Doc. Code: 6117-101.8 Revision: A

1. Product Description

Piccolo Programmable Logic Controllers Series were designed for applications in medium and small size automation and control processes, with excellent cost x benefit relation and high processing capacity.

The compact design integrates in one unique plastic case, a full featured PC, digital I/O, analog I/O and high speed counter and a serial port for programming or connection to ALNET I network.

The I/O points quantity and output type varies according to the model, matching exactly theapplication needs.

The following PCs are available:

- PL101/R: PC w/ 8 I/6 O, 16K RAM, 16K EEPROM, RELAY
- PL101/T: PC w/ 8 I/6 O, 16K RAM, 16K EEPROM, 24VDC
- PL102/R: PC w/ 14 I/10 O, 16K RAM, 16K EEPROM, RELAY
- PL102/T: PC w/ 14 I/10 O, 16K RAM, 16K EEPROM, RELAY
- PL103/R: PC w/ 16 I/16 O, 16K RAM, 16K EEPROM, RELAY, expandable
- PL103/T: PC w/ 16 I/16 O, 16K RAM, 16K EEPROM, RELAY, expandable

2. Packing List

The product package contains:

- PL101/R or PL101/T or PL102/R or PL102/T or PL103/R or PL103/T: PC with integrated I/O

3. Specifications

3.1. General

	PL101		PL102		PL103	
	/R	/T	/R	/T	/R	/T
Total I/O points	14	14	24	24	132	132
Modular I/O interface:						
- modules	-	-	-	-	3	3
- digital I/O	-	-	-	-	96	96
Integrated I/O interface:						
- 24 Vdc inputs	8	8	14	14	16	16
- relay outputs	6	-	10	-	16	-
- transistor outputs	-	6	-	10	-	16
- analog I/O points	-	-	2	2	2	2
- high speed counter input	-	-	1	1	1	1
(1)	-	-	1	1	1	1
Communication interface:	Serial				Serial	
- type	RS-232C				RS-232C RS-485	
- protocol (2)	ALNET I				ALNET I	
- baud-rate (3)	Configurable				Configurable	
Program memory	16K RAM					
Program memory backup	16K E2PROM					
Program and data retention	Lithium Battery					
CPU status LEDs	Yes					
Clock frequency	14.7456 MHz					
Hardware watchdog timer	Yes					
Protection (4)	IP20					
Temperature:						
- operation (5)	0 a 60°C					
- storage(6)	-25 a 70°C					
Operation humidity (7)	5 a 95%					
Weight:						
- net	350 g		400 g		500 g	
- shipped	400 g		450 g		550 g	

(1)configured as interruption or counter

(2)ALNET I version 2.00

(3)300 to 9600 bps

(4) Degree of protection: against contact with live moving parts inside and no protection against water, according to IEC Pub. 144(1963) standard

(5)Exceeds IEC 1131

(6)According to IEC 1131

(7)According to IEC 1131 level RH2

3.2. Electrical

- Power supply voltage: 19,2 a 30 Vdc filtered (including ripple)
- Maximum power dissipation: 5W under nominal voltage
- Internal lithium battery ½ AA - 3A
- Electrostatic surge discharge:
  according to IEC 1131, level 4
- Electrical noise immunity (oscillating wave):
  according to IEC 1131 and IEEE C37.90.1 (SWC)
- Electrical noise immunity (fast transient):
  according to IEC 801-4, level 3
- Irradiated electrical field immunity: 10V/m @ 140 MHz
  according to IEC 1131
- Electric discharge protection
  according to IEC 536 (1976), class I.

3.3. Software

- Programming Language: ladder diagram, structured in modules with functions and subroutines

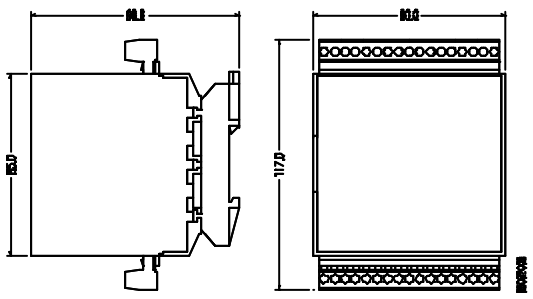
- Programmer:
  AL-3832 - version 2.00 or later
  AL-3830 - version 3.50 or later
  AL-3840 (Mastertool) - version 1.20 or later
  AL-3842 (Mastertool/PL) - version 1.21 or later
- PL102/T, PL103/R and PL103/T software functions included in the programmer:
  F-CONT.005 - access to integrated counter points
  F-ANLOG.006 - access to integrated analog points
  F-PID.033 - PID control function
- Total application program memory: 16 Kbytes RAM
- Total backup memory: 16 Kbytes E2PROM
- On-line programming without stopping execution, through serial channel.
- Digital processing operands (1 bit):
  - Inputs (E):
    total input points capacity: 64 (E000.0 to E007.7) - PL103 model
  - Outputs (S):
    total output points capacity: 64 (S008.0 to S015.7) - PL103 model
  - Auxiliary (A):
    up to 768 auxiliary relays (A000.0 to A095.7)
- Numerical processing operands:
  - memory constant (KM): 16 bits, complement of 2 format
  - decimal constant (KD): 32 bits, BCD w/ signal
  - memory (M): up to 4096, 16 bits binary format
  - decimal (D): up to 2048, 32 bits, BCD format w/ signal
  - memory table (TM): up to 255 with up to 255 positions. Each position is equivalent to one M operand.
  - decimal table (TD): up to 255, up to 255 positions. Each position is equivalent to one D operand.

Operands S, A, M and D can be changed to retentive by programmer. The retentive operands preserve their values even on power failures. The non-retentive ones will be zero on power up. The table operands are all retentive.

All numeric operands (KM, KD, M, D, TM and TD) allow signal treatment. The operand quantity is configurable for each application, memory capacity (8Kbytes) limits the operand quantity available.

- Operand memory capacity:8 Kbytes
- Average execution time for contact instruction: 5 µs
- Average memory occupation for contact instruction: 8 bytes

4. Physical Dimensions



dimensions in mm

5. Accessories

5.1. Cables

Cable	Interconnected equipment		Length
AL-1330	Piccolo	IBM - PC (DB9) programmer	3 m
AL-1333	Piccolo	FT1 and FT3 (RS232)	3 m
AL-1335	Piccolo	AL-1413	3 m
AL-1337	Piccolo	FT5 and FT10 (RS232)	3 m
AL-1338	Piccolo	FT1, FT3, FT5 and FT10 (RS485)	3 m
AL-2300	Piccolo	AL-2600	3 m

5.2. Other

	Description	Function
PL143/R	16 24 Vdc inputs and 16 relay outputs	Digital I/O module
PL143/T	16 24 Vdc inputs and 16 24Vdc transistor outputs	Digital I/O module
AL-1517 or PL150	110/220 Vac, 24Vdc, 1A , rail mounting TS32/35	Power supply
QK1500	TS32/35 CPU and I/O modules rail mounting	Mounting rail

6. Integrated I/O Interface

6.1. Digital Inputs

6.1.1. General

- Input points quantity:
  8 in PL101
  14 in PL102
  16 in PL103
- Input points are not isolated between each other (0V is the same for all points)
- Individual optocoupling for each point
- Status information for each point (LED)
- Process connection: terminal block, 0.5 up to 1.5 mm^2 wire

6.1.2. Electrical

- Input voltages:
  - 0 logic level: 0 Vdc to 5 Vdc
  - 1 logic level: 13 Vdc to 30 Vdc
- transition time 0-1 and 1-0: 2 ms
- Isolation: 1000 Vdc between input's 0V and ground or system

6.2. PL101/R, PL102/R and PL103/R Digital Outputs

6.2.1. General

- Output type: Normally open relay
- Number of points:
  6 in PL101/R
  10 in PL102/R
  16 in PL103/R
- Individual optocoupling for each output point
- Status information for each point (LED)
- Process connection: terminal block, 0.5 up to 1.5 mm^2 wire

6.2.2. Electrical

- Nominal maximum commutation voltage: 30 Vdc to 250 Vac
- Nominal current per point: 2 A for resistive loads and 0.5A for inductive and lamp loads
- Maximum total current on outputs points: 8A
- Protection against malfunction:
  disable outputs when in CPU is in error
- Protection against power fault:
  disable outputs in power fail
- External supply current:
  300 mA for PL103
  180 mA for PL102
  110 mA for PL101
- Isolation: 1000 Vdc between output's 0V and ground or system

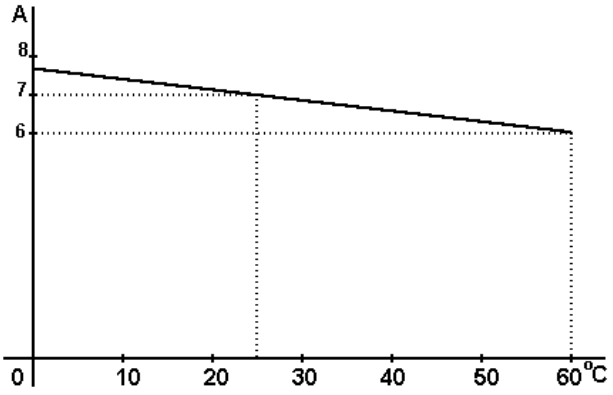
6.3. PL101/T, PL102/T and PL103/T Digital Outputs

6.3.1. General

- Output type: source transistor
- Number of points:
  6 in PL101/T
  10 in PL102/T
  16 in PL103/T
- Output points not isolated between each other (0V is the same for all I/O points).
- Individual optocoupling for each output point
- Status information for each point (LED)
- Process connection: terminal block, 0.5 up to 1.5 mm^2 wire

6.3.2. Electrical

- Power supply voltage: 19.2 a 30 Vdc
- Maximum current per point: 0.5 A
- Maximum total current X temperature:



- Protection against malfunction:
  disable outputs when in CPU is in error
- Protection against power fail:
  disable outputs in power fail
- Protection against overcurrent:
  deactivates outputs if any point's current exceeds 0.5A per point. Outputs must be powered on again to establish normal operation.
- Isolation:
  1000 Vdc between input's 0V and ground or system

6.4. High Speed Counter

- Quantity: 2

PL101/R and PL101/T don't have high speed counter.

6.4.1. Configured as High Speed Counter

- Maximum operation voltage: 30 Vdc
- High to low level transition counting. Not compatible with quadrature signals.
- Input impedance @ 5V:
  > 1 MΩ
  above 5V, the impedance is 15 kΩ
- Logic 1 level:
  Minimum voltage: 3V
- Logic 0 level:
  Maximum voltage: 2V
- Histeresis: 1V
- Maximum frequency: 10 kHz (square wave, 50% duty cycle)
- Minimum pulse width (logic 0 level): 25 µs
- Process connection: terminal block, 0.5 up to 1.5 mm^2 wire
- Programming: F-CONT.005 function module.

6.4.2. Configured as Interrupt Input

- Maximum operation voltage: 30 Vdc
- Low to high level transition.
- Input impedance @ 5V:
  > 1 MΩ
  above 5V, the impedance is 15 kΩ
- Logic 1 level:
  Minimum voltage: 3V
- Logical 0 level:
  Maximum voltage: 2V
- Histeresis: 1V
- Maximum frequency:
  Limited by the software response time.
- Minimum pulse width (0 level):
  25 µs
- Process connection: terminal block, 0.5 up to 1.5 mm^2 wire
- Programming: E-020 module

6.5. Analog Channels

- Quantity: 2, non isolated. Each one can be configured to be input or output.

PL101/R and PL101/T don't have analog channels.

- Resolution: 1/256 (8 bits)
- Monotonicity: yes
- Maximum error @ 25°C: 0,2% of maximum value
- Process connection: terminal block, 0.5 up to 1.5 mm^2 wire
  Uses shielded cables grounded in one extremity
- Programming: F-ANLOG.006 software function module

6.5.1. Configured as Input

- Signal level: 0 to 10 Vdc
- Input impedance: > 10 MΩ
- Delay time: 305 ms
- Conversion type: successive approximations
- Overvoltage allowed: 15 V

6.5.2. Configured as Output

- Output level: 0 a 10 Vdc
- Loads allowed: resistive, capacitive or inductive
- Maximum capacitive load: 10 nF
- GND and power supply short-circuit protection
  Maximum current to GND and power supply: 20mA

7. Programming

Piccolo Series uses ladder diagram language. Its main advantage is being graphical and very similar to conventional relay diagrams. Programming is done with the following instruction set. For more information, see the AL-3830 Programmer User's Manual or MASTERTOOL Programmer User's Manual.

The instruction set is divided in 9 groups:

- RELAYS
  - RNA - Normally opened contact
  - RNF - Normally closed contact
  - BOB - Simple coil
  - BBL - Turn-on coil
  - BBD - Turn-off coil
  - SLT - Jump coil
  - PLS - Pulse relay
  - RM - Master relay
  - FRM - End of master relay
- MOVE
  - MOV - simple operands move
  - MOP - partial operand move
  - MOB - operand block move
  - MOT - operand table move
  - MES - I/O move
  - CES - I/O conversion
  - AES - I/O refresh
  - CAB - Constant block loading
- ARITHMETIC
  - SOM - Addition
  - SUB - subtraction
  - MUL - multiplication
  - DIV - division
  - AND - logic AND between operands
  - OR - logic OR between operands
  - XOR - logic XOR between operands
- COUNTERS
  - CON - simple counter
  - COB - bi-directional counter
  - TEE - power on timer
  - TED - power off timer
- CONVERSION
  - B/D - binary to decimal conversion
  - D/B - decimal to binary conversion
- TEST
  - CAR - load operand
  - = - equal
  - < - lesser
  - > - greater
- INDEXED
  - LDI - turn on or off indexed points
  - TEI - indexed points test
  - SEQ - sequencer
- CALL
  - CHP - call procedure module
  - CHF - call function module
- LINKS
  - LGH - horizontal link
  - LGV - vertical link
  - LGN - logical NOT link

8. ALNET I

All Piccolo Series PCs conforms to version 2.00 ALNET I network commands. This feature makes possible to link them in networks or to AL-600 series, AL-2000 series, AL-3000 series and QUARK series PCs, or peer to peer with Foton MMI.

9. Manuals

For more technical details, installation, programming and Piccolo series PCs user safety, please read the following manuals:

- Piccolo Series User's Manual
- AL-3830 User's Manual
- AL-3840 (Mastertool) User's Manual

10. Revisions

This Technical Characteristic is valid for PL101/R, PL101/T, PL102/R, PL102/T, PL103/R and PL103/T revision A and above.

The revision of this document is shown on top of the page, indicating contains changing or format improvements.

ALTUS has rights to modify this TC without previous notice, in order to improve product characteristics.

The following report shows each revision and corresponding remarks:

Revision: A	Date: 01/15/97
Approval: José Adil - R&D	
Author: Alexandre Hessler - R&D	

Remarks:

- Initial revision