

SIEMENS

Control Systems SIMATIC C7

Overview

August 2000

Areas of application

The SIMATIC® C7 control systems combine a programmable controller and an operator panel in one unit. This enables complete machine control systems to be implemented with minimum size, at an economical price. Since the PLCs and OPs are products from the SIMATIC range, there are wide options for expanding the C7 control systems and integrating them in a SIMATIC automation network.

Applications include, for example:

- General mechanical engineering (construction of series machines in particular)
- Special machines
- Plastics industry machines
- Textile machines
- Woodworking machines.

The SIMATIC C7 control systems operate in many environments:

- High electromagnetic compatibility
- Withstand high levels of shock and vibration
- Permitted ambient temperatures up to 50 °C even if no fan is used
- Fulfill national and international standards according to DIN, UL, CSA, FM, ISO 9001 and marine classifications.

Design

The control systems C7 consist of the following individual components:

- SIMATIC S7-300®, consisting of CPU, signal modules, and interface board. The performance is about equal to SIMATIC S7 CPU 314 to SIMATIC S7 CPU 315-2DP.
- SIMATIC Operator Panels OP3, OP7, OP17 or OP25

This design ensures that the SIMATIC C7 is so economical:

- Even if space is scarce you can implement a complete automation system.
- Cut installation costs; since only one device needs to be installed.



SIMATIC Controller

Overview

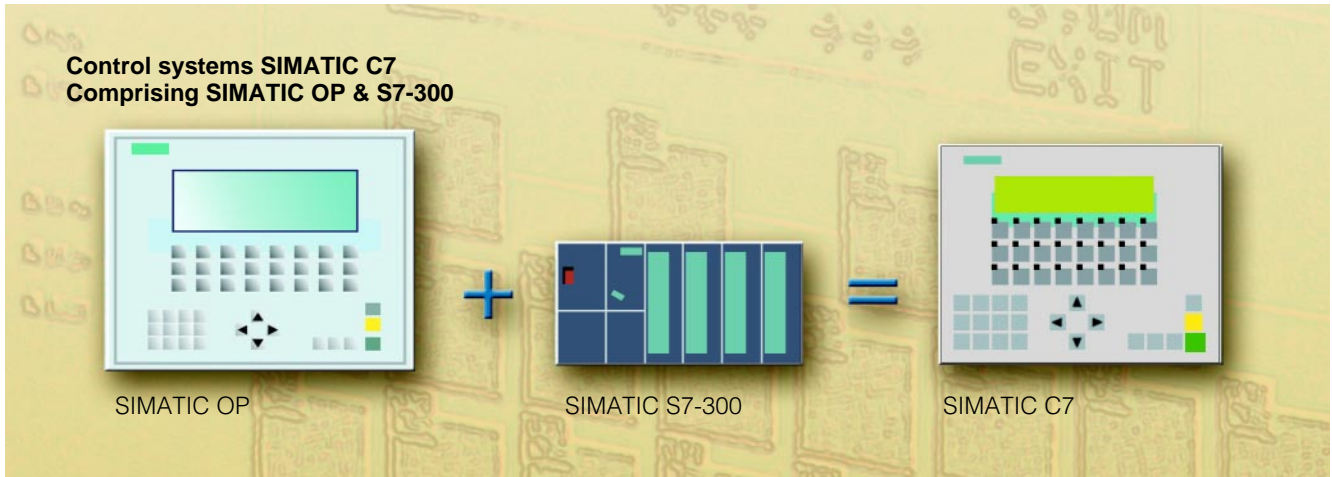


Integrated Components	C7-621	C7-621 ASi	C7-633/P	C7-633 DP
PLC-CPU	CPU 314	CPU 314	CPU 315	CPU 315-2DP
CPU user memory	32 KB	32 KB	48 KB	64 KB
OP	OP3	OP3	OP7	OP7
Number of lines x characters per line, resolution	2 x 20	2 x 20	4 x 20	4 x 20
I/O	16 DI 16 DO 4 AI 1 AO	-	16 DI 16 DO 4 AI 4 AO 4 alarms/counters/ frequency meters	-
Communications interface	MPI	MPI AS-Interface	MPI	MPI PROFIBUS-DP master or slave



Integrated Components	C7-634/P	C7-634 DP	C7-626/P	C7-626/P DP
PLC-CPU	CPU 315	CPU 315-2DP	CPU 315	CPU 315-2DP
CPU user memory	48 KB	64 KB	96 KB	128 KB
OP	OP17	OP17	OP25	OP25
Number of lines x characters per line, resolution	4 x 20 or 8 x 40	4 x 20 or 8 x 40	Full graphics 320 x 240	Full graphics 320 x 240
I/O	16 DI 16 DO 4 AI 4 AO 4 alarms/counters/ frequency meters	-	16 DI 16 DO 4 AI 4 AO 4 alarms/counters/ frequency meters	16 DI 16 DO 4 AI 4 AO 4 alarms/counters/ frequency meters
Communications interface	MPI	MPI PROFIBUS-DP master or slave	MPI	MPI PROFIBUS-DP master or slave

Features



Features

Housing/Assembly

- Rugged, compact plastic and metal housing features IP 65 / NEMA 4 degree of protection (front only)
- Can be installed in cabinet consoles, and mounted on rails
- Stationary wiring

Front panel

- Rugged membrane keyboard
- Backlit LC display provides wide viewing angle, flicker-free, with graphics, passive b/w
- LEDs for PLC status and operation

Interfaces

- Powerful communication capability via the MPI multipoint interface
- Printer interface e.g. for outputting production data
- PROFIBUS DP (C7-6xx DP) master/slave, 12 Mbit/s
- AS-Interface (C7-621 ASi)
- Interface for user-friendly expansion with modules from the S7-300 spectrum

Integrated I/O units

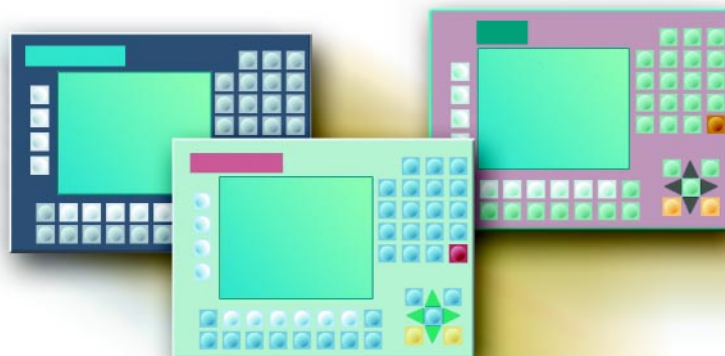
- digital inputs¹⁾
- digital outputs¹⁾
- analog inputs¹⁾
- analog outputs¹⁾
- multi-purpose inputs¹⁾, can be used as digital inputs¹⁾ DC 24 V or alarm inputs or inputs as forward/backward counters featuring 10 kHz, or input for period duration measurements or frequency measurements

Customer-specific versions

You can obtain the SIMATIC C7 systems in a customer-specific design. A customer specific design is advantageous if you wish to harmonize the appearance and functions of the complete system with your machine or plant.

The design can be modified in a variety of ways:

- Customer-specific company logo
- Special colors
Company logo and front foil come in RAL or Pantone colors of your choice. The color of the front panel can also be adapted to suit your or customers specifications.
- Customer-specific key labels



¹⁾ Depending on the C7 version

Integrated Hardware and Expansion Capabilities

The integrated PLC: SIMATIC S7-300

- Fast command processing; Command processing times from 0.3 μ s open completely new fields of application in the lower performance range.
- Human-machine interfaces (HMI); Easy-to-use HMI services are already integrated in the operating system of the C7. HMI functions do not have to be programmed any more at high costs. The integrated SIMATIC operator panel requests data from the PLC process and refreshes the data when needed. This data traffic is facilitated by the operating system of the PLC integrated in the SIMATIC C7 control system. Symbols and database used in this process are uniform.
- Diagnostic functions; The intelligent diagnostics system of the PLC constantly checks the proper operation of the system and registers errors and specific system events (e.g. time-outs, swapped boards, etc.). The events receive a time stamp and are stored in a ring buffer storage space for later evaluation.
- Password protection; A password allows you to protect your PLC know-how against unauthorized copying and writing.
- Floating-point arithmetic; Floating-point arithmetic comes in handy if complex arithmetical functions have to be solved.

HMI with integrated operator panel

- Management and processing of operating messages and fault messages with associated process values. You can even assign priorities to determine which process and machine conditions are shown, with corresponding process data in clear text.
- Display of process images; important machine and process information is displayed as images in a compact manner. Input is transmitted immediately to the CPU for the process.

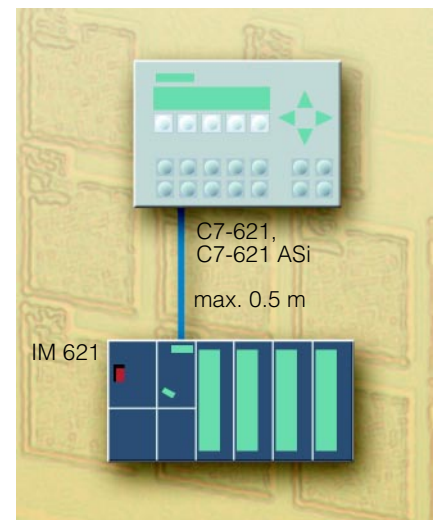
- User menu; In order to allow you to adapt the operating sequence to the application, you can define user-specific menus.
- Limit-value monitoring and password protection; Programmable limit values and passwords improve security when making entries.
- Variable printout; Printers, which can be connected directly, log data quickly and simply e.g. for quality checks (not C7-621).
- Online language selection; All texts can be stored in up to three languages. This is important for international applications and services.
- Information texts on messages, displays, etc.; At the touch of a button you receive valuable information, e.g. to clear a fault or for detailed maintenance procedures (not C7-621).
- Indicates condition of integrated inputs and outputs.
- Recipe (batch) management; up to 255 different recipes can be managed simultaneously (not C7-621).

Expansion capabilities

Different variants with graded performance power and the comprehensive SIMATIC S7-300 module range enable precise adaption of the SIMATIC C7 to the task in hand. When the task grows, the control system can be upgraded at any time by using additional modules.

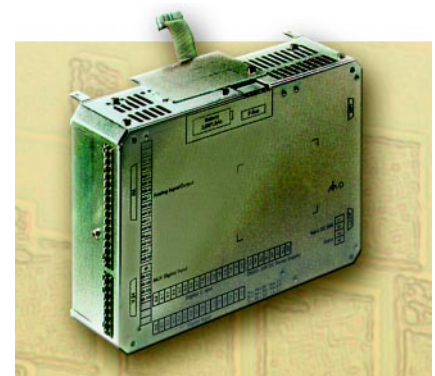
C7-621, C7-621 ASi

- S7-300 modules; the C7 can be expanded with up to 4 SIMATIC S7-300 modules via the IM 621 interface.



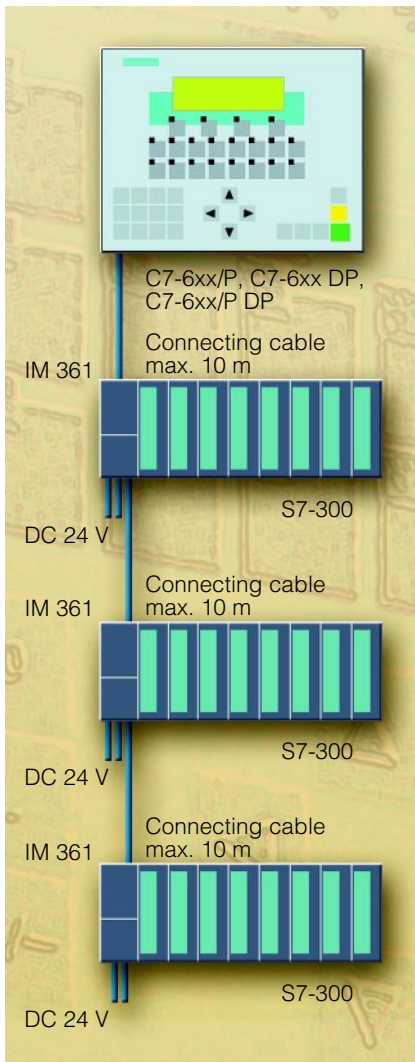
C7-633, C7-634, C7-626

- The SIMATIC C7 input/output board expands the integrated I/O features by 16 digital inputs, 16 digital outputs, 4 analog inputs, 4 analog outputs, 4 universal inputs. The complete solution requires minimal space. The board is attached to the rear wall of the SIMATIC C7, and connected to the C7 with a bus cable. This SIMATIC C7-input/output board can only be used with C7-6xx/P and C7-6xx/DP units.



Communications

- The SIMATIC S7-300 facilitates connection of up to 24 boards, located on three racks, to the SIMATIC C7. Each rack can accommodate up to 8 boards.



Integrated communications

MPI

The multipoint interface is a communications interface integrated in SIMATIC C7. Use this interface to establish elementary networks.

The MPI allows several programming units, operator panels, S7-300 and S7-400 to be connected simultaneously.

- Up to 32 MPI participants
- up to 4 communications channels per CPU
- Transmission rate is 187.5 kbit/s

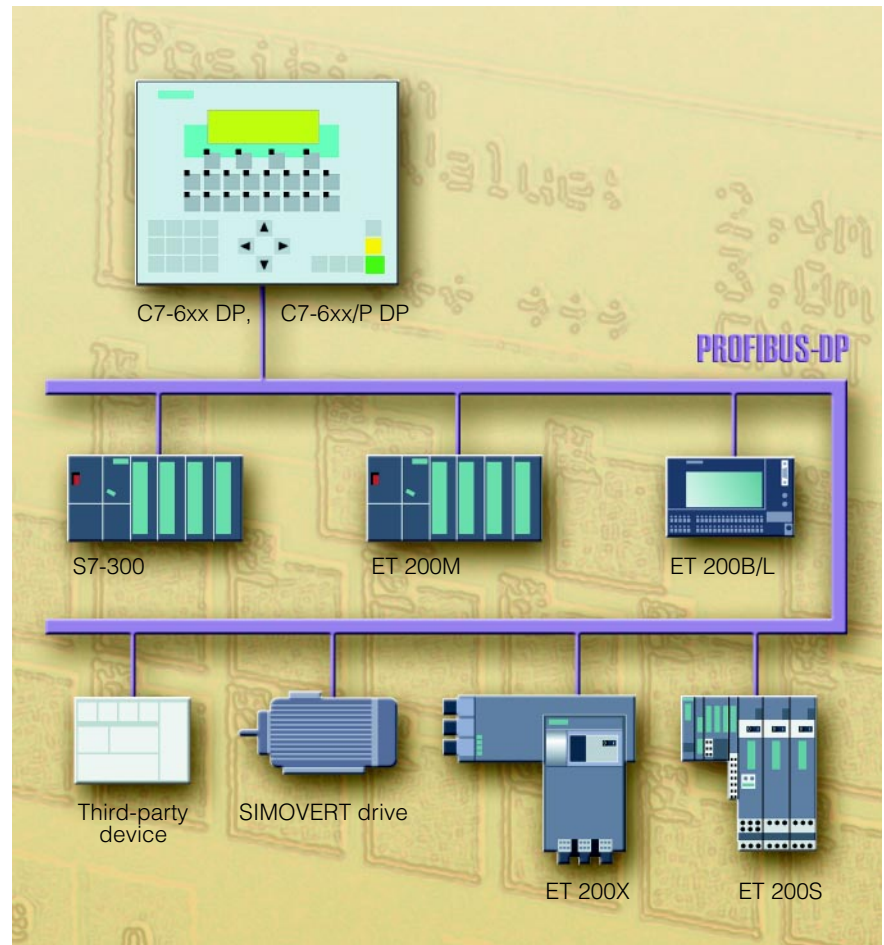
The “Global Data Communications” service allows CPUs incorporated in the network to exchange data cyclically without the need for additional software programs.

PROFIBUS-DP

The control systems C7-626/P DP, C7-633 DP and C7-634 DP come with integrated PROFIBUS-DP interface. Using software, you can set them up as master or as slave units.

If you use the C7 as DP-Master, the distributed I/Os with STEP[®] 7 are configured and programmed in such a way that they act just like central I/O boards. You do not have to set up or program the communications involved.

It is also possible to employ the control systems C7-626/P DP, C7-633 DP and C7-634 DP at the PROFIBUS-DP as slaves (as seen more and more recently, due to the advantages of having distribute intelligence at the machine).



Software

Communications (continued)

ASi (for C7-621-ASi)

The actuator-sensor interface (AS-Interface) is a networking system for binary sensors and actuators at the lowest field level. The sensors and actuators are connected on a common twisted-pair cable. The SIMATIC C7-621 ASi can be connected to the AS-Interface as a master.

Software development

SIMATIC Industrial Software

Program the SIMATIC C7 with the SIMATIC Industrial Software tools STEP 7 and ProTool®.

SIMATIC Industrial Software features central data management and a host of harmonizing tools. This means that the software provides continuity over the entire project, including the planning and design phases, communications, programming, testing, commissioning, and documentation. All data have to be entered only once, in one user interface.

Context-sensitive help functions provide help much faster than a paper manual.

Project planning, programming, commissioning and documenting - with STEP 7

STEP 7 provides a matching function for every task to be handled by the PLC; you can toggle between the programming languages statement list, ladder diagram and control system flowchart ad lib.

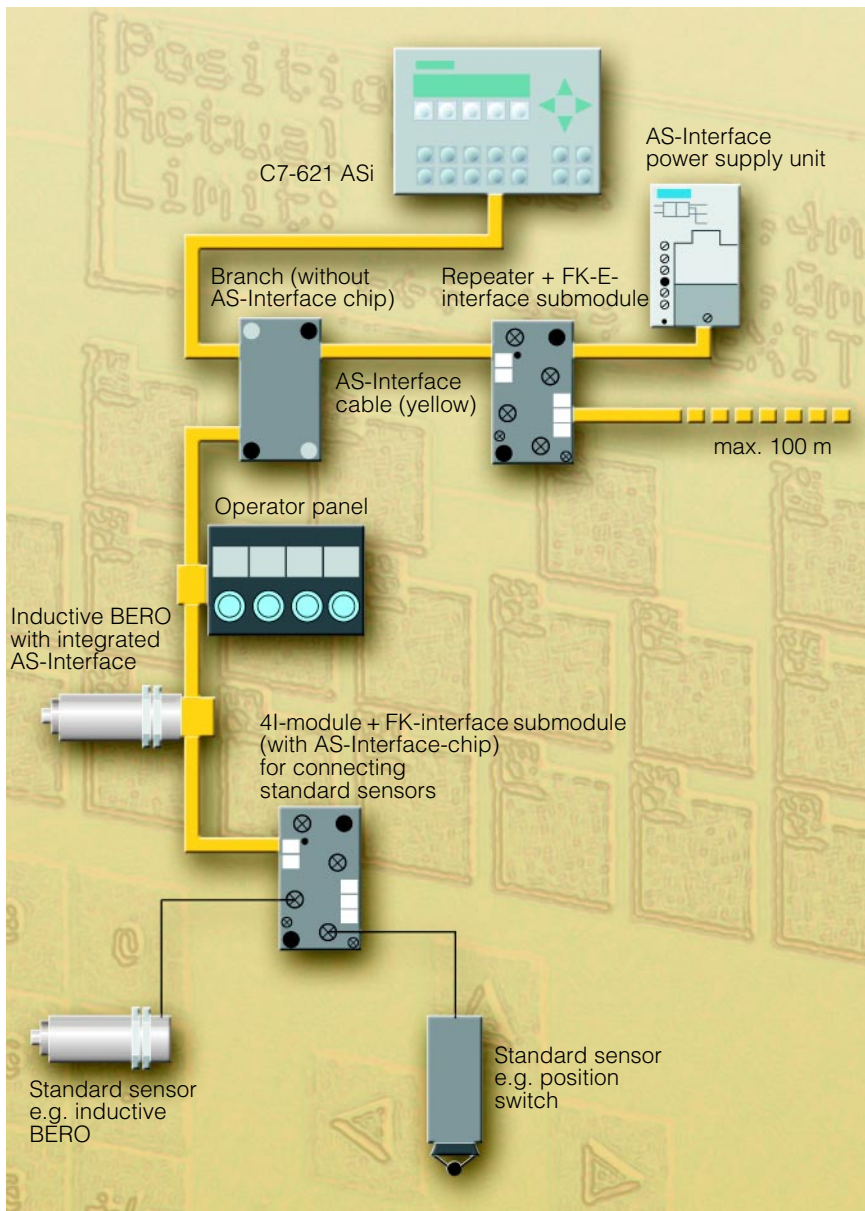
Also, STEP 7 possesses such a large scope of commands that every complex function can be programmed easily.

Two versions are available: For newcomers to the STEP 7 world, we recommend the low-cost STEP 7-Mini software version. For all others we recommend STEP 7. Another good reason to use STEP 7 is that under STEP 7 you can use application-oriented engineering tools.

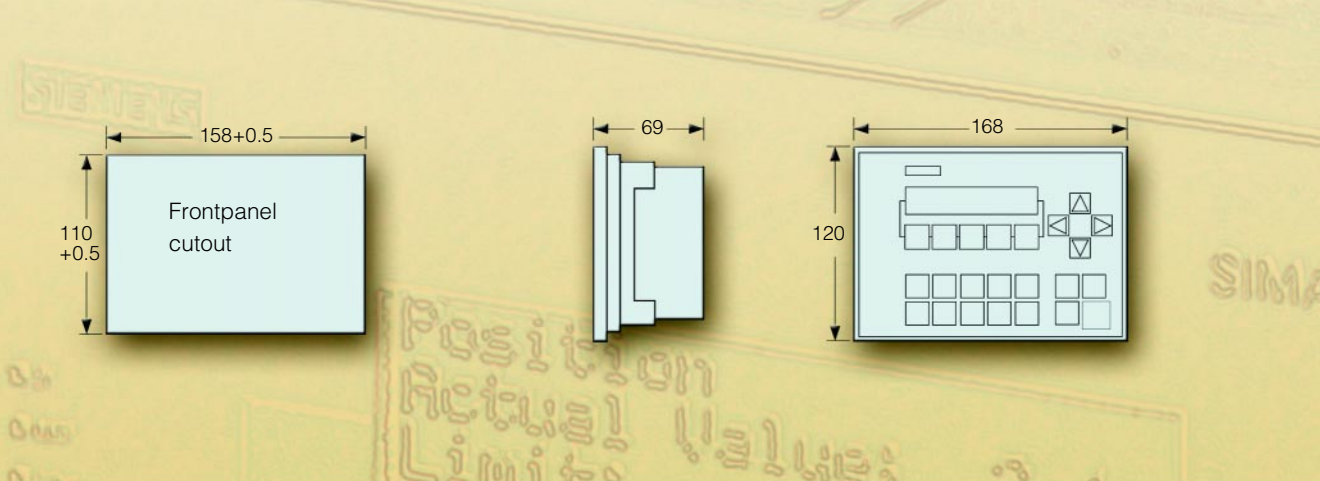
The tool for human-machine interfacing: ProTool

The HMI functions of the SIMATIC C7 employ ProTool, which is perfectly integrated into STEP 7. Common data management is used, such as direct access to symbol lists or communication parameters.

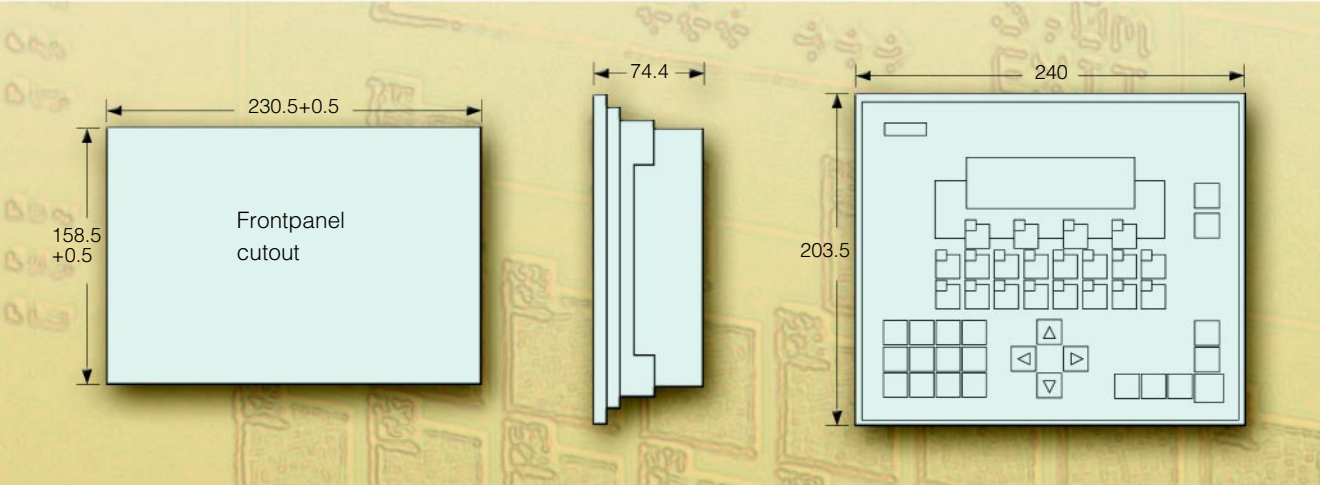
SIMATIC ProTool is based on the latest findings on the design of configuration surfaces. For example, configuration of pictures and messages takes place on the PC, without the need for a C7 (offline configuration).



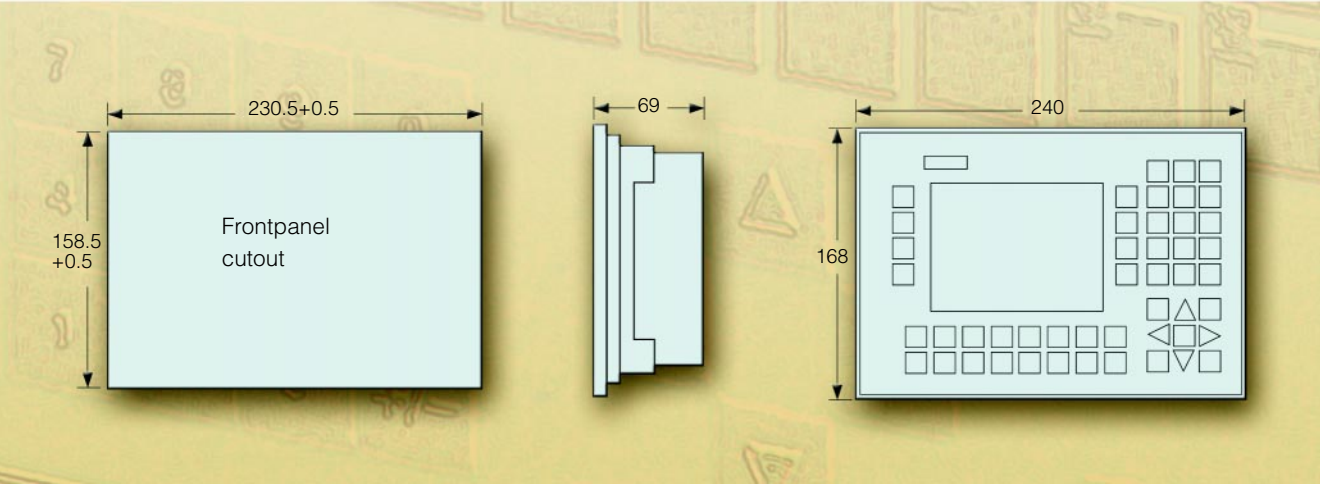
Dimension drawings (in mm)



Dimension drawing C7-621



Dimension drawing C7-633/C7-634



Dimension drawing C7-626

Technical Specifications

	C7-621	C7-621 ASi	C7-633/P
General			
Degree of protection	Front: IP 65 to IEC 529, housing: IP 20 to IEC 529		Front: IP 65 to IEC 529,
Ambient temperature <ul style="list-style-type: none"> with vertical operation mounted at 45° 	0 to 50 °C, 0 to 45 °C, restricted readability with horizontal installation		0 to 50 °C 0 to 45 °C
Relative humidity	5 to 95% at 25 °C (no condensation), tested in accordance with DIN IEC 68-2-3		5 to 95% at 25 °C (no accordance with
Acceptance, certification	EN 61131-2 (IEC 1131-2); UL Listing UL 508; Canadian Standard Association (CSA) in accordance with Standard C22.2 number 142; FM approval, FM standards No. 3611, 3600, 3810 Class I, Div. 2 Group A, B, C, D; DIN/ISO 9001 Certification of manufacture and design		EN 61131-2 (IEC 1131-2); Canadian Standard accordance with Standard FM approval, FM standards No. 3611, Div. 2 Group A, B, C, D; DIN/ISO 9001 Certification
Supply voltage <ul style="list-style-type: none"> rated value permissible range 	24 V DC 20.4 to 30.2 V		24 V DC 20.4 to 30.2 V
Current consumption, typical/max.	0.3 A/1 A		550 mA/1 A
Power loss, typical	8 W		12 W
Dimensions <ul style="list-style-type: none"> Device (W x H x D) in mm/inch Sectional dimensions (W x H) in mm/inch 	168 x 120 x 69/6.61 x 4.72 x 2.72 158.5 x 110.5/6.24 x 4.35		240 x 203.5 x 89.4/ 9.45 x 8.01 x 3.52 231 x 159/9.09 x 6.26
Weight	800 g		1800 g
PLC			
User memory (1 instruction corresponds to an average of 3 bytes)	32 KB/10 K instructions RAM (integrated)		48 KB/ 16 K instructions RAM
Loading memory <ul style="list-style-type: none"> integrated (for data) removable, max. 	48 KB RAM 48 KB FEPRM –		80 KB RAM 512 KB
Data buffering <ul style="list-style-type: none"> with battery without battery, max. 	– 144 bytes, configurable for flags, counters, data		all data 4736 bytes, configurable data
Max. no. of blocks	32 FC, 32 FB, 63 DB		128 FC, 128 FB or 127 DB
Program execution	<ul style="list-style-type: none"> start-up (OB 100) free cycle (OB 1) interrupt controlled (OB 40) error handling (OB 80, 81, 82, 85, 86, 87, 121, 122) 		<ul style="list-style-type: none"> start-up (OB 100) free cycle (OB 1) clock time controlled time controlled (OB 35) interrupt controlled error handling (OB 80, 81, 82, 85, 86,
Processing times for <ul style="list-style-type: none"> bit operations word operations timing/counting operations fixed point addition Floating point addition 	0.3 to 0.6 µs 1 µs 12 µs 2 µs 50 µs		0.3 to 0.6 µs 1 µs 12 µs 2 µs 50 µs
Flags	1024		2048

C7-633 DP	C7-634/P	C7-634 DP	C7-626/P	C7-626/P DP
housing: IP 20 to IEC 529	Front: IP 65 to IEC 529, housing: IP 20 to IEC 529		Front: IP 65 to IEC 529, housing: IP 20 to IEC 529	
	0 to 50 °C 0 to 45 °C		0 to 45 °C 0 to 30 °C, with forced ventilation and horizontal mounting max. 45 °C possible	
condensation), tested in DIN IEC 68-2-3	5 to 95% at 25 °C (no condensation), tested in accordance with DIN IEC 68-2-3		5 to 95% at 25 °C (no condensation), tested in accordance with DIN IEC 68-2-3	
UL Listing UL 508; Association (CSA) in C22.2 number 142; 3600, 3810 Class I, of manufacture and design	EN 61131-2 (IEC 1131-2); UL Listing UL 508; Canadian Standard Association (CSA) in accordance with Standard C22.2 number 142; FM approval, FM standards No. 3611, 3600, 3810 Class I, Div. 2 Group A, B, C, D; DIN/ISO 9001 Certification of manufacture and design		EN 61131-2 (IEC 1131-2); UL Listing UL 508; Canadian Standard Association (CSA) in accordance with Standard C22.2 number 142; FM approval, FM standards No. 3611, 3600, 3810 Class I, Div. 2 Group A, B, C, D; DIN/ISO 9001 Certification of manufacture and design	
	24 V DC 20.4 to 30.2 V		24 V DC 20.4 to 30.2 V	
	550 mA/1 A		700 mA/2 A	
	12 W		17 W	
240 x 203.5 x 74.4/ 9.45 x 8.01 x 2.93 231 x 159/9.09 x 6.26	240 x 203.5 x 89.4/ 9.45 x 8.01 x 3.52 231 x 159/9.09 x 6.26	240 x 203.5 x 74.4/ 9.45 x 8.01 x 2.93 231 x 159/9.09 x 6.26	240 x 168 x 69/9.45 x 6.61 x 2.72 231 x 159/9.09 x 6.26	
1600 g	1900 g	1700 g	1780 g	1780 g
64 KB/ 20 K instructions RAM	48 KB/ 16 K instructions RAM	64 KB/ 20 K instructions RAM	RAM 96 KB/32 K instructions (integrated)	RAM 128 KB/42 K instructions (integrated)
96 KB RAM 512 KB	80 KB RAM 512 KB	96 KB RAM 512 KB	180 KB RAM, 512 KB FEPROM –	260 KB RAM, 512 KB FEPROM –
for flags, timers, counters,	all data 4736 bytes, configurable for flags, timers, counters, data		all data 4736 bytes, configurable for flags, timers, counters, data	
	128 FC, 128 FB or 127 DB		128 FC, 128 FB or 127 DB	
(OB 10) (OB 40) 87, 121, 122)	<ul style="list-style-type: none"> ▪ start-up (OB 100) ▪ free cycle (OB 1) ▪ clock time controlled (OB 10) ▪ time controlled (OB 35) ▪ interrupt controlled (OB 40) ▪ error handling (OB 80, 81, 82, 85, 86, 87, 121, 122) 		<ul style="list-style-type: none"> ▪ start-up (OB 100) ▪ free cycle (OB 1) ▪ clock time controlled (OB 10) ▪ time controlled (OB 35) ▪ interrupt controlled (OB 40) ▪ error handling (OB 80, 81, 82, 85, 86, 87, 121, 122) 	
	0.3 to 0.6 µs 1 µs 12 µs 2 µs 50 µs		0.3 to 0.6 µs 1 µs 12 µs 2 µs 50 µs	
	2048		2048	

Technical Specifications (continued)

	C7-621	C7-621 ASi	C7-633/P
Counters/counter range	32/1 to 999		64/1 to 999
Timers/timing range	64/1 to 9990 s		128/10 ms to 9990 s
S7-300 expansion modules	max. 4		max. 24
Compatible modules <ul style="list-style-type: none"> ▪ FM ▪ CP, point to point ▪ CP, LAN 	4 2 1		8 4 2
Total I/O addressing space	128/128 bytes		256/256 bytes
Process image	64/64 bytes		128/128 bytes
Multi-point interface MPI	yes, occupies two stations per device (1x CPU, 1x OP)		yes, occupies two stations 1x OP)
PROFIBUS DP interface	-		-
Modules per ET200M	8		8
DP connection (master/slave)	1 (CP342-5)		1 (CP342-5)
Integrated AS master interface	-	1	-
Digital inputs	16	-	16
Digital outputs	16	-	16
Universal inputs	-	-	4
Analog inputs	4	-	4
Analog outputs	1	-	4
Programming, planning, configuring <ul style="list-style-type: none"> ▪ Programming software ▪ Configuring control and monitoring 	STEP 7, STEP 7-Mini ProTool/Lite®, ProTool, ProTool/Pro®		STEP 7, STEP 7-Mini ProTool/Lite, ProTool,
OP			
Display <ul style="list-style-type: none"> ▪ Number of lines x characters per line ▪ Character height ▪ Resolution ▪ Active screen area (W x H) in mm 	LC display, LED backlit 2 x 20 5 mm - -		LC display, 4 x 20 8 mm - -
Number of softkeys/function keys	5/-		4/16
Process signals, max.	499		499
Fault signals, max.	-		499
Max. variables in message text	8		8
Number of screens	40		99
Full graphics	-		-
Semi graphics	-		within the bounds of the
Recipes, max.	-		99
On-line languages	3		3
Clock	Software clock		Software clock
Printer interface	-		RS232

C7-633 DP	C7-634/P	C7-634 DP	C7-626/P	C7-626/P DP
	64/1 to 999		64/1 to 999	
	128/10 ms to 9990 s		128/10 ms to 9990 s	
	max. 24		max. 24	
	8 4 2		8 4 2	
	256/256 bytes		256/256 bytes	
	128/128 bytes		128/128 bytes	
per device (1x CPU,	yes, occupies two stations per device (1x CPU, 1x OP)		yes, occupies two stations per device (1x CPU, 1x OP)	
1	-	1	-	1
	8		8	
1 (integrated, master/ slave) 1 (CP342-5)	1 (CP342-5)	1 (integrated, master/ slave) 1 (CP342-5)	1 (CP 342-5)	1 (integrated, master/ slave) 1 (CP 342-5)
	-		-	
-	16	-	16	
-	16	-	16	
-	4	-	4	
-	4	-	4	
-	4	-	4	
ProTool/Pro	STEP 7, STEP 7-Mini ProTool/Lite, ProTool, ProTool/Pro		STEP 7, STEP 7-Mini ProTool, ProTool/Pro	
LED backlit	LC display, LED backlit 4 x 20 / 8 x 40 11 / 6 mm - -		LC display, CCFL backlit, passive monochrome - - 320 x 240 pixels 105 x 79	
	8/16		14/10	
	999		2000 (depending on user memory)	
	999		2000 (depending on user memory)	
	8		8	
	99		depends on user memory	
	-		yes, access to external editors	
character set	within the bounds of the character set		yes	
	99		255	
	3		3	
	real-time clock (hardware clock)		real-time clock (hardware clock)	
	RS232		RS232	



Additional information regarding this product can be found on the Internet under

<http://www.ad.siemens.de/simatic-c7>

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