data set.
- If no fieldbus technology module is connected, the DIP switch is used for the configuration of the CAN hardware that is integrated in the basic device.
  The control of operating parameters for the RS485 communication that is also supported in the basic device is not possible in favour of the parameterisation of the CAN interface.

Fieldbus specific functional assignment of the DIP switches

DIP switch		Functionally of the DIP switch (fieldbus specific with technology module)				
		CAN (in the basic device)	PROFIBUS	PROFINET	Sercos (without DIP switch)	EtherCAT
	8	Communication: 1: On 0: Off	Communication: 1: On 0: Off	Communication: 1: On 0: Off	Communication: 1: On 0: Off	Communication: 1: On 0: Off [1]
	7	Baudrate: 11: 1 MBaud 10: 500 kBaud 01: 250 KBaud 00: 125 kBaud	Slave address respectively address offset [2]: 0 .. 127 valid range: 3 .. 125	No function	Baudrate: 11: 16 MBaud 10: 8 MBaud 01: 4 MBaud 00: 2 MBaud	No function [1]
	6					
	5	Node address respectively address offset [2]: 1 ... 31			Drive address respectively address offset [2]: 1 ... 31	
	4					
	3					
	2					
	1					

[1] If all DIP switches == 0: automatic start-up of EtherCAT is activated ➔ EtherCAT is switched on.
If at least one of the DIP switches 1 to 7 <> 0 and DIP switch 8 == 0: no automatic start-up of EtherCAT ➔ EtherCAT is switched off.

[2] If necessary, the addresses will be added as an offset of a predefined base address of the corresponding bus system. The base address can be predefined in the Metronix ServoCommander® and can then be saved in the parameter set of the ARS 2000 FS.

The activation of a fieldbus via the DIP switch takes precedence over the activation of the fieldbus based on the parameter data set.
In order to be nonetheless able to change settings and test different configurations during the operation, the fieldbus menu of the Metronix ServoCommander® can be used.

After a reset, however, the setting of the DIP switches will be checked and used.
Example:

- DIP switch position <> 0 and DIP8 = ON
  ➔ fieldbus always activated, can be changed via Metronix ServoCommander®.
- DIP switch position <> 0 and DIP8 = OFF
  ➔ fieldbus always off, can be changed via Metronix ServoCommander®.
- DIP switch position = 0
  ➔ fieldbus configuration based on the parameter set. Can be changed and saved via Metronix ServoCommander® (downward-compatible).

6.2 Overview module types and integrated Functional Safety

Overview module types

Module type	Integrated Functional Safety	
FSM 2.0 - FBA	none	FBA = Fieldbus activation This module is equipped with DIP switches for activation and controlling the fieldbus communication. The functionality of the DIP switches is identical to the functionality of the DIP switches of the modules FSM 2.0 – STO and FSM 2.0 - MOV.
FSM 2.0 – STO	STO	“Safe Torque Off” (STO) with SIL3 in accordance with EN 61800-5-2 / EN 62061 / IEC 61508 or category 4 / PL e in accordance with EN ISO 13849-1.
FSM 2.0 – MOV	STO, SS1, SS2, SOS, SLS, SSR, SSM, SBC	Safety functions in accordance with EN 61800-5-2, SIL3 in accordance with EN 61800-5-2, EN 61508 and EN 62061 , PL e in accordance with EN ISO 13849-1 [1)]

[1)] Maximum achievable classification, limitations dependent on the safety function as well as circuitry and the encoders.

6.3 Integrated safety technology (schematic representation)

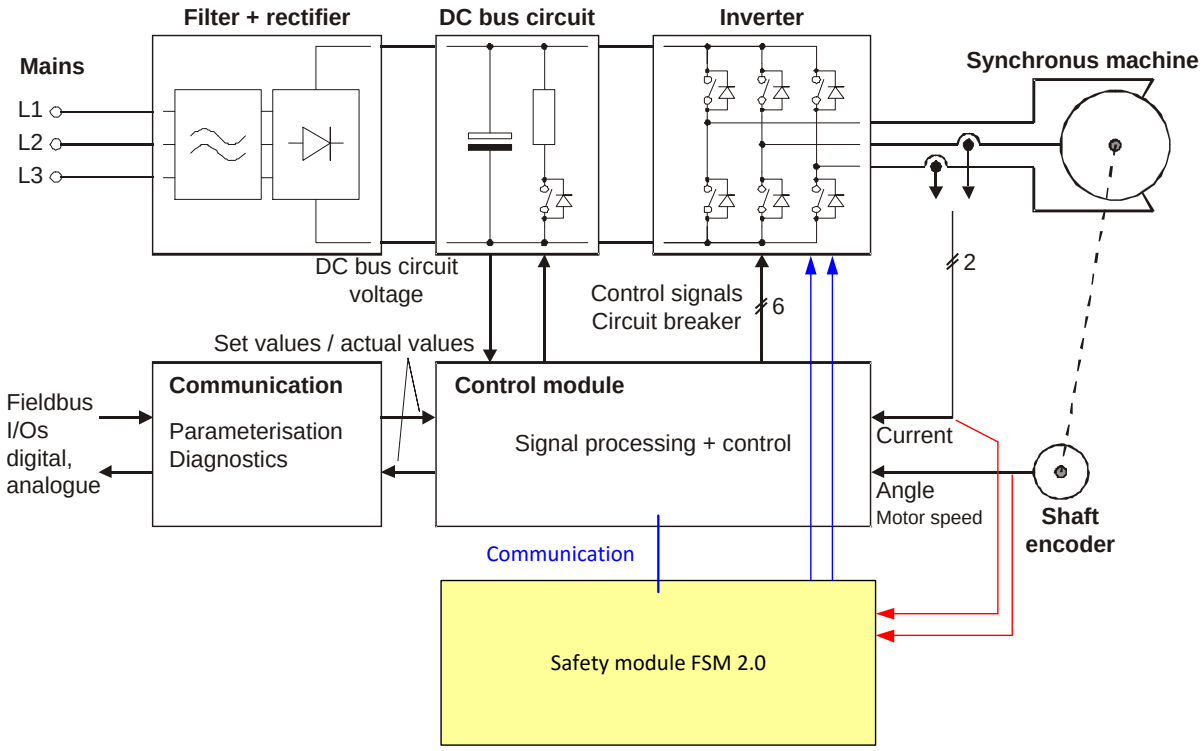


Figure 2: Schematic representation of the integrated safety technology (MOV)

6.4 FSM 2.0 – FBA

INFORMATION

Please note that the module FSM 2.0 – FBA does not offer any safety functionalities.

As a standard, the basic device comes supplied with a so-called "FBA module" (**F**ield**b**us **A**ctivation module). It has a DIP switch (8 poles) on its front panel. Under certain conditions, substantial parts of the parameters of the fieldbus communication can be configured with the aid of this DIP switch. Depending on the fieldbus that is used, it is possible, for example, to adjust the fieldbus node number, baud rate, etc. This means, for example, that a servo positioning controller that is supplied in its original state (i.e. without a parameterisation or fieldbus data settings) can be installed and used in a system.
In addition, the FBA module is required for enabling the driver power supply for the power output stage.

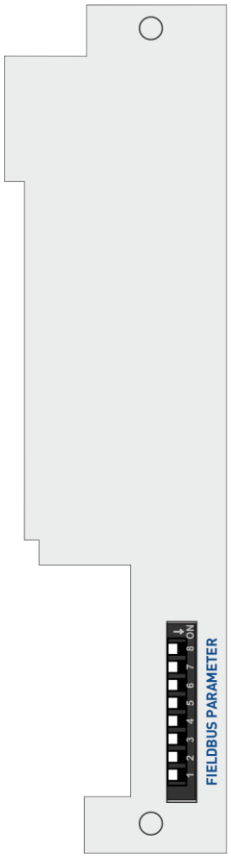


Figure 3: FBA module: front view

6.5 FSM 2.0 – STO

Please refer to the original instructions "FSM 2.0 – STO" for further information.

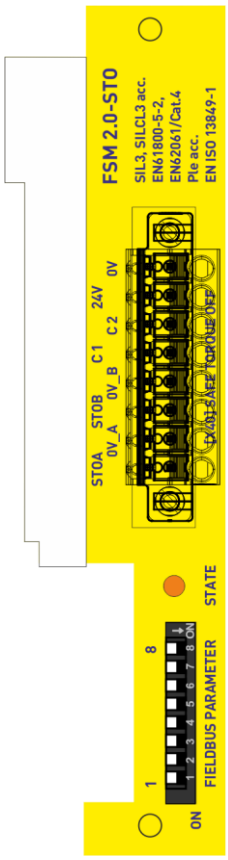


Figure 4: STO module: front view

6.5.1 Features

The Functional Safety Module FSM 2.0 – STO serves as an expansion of the Servo drive ARS 2000 FS.

- It reaches the function “Safe Torque Off” (STO) with SIL3 according to EN 61800-5-2 / EN 62061 / IEC 61508 or category 4 / PL e according to EN ISO 13849-1.
- It reaches the function “Safe Torque Off” (STO) with SIL3 in accordance with EN 61800-5-2 and PL e in accordance with EN 13849-1.
- It is equipped with a floating feedback contact.
- It can be simply plugged into the basic unit from the outside, so that it can be used for upgrading systems that are already equipped with ARS 2300 FS Servo drives.
- It is exclusively suitable for the ARS 2000 FS product range.
- It offers a user-friendly parameterisation with the Metronix ServoCommander® software.

CAUTION!

The function STO as a sole safety function is not sufficient for drives under permanent torque, such as hanging loads.

CAUTION!

For drives, the function STO must be validated after installation and after any changes of the installation.

This validation must be documented by the commissioning engineer.

6.5.2 Pin assignment STO [X40]

Pin assignment X40 STO

Pin no.	Name	Value	Specification
8	0V	0 V	Reference potential for internal controller supply
7	24V	+24 V DC	24 V supply out
6	C2		Feedback contact for the state “STO” to an external control
5	C1		
4	0V_B	0 V	Reference potential for STOB
3	STOB	0 V / 24 V	Control input B for the function STO
2	0V_A	0 V	Reference potential for STOA
1	STOA	0 V / 24 V	Control input A for the function STO

INFORMATION

The functionality of the DIP switches is identical to the functionality of the DIP switches of the module FSM 2.0 – FBA.

6.6 FSM 2.0 – MOV

Please refer to the original instructions "FSM 2.0 – MOV" for further information.

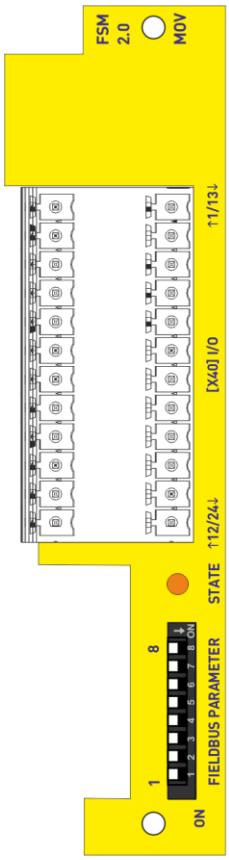


Figure 5: MOV module: front view

6.6.1 Features

The Functional Safety Module FSM 2.0 – MOV serves as an expansion of the Servo drive ARS 2000 FS to implement the safety functions:

- STO – Safe Torque Off
- SS1 – Safe Stop 1
- SS2 – Safe Stop 2
- SOS – Safe Operating Stop
- SLS – Safely-Limited Speed
- SSR – Safe Speed Range
- SSM – Safe Speed Monitor
- SBC – Safe Brake Control
- When suitable position transmitters are used and with suitable activation of the safety module, the requirements are fulfilled in accordance with EN 61800-5-2 up to and including SIL3 and in accordance with EN ISO 13849-1 up to and including Category 4 / PL e.
  Depending on the encoders used for position recording, it is possible that only SIL2 is implemented
- It is equipped with a floating feedback contact.
- It can be simply plugged into the basic unit from the outside, so that it can be used for upgrading systems that are already equipped with ARS 2100 FS Servo drives.
- It is exclusively suitable for the ARS 2000 FS product range.
- It offers a user-friendly parameterisation with the Metronix ServoCommander® software with including the SafetyTool.

CAUTION!

The function STO as a sole safety function is not sufficient for drives under permanent torque, such as hanging loads.

CAUTION!

For drives, the function must be validated after installation and after any changes of the installation.

This validation must be documented by the commissioning engineer.

6.6.2 Pin assignment MOV [X40]

Pin assignment X40 MOV

Pin	Designation	Description (factory setting[1)])
X40A plug connector		
1	DIN40A	Digital input 40, two-channel (Factory setting: Emergency stop switching device, STO and SBC request)
2	DIN40B	
3	DIN42A	Digital input 42, two-channel
4	DIN42B	
5	DOUT40A	Digital output 40, two-channel
6	DOUT40B	
7	DIN44	Digital input 44 (Factory setting: Brake feedback)
8	DIN45	Digital inputs 45, 46, 47 (Factory setting: Mode selector switch)
9	DIN46	
10	DIN47	
11	DIN48	Digital input 48 (Factory setting: Error acknowledgement).
12	DIN49	Digital input 49 (Factory setting: Terminate safety function on rising edge).
X40B plug connector		
13	DIN41A	Digital input 41, two-channel
14	DIN41B	
15	DIN43A	Digital input 43, two-channel
16	DIN43B	
17	DOUT41A	Digital output 41, two-channel
18	DOUT41B	
19	DOUT42A	Digital output 42, two-channel
20	DOUT42B	

Pin assignment X40 MOV

Pin	Designation	Description (factory setting[1)])
21	C1	Signal contact, relay contacts (Factory setting: Safe state reached, no safety condition violated). – Opened: “Safety function not active” – Closed: “Safety function active”
22	C2	
23	GND24	0 V, reference potential for DINx / DOUTx / +24 V
24	+24 V	24 V output, auxiliary supply, e.g. for safety peripherals (24 V DC logic supply of the motor controller).

[1)] Function when the device is delivered or after resetting to factory settings (advanced parameterisation)

INFORMATION

The functionality of the DIP switches is identical to the functionality of the DIP switches of the module FSM 2.0 – FBA.

6.7 Mechanical installation FSM 2.0

As a standard, the ARS 2300 FS series Servo drives come supplied with the module FSM 2.0 – FBA (short “FBA module”) integrated in the FSM slot.
You can remove the FBA module and replace it with a Functional Safety Module FSM 2.0 – STO or FSM 2.0 – MOV (short “safety module“).

CAUTION!

The Servo drive must be disconnected from any current-carrying connections prior to the installation of the module.

To remove the FBA module from the Servo drive and then insert the safety module module, please proceed as follows:

1. Remove the two fastening screws of the FBA module with a suitable Phillips screwdriver.
2. Loosen the FBA module a few millimetres by levering it slightly at the recesses of the upper and lower edges of the front plate.
3. Remove the FBA module completely from the FSM slot.
4. Push the safety module module into the open FSM slot so that the lateral guides hold the board.
5. Push the safety module module into the slot and carefully into the connector at the backside of the Servo drive until it reaches the stop.
6. Screw the safety module module onto the front side of the housing of the Servo drive with the two fastening screws.
7. Ensure that the front plate of the safety module module has conducting contact with the housing of the Servo drive.

7 Mechanical installation

7.1 Important notes

- Only use the servo drive ARS 2300 FS as a built-in device for switch cabinets with IP54
- Mounting position vertical with supply lines [X9] on top
- Mount to control cabinet plate using the mounting holes on top and bottom
- Installation free spaces:
  Keep a minimum distance of 100 mm to other components each above and underneath the device to ensure sufficient venting.
  For optimal wiring of the motor cable and angle encoder cable on the bottom of the device an installation free space of 150mm is recommended!
- Mounting distance:
  The servo drives ARS 2300 FS may be installed adjacently in one switch cabinet without a gap, proper usage and installation on a heat-dissipating rear panel provided. Please note that excessive heat may cause premature aging and/or damaging of the device. In case the servo drives are subject to high thermal stress, a mounting distance of 10 mm between two ARS 2300 FS is recommended!

7.2 Device view ARS 2320 FS

100 mm free space for sufficient ventilation

LEDs + 7 Segment display:
- Ready / Error
- Enable
- Can On
- Status display

FSM module:
- FSM 2.0 FBA
- Optional FSM 2.0 STO
- Optional FSM 2.0 MOV

Technology slot such as:
- PROFIBUS-DP
- PROFINET
- EtherCAT

Terminating resistor for CANopen
SD-Card slot
Boot action

X19: USB

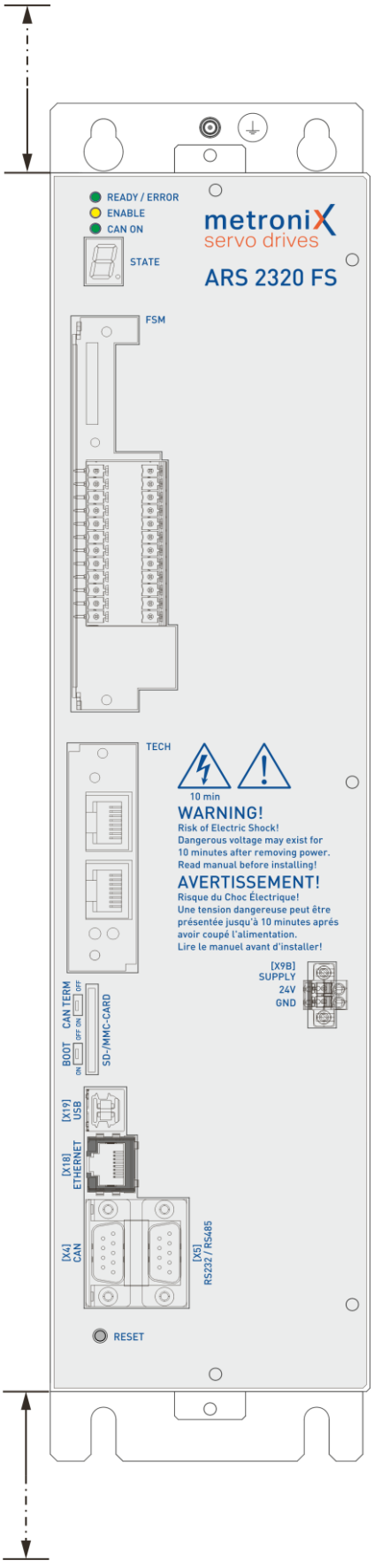
X18: Ethernet

X4: CAN

X5: RS232

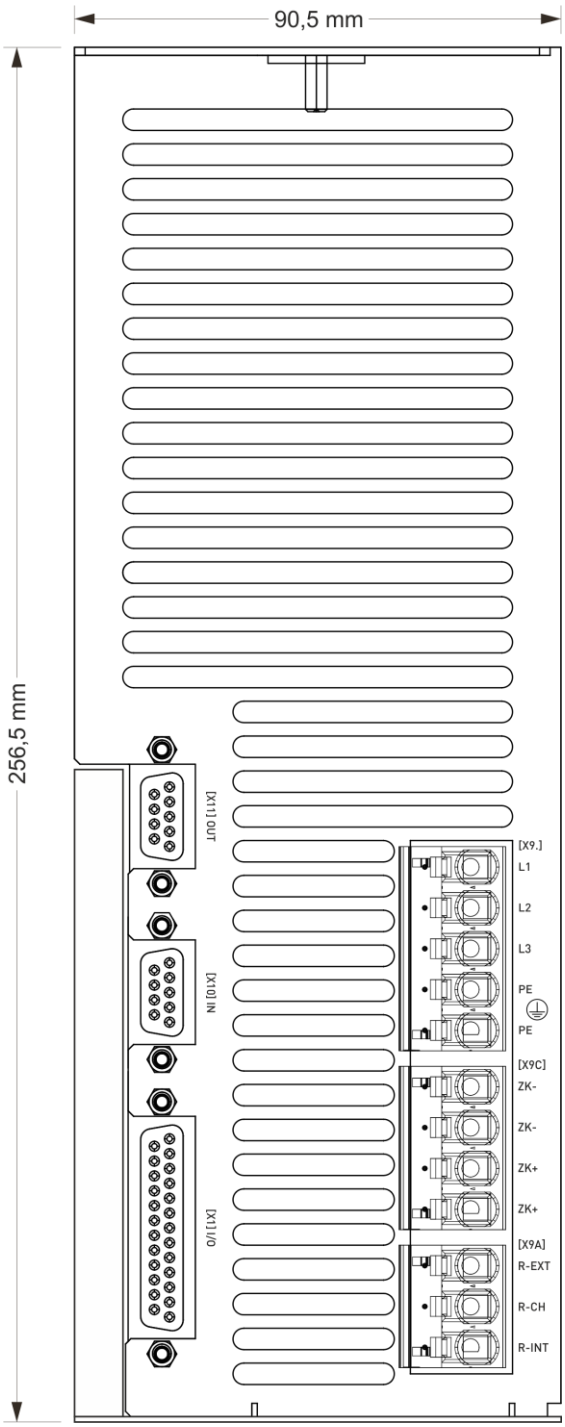
RESET button

100 - 150 mm free space for sufficient ventilation



X9B: 24VDC Supply

Figure 6: Servo drive ARS 2320 FS: Front view and Installation space



X11:
Incremental encoder output

X10:
Incremental encoder input

X1:
I/O interface

X9:
Power Supply

X9C:
DC bus voltage

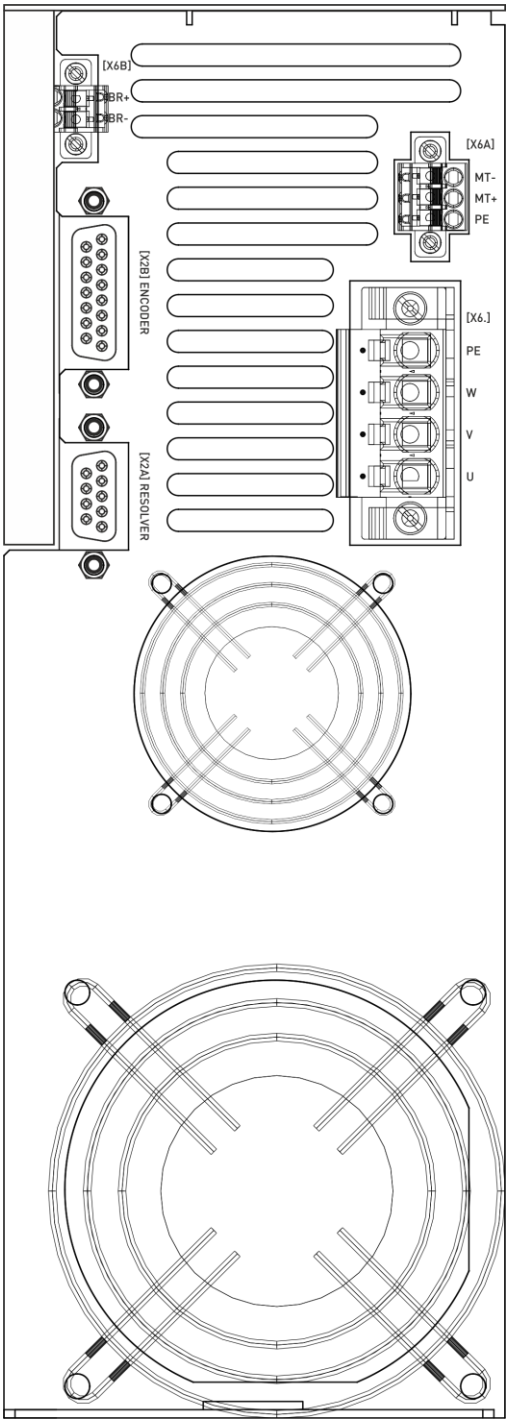
X9A:
Brake resistor

Figure 7: Servo drive ARS 2320 FS: Top view

X6B:
Motor holding brake

X2B:
Multi-Encoder

X2A:
Resolver



X6A:
Motor temperature sensor

X6:
Motor

Figure 8: Servo drive ARS 2320 FS: Bottom view

7.3 Installation/Mounting ARS 2320 FS

The Servo drive ARS 2320 FS has attachment lugs on the top and the bottom of the device. These are used to mount the Servo drive vertically to a control cabinet plate.
Please use M5 or M6 screws for the mounting of the Servo drive.

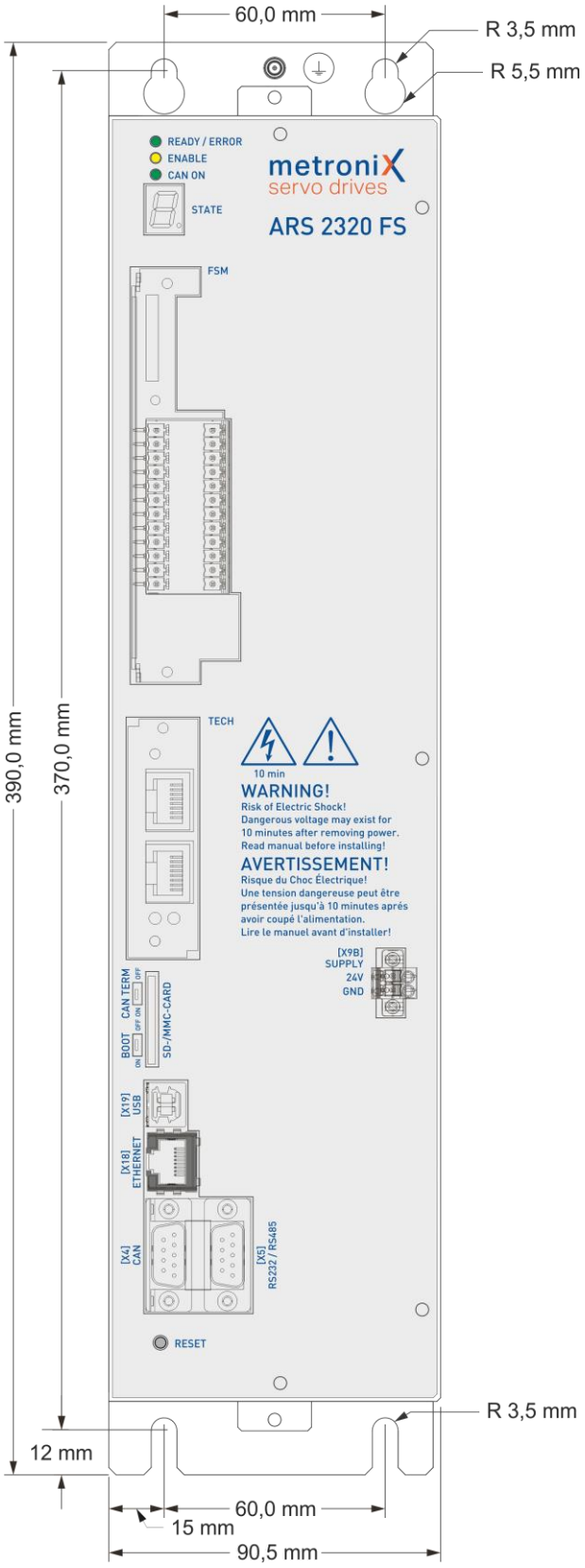


Figure 9: Servo drive ARS 2320 FS: Mounting plate

7.4 Device View ARS 2340 FS

100 mm free space for sufficient ventilation

LEDs + 7 Segment display:
- Ready / Error
- Enable
- Can On
- Status display

FSM module:
- FSM 2.0 FBA
- Optional FSM 2.0 STO
- Optional FSM 2.0 MOV

Technology slot such as:
- PROFIBUS-DP
- PROFINET
- EtherCAT

Terminating resistor for CANopen
SD-Card slot
Boot action

X19: USB

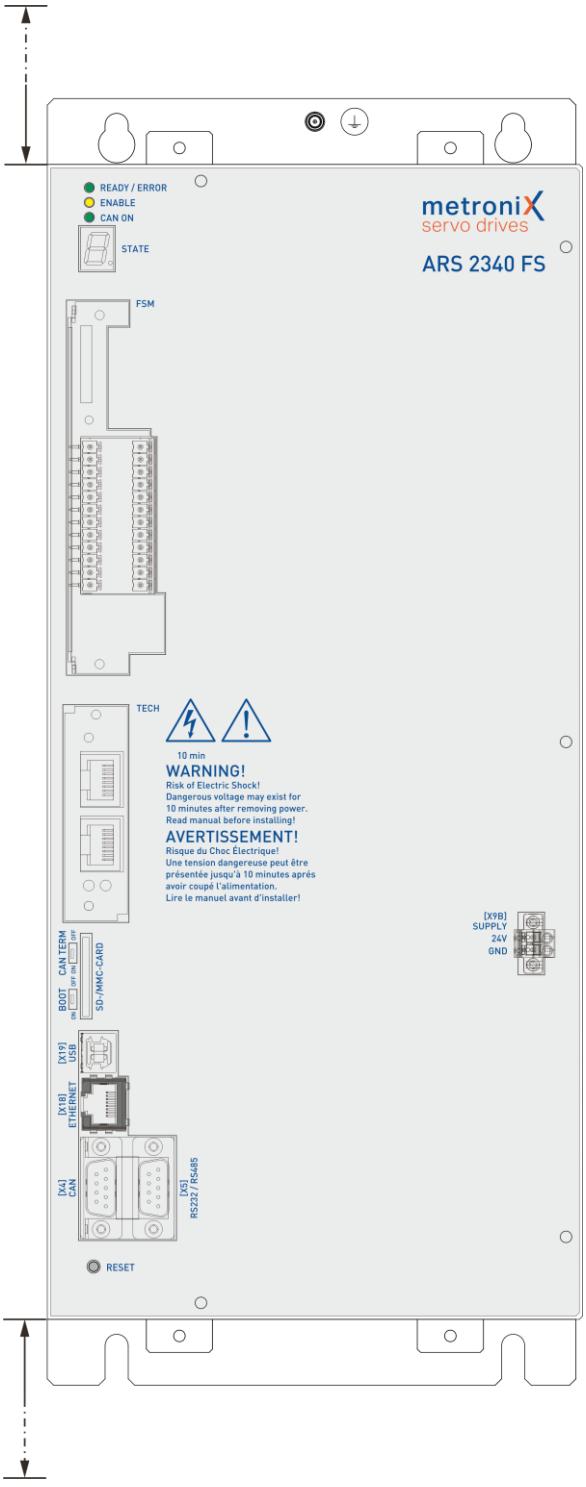
X18: Ethernet

X4: CAN

X5: RS232

RESET button

100 mm free space for sufficient ventilation



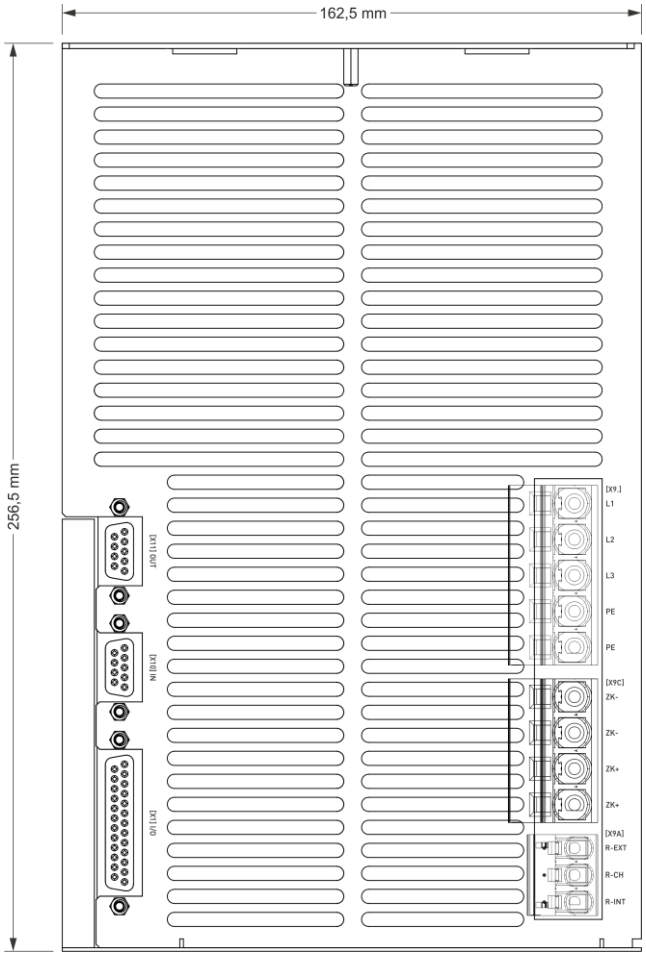
X9B: 24VDC Supply

Figure 10: Servo drive ARS 2340 FS: Front view and Installation space

X11:
Incremental encoder output

X10:
Incremental encoder input

X1:
I/O interface



X9:
Power Supply

X9C:
DC bus voltage

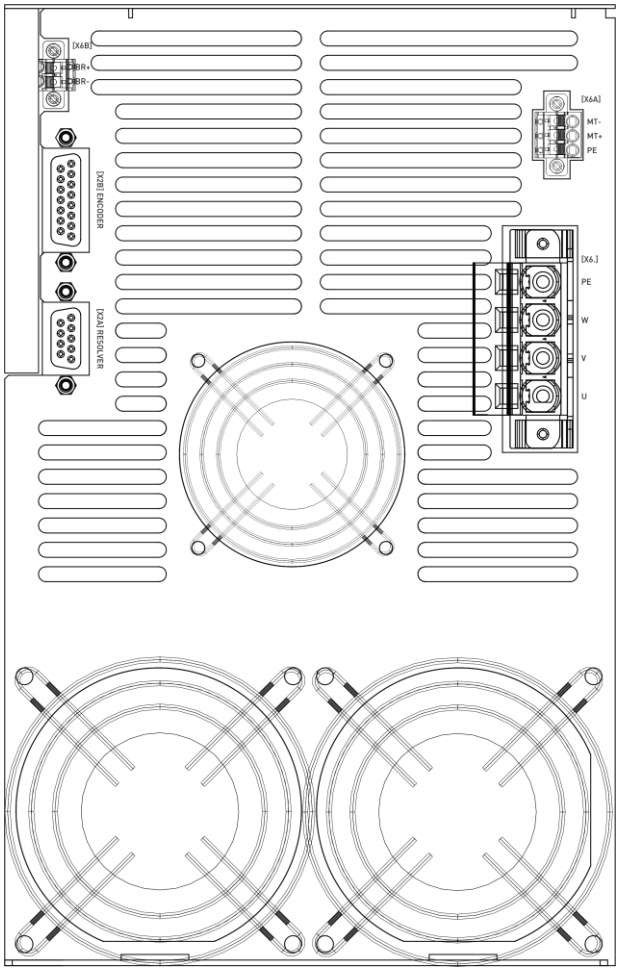
X9A:
Brake resistor

Figure 11: Servo drive ARS 2340 FS: Top view

X6B:
Motor holding brake

X2B:
Multi-Encoder

X2A:
Resolver



X6A:
Motor temperature sensor

X6:
Motor

Figure 12: Servo drive ARS 2340 FS: Bottom view

7.5 Installation/Mounting ARS 2340 FS

The Servo drive ARS 2320 FS has attachment lugs on the top and the bottom of the device. These are used to mount the Servo drive vertically to a control cabinet plate.
Please use M5 or M6 screws for the mounting of the Servo drive.

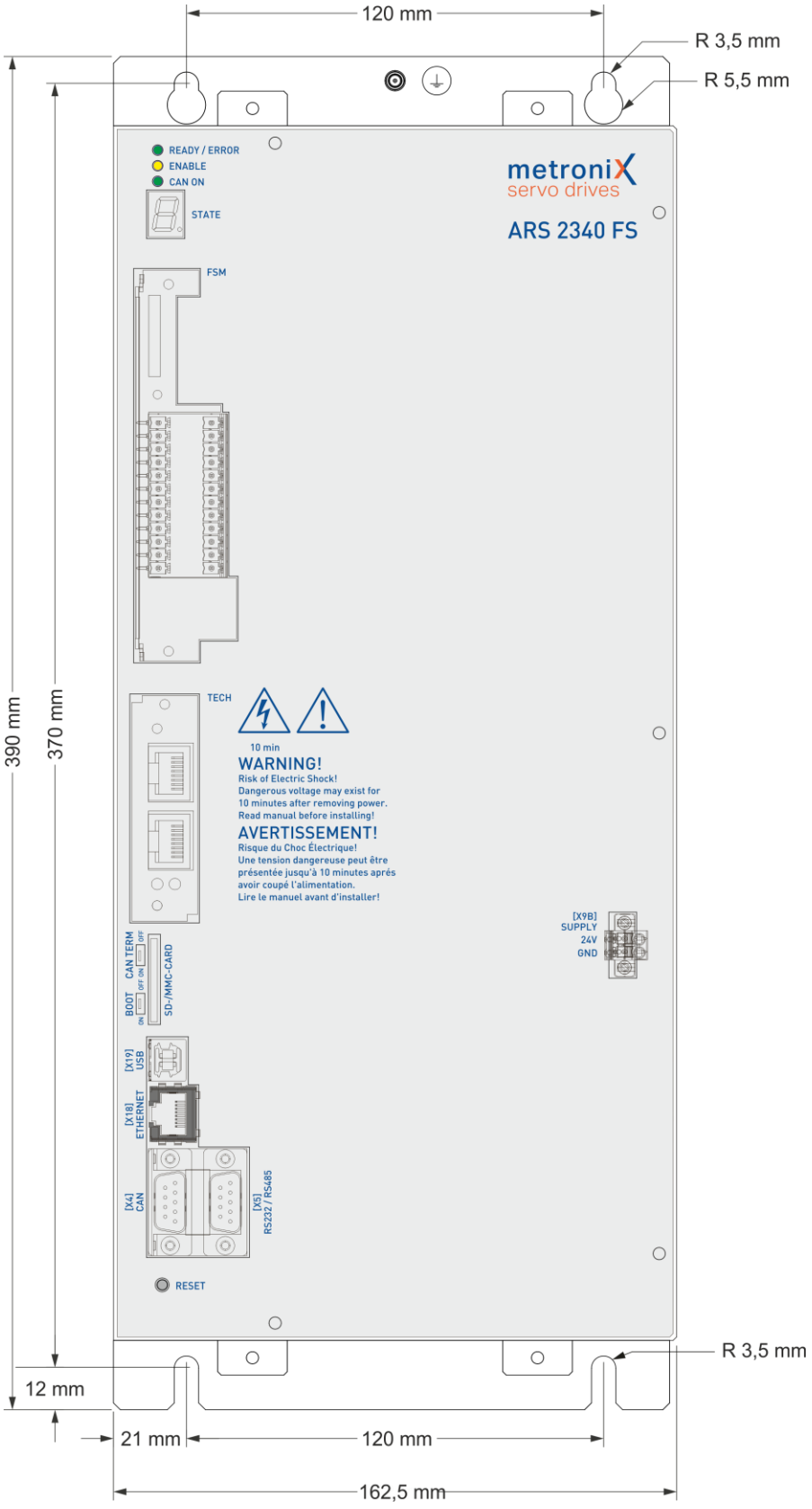


Figure 13: Servo drive ARS 2340 FS: Mounting plate

7.6 Device View ARS 2360W FS

100 mm free space for sufficient ventilation

LEDs + 7 Segment display:
- Ready / Error
- Enable
- Can On
- Status display

FSM module:
- FSM 2.0 FBA
- Optional FSM 2.0 STO
- Optional FSM 2.0 MOV

Technology slot such as:
- PROFIBUS-DP
- PROFINET
- EtherCAT

Terminating resistor for CANopen
SD-Card slot
Boot action

X19: USB

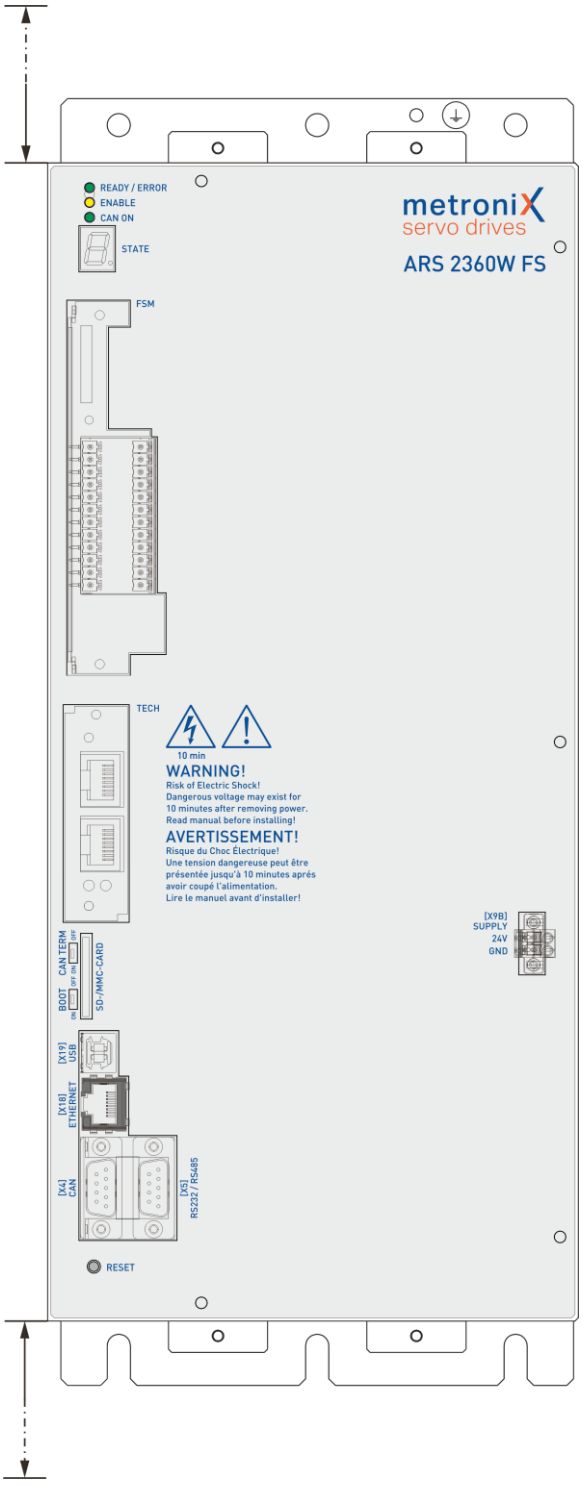
X18: Ethernet

X4: CAN

X5: RS232

RESET button

100 mm free space for sufficient ventilation



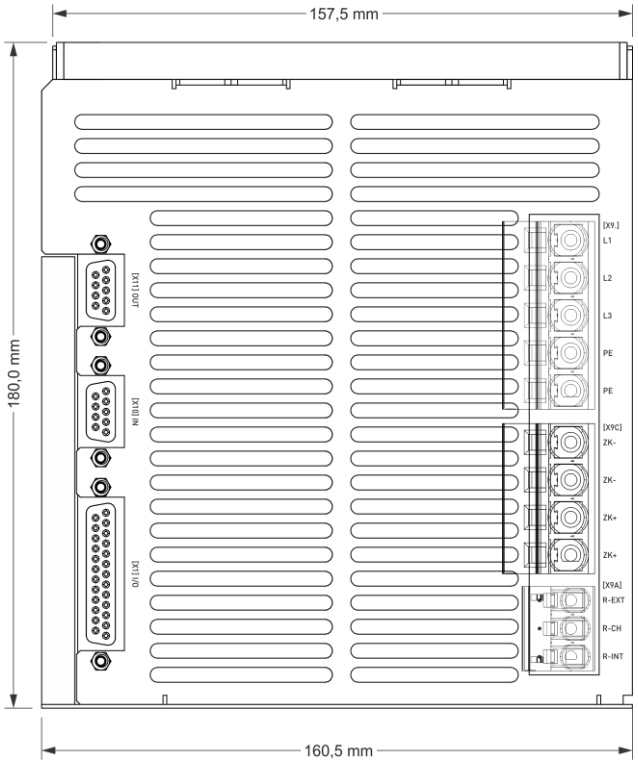
X9B: 24VDC Supply

Figure 14: Servo drive ARS 2360W FS: Front view and Installation space

X11:
Incremental encoder output

X10:
Incremental encoder input

X1:
I/O interface



X9:
Power Supply

X9C:
DC bus voltage

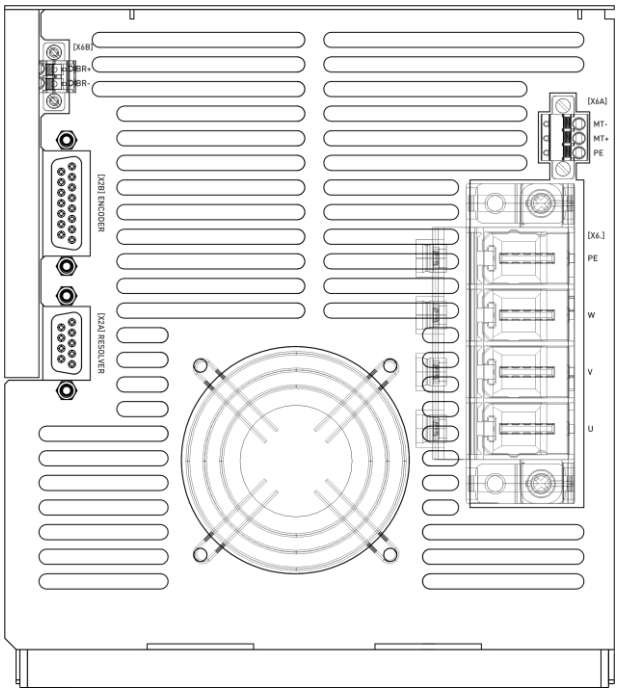
X9A:
Brake resistor

Figure 15: Servo drive ARS 2360W FS: Top view

X6B:
Motor holding brake

X2B:
Multi-Encoder

X2A:
Resolver



X6A:
Motor temperature sensor

X6:
Motor

Figure 16: Servo drive ARS 2360W FS: Bottom view

7.7 Installation/Mounting ARS 2360W FS

The Servo drive ARS 2320 FS has attachment lugs on the top and the bottom of the device. These are used to mount the Servo drive vertically to a water cooling system.
Please use M6 screws for the mounting of the Servo drive.

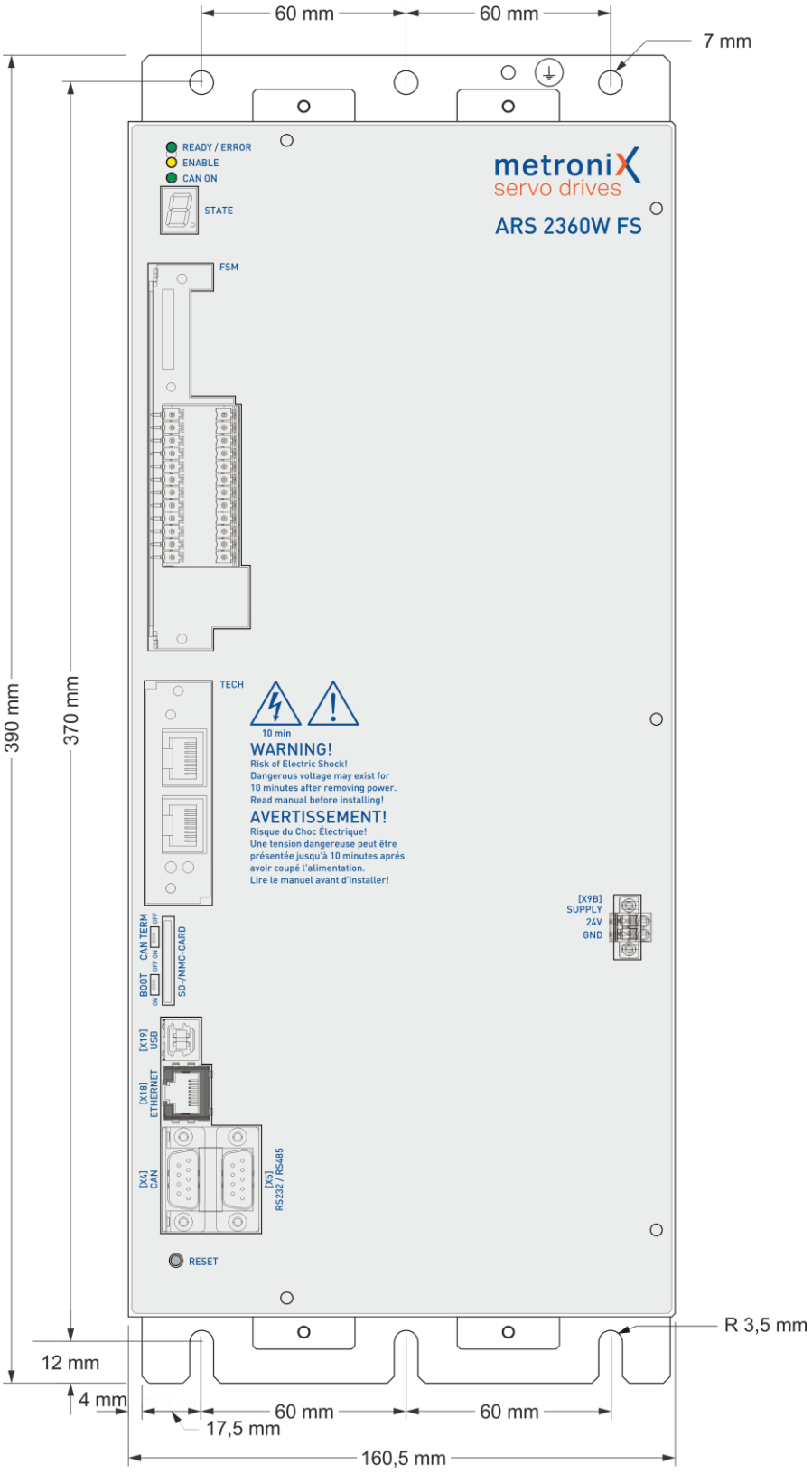


Figure 17: Servo drive ARS 2360W FS: Mounting plate

7.8 Water cooling system for ARS 2360W FS

The technical data and the requirements for the cooling circuit are shown in chapter 4.
The following examples for water cooling systems can be obtained from the manufacturers specified below.

INFORMATION

Please use the mounting dimensions for the drill holes as described in chapter 7.7

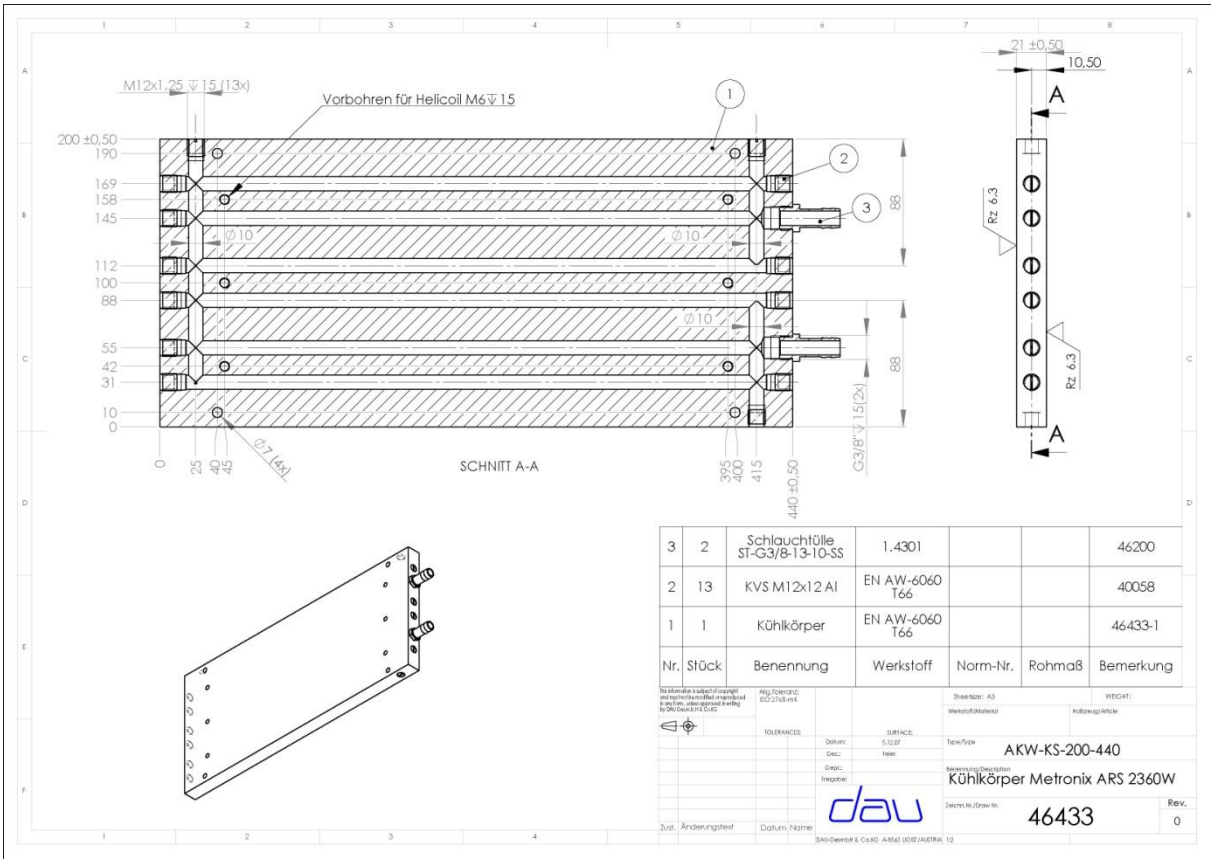


Figure 18: Water cooling system – example by the manufacturer Dau

Address:

DAU Ges.m.b.H & Co.KG
Dietenberg 38
A-8563 Ligist / Austria
Tel.: +43 (0)31 43 23 51-0
Fax: +43 (0)31 43 23 51-14
Mobile: +43 676 6060022
www.dau-at.com

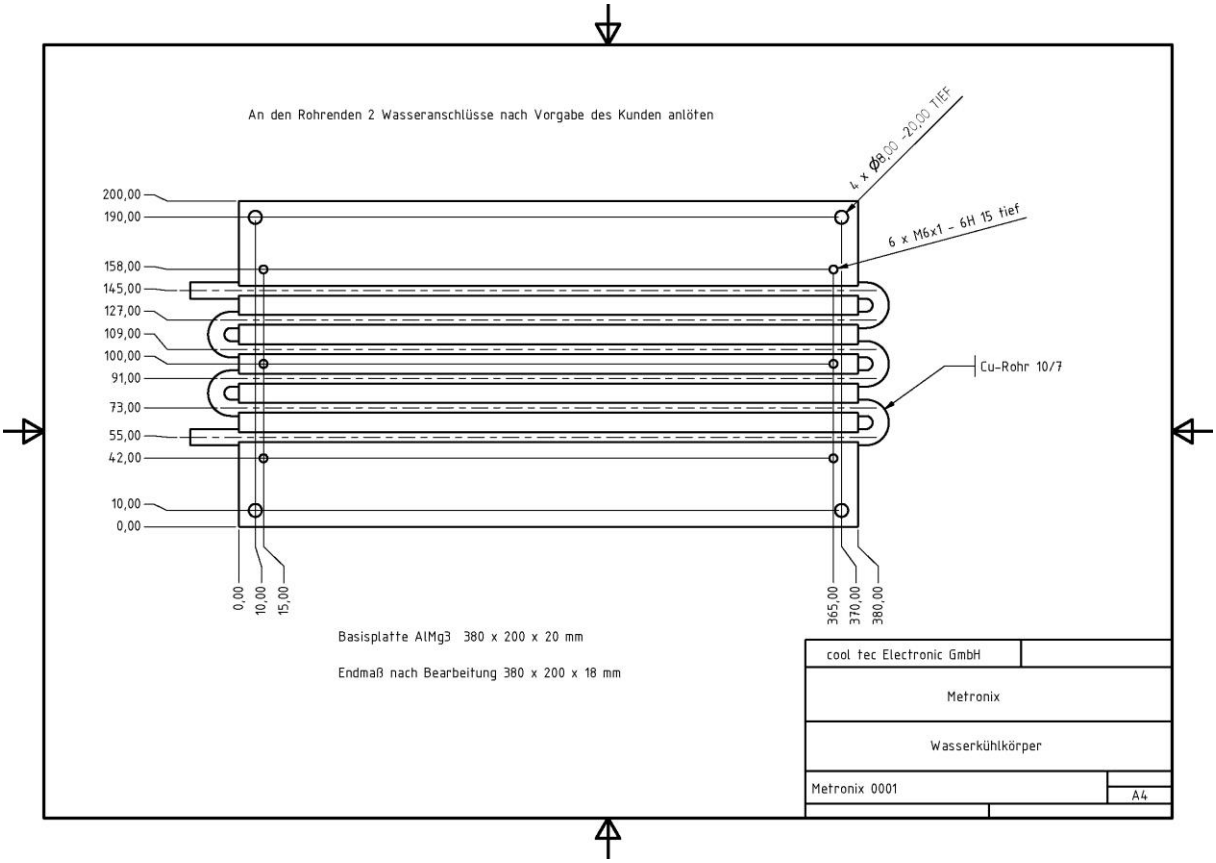


Figure 19: Water cooling system – example by the manufacturer Cool Tec

Address:

Cool Tec Electronic GmbH
Ilmenauer Straße 7
D-98701 Großbreitenbach
Tel.: +49 (0)36781 4469-0
Fax: +49 (0)36781 4469-4
www.cooltec.de

8 Electrical installation

INFORMATION

If they have the same DC bus voltage, it is possible to couple multiple servo drives of the ARS 2320/40/60W FS series.

CAUTION!

Operation with DC bus coupling together with devices with other mains supply is not allowed.

8.1 Notes concerning the safe and EMC-compliant installation

8.1.1 Definitions and terms

Electromagnetic compatibility (EMC) or electromagnetic interference (EMI) includes the following requirements:

- Sufficient **immunity** of an electrical installation or an electrical device against external electrical, magnetic, or electromagnetic interferences via cables or the environment.
- Sufficiently small **unwanted emission** of electrical, magnetic, or electromagnetic interference from an electrical installation or an electrical device to other devices in the vicinity via cables or the environment.

8.1.2 General information on EMC

The interference emission and interference immunity of a servo drive always depend on the overall drive concept consisting of the following components:

- Power supply
- Servo drive
- Motor
- Electromechanical system
- Configuration and type of wiring
- Superordinate control system

In order to increase interference immunity and to decrease interference emissions, the ARS 2300 FS servo drive has integrated output chokes and line filters so that it can be used without additional shielding and filtering devices in most applications.

INFORMATION

In most cases no external filtering is required

8.1.3 Proper EMC-compliant and secure cabling

The following must be considered for an EMC-compliant setup of the drive system:

CAUTION!

For safety reasons, all of the PE earth (ground) conductors must be connected prior to the initial operation of the system.

The EN 61800-5-1 regulations concerning protective earthing (grounding) must be complied with during the installation!

- In order to keep the leakage currents and losses in the motor connecting cable as small as possible, the ARS 2300 FS servo drive should be located as close to the motor as possible.
- Suitable installation and suitable wiring of all connection cables provided, the servo drives ARS 2300 FS fulfill the requirements of the corresponding product standard, see chapter 4.1. This standard refers to “classes” and so-called “environments”. The first environment includes mains supplies serving residential buildings and the second environment includes mains supplies exclusively serving industrial buildings.
- The servo drive ARS 2300 FS must be installed in a steel switch cabinet. In most cases a standard model will sufficiently attenuate emitted interference. The motor-cable shields must be connected with the switch cabinet mounting plate.
- The control cabinet bed plate must be conducting (zinc-coated design). The imperative central grounding point should also be located on the control cabinet bed plate.
- In order to keep the leakage currents and the losses in the motor connection cable as small as possible, the servo drive ARS 2300 FS should be located as close to the motor as possible.
- Motor cable and angle encoder cable must be shielded.
- The shield of the motor cable must be connected to the housing of the servo drive ARS 2300 FS (shield connection terminal). The cable shield also has to be connected to the associated servo drive so that the leakage currents can flow back into the servo drive causing the leakage.
- The mains-end PE connection must be connected to the PE connection point of the supply connection [X9].
- The inner PE conductor of the motor cable must be connected to the PE connection point of the motor connection [X6].
- The signal lines must be as far away from the power cables as possible. They should not be placed parallel. If intersections cannot be avoided, they should be perpendicular (that is at a 90° angle), if possible.
- Unshielded signal and control lines should not be used. If their use is inevitable they should at least be twisted.
- Even shielded cables will inevitably have short unshielded ends (unless shielded connector housings are used). In general, the following applies:
  - Connect the inner shields to the corresponding pins of the connectors
  - Length of the unshielded cores 35 mm maximum
  - Connect the total shield on the servo drive side and the motor side as described in chapter 8.1 .
  - Connect the total shield on the motor side plane to the connector housing or motor housing; Maximum length 40 mm.

8.1.4 Operation with long motor cables

INFORMATION

Compliance with the EMC standard EN 61800-3 is only possible with motor cable lengths of up to 30 m guaranteed.

For longer cable lengths, operation is not permitted.

In applications involving long motor cables and/or in the case of unsuitable motor cables with a non-permissible high cable capacity, the filters may be thermally overloaded.
To avoid these problems, we strongly recommend the following procedure for applications requiring long motor cables:

- Use only cables with less than 150 pF/m (capacitance per unit length) between the motor phase and shield! (Please contact the motor cable supplier, if necessary.)
- The frequency of the power output stage must be reduced.

8.1.5 ESD protection

CAUTION!

Unused D-Sub connectors may cause damage to the device or other parts the system due due to ESD (electrostatic discharge).

INFORMATION

To avoid such damage, observe the following points:

- Ensure grounding of all system parts before the voltage is switched on.
- Commissioning personnel and also service and maintenance personnel must be trained in ESD-protection and wear appropriate shoes.
- When handling, for example, the USB connector, it makes sense first touch the control cabinet housing (should be at PE potential) by hand before touching a plug on the servo drive.

The ARS 2300 FS servo drive has been designed to provide high interference immunity. For this reason, some function blocks are electrically isolated. Inside the device, the signals are transmitted via optocouplers.
The following isolated areas are distinguished:

- Power output stage with a DC bus circuit and mains input
- Electronic control system for the processing of the analogue signals
- 24 V supply and digital inputs and outputs

8.2 Wiring diagram Power Supply [X9, X9A, X9B, X9C] and Motor [X6, X6A, X6B]

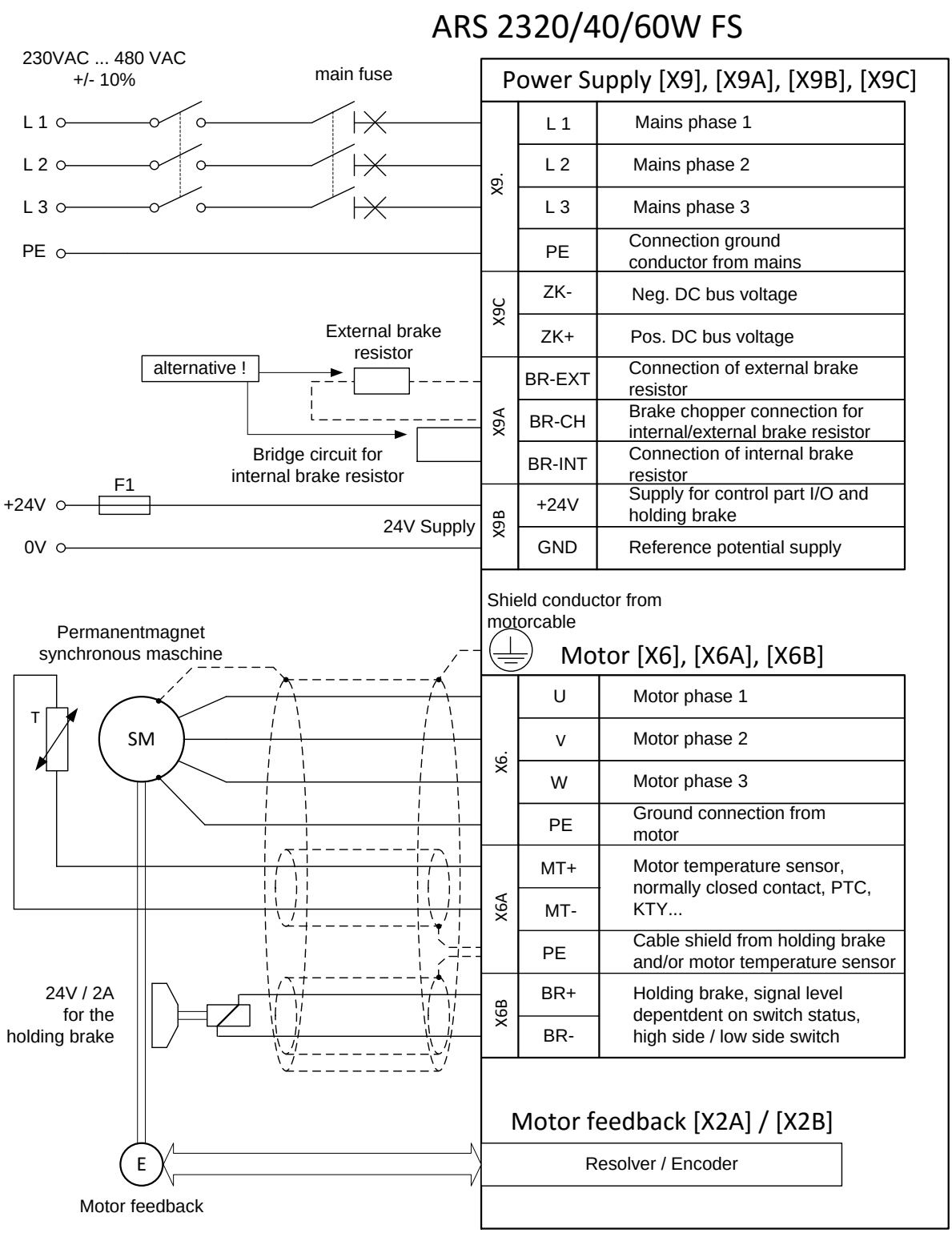


Figure 20: Connection to power supply [X9] and motor [X6]

8.3 Power Supply [X9, X9A, X9B, X9C]

The operation of the Servo drive ARS 2300 FS requires a 24V supply source for the electronics, which is connected to the terminals +24V and GND. The connection to the supply for the power output stage is made to terminals L1, L2 and L3 for AC supply.
The ARS 2300 FS servo drive has an internal brake chopper and braking resistor. For more braking power, an external braking resistor can be connected to the [X9A] pin-and-socket connector.

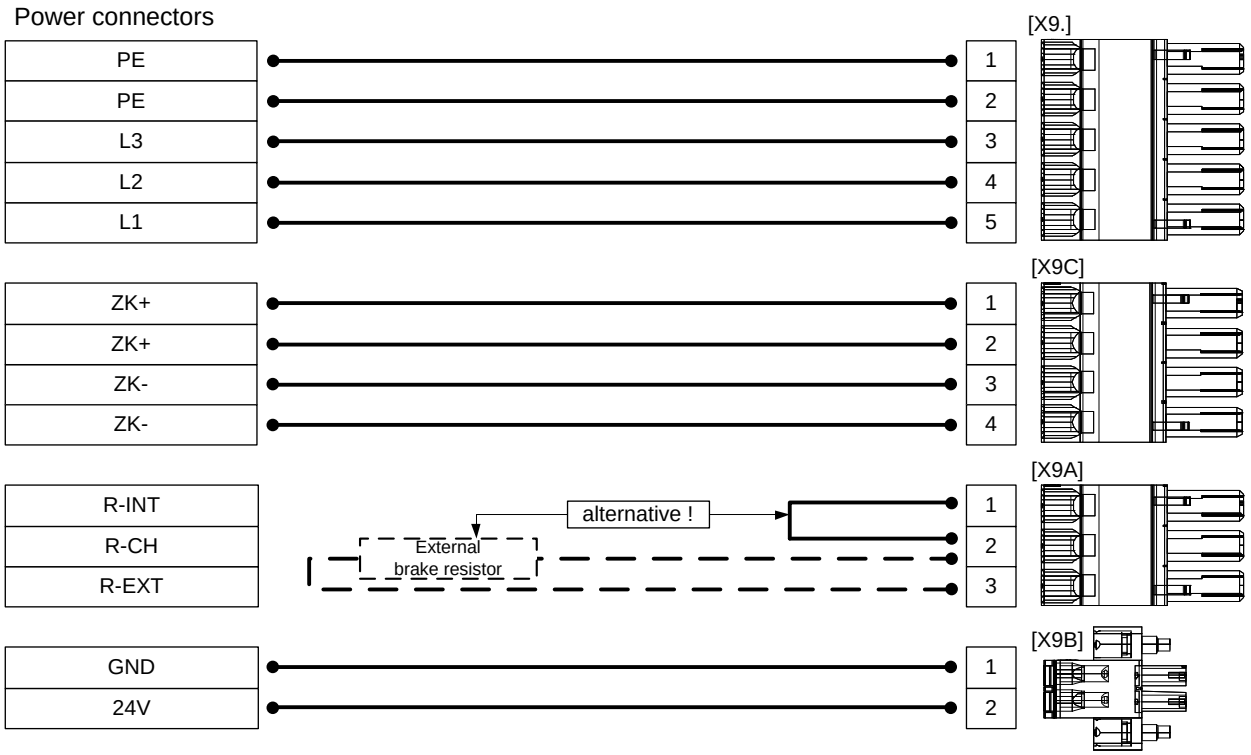


Figure 21: Supply connection [X9]

Pin assignment X9 Mains

Pin No.	Denomination	Value	Specification
1	PE	0 V	Connection of mains ground conductor PE [1]
2	PE	0 V	Connection of mains ground conductor PE
3	L3	230...480VAC	Mains supply phase L3
4	L2	230...480VAC	Mains supply phase L2
5	L1	230...480VAC	Mains supply phase L1

[1] One PE connection on X9 is sufficient

Additional PE connection on the mounting plate / cold plate:

It is necessary to make an additional PE connection on the cold plate (M4 screw) with the same cross section like the mains supply, see picture in chapter 7.

Pin assignment X9A Brake Resistor

Pin No.	Denomination	Value	Specification
1	R-INT	< 800 VDC	Internal braking resistor
2	R-CH	< 800 VDC	Brake chopper connection for external braking resistor against BR-EXT Brake chopper connection (wire jumper) for internal braking resistor against BR-INT
3	R-EXT	< 800 VDC	Internal braking resistor

INFORMATION

If no external braking resistor is used, a bridge has to be installed between PIN1 and PIN2, so that the DC bus precharge, when the mains power supply is “ON”, and the DC bus rapid discharge can function properly!

Pin assignment X9B 24V Supply

Pin No.	Denomination	Value	Specification
1	GND	0 VDC	Reference potential for the 24VDC supply and the PLC
2	24V	24 VDC	24VDC supply for control section

Pin assignment X9C DC BUS

Pin No.	Denomination	Value	Specification
1	ZK+	< 700 VDC	Positive DC bus voltage
2	ZK+	< 700 VDC	Positive DC bus voltage
3	ZK-	< 700 VDC	Negative DC bus voltage
4	ZK-	< 700 VDC	Negative DC bus voltage

Mating plug X9, X9A,X9B, X9C

INFORMATION		
Mating plug	**ARS 2320 FS**	**ARS 2340 FS and ARS 2360W FS**
X9	Phoenix Contact SPC 5/ 5-ST-7,62 (1996045) or PC 5/ 5-ST1-7,62 (1777752)	Phoenix Contact SPC 16/5-ST-10,16 (1711297) or PC 16/5-ST-10,16 (1967401)
X9A	Phoenix Contact SPC 5/ 3-ST-7,62 (1996029) or PC 5/ 3-ST1-7,62 (1777736)	see ARS 2320 FS
X9B	Phoenix Contact FK-MCP 1,5/ 2-STF-3,81 (1851232) or MC 1,5/ 2-STF-3,81 (1827703)	see ARS 2320 FS
X9C	Phoenix Contact SPC 5/ 4-ST-7,62 (1996032) or PC 5/ 4-ST1-7,62 (1777749)	Phoenix Contact SPC 16/4-ST-10,16 (1711284) or PC 16/4-ST-10,16 (1967391)

Recommended cable types:

The cable names given refer to cables made by Lapp. They have proven to be reliable and are successfully used in many applications. However, it is also possible to use comparable cables from other manufacturers for example Lütze, Helukabel or SAB Bröckskes.

- LAPP KABEL ÖLFLEX-CLASSIC 110

Cabling and Circuit breaker

Technical data	ARS 2320 FS	ARS 2340 FS	ARS 2360W FS
Cable cross section 24 VDC Supply (flexible conductors, wire end sleeve with insulating collar)	0,5 mm^2...0,75mm^2		
Tightening torque for Mating plug with M2 screws	0,22…0,25 Nm		
Cable cross section mains (flexible conductors, wire end sleeve with insulating collar)	4 mm^2	6 mm^2	10 mm^2
Tightening torque for Mating plug with screws	M3: 0,7…0,8 Nm	M4: 1,7...1,8 Nm	M4: 1,7...1,8 Nm
Recommended Circuit Breaker	B25	B40	B40

8.4 Motor [X6, X6A, X6B]

The motor is connected to the terminals U,V,W via motor cable to [X6].
The motor temperature sensor is connected to terminals MT+ and MT-, if it is lead into one cable together with the motor phases. If a temperature sensor (e.g. KTY81) is used in the motor, it is connected via the encoder cable to [X2A] or [X2B].

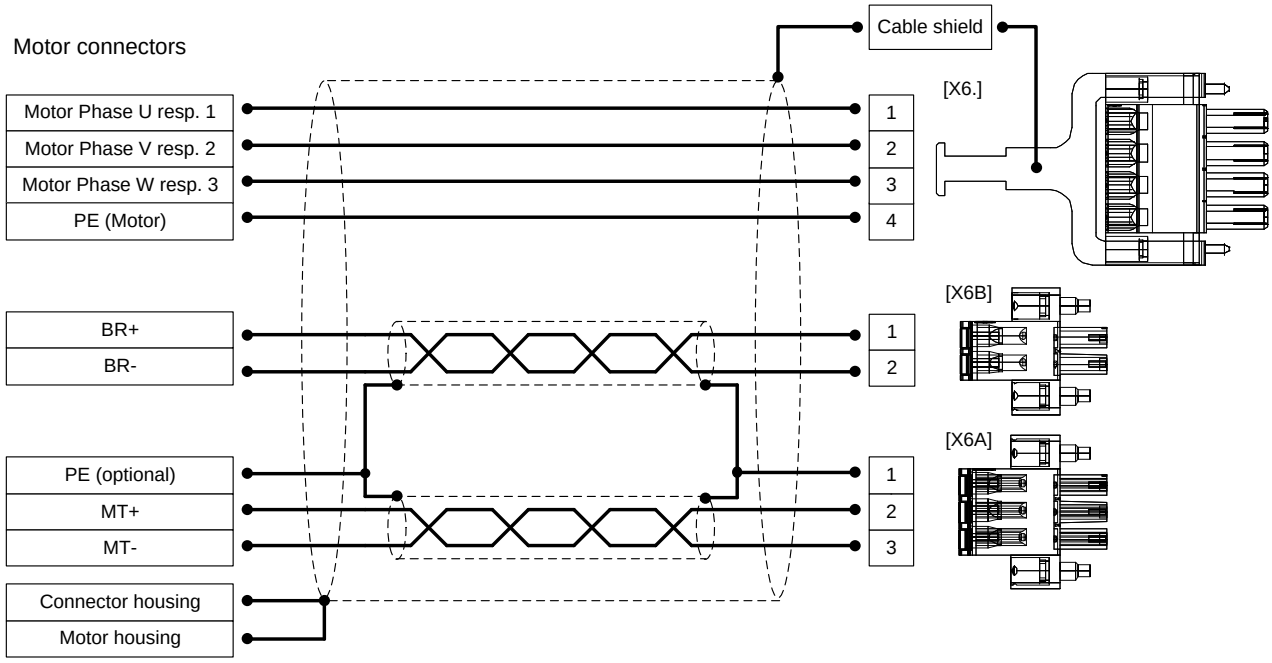


Figure 22: Motor connection [X6]

Terminals BR+ and BR- can be used to connect a holding brake of the motor. The holding brake is supplied with power via the power supply of the servo drive. Please note the maximum output current that is provided by the ARS 2300 FS servo drive. It may be necessary to connect a relay between the device and the holding brake.

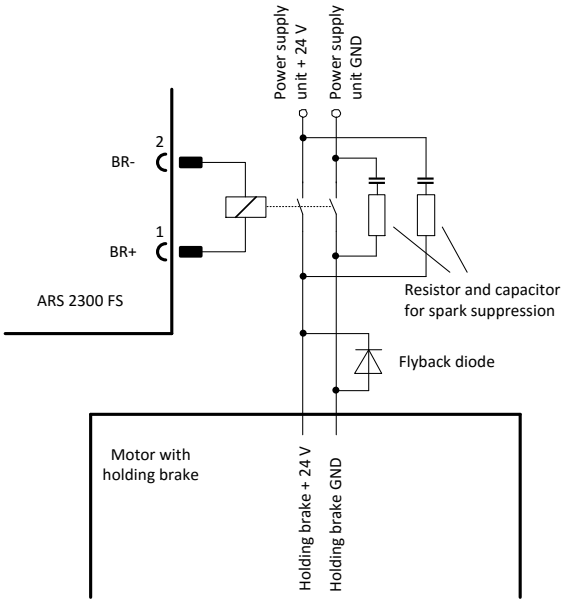


Figure 23: Connecting a holding brake with a high current demand (> 2 A) to the device

INFORMATION

Switching of inductive direct current via relays produces strong currents and sparking. For interference suppression, we recommend using integrated RC suppressor elements, for example by Evox RIFA, product name: PMR205AC6470M022 (RC element with 22 Ω in series with 0.47 µF).

Pin assignment X6 Motor

Pin No.	Denomination	Value	Specification
1	U	0...400 V_{eff}	Connection of the motor phase U
2	V	0...400 V_{eff}	Connection of the motor phase V
3	W	0...400 V_{eff}	Connection of the motor phase W
4	PE	0 V	Connection of motor PE line

Pin assignment X6A Motor temperature sensor

Pin No.	Denomination	Value	Specification
1	PE	0 V	Connection of optional ground conductor PE
2	MT+	-	Motor temperature sensor, normally closed contact, normally open contact, PTC, NTC, KTY
3	MT-	-	Reference potential

Pin assignment X6B Motor holding brake

Pin No.	Denomination	Value	Specification
1	BR+	24 VDC	Motor temperature sensor, normally closed contact, normally open contact, PTC, NTC, KTY
2	BR-	0 V	Reference potential

Mating plug X6, X6A, X6B

INFORMATION

Mating plug	ARS 2320 FS	ARS 2340 FS	ARS 2360W FS
X6	Phoenix Contact SPC 5/ 4-STF-SH-7,62 (1704071) or PC 5/ 4-STF-SH1-7,62 (1778191)	Phoenix Contact SPC 16/5-ST-10,16 (1711297) or PC 16/4-STF-SH-10,16 (1970359)	Phoenix Contact PC 35 HC/ 4-STF-SH-15,00 (1762848)
X6A	Phoenix Contact FK-MCP 1,5/ 3-STF-3,81 (1851245) or MC 1,5/ 3-STF-3,81 (1827716)	see ARS 2320 FS	see ARS 2320 FS
X6B	Phoenix Contact FK-MCP 1,5/ 2-STF-3,81 (1851232) or MC 1,5/ 2-STF-3,81 (1827703)	see ARS 2320 FS	see ARS 2320 FS

- Connect the inner shields to X6A.PIN1; maximum length 100 mm.
- Length of unshielded cores maximum 50 mm.
- Connect total shield to X6 Shield terminal. Use cable strap to fix the shield on the connector.
- Connect total shield on motor side flat to connector or motor housing; maximum length 40 mm.

INFORMATION

The cable shield of the motor cable must also be connected to the controller Shieldterminal on X6.

The Servo drive ARS 2300 FS must be connected to ground with its PE connection.
The ARS 2300 FS must be completely wired first. Only then the operating voltages for the DC bus and the electronics supply may be switched on.

CAUTION!

The servo drive will be damaged

- in the case of inversed wiring of the operating voltage connections,
- in the case of excessive operating voltage or
- in the case of confusing the connections for operating voltage and motor!

CAUTION! DANGEROUS VOLTAGE

The signals for the temperature sensor "MT+" (X6A.PIN2) and "MT-" (X6A.PIN3) on the motor connector plug [X6] are not situated on safety extra-low voltage (PELV - protective extra-low voltage). The connections are designed for non-PELV temperature sensors. The isolation to PELV is part inside the ARS 2300 FS.

Recommended cable types:

The cable names given refer to cables made by Lapp. They have proven to be reliable and are successfully used in many applications. However, it is also possible to use comparable cables from other manufacturers, for example Lütze, Helukabel or SAB Bröckskes / Desina.

- LAPP KABEL Type ÖLFLEX-SERVO 719 CY
- LAPP KABEL Type ÖLFLEX-SERVO-FD 750 P

Cabling

Technical data	ARS 2320 FS	ARS 2340 FS	ARS 2360W FS
Max. cable length screened	see chapter 4.3		
Cable cross section (flexible conductors, wire end sleeve with insulating collar)	4 mm²	10 mm^2	16 mm^2
Tightening torque for Mating plug with screws	M3: 0,7 … 0,8 Nm	M4: 1,7...1,8 Nm	M5: 2,5 Nm

8.5 I/O communication [X1]

Pin assignment X1 I/O communication

Pin No.		Denomination	Value	Specification
1		AGND	0V	Shield for analog signals, AGND
	14	AGND	0V	Reference potential for analog signals
2		AIN0	U_{on} = ±10V RI ≥30kΩ	Setpoint input 0, differential, max. 30V input voltage
	15	#AIN0		
3		AIN1	U_{on} = ±10V R_I ≥30kΩ	Setpoint input 1, single ended, max. 30V input voltage
	16	AIN2	U_{on} = ±10V R_I ≥30kΩ	Setpoint input 2, single ended, max. 30V input voltage
4		+VREF	+10V	Reference output for setpoint potentiometer
	17	AMON0	±10V	Analog monitor output 0
5		AMON1	±10V	Analog monitor output 1
	18	+24V	24V / 100mA	Auxiliary voltage for IOs at X1
6		GND24	corresponding GND	Reference potential for digital I/Os
	19	DIN0	POS Bit0	Target selection positioning Bit0 (LSB)
7		DIN1	POS Bit1	Target selection positioning Bit1
	20	DIN2	POS Bit2	Target selection positioning Bit2
8		DIN3	POS Bit3	Target selection positioning Bit3 (MSB)
	21	DIN4	FG_E	Power stage enable
9		DIN5	FG_R	Controller enable
	22	DIN6	END0	Input end switch 0 (locks n > 0)
10		DIN7	END1	Input end switch 1 (locks n < 0)
	23	DIN8	START	Input for positioning start
11		DIN9	SAMP	High-speed input
	24	DOUT0 / READY	24V / 100mA	Output operational state
12		DOUT1	24V / 100mA	Output freely programmable
	25	DOUT2	24V / 100mA	Output freely programmable, optional use as input DIN10
13		DOUT3	24V / 100mA	Output freely programmable, optional use as input DIN11

The servo drives ARS 2300 FS features two potential ranges:

Analogue inputs and outputs:
All of the analogue inputs and outputs refer to AGND. AGND is internally connected to GND, the reference potential for the control module with µC and AD converters in the servo drive. This potential range is electrically isolated from the 24 V range and from the DC bus circuit.

24 V inputs and outputs:
These signals refer to the 24 V supply voltage of the ARS 2300 FS servo drive, which is supplied via [X9B]. They are separated from the reference potential of the control module by way of optocouplers.

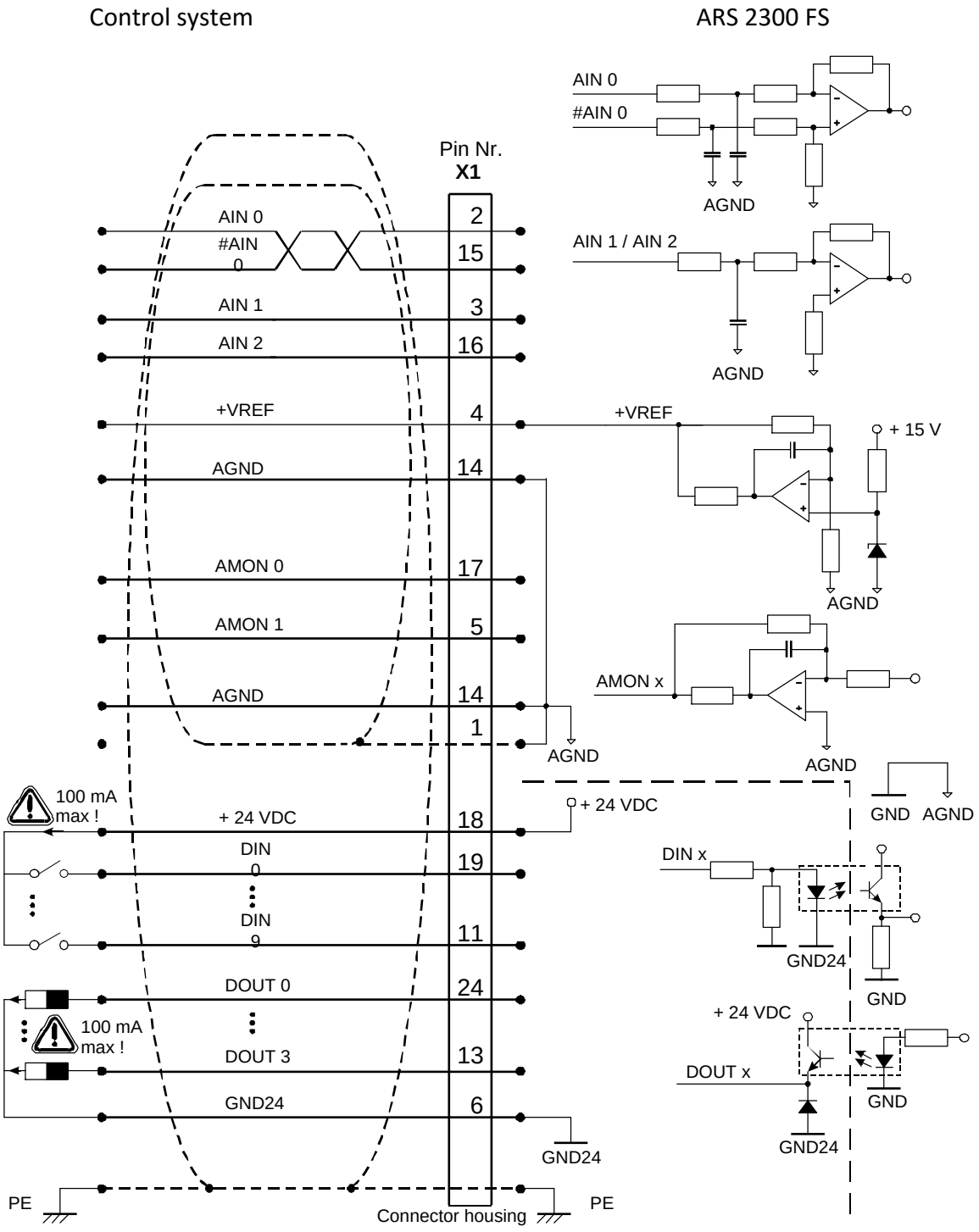


Figure 24: Basic circuit diagram of connector [X1]

The ARS 2300 FS servo positioning controller has one differential (AIN 0) and two single-ended analogue inputs for input voltages in the range of ±10 V. The inputs AIN 0 and #AIN 0 are led to the control system via twisted cables (twisted-pair type). If the control system is equipped with single-ended outputs, the output is connected to AIN 0 and #AIN 0 is connected to the reference potential of the control system. If the control system is equipped with differential outputs, they are to be connected 1:1 to the differential inputs of the ARS 2300 FS servo positioning controller.
The reference potential AGND is connected to the reference potential of the control system. This is necessary in order to prevent the differential input of the ARS 2300 FS servo positioning controller from being overridden by high "common-mode interference".
There are two analogue monitor outputs with output voltages in the range of ± 10 V and one output for a reference voltage of +10 V. These outputs can be led to the superordinate control system; the reference potential AGND must be carried along. If the control system is equipped with differential inputs, the "+" input of the control system is connected to the output of the ARS 2300 FS servo positioning controller and the "-" input of the control system to AGND.

Mating plug X1

	**INFORMATION**
Mating plug	**ARS 2320/40/60W FS**
X1	D-SUB connector, 25-pin type, male Housing for a 25-pin D-SUB connector with locking screws of type 4/40 UNC

Recommended cable type or comparable:

- LAPP KABEL UNITRONIC LiYCY (TP); 25 x 0.25 mm²; ∅ 10.7 mm

8.6 Resolver [X2A]

Pin assignment X2A Resolver

Pin No.		Denomination	Value	Specification
1		S2	$3{,}5V_{RMS}$ / 5-10kHz $R_i > 5k\Omega$	SINE trace signal, differential
	6	S4		
2		S1	$3{,}5V_{RMS}$ / 5-10kHz $R_i > 5k\Omega$	COSINE trace signal, differential
	7	S3		
3		AGND	0V	Shield for signal pairs (inner shield)
	8	MT-	GND (0 V)	Reference potential temperature sensor
4		R1	$7V_{RMS}$ / 5-10kHz $I_A \leq 150mA_{RMS}$	Carrier signal for resolver
	9	R2	GND (0V)	
5		MT+	+3,3V / Ri=2kΩ	Motor temperature sensor, normally closed contact, PTC, NTC, KTY

INFORMATION

The Motor temperature sensor can either be connected to X2A or X2B. It is not possible to connect multiple sensors.

INFORMATION

In addition, a low-impedance connection of the outer cable shield to the housing of the servo drive has to be established. Therefore, the outer cable shield of the angle encoder cable must be connected to the housing of the angle encoder connector.

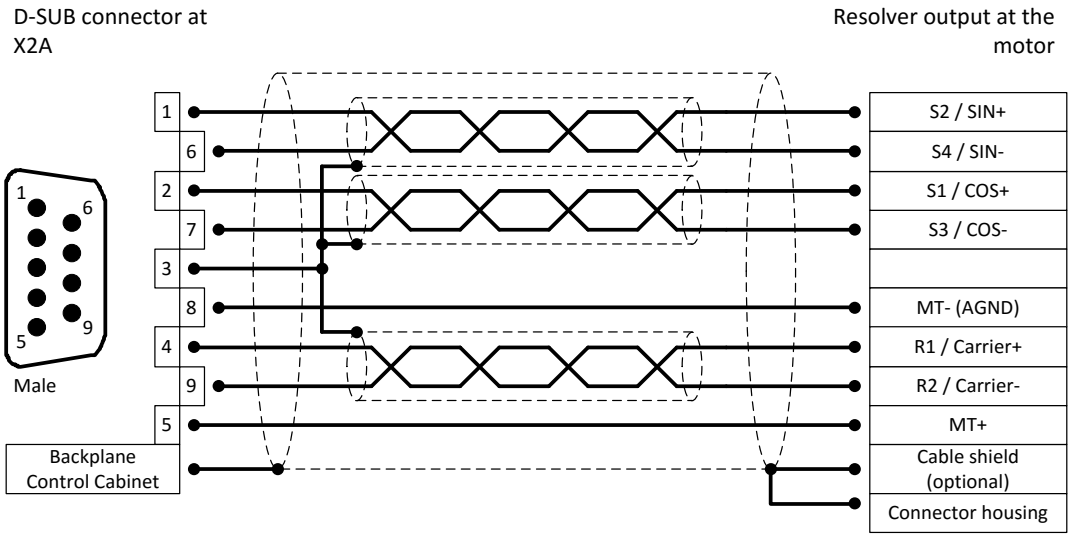


Figure 25: Pin assignment: Resolver connection [X2A]

- The outer shield is always connected to PE (connector housing) on the servo drive.
- The three inner shields are connected on one side of the servo drive ARS 2300 FS to Pin 3 of [X2A].

Mating plug X2A

INFORMATION	
Mating plug	**ARS 2320/40/60W FS**
X2A	D-SUB connector, 9-pin type, male Housing for a 9-pin D-SUB connector with locking screws of type 4/40 UNC

Recommended cable type or comparable:

- LAPP KABEL ÖLFLEX SERVO 720 CY; 3 x (2 x 0.14 DY) + 2 x (0.5 DY) CY; ∅ 8.5 mm, with tinned CU overall shielding, error during the angle measurement up to approx. 1.5° with a cable length of 50 m

  Use 2 x (0.5 DY) for the resolver carrier!

For highly flexible applications:

- LAPP KABEL ÖLFLEX SERVO FD 770 CP; 3 x (2 x 0.14 D12Y) + 2 x (0.5 D12Y) CP; ∅ 8.3 mm, with tinned CU overall shielding, error during the angle measurement up to approx. 1.5° with a cable length of 50 m

  Use 2 x (0.5 D12Y) for the resolver carrier!

8.7 Encoder [X2B]

At the 15-pole D-Sub connection [X2B], motors with encoder can be fed back. The possible incremental encoders for the encoder connection are divided into several groups. The universal encoder input [X2B] can be used for one of the described encoder types.

- Analog incremental encoder
- Incremental encoder with serial communication interface (for example EnDat, HIPERFACE)
- Digital incremental encoder

CAUTION!

In case of wrong activated voltage supply, the encoder can be destroyed!

Make sure the correct supply voltage is activated, before connected to [X2B]. Therefore, start the parameterization software *Metronix ServoCommander®* and select *Parameters / Device parameters / Angle encoder settings*.

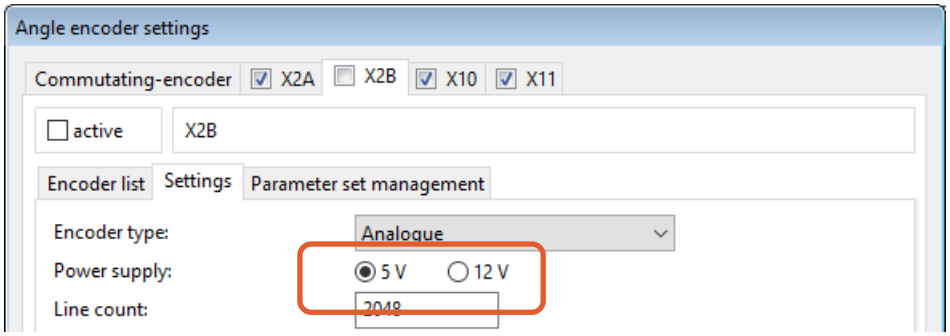


Figure 26: Metronix ServoCommander®: Angle encoder settings [X2B]

Pin assignment X2B Analog incremental encoder

Pin No.		Denomination	Value	Specification
1		MT+	+ 3.3 V / Ri = 2 kΩ	Motor temperature sensor, normally closed contact, PTC, NTC, KTY...
	9	U_SENS+	5 V ... 12 V $R_I \approx 1$ kΩ	Sensor input for encoder supply
2		U_SENS-		
	10	US	5 V / 12 V / ± 10% I_{max} = 300 mA	Supply voltage
3		GND / MT-	0 V	Reference potential Supply voltage and motor temperature sensor
	11	R	0.2 V_{pp} … 0.8 V_{pp} RI ≈ 120 Ω	Reset pulse trace signal (differential) from high-resolution incremental encoder
4		#R		
	12	COS_Z1 / D	1 V_{pp} / ± 10% RI ≈ 120 Ω	COSINE commutation signal (differential) from high-resolution incremental encoder
5		#COS_Z1 / #D		
	13	SIN_Z1 / C	1 V_{pp} / ± 10% RI ≈ 120 Ω	SINE commutation signal (differential) from high-resolution incremental encoder
6		#SIN_Z1 / #C		
	14	COS_Z0 / B	1 V_{pp} / ± 10% RI ≈ 120 Ω	COSINE trace signal (differential) from high-resolution incremental encoder
7		#COS_Z0 / #B		
	15	SIN_Z0 / A	1 V_{pp} / ± 10% RI ≈ 120 Ω	SINE trace signal (differential) from high-resolution incremental encoder
8		#SIN_Z0 / #A		

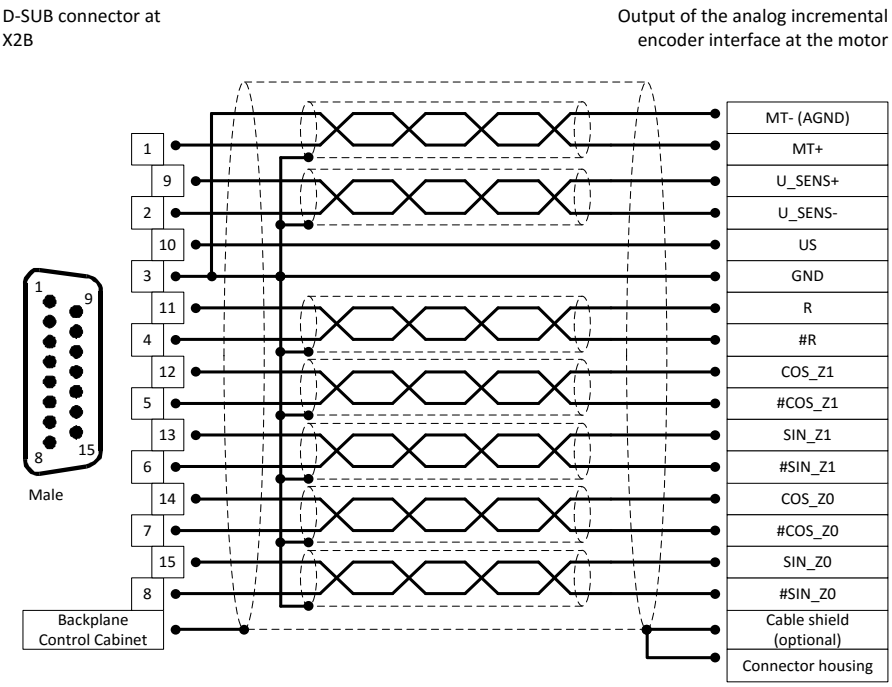


Figure 27: Pin assignment: Analog incremental encoder [X2B]

Pin assignment X2B Incremental encoder with serial communication interface

Pin No.		Denomination	Value	Specification
1		MT+	+ 3.3 V / Ri = 2 kΩ	Motor temperature sensor, normally closed contact, PTC, NTC, KTY...
	9	U_SENS+	5 V ... 12 V $R_I \approx 1$ kΩ	Sensor input for encoder supply
2		U_SENS-		
	10	US	5V / 12 V / ± 10% I_{max} = 300 mA	Supply voltage
3		GND / MT-	0 V	Reference potential Supply voltage and motor temperature sensor
	11	n.c.		
4		n.c.		
	12	DATA / SL+	5 V_{pp} RI ≈ 120 Ω	Bidirectional RS485 data line (differential) (EnDat / HIPERFACE / BiSS)
5		#DATA / SL-		
	13	SCLK / MA+	5 V_{pp} RI ≈ 120 Ω	Clock output RS485 (differential) (EnDat, BiSS)
6		#SCLK / MA-		
	14	COS_Z0 / B	1 V_{pp} / ± 10% RI ≈ 120 Ω	COSINE trace signal (differential) from high-resolution incremental encoder
7		#COS_Z0 / #B		
	15	SIN_Z0 / A	1 V_{pp} / ± 10% RI ≈ 120 Ω	SINE trace signal (differential) from high-resolution incremental encoder
8		#SIN_Z0 / #A		

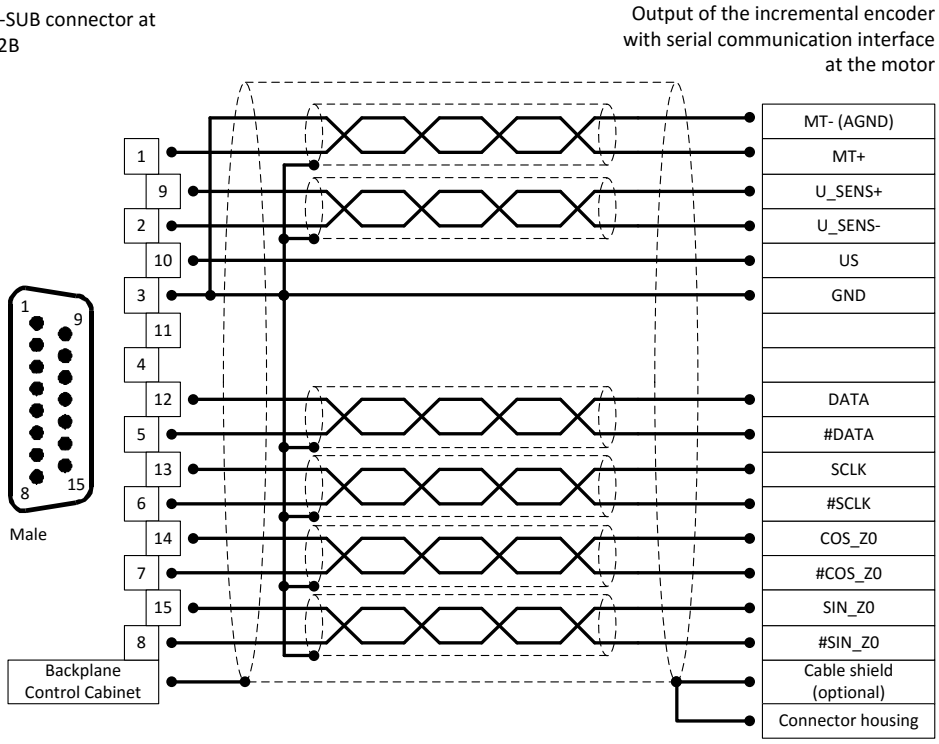


Figure 28: Pin assignment: Incremental encoder with serial communication interface (for example EnDat, HIPERFACE, BiSS) [X2B]

Pin assignment X2B Digital incremental encoder

Pin No.		Denomination	Value	Specification
1		MT+	+ 3.3 V / Ri = 2 kΩ	Motor temperature sensor, normally closed contact, PTC, NTC, KTY...
	9	U_SENS+	5 V ... 12 V $R_I \approx 1$ kΩ	Sensor input for encoder supply
2		U_SENS-		
	10	US	5 V / 12 V / ± 10% I_{max} = 300 mA	Supply voltage
3		GND / MT-	0 V	Reference potential Supply voltage and motor temperature sensor
	11	N	2 V_{pp} … 5 V_{pp} RI ≈ 120 Ω	Reset pulse trace signal (differential) from high-resolution incremental encoder
4		#N		
	12	H_U	0 V / 5 V RI ≈ 2 kΩ on VCC	Phase U hall sensor for commutation
5		H_V		Phase V hall sensor for commutation
	13	H_W		Phase W hall sensor for commutation
6		n.c.		
	14	A	2 V_{pp} … 5 V_{pp} RI ≈ 120 Ω	A trace signal (differential) from digital incremental encoder
7		#A		
	15	B	2 V_{pp} … 5 V_{pp} RI ≈ 120 Ω	B trace signal (differential) from digital incremental encoder
8		#B		

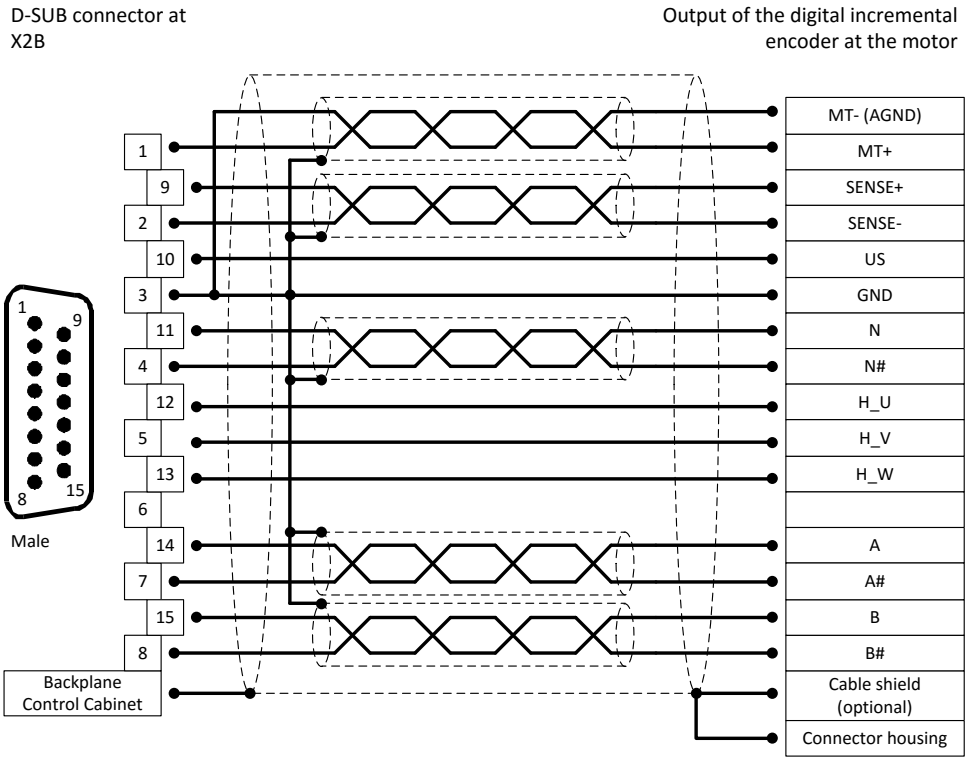


Figure 29: Pin assignment: Digital incremental encoder [X2B]

Mating plug X2B

INFORMATION	
Mating plug	**ARS 2320/40/60W FS**
X2B	D-SUB connector, 15-pin type, male Housing for a 15-pin D-SUB connector with locking screws of type 4/40 UNC

Recommended cable type:

We recommend using the encoder connecting cables that have been approved for the product in question by the corresponding manufacturer (Heidenhain, Sick-Stegmann, etc.). If the manufacturer does not recommend a particular cable, we recommend configuring the encoder connecting cables as described.

INFORMATION

For the angle encoder supply US and GND, we recommend a minimum cross-section of 0.25 mm² for an angle encoder cable length up to 25 m, and a minimum cross-section of 0.5 mm² for an angle encoder cable length up to 50 m.

8.8 CAN [X4]

Pin assignment X4 CAN

Pin No.		Denomination	Values	Specification
1		-	-	Not occupied
	6	GND	0V	CAN-GND, galvanically connected to GND in servo drive
2		CANL	*)	CAN-Low signal line
	7	CANH	*)	CAN-High signal line
3		GND	0V	See Pin no. 6
	8	-	-	Not occupied
4		-	-	Not occupied
	9	-	-	Not occupied
5		Cable shield	PE	Connection for cable shield

*) An external terminating resistor of 120 Ω is required on both ends of the bus.
If the bus ends are not formed by ARS 2300 FS servo drive with integrated terminating resistors, we recommend using metal film resistors with a 1% tolerance of type 0207.

INFORMATION

When cabling the servo drives via the CAN bus, comply with the following information and notes in order to ensure a stable and interference-free system. Improper cabling may cause the CAN bus to malfunction which, in turn, will cause the controller to shut down with an error for safety reasons.

The CAN bus provides an easy and fail-safe way of connecting all of the components of a system. However, this requires compliance with the following cabling instructions.

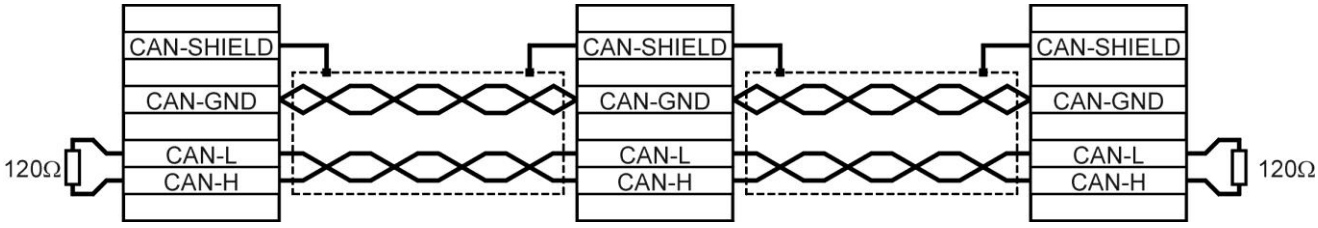


Figure 30: CAN bus cabling example

- The individual nodes of the network are always connected in line so that the CAN cable is looped through from controller to controller.
- A terminating resistor of 120 Ω must be present on both ends of the CAN bus cable. The ARS 2300 FS servo drive is equipped with an integrated terminating resistor that can be activated/deactivated via the DIP switch "CAN TERM" on the front panel.
- **Shielded** cables with exactly two **twisted** pairs must be used for cabling.
- Use one twisted pair to connect CAN-H and CAN-L.
- The cores of the other pair are used **jointly** for CAN-GND.
- The shield of the cable is connected to the CAN shield connectors for all nodes.
- We advise against the use of plug adaptors for cabling the CAN bus. However, if this is necessary, use metal connector housings for connecting the cable shield.

In order to keep interferences as low as possible ensure that

- the motor cables are not installed parallel to signal lines
- the motor cables comply with the Metronix specification
- the motor cables are properly shielded and earthed (grounded)

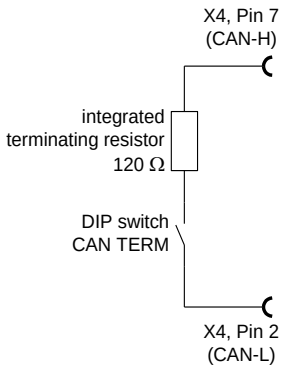


Figure 31: Integrated CAN terminating resistor

Mating plug X4

INFORMATION

Mating plug	ARS 2320/40/60W FS
X2B	D-SUB connector, 9-pin type, female Housing for a 9-pin D-SUB connector with locking screws of type 4/40 UNC

Recommended cable type or comparable:

INFORMATION
Technical data of the CAN bus cable: 2 pairs of 2 twisted cores, d ≥ 0.22 mm^2, shielded, loop resistance < 0.2 Ω/m, wave impedance 100-120 Ω.

- LAPP KABEL UNITRONIC BUS CAN; 2 x 2 x 0.22; ∅ 7.6 mm, with CU overall shielding

For highly flexible applications:

- LAPP KABEL UNITRONIC BUS CAN FD P; 2 x 2 x 0.25; ∅ 8.4 mm, with CU overall shielding

8.9 RS232 [X5]

Pin assignment X5 RS232

Pin No.		Denomination	Values	Specification
1		-	-	Not occupied
	6	-	-	Not occupied
2		RxD	10 V / R_I > 2kΩ	Receive line, RS232 specification
	7	-	-	Not occupied
3		TxD	10 V / R_A < 2kΩ	Transmitting line, RS232 specification
	8	-	-	Not occupied
4		+RS485	-	Reserve for option RS485 Interface
	9	-RS485	-	Reserve for option RS485 Interface
5		GND	0V	Interfaces GND, galvanically connected to DGND

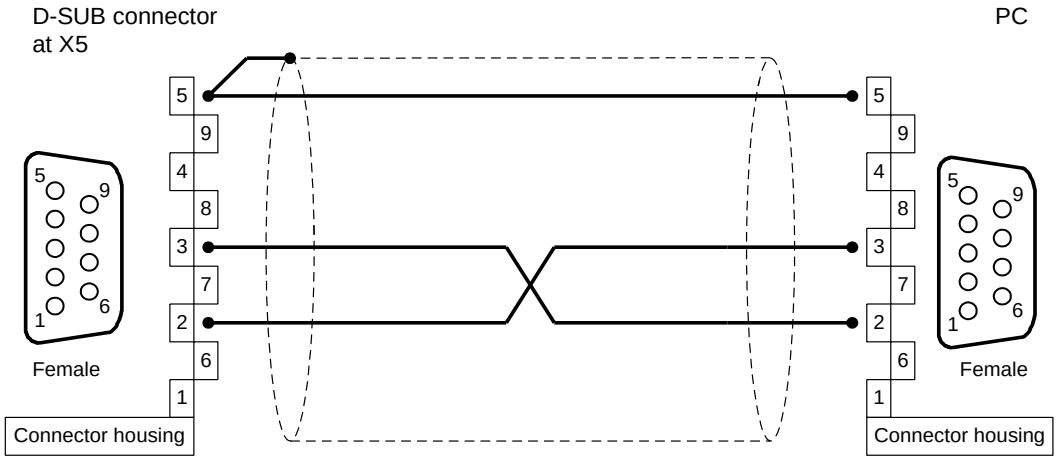


Figure 32: RS232 cabling example

Mating plug X5

INFORMATION	
Mating plug	**ARS 2320/40/60W FS**
X5	D-SUB connector, 9-pin type, female Housing for a 9-pin D-SUB connector with locking screws of type 4/40 UNC

Recommended cable type or comparable:

- Interface cable for the serial interface (null modem), 3 cores

8.10 Incremental Encoder Input [X10]

Pin assignment X10 Incremental Encoder Input

Pin No.		Denomination	Values	Specification
1		A / CLK	5V / $R_I \approx 120\Omega$	Incremental encoder signal A / Stepper motor signal CLK positive polarity as per RS422
	6	A# / CLK#	5V / $R_I \approx 120\Omega$	Incremental encoder signal A# / Stepper motor signal CLK negative polarity as per RS422
2		B / DIR	5V / $R_I \approx 120\Omega$	Incremental encoder signal B / Stepper motor signal DIR positive polarity as per RS422
	7	B# / DIR#	5V / $R_I \approx 120\Omega$	Incremental encoder signal B# / Stepper motor signal DIR negative polarity as per RS422
3		N	5V / $R_I \approx 120\Omega$	Incremental encoder index pulse N positive polarity as per RS422
	8	N#	5V / $R_I \approx 120\Omega$	Incremental encoder index pulse N# negative polarity as per RS422
4		GND	-	Reference GND for encoder
	9	GND	-	Shield for the connection cable
5		VCC	+5V / ±5% 100mA	Auxiliary supply (short circuit-proof), load with 100mA maximum

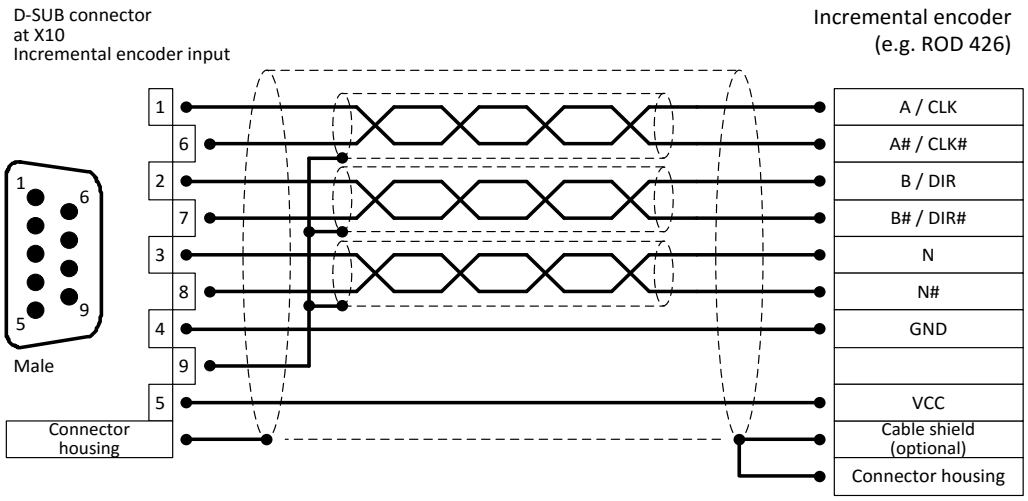


Figure 33: Pin assignment: Incremental encoder input [X10]

Input [X10] can be used to process incremental encoder signals and pulse direction signals like the ones generated by the control boards for stepper motors.
The input amplifier at the signal input is designed to process differential signals in accordance with the RS422 interface standard. Processing of other signals and levels (e.g. 5 V single-ended or 24 V_{HTL} of a PLC) may also be possible. Please contact your sales partner.

Mating plug X10

INFORMATION	
Mating plug	**ARS 2320/40/60W FS**
X10	D-SUB connector, 9-pin type, male Housing for a 9-pin D-SUB connector with locking screws of type 4/40 UNC

Recommended cable type or comparable:

- We recommend using encoder connecting cables in which the incremental encoder signals are twisted in pairs and the individual pairs are shielded.

8.11 Incremental Encoder Output [X11]

Pin assignment X11 Incremental Encoder Output

Pin No.		Denomination	Values	Specification
1		A	5V / $R_A \approx 66\Omega$ *)	Incremental encoder signal A
	6	A#	5V / $R_A \approx 66\Omega$ *)	Incremental encoder signal A#
2		B	5V / $R_A \approx 66\Omega$ *)	Incremental encoder signal B
	7	B#	5V / $R_A \approx 66\Omega$ *)	Incremental encoder signal B#
3		N	5V / $R_A \approx 66\Omega$ *)	Incremental encoder index pulse N
	8	N#	5V / $R_A \approx 66\Omega$ *)	Incremental encoder index pulse N#
4		GND	-	Reference GND for encoder
	9	GND	-	Shield for connection cable
5		VCC	+5V / ±5% 100mA	Auxiliary supply (short-circuit-proof), load with 100mA maximum

*) The value for R_A is the differential output resistance

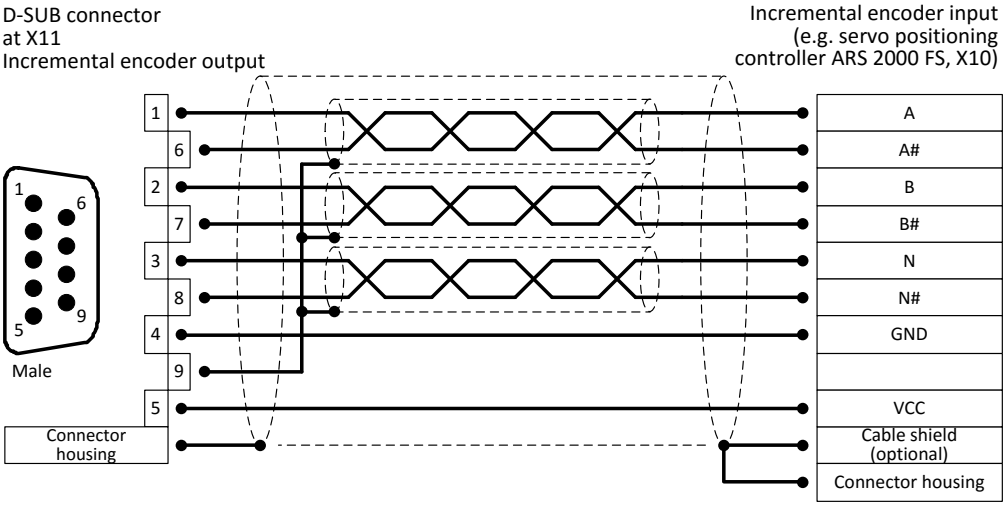


Figure 34: Pin assignment: Incremental encoder output [X11]

The output driver at the signal output provides differential signals (5 V) as per the RS422 interface standard. Up to 32 additional servo controllers can be controlled by one device.

Mating plug X11

INFORMATION	
Mating plug	**ARS 2320/40/60W FS**
X11	D-SUB connector, 9-pin type, male Housing for a 9-pin D-SUB connector with locking screws of type 4/40 UNC

Recommended cable type or comparable:

- We recommend using encoder connecting cables in which the incremental encoder signals are twisted in pairs and the individual pairs are shielded.

8.12 Ethernet communication [X18]

The ARS 2300 FS servo drive comprises a Ethernet communication interface, which is for connection via PC and for using the parameterisation tool Metronix ServoCommander®

Pin assignment X18 Ethernet

Pin No.	Specification	
1	Transmission signal + (TX+)	Pair 3
2	Transmission signal- (TX-)	Pair 3
3	Receiver signal + (RX+)	Pair 2
4	nc	Pair 1
5	nc	Pair 1
6	Receiver signal- (RX-)	Pair 2
7	nc	Pair 4
8	nc	Pair 4

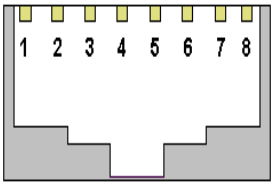


Figure 35: Pin assignment: Ethernet interface [X18]

Mating plug X18

INFORMATION	
Mating plug	**ARS 2320/40/60W FS**
X18	RJ45 connector

Recommended cable type or comparable:

- Cat.6 Patchkabel RJ45 LAN Kabel S-FTP/PIMF

8.13 USB communication [X19]

The ARS 2300 FS servo drive comprises a USB (universal serial bus) communication interface, which is for connection via PC and for using the parameterisation tool Metronix ServoCommander®

The USB communication interface requires no auxiliary power supply.

For the correct operation is a short USB cable (<3m) and a correct installation and earthing the servo drive required. Should it nevertheless gets problems with hanging communication by strong disturbances, the USB plug can briefly deducted to rebuild the communication.

INFORMATION
In the case of non-EMC-compliant wiring of servo drive and motor, it can lead to balancing currents via the connected computer and the USB interface. This can lead to problems with the communication. To avoid this, we recommend the use of the galvanically isolated USB adapter "Delock USB Isolator" (Type 62588 from Delock) or one comparable adapter.

Pin assignment X19 USB

Pin No.	Specification	
1		
2	D-	Data -
3	D+	Data +
4	GND	GND

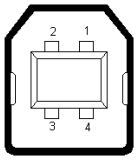


Figure 36: Pin assignment: USB interface [X19]

Mating plug X19

INFORMATION	
Mating plug	**ARS 2320/40/60W FS**
X19	USB-connector (male), type B

Recommended cable type or comparable:

- Interface cable for the USB interface, 4 cores, shielded and twisted. In order to set up a USB connection, it is mandatory to use a twisted and shielded (4-core) cable since, otherwise, the transmission may be subject to interferences. In addition, it must be ensured that the cable has a wave impedance of 90 Ω.

8.14 SD/SDHC/MMC card slot

The ARS 2300 FS servo drive comprises a SD-Card slot for the support of Firmware downloads and uploads and downloads of parameter sets.

Pin assignment SD card

Pin No.	Name	SD mode	SPI mode
1	DATA3/CS	Data line 3 (bit 3)	Chip select
2	CMD/DI	Command/response	Host to card commands and data
3	Vss1	Supply voltage earth (ground)	Supply voltage earth (ground)
4	Vcc	Supply voltage	Supply voltage
5	CLK	Clock	Clock
6	Vss2	Supply voltage earth (ground)	Supply voltage earth (ground)
7	DAT0/DO	Data line 0 (bit 0)	Card to host data and status
8	DAT1	Data line 1 (bit 1)	Reserved
9	DAT2	Data line 2 (bit 2)	Reserved

SD-Card slot

Technical data	
Card types	SD/SDHC/MMC
File systems	FAT16 and FAT32
Functions	Load a parameter set (DCO file), save the current parameter set (DCO file), load a firmware file
File names	Only file and directory names according to the 8.3 standard are supported.

INFORMATION

8.3 file and directory names have a maximum of eight characters (letters or numbers) followed by a full stop/period (".") and an extension with a maximum of three characters. In addition, only upper-case letters and numbers are permissible in the file and directory names.

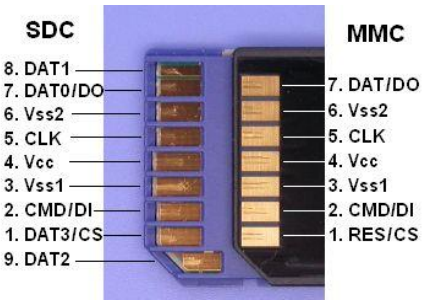


Figure 37: Pin assignment: SD card

8.14.1 BOOT-DIP-Switch

During a restart/reset, the BOOT-DIP-Switch is used to determine whether to perform a firmware download from the SD-/MMC-Card or not. The position of the switch is shown in *Figure 6*.

- BOOT-DIP-Switch in position “ON” → firmware download requested
- BOOT-DIP-Switch in position “OFF” → firmware download not requested

If there is no SD-/MMC-Card in the card slot of the servo drive and the BOOT-DIP-Switch is in the position “ON” (firmware download requested), the error 29-0 is triggered after a restart/reset.
This error stops all further performances. This means that there is no communication possible via USB.

9 Additional requirements for the servo drives concerning the UL approval

This chapter gives further information concerning the UL approval.

9.1 Circuit protection

INFORMATION

In case of a required UL-certification the following data for the main fuse are to be considered:
ARS 2320 FS: Listed Circuit Breaker according to UL 489, rated 480Y/277 Vac, 25 A, SCR 10 kA
ARS 2340 FS and ARS 2320W FS: Listed Circuit Breaker according to UL 489, rated 480Y/277 Vac, 40 A,
SCR 10 kA

9.2 Wiring and environment regards

- Use 60/75 or 75°C copper (CU) wire only.
- To be used in a Pollution Degree 2 environment only.

9.3 Motor temperature sensor

INFORMATION

Motor overtemperature sensing is not provided by the drive according to UL.

When a UL-certification is required, then in order to prevent motor overtemperatures the servo drives may only be operated in connection with motors that are provided with an integrated motor temperature sensor. The sensor has to be connected to the servo drive and the temperature monitoring has to be activated accordingly on the software side.

10 Start-up

Please see documentation of the servo drives ARS 2302 FS – ARS 2310 FS.

11 Service functions and error messages

Please see documentation of the servo drives ARS 2302 FS – ARS 2310 FS.

12 Technology modules

Please see documentation of the servo drives ARS 2302 FS – ARS 2310 FS.

13 Appendix

13.1 CE conformity according EMC- , Low voltage and RoHS directive

CE

metronix
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04/2019

EU Konformitätserklärung | **EU Declaration of Conformity**

Metronix Meßgeräte und Elektronik GmbH, Kocherstrasse 3, 38120 Braunschweig GERMANY

erklärt hiermit in alleiniger Verantwortung, dass die Servoregler	hereby declares under sole responsibility that the Servo drives

ARS 2320 FS
ARS 2340 FS
ARS 2360W FS

konform sind mit den Vorschriften der folgenden Richtlinien und Normen:	comply with the following directives and standards:
Niederspannungsrichtlinie 2014/35/EU	**Low Voltage Directive** 2014/35/EU
Angewandte harmonisierte Normen: **EN 61800-5-1:2007 + A1:2017**	Applied harmonized standards: **EN 61800-5-1:2007 + A1:2017**
EMV-Richtlinie 2014/30/EU	**EMC Directive** 2014/30/EU
Angewandte harmonisierte Normen: **EN 61800-3:2004 + A1:2012**	Applied harmonized standards: **EN 61800-3:2004 + A1:2012**
RoHS2 Richtlinie 2011/65/EU	**RoHS2 Directive** 2011/65/EU
Angewandte harmonisierte Normen: **EN 50581:2012**	Applied harmonized standards: **EN 50581:2012**
Weitere angewandte nicht harmonisierte Normen oder sonstige Spezifikationen: **keine**	**More applied non-harmonized standards or specifications:** **none**
Besondere Bedingungen: Die aufgeführten Geräte sind im Sinne der EMV-Richtlinie keine eigenständig betreibbaren Produkte. Die Einhaltung der Richtlinie setzt den korrekten Einbau der Produkte, die Beachtung der spezifischen Installationshinweise und der Produktdokumentation voraus. Dies wurde an bestimmten Anlagenkonfigurationen nachgewiesen.	**Specific Requirements:** According to the EMC Directive, the listed devices are not independently operable products. Compliance of the directive requires the correct installation of the product, the observance of the specific installation notes and product documentation. This was tested in specific system configurations.
Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.	This declaration certifies compliance with the stated Directive, but implies no warranty of properties.
Die Sicherheits- und Installationshinweise der Produktdokumentation sind zu beachten.	The safety and installation instructions of the product documentation are to be considered

Ort / Place: Braunschweig

Datum / Date: 02.09.2019

General Manager

Unterschrift / Signature:

Walter Wehmeyer

FM 7.3.3-4 Vers. 1.2

13.2 CE conformity according Machinery directive – MOV

CE

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05/2019

EG Konformitätserklärung

EC Declaration of Conformity

Metronix Meßgeräte und Elektronik GmbH, Kocherstrasse 3, 38120 Braunschweig GERMANY

erklärt hiermit in alleiniger Verantwortung, dass das Sicherheitsmodul

hereby declares under sole responsibility that the safety module

FSM 2.0 – MOV

in Verbindung mit den Servoreglern

ARS 2102 FS,
ARS 2105 FS,
ARS 2108 FS,
ARS 2320 FS,
ARS 2360W FS
ARS 2302 FS,
ARS 2305 FS,
ARS 2310 FS,
ARS 2340 FS,

und dem Parametriertool

Metronix SafetyTool

FSM 2.0 – MOV

in connection with the servo drives

ARS 2102 FS,
ARS 2105 FS,
ARS 2108 FS,
ARS 2320 FS,
ARS 2360W FS
ARS 2302 FS,
ARS 2305 FS,
ARS 2310 FS,
ARS 2340 FS,

and the configuration tool

Metronix SafetyTool

konform ist mit den Vorschriften der folgenden Richtlinien und Normen:

complies with the following directives and standards:

Maschinenrichtlinie
2006/42/EG

Angewandte harmonisierte Normen:

EN 61800-5-2:2017
max. SIL 3
(Sicherheitsfunktionen siehe Betriebsanleitung)

EN 61800-5-1:2007 + A1:2017 (in Auszügen)

EN 61800-3:2018

EN 62061:2005 + AC:2010 + A1:2013 + A2:2015
max. SIL CL 3
(Sicherheitsfunktionen siehe Betriebsanleitung)

EN ISO 13849-1:2015
max. Kategorie 4
PL e
(Sicherheitsfunktionen siehe Betriebsanleitung)

IEC 61508 Teil 1-7:2010
max. SIL 3
(Sicherheitsfunktionen siehe Betriebsanleitung)

Machinery Directive
2006/42/EC

Applied harmonized standards:

EN 61800-5-2:2007
max. SIL 3
(safety functions see manual)

EN 61800-5-1:2007 + A1:2017 (in extracts)

EN 61800-3:2018

EN 62061:2005 + AC:2010 + A1:2013 + A2:2015
max. SIL CL 3
(safety functions see manual)

EN ISO 13849-1:2015
max. Category 4
PL e
(safety functions see manual)

IEC 61508 Parts 1-7:2010
max. SIL 3
(safety functions see manual)

Konformitätsbewertung

Das bezeichnete Produkt verfügt über die integrierten Sicherheitsfunktionen STO, SLS, SOS, SSR, SBC, SS1 und SS2. Es wird bestätigt, dass der Prüfgegenstand mit den Anforderungen nach Anhang I der Richtlinie 2006/42/EG über Maschinen übereinstimmt.

Benannte Stelle

TÜV Rheinland Industrie Service GmbH
Certification Body for Machinery, NB 0035
Alboinstrasse 56
12103 Berlin / Germany

Zertifikat:

01/205/5058.02/19

Gültigkeit

24.07.2024

Conformity Assessment

The designated product offers the integrated safety functions STO, SLS, SOS, SSR, SBC, SS1 and SS2. It is confirmed, that the product under test complies with the requirements for machines defined in Annex I of the EC Directive 2006/42/EC.

notified body

TÜV Rheinland Industrie Service GmbH
Certification Body for Machinery, NB 0035
Alboinstrasse 56
12103 Berlin / Germany

Certificate:

01/205/5058.02/19

Date of expiry

2024-07-24

FM 7.3.3-5 Vers. 2.0 (1/2)

CE

metronix
A company of Apex Tool Group, LLC.

05/2019

Weitere angewandte nicht harmonisierte Normen oder sonstige Spezifikationen:

keine

Besondere Bedingungen:

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.

Die Sicherheits- und Installationshinweise der Produktdokumentation sind zu beachten.

Die Produkte sind bestimmt zum Einbau in Maschinen. Die Inbetriebnahme ist solange untersagt bis festgestellt wurde, dass die Maschine, in welche diese Produkte eingebaut werden sollen, den Bestimmungen der o.g. EG Richtlinie entsprechen.

More applied non-harmonized standards or specifications:

none

Specific Requirements:

This declaration certifies compliance with the stated Directive, but implies no warranty of properties.

The safety and installation instructions of the product documentation are to be considered

These products are intended for installation in machines. Operation is prohibited until it has been determined that the machines in which these products are to be installed, conforms to the above mentioned EC Directive.

Ort / Place: Braunschweig

Datum / Date: 14. 10. 2019

General Manager

Unterschrift / Signature:

Walter Wehmeyer

FM 7.3.3-5 Vers. 2.0 (2/2)

13.3 CE conformity according Machinery directive – STO

CE

metronix
A company of Apex Tool Group, LLC.

06/2019

EG Konformitätserklärung

EC Declaration of Conformity

Metronix Meßgeräte und Elektronik GmbH, Kocherstrasse 3, 38120 Braunschweig GERMANY

erklärt hiermit in alleiniger Verantwortung, dass das Sicherheitsmodul

hereby declares under sole responsibility that the safety module

FSM 2.0 – STO

in Verbindung mit den Servoreglern

ARS 2102 FS,
ARS 2105 FS,
ARS 2108 FS,
ARS 2320 FS,
ARS 2360W FS
ARS 2302 FS,
ARS 2305 FS,
ARS 2310 FS,
ARS 2340 FS,

und dem Parametriertool

Metronix SafetyTool

FSM 2.0 – STO

in connection with the servo drives

ARS 2102 FS,
ARS 2105 FS,
ARS 2108 FS,
ARS 2320 FS,
ARS 2360W FS
ARS 2302 FS,
ARS 2305 FS,
ARS 2310 FS,
ARS 2340 FS,

and the configuration tool

Metronix SafetyTool

konform ist mit den Vorschriften der folgenden Richtlinien und Normen:

complies with the following directives and standards:

Maschinenrichtlinie
2006/42/EG

Angewandte harmonisierte Normen:

EN 61800-5-2:2017
max. SIL 3
(Sicherheitsfunktionen siehe Betriebsanleitung)

EN 61800-5-1:2007 + A1:2017 (in Auszügen)

EN 61800-3:2018

EN 62061:2005 + AC:2010 + A1:2013 + A2:2015
max. SIL CL 3
(Sicherheitsfunktionen siehe Betriebsanleitung)

EN ISO 13849-1:2015
max. Kategorie 4
PL e
(Sicherheitsfunktionen siehe Betriebsanleitung)

IEC 61508 Teil 1-7:2010
max. SIL 3
(Sicherheitsfunktionen siehe Betriebsanleitung)

Machinery Directive
2006/42/EC

Applied harmonized standards:

EN 61800-5-2:2007
max. SIL 3
(safety functions see manual)

EN 61800-5-1:2007 + A1:2017 (in extracts)

EN 61800-3:2018

EN 62061:2005 + AC:2010 + A1:2013 + A2:2015
max. SIL CL 3
(safety functions see manual)

EN ISO 13849-1:2015
max. Category 4
PL e
(safety functions see manual)

IEC 61508 Parts 1-7:2010
max. SIL 3
(safety functions see manual)

Konformitätsbewertung

Das bezeichnete Produkt verfügt über die integrierte Sicherheitsfunktionen STO. Es wird bestätigt, dass der Prüfgegenstand mit den Anforderungen nach Anhang I der Richtlinie 2006/42/EG über Maschinen übereinstimmt.

Benannte Stelle

TÜV Rheinland Industrie Service GmbH
Certification Body for Machinery, NB 0035
Alboinstrasse 56
12103 Berlin / Germany

Zertifikat:

01/205/5058.02/19

Gültigkeit

24.07.2024

Conformity Assessment

The designated product offers the integrated safety function STO. It is confirmed, that the product under test complies with the requirements for machines defined in Annex I of the EC Directive 2006/42/EC.

notified body

TÜV Rheinland Industrie Service GmbH
Certification Body for Machinery, NB 0035
Alboinstrasse 56
12103 Berlin / Germany

Certificate:

01/205/5058.09/19

Date of expiry

2024-07-24

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(1/2)

CE

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A company of Apex Tool Group, LLC.

06/2019

Weitere angewandte nicht harmonisierte Normen oder sonstige Spezifikationen:

keine

Besondere Bedingungen:

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.

Die Sicherheits- und Installationshinweise der Produktdokumentation sind zu beachten.

Die Produkte sind bestimmt zum Einbau in Maschinen. Die Inbetriebnahme ist solange untersagt bis festgestellt wurde, dass die Maschine, in welche diese Produkte eingebaut werden sollen, den Bestimmungen der o.g. EG Richtlinie entsprechen.

More applied non-harmonized standards or specifications:

none

Specific Requirements:

This declaration certifies compliance with the stated Directive, but implies no warranty of properties.

The safety and installation instructions of the product documentation are to be considered

These products are intended for installation in machines. Operation is prohibited until it has been determined that the machines in which these products are to be installed, conforms to the above mentioned EC Directive.

Ort / Place: Braunschweig

Datum / Date: 16.10.2019

General Manager

Unterschrift / Signature:

Walter Wehmeyer

FM 7.3.3-5 Vers. 2.0

(2/2)

13.4 cULus certification

on request