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S5-90U, S5-95U

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Design





The S5-90U and S5-95U consist of a tough plastic case, into which the processor, power supply, inputs and outputs are integrated. This enclosure can be snapped onto a DIN rail. Both devices can be expanded with all I/O modules of the S5-100U. The S5-90U is expandable over the IM 90 interface, the S5-95U is directly expandable (see also page 2/3).

Technical specifications

	S5-90U	S5-95U
General		
Range of functions	Boolean logic, bracketed operations, result assignment, setting/resetting (latching/unlatching), counter and timer functions, load, transfer, comparison and jump operations, block calls, special functions, arithmetic	
Programming language	STEP 5	STEP 5
Methods of representation	STL, LAD, CSF	STL, LAD, CSF, GRAPH Mini, GRAPH 5 (with restrictions)
Program organization	Linear or structured	Linear or structured
Integral function blocks (in the operating system)	—	Analog value input, output, BCD/binary code conversion, multiplication and division for 16-bit fixed-point numbers, L2 SEND, L2 RECIVE (L2 interface only)
Integral organization blocks (in the operating system)	Cyclic, alarm-driven program execution, manual and automatic restart	Cyclic, alarm-driven program execution, manual and automatic restart, time-controlled program execution, response in case of battery failure, retriggering the scan time, PID control algorithm
Execution time for 1024 binary statements approx.	2 ms	2 ms
Program memory		
• RAM (internal) or alternatively EPROM or EEPROM (in memory submodule) (2 byte = 1 statement)	4 Kbyte	16 Kbyte, can be allocated to program or data according to user requirements; additionally 4 Kbyte for data blocks[1]
Backup time for RAM min.	1 year	1 year
Bit memories		
• Number	1024, 512 of which are retentive	2048, 512 of which are retentive
Timers		
• Number	32	128
• Range	0.01 to 9990 s	0.01 to 9990 s
Counters		
• Number	32; 8 of which are retentive	128; 8 of which are retentive
• Range	0 to 999	0 to 999
Number of inputs/outputs		
• Digital inputs/outputs maximum/onboard	176/16	480/32
• Analog inputs/outputs maximum/onboard	16/—	41/9
• Interrupt inputs maximum/onboard	1/1	4/4
• Counter inputs maximum/onboard	13/1	66/2
Hardware clock	—	Date/time/operating hours counter/clock prompt

[1] Not with basic unit

S5-90U, S5-95U (continued)

Technical specifications (continued)

		S5-90U	S5-95U
Expansion	max.	6 S5-100U modules via IM 90, including IPs and CPs	32 S5-100U modules, including IPs and CPs
Module configuration		Installation in up to 4 tiers, with max. 10 m between tiers	
Arrangement of modules		Horizontal or vertical (vertical arrangement reduces the permissible ambient temperature)	
Linkup		programming devices	
• programming devices port (20 mA current loop)		PG, PC[1], OP, SINEC L1 (slave), PROFIBUS (via CP 541)	PG, PC[1], OP, SINEC L1 (slave), PROFIBUS (via CP 541)
• 2nd serial interface (20 mA current loop) (optional)			PG, PC[1], OP, SINEC L1 (slave, p.t.p. master), computer link with 3964(R), ASCII driver
• PROFIBUS interface (RS 485) (optional)		—	Standard connection, PLC-PLC link, cyclic I/O, layer 2 services, FMA services, programming devices functions
• PROFIBUS-DP interface (RS 485) (optional)		—	DP slave or master interface, DIN E 19245 Part 3 (1.5 Mbit/s), Data transfer rate 9.6 to 1500 kbit/s
programming devicess		PG 605, PG 720, PG 720C, PG 760, PC (AT-compatible)	PG 605, PG 720, PG 720C, PG 740, PG 760, PC (AT-compatible)
Degree of protection		IP 20 in acc. with IEC 529	
Ambient temperature			
• Horizontal installation		0 to 60 °C	
• Vertical installation		0 to 40 °C	
Transport and storage temperature		– 40 °C to + 70 °C	
Humidity rating		F in acc. with DIN 40 040 (15 % to 95 %, indoor)	
Altitude rating		S in acc. with DIN 40 040 (860 to 1060 hPa)	
Mechanical rating			
• Oscillation test		IEC 68-2-6	
Tested with		10 to 57 Hz (constant amplitude 0.075 mm) 57 to 150 Hz (constant acceleration 1 g)	
• Shock test		IEC 68-2-27	IEC 68-2-27
Tested with		12 shocks (semisinusoidal, 15 g, 11 ms)	12 shocks (semisinusoidal, 15 g, 11 ms)
Dimensions (W x H x D) in mm (in)		145 x 135 x 97 (5.6 x 5.2 x 3.7)	145 x 135 x 146 (5.6 x 5.2 x 5.6)
Weight			
• PLC	approx.	1.5 kg (4 lb)	1.5 kg (4 lb)
• Memory submodule	approx.	0.1 kg (0.27 lb)	0.1 kg (0.27 lb)
Onboard power supply			
Supply voltage			
• Rated value		115 V/230 V AC	24 V DC
• Permissible range		93 V to 127 V/187 to 253 V	20 V to 30 V
Output voltage			
• V_1		24 V DC (for sensor)	9 V DC (for external I/O)
• V_2		5.2 V DC (for PGs)	5.2 V DC (for PGs)
Output current			
• from V_1	max.	100 mA	1 A
• from V_2	max.	100 mA	650 mA
Short-circuit protection		Electronic	Electronic
Backup battery		Lithium battery	Lithium battery
• Backup period at 25 °C and uninterrupted backup of the CPU with memory submodule		1 year	1 year
• Battery life	approx.	5 years	5 years
Protection class		Class 1 to IEC 536	Class 1 to IEC 536
Galvanic isolation V_1		Yes	No
Galvanic isolation V_2		No	No
RI specification		A in acc. with VDE 0871	
Cable cross-section for screw terminals			
– Flexible cables		2 x (0.5 to 1.5) mm^2 (with connector sleeves)	2 x (0.5 to 1.5) mm^2 (with connector sleeves)
– Solid cables		2 x (0.5 to 2.5) mm^2	2 x (0.5 to 2.5) mm^2

[1] Via interface converter

S5-90U, S5-95U (continued)

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Technical data (continued)

		S5-90U	S5-95U
Onboard digital inputs			
Number of inputs		10	16
Galvanic isolation/in groups of		Yes/10	Yes/16
Input voltage			
• Rated value		24 V DC	24 V DC
• At "0" signal		0 to 5 V	– 30 V to + 5 V
• At "1" signal		13 V to 30 V	13 V to 30 V
Input current			
• At "1" signal	typ.	8.5 mA (at 24 V)	6.5 mA (at 30 V)
Delay time			
• At "0" → "1"	typ.	2.8 ms	2.5 ms
• At "1" → "0"	typ.	3.6 ms	2.0 ms
Cable length (unshielded)	max.	100 m (328 ft)	100 m (328 ft)
Quiescent current with 2-wire BERO connected	max.	1.5 mA	1.5 mA
Onboard digital outputs			
Number of outputs		6 (relay contacts)	16
Galvanic isolation/in groups to		Yes/1	Yes/16
Load voltage L+			
• Rated value		—	24 V DC
• Permissible range		—	20 V to 30 V
Output current at "1" signal	max.	—	0.5 A
Lamp load	max.	—	5 W
Residual current at "0" signal	max.	—	400 µA
Output voltage			
• At "0" signal	max.	—	2.4 V (at 6 kΩ load voltage)
• At "1" signal	max.	—	L+ – 0.6 V (at 0.5 A and 24 V DC)
Short-circuit protection		—	Electronic
Switching frequency			
• With resistive load	max.	10 Hz	100 Hz
• With inductive load	max.	10 Hz	2 Hz
Total current		—	6 A (8 A at max. 50 °C)
Cable length unshielded	max.	100 m (328 ft)	100 m (328 ft)
Continuous current		3 A	—
Switching capacity of the contacts			
• With resistive load	max.	3 A at 250 V AC; 1.5 A at 30 V DC	—
• With inductive load	max.	0.5 A at 250 V AC and 30 V DC	—
Operating cycles of the contacts (in acc. with VDE 0660, Part 200)			
• AC-11		1×10^6	—
• DC-11		0.5×10^6	—
Onboard interrupt inputs			
Number of inputs		1, can also be used as digital input	4, can also be used as digital input
Galvanic isolation		Yes	No
Input voltages and currents		See onboard digital inputs	
Delay time			
• At "0" → "1"	typ.	40 µs	75 µs
• At "1" → "0"	typ.	180 µs	140 µs
Pulse duration	min.	500 µs	500 µs
Cable length	max.	50 m (164 ft) (unshielded)	100 m (328 ft) (shielded)
Onboard counter inputs			
Number of inputs		1, can also be used as digital input	2
Galvanic isolation		Yes	No
Input voltages and currents		See onboard digital inputs	
Delay time			
• At "0" → "1"	typ.	40 µs	10 µs
• At "1" → "0"	typ.	180 µs	15 µs
Counting frequency	max.	1 kHz	Counter A: 5 kHz Counter B: 2 kHz
Pulse duration	min.	500 µs	min. 100 µs
Cable length	max.	50 m (164 ft) (unshielded)	100 m (328 ft) (shielded)

S5-90U, S5-95U (continued)

Technical specifications (continued)

		S5-90U	S5-95U
Onboard analog inputs			
Number of inputs		—	8; can also be used as digital inputs
Input range (rated value)		—	0 to 10 V
Galvanic isolation		—	No
Input resistance		—	20 kΩ
Digital representation of the input signal		—	12 bit
Resolution		—	10 bit
Measuring principle		—	Instantaneous value coding (successive approximation)
Conversion time		—	40 µs
Internal setting time		—	3.5 ms
Error message in the event of overrange		—	Yes
Operational limits[1] (0 to 60 °C)		—	1.68 %
Cable length (shielded)	max.	—	100 m (328 ft)
Onboard analog outputs			
Number of outputs		—	1
Galvanic isolation		—	No
Digital representation of the signal		—	11 bit
Resolution		—	10 bit
Voltage output			
• Output range (rated value)		—	0 to 10 V
• Load resistance	min.	—	2.5 kΩ
• Conversion time	max.	—	20 µs (incl. setting time)
• Short-circuit protection		—	Yes
• Short-circuit current	typ.	—	30 mA
• Operational limits[1] (0 to 60 °C)		—	1 %
• Cable length (shielded)	max.	—	100 m (328 ft)
Current output			
• Output range (rated value)		—	0 to 20 mA
• Load resistance	max.	—	300 Ω
• Conversion time	max.	—	30 µs
• Operational limits[1] (0 to 60 °C)		—	11 %
• Cable length (shielded)	max.	—	100 m (328 ft)

[1] Based on rated value of measuring range (10 V or 20 mA)

Ordering data

	Order No.
S5-90U programmable controller incl. backup battery for 115/230 V AC, without User's Guide	**6ES5 090-8MA01**
375 memory submodule	
EPROM 8 Kbyte	**6ES5 375-8LA12**
EEPROM 2 Kbyte	**6ES5 375-8LC11**
EEPROM 4 Kbyte	**6ES5 375-8LC21**
Backup battery (lithium battery)	**6ES7 971-1AA00-0AA0**
To be ordered as a separate item: **S5-90U/-95U system manual** with User's Guide for S5-90U/-95U	
German	**6ES5 998-8MA12**
English	**6ES5 998-8MA22**
French	**6ES5 998-8MA32**
Spanish	**6ES5 998-8MA42**
Italian	**6ES5 998-8MA52**
35 mm DIN rail	
Length 483 mm (for 19 in cabinets)	**6ES5 710-8MA11**
Length 530 mm (for 600 mm cabinets)	**6ES5 710-8MA21**
Length 830 mm (for 900 mm cabinets)	**6ES5 710-8MA31**
Length 2 m	**6ES5 710-8MA41**
Wall fastenings for direct mounting of the S5-90U on walls and supporting plates, 1 set, consisting of 4 fastenings	**6ES5 981-8MB11**
IM 90 interface module for expansion of the S5-90U by up to 6 I/O modules	**6ES5 090-8ME11**
Bus units, I/O modules	See as of page 2/27
Simulator for digital input signals	**6ES5 788-8MK11**
STEP 5 package for mini controllers based on S5-DOS/ST, runs under PG/PC, in Ger., Eng., Fr., It., Sp.	
Single licence	**6ES5 864-0MA03**
Copy licence	**6ES5 864-0MA03-0KL1**
COM DB1 parameterization software	see S5-95U (next page)

S5-90U, S5-95U (continued)

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Ordering data	Order No.
S5-95U programmable controller for 24 V DC, without User's Guide	**6ES5 095-8MA03**
S5-95U programmable controller with PROFIBUS interface for 24 V DC, without User's Guide	**6ES5 095-8MB02**
S5-95U programmable controller with 2nd serial interface for 24 V DC, without User's Guide	**6ES5 095-8MC01**
S5-95U programmable controller with PROFIBUS-DP slave interface for 24 V DC, without User's Guide	**6ES5 095-8MD01**
S5-95U programmable controller with PROFIBUS-DP master interface for 24 V DC, without User's Guide	**6ES5 095-8ME01**
375 memory submodule	
EPROM 8 Kbyte	**6ES5 375-1LA15**
EPROM 16 Kbyte	**6ES5 375-1LA21**
EPROM 32 Kbyte	**6ES5 375-1LA41**
EEPROM 2 Kbyte	**6ES5 375-0LC11**
EEPROM 4 Kbyte	**6ES5 375-0LC21**
EEPROM 8 Kbyte	**6ES5 375-0LC31**
EEPROM 16 Kbyte	**6ES5 375-0LC41**
EEPROM 32 Kbyte	**6ES5 375-0LC61**
Backup battery (lithium battery)	**6ES5 980-0MA11**
To be ordered as a separate item:	
S5-90U/-95U system manual with User's Guide for S5-90U/-95U	**6ES5 998-8MA** ▯**2**
The following can be ordered in addition to the system manual:	
Manual of the PROFIBUS interface of the S5-95U	**6ES5 998-8MB** ▯**2**
The following can be ordered in addition to the system manual:	
Manual of the 2nd serial interface of the S5-95U	**6ES5 998-8MC** ▯**1**
The following can be ordered in addition to the system manual:	
Manual of the PROFIBUS-DP interface of the S5-95U	**6ES5 998-8MD** ▯**1**
For **Description of the S5-95U with PROFIBUS-DP master interface** see **Manual of the ET 200 distributed I/O system**	**6ES5 998-3ES** ▯**2**
German	**1**
English	**2**
French	**3**
Spanish	**4**
Italian	**5**

Ordering data	Order No.
Power supply module	
for 115/230 V AC ; 24 V DC/2 A	**6ES5 931-8MD11**
for 115/230 V AC; 24 V DC/4 A	**6EW1 380-1AB**
for 115/230 V AC; 24 V DC/10 A	**6EW1 380-4AB01**
35 mm DIN rail	see S5-90U (see page 2/19)
Front connector[1]	
40-pin for crimp terminals (increased EMC protection)	
• With crimp contacts	**6ES5 490-8MA13**
• Without crimp contacts	**6ES5 490-8MA03**
40-pin, for screw terminals	
• Standard	**6ES5 490-8MB11**
• Increased EMC protection	**6ES5 490-8FB11**
Sub D connector	
9-pin, male contacts	**6ES5 750-2AA11**
15-pin, male contacts	**6ES5 750-2AA21**
Extractor tool for crimp contacts	**6ES5 497-8MA11**
Crimp contacts, pack of 250	**6XX3 070**
Crimping tool for crimp contacts	**6XX3 071**
Bus units, I/O modules	see page 2/27
STEP 5 package for mini PLCs Runs under PG/PC, in German, English, French, Spanish, Italian	
Single license	**6ES5 864-0MA04**
Copy license	**6ES5 864-0MA04-0KL1**
COM DB1 parameter assignment software for high-speed, user-friendly parameter assignment of S5-90U, S5-95U, S5-100U, based on S5-DOS/ST, runs under PG/PC	
Single license	**6ES5 895-3MW** ▯**1**
German	**1**
English	**2**
French	**3**
Spanish	**4**
Italian	**5**

1) The left row of terminals on the front connector is marked with an "a", the right row with a "b".
2) Only for S5-95U with PROFIBUS-DP master interface (6ES5 095-8ME01)

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