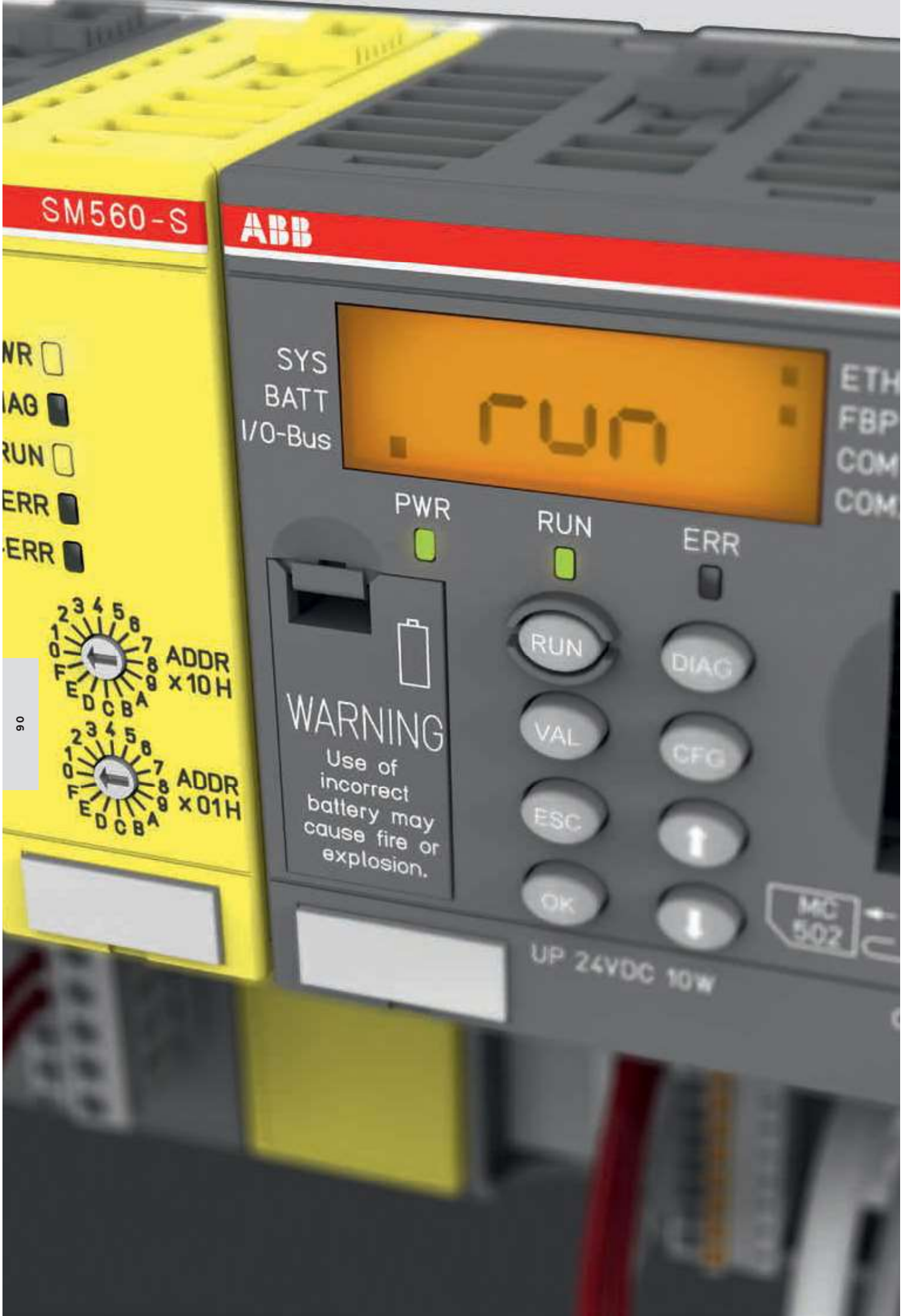
AC500-S
Functional Safety PLC


SM560-S
ABB
SYS
BATT
I/O-Bus
run
ETH
FBP
COM
COM
PWR
RUN
ERR
RUN
DIAG
VAL
CFG
ESC
OK
WARNING
Use of incorrect battery may cause fire or explosion.
ADDR x10H
ADDR x01H
MC 502
UP 24VDC 10W

AC500-S
Key features

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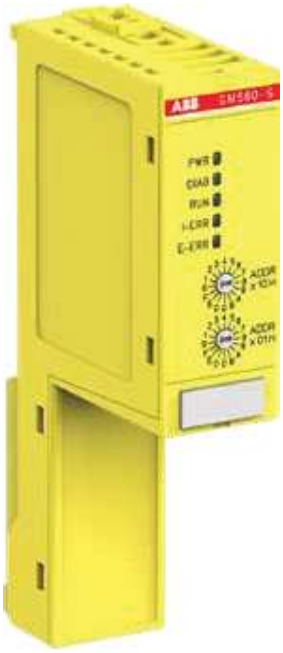
Easy integration: Simple expansion of ABB PLC with safety functions. One common engineering and diagnostic system for safety and standard CPUs. eXtreme Conditions (-XC) version is available.



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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.

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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.

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PROFINET/PROFIsafe interface for decentralized safety I/Os, safe position and speed monitoring as well as triggering of safety drive functions.

AC500-S
Ordering data

Safety CPU

Description	User program memory MB	Type	Order code	Price	Weight (1 pce) kg
Safety CPU module	1	SM560-S	1SAP280000R0001		0.100
Safety CPU module with F-Device functionality for 1 PROFIsafe network	1.3	SM560-S-FD-1	1SAP286000R0001		0.100
Safety CPU module with F-Device functionality for 4 PROFIsafe networks	1.3	SM560-S-FD-4	1SAP286100R0001		0.100

S500 Safety I/O

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

S500 Safety terminal unit

Description	Type	Order code	Price	Weight (1 pce) kg
Spring terminal unit for safety I/O modules	TU582-S	1SAP281200R0001		0.200

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	Price	Weight (1 pce) kg
AC500-S Safety PLC training case	SM560-S, DI581-S, DX581-S, AI581-S, TU582-S with PM573-ETH and PNIO	TA514-SAFETY	1SAP182900R0001		10

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AC500-S training case

AC500-S-XC

Ordering data

Safety XC CPU

Description	User program memory MB	Type	Order code	Price	Weight (1 pce) kg
Safety CPU module	1	SM560-S-XC	1SAP380000R0001		0.100
Safety CPU module with F-Device functionality for 1 PROFIsafe network	1.3	SM560-S-FD-1-XC	1SAP386000R0001		0.100
Safety CPU module with F-Device functionality for 4 PROFIsafe networks	1.3	SM560-S-FD-4-XC	1SAP386100R0001		0.100

S500-XC Safety I/O

Description	Input signal SIL2	Input signal SIL3	Output signal SIL3	Type	Order code	Price	Weight (1 pce) kg
Safety digital input module	16	8	-	DI581-S-XC	1SAP484000R0001		0.130
Safety digital input / output module	8	4	8	DX581-S-XC	1SAP484100R0001		0.130
Safety analog input module	4	2	-	AI581-S-XC	1SAP482000R0001		0.130

S500-XC Safety terminal unit

Description	Type	Order code	Price	Weight (1 pce) kg
Spring terminal unit for safety I/O modules	TU582-S-XC	1SAP481200R0001		0.200

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

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

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
Cycle time for 1 instruction			
Binary		0.05 µs	
Word		0.06 µs	
Floating point		0.5 µs	
Max. number of centralized inputs/outputs			
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	
Program execution			
Cyclical		●	
User program protection by password		●	
Interfaces			
Ethernet		Via AC500 CPU or PROFINET coupler	
COM		Via AC500 CPU	
Programming		Via AC500 CPU	
Approvals		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		
Digital inputs			
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	-
Input current per channel			
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	-
Digital outputs			
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)	-
Output current			
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	-
Switching frequency			
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
Analog inputs			
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	-	-	-
Signal resolution for channel configuration			
0...20 mA, 4...20 mA	-	-	14 bits
Process voltage UP			
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 %
Maximum cable length for connected process signals			
Shielded cable	1000 m	1000 m	-
Unshielded cable	600 m	600 m	-
Max. line length of the analog lines, conductor cross section > 0.14 mm²	-	-	100 m
Potential isolation			
Per module	●		
Fieldbus connection	Via AC500 CPU or PROFINET communication module		
Voltage supply for the module	Internally via extension bus interface (I/O bus)		
Approvals	CE, cUL, UL, C-Tick and other on request		

AC500-S
System data

Operating and ambient conditions

Voltages according to EN 61131-2		
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
Important: Exceeding the maximum process and supply voltages could lead to unrecoverable damage of the system. The system could be destroyed.		
Temperature		
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	
Humidity		
Operating / Storage		Max. 95 %, without condensation
Air pressure		
Operating		> 800 hPa / < 2000 m
Storage		> 660 hPa / < 3500 m

Creepage distances and clearances

Insulation Test Voltages, Routine Test, according to EN 61131-2	AC voltage during 2 seconds
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)		In accordance with EN 61000-4-2, zone B, criterion B
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)		In accordance with EN 61000-4-3, zone B, criterion A
Test field strength		10 V/m
Against transient interference voltages (burst)		In accordance with EN 61000-4-4, zone B, criterion B
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)		In accordance with EN 61000-4-6, zone B, criterion A
Test voltage		10 V zone B
High energy surges		In accordance with EN 61000-4-5, zone B, criterion B
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

Voltages according to EN 61131-2		
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
Important: Exceeding the maximum process and supply voltages could lead to unrecoverable damage of the system. The system could be destroyed.		
Temperature		
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	
Humidity		
Operating / Storage		Max. 100 %, with condensation
Air pressure		
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

Insulation Test Voltages, Routine Test, according to EN 61131-2	AC voltage during 2 seconds
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)		In accordance with EN 61000-4-2, zone B, criterion B
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)		In accordance with EN 61000-4-3, zone B, criterion A
Test field strength		10 V/m
Against transient interference voltages (burst)		In accordance with EN 61000-4-4, zone B, criterion B
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)		In accordance with EN 61000-4-6, zone B, criterion A
Test voltage		10 V zone B
High energy surges		In accordance with EN 61000-4-5, zone B, criterion B
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