



# Siemens S7-1500 Advanced Controller

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# SIMATIC New Controller Generation

Challenges need innovative answers

## Individualization



### Production

- Customized mass production
- Top quality at a competitive price

## Globalization



### Production Logistics

- Global alliance of production and suppliers
- New business models

## Time to Market



### New Technology

- Critical to success in highly competitive industries
- Pressure on productivity increases, shortening time for new development

## Sustainability



### Energy Consumption

- The efficient use of energy and environmentally safe materials

# SIMATIC New Controller Generation

## Challenges sets new automation scale

### Trends

Ethernet-based field bus

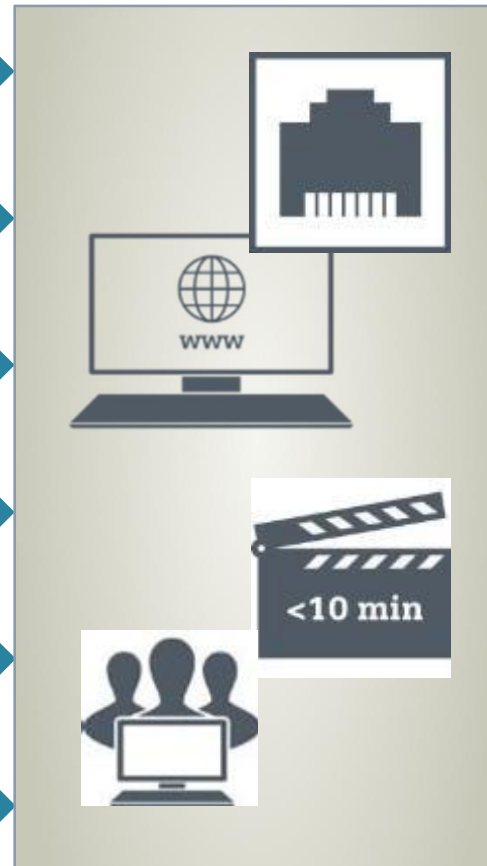
IT functionality

Increased functionality and design flexibility

Increased Integrated functionality

Optimized usability

Easy to manage, reduced complexity



### Solutions...

PROFINET I/O as a standard at all PLCs

e.g. web server on-board all PLCs

For the same price

More interfaces, higher performance, memory ...

e.g. motion control functions / PID controller /  
Trace / high speed counters

e.g. integrated system diagnostics, project upload  
Simplified commissioning (serial machine building)

Reduced, optimized portfolio  
Increase of system functionality

# Totally Integrated Automation – “See the bigger picture”

## Feature / Function

### TIA Topics

- Integrated Engineering
- Industrial Data Management
- Industrial Communication
- Industrial Security
- Safety Integrated

### Engineering

- TIA stands for efficiency and productivity, in particular in Engineering

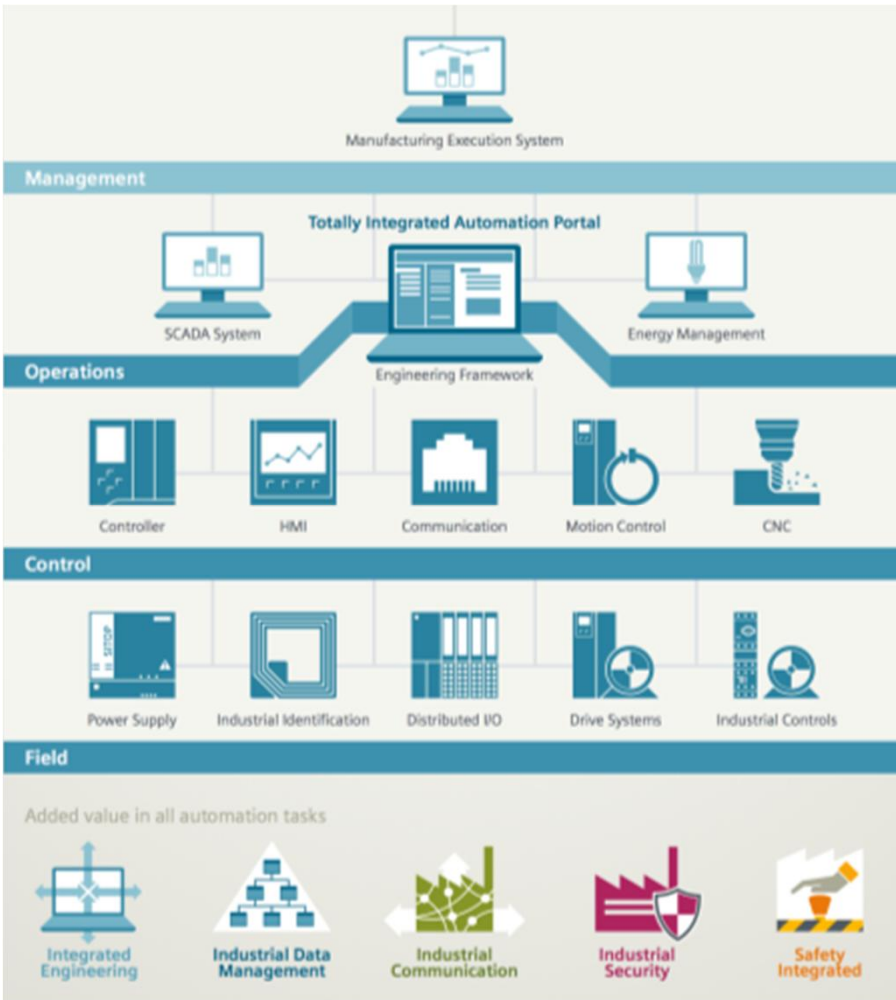
- TIA Application with 3rd Party Integration incl. Engineering

## Benefit



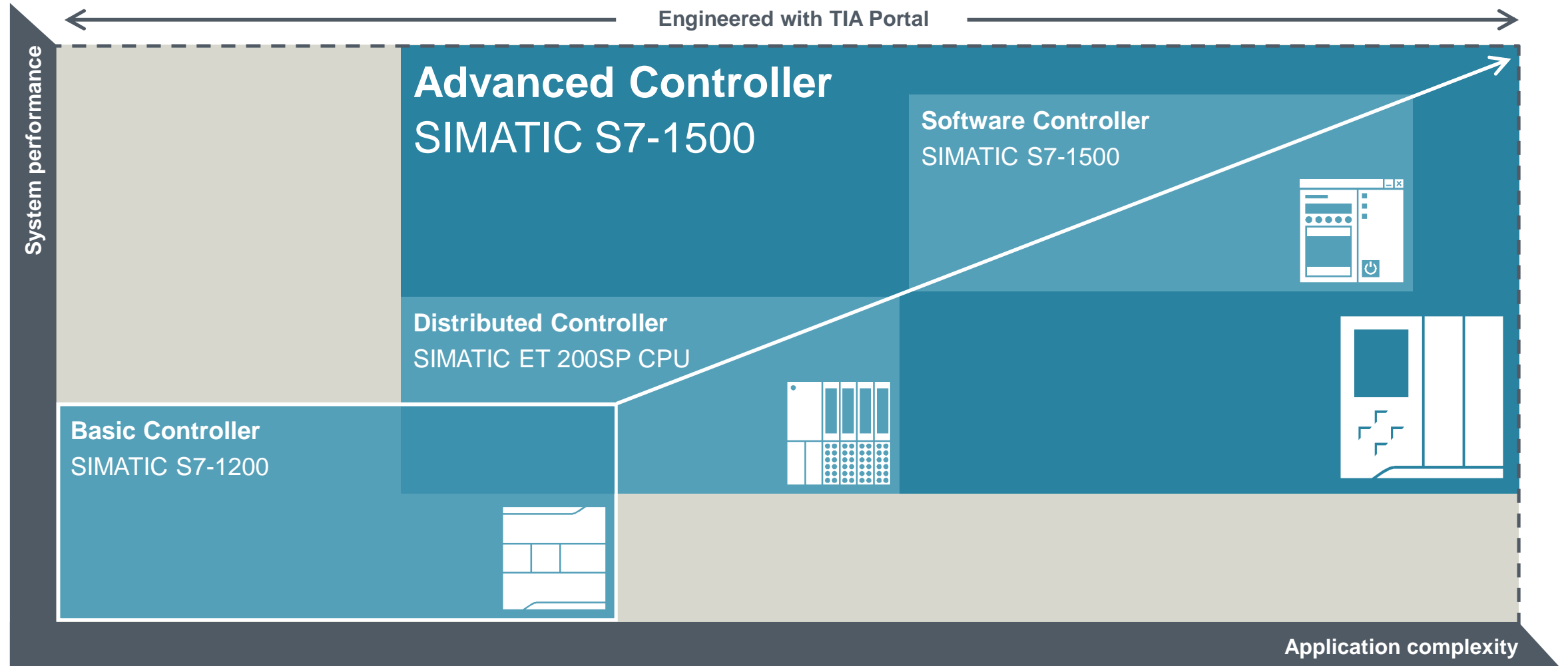
Efficient interoperability of all automation components

- Efficiency in Engineering
- Perfect Interoperability with 3rd Party Application



# New SIMATIC controller generation

Always the appropriate controller with comprehensive functionalities!



# SIMATIC S7-1500

## Overview of Highlights

### Hardware

- Max. 32 modules / line
- Identical modules for U-connector and backplane assembly
- Sufficient memory for any application
- Load memory via SIMATIC memory card

### Communication

- PN IO RT/IRT in every CPU
- 2 additional interfaces for network separation
- All I/O data (PLC, CM) in the process image
- Easy communication programming for PLC & CMs
- Integrated web server

### Display

- For commissioning
- For rapid diagnostics
- All error messages in plain text
- Access to MLFB, serial number,....

### Technology

- Standard motion (via PN IRT V2.2)
- Trace for all tags
- New PID control functions

### Performance

- Extremely fast backplane bus
- Extremely fast bit instructions
- Extremely short response time (terminal <-> terminal)



### Portfolio

- One system for machine and plant engineering
- Reduction of modules by >50% with CPU
- Reduction of modules by >30% with I/O

### STEP7 language innovations

- Fully symbolic programming
- High-performance LAD/FBD/SCL compiler
- Innovations LAD/FBD/SCL
- Max. DB: 10MB, FBs/FCs: 512k

### System diagnostics, alarms

- Fully integrated system diagnostics
- One ALARM FB
- Uniform representation PLC&HMI

### Plug & play

- Read-out of actual configuration
- Complete project upload to empty programming device

### Data log (archives) and recipes

- On the SIMATIC memory card in csv format
- Access via web server

### compatibility

- Within the complete product range
- Easy migration 300/400->1500

### Security integrated

- Know-how protection / copy protection
- Authentication
- Manipulation protection

# SIMATIC S7-1500

## Engineering in the TIA Portal

### Efficient engineering

- Fully symbolic programming
- Optimized LAD/FBD/SCL compiler for increased performance
- Identical command scope in all programming languages
- Compute box in LAD/FBD for complex computing algorithms
- Support of 64-bit data types (LREAL, LINT, LWORD...)
- in all IEC languages
- No restriction of block sizes to 64 kByte – FBs/FCs with maximally 512 kByte, DBs with maximally 10 Mbyte (system limit 16 Mbyte)
- Free assignment of OB types to OB numbers
- Implicit type conversion
- Programming guideline for SIMATIC S7-1500:

<http://support.automation.siemens.com/WW/view/de/81318674>

The screenshot displays the Siemens TIA Portal interface. On the left, the 'Object tree' shows the project structure for 'Demo' and 'PLC\_1 [CPU 1516-3 PN/DP]'. The main window is divided into two panes. The top pane, titled 'Results', shows a table of data for 'Results [DB6]':

	Name	Data type	Start value	Retain
1	Static			
2	Pool	Array [0..1999] of *Result*		
3	Pool[0]	*Result*		
4	Date	DTL#1970-1-1-00		
5	YEAR	UInt	1970	
6	MONTH	USInt	1	
7	DAY	USInt	1	
8	WEEKDAY	USInt	5	
9	HOUR	USInt	0	
10	MINUTE	USInt	0	
11	SECOND	USInt	0	
12	NANOSECO...	UDInt	0	
13	Value	*Position*		

The bottom pane shows a ladder logic diagram for a 'CALCULATE' block. The block is of type 'LReal'. It has an enable input 'enable' (EN) and three real inputs: 'my\_int' (IN1), 'my\_real' (IN2), and 'my\_real' (IN3). The output is 'my\_out' (OUT). The calculation formula is:  $OUT := abs(in1 + in2) * sqrt(in3)$ . The diagram also shows a 'PIM14.0' input and an 'ENO' output.

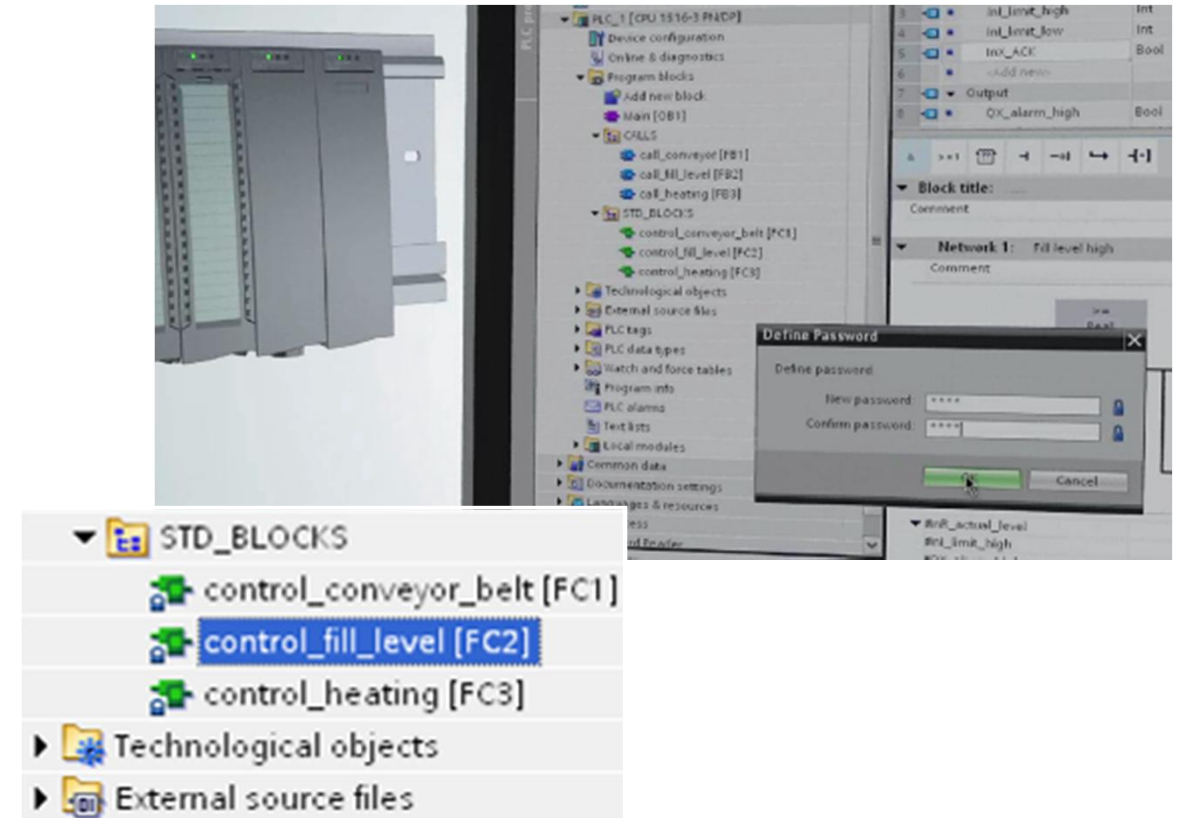
Efficient, flexible and free programming

# SIMATIC S7-1500

## Security Integrated

### Enhanced know-how protection in STEP 7

- Password protection against unauthorized opening of program blocks with STEP 7, resulting in protection against unauthorized copying, e.g. of developed algorithms
- Password protection against unauthorized evaluation of program blocks with external programs
  - from the STEP 7 project
  - from data on the memory card
  - from program libraries



Protection of intellectual property and investment



# SIMATIC S7-1500

## Integrated Technology: PID Control

The screenshot displays the SIMATIC Manager interface for PID control tuning. On the left is the 'Commissioning editor' tree showing the project structure for PID\_1. The main area is divided into several functional panels:

- Measurement:** Shows a real-time graph of Setpoint (red), Input (green), and Output (blue) over time. The x-axis represents time in seconds [s], ranging from 0.0 to 120.0. The y-axis represents the Setpoint value, ranging from 0 to 100. A 'Start' button is present next to the 'Sampling time' (0.3 s).
- Tuning mode:** A dropdown menu is set to 'Fine tuning', with a 'Start' button.
- Tuning status:** Displays the progress of the tuning process using a bar chart and the status 'System tuned.' with a green checkmark. It includes an 'ErrorAck' button and 'PID Parameters' options like 'Upload PID parameters' and 'Go to PID parameters'.
- Online status of controller:** Shows the current Setpoint (50.0), Input (50.0), and Output (50.000 %). It includes a 'Manual mode' checkbox and a 'Controller state' section with 'Enabled - automatic mode' and a 'Stop' button.

Four orange callout boxes highlight specific features:

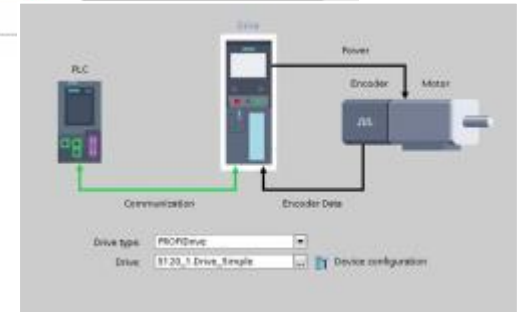
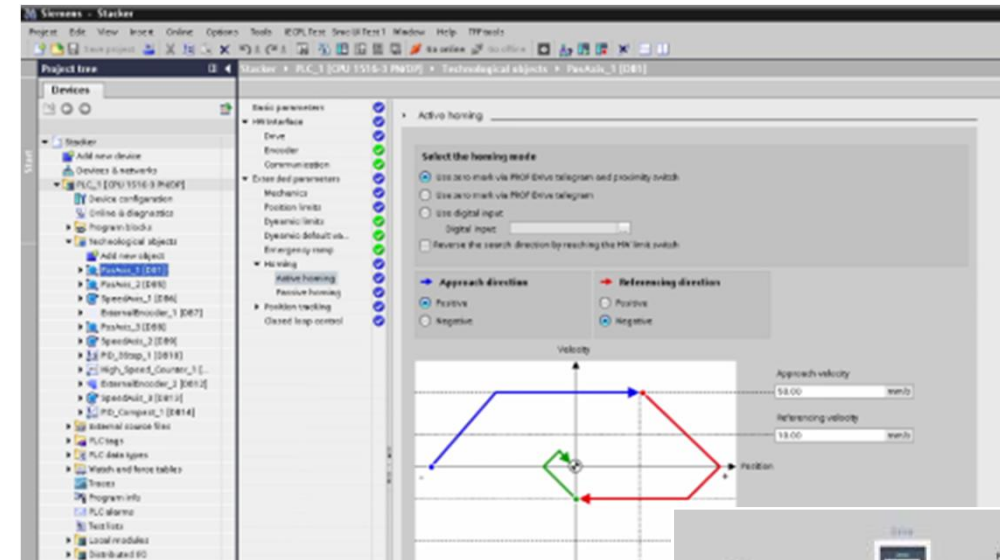
- Tuning:** Points to the 'Tuning mode' dropdown and 'Start' button.
- Integrated trace:** Points to the real-time graph showing Setpoint, Input, and Output.
- Tuning progress and status:** Points to the 'Tuning status' panel.
- Online informationen:** Points to the 'Online status of controller' panel.
- Controller E-STOP:** Points to the 'Stop' button in the 'Controller state' section.

# SIMATIC S7-1500

## Integrated Technology

### Motion Control functionality

- Flexible connection of drives via PROFINET, PROFIBUS or analog interfaces
- Easy programming of motion sequences with PLCopen motion blocks
- Uniform configuration for CPU / HMI / drives
- Comfortable diagnostics and commissioning tools
- (control panel, trace)
- Easy troubleshooting through automatic alarming of the engineering system and the HMI
- Functional scope V13
- Speed axis, positioning axis, encoder



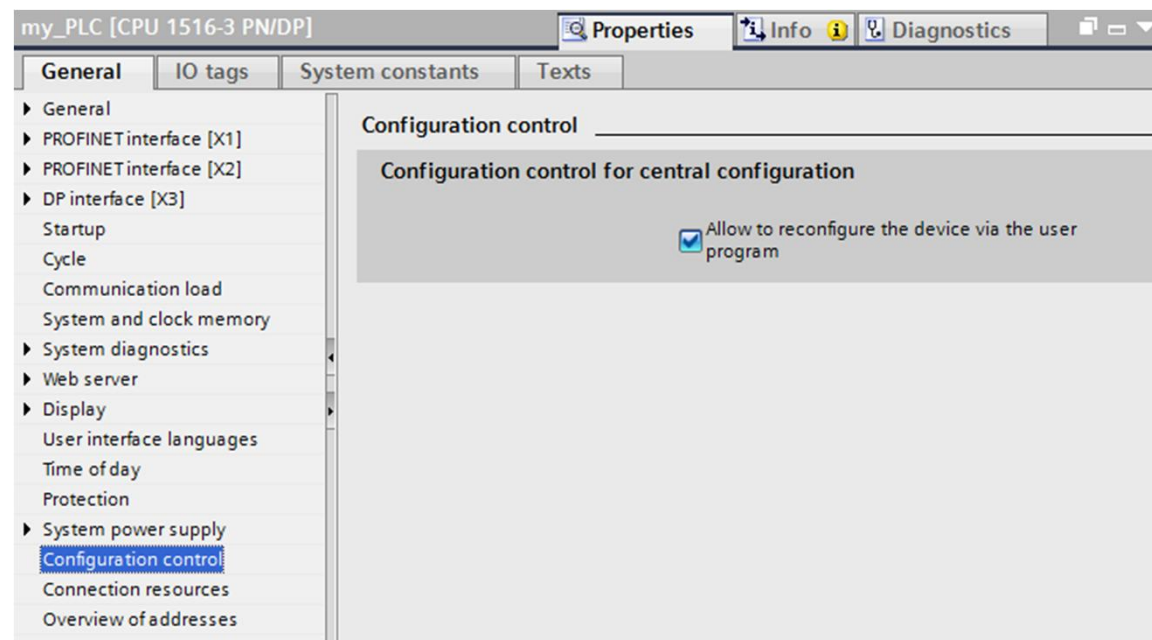
Easy scalability through integration of identical motion control functions in all CPUs

# SIMATIC S7-1500

## Option Handling in Central Assembly

### Option handling in central assembly

- Various hardware configurations can be saved in the control:
  - Configuration modification in the user program
  - Option retrofitting upon configuration completion



Maximum configuration:  
Options:  
A, B, C, D



Configuration upon delivery:  
Options:  
A, D



Machine update:  
Options:  
A, D, C



# Modular Controller with integrated safety functionality for Advanced Control applications

## S7-1500 with Safety Integrated



- CPU 1518F
- CPU 1517F



- CPU 1516F
- CPU 1515F



- CPU 1511F
- CPU 1513F

### Feature / Function

- All standard controllers also available as fail-safe controllers
- One controller for standard and fail-safe automation
- F-runtime group for autonomous prioritization and timing settings
- All controllers with Onboard Status-Display
- Additional password for access to F configuration & F program

### Benefit

- ▶ Simplified CPU selection thanks optimized portfolio
- ▶ Minimization of types and parts
- ▶ Efficient engineering in the TIA Portal
- ▶ Diagnostics messages without programming device
- ▶ Maximum protection against manipulation

# Fail-safe modules for SIMATIC ET 200MP

...high channel modules for optimum utilization of control cabinet volume

## ET 200MP



- 16 F-DI 24V \*)
- 8 F-DQ 2A PPM \*)

\*) planned release for delivery QII/2015

### Feature / Function

- Fail-safe, digital input and output modul for S7-1500 and ET 200MP
- Reduction in module width of 60% or more
- Signal-test (Short-circuit, wire breakage, ...) onboard
- Fault messages in plain text
- PROFIsafe address configured via software and saved in the coding module

### Benefit

- Minimization of types and parts via simply add of failsafe modules to the standard I/O
- Optimum utilization of control cabinet volume
- High availability via easy and rapid localization of faults
- Simple commissioning and module replacement

# Advanced Controller: SIMATIC S7-1500

SIMATIC S7-1500: Easy PLC selection thanks to an optimized Portfolio

## CPU



CPU 1511-1PN CPU-1515/F-2PN CPU-1518/F-4PN/DP  
 CPU 1513-1PN CPU-1516/F-3PN/DP CPU-1517/F-3PN/DP

## Interface-module



2x IM PN  
 1x IM DP

## Power-module/supply



2x PM  
 3x PS

## Communication-module



4x CM PtP  
 2x CM/CP DP  
 2x CM/CP Ethernet

## Signal-module



13xI/Q(35mm)  
 8x I/Q (25 mm)

## Technology-module



3xTM  
 TM Count  
 TM PosInput2  
 TM Timer DIDO

# The new Advanced Controller in compact construction form

## SIMATIC S7-1500C / Advanced Controller



### Feature / Function

**Two compact CPUs with integrated analogous and digital inputs and outputs**

- CPU 1511C-1PN
- CPU 1512C-1PN

**Integrated counting measurement or frequency measurement with 100 kHz fast inputs**

**Less width with integrated inputs and outputs**

### Benefit

Part reduction and type variety

For higher performance with technological functionality.

Special space-saving construction form by retention of the S7-1500 characteristics

# Advanced Controller: SIMATIC S7-1500

Get more Information...



## Reference center

### From customer to customer!

- Customers gives account to there experiences using our Products for their applications

<https://webservices.siemens.com/referenzen/#language=en>



## Internet

### Detailed product information and related subjects!

- Product Websites
- Twitter, Youtube..

<http://www.siemens.com/S7-1500>



## Getting Started

### Easy Introduction to the new SIMATIC controller Generation!

- Learn about the new possibilities and get to know the new Hardware even better

[www.siemens.com/getting-started/s7-1500](http://www.siemens.com/getting-started/s7-1500)



## Starter kits

### Why wait

### ...when getting started is so easy?

- Customers gives account to there experiences using our Products for their applications

[6ES7511-1AK01-4YB5](http://www.siemens.com/6ES7511-1AK01-4YB5)





Thank you for your attention!



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