

SM560-S

ABB

WR   
IAG   
RUN   
ERR   
ERR

1 2 3 4 5 6 7 8 9  
0 F E D C B A ADDR x10H  
1 2 3 4 5 6 7 8 9  
0 F E D C B A ADDR x01H

SYS  
BATT  
I/O-Bus

run

ETH  
FBP  
COM  
COM

PWR



RUN



ERR



  
**WARNING**  
Use of  
incorrect  
battery may  
cause fire or  
explosion.

RUN  
DIAG  
VAL  
CFG  
ESC  
↑  
OK  
↓

MC  
502

UP 24VDC 10W

# AC500-S

## Key features



Easy integration: Simple extension of ABB PLC with safety functions. One common engineering and diagnostic system for safety and standard CPUs. Extreme conditions (-XC) version is available.

Easy implementation of flexible configuration concept (one safety program for various machine types). Safety CPU can be configured to work even if standard CPU is in STOP mode.

Automation Builder productivity suite providing integrated support of ST, Ladder (LD) and Function Block Diagram (FBD) programming with a common look and feel. Trigonometric functions are supported for easy implementation of complex calculation tasks.

Both simple and complex safety functions can be easily implemented:

- Safely limited acceleration
- Safely limited deceleration
- Safely limited force
- Safely limited orientation
- Safely limited position
- Safely limited speed
- Safely limited torque.

PROFINET/PROFIsafe interface for decentralized safety I/Os, safe position and speed monitoring as well as triggering of safety drive functions. Configurable real-time exchange of high volume process and safety data between multiple PLC controllers using PROFINET/PROFIsafe.

## AC500-S

### Ordering data

#### Safety CPU

Description	User program memory		Type	Order code	Weight (1 pce) kg
	MB				
Safety CPU module	1		SM560-S	1SAP280000R0001	0.087
Safety CPU module with F-Device functionality for 1 PROFI-safe network	1.3		SM560-S-FD-1	1SAP286000R0001	0.087
Safety CPU module with F-Device functionality for 4 PROFI-safe networks	1.3		SM560-S-FD-4	1SAP286100R0001	0.087

#### S500 Safety I/O

Description	Input signal		Output signal SIL3	Type	Order code	Weight (1 pce) kg
	SIL2	SIL3				
Safety digital input module	16	8	-	DI581-S	1SAP284000R0001	0.122
Safety digital input / output module	8	4	8	DX581-S	1SAP284100R0001	0.130
Safety analog input module	4	2	-	AI581-S	1SAP282000R0001	0.125

#### S500 Safety terminal unit

Description	Type	Order code	Weight (1 pce) kg
Spring terminal unit for safety I/O modules	TU582-S	1SAP281200R0001	0.162

#### Software

AC500-S safety PLC programming license needs to be purchased as an additional feature of Automation Builder. For details, see ordering data of Automation Builder.



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SM560-S  
SM560-S-FD-1  
SM560-S-FD-4



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DI581-S  
DX581-S  
AI581-S



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TU582-S

#### Accessories for AC500-S

For	Description	Type	Order code	Weight (1 pce) kg
AC500-S safety PLC training case (1)	SM560-S, DI581-S, DX581-S, AI581-S, TU582-S with PM573-ETH and PNIO	TA514-SAFETY	1SAP182900R0001	10

(1) Any standard AC500 CPU (V2 or V3) can be used instead of PM573-ETH in TA514-SAFETY. They have to be ordered separately. In case of AC500 V3 CPUs, TB5620-2ETH shall be ordered as well.



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AC500-S training case

## AC500-S-XC

### Ordering data

#### Safety XC CPU

Description	User program memory		Type	Order code	Weight (1 pce) kg
	MB				
Safety CPU module	1		SM560-S-XC	1SAP380000R0001	0.089
Safety CPU module with F-Device functionality for 1 PROFI-safe network	1.3		SM560-S-FD-1-XC	1SAP386000R0001	0.089
Safety CPU module with F-Device functionality for 4 PROFI-safe networks	1.3		SM560-S-FD-4-XC	1SAP386100R0001	0.089

#### S500-XC Safety I/O

Description	Input signal		Output signal SIL3	Type	Order code	Weight (1 pce) kg
	SIL2	SIL3				
Safety digital input module	16	8	-	DI581-S-XC	1SAP484000R0001	0.123
Safety digital input / output module	8	4	8	DX581-S-XC	1SAP484100R0001	0.131
Safety analog input module	4	2	-	AI581-S-XC	1SAP482000R0001	0.126

#### S500-XC Safety terminal unit

Description	Type	Order code	Weight (1 pce) kg
Spring terminal unit for safety I/O modules	TU582-S-XC	1SAP481200R0001	0.164



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SM560-S-XC  
SM560-S-FD-1-XC  
SM560-S-FD-4-XC



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DI581-S-XC  
DX581-S-XC  
AI581-S-XC



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TU582-S-XC

## AC500-S and AC500-S-XC

### Technical data

#### Safety CPUs

Type		SM560-S / SM560-S-XC	SM560-S-FD-1 / SM560-S-FD-4 / SM560-S-FD-1-XC / SM560-S-FD-4-XC
Performance level		PL e (ISO 13849-1)	
Safety	integrity level	SIL3 (IEC 61508:2010, IEC 62061, IEC 61511)	
	protocol	PROFIsafe V2 F-Host via PROFINET	PROFIsafe V2 F-Host and F-Device (for 1 or 4 PROFIsafe networks, respectively) via PROFINET
Program memory flash EPROM and RAM		1 MB	1.3 MB
Integrated data memory		1 MB thereof 120 kB saved	1.0 MB thereof 120 kB saved
<b>Cycle time for 1 instruction</b>			
Binary		0.05 µs	
Word		0.06 µs	
Floating point		0.5 µs	
<b>Max. number of centralized inputs/outputs</b>			
Max. nb. of safety extension modules on I/O bus		10	
Digital	inputs	160 (SIL2) / 80 (SIL3)	
	outputs	80 (SIL3)	
Analog	inputs	40 (SIL2) / 20 (SIL3)	
Max. number of decentralized inputs/outputs		On PROFINET: up to 128 stations with up to 10 safety extension modules	
<b>Program execution</b>			
Cyclical		•	
User program protection by password		•	
<b>Interfaces</b>			
Ethernet		Via AC500 CPU or communication module	
COM		Via AC500 CPU	
Programming		Via AC500 CPU	
<b>Approvals</b>		CE, cUL, UL, C-Tick and other on request	

## AC500-S and AC500-S-XC

### Technical data

#### S500 and S500-XC Safety I/O

Type	DI581-S / DI581-S-XC	DX581-S / DX581-S-XC	AI581-S / AI581-S-XC
Performance Level	PL e (ISO 13849-1)		
Safety Integrity Level	SIL3 (IEC 61508:2010, IEC 62061, IEC 61511)		
Safety protocol	PROFIsafe V2 via PROFINET		
<b>Digital inputs</b>			
Number of channels per module	16 (SIL2) / 8 (SIL3)	8 (SIL2) / 4 (SIL3)	-
Input signal voltage	24 V DC	24 V DC	-
Frequency range	65 Hz	65 Hz	-
Input characteristic acc. to EN61131-2	Type 1	Type 1	-
0 signal	-3...+5 V DC	-3...+5 V DC	-
Undefined signal state	5...15 V DC	5...15 V DC	-
1 signal	15...30 V DC	15...30 V DC	-
Input time delay (0 → 1 or 1 → 0)	Input filter configurable from 1, 2, 5...500 ms	Input filter configurable from 1, 2, 5...500 ms	-
Test pulse outputs	8	4	-
<b>Input current per channel</b>			
At input voltage	24 V DC / 7 mA typically	24 V DC / 7 mA typically	-
	5 V DC / < 1 mA	5 V DC / < 1 mA	-
	15 V DC / > 4 mA	15 V DC / > 4 mA	-
	30 V DC / < 8 mA	30 V DC / < 8 mA	-
<b>Digital outputs</b>			
Number of channels per module	-	8 (SIL3)	-
Transistor outputs 24 V DC, 0.5 A	-	●	-
Transistor outputs 24 V DC, 2 A	-	● (1)	-
Switching of 24 V load	-	●	-
Safety relay outputs	-	● (2)	-
<b>Output current</b>			
Nominal current per channel	-	500 mA at UP = 24 V	-
Maximum (total current of all channels)	-	4 A / 500 mA / channel	-
Residual current at signal state 0	-	< 0.5 mA	-
Demagnetization when switching off inductive loads	-	By internal suppressor diodes	-
<b>Switching frequency</b>			
Short-circuit / overload proofness	-	●	-
For inductive load	-	On request	-
For lamp load	-	On request	-
Proofness against reverse feeding of 24 V signals	-	●	-

(1) Transistor outputs 24 V DC, 2 A. For details, please see application notes in chapter 8.

(2) Safety relay outputs using external safety relay, e.g. ABB BSR23. For details, please see application notes in chapter 8.

## AC500-S and AC500-S-XC

### Technical data

#### S500 and S500-XC Safety I/O

Type	DI581-S / DI581-S-XC	DX581-S / DX581-S-XC	AI581-S / AI581-S-XC
<b>Analog inputs</b>			
Number of channels per module	-	-	4 (SIL2) / 2 (SIL3)
Input resistance per channel	-	-	125 Ohm
Time constant of the input filter	-	-	10 ms
Conversion cycle	-	-	0.33 ms
Overvoltage protection	-	-	-
<b>Signal resolution for channel configuration</b>			
0...20 mA, 4...20 mA	-	-	14 bits
<b>Process voltage UP</b>			
Nominal voltage	24 V DC		
Maximum ripple	5 %		
Reverse polarity protection	●		
Fuse for process voltage UP	10 A miniature fuse		
Connections for sensor voltage supply	●		
Terminal 24 V and 0 V			
Conversion error of analog values caused by non-linearity, calibration errors ex and the resolution in the nominal range	-	-	±1.5 %
<b>Maximum cable length for connected process signals</b>			
Shielded cable	1000 m	1000 m	-
Unshielded cable	600 m	600 m	-
Max. line length of the analog lines, conductor cross section > 0.14 mm <sup>2</sup>	-	-	100 m
<b>Potential isolation</b>			
Per module	●		
Fieldbus connection	Via AC500 CPU or PROFINET communication module		
Voltage supply for the module	Internally via extension bus interface (I/O bus)		
<b>Approvals</b>	CE, cUL, UL, C-Tick and other on request		

## AC500-S

### System data

#### Operating and ambient conditions

<b>Voltages according to EN 61131-2</b>		
24 V DC	Process and supply voltage	24 V (-15 %, +20 %)
	Protection against reverse polarity	Yes
Allowed interruptions of power supply acc. to EN 61131-2	DC supply	Interruption < 10 ms, time between 2 interruptions > 1 s
<b>Important:</b> Exceeding the maximum process and supply voltages could lead to unrecoverable damage of the system. The system could be destroyed.		
<b>Temperature</b>		
Operating	0 °C ... +60 °C	horizontal mounting of modules
	0 °C ... +40 °C	vertical mounting of modules and output load reduced to 50 % per group
Storage / Transport	-40 °C ... +70 °C	
<b>Humidity</b>		
Operating / Storage	Max. 95 %, without condensation	
<b>Air pressure</b>		
Operating	> 800 hPa / < 2000 m	
Storage	> 660 hPa / < 3500 m	

#### Creepage distances and clearances

<b>Insulation Test Voltages, Routine Test, according to EN 61131-2</b>	<b>AC voltage during 2 seconds</b>
24 V circuits (supply, 24 V inputs/outputs), if they are electrically isolated against other circuitry	350 V

The creepage distances and clearances meet the requirements of the overvoltage category II, pollution degree 2.

## AC500-S

### System data

#### Power supply units

For the supply of the modules, power supply units according to PELV specifications must be used.

#### Electromagnetic Compatibility

Immunity		
Against electrostatic discharge (ESD)		
Electrostatic voltage in case of	air discharge	±8 kV
	contact discharge	±6 kV
ESD with communication connectors		In order to prevent operating malfunctions, it is recommended that the operating personnel discharge themselves prior to touching communication connectors or perform other suitable measures to reduce effects of electrostatic discharges.
ESD with connectors of Terminal Bases		The connectors between the Terminal Bases and CPUs or Communication Modules must not be touched during operation. The same is valid for the I/O-Bus with all modules involved.
Against the influence of radiated (CW radiated)		
Test field strength		10 V/m
Against transient interference voltages (burst)		
Supply voltage units	DC	2 kV
Digital inputs/outputs	24 V DC	2 kV
Analog inputs		1 kV
Against the influence of line-conducted interferences (CW conducted)		
Test voltage		10 V zone B
High energy surges		
Power supply	DC	1 kV CM (1) / 0.5 kV DM (2)
DC I/O supply, add. DC-supply-out		0.5 kV CM (2) / 0.5 kV DM (2)
I/O analog, I/O DC unshielded		1 kV CM (2) / 0.5 kV DM (2)
Radiation (radio disturbance)		In accordance with EN 55011, group 1, class A

(1) High requirement for shipping classes is achieved with additional specific measures (see specific documentation).

(2) CM = Common Mode; DM = Differential Mode.

#### Mechanical Data

Wiring method / terminals	
Mounting	Horizontal (DIN rail mounting)
Degree of protection	IP20
Housing	In accordance with UL 94
Vibration resistance acc. to EN 61131-2	all three axes (DIN rail mounting) 5...11.9 Hz, continuous 3.5 mm 11.9...150 Hz, continuous 1 g
Shock resistance	All three axes 15 g, 11 ms, half-sinusoidal
Mounting of the modules	
DIN rail according to DIN EN 50022	35 mm, depth 7.5 mm or 15 mm
Mounting with screws	Screws with a diameter of 4 mm
Fastening torque	1.2 Nm

## AC500-S-XC

### System data

#### Operating and ambient conditions

<b>Voltages according to EN 61131-2</b>		
24 V DC	Process and supply voltage	24 V (-15 %, +20 %)
	Protection against reverse polarity	Yes
Allowed interruptions of power supply acc. to EN 61131-2	DC supply	Interruption < 10 ms, time between 2 interruptions > 1 s
<b>Important:</b> Exceeding the maximum process and supply voltages could lead to unrecoverable damage of the system. The system could be destroyed.		
<b>Temperature</b>		
Operating	-40 °C ... +70 °C	horizontal mounting of modules
	-40 °C ... +40 °C	vertical mounting of modules and output load reduced to 50 % per group
Storage / Transport	-40 °C ... +85 °C	
<b>Humidity</b>		
Operating / Storage		Max. 100 %, with condensation
<b>Air pressure</b>		
Operating		620...1080 hPa / (-1000...4000 m) > 2000 m (< 795 hPa): max. operating temperature must be reduced by 10 °C.
Storage		> 620 hPa / < 4000 m

#### Creepage distances and clearances

<b>Insulation Test Voltages, Routine Test, according to EN 61131-2</b>	<b>AC voltage during 2 seconds</b>
24 V circuits (supply, 24 V inputs/outputs), if they are electrically isolated against other circuitry	350 V

The creepage distances and clearances meet the requirements of the overvoltage category II, pollution degree 2.

## AC500-S-XC

### System data

#### Power supply units

For the supply of the modules, power supply units according to PELV specifications must be used.

#### Electromagnetic Compatibility

Immunity		
Against electrostatic discharge (ESD)		
Electrostatic voltage in case of		In accordance with EN 61000-4-2, zone B, criterion B
	air discharge	±8 kV
	contact discharge	±6 kV
ESD with communication connectors		
		In order to prevent operating malfunctions, it is recommended that the operating personnel discharge themselves prior to touching communication connectors or perform other suitable measures to reduce effects of electrostatic discharges.
ESD with connectors of Terminal Bases		
		The connectors between the Terminal Bases and CPUs or Communication Modules must not be touched during operation. The same is valid for the I/O-Bus with all modules involved.
Against the influence of radiated (CW radiated)		
Test field strength		In accordance with EN 61000-4-3, zone B, criterion A
		10 V/m
Against transient interference voltages (burst)		
Supply voltage units		In accordance with EN 61000-4-4, zone B, criterion B
	DC	2 kV
	Digital inputs/outputs	24 V DC
	24 V DC	2 kV
	Analog inputs	1 kV
Against the influence of line-conducted interferences (CW conducted)		
Test voltage		In accordance with EN 61000-4-6, zone B, criterion A
		10 V zone B
High energy surges		
Power supply		In accordance with EN 61000-4-5, zone B, criterion B
	DC	1 kV CM (1) / 0.5 kV DM (2)
	DC I/O supply, add. DC-supply-out	0.5 kV CM (2) / 0.5 kV DM (2)
	I/O analog, I/O DC unshielded	1 kV CM (2) / 0.5 kV DM (2)
Radiation (radio disturbance)		
		In accordance with EN 55011, group 1, class A

(1) High requirement for shipping classes is achieved with additional specific measures (see specific documentation).

(2) CM = Common Mode; DM = Differential Mode.

#### Mechanical Data

Wiring method / terminals	
Mounting	Horizontal (DIN rail mounting)
Degree of protection	IP20
Housing	In accordance with UL 94
Vibration resistance acc. to EN 61131-2	all three axes (DIN rail mounting) 5...11.9 Hz, continuous 3.5 mm 11.9...150 Hz, continuous 1 g
Shock resistance	All three axes 15 g, 11 ms, half-sinusoidal
Mounting of the modules	
DIN rail according to DIN EN 50022	35 mm, depth 7.5 mm or 15 mm
Mounting with screws	Screws with a diameter of 4 mm
Fastening torque	1.2 Nm