Welcome to AC500-S Safety PLC
Complex becomes simple

Power and productivity
for a better world™

AC500-S Safety Modules: Safety CPU, Safety Digital Input, Safety Digital Input/Output, Safety Analog Input and Terminal Unit

Complex becomes simple

When it comes to flexibility, reliability and efficiency in machine safety automation, AC500-S Safety PLC is your ideal choice

More programming comfort

- Standard and safety programming editors look just the same (short learning curve), which saves your personnel training costs.
- Structured Text for safety programming with trigonometric functions (COS, SIN, TAN, ASIN, ACOS and LOG) and floating-point calculations, which saves program development efforts and allows implementing the most complex functional safety logic easier.
- AC500-S Safety Code Analysis tool for ensuring well-structured (syntax analysis), easily understandable program code. It saves time and money towards certification issues; it is first of its kind in the market.
- PLCopen Safety Library support & Programming of customized safety libraries possible.

More flexibility

- Separate Safety CPU ensures free choice of standard CPU performance so that cost-optimized solution for machine control part can be always reached.
- Safety CPU can be configured to work even if the standard CPU is in STOP or maintenance mode or during online change, which ensures safe machine state even when process control part is stopped.
- Address switch on the Safety CPU allows implementing flexible configuration concept in machines (One safety program for various machine types), which saves engineering and maintenance costs for functional safety engineering.
- A single safety I/O channel could be individually reintegrated, which may provide higher machine availability in many customer cases.

More functionality

- More test pulse outputs ensure higher degree of fault diagnostics and reaction, which results in higher safety integrity level for safety functions in the machine.
- Safe position monitoring and speed monitoring using PROFINET/PROFIsafe encoders.
- Standard SD card can be used to clone both safety and standard programs for later replication on other identical machines, which allows easy machine replication without an engineering PC.
- Safety CPU ensures not only safety but also high data security.
- Extreme condition (XC) modules are available (-40 to +70 °C, high vibration and shock requirements, etc.), which allows cost-savings in engineering and operation.

More support

- Our hotline support is available **24/7** for technical support and advice.


2

Our answer to your challenges

Your partner for simple to most complex functional safety applications.

Cranes
With features like trigonometric functions and processing of analog values, the AC500-S allows you to focus on your projects without questioning the safety of your crane applications – letting our Safety PLC take care of reducing downtime, increasing precision and keeping your work areas safe.

Hoists
Controlling heavy loads at high speeds requires a PLC that provides the ultimate in safety and reliability – no chances taken. ABB's AC500 family of PLCs gives hoist and elevator manufacturers a cost-effective and dependable way to be one step ahead of the competition by offering a product that has a PLC already integrated in it, cutting costs and increasing safety in one step.

Robotics
When it comes to the specific needs of robotics applications, the ability to customize an application according to precise requirements is an absolute must. ABB's AC500-S Safety PLC opens the door to even more specialized and reliable robotic applications through features like digital or analog signaling and high speed CPU cycle times, giving you more than the state-of-the-art in safety programming.

Wind turbines
Worried about what would happen if your wind power application malfunctioned? The new AC500-S Safety PLC from ABB offers you unsurpassed technology that lets you implement even the most challenging of safety applications – putting the power in your hands to achieve everything from speed and safety value monitoring to emergency stop functions.

Food & Beverage
Each day you face the demands of tight delivery times, high quality standards and safety. You also need to operate efficiently, even 24/7. Everything counts. We understand these needs. Our PLCs and drives help you run your food and beverage applications, from raw material handling, to processing and conveying, to packing and storage, without compromising on the functional safety standards you demand.

Automated guided vehicles (AGVs)
Automated Guided Vehicles are required to consistently and predictably transport loads of material where little or no human decision making skill is required to perform the movement. AC500-S will help you to implement the necessary movements with accurate safe position, speed and velocity information in real time in achieving higher efficiency and quality.

Simple expansion of a standard PLC system

A typical AC500-S Safety PLC Configuration

1 Standard communication module
ABB's AC500 family is packed with advanced communications technologies to bring you to the next level in communication. We've got all common communication standards covered, such as Ethernet, EtherCAT, PROFINET IO, PROFIBUS DP, CANopen, DeviceNet, Modbus TCP, Modbus serial, Serial, ABB CS31 and PROFIsafe via PROFINET.

2 Safety PLC
Just as you've come to expect from ABB, our Safety PLC is SIL3 (IEC 62061, IEC 61508:2010) and PL e (ISO 13849-1) certified. And an array of features such as system diagnostics provided via LEDs and onboard display of standard CPU gives you the added diagnostic concept your applications demand.

3 Standard PLC
ABB's complete AC500 range of CPUs, from the PM572 to the PM595, can be used with our AC500-S CPU to create truly customized solutions – even for your most challenging requirements. We keep it simple by offering programming of safety and standard applications via a standard PLC interface.

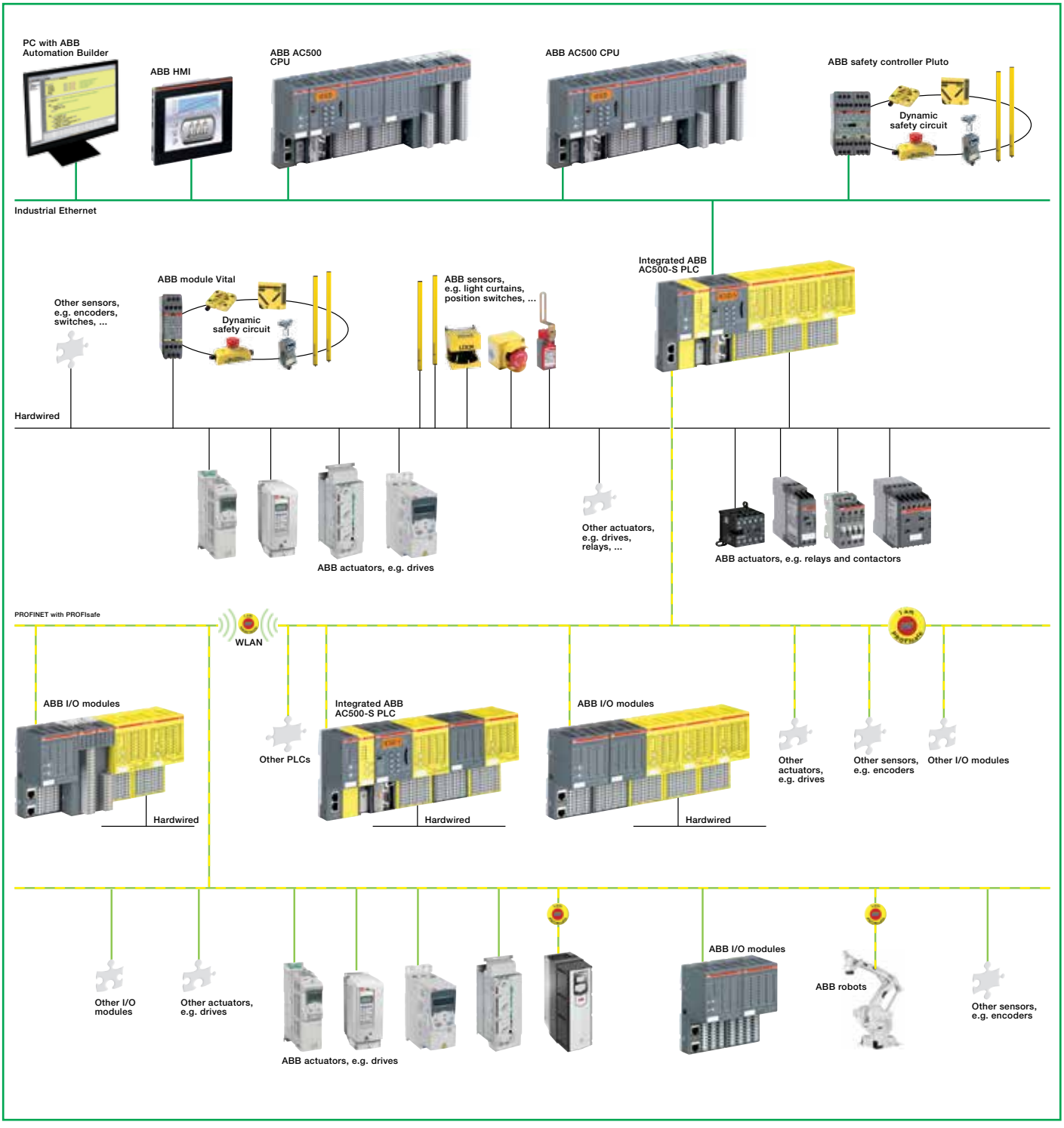
4 Standard I/O module
With ABB's standard I/O module, the complete S500 and S500-eCo I/O module range can be connected to the standard PLC, providing you with the ultimate in flexibility and simplicity. And a wealth of functions in our configurable I/O modules allows you to get the customized and low-priced solutions you need to sustainably optimize your applications.

5 Safety I/O module
Our safety I/O modules are certified up to SIL3 (IEC 62061, IEC 61508:2010) and PL e (ISO 13849-1), giving you the reliability you need to be able to focus on what really matters – your applications. Features such as channel-wise error diagnostics and the flexibility to choose between channel-wise or module switch-off in case of channel error make working safely that much easier.

One-stop solution for all your Functional Safety needs

ABB offers a wide range of functional safety products for machine safety applications covering safety sensors, actuators and Safety PLCs.

The system solution in safety



Engineering Functional Safety

Increase your engineering productivity in projects involving functional safety using the integrated engineering suite Automation Builder.

Automation Builder

ABB Automation Builder is the engineering software for integrated industrial automation applications to automate machines and systems in an integrated way – PLC, safety, HMI, drives, motion and robots.

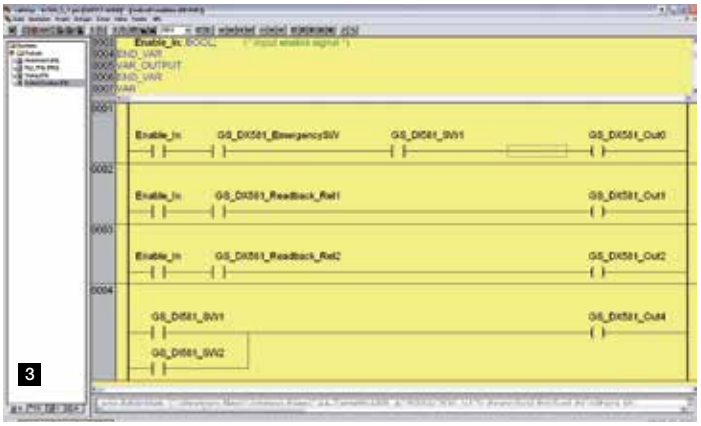
Structured Text for Safety

This IEC 61131-3-compatible Structured Text (ST) programming language is the ultimate choice for facing the challenges of modern safety applications. This flexible and intuitive language makes it easier and more convenient than ever before to create powerful and reliable safety applications for your PLCs – while still giving you the flexibility of using Function Block Diagram (FBD) and Ladder Diagram (LD).

Functional Safety Design Tool (FSDT)

This is ABB support tool for performing functional safety modeling, design, calculations and verification for machine functional safety. The tool supports both machinery functional safety standards: ISO 13849-1 and IEC 62061. The tool is aimed to simplify the process of safety function design and verification and to generate documentation to support compliance to the requirements of the mentioned standards and the European Machine Directive for safety.

1 Structured Text | **2** Function Block Diagram | **3** Ladder Diagram



Ordering Data

AC500-S (-XC) modules and training case

Safety CPUs

Type	Description	User program memory	Order code
SM560-S	Safety CPU module	1 MB	1SAP 280 000 R0001
SM560-S-XC	Extreme condition (XC) Safety CPU module	1 MB	1SAP 380 000 R0001

S500 Safety I/O

Type	Description	Input signal	Output signal	Order code
DI581-S	Safety digital input module	16 (SIL2) or 8 (SIL3)	-	1SAP 284 000 R0001
DI581-S-XC	Safety digital input module	16 (SIL2) or 8 (SIL3)	-	1SAP 484 000 R0001
DX581-S	Safety digital input / output module	8 (SIL2) or 4 (SIL3)	8 (SIL3)	1SAP 284 100 R0001
DX581-S-XC	Safety digital input / output module	8 (SIL2) or 4 (SIL3)	8 (SIL3)	1SAP 484 100 R0001
AI581-S	Safety analog input module	4 (SIL2) or 2 (SIL3)	-	1SAP 282 000 R0001
AI581-S-XC	Safety analog input module	4 (SIL2) or 2 (SIL3)	-	1SAP 482 000 R0001

S500-S terminal unit

Type	Description	Order code
TU582-S	Spring terminal unit for safety I/O modules	1SAP 281 200 R0001
TU582-S-XC	Spring terminal unit for safety I/O modules	1SAP 481 200 R0001

AC500-S Training case

Type	Description	Order code
TA514-SAFETY	AC500-S training case for demonstrations	1SAP 182 900 R0001

Technical data (1)

Type	SM560-S / SM560-S-XC
Performance Level	PL e (ISO 13849-1)
Safety Integrity Level	SIL3 (IEC 61508: 2010, IEC 62061)
Safety protocol	PROFIsafe V2 via PROFINET
Program memory Flash EPROM and RAM	1 MB
Integrated data memory	1 MB thereof 120 KB saved
Cycle time for 1 instruction	
Binary	0.05 µs
Word	0.06 µs
Flöating point	0.5 µs
Max. number of centralized inputs/outputs	
Max. number of safety extension modules on I/O bus	up to max. 10
Digital inputs	160 (SIL2) / 80 (SIL3)
Digital 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 standard AC500 CPU or PROFINET coupler
COM	Via standard AC500 CPU
Programming	Via standard AC500 CPU
Approvals	CE, cUL, UL, C-Tick and others on request

Technical data (2)

Type	DI581-S / DI581-S-XC	DX581-S / DX581-S-XC	AI581-S / AI581-S-XC
Performance Level	PL e (ISO 13849-1)	PL e (ISO 13849-1)	PL e (ISO 13849-1)
Safety Integrity Level	SIL3	SIL3	SIL3
	(IEC 61508: 2010, IEC 62061)	(IEC 61508: 2010, IEC 62061)	(IEC 61508: 2010, IEC 62061)
Safety protocol	PROFIsafe V2 via PROFINET	PROFIsafe V2 via PROFINET	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 V DC ... + 5 V DC	- 3 V DC ... + 5 V DC	-
Undefined signal state	> +5 V DC ... < + 15 V DC	> +5 V DC ... < + 15 V DC	-
1 signal	+ 15 V DC ... + 30 V DC	+ 15 V DC ... + 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	-	✓	-
Switching of 24 V load	-	✓	-
Output current			
Nominal current per channel	-	500 mA at UP = 24 V	-
Maximum (total current of all channels)	-	4 Amp. / 500 mA / channel	-
Residual current at signal state 0	-	< 0.5 mA	-
Demagnetization when switching off inductive loads	-	By internal suppressor diods	-
Switching frequency			
Short-circuit / overload proofness	-	✓	-
For inductive load	-	On request	-
For lamp load	-	On request	-
Proofness against reverse feeding of 24 V signals	-	✓	-

Technical data (3)

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	24 V DC	24 V DC
Maximum ripple	5%	5%	5%
Reverse polarity protection	✓	✓	✓
Fuse for process voltage UP	10 A miniature fuse	10 A miniature fuse	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 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 (m) of the analog lines,	-	-	100 m
conductor cross section > 0.14 mm²			
Potential isolation			
Per module	✓	✓	✓
Fieldbus connection	Via standard AC500 CPU or PROFINET coupler		
Voltage supply for the module	Internally via extension bus interface (I/O bus)		
Approvals	CE, cUL, UL, C-Tick and others on request		

Even for harsh environmental conditions

AC500-S-XC eliminates the need for sophisticated protective enclosures

XC stands for extreme conditions

AC500–S applications range from Crane, Hoist, Winch, Robots, Wind, Solar etc. wherein harsh environmental conditions are expected. All AC500-S components are available as XC version as well. Physical dimensions, basic electrical characteristics and software compatibility correspond with the standard version. In many cases, this makes engineering and operations much more cost-efficient.

Benefits of XC version

AC500-S-XC benefit is cost saving in engineering and operations. Many extras become obsolete like sealing at cable entrances and doors, shock absorbers, HVAC for the panel, cooling fins and cut-outs and EMC protection

Operating in wet environment

– Increased resistance to 95% humidity

Extended EMC requirements

– EN 61000-4-5 surge immunity test
– EN 61000-4-4 transient / burst immunity test

Use at high altitudes

– Operating altitude up to 4,000 m above sea level

Extended operating temperature

– -40 °C up to +70 °C operating temperature

Extended immunity to vibration

– 4 g root mean square random vibration up to 500 Hz
– 2 g sinusoidal vibration up to 500 Hz

Extended immunity to hazardous gases and salt mist

– G3, 3C2 immunity
– Salt mist EN 60068-2-52 / EN 60068-2-11

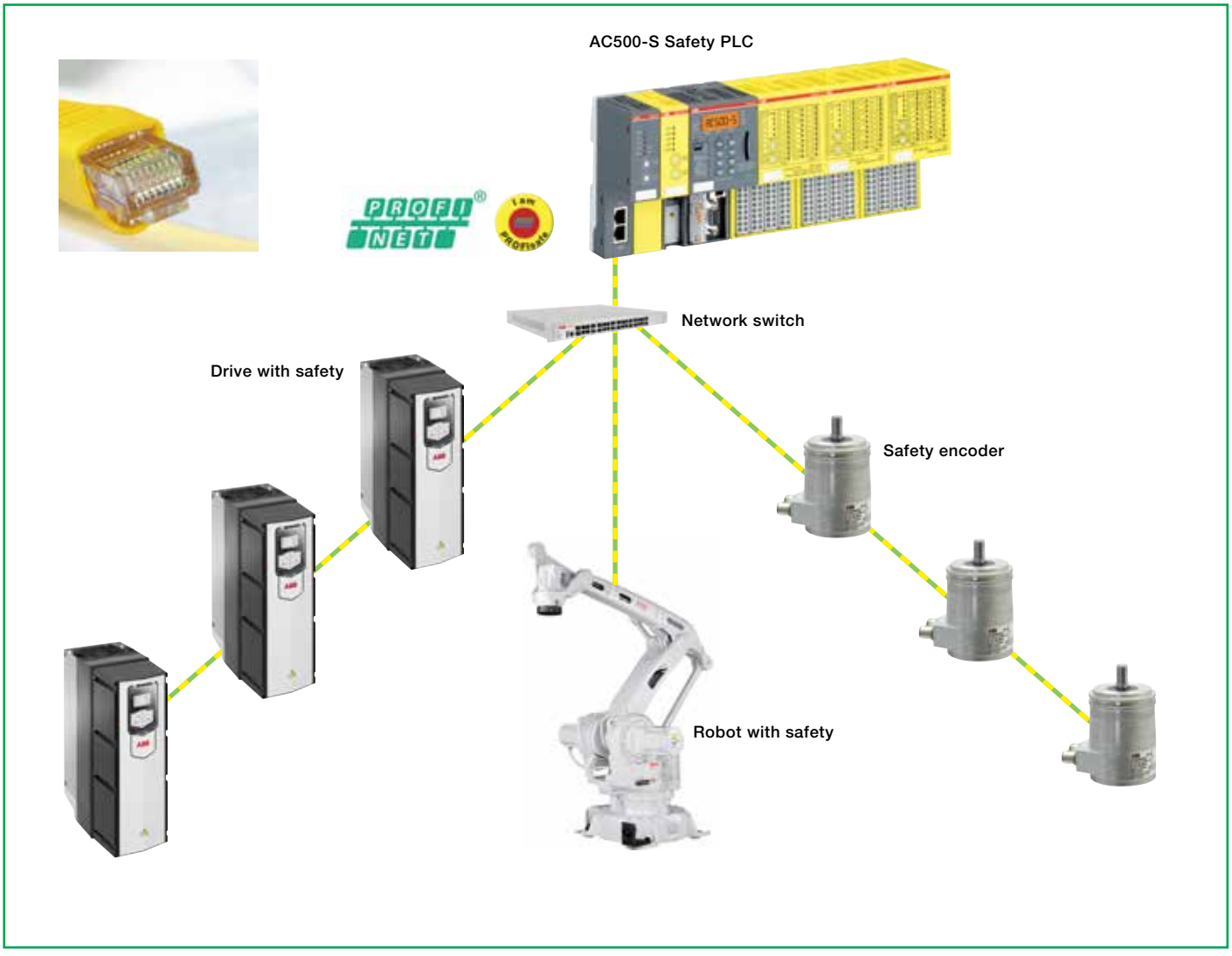
Complex becomes simple

Trigger safety functions using PROFIsafe communication between AC500-S and ABB ACS880 Drives over PROFINET and save your wiring, operation and engineering costs

AC500-S Safety PLC can be used for controlling drives and machines from a common source. In this way different safety functions can be performed with the application being controlled by one common Safety PLC. It's ideal to build the safety monitoring solution using integrated drive-based functional safety in ABB ACS880 drives together with AC500-S Safety PLC and save costs on engineering and safety encoders.

As levels, complexity and modularity of industrial automation increase, drive-based functional safety is fast becoming an important part of overall safety design for industrial processes. It allows saving your total automation solution costs.

In larger systems with several drives, control of the overall safety system can be done using AC500-S Safety PLC, which activates drive-based safety functions when required in the whole system using control commands sent on PROFINET/ PROFIsafe communication bus to ABB Drives.



Complex becomes simple

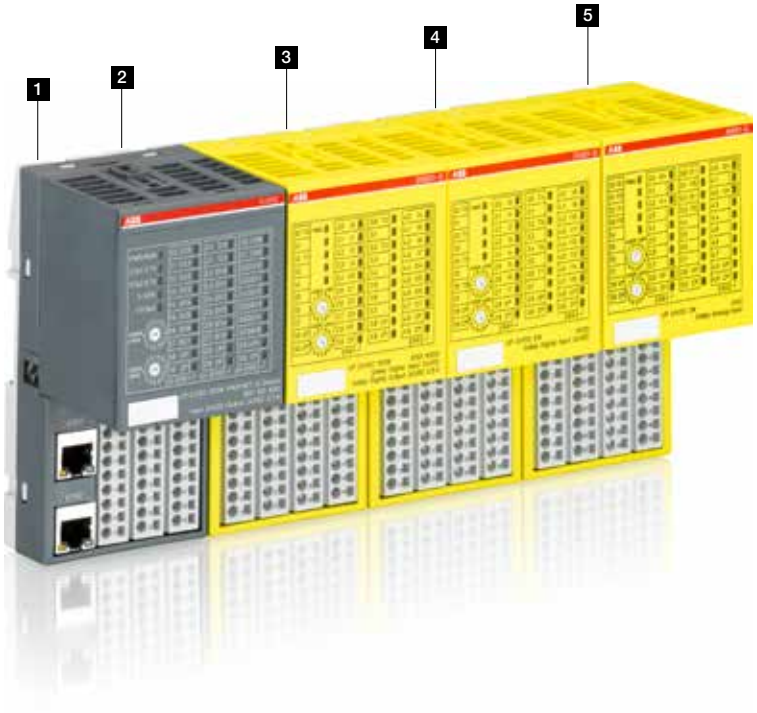
1 PROFIsafe and PROFINET

2 CI50x-PNIO

3 8 Safety digital inputs / 8 Safety digital outputs

4 16 Safety digital inputs

5 4 Safety analog inputs



Simply extend your control system with ABB standard and Safety I/Os to save wiring efforts, operation costs and use unique features of our Safety I/O portfolio to increase your machine productivity

More functionality

- More test pulse outputs on safety digital I/O modules ensure higher degree of fault diagnostics and reaction, which results in higher safety integrity level for safety functions in the machine.
- Each safety I/O channel has not only process state LED but also fault-diagnostic LED which significantly simplifies maintenance work and, thus, save your operation costs.
- Extreme condition (XC) modules are available (-40 to +70 °C, high vibration and shock requirements, etc.), which allows cost-savings in engineering and operation.
- Fool-proof protection implemented in all safety I/O modules (reverse signal or power supply polarity, wrong module placement, short circuit etc.), which allows you save costs on damaged modules due to wrong wiring.
- Max. cable length for connected process signals could go up to 1000 m (Shielded cable) or 600 m (Unshielded cable), which helps you to realize reliable safety applications even in the toughest requirements.

More flexibility

- A single safety I/O channel can be individually reintegrated, which may provide higher machine availability in many customer cases.
- Front panel rotary switch for PROFIsafe address ensures less maintenance effort because you can see all pre-set PROFIsafe addresses directly looking at the front cover of Safety I/O modules (no more need to disassemble Safety I/Os).
- Built-in module power supply (no additional 24V DC power supply needed), which makes your power supply connections much simpler.
- Ability to do your wiring on Safety I/O Terminal Units even if Safety I/O modules are not yet available (Field wiring and module replacement actions are independent of each other), which allows you outsourcing wiring jobs and save your engineering costs.

More support

- Our hotline support is available **24/7** for technical support and advice.

Contact us

ABB Automation Products GmbH
Wallstadter Str. 59
68526 Ladenburg, Germany
Phone: +49 (0) 6221 701-1444
Fax: +49 (0) 6221 701-1382
Email: plc.sales@de.abb.com

www.abb.com/plc
www.abb.com/drives

ABB Global Contact Directory
The ABB Contact Directory (http://www.abb.com/contacts/) helps you find local contacts for ABB products in your country.
Please select the relevant product group from the dropdown menu to the right or from the page.

Note:
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB AG does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB AG.

Copyright© 2015 ABB
All rights reserved

Order Number 3ADR 025 011 B0202 Printed in Finland (10/15)

Power and productivity
for a better world™