Basic Controller
SIMATIC S7-1200
Be flexible thanks to networking possibilities
SIMATIC controllers set 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
SIMATIC S7-1200 configured in TIA Portal
Highlight performance

Comprehensive network options for SIMATIC S7-1200

- PROFINET Master – decentralized Profinet architectures possible for I/O, HMI, drives, and other Profinet field devices. NO communication module required!
- PROFIBUS Master & Slave – decentralized Profinet architectures possible for I/O, drives, and other Profinet devices, including integration into existing system networks.
- AS-i Master – The new AS-i-Master is configured in full in the TIA Portal and a new AS-i network can be created very easily with just a few clicks. AS-i networks do not therefore require separate software!
- CANopen Master – Enables connection with CANopen devices, as well as with devices running Transparent CAN 2.0A.

Comprehensive network options to meet your requirements!
SIMATIC S7-1200 configured in TIA Portal
Highlight performance

Comprehensive network options for SIMATIC S7-1200

- Modbus TCP – Enables communication with devices as Modbus master or slave. Only one TCP function block is required for this.
- IO-Link Master – Fast and easy integration of the SIRIUS compact starter, M200D starter and SIRIUS soft starter for simple starter control.
- GPRS/LTE module – Easy implementation for data recording and control of decentralized computer.
- TCP/IP – Via the instructions for open communication you can communicate with other CPUs, other PCs and with devices that use TCP/IP communication protocols as standard. NO communication module required!

Comprehensive network options to meet your requirements!
SIMATIC S7-1200 in the TIA Portal
Highlight performance

Comprehensive network options for SIMATIC S7-1200

- RS-485, RS-422 & RS-232 – The S7-1200 CPU supports point-to-point (PtP) communication for character-based serial protocols, and this provides maximum freedom and flexibility for the use of PtP communication instructions in the user program.

- Modbus RTU – Using the Modbus instructions the Modbus master or slave is able to communicate with devices that use the Modbus RTU protocol.

- USS – Using simple USS instructions you can control the operation of drives that support the USS (Universal Serial Interface) protocol

Comprehensive network options to meet your requirements!
# Communication S7-1200

<table>
<thead>
<tr>
<th>Module</th>
<th>Communication</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM 1241</td>
<td>RS232</td>
<td>serial</td>
</tr>
<tr>
<td>CM 1241</td>
<td>RS422/485</td>
<td>serial</td>
</tr>
<tr>
<td>CM 1243-2</td>
<td>AS-i master</td>
<td></td>
</tr>
<tr>
<td>CM 1242-5</td>
<td>PROFIBUS</td>
<td>DP slave</td>
</tr>
<tr>
<td>CM 1243-5</td>
<td>PROFIBUS</td>
<td>DP master</td>
</tr>
<tr>
<td>CP 1242-7</td>
<td>GPRS</td>
<td>Mobile communications telecontrol</td>
</tr>
<tr>
<td>CP 1243-7</td>
<td>LTE</td>
<td>Mobile communications telecontrol</td>
</tr>
<tr>
<td>CP1243-1</td>
<td>Ethernet</td>
<td>VPN/Firewall, Telecontrol Ethernet (DNP3, IEC 60870)</td>
</tr>
<tr>
<td>RF120C</td>
<td>RFID</td>
<td>1 Reader port; RS422</td>
</tr>
<tr>
<td>CM CANopen</td>
<td>CANopen</td>
<td>3rd party: HMS 021620-B</td>
</tr>
</tbody>
</table>

![Diagram of CM CP, CPU, and SM connections](image)
## Communication

**S7-1200 integrated PROFINET (Ethernet) interface**

<table>
<thead>
<tr>
<th>Communication ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>... with the STEP 7 software</td>
</tr>
<tr>
<td>• CPU hardware configuration</td>
</tr>
<tr>
<td>• Loading a project</td>
</tr>
<tr>
<td>• Monitoring/amending runtime tags</td>
</tr>
<tr>
<td>• Set runtime I/O statuses</td>
</tr>
<tr>
<td>• Diagnostics information</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>... with HMI panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Data from or to the CPU</td>
</tr>
<tr>
<td>• System diagnostics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>... from CPU to CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Open communication with T-block instructions</td>
</tr>
<tr>
<td>• Supported protocols: TCP/IP, ISO on TCP, UDP, S7 Com. (PUT/GET)</td>
</tr>
</tbody>
</table>

**S7-1200 CPUs use PROFINET connections to STEP 7, S7-1200 CPUs and HMI panels**
Communication
MRP - Media redundancy protocol

Based on ring topology (IEC 61158-5-10)

Max. 50 nodes in the ring
- PROFINET IO-Controller
- PROFINET IO-Devices
- Components of the network infrastructure (IE switches)

200 ms reconfiguration time

CPU 1215/17 as MRP Client at least FW V4.1

Configuration and diagnostics in STEP7

- Improved plant availability
- More flexibility
- Lower costs since less equipment required
Communication
S7 routing

- Enables a connection between different subnets
- A SIMATIC S7-1200 station acts as an S7 router
- Based on PROFINET
- Actually only with CP 1243-1 at least V2.0 (6GK7243-1BX30-0XE0) and CPU FW V4.2
Communication
Webserver

Communication ...

Integrated Web server
• Access to system and process reports as well as identification data
• System diagnostics for all configured assemblies centrally and decentralized
• Communication diagnostics on parameters, statistics, connection status
• Access to process data via tag tables and freely definable tag lists
• Pages to be defined by the user
• Firmware update

Archive
• Access via Webserver using Filebrowser for reciprocal exchanges of data in .csv format
• Logging of user-defined tags

Simple location-independent information recording for process variables and system status
Communication
Station webserver

Various types of communication access:
- CPU PN interface, CP 1243-7 LTE
- CP1242-7 V2

Remote access via Internet/mobile communications
PN access

- Central access via CPU page independently of the interface
- User is then able to browse to the CP-specific webpages from there

uniform, consistent webserver for entire S7-1200 station
Communication
PROFINET i-Device

- Simple configuration of S7-1200 CPUs in a master/slave architecture through reading and writing the reciprocal I/O images
- Connection of CPUs in different projects
- NO PN-PN coupler required (transparent network)

Savings with costs / installation / wiring of additional hardware
Shared I-device

- Access for up to 2 controllers on S7-1200 as i-device
- Rapid exchange of data in real time between S7-1x00 CPUs
- Incorporation of 3rd party controllers under PROFINET

As of V4.1
Communication
Serial communication

S7-1200 CPU communication via RS232 and RS485 connections

- ASCII protocol (character-based serial communication) uses STEP 7 PtP instructions
- USS Drive protocol is programmed with STEP 7 USS library instructions
- MODBUS protocol is programmed with STEP 7 MODBUS library instructions
- 3964R Protokoll

Use of RS232 and RS485/422 modules CM1241 or RS485 Signalboard CB1241 for PtP communication
Communication
USS drives

PZD parameters – Up to eight user-defined PZD parameters for control and speed

Update rate
• Fixed update rate (as fast as possible)
• Enable instructions in an interrupt alarm OB in order to set a user-defined update rate.

Support for drives
• Maximum 15 drives per CM (communication module) supported
• Non support:
  • MM3 drives
  • Deregistration of missing drives
Communication
IO-Link support

IO link master specification V1.1

- S7-1200 CPU up to 8 IO-Link master modules - centralized
- Data rate COM1 (4.8 kbaud), COM2 (38.4 kbaud), COM3 (230.4 kbaud)
- Standard IO Mode (SIO Mode)
- up to 4 IO-Link devices (3 wire) or 4 standard actuators
- Diagnostics configurable for each port
- I&M identification
- IO-Link parameter allocation with S7-PCT (Port Configuration Tool) V3.2
Communication
SM 1278 4xIO-Link master (6ES7 274-1XK30-0XA0)

- Point-to-point connection, no bus system
  - Existing wiring topologies are retained
- Standard sensor/actuator cable (three wires with one signal wire), unshielded, 20 m in length, no special-purpose cable/connector
- Manufacturer-independent communication standard for the PNO
- Non-stop consistent communication
  - Cyclical, bidirectional process data communication (typ. 2 ms cycle)
  - Non-cyclical service data transmission between sensors/actuators and the controller as required
- Integrated differentiated diagnostics alarms
  - Link

3UG4 monitoring relays
3RW40 soft starters
3RA27 function modules for feeders
3RA6 compact starters
# Communication

**SIMATIC RF120C – Fast communication module for S7-1200**

<table>
<thead>
<tr>
<th><strong>RF120C</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interface to the application</strong></td>
<td>Internal S7 bus</td>
</tr>
<tr>
<td><strong>Connection technology</strong></td>
<td>S7-1200 setup technology; screw terminals for 24 V supply</td>
</tr>
<tr>
<td><strong>Interface to the reader</strong></td>
<td>RS422 incl. 24 Volt; up to 115.2 Kbaud</td>
</tr>
<tr>
<td><strong>Connection technology</strong></td>
<td>Submin-D connector</td>
</tr>
<tr>
<td><strong>RFID system</strong></td>
<td>RF200, RF300, RF600, MOBY D/U, MV400</td>
</tr>
<tr>
<td><strong>FB, driver</strong></td>
<td>Instructions: Read, Write, Read_EPC-Mem, Write_EPC-Mem, Set_Ant_RF300, Set_Ant_RF600, Reset_Reader; based on FB101</td>
</tr>
<tr>
<td><strong>Number of readers</strong></td>
<td>1 per RF120C; 3 per S7-1200</td>
</tr>
<tr>
<td><strong>Degree of protection</strong></td>
<td>IP 20</td>
</tr>
<tr>
<td><strong>Dimensions (W x H x D)</strong></td>
<td>30 x 100 x 75</td>
</tr>
</tbody>
</table>
SIMATIC S7-1200
SIWAREX WP231 – Basic applications

Supported S7-1200 CPU:
- CPU 1212C → up to two SIWAREX modules
- CPU 1214C or higher → up to eight SIWAREX modules
- Full parameter access from the CPU via free downloadable function block
  → Complete commissioning and calibration via CPU/HMI

Applications:
- Level measurement in silos and bunkers
- Plattform scales
- Force and tension measurements
- Typical industries: Food & Beverage, Chemicals, Cement, Aggregate
- Legal for trade certificate according OIML-R76

Connection options:
- Up to eight parallel connected analog 350 Ohm load cells per SIWAREX (1mV/V, 2mV/V, 3mV/V or 4mV/V)
- 1 SIWAREX = 1 scale
- 4 digital inputs / 4 digital outputs
- 1 analog output
- Ethernet (Modbus TCP & SIWATOOL)
- RS485 (Modbus RTU)
Applications:
- Belt scales (Cement-, Aggregate plants, Mines, Food & Beverage plants)
- Weigh feeder applications (Food & Beverage, Chemical, Steel)

Supported S7-1200 CPU:
- CPU 1212C → up to two SIWAREX modules
- CPU 1214C or higher → up to eight SIWAREX modules
- Full parameter access from the CPU via free downloadable function block → Complete commissioning and calibration via CPU/HMI

Connection options:
- Up to eight parallel connected analog 350 Ohm load cells per SIWAREX (1mV/V, 2mV/V, 3mV/V or 4mV/V)
- 1 SIWAREX = 1 scale
- 3 digital inputs / 4 digital outputs / 1 speed sensor input
- 1 analog output
- Ethernet (Modbus TCP & SIWATOOL)
- RS485 (Modbus RTU)
## SIMATIC S7-1200
### SIWAREX WP251 – Dosing, Batching and Bagging applications

<table>
<thead>
<tr>
<th>Supported S7-1200 CPU:</th>
<th>Applications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CPU 1212C → up to two SIWAREX modules</td>
<td>• Dosing and batching scales (Chemical-, Food-, Pharma, Packaging industries)</td>
</tr>
<tr>
<td>• CPU 1214C or higher → up to eight SIWAREX modules</td>
<td>• Bagging machines (Bulk solids industries)</td>
</tr>
<tr>
<td>• Full parameter access from the CPU via free downloadable function block → Complete commissioning and calibration via CPU/HMI</td>
<td>• Eichfähig gemäß OIML-R51, R61 und R76</td>
</tr>
</tbody>
</table>

### Connection options:
- Up to eight parallel connected analog 350 Ohm load cells per SIWAREX (1mV/V, 2mV/V, 3mV/V or 4mV/V)
- 1 SIWAREX = 1 scale
- 4 digital inputs / 4 digital outputs
- 1 analog output
- Ethernet (Modbus TCP & SIWATOOL) → RS485 (Modbus RTU)
- RS485 (Modbus RTU)
SIMATIC S7-1200C CANopen master/slave

- A CANopen connection to a S7-1200 system enables integration between devices and the S7-1200 system
- **Up to 3 CANopen modules per S7-1200 CPU**
  - Connection type to the CAN: 9-pin DSUB (male)
- **Up to 16 CANopen nodes per module**
- 256 bytes each for inputs and outputs with the CANopen module
- Can be integrated in the hardware catalog of the TIA Portal configuration suite
- Ready-made function blocks for simple PLC programming available in the TIA Portal
- → [Link](#)

Easy integration in CANopen applications
## MODBUS RTU protocol

- Use of a CM or CB 1241 module for serial communication
- MODBUS instructions of the communication module for simplified MODBUS RTU operation.
  - MB_COMM_LOAD for basic initialization of the master and slave operation
  - MB_MASTER and MB_SLAVE for controlling the report and connection allocations
- Modbus addressing supports a maximum of 247 slaves (slave numbers 1 to 247).
- Maximum of 32 devices per segment in the Modbus network depending on the loading and drive functions of the RS485 interface
- Repeater required if using more than 32 devices to extend to the next segment

## MODBUS TCP protocol

- Open User Communication MODBUS TCP instructions use the PROFINET port integrated in the CPU
Communication
Overview of CP 1243-1 product features

CP1243-1 (6GK7243-1BX30-0XE0)

- Single-width S7-1200 enclosure (30 x 110 x 75)
- Temperature range in operation: -20°C to +70°C
- Standard rail mounting
- Diagnostic LEDs (overall status and detail)
- Power supply using backplane bus
- 1 x Ethernet Port RJ45 (10/100 Mbit/s) for connecting a modem/router such as SCALANCE M
- Integrated security functions (VPN and Firewall)
- Integration to Scada Systems via Telecontrol Protokolls (DNP3, IEC 60870)
Overview of CP 1243-7 product features

CP1243-7 (6GK7243-7KX30-0XE0 – EU version
6GK7243-7SX30-0XE0 – US version)

- 1 connection to LTE (4G) mobile network
  (different versions for EU and North America)
- Single-width S7-1200 enclosure (30 x 110 x 75)
- Temperature range in operation from -20°C to +70°C
- Standard rail mounting
- Diagnostic LEDs (overall status and detail)
- Integrated security functions (VPN and Firewall)
- Access to the CPU Webserver
- Email and SMS Alarms
- Process Monitoring and Control via Cellular network

Communication processor to connect SIMATIC S7-1200 via LTE (4G) mobile network to control point system with TeleControl Server Basic
SIMATIC S7-1200 PROFIBUS communication
DP master CM 1243-5 and DP slave CM 1242-5

Communication for S7-1200 CPUs according to PROFIBUS standard IEC61158/61784

PROFIBUS DP-Master CM 1243-5
- Connection for up to 16 DP slaves
- PG/OP communication:
  up to 4 connection for HMI and 1 connection for PG
- S7 communication:
  4 S7 connections to other S7 stations with PUT(GET)

PROFIBUS DP-Slave CM 1242-5
- as an intelligent DP slave for communication for the S7-1200
  with any other DP master
Challenges need innovative answers

<table>
<thead>
<tr>
<th>Individualization</th>
<th>Globalization</th>
<th>Time to Market</th>
<th>Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td><strong>Production Logistics</strong></td>
<td><strong>New Technology</strong></td>
<td><strong>Energy Consumption</strong></td>
</tr>
<tr>
<td>• Customized mass production</td>
<td>• Global alliance of production and suppliers</td>
<td>• Critical to success in highly competitive industries</td>
<td>• The efficient use of energy and environmentally safe materials</td>
</tr>
<tr>
<td>• Top quality at a competitive price</td>
<td>• New business models</td>
<td>• Pressure on productivity increases, shortening time for new development</td>
<td></td>
</tr>
</tbody>
</table>

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Always the appropriate controller with comprehensive functionalities!

- Advanced Controllers
  - SIMATIC S7-1500
- Distributed Controllers
  - SIMATIC ET 200 CPU
- Basic Controllers
  - SIMATIC S7-1200
- Software Controllers
  - SIMATIC S7-1500

Engineered with TIA Portal
Innovations across the entire automation life cycle!

- Security Integrated
- Technology Integrated
- Safety Integrated
- Engineered in TIA Portal
- Integrated system diagnosis
- Design and Handling
Innovative system functions for more productivity!

Security integrated
Protecting intellectual property and investment
Protecting against unauthorized project changes

System Diagnostics
For Efficient fault analysis, Uniform display concept and reducing plant downtimes

Scalability
Investment protection while replacing S7-1200 with S7-1500 thanks to compatibility of programs
### User-friendly products, high efficiency and a scalable product portfolio

<table>
<thead>
<tr>
<th>Feature / Function</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated PROFINET</td>
<td>Web server for service- and diagnostic information</td>
</tr>
<tr>
<td>Technology Integrated</td>
<td>perfect integration of drives through motion control functionalities and PROFIdrive</td>
</tr>
<tr>
<td>Integrated Trace functionality</td>
<td>Program- and application diagnostics at real-time for recognizing even sporadic problems</td>
</tr>
<tr>
<td>Use of all TIA Portal advantages</td>
<td>Efficient programming, commissioning and service tools highest engineering requirements</td>
</tr>
</tbody>
</table>
### Feature / Function

<table>
<thead>
<tr>
<th>Feature / Function</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System Modularity</strong></td>
<td>Adding I/O without increasing the CPU footprint</td>
</tr>
<tr>
<td>Modular board concept is integrated customization</td>
<td></td>
</tr>
<tr>
<td><strong>Extensive built-in hardware capabilities</strong></td>
<td>Reduced need for additional specialty modules, smaller footprint and lower cost</td>
</tr>
<tr>
<td>Ethernet, analog in/out-puts, MC I/O, HSC I/O, SD memory</td>
<td></td>
</tr>
<tr>
<td><strong>One Engineering Software</strong></td>
<td>Reduced engineering time/cost, easier to maintain, easier to reuse</td>
</tr>
<tr>
<td>One user program for logic, HMI, networking &amp; drives.</td>
<td></td>
</tr>
<tr>
<td><strong>Safety Integrated</strong></td>
<td>reduction of types- and components by single automation system for Standard and Safety</td>
</tr>
<tr>
<td>One Controller for fail-safe and standard-automation</td>
<td></td>
</tr>
</tbody>
</table>
### Feature / Function

- Basic Controller with Safety Integrated
- Connecting ext. devices via PROFIsafe
- CPU 1212CF
- Energy Meter Module SM1238 AI
- MRP at 2 Port CPUs 1215 / 17 as client (FW 4.2)
- S7-Routing (FW 4.2)
- Userdefined web pages as start pages (FW 4.2)
- Backup / Restore with retain data (FW 4.2)

### Benefit

- One Controller, one Network and one Engineering for standard and fail-safe automation tasks
- Central Measurement and Handling of energy data
- Higher flexibility in network set-up (flexible topology) and higher network availability
- Individual and easy adaption of (CPU) web pages to applications
- Protection of data loss (incl actual process values)
Easy PLC selection thanks to an optimized Portfolio

Switch-module

Power-module

Communication-modules

CPUs

Signal-modules

Technology-modules

Signal-boards

CSM

PM

13x CM / CP

CPU 1211C-1PN
CPU 1212C-1PN
CPU 1214C-1PN
CPU 1215C-2PN
CPU 1217C-2PN
CPU 1212FC
CPU 1214FC
CPU 1215FC

22x I/Q

2xTM

11x SB
1x CB
1x BB

SM 1226 F-DO 2x Relay
SM 1226F-DO 4 x 24 V DC
SM 1226 F-DI 16 x 24 V DC
Marienhöher Milchproduktion Agro Waldkirchen GmbH / Waldkirchen, Germany - S7-1200 and Energy Meter Module

### Project information
- **End customer / F&B**: Waldkirchen/ Germany
- Energy data acquisition of direct marketing (butcher shop, diary, cheese factory, sales room), transparency and internal balancing in an agricultural enterprise

### Challenge
1. Allow internal balancing during operation without high effort and cost
2. Efficient operation and cost optimization
3. Reliable System Protection

### Customer benefits
1. **Transparency in energy consumption**
   - ... through the acquisition of energy data in a compact solution
2. **Increase of energy efficiency**
   - ... through analysis of the reactive power consumption
3. **Guaranteeing plant availability**
   - ... by monitoring the current peaks

### Products/solution
- **CPU 1212C with SM1238 Energy Meter Module**
- **CPU 1212C with SM1238 and visualization via KTP 400**
- **CPU 1212C with SM1238 and visualization via KTP 400**

### Products used

<table>
<thead>
<tr>
<th>Products used</th>
<th>Previously</th>
<th>Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>CPU 1212C</td>
</tr>
<tr>
<td>Janitza UMG96</td>
<td>SM 1238 Energy Meter</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>Basic Panel, KTP 400</td>
<td>TIA Portal Basic</td>
</tr>
</tbody>
</table>

### Products changed
- **Janitza UMG96** → **SM 1238 Energy Meter**

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SIMATIC Controller
Get more Information…

**Newsletter**
Always up-to-date!
- interesting news from and about AS, such as product innovations, success news, best practice information

[www.industry.siemens.com/newsletter](http://www.industry.siemens.com/newsletter)

**Internet**
Detailed product information and related subjects!
- Product Websites
- Twitter, Youtube..

[http://www.siemens.com/S7-1200](http://www.siemens.com/S7-1200)

**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/automation-tasks](http://www.siemens.com/automation-tasks)

**References Center**
From customer to customer!
- Customers gives account to there experiences using our Products for their applications

[https://webservices.siemens.com/references/#language=en](https://webservices.siemens.com/references/#language=en)