SIMATIC S7-200 SMART

S7-200 SMART Programmable controller

Answers for industry.
Siemens is synonymous with innovation, especially in the domain of industrial automation. Committed to R&D, promotion and application of latest technologies, Siemens has been instrumental in enhancing our customers’ competitiveness for over 140 years. Our state-of-the-art automation products and solutions not only improve production efficiency but also reduce total cost of ownership.

One such innovation from the house of Siemens is the SIMATIC controller series. These Programmable Logic Controllers (PLC) from Siemens offer a wide range of selection options starting from the most basic logic controller ‘LOGO!’ to powerful SIMATIC S7 series, which are high performance programmable controllers. For specific applications with higher demands on data storage, faster communication with embedded applications including GUI, Siemens also offers the automation controller system based on PC. Irrespective of the requirements, one can flexibly combine one or more Simatic controllers and customize the solution optimally.

SIMATIC S7-200 SMART, our newly launched micro PLC product, is designed to suit the needs of developing markets that are under constant pressure due to prices and demands for continuous performance. Providing an excellent performance-to-price ratio, SIMATIC S7-200 SMART when combined with other SMART drive products from Siemens helps in building an extremely cost effective yet efficient automation solution.
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SIMATIC S7-200 SMART Product Highlights

**More models, more choices**

It provides CPU modules that have a large number of I/O points onboard (up to 60 points.) The CPU module has a standard type and compact type for the users to choose, which can meet the different needs of customers.

**Extension options, accurate customization**

The new signal boards are designed with scalable communication ports, digital or analog channels, that are closely fitting to the user’s application requirements, and lower the user’s costs for expansion.

**High speed chip, excellent performance**

It is equipped with Siemens dedicated processor chip, the basic instruction execution time is up to 0.15 μs, it has the leading performance compared to the micro PLC of the same level, it can easily deal with complex and fast processes.

**Ethernet interconnectivity, economic and convenient**

All CPUs have integrated Ethernet interface to download the programs conveniently and quickly using the common cable. Through the Ethernet port, it can connect to other Simatic CPUs / HMIs to realize interconnection and set up the network.
Tri-axial pulse, freedom in motion

Provides powerful functions of speed and positioning control, the CPU module can maximally integrate three 100 kHz high speed pulse outputs, and support PWM/PTO.

Common SD card, fast update

This PLC integrates Micro SD card slot, supports common Micro SD card, can be used to update the program or device firmware, and can provide great convenience to the engineer who conducts the field service.

User-friendly software, programming efficiency

Based on the powerful functions inherited from the Siemens programming software, it has absorbed more humanized design which has enhanced the user friendliness of the software greatly. Improved the efficiency in developing the program.

Perfect integration, seamless integration

The perfect integration of SIMATIC S7-200 SMART, Basic LINE HMI and SINAMICS V20/V90, forms the micro automation solutions that is cost-effective; meeting the OEM customer’s full range of demand.
CPU module

The new S7-200 SMART has two different types of CPU modules, i.e. standard type and compact type. Standard type CPU is expandable with I/O expansion modules and signal boards. Compact type CPUs are non expandable with I/O expansion modules and signal boards.

### CPU module

<table>
<thead>
<tr>
<th>Type</th>
<th>CR40</th>
<th>CR60</th>
<th>SR20</th>
<th>SR30</th>
<th>SR40</th>
<th>SR60</th>
<th>ST20</th>
<th>ST30</th>
<th>ST40</th>
<th>ST60</th>
</tr>
</thead>
<tbody>
<tr>
<td>High speed counter</td>
<td>4 at 100 kHz for single phase</td>
<td>4 at 200 kHz for single phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High speed pulse output</td>
<td>—</td>
<td>2 at 100 kHz</td>
<td>3 at 100 kHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of communication ports</td>
<td>2</td>
<td>2 – 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Expansion modules</td>
<td>—</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum I/O handling capacity</td>
<td>40</td>
<td>60</td>
<td>212</td>
<td>222</td>
<td>232</td>
<td>252</td>
<td>212</td>
<td>222</td>
<td>232</td>
<td>252</td>
</tr>
<tr>
<td>Maximum analogue I/O</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>36</td>
</tr>
</tbody>
</table>

1) Only supports the standard type CPU module
2) Only supports the standard type transistor output;
3) The maximum I/O handling capacity is considering I/O expansion with Signal boards.
Communication and running state indicator, the PLC state can be seen easily.

The input and output terminals of all modules are removable.

Generic Micro SD card supports program downloading and PLC firmware updating.

Siemens dedicated high speed chip is incorporated, with basic instruction execution time up to 0.15 μs;

It is equipped with super capacitor, when the power is down, it still can guarantee the normal work of the clock.

Integrated Ethernet port that makes the downloading and networking equipment more convenient;

Signal board extension achieves accurate configuration, without occupying space in the electric control cabinet.

Convenient installation, support rail type and screw type installation;

Pin plug connection, module can be connected more closely.
Signal board

The signal board is mounted directly on the front of the CPU body; without occupying the cabinet space, its installation and disassembly are convenient and quick. For a small amount of I/O points extension and more demand for communication ports, the signal board with new design can provide more economical and flexible solutions.

### Basic information of the signal board

<table>
<thead>
<tr>
<th>Model</th>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB DT04</td>
<td>2DI/2DO transistor output</td>
<td>It provides additional digital I/O extensions, and support 2 digital inputs and 2 digital transistor outputs.</td>
</tr>
<tr>
<td>SB AQ01</td>
<td>1AO</td>
<td>It provides additional analogue I/O extension, and support 1 analogue output, with a precision 12 bits.</td>
</tr>
<tr>
<td>SB CM01</td>
<td>RS232/RS485</td>
<td>It provides additional RS232 or RS485 serial communication interface, the conversion can be realized via simple configuration in the software.</td>
</tr>
<tr>
<td>SB BA01</td>
<td>Battery module</td>
<td>It supports the generic CR1025 cell (battery), which can drive the clock for about 1 year.</td>
</tr>
</tbody>
</table>

### Signal board configuration

When the standard CPU module is selected in the system block, the aforementioned four signal boards will display the SB options:

- When SB DT04 is selected, the system can automatically distribute I7.0 and Q7.0 as the beginning of the I/O image area.
- When SB AQ01 is selected, the system can automatically allocates AQW12 as the I/O image area.
- When SB CM01 is selected, it can be done via selecting the RS232 or RS485 in the port type setting box.
- When SB BA01 is selected, the low power consumption alarm can be initialized or the power consumption state can be monitored via I7.0.

### Installation steps

1. Remove the cover board of terminal
2. Remove the cover board with Screw driver
3. No fastening screw is required, gently insert it;
4. The installation is complete
Network communication

All S7-200 SMART CPUs offer 1x Ethernet interface and the 1x RS485 interface onboard. Using Signal board CM01, one can add additional RS485/232 interface.

Ethernet communication

All the CPU modules are equipped with Ethernet interface, which supports Siemens S7 protocol, can support many terminal connections:

- Can be used as the programs downloading port (via general network cable)
- Communicate with Simatic Key/touch HMI with Profinet/Ethernet interface, maximally support 8 sets of equipment
- Communicate with multiple Ethernet equipment through the switch to achieve fast data communication.
- Supports up to 8 active GET/PUT connections and 8 passive GET/PUT connections.

Serial communication

On board RS485 port as well as additional RS232/485 port using CM01 can communicate with the inverter and touch screen and so on third party equipments. Signal board offers configurable RS232/RS485 port, maximally supports for up to 4 devices.

Serial port supports the following protocols:

- Modbus RTU
- PPI
- USS
- Free port communication (for interconnection with Bar code scanners, weighing scales, serial printers etc.)

Communication with the host computer*

Using Siemens PC Access tool, it is possible to read the data from S7-200 SMART on to the host computer. This can be used for simple GUI requirements for data monitoring or data archiving.

(PC Access is an OPC server protocol specifically developed for S7-200 series PLC, an OPC software dedicatedly developed for interaction between the micro PLC and host computer)

*) it will be released soon, please consult the Siemens offices and authorized distributors for the specific information.
Motion control

S7-200 SMART CPU provides maximum three 100KHz high speed pulse outputs, it can be configured for PWM output or motion control output through the powerful and flexible setup wizard, providing a unified solution for speed and position control of both the stepper motor or servo motor, satisfying the precise positioning requirements of the small mechanical equipment.

Basic functions of motion control

- Standard type transistor output module CPU, ST30/ST40/ST60 provides three 100 kHz high speed pulse output (ST20 provides two 100 kHz), supports PWM (pulse width modulation) and PTO (pulse train output).
- In PWM mode, the cycle of the output pulse is fixed, the pulse width and duty cycle are adjusted by the program, which can adjust the speed of the motor, the opening of valves etc.
- In PTO mode (motion control), the output pulse can be configured as multiple modes of operation, including automatically finding the original point, for realising the control of the stepper motor or servo motor, achieving the purpose of speed adjustment and positioning;
- The Q0.0, Q0.1 and Q0.3 on the CPU body can be configured as the PWM output or high speed pulse output, the above functions can be set up via the Wizard;

PWM and motion control wizard settings

In order to simplify the control functions in your application, the position control wizard provided by the STEP 7- Micro/WIN SMART can help you complete the PWM and the PTO configuration in a few minutes. The wizard can generate the position instructions, you can dynamically control the speed and position in your application with these instructions.

According to the user selected PWM pulse number, the PWM wizard can generate PWMx_RUN subroutine frame corresponding to editing. Motion control wizards can maximally provide the settings for three pulse outputs, the pulse output speed is adjustable from 20 Hz to 100 kHz.
Monitoring of motion control

In order to help users develop motion control scheme, STEP 7- Micro/WIN SMART provides the motion control panel. The operation, configuration and envelope configuration settings let the users easily monitor, on the motion control function operation, the start and test phases in the development process.

- The use of the motion control panel can verify whether the motion control wiring is correct or not, you can adjust the configuration data and test each mobile envelope;
- Display the current speed, current position and direction of the bit control, as well as the input and output of LED (except pulse LED) status;
- View to modify the configuration settings of the bit control operation stored in the CPU module.

Motion control features

- It provides configurable measurement system, it can use the engineering units (such as inches or centimetres) when inputting the data, and can also use the pulse number.
- It provides configurable backlash compensation;
- It supports the absolute, relative and manual control modes;
- It supports the continuous operation;
- It provides up to 32 groups of motion envelope, each envelope can set maximally 16 levels of speed;
- It provides 4 different reference point searching modes, each mode can select the initial direction search and the final approach direction.

Typical applications

- Labelling machine
- Pillow-type packaging machine
- Woodworking machinery
User-friendly software improves programming efficiency

STEP 7- Micro/WIN SMART is the programming software of the S7-200 SMART, it can run smoothly on the Windows XP SP3/Windows 7 Operating System. It supports LAD (ladder diagram), STL (Statement List), FBD (function block diagram) programming languages, freely converting between parts of language, the installation file is less than 100 MB. While inheriting the excellent programming idea of the STEP 7- Micro/WIN, the more user-friendly design makes programming easier and project development more efficient.

New menu design

It has no more traditional drop-down menu. It has adopted the band-type menu design, all menu options can be seen completely. The image of the icon display makes the operation more convenient.

By double clicking on the menu, it can be hidden so as to provide more space for a visual programming window.

Fully movable window design

All windows in the software interface can move freely, and provide eight kinds of drag and drop methods.

The main window, the program editor, the output window, variable table, state diagram etc. windows can be combined according to the user’s habits, maximally improve the programming efficiency.

The definitions of variables and program notes

The users can define the variable name according to the process flow, and can call through the variable name directly, allowing users to fully enjoy the convenience of high-level programming language. A special function registers the address call, automatically naming the variable, which can now be called directly the next time.

Micro/WIN SMART provides a perfect function for annotation, can add annotations to program block, programming network and variables, with its readability greatly improved. When the mouse is moved to the instruction block, data types supported by each pin are automatically displayed.
STEP 7-Micro/WIN SMART Software features:

1. New menu design
2. Fully movable window design
3. Variable definitions and notes
4. Novel wizard setting
5. Status monitoring
6. Convenient command Library
7. Powerful password protection functions

For detailed information about the software, consult the S7-200 SMART System Manual.

Setup wizard

Micro/WIN SMART integrates simple and quick wizard settings; you can just follow the wizard prompts to set up the parameters for each step of the complex function setting. The new guidance function allows the user to directly set up a step function, and without the need to reset every step, to modify the wizard settings.

The wizard setting supports the following functions:
- HSC (high speed counter)
- Motion control
- PID
- PWM (Pulse width Modulation)
- Text display

Status monitoring

In the Micro/WIN SMART status graph, it can monitor the current values of each input/output channel of PLC, at the same time, it can conduct the mandatory input operation to test the program logic for each channel.

Status monitoring value can be displayed in numerical form, and can also be directly displayed in the waveform, the aforementioned two can also be switched each other.

In addition, the Micro/WIN SMART system can monitor the PID and motion control operation, equipment operation status through the dedicate operation panel.

Convenient command Library

In PLC programming, the same tasks that are repetitively executed will be generally included in a subprogram, which can be directly used in the future. The use of subroutines can better organize the program structure, facilitate the debugging and reading.

Micro/WIN SMART provides the command library functions, converting the subroutine into a block of instructions, as a common block of instructions, which will be directly dragged and dropped into the programming interface to complete the call. The command library function provides password protection function, preventing the database files from being randomly reviewed or modified.

In addition, Siemens offers a large instruction library to complete a variety of functions, which can be easily added into the software.
SMART micro automation solutions

The perfect combination of Siemens SIMATIC micro-automation products and SINAMICS drive products has created new micro automation solutions that are economical, reliable and easy to use. SIMATIC S7-200 SMART PLC, SIMATIC BASIC LINE touch/Key HMI, SINAMICS V20 inverter and SINAMICS V90 servo system, that are of high performance-to-price ratio helps users to improve the performance of machinery and equipment, reduce the development cost, significantly shorten the launching time of the machine and equipment, and effectively improve the market competitiveness of the user.

Recommendations for the use of S7-200 SMART:

- While programming and debugging, it is suggested to, using 1 set of ordinary switchboard, to connect the related equipment (including PLC, touch screen, computer) to the switch. After downloading the PLC or touch screen programs, they can be directly tested on the touch screen through touch. When testing the PLC working state, there is no need to use a cable to connect the PLC and touch screen.

- Through the use of Micro SD card the fast and batch downloading of the PLC program can be realized. The well-prepared source card can be delivered to the end user by courier, or, in the scenario of urgent demand, the source file stored in the card can be sent via Email directly to the user at the site, the source file will be copied to the SD card and can be used after receiving.
Common SD card – Fast Update!!

The S7-200 SMART CPUs support the use of a microSDHC card for:

• User program transfer.
• Reset CPU to factory default condition.
• Firmware update of the CPU and attached expansion modules as supported

You can use any standard, commercial microSDHC card with a capacity in the range 4GB to 16GB. For detailed information about the software, consult the S7-200 SMART System Manual.

Program Transfer

A memory card can be used to transfer user program content into the CPU’s permanent memory, completely or partially replacing content already in the load memory.

For duplication of program from one CPU to other CPUs, you need not require software. Time & cost saving is also achieved.

Firmware upgrade

A memory card can be used to update the firmware in a CPU and any connected expansion modules.

No return to the factory for FW upgrade, it can be done with SD card.

Restore factory settings

A memory card can be used to erase all retained data, putting the CPU back into a factory default condition.
# Technical specifications

## Technical specification for CPU SR20/ST20

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU SR20 AC/DC/RLY</th>
<th>CPU ST20 DC/DC/DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.: (MLFB)</td>
<td>6ES7 288-1SR20-0AA0</td>
<td>6ES7 288-1ST20-0AA0</td>
</tr>
</tbody>
</table>

### Standard

<table>
<thead>
<tr>
<th>Dimension W x H x D (mm)</th>
<th>90 x 100 x 81</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>367.3 g</td>
</tr>
<tr>
<td>Power consumption</td>
<td>14 W</td>
</tr>
<tr>
<td>Available current (EM bus)</td>
<td>Max. 740 mA (5 V DC)</td>
</tr>
<tr>
<td>Available current (24 V DC)</td>
<td>Max. 300 mA (sensor power source)</td>
</tr>
<tr>
<td>Digital input current consumption (24 V DC)</td>
<td>4 mA for each input point used</td>
</tr>
</tbody>
</table>

### CPU features

- **User memory**
  - 12 KB program memory / 8 KB data memory / max. 10 KB retentive memory
- **On board digital I/O**
  - 12 input points / 8 output points
- **Process image size**
  - 256 bits input (I) / 256 bits output (Q)
- **Analog image**
  - 56 words input (AI) / 56 words output (AQ)
- **Bit memory (M)**
  - 256 bits
- **Temporary (local) memory**
  - The main program has 64 bytes, each subroutine and interrupt program has 64 bytes
- **I/O module extension**
  - 6 extension modules
- **Signal board extension**
  - Max. 1 signal board
- **High speed counters**
  - 4 in total
  - Single phase: 4 of 200 kHz
  - Quadrature phase: 2 of 100 kHz
- **Pulse output**
  - 12
- **Pulse capture input**
  - 2 in total, resolution is of 1ms,
- **Interrupt Edge**
  - 4 rising edges and 4 falling edges (when using optional signal board, there are 6 edges each)
- **Memory**
  - Micro SDHC card (optional)
- **Precision of real-time clock**
  - 120 seconds/month
- **Real-time clock hold time**
  - In general 7 days, or min. 6 days when 25 °C (Maintenance free super capacitor)

### Performance/Processing Time

- **Boolean**
  - 0.15 μs/instruction
- **Moving word operations**
  - 1.2 μs/instruction
- **Real mathematical operations**
  - 3.6 μs/instruction

### The user’s program elements supported by the S7-200 SMART

- **POUs**
  - type/quantity
    - main program: 1
    - sub-program: 128 (0 to 127)
    - interrupt program: 128 (0 to 127)
  - Nesting depth
    - from main program: 8 sub-program level
    - from interrupt program: 4 sub-program level
- **Accumulators**
  - 4
- **Timer**
  - type/quantity
    - non-holding (or not retained) (TON, TOF): 192
    - holding (or retained) (TONR): 64
- **Counters**
  - 256

### Communications

- **Number of ports**
  - 1 Ethernet port / 1 serial (RS485) / 1 additional serial (optional RS232/485 signal board) port
- **HMI equipment**
  - max. 4 connection on serial port
  - max. 8 connections on ethernet port
- **Programming equipment (PG)**
  - Ethernet: 1
  - Number of connections
    - Ethernet:
      - 8 for HMI
      - 1 for programming
      - 8 for CPU
      - 8 for active GET/PUT connection
      - 8 for passive GET/PUT connection serial (RS485)
    - each port has 4 for HMI connections
  - Data transmission rate
    - Ethernet: 10/100 Mb/s
    - RS485: 9600, 19200 and 187500 b/s
    - RS485 free port: 1200 to 115200 b/s
  - Isolation (external signal and PLC logic side)
    - Ethernet: Transformer isolation, 1500 V AC
    - RS485: none
  - Type of cable
    - Ethernet: CAT5e shielded cable
    - RS485: PROFIBUS network cable
- **Voltage range**
  - 85 ~ 264 V AC
- **Power supply frequency**
  - 47 ~ 63 Hz
## Model (continued)

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU SR20 AC/DC/RLY</th>
<th>CPU ST20 DC/DC/DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input current</td>
<td>When the maximum load is reached, only CPU is included</td>
<td>When the maximum load is reached, only CPU is included</td>
</tr>
<tr>
<td>When the maximum load is reached, it CPU and all the scalable extensions are included</td>
<td>160 mA when voltage is 24 V DC (without a 300 mA sensor power output)</td>
<td></td>
</tr>
<tr>
<td>210 mA when voltage is 120 V AC (with a 300 mA sensor power output)</td>
<td>480 mA when voltage is 24 V DC (with a 300 mA sensor power output)</td>
<td></td>
</tr>
<tr>
<td>90 mA when voltage is 120 V AC (with a 300 mA sensor power output)</td>
<td>When the maximum load is reached, CPU and all the scalable extensions are included</td>
<td></td>
</tr>
<tr>
<td>60 mA when voltage is 240 V AC (without a 300 mA sensor power output)</td>
<td>720 mA when voltage is 24 V DC</td>
<td></td>
</tr>
<tr>
<td>When the maximum load is reached, it CPU and all the scalable extensions are included</td>
<td></td>
<td></td>
</tr>
<tr>
<td>290 mA when voltage is 120 V AC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120 mA when voltage is 240 V AC (with a 300 mA sensor power output)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 mA when voltage is 240 V AC (without a 300 mA sensor power output)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hold time (power off)</td>
<td>30 ms when voltage is 120 V AC</td>
<td>20 ms when voltage is 24 V DC</td>
</tr>
<tr>
<td>Internal fuse (cannot be replaced by the user)</td>
<td>3 A, 250 V, Slow-blow fuse</td>
<td>3 A, 250 V, Slow-blow fuse</td>
</tr>
</tbody>
</table>

### Digital input

| Number of input points | 12 |
| Type | The sinking / sourcing type (IEC type 1 sinking) | The sinking/source type (IEC type 1 sinking excluding I0.0 to I0.3) |
| Rated voltage | It is 24V DC when the current is 4 mA, nominal value |
| Allowable continuous voltage | Max 30 V DC |
| Surge voltage | 35 V DC, lasting 0.5 s |
| Logic 1 signal (min) | It is 15 V DC when the current is 2.5 mA |
| Logic 0 signal (min) | It is 5 V DC when the current is 1 mA |
| Isolation (field side and logic side) | 500 V AC, lasting 1 min |
| Number of inputs that connect at the same time | 1 |
| Filter time | Each channel can be separately selected (point I0.0 to I0.3) : 0.2, 0.4, 0.8, 1.6, 3.2, 6.4 and 12.8 µs |
| HSC clock input frequency (max) | Single phase: 4 of 200 kHz |
| Logic 1 battery (15 – 26 V DC) | Quadrature phase: 2 of 100 kHz |
| Cable length (max), its unit is meter | Shielded: 500m (normal input), 50m (HSC input); non-shielded: 300m (normal input) |
| Isolation (CPU logic side and sensor power source) | Not isolated |

### Digital output

| Number of output | 8 |
| Type | Relay, dry contact | Solid state-MOSFET (source-type) |
| Voltage range | 5 – 30 V DC or 5 – 250 V AC | 20.4 – 28.8 V DC |
| Logic 1 signal when the current is max. | Min. 20 V DC |
| Logic 0 signal when the load is KG | Max. 0.1 V DC |
| Rated current at each point (max) | 2.0 A |
| Rated current at each public end (max) | 0.5 A |
| Lamp load | 6 A |
| On state resistance | New equipment is 0.2 Ω maximally |
| Leakage current at each point | Max. 10 µA |
| Surge current | It is 7A when the contact is closed |
| Overload protection | 8 A, max. lasting 100 ms |
| Isolation (field side and logic side) | None |
| New equipment is 100 MΩ minimally | |
| Disconnect the insulation between the contacts | 750 V AC, lasting 1 min |
| Isolated group | 2 |
| Inductive voltage clamp | Not recommended |
| Relay max. on/off frequency | Not recommended |
| Switching delay (Qa 0-Qa.3) | Max. 10 ms |
| Switching delay (Qa 0-Qa.7) | Max. 10 ms |
| Mechanical life (no load) | 10,000,000 break/close cycles |
| Contact life under the rated load | 100,000 break/close cycles |
| Output state under the STOP mode | Last value or replicable value (The default value is 0) |
| Number of output that are connected at the same time | 8 |
| Cable length | Shielded: 500 m; non-shielded: 300 m |
## Technical specification for CPU SR30/ST30

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU SR30 AC/DC/RLY</th>
<th>CPU ST30 DC/DC/DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No. (MLFB)</td>
<td>6ES7 288-1SR30-0AA0</td>
<td>6ES7 288-1ST30-0AA0</td>
</tr>
</tbody>
</table>

### Standard
- **Dimension W x H x D (mm)**: 110 x 100 x 81
- **Weight**: 435 g / 375 g
- **Power consumption**: 14 W / 12 W
- **Available current (EM bus)**: Max. 740 mA (5 V DC)
- **Available current (24 V DC)**: Max. 300 mA (sensor power source)
- **Digital input current consumption (24 V DC)**: 4 mA for each input point used

### CPU features
- **User memory**: 18 KB program memory / 12 KB data memory / max. 10 KB retentive memory
- **On board digital I/O**: 18 input points / 12 output points
- **Process image size**: 256 bits input (I) / 256 bits output (Q)
- **Analog image**: 56 words input (AI) / 56 words output (AQ)
- **Bit memory (M)**: 256 bits
- **Temporary (local) memory**: The main program has 64 bytes, each subroutine and interrupt program has 64 bytes
- **I/O module extension**: 6
- **Signal board extension**: Max. 1 signal board
- **High speed counters**: 4 in total, Single phase: 4 of 200 kHz, Quadrature phase: 2 of 100 kHz
- **Cycle interrupt**: 2 in total, resolution is of 1ms,
- **Interrupt Edge**: 4 rising edges and 4 falling edges (when using optional signal board, there are 6 edges each)
- **Memory**: Micro SDHC card (optional)
- **Precision of real-time clock**: 120 seconds/month
- **Real-time clock hold time**: In general 7 days, or min. 6 days when 25 °C (Maintenance free super capacitor)

### Performance/Processing Time
- **Boolean**: 0.15 μs/instruction
- **Moving word operations**: 1.2 μs/instruction
- **Real mathematical operations**: 3.6 μs/instruction

### The user’s program elements supported by the S7-200 SMART

<table>
<thead>
<tr>
<th>POUs</th>
<th>type/quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>main program</td>
<td>1</td>
</tr>
<tr>
<td>sub-program</td>
<td>128 (0 to 127)</td>
</tr>
<tr>
<td>interrupt program</td>
<td>128 (0 to 127)</td>
</tr>
<tr>
<td>Nesting depth</td>
<td>from main program: 8 sub-program level, from interrupt program: 4 sub-program level</td>
</tr>
</tbody>
</table>

| Accumulators | 4 |
| Timer | type/quantity |
| non-holding (or not retained) (TON, TOF) | 192 |
| holding (or retained) (TONR) | 64 |
| Counters | 256 |

### Communications
- **Number of ports**: 1 Ethernet port / 1 serial (RS485) / 1 additional serial (optional RS232/485 signal board) port
- **HMI equipment**: max. 4 connection on serial port, max. 8 connections on ethernet port
- **Programming equipment (PG)**: Ethernet: 1
- **Number of connections**: Ethernet: 8 for HMI, 1 for programming, 8 for CPU, 8 for active GET/PUT connection, 8 for passive GET/PUT connection, serial (RS485) 8 for each port has 4 for HMI connections
- **Data transmission rate**: Ethernet: 10/100 Mb/s, RS485 system protocol: 9600, 19200 and 187500 b/s, RS485 free port: 1200 to 115200 b/s
- **Isolation (external signal and PLC logic side)**: Ethernet: Transformer isolation, 1500 V AC, RS485: none
- **Type of cable**: Ethernet: CAT5e shielded cable, RS485: PROFIBUS network cable

### Power source
- **Voltage range**: 85 ~ 264 V AC
- **Power supply frequency**: 47 ~ 63 Hz
- **Power supply type**: 20.4 ~ 28.8 V DC
**Model**

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU SR30 AC/DC/RLY</th>
<th>CPU ST30 DC/DC/DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input current</td>
<td>When the maximum load is reached, only CPU is included</td>
<td>When the maximum load is reached, only CPU is included</td>
</tr>
<tr>
<td></td>
<td>92 mA (including power source of the sensor) when the voltage is 120 V AC</td>
<td>64 mA when voltage is 24 V DC (without a 300 mA sensor power output)</td>
</tr>
<tr>
<td></td>
<td>52 mA (including power source of the sensor) when the voltage is 240 V AC</td>
<td>365 mA when voltage is 24 V DC (with a 300 mA sensor power output)</td>
</tr>
<tr>
<td></td>
<td>When the max load is reached, it CPU and all the scalable extensions are included</td>
<td>When the max load is reached, CPU and all the scalable extensions are included</td>
</tr>
<tr>
<td></td>
<td>136 mA when voltage is 120 V AC</td>
<td>624 mA when voltage is 24 V DC</td>
</tr>
<tr>
<td></td>
<td>72 mA when voltage is 240 V AC</td>
<td></td>
</tr>
<tr>
<td>Inrush current (max)</td>
<td>8.9 A when voltage is 264 V AC</td>
<td>6 A when voltage is 28.8 V DC</td>
</tr>
<tr>
<td>Isolation (input power with the logic side)</td>
<td>1500 V AC</td>
<td>–</td>
</tr>
<tr>
<td>Leakage current, AC line for functional earthing</td>
<td>Max 0.5 mA</td>
<td>–</td>
</tr>
<tr>
<td>Hold time (power off)</td>
<td>30 ms when voltage is 120 V AC</td>
<td>20 ms when voltage is 24 V DC</td>
</tr>
<tr>
<td></td>
<td>200 ms when voltage is 240 V AC</td>
<td></td>
</tr>
<tr>
<td>Internal fuse (cannot be replaced by the user)</td>
<td>3 A, 250 V, Slow-blow fuse</td>
<td></td>
</tr>
</tbody>
</table>

**Sensor power source**

- Voltage range: 20.4 ~ 28.8 V DC
- Rated output current (max): 300 mA (short circuit protection)
- Maximum ripple noise (<10 MHz): <1 V peak-peak value
- Isolation (CPU logic side and sensor power source): Not isolated

**Digital input**

- Number of input points: 18
- Type: The sinking / sourcing type (IEC type 1 sinking) The sinking/sourcing type (IEC type 1 sinking excluding I0.0 to I0.3)
- Rated voltage: It is 24 V DC when the current is 4 mA, rated value
- Allowable continuous voltage: Max 30 V DC
- Surge voltage: 35 V DC, lasting 0.5 s
- Logic 1 signal (min): It is 15 V DC when the current is 2.5 mA
- Logic 0 signal (min): It is 5 V DC when the current is 1 mA
- Isolation (field side and logic side): 500 V AC, lasting 1 min
- Isolation group: 1
- Filter time: Each channel can be separately selected (point I0.0 to I1.5) : 0.2, 0.4, 0.8, 1.6, 3.2, 6.4 and 12.8 µs Each channel can be separately selected (I0.6) : 0, 6.4, 12.8 ms
- HSC clock input frequency (max) (Logic 1 battery = 15 ~ 26 V DC)
  - Single phase: 4 of 200 kHz
  - Quadrature phase: 2 of 100 kHz
- Numbers of inputs that connect at the same time: 18
- Cable length (max), its unit is meter
  - Shielding: 500m (normal input), 50m (HSC input) ; non shielding: 300m (normal input)
- Digital output
  - Number of output: 12
  - Type: Relay, dry contact Solid state-MOSFET (source type)
  - Voltage range: 5 ~ 30 V DC or 5 ~ 250 V AC
  - Logic 1 signal when the current is max. : 2.0 A
  - Logic 0 signal when the load is 10 K Ω : 0.5 A
  - Rated current at each point (max): 10.0 A
  - Rated current at each public end (max): 6 A
  - Rated current: 30 W DC/200 W AC
  - Lamp load: 5 W
  - On state resistance New equipment is 0.2 Ω maximally
  - Leakage current at each point: Max. 10 µ A
  - Surge current: It is 7A when the contact is closed
  - Overload protection: none
  - Isolation (field side and logic side): 1500 V AC, lasting 1 min (coil and contact) none, (coil and logic side) 500 V AC, lasting 1 min
  - Isolation resistance New equipment is 100 Ω minimally
  - Disconnect the insulation between the contacts: 750 V AC, lasting 1 min
  - Isolated group: 1
  - Inductive voltage clamp: Not recommended Lr = 48 V DC, 1 W loss
  - Switching delay (Qa.0-Qa.3): Max. 10 ms
  - Switching delay (Qa.4-Qb.7): Max. 10 ms
  - Mechanical life (no load): 10,000,000 break/close cycles
  - Contact life under the rated load: 100,000 break/close cycles
  - Output state under the STOP mode
  - Last value or replicable value (The default value is 0)
  - Number of output that are connected at the same time: 12
  - Cable length: Shielded: 500 m; non shielded: 150 m
## Technical specification for CPU SR40/ST40/CR40

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU SR40 AC/DC/RLY</th>
<th>CPU ST40 DC/DC/DC</th>
<th>CPU CR40 AC/DC/RLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.: (MLFB)</td>
<td>6ES7 288-1SR40-0AA0</td>
<td>6ES7 288-1ST40-0AA0</td>
<td>6ES7 288-1CR40-0AA0</td>
</tr>
</tbody>
</table>

### Standard

| Dimension W x H x D (mm) | 125 x 100 x 81 |
| Weight                  | 441.3 g / 410.3 g / 440 g |
| Power consumption       | 23 W / 18 W / 18 W |
| Available current (EM bus) | Max. 740 mA (5 V DC) |
| Available current (24 V DC) | Max. 300 mA (sensor power source) |
| Digital input current consumption (24 V DC) | 4mA for each input point used |

### CPU features

**User memory**
- 24 KB program memory / 16 KB data memory / max. 10 KB retentive memory
- 12 KB program memory / 8 KB data memory / max. 10 KB retentive memory

**On board digital I/O**
- 24 input points / 16 output points

**Process image size**
- 256 bits input (I) / 256 bits output (Q)

**Analog image**
- 56 words input (AI) / 56 words output (AQ)

**Bit memory (M)**
- 256 bits

**Temporary (local) memory**
- The main program has 64 bytes, each subroutine and interrupt program has 64 bytes

**I/O module extension**
- 6 extension modules

**Signal board extension**
- Max. 1 signal board

**High speed counters**
- 4 in total
  - Single phase: 4 of 200 kHz
  - Quadrature phase: 2 of 100 kHz

**Pulse output**
- 3, 100 kHz

**Pulse capture input**
- 14

**Cycle interrupt**
- 2 in total, resolution is of 1ms,

**Interrupt Edge**
- 4 rising edges and 4 falling edges (when using optional signal module, there are 6 edges each)

**Memory**
- Micro SDHC card (optional)

**Precision of real-time clock**
- 120 seconds/month

**Real-time clock hold time**
- In general 7 days, or min. 6 days when 25 °C (Maintenance free super capacitor)

### Performance/ Processing Time

**Boolean**
- 0.15 μs/instruction

**Moving word operations**
- 1.2 μs/instruction

**Real mathematical operations**
- 3.6 μs/instruction

### The user’s program elements supported by the S7-200 SMART

#### POUs type/quantity

- main program: 1
- sub-program: 128 (0 to 127)
- interrupt program: 128 (0 to 127)
- from main program: 8 sub-program level
- from interrupt program: 4 sub-program level

#### Accumulators

- 4

#### Timer type/quantity

- non-holding (or not retained) (TON, TOF) : 192
- holding (or retained) (TONR) : 64

#### Counters

- 256

### Communications

**Number of ports**
- 1 Ethernet port / 1 serial (RS485) / 1 additional serial (RS232/485 signal board is selectable, only limited to SR40 and ST40)

**HMI equipment**
- max. 4 connection on serial port
- max. 4 connections on ethernet port

**Programming equipment (PG)**
- Ethernet: 1

**Number of connections**

- Ethernet: 4 for HMI
- 1 for programming
- 8 for CPU
- 8 for active GET/PUT connection
- 8 for passive GET/PUT connection serial (RS485):
- each port has 4 for HMI connections

**Data transmission rate**
- Ethernet: 10/100 Mbit/s
- RS485 system protocol: 9600, 19200 and 187500 b/s
- RS485 free port: 1200 to 115200 b/s

**Isolation (external signal and PLC logic side)**
- Ethernet: Transformer isolation, 1500 V AC
- RS485: none

**Type of cable**
- Ethernet: CAT5e shielded cable
- RS485: PROFIBUS network cable

### Power source

**Voltage range**
- SR40/ST40/CR40: 85 ~ 264 V AC
- 20.4 ~ 28.8 V DC

**Power supply frequency**
- 47 ~ 63 Hz
- 47 ~ 63 Hz
<table>
<thead>
<tr>
<th>Model</th>
<th>CPU SR40 AC/DC/RLY</th>
<th>CPU ST40 DC/DC/DC</th>
<th>CPU CR40 AC/DC/RLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input current</td>
<td>Only includes the CPU</td>
<td>130 mA when voltage is 120 V AC (without a 300 mA sensor power output)</td>
<td>190 mA when voltage is 24 V DC (without a 300 mA sensor power output)</td>
</tr>
<tr>
<td></td>
<td>Includes CPU and all extension accessories</td>
<td>250 mA when voltage is 120 V AC (with a 300 mA sensor power output)</td>
<td>470 mA when voltage is 24 V DC (with a 300 mA sensor power output)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80 mA when voltage is 240 V AC (without a 300 mA sensor power output)</td>
<td>150 mA when voltage is 240 V AC (with a 300 mA sensor power output)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 mA when voltage is 24 V AC (without a 300 mA sensor power output)</td>
<td>150 mA when voltage is 24 V AC (with a 300 mA sensor power output)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>130 mA when voltage is 120 V AC</td>
<td>250 mA when voltage is 120 V AC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80 mA when voltage is 240 V AC</td>
<td>150 mA when voltage is 240 V AC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 mA when voltage is 24 V AC</td>
<td>150 mA when voltage is 24 V AC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250 mA when voltage is 24 V DC</td>
<td>680 mA when voltage is 24 V DC</td>
</tr>
<tr>
<td>Inrush current (max)</td>
<td>16.3 A when voltage is 264 V AC</td>
<td>11.7 A when voltage is 28.8 V DC</td>
<td>7.3 A when voltage is 264 V AC</td>
</tr>
<tr>
<td>Isolation (input power with the logic side)</td>
<td>1500 V AC</td>
<td>–</td>
<td>1500 V AC</td>
</tr>
<tr>
<td>Leakage current, AC line for functional earthing</td>
<td>Max 0.5 mA</td>
<td>–</td>
<td>Max 0.5 mA</td>
</tr>
<tr>
<td>Hold time (power off)</td>
<td>30 ms when voltage is 120 V AC</td>
<td>50 ms when voltage is 120 V AC</td>
<td>200 ms when voltage is 24 V DC</td>
</tr>
<tr>
<td>Internal fuse (cannot be replaced by the user)</td>
<td>3 A, 250 V, Slow-blow fuse</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

**Sensor power source**

- **Voltage range**: 20.4 ~ 28.8 V DC
- **Rated output current (max)**: 300 mA (short circuit protection)
- **Maximum ripple noise (<10 MHz)**: <1 V peak-peak value
- **Isolation (CPU logic side and sensor power source)**: Not isolated

**Digital input**

- **Number of input points**: 24
- **Type**: The sinking / sourcing type (IEC type 1 sinking)
- **Rated voltage**: It is 24 V DC when the current is 4 mA, nominal value
- **Allowable continuous voltage**: Max 30 V DC
- **Surge voltage**: 35 V DC, lasting 0.5 s
- **Logic 1 signal (min)**: It is 15 V DC when the current is 2.5 mA, 10.0 to 10.4 V DC at 8 mA
- **Logical 0 signal (min)**: It is 5 V DC when the current is 1 mA
- **Isolation (field side and logic side)**: 500 V AC, lasting 1 min
- **Isolation group**: 1
- **Filter time**: Each channel can be separately selected (only first 14 input loads on board, including the digital input of the signal board)
  - 0.2, 0.4, 0.8, 1, 6, 3.2, 6.4 and 12.8 µs
  - 0.2, 0.4, 0.8, 1, 6, 3.2, 6.4 and 12.8 ms
- **HSC clock input frequency (max)**: Single phase: 4 of 200 kHz
  - Quadrature phase: 2 of 100 kHz
- **Number of inputs that connect at the same time**: 24
- **Cable length (max)**: 10.0 to 10.3: Shielding: 500 m (normal input), 50 m (HSC input), All other inputs: shielding 500 m (normal input)

**Digital output**

- **Number of output**: 16
- **Type**: Relay, dry contact
- **Voltage range**: 5 ~ 30 V DC or 5 ~ 250 V AC
- **Logic 1 signal when the current is max.**: –
- **Logic 0 signal when the load is KG**: –
- **Rated current at each point (max)**: 2.0 A
- **Lamp load**: 30 W DC/200 W AC
- **On state resistance**: New equipment is 0.2 Ω maximally
- **Leakage current at each point**: –
- **Surge current**: It is 7A when the contact is closed
- **Overload protection**: none
- **Isolation (field side and logic side)**: 1500 V AC, lasting 1 min (coil and contact) none, (coil and logic side)
- **Isolation resistance**: New equipment is 100 MΩ minimally
- **Disconnect the insulation between the contacts**: 750 V AC, lasting 1 min
- **Isolated group**: 4
- **Inductive voltage clamp**: Not recommended
- **Switching delay (Qa.0-Qa.3)**: Max. 10 ms
- **Switching delay (Qa.4-Qb.7)**: Max. 10 ms
- **Mechanical life (no load)**: 10,000,000 break/close cycles
- **Contact life under the rated load**: 100,000 break/close cycles
- **Output state under the STOP mode**: Last value or replicable value (The default value is 0)
- **Number of output that are connected at the same time**: 16
- **Cable length**: Shielded: 500 m; non shielded: 150 m
# Technical specification for CPU SR60/ST60/CR60

<table>
<thead>
<tr>
<th>Model</th>
<th>CPU SR60 AC/DC/RLY</th>
<th>CPU ST60 DC/DC/DC</th>
<th>CPU CR60 AC/DC/RLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.: (MLFB)</td>
<td>6ES7 288-1SR60-0AA0</td>
<td>6ES7 288-1ST60-0AA0</td>
<td>6ES7 288-1CR60-0AA0</td>
</tr>
</tbody>
</table>

## Standard
- **Dimension W x H x D (mm)**: 175 x 100 x 81
- **Weight**: 611.5 g / 528.2 g / 620 g
- **Power consumption**: 25 W / 20 W
- **Available current (EM bus)**: Max. 740 mA (5 V DC)
- **Available current (24 V DC)**: Max. 300 mA (sensor power source)
- **Digital input current consumption (24 V DC)**: 4 mA for each input point used

## CPU features
### User memory
- 30 KB program memory / 20 KB data memory / max. 10 KB retentive memory
- 12 KB program memory / 8 KB data memory / max. 10 KB retentive memory

### On board digital I/O
- 36 input points / 24 output points

### Process image size
- 256 bits input (I) / 256 bits output (Q)

### Analogue image
- 56 words input (AI) / 56 words output (AQ)

### Bit memory (M)
- 256 bits

### Temporary (local) memory (L)
- The main program has 64 bytes, each subroutine and interrupt program has 64 bytes

### I/O module extension
- 6 extension modules

### Signal board extension
- Max. 1 signal board

### High speed counters
- 4 in total (Single phase: 4 of 200 kHz, Quadrature phase: 2 of 100 kHz)
- 4 in total (Single phase: 4 of 100 kHz, Quadrature phase: 2 of 50 kHz)

### Pulse output
- 3, 100 kHz

### Pulse capture input
- 14

### Cycle interrupt
- 2 in total, resolution is of 1ms

### Interrupt Edge
- 4 rising edges and 4 falling edges (when using optional signal module, there are 6 edges each)
- 4 rising edges and 4 falling edges

### Memory
- Micro SDHC card (optional)

### Precision of real-time clock
- 120 seconds/month
- In general 7 days, or min. 6 days when 25 °C (Maintenance free super capacitor)

### Performance/Processing Time
- **Boolean**: 0.15 μs/instruction
- **Moving word operations**: 1.2 μs/instruction
- **Real mathematical operations**: 3.6 μs/instruction

## The user’s program elements supported by the S7-200 SMART

### POUs
- **type/quantity**
  - main program: 1
  - sub-program: 128 (0 to 127)
  - interrupt program: 128 (0 to 127)
  - Nesting depth:
    - from main program: 8 sub-program level
    - from interrupt program: 4 sub-program level

### Accumulators
- 4

### Timer
- **type/quantity**
  - non-holding (or not retained) (TON, TOF): 192
  - holding (or retained) (TONR): 64

### Counters
- 256

## Communications
### Number of ports
- 1 Ethernet port / 1 serial (RS485) / 1 additional serial (RS232/485 signal board is selectable)

### HMI equipment
- max. 4 connection on serial port
- max. 8 connections on ethernet port

### Programming equipment PG
- Ethernet: 1

### Number of connections
- Ethernet:
  - 8 for HMI
  - 1 for programming
  - 8 for CPU
  - 8 for active GET/PUT connection
  - 8 for passive GET/PUT connection serial (RS485)
- each port has 4 for HMI connections

### Data transmission rate
- Ethernet: 10/100 Mbits
- RS485 system protocol: 9600, 19200 and 187500 b/s
- RS485 free port: 1200 to 115200 b/s

### Isolation (external signal and PLC logic side)
- Ethernet: Transformer isolation, 1500 V AC
- RS485: none

### Type of cable
- Ethernet: CAT5e shielded cable
- RS485: PROFIBUS network cable

## Power source
### Voltage range
- 85 ~ 264 V AC
- 20.4 ~ 28.8 V DC
- 85 ~ 264 V AC

### Power supply frequency
- 47 ~ 63 Hz
- –
- 47 ~ 63 Hz
Model | CPU 5060 ASC/DC/RLY | CPU ST60 DC/DC/DC | CPU CR60 AC/DC/RLY
---|---|---|---
Power input when max. load of the input current is reached | Only includes the CPU | Includes CPU and all extension accessories | Includes CPU and all extension accessories
Inrush current (max) when voltage is 264 V AC | 16.3 A | 220 mA when voltage is 24 V DC | 160 mA when voltage is 120 V AC (with a 300 mA sensor power output)
| 11.5 A when voltage is 28.8 V DC | (with a 300 mA sensor power output) | 280 mA when voltage is 120 V AC (with a 300 mA sensor power output)
| 7.3 A when voltage is 264 V AC (with a 300 mA sensor power output) | 710 mA when voltage is 24 V DC | (with a 300 mA sensor power output)
Max. load of the input current is reached | 160 mA when voltage is 264 V AC | 300 mA (short circuit protection) | 280 mA when voltage is 120 V AC (with a 300 mA sensor power output)
Isolation (input power with the logic side) | 1500 V AC | none | 1500 V AC
Leakage current, AC line for functional earthing | none | none | none
Hold time (power off) | 30 ms when voltage is 120 V AC | 20 ms when voltage is 24 V DC | 50 ms when voltage is 120 V AC (with a 300 mA sensor power output)
Internal fuse (cannot be replaced by the user) | 3 A, 250 V, Slow-blow fuse | 3 A, 250 V, Slow-blow fuse | 3 A, 250 V, Slow-blow fuse
Sensor power source | | | |
Voltage range | 20.4 ~ 28.8 V DC | 20.4 ~ 28.8 V DC | 20.4 ~ 28.8 V DC
Rated output current (max) | 300 mA | 300 mA | 300 mA
Maximum ripple noise (<10 MHz) | <1 V peak-peak value | <1 V peak-peak value | <1 V peak-peak value
Rated voltage | 24 V DC when the current is 4 mA, rated value | 24 V DC when the current is 4 mA, rated value | 120 V AC when the current is limited to I0.0 to I0.3
Allowable continuous voltage | Max 30 V DC | Max 30 V DC | Max 30 V DC
Surge voltage | 35 V DC, lasting 0.5 s | 35 V DC, lasting 0.5 s | 35 V DC, lasting 0.5 s
Logic 1 signal (min) | I (max) is V 4 V DC when it ranges from I0.0 to I0.3: 8 mA | Other input: 15 V DC when it is 2.5 mA | Other input: 15 V DC when it is 2.5 mA
| | Other input: 15 V DC when it is 2.5 mA | Other input: 15 V DC when it is 2.5 mA
Logic 0 signal (min) | | The voltage is 1 V DC when it ranges from I0.0 to I0.3: 1 mA | The voltage is 1 V DC when it ranges from I0.0 to I0.3: 1 mA
| | Other input: 5 V DC when it is 1 mA | Other input: 5 V DC when it is 1 mA
Isolation (field side and logic side) | 500 V AC, lasting 1 min | 500 V AC, lasting 1 min | 500 V AC, lasting 1 min
Isolation group | 1 | 1 | 1
Filter time | Each channel can be separately selected (I0.0 to I1.5) : 0.2, 0.4, 0.8, 1.6, 3.2, 6.4 and 12.8 µs | Each channel can be separately selected (I0.6) : 0, 6.4, 12.8 ms | Each channel can be separately selected (I0.6) : 0, 6.4, 12.8 ms
HSC clock input frequency (max) | Single phase: 4 of 200 kHz | Single phase: 4 of 100 kHz | Single phase: 4 of 100 kHz
| Quadrature phase: 2 of 100 kHz | Quadrature phase: 2 of 50 kHz |
Number of inputs that connect at the same time | 36 | 36 | 36
Cable length (max) | Shielded: 500m (normal input), 50m (HSC input); non shielded: 300m (normal input) | Shielded: 500m (normal input), 50m (HSC input); non shielded: 300m (normal input) | Shielded: 500m (normal input), 50m (HSC input); non shielded: 300m (normal input)
| | 10.0 to I0.3, shielded (only limited to this category): 500 m (normal input), 50 m (HSC input) | 10.0 to I0.3, shielded (only limited to this category): 500 m (normal input), 50 m (HSC input) |
| | All other inputs: shielded: 500 m (normal input); non shielded: 300 m (normal input) | All other inputs: shielded: 500 m (normal input); non shielded: 300 m (normal input) |
Digital output | | | |
Number of output | 24 | 24 | 24
Type | Relay, dry contact | Solid state-MOSFET (source-type) | Relay, dry contact
Voltage range | 5 ~ 30 V DC or 5 ~ 250 V AC | 5 ~ 30 V DC or 5 ~ 250 V AC | 5 ~ 30 V DC or 5 ~ 250 V AC
Logic 1 signal when the current is max. | Min. 20 V DC | - | -
Logic 0 signal when the load is KG | Max. 0.1 V DC | - | -
Rated current at each point (max) | 20 mA | 20 mA | 20 mA
Lamp load | 30 W DC/200 W AC | 30 W DC/200 W AC | 30 W DC/200 W AC
On state resistance | New equipment is 0.2 Ω maximally | New equipment is 0.2 Ω maximally | New equipment is 0.2 Ω maximally
Leakage current at each point | Max. 10 µA | Max. 10 µA | Max. 10 µA
Surge current | 8 A, max. lasting 100 ms | 8 A, max. lasting 100 ms | 8 A, max. lasting 100 ms
Overload protection | none | none | none
Isolation (field side and logic side) | 1500 V AC, lasting 1 min (coil and contact) | 500 V AC, lasting 1 min | 1500 V AC, lasting 1 min (coil and contact)
| | (coils and logic side) | none, (coils and logic side) |
Isolation resistance | New equipment is 100 MO minimally | New equipment is 100 MO minimally | New equipment is 100 MO minimally
| | - | - |
Disconnect the insulation between the contacts | 750 V AC, lasting 1 min | 750 V AC, lasting 1 min | 750 V AC, lasting 1 min
Isolated group | 6 | 6 | 6
Inductive voltage clamp | Not recommended | L = -48 V DC, 1 W loss | Not recommended
Switching delay (Qa.0-Qa.3) | Max. 10 ms | From the disconnection to connection max. 1 µs | Max. 10 ms
| | max. 1 µs | max. 1 µs |
Switching delay (Qa.4-Qb.7) | Max. 10 ms | From the disconnection to connection max. 50 µs | Max. 10 ms
| | max. 50 µs | max. 50 µs |
Mechanical life (no load) | 10,000,000 break/close cycles | 10,000,000 break/close cycles | 10,000,000 break/close cycles
Contact life under the rated load | 100,000 break/close cycles | 100,000 break/close cycles | 100,000 break/close cycles
Output state under the STOP mode | Last value or replicable value (The default value is 0) | Last value or replicable value (The default value is 0) | Last value or replicable value (The default value is 0)
Number of output that are connected at the same time | 16 | 16 | 16
Cable length | Shielded: 500 m; non shielded: 150 m | Shielded: 500 m; non shielded: 150 m | Shielded: 500 m; non shielded: 150 m
### Technical specification for digital input modules

<table>
<thead>
<tr>
<th>Model</th>
<th>EM DI08</th>
<th>Order No. (MLFB)</th>
<th>6ES7 288-2DE08-0AA0</th>
</tr>
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<tbody>
<tr>
<td><strong>Standard</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimension W x H x D (mm)</td>
<td>45 x 100 x 81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>141.4 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>1.5 W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption (SM bus)</td>
<td>105 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>4 mA for each input point used</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Digital input</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of input points</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>The sinking / sourcing type (IEC type 1 sinking)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated voltage</td>
<td>It is 24 V DC when the current is 4 mA, nominal value</td>
<td></td>
<td></td>
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### Technical specification for digital output modules

<table>
<thead>
<tr>
<th>Model</th>
<th>EM DR08</th>
<th>EM DT08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order No. (MLFB)</td>
<td>6ES7 288-2DR08-0AA0</td>
<td>6ES7 288-2DT08-0AA0</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimension W x H x D (mm)</td>
<td>45 x 100 x 81</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>166.3 g</td>
<td>147 g</td>
</tr>
<tr>
<td>Power consumption</td>
<td>4.5 W</td>
<td>1.5 W</td>
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<tr>
<td>Current consumption (SM bus)</td>
<td>120 mA</td>
<td></td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>Each relay coil used is 11 mA</td>
<td>–</td>
</tr>
<tr>
<td><strong>Digital output</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of outputs</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Relay, dry contact</td>
<td>Solid state-MOSFET (source-type)</td>
</tr>
<tr>
<td>Voltage range</td>
<td>5 ~ 30 V DC or 5 ~ 250 V AC</td>
<td>20.4 ~ 28.8 V DC</td>
</tr>
<tr>
<td>Logic 1 signal when the current is max.</td>
<td>–</td>
<td>20 V</td>
</tr>
<tr>
<td>Logic 0 signal when the load is KG</td>
<td>–</td>
<td>0.1 V</td>
</tr>
<tr>
<td>Rated current at each point (max)</td>
<td>2.0 A</td>
<td>0.75 A</td>
</tr>
<tr>
<td>Lamp load</td>
<td>30 W DC/200 W AC</td>
<td>5 W DC</td>
</tr>
<tr>
<td>Resistance of the contact in the ON state</td>
<td>New equipment is 0.2 Ω maximally</td>
<td>0.6 Ω</td>
</tr>
<tr>
<td>Leakage current at each point</td>
<td>–</td>
<td>10 µ A</td>
</tr>
<tr>
<td>Surge current</td>
<td>It is 7A when the contact is closed</td>
<td>8 A, max. lasting 100 ms</td>
</tr>
<tr>
<td>Overload protection</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>Isolation (field side and logic side)</td>
<td>1500 V AC, lasting 1 min (coil and contact) none, (coil and logic side)</td>
<td>500 V AC, lasting 1 min</td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>New equipment is 100 Ω minimally</td>
<td>–</td>
</tr>
<tr>
<td>Disconnect the insulation between the contacts</td>
<td>750 V AC, lasting 1 min</td>
<td>–</td>
</tr>
<tr>
<td>Isolated group</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Current of each public end (max)</td>
<td>8 A</td>
<td>3 A</td>
</tr>
<tr>
<td>Inductive voltage clamp</td>
<td>–</td>
<td>– 48 V DC</td>
</tr>
<tr>
<td>Switching delay</td>
<td>Max. 10 ms</td>
<td>From the disconnection to connection max. 50 µs from the connection to disconnection is 200 µs max.</td>
</tr>
<tr>
<td>Mechanical life (no load)</td>
<td>10,000,000 break/close cycles</td>
<td>–</td>
</tr>
<tr>
<td>Contact life under the rated load</td>
<td>100,000 break/close cycles</td>
<td>–</td>
</tr>
<tr>
<td>Output state under the STOP mode</td>
<td>Last value or replicable value (The default value is 0)</td>
<td></td>
</tr>
<tr>
<td>Number of output that are connected at the same time</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td>Shielded: 500 m; non shielded: 300 m</td>
<td></td>
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## Technical specification for digital input/output modules

<table>
<thead>
<tr>
<th>Model</th>
<th>EM DR16</th>
<th>EM DT16</th>
<th>EM DR32</th>
<th>EM DT32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>(MLFB) 6ES7 288-2DR16-0AA0</td>
<td>6ES7 288-2DT16-0AA0</td>
<td>6ES7 288-2DR32-0AA0</td>
<td>6ES7 288-2DT32-0AA0</td>
</tr>
<tr>
<td>Dimension W x H x D (mm)</td>
<td>45 x 100 x 81</td>
<td>70 x 100 x 81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>201.9 g</td>
<td>179.7 g</td>
<td>295.4 g</td>
<td>257.3 g</td>
</tr>
<tr>
<td>Power consumption</td>
<td>5.5 W</td>
<td>2.5 W</td>
<td>10 W</td>
<td>4.5 W</td>
</tr>
<tr>
<td>Current consumption (SM bus)</td>
<td>145 mA</td>
<td>145 mA</td>
<td>180 mA</td>
<td>185 mA</td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>4 mA for each input point used</td>
<td>–</td>
<td>Each relay coil used is 11 mA</td>
<td>–</td>
</tr>
</tbody>
</table>

### Digital input
- **Number of input points**: 8, 16
- **Type**: The sinking / sourcing type (IEC type 1 sinking)
- **Rated voltage**: It is 24V DC, when the current is 4mA, nominal value
- **Allowable continuous voltage**: Max 30 V DC
- **Surge voltage**: 35 V DC, lasting 0.5 s
- **Logic 1 signal (min)**: 15 V DC
- **Logic 0 signal (min)**: 5 V DC
- **Isolation (field side and logic side)**: 500 V AC, lasting 1 min
- **Isolation group**: 2
- **Filter time**: 0.2, 0.4, 0.8, 1.6, 3.2, 6.4 and 12.8 ms (optional, 4 form one group)
- **Number of inputs that connect at the same time**: 8, 16
- **Cable length**: 500 m (Shielded), 150 m (non shielded)

### Digital output
- **Number of output**: 8, 16
- **Type**: Relay, dry contact
- **Voltage range**: 6 ~ 30 V DC or 5 ~ 250 V AC
- **Logic 1 signal when the current is max.**: – Min. 20 V DC
- **Logic 0 signal when the load is KG**: – Max. 0.1 V DC
- **Rated current at each point (max)**: 2 A, 0.75 A, 2 A, 0.75 A
- **Lamp load**: 30 W DC/200 W AC, 5 W, 30 W DC/200 W AC, 5 W
- **Resistance of the contact in the ON state**: New equipment is 0.2 Ω maximally
- **Leakage current at each point**: – Max. 10 μ A
- **Surge current**: It is 7A when the contact is closed
- **Overload protection**: none
- **Isolation (field side and logic side)**: 1500 V AC, lasting 1 min (coi and logic side) minimally
- **Isolation resistance**: New equipment is 100 M Ω minimally
- **Isolate group**: 2
- **Each end of the current public**: 8 A, 3 A, 8 A, 6 A
- **Inductive voltage clamp**: - -48 V – -48 V
- **Switching delay**: From the disconnection to connection max. 1 μs from the connection to disconnection is 3 μs max.
- **Mechanical life (no load)**: 10,000,000 break/close cycles
- **Contact life under the rated load**: 100,000 break/close cycles
- **Output state under the STOP mode**: Last value or replicable value (The default value is 0)
- **Number of output that are connected at the same time**: 8, 16
- **Cable length**: Shielded: 500 m; non shielded: 300 m
### Technical specification for analogue input modules

<table>
<thead>
<tr>
<th>Model</th>
<th>EM AIO4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>(MLFB) 6ES7 288-3AD04-0AA0</td>
</tr>
<tr>
<td>Standard</td>
<td></td>
</tr>
<tr>
<td>Dimension W x H x D (mm)</td>
<td>45 x 100 x 81</td>
</tr>
<tr>
<td>Weight</td>
<td>147 g</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1.5 W (no load)</td>
</tr>
<tr>
<td>Current consumption (SM bus)</td>
<td>80 mA</td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>40 mA (no load)</td>
</tr>
<tr>
<td>Analogue input</td>
<td></td>
</tr>
<tr>
<td>No. of Inputs</td>
<td>4</td>
</tr>
<tr>
<td>Type</td>
<td>Voltage or current (differential) : 2 can be selected as a group</td>
</tr>
<tr>
<td>Range</td>
<td>±10 V, ±5 V, ±2.5 V, or 0 ~ ±20 mA</td>
</tr>
<tr>
<td>Full scale range (data word)</td>
<td>±27, 648 ~ 27, 648</td>
</tr>
<tr>
<td>Overshoot / undershoot range (data word)</td>
<td>Voltage: ±27, 649 ~ 32, 511/27, 649 ~ ±32, 512</td>
</tr>
<tr>
<td>Overflow / underflow (data word)</td>
<td>Voltage: ±32, 512 ~ 32, 767/32, 513 ~ ±32, 768</td>
</tr>
<tr>
<td>Resolution</td>
<td>Voltage mode: 11 bits + signal bits</td>
</tr>
<tr>
<td>Maximum voltage / current resistance</td>
<td>±35 V/±40 mA</td>
</tr>
<tr>
<td>Smoothness</td>
<td>None, weak, medium or strong</td>
</tr>
<tr>
<td>Noise suppression</td>
<td>400, 60, 50 or 10 Hz</td>
</tr>
<tr>
<td>Input resistance</td>
<td>≥9 MΩ (voltage) / 250 Ω (current)</td>
</tr>
<tr>
<td>Resolution</td>
<td>Voltage mode: 11 bits + signal bits</td>
</tr>
<tr>
<td>Maximum voltage / current resistance</td>
<td>±35 V/±40 mA</td>
</tr>
<tr>
<td>Smoothness</td>
<td>None, weak, medium or strong</td>
</tr>
<tr>
<td>Noise suppression</td>
<td>400, 60, 50 or 10 Hz</td>
</tr>
<tr>
<td>Input resistance</td>
<td>≥9 MΩ (voltage) / 250 Ω (current)</td>
</tr>
<tr>
<td>Resolution</td>
<td>Voltage mode: 11 bits + signal bits</td>
</tr>
<tr>
<td>Maximum voltage / current resistance</td>
<td>±35 V/±40 mA</td>
</tr>
<tr>
<td>Smoothness</td>
<td>None, weak, medium or strong</td>
</tr>
<tr>
<td>Noise suppression</td>
<td>400, 60, 50 or 10 Hz</td>
</tr>
<tr>
<td>Input resistance</td>
<td>≥9 MΩ (voltage) / 250 Ω (current)</td>
</tr>
<tr>
<td>Precision (25°C / 0 ~ 55°C)</td>
<td>Voltage mode: full range ±0.1 %/±0.2 %</td>
</tr>
</tbody>
</table>

### Technical specification for analogue output modules

<table>
<thead>
<tr>
<th>Model</th>
<th>EM AQ02</th>
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</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>(MLFB) 6ES7 288-3AQ02-0AA0</td>
</tr>
<tr>
<td>Standard</td>
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</tr>
<tr>
<td>Dimension W x H x D (mm)</td>
<td>45 x 100 x 81</td>
</tr>
<tr>
<td>Weight</td>
<td>147.1 g</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1.5 W (no load)</td>
</tr>
<tr>
<td>Current consumption (SM bus)</td>
<td>80 mA</td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>50 mA (no load)</td>
</tr>
<tr>
<td>Analogue output</td>
<td></td>
</tr>
<tr>
<td>No. of Inputs</td>
<td>2</td>
</tr>
<tr>
<td>Type</td>
<td>Voltage or current</td>
</tr>
<tr>
<td>Range</td>
<td>±10 V or 0 ~ ±20 mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>Voltage mode: 10 bits + signal bits</td>
</tr>
<tr>
<td>Full scale range (data word)</td>
<td>Voltage: ±27, 648 ~ 27, 648</td>
</tr>
<tr>
<td>Overshoot / undershoot range (data word)</td>
<td>Voltage: ±27, 649 ~ 32, 511/27, 649 ~ ±32, 512</td>
</tr>
<tr>
<td>Overflow / underflow (data word)</td>
<td>Voltage: ±32, 512 ~ 32, 767/32, 513 ~ ±32, 768</td>
</tr>
<tr>
<td>Resolution</td>
<td>Voltage mode: 11 bits + signal bits</td>
</tr>
<tr>
<td>Maximum voltage / current resistance</td>
<td>±35 V/±40 mA</td>
</tr>
<tr>
<td>Smoothness</td>
<td>None, weak, medium or strong</td>
</tr>
<tr>
<td>Noise suppression</td>
<td>400, 60, 50 or 10 Hz</td>
</tr>
<tr>
<td>Input resistance</td>
<td>≥9 MΩ (voltage) / 250 Ω (current)</td>
</tr>
<tr>
<td>Resolution</td>
<td>Voltage mode: 11 bits + signal bits</td>
</tr>
<tr>
<td>Maximum voltage / current resistance</td>
<td>±35 V/±40 mA</td>
</tr>
<tr>
<td>Smoothness</td>
<td>None, weak, medium or strong</td>
</tr>
<tr>
<td>Noise suppression</td>
<td>400, 60, 50 or 10 Hz</td>
</tr>
<tr>
<td>Input resistance</td>
<td>≥9 MΩ (voltage) / 250 Ω (current)</td>
</tr>
<tr>
<td>Precision (25°C / 0 ~ 55°C)</td>
<td>Voltage mode: full range ±0.1 %/±0.2 %</td>
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### Technical specification for analogue input/output modules

<table>
<thead>
<tr>
<th>Model</th>
<th>EM AM06</th>
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<tbody>
<tr>
<td>Order No.</td>
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<tr>
<td>Standard</td>
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<tr>
<td>Dimension W x H x D (mm)</td>
<td>45 x 100 x 81</td>
</tr>
<tr>
<td>Weight</td>
<td>173.4 g</td>
</tr>
<tr>
<td>Power consumption</td>
<td>≥9 MΩ (voltage) / 250 Ω (current)</td>
</tr>
<tr>
<td>Current consumption (SM bus)</td>
<td>80 mA</td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>60 mA (no load)</td>
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<tr>
<td>Analogue input</td>
<td></td>
</tr>
<tr>
<td>No. of Inputs</td>
<td>4</td>
</tr>
<tr>
<td>Type</td>
<td>Voltage or current (differential) : 2 can be selected as a group</td>
</tr>
<tr>
<td>Range</td>
<td>±10 V, ±5 V, ±2.5 V, or 0 ~ ±20 mA</td>
</tr>
<tr>
<td>Full scale range (data word)</td>
<td>±27, 648 ~ 27, 648</td>
</tr>
<tr>
<td>Overshoot / undershoot range (data word)</td>
<td>Voltage: ±27, 649 ~ 32, 511/27, 649 ~ ±32, 512</td>
</tr>
<tr>
<td>Overflow / underflow (data word)</td>
<td>Voltage: ±32, 512 ~ 32, 767/32, 513 ~ ±32, 768</td>
</tr>
<tr>
<td>Resolution</td>
<td>Voltage mode: 11 bits + signal bits</td>
</tr>
<tr>
<td>Maximum voltage / current resistance</td>
<td>±35 V/±40 mA</td>
</tr>
<tr>
<td>Smoothness</td>
<td>None, weak, medium or strong</td>
</tr>
<tr>
<td>Noise suppression</td>
<td>400, 60, 50 or 10 Hz</td>
</tr>
<tr>
<td>Input resistance</td>
<td>≥9 MΩ (voltage) / 250 Ω (current)</td>
</tr>
<tr>
<td>Resolution</td>
<td>Voltage mode: 11 bits + signal bits</td>
</tr>
<tr>
<td>Maximum voltage / current resistance</td>
<td>±35 V/±40 mA</td>
</tr>
<tr>
<td>Smoothness</td>
<td>None, weak, medium or strong</td>
</tr>
<tr>
<td>Noise suppression</td>
<td>400, 60, 50 or 10 Hz</td>
</tr>
<tr>
<td>Input resistance</td>
<td>≥9 MΩ (voltage) / 250 Ω (current)</td>
</tr>
<tr>
<td>Precision (25°C / 0 ~ 55°C)</td>
<td>Voltage mode: full range ±0.1 %/±0.2 %</td>
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</table>
Technical specification for digital input / output signal board

<table>
<thead>
<tr>
<th>Model</th>
<th>SB DT04</th>
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<tbody>
<tr>
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<td>6ES7 288-5DT04-0AA0</td>
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<td>Standard</td>
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<tr>
<td>Dimension W x H x D (mm)</td>
<td>35 x 52.2 x 16</td>
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<tr>
<td>Weight</td>
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</tr>
<tr>
<td>Power consumption</td>
<td>1.0 W</td>
</tr>
<tr>
<td>Current consumption (SM bus)</td>
<td>50 mA</td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>Each input used 4mA</td>
</tr>
</tbody>
</table>

**Analogue input**

| No. of Inputs | 2 |
| Type | Sinking type/sources type (IEC type 1 sinking) |
| Rated voltage | 24 V DC, When the current is 4 mA, nominal value |
| Allowable continuous voltage | Max. 30 V DC |
| Surge voltage | 35 V DC, lasting 0.5 s |
| Logic 1 signal (min) | 15 V DC when the current is 2.5 mA |
| Logic 0 signal (max) | 5 V DC when the current is 1 mA |
| Isolation (field side and logic side) | 500 V AC, lasting 1 min |
| Isolation group | 1 |

**Filter time**

Each channel can be selected separately

- 0.2, 0.4, 0.8, 1.6, 3.2, 6.4 and 12.8 µs
- 0.2, 0.4, 0.8, 1.6, 3.2, 6.4 and 12.8 µs

**Number of inputs connected at the same time**

2

**Cable length**

500 m (shielded), 300 m (non shielded)

Digital output

| No. of Outputs | 2 |
| Type | Solid state -MOSFET |
| Voltage range | 20.4 ~ 24 V DC |
| Logic 1 signal at max current | Min 20 V DC |
| Logic 0 signal at max current | Max 0.1 V DC |
| Rated current of each point (max) | 0.5 A |
| Lamp load | 5 W |
| Contact resistance in the ON status | Max 0.6 Ω |
| Current leakage at point | Max 10 µA |
| Surge current | 5 A, max lasting 100 ms |
| Overload protection | No |
| Isolation (field side and logic side) | 500 V AC, lasting 1 min |
| Isolation group | 1 |
| Current of each public end | 1 A |
| Inductive voltage clamp | L = ~ 48 V, 1 W loss |
| Switching delay | Disconnected to connected maximally 2 µs |
| Output state under the STOP mode | Last value or replicable value (The default value is 0) |
| Number of inputs connected at the same time | 2 |
| Cable length (max) | 500 m (shielded), 300 m (non shielded) |

Technical specification for analogue output signal board

<table>
<thead>
<tr>
<th>Model</th>
<th>SB AQ01</th>
</tr>
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<tbody>
<tr>
<td>Order No. (MLFB)</td>
<td>6ES7 288-5AQ01-0AA0</td>
</tr>
<tr>
<td>Standard</td>
<td></td>
</tr>
<tr>
<td>Dimension W x H x D (mm)</td>
<td>35 x 52.2 x 16</td>
</tr>
<tr>
<td>Weight</td>
<td>17.4 g</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1.5 W</td>
</tr>
<tr>
<td>Current consumption (SM bus)</td>
<td>15 mA</td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>40 mA (no load)</td>
</tr>
</tbody>
</table>

**Analogue output**

| No. of Inputs | 1 |
| Type | Voltage or current |
| Range | ±10 V or 0 ~ 20 mA |
| Resolution | Voltage mode: 11 bits + signal bits |
| Full scale range (data word) | 27, 648 ~ 27, 648 (~10V ~ 10 V) 0 ~ 27, 648 (0 ~ 20 mA) |
| Precision (25°C ~ 55°C) | ±0.5 % / ±1.0 % |

**Stabilisation time** (95% of the new value)

Voltage: 300 µs (R), 750 µs (R), 750 µs (1 µ F)

**Load resistance**

Voltage: ±1000 Ω

**Output state under the STOP mode**

- Last value or replicable value
- None

**Cable length (max)**

10 m, shielded twisted pair

Diagnosis

- Overflow / underflow
- Short circuit to ground (only for voltage mode)
- Circuit breaker (only for current mode)

Technical specification for battery signal board

<table>
<thead>
<tr>
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<th>SB BA01</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Standard</td>
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<tr>
<td>Dimension W x H x D (mm)</td>
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</tr>
<tr>
<td>Weight</td>
<td>18.2 g</td>
</tr>
<tr>
<td>Power consumption</td>
<td>0.5 W</td>
</tr>
<tr>
<td>Current consumption (5 V DC)</td>
<td>50 mA</td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>1.5 W</td>
</tr>
<tr>
<td>Weight</td>
<td>17.4 g</td>
</tr>
<tr>
<td>Dimension W x H x D (mm)</td>
<td>35 x 52.2 x 16</td>
</tr>
<tr>
<td>Standard</td>
<td>(MLFB) 6ES7 288-5CM01-0AA0</td>
</tr>
<tr>
<td>Order No</td>
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<tr>
<td>Dimensions</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>18.2 g</td>
</tr>
<tr>
<td>Power consumption</td>
<td>0.5 W</td>
</tr>
<tr>
<td>Current consumption (5 V DC)</td>
<td>50 mA</td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>1.5 W</td>
</tr>
<tr>
<td>Weight</td>
<td>17.4 g</td>
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<td>Dimensions</td>
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<td>Current consumption (5 V DC)</td>
<td>50 mA</td>
</tr>
<tr>
<td>Current consumption (24 V DC)</td>
<td>1.5 W</td>
</tr>
</tbody>
</table>

**Battery (need to be bought by the user)**

- Hold duration: About 1 year
- Type of battery: CR1025 cell battery
- Nominal voltage: 3 V
- Nominal capacity: 30 mA

**Diagnosis**

- Critical cell voltage: <2.5 V
- Battery diagnosis: Low voltage lamp
- Battery status update: The battery status will be updated in the boot, then the CPU in RUN mode

Cable length, shielded cable

| Length of cable, shielded cable | Isolation repeaters: 1000 m, baud rate up to 187.5 K |
| Length of cable, shielded cable | Isolation repeaters: 1000 m, baud rate up to 187.5 K |

Transmitter and receiver (RS485)

- common-mode voltage range: -7 V ~ +12 V, 1 s, 3 VRMS continuous
- Receiver differential output voltage: min 2 V when RL = 100 Ω
- terminator and bias: On TXD 4.7 KΩ for +5 V
- Receiver input impedance: Min 12 KΩ
- The receiver threshold / sensitivity: Minimum ±0.2 V, the typical lag 0.5 V
- Isolation: None
- The RS485 signal and the shell grounding RS485 signal and CPU logic common end
- Length of cable, shielded cable: 1000 m, baud rate up to 187.5 K

Transmitter and receiver (RS232)

- common-mode voltage range: -7 V ~ +12 V, 1 s, 3 VRMS continuous
- Transmitter differential output voltage: min 2 V when RL = 100 Ω
- terminator and bias: On TXD 4.7 KΩ for +5 V
- Receiver input impedance: Min 12 KΩ
- The receiver threshold / sensitivity: Minimum ±0.2 V, the typical lag 0.5 V
- Isolation: None
- The RS232 signal and the shell grounding RS232 signal and CPU logic common end
- Length of cable, shielded cable: 1000 m, baud rate up to 187.5 K
Technical specification for RTD module

**Model**

Order No.: (MLFB) 6ES7 288-3AR02-0AA0

**Standard**

- Dimension W x H x D (mm): 45 x 100 x 81
- Weight: 148.7 g
- Power consumption: 1.5 W
- Current consumption (SM bus): 80 mA
- Current consumption (24 V DC): 40 mA

**Analogue input**

- No. of Inputs: 2
- Type: RTD and resistance value of module reference ground
- Nominal range (data word) overshoot / undershoot range (data word): Please refer to RTD sensor selection table in the 57-200 SMART System Manual
- Resolution:
  - Temperature: 0.1°C / 0.1°F
  - Resistance: 
    - 15 position + sign
    - Maximum voltage hold: ±35 V
    - Noise suppression: 85 dB, 10 Hz/50 Hz/60 Hz/400 Hz
  - Common mode rejection: > 120 dB
- Resistance: > 10 MΩ

**Isolation**

- Field side and logic side: 500 V AC
- Field side and 24 V DC side: 500 V AC
- 24 V DC side and logic side: 500 V AC
- Channel to channel isolation: 0

**Precision**

- Please refer to RTD sensor selection table
- Repeatability: ±0.05 % FS
- Maximum power consumption of the sensor: 0.5 W

**Measuring principle**

- Sigma-Delta

**Module update time**

- Please refer to the noise reduction selection table

**Cable length (maximum)**

- The maximum length to the sensor is 100 m

**Cable resistance**

- Max.20 Ω, for Cu10; max. is 2.7 Ω

**Diagnosis**

- Over/underflow
- Circuit breaker (only current mode)
- 24 V DC low voltage

**Model**

Order No.: (MLFB) 6ES7 288-3AR04-0AA0

**Standard**

- Dimension W x H x D (mm): 45 x 100 x 81
- Weight: 125 g
- Power consumption: 1.5 W
- Current consumption (SM bus): 80 mA
- Current consumption (24 V DC): 40 mA

**Analogue input**

- No. of Inputs: 4
- Type: Please refer to RTD sensor selection table in the 57-200 SMART System Manual
- Nominal range (data word) overshoot / undershoot range (data word): Please refer to RTD sensor selection table in the 57-200 SMART System Manual
- Resolution:
  - Temperature: 0.1°C / 0.1°F
  - Resistance: 15 position + sign
  - Maximum voltage hold: ±35 V
  - Noise suppression: For the selected filter settings (10 Hz, 50 Hz, 60 Hz or 400 Hz) is 85 dB
  - Common mode rejection: 120 V AC of, > 120 dB
  - Resistance: ≥ 10 MΩ
- Isolation:
  - Field side and logic side: 500 V AC
  - Field side and 24 V DC side: 500 V AC
  - 24 V DC side and logic side: 500 V AC
  - Channel to channel isolation: 0

**Module update time**

- Please refer to the noise reduction selection table

**The cold end temperature error**

- ±0.5 °C

**Cable length (maximum)**

- The maximum length to the sensor is 100 m

**Module update time**

- Please refer to the noise reduction selection table

**Cable resistance**

- Max.100 Ω

**Diagnosis**

- Over/underflow
- Circuit breaker (only current mode)

---

**General technical specifications**

**Electromagnetic compatibility - immunity with EN61000-6-2**

- EN 61000-4-2 electrostatic discharge: 8 kV, the air discharge to all surfaces; ±4 kV, conductive contact discharge on the exposed surface
- EN 61000-4-3 Radiation, radio frequency, electromagnetic field immunity test:
  - When 80 ~ 1000 MHz, 10 V/m, 1 kHz, 80 % AM
  - When 1.4 ~ 2.0 GHz, 3 V/m, 1 kHz, 80 % AM
  - When 2.0 ~ 2.7 GHz, 1 V/m, 1 kHz, 80 % AM
- EN 61000-4-4 fast transient Bursts
  - AC system — 2 kV Common mode, 1 kV Differential mode
  - DC system — 2 kV Common mode, 1 kV Differential mode
  - For the DC system (I/O signal, DC power supply system), need the external protection
- EN 61000-6-4 Conducted interference:
  - When 150 kHz ~ 80 MHz, 10 V RMS, 1 kHz, 80 % AM
  - When 1.4 ~ 2.0 GHz, 3 V/m, 1 kHz, 80 % AM
  - When 2.0 ~ 2.7 GHz, 1 V/m, 1 kHz, 80 % AM
- EN 61000-4-11 Voltage dip: Communication systems; 60 Hz, 0% for 1 cycles, 40% for 12 cycles and 70% for 30 cycles

**Electromagnetic compatibility of a conduction and radiation in accordance with EN 61000-6-4**

- Transmission of EN55001, class A group 1:
  - 0.15 MHz ~ 0.5 MHz < 79 dB (µV) Quasi peak; < 66 dB (µV) Average value
  - 0.5 MHz ~ 5 MHz < 73 dB (µV) Quasi peak; < 60 dB (µV) Average value
  - 5 MHz ~ 30 MHz < 73 dB (µV) Quasi peak; < 60 dB (µV) Average value
  - 30 MHz ~ 230 MHz < 40 dB (µV/m) Quasi peak; Measured distances is 10m
  - 230 MHz ~ 1 GHz < 47 dB (µV/m) Quasi peak; Measured distances is 10m

**Environmental conditions - transport and storage**

- EN60068-2-2, 8bit test, EN60068-2-1 test Ab, hot and cold
- EN60068-2-30, Db test, damp heat
- EN60068-2-14 Na test, a temperature change
- EN60068-2-14 mechanical shock
- EN60068-2-26 Sinusoidal vibration

**Ambient temperature range**

- For the wind coming in:
  - 0°C ~ 55°C, horizontal installation
  - 0°C ~ 45°C, vertical installation
  - Humidity 95 %, No condensation
  - Atmospheric pressure: 1080 ~ 795 hPa (equivalent to altitude 1000 ~ 2000 m)
  - Pollution concentration: SO2: < 0.5 ppm; H2S: < 0.1 ppm; RH: < 60 %, No condensation
  - Temperature: 0°C ~ 55°C

**High voltage insulation test**

- 24 V/5 V nominal circuit
- 115/230 V Ground circuit
- 11.5/230 V circuit for a 115/230 circuit
- 11.5/230 V circuit for a 24 V/5 V circuit
- Ethernet port on 24 V/5 V circuit and ground

---

**Technical specification of thermocouple module**

**Model**

Order No.: (MLFB) 6ES7 288-3AT04-0AA0

**Standard**

- Dimension W x H x D (mm): 45 x 100 x 81
- Weight: 125 g
- Power consumption: 1.5 W
- Current consumption (SM bus): 80 mA
- Current consumption (24 V DC): 40 mA

**Analogue input**

- No. of Inputs: 4
- Type: Please refer to RTD sensor selection table in the 57-200 SMART System Manual
- Nominal range (data word) overshoot / undershoot range (data word): Please refer to RTD sensor selection table in the 57-200 SMART System Manual
- Resolution:
  - Temperature: 0.1°C / 0.1°F
  - Resistance: 15 position + sign
  - Maximum voltage hold: ±35 V
  - Noise suppression: For the selected filter settings (10 Hz, 50 Hz, 60 Hz or 400 Hz) is 85 dB
  - Common mode rejection: 120 V AC of, > 120 dB
  - Resistance: ≥ 10 MΩ
- Isolation:
  - Field side and logic side: 500 V AC
  - Field side and 24 V DC side: 500 V AC
  - 24 V DC side and logic side: 500 V AC
  - Channel to channel isolation: 0

**Module update time**

- Please refer to the noise reduction selection table

**The cold end temperature error**

- ±0.5 °C

**Cable length (maximum)**

- The maximum length to the sensor is 100 m

**Cable resistance**

- Max.100 Ω

**Diagnosis**

- Over/underflow
- Circuit breaker (only current mode)
**Mounting dimensions**

1. Side view
2. Horizontal mounting
3. Vertical mounting
4. Gap area

**Input and output wiring diagram**

Be sure to bear in mind the following guidelines, when planning the installation:

- The equipment shall be isolated from the thermal radiation, high voltage and electrical noise.
- Leave enough space for cooling and wiring. A 25mm height space above or under the equipment must be left so as to allow free air circulation.

Please refer to “S7-200 SMART System Manual” for the specific requirements of installation and guidelines.

**Order number description**

Siemens S7 series PLC

S7-200 SMART

1. CPU
2. Digital expansion module
3. Analog expansion module
5. Signal board

C/S stands for CPU type
C stands for economic type, S stands for standard type
D/A represents the extension module type
D represents a digital expansion module, A represents an analog expansion module

E/Q represents input/output
R/T represents the digital expansion module relay output / transistor output
M represent the mixed input /output expansion module
* AR represents the RTD expansion module, AT represents the thermocouple module

XX represents the number input/output ports

0A: Reserved
A0: version No.
Schematic diagram of the module and the signal board wiring
## Order data

### SIMATIC S7-200 SMART order data

<table>
<thead>
<tr>
<th>Central processing unit (CPU)</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU SR20</td>
<td>6ES7 288-1SR20-0AA0</td>
</tr>
<tr>
<td>CPU ST20</td>
<td>6ES7 288-1ST20-0AA0</td>
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<td>CPU SR30</td>
<td>6ES7 288-1SR30-0AA0</td>
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<td>CPU ST30</td>
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<td>CPU CR60</td>
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<th>Extension module (EM)</th>
<th>Order No.</th>
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<tbody>
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<th>Order No.</th>
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<tbody>
<tr>
<td>Step7 Micro/win smart</td>
<td>6ES7 288-8SW01-0AA0</td>
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