

SILGE ELECTRONICA S.A.

Av. Mitre 950 – B1604AKN - Florida Tel. 4730-1001-Fax: 4760-4950

Email: ventas@silge.com.ar Internet: <http://www.silge.com.ar>

MODELS T16 & P16 - TEMPERATURE/PROCESS CONTROLLERS



- PID CONTROL WITH REDUCED OVERSHOOT
- T16 ACCEPTS TC AND RTD
- P16 ACCEPTS 0-10 V AND 0/4-20 mA SIGNALS
- ON DEMAND AUTO-TUNING OF PID SETTINGS
- DC ANALOG OUTPUT (OPTIONAL)
- USER PROGRAMMABLE FUNCTION BUTTON
- PC OR FRONT PANEL PROGRAMMING
- PC CONFIGURABLE WITH TP16KIT


EMC
COMPLIANT

NEMA 4X/
IP65

PARAMETER
LOCKOUT

PROGRAMMING
SOFTWARE

FRONT PANEL
PROGRAMMABLE


ALARMS


ANALOG
OUTPUT

PC
CONFIGURABLE

FAX/WEB
DOC # 05019

Product Features

GENERAL DESCRIPTION

The Model T16 Controller accepts signals from a variety of temperature sensors (thermocouple or RTD), while the Model P16 Controller accepts either a 0 to 10 VDC or 0/4 to 20 mA DC input signal. Both controllers can provide an accurate output control signal (time proportional or DC Analog Output) to maintain a process at a setpoint value. Dual 4-digit displays allow viewing of the process/temperature and setpoint simultaneously. Front panel indicators inform the operator of the controller and output status. The comprehensive programming allows these controllers to meet a wide variety of application requirements.

MAIN CONTROL

The controller operates in the PID Control Mode for both heating and cooling, with on-demand auto-tune, that establishes the tuning constants. The PID tuning constants may be fine-tuned through the front panel and then locked out from further modification. The controller employs a unique overshoot suppression feature, that allows the quickest response without excessive overshoot. Switching to Manual Mode provides the operator direct control of the output. The controller may also be programmed to operate in On/Off mode with adjustable hysteresis.

ALARMS

Optional alarm(s) can be configured independently for absolute high or low acting with balanced or unbalanced hysteresis. They can also be configured for deviation and band alarm. In these modes, the alarm trigger values track the setpoint value. Adjustable alarm trip delays can be used for delaying

output response. The alarms can be programmed for Automatic or Latching operation. A selectable standby feature suppresses the alarm during power-up until the temperature stabilizes outside the alarm region.

ANALOG OUTPUT OPTION

The optional DC Analog Output (10 V or 20 mA) can be configured and scaled for control or re-transmission purposes. The programmable output update time reduces valve or actuator activity.

PC PROGRAMMING KIT

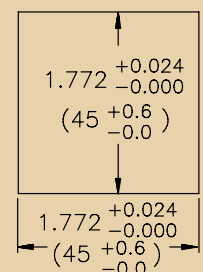
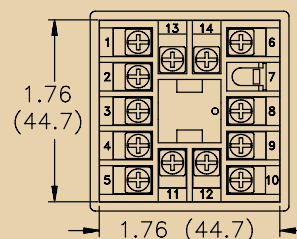
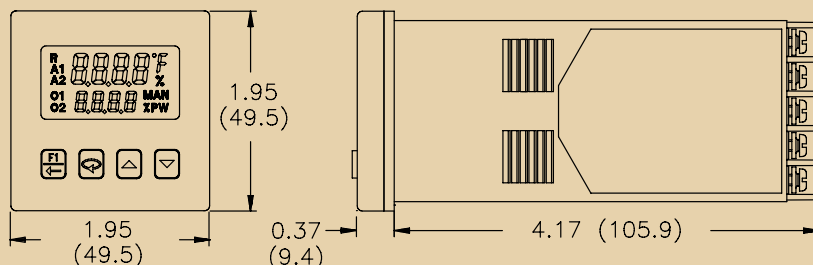
The optional TP16KIT contains a programming module with a 9 pin RS232 connector, cable and Windows® based configuration software. The software allows downloading, uploading and storage of T16 and P16 program files. All controllers have a communications port that allows configuration by PC even without controller power connected. Controller calibration is also possible using the software when the proper calibration equipment and controller power is connected.

CONSTRUCTION

The controller is constructed of a lightweight, high impact, black plastic textured case and bezel with a clear display window. The front panel meets NEMA 4X/IP65 specifications when properly installed. In applications that do not require protection to NEMA 4X, multiple controllers can be stacked horizontally or vertically. Modern surface-mount technology, extensive testing, plus high immunity to noise interference makes the controller extremely reliable in industrial environments.

DIMENSIONS "In inches (mm)"

PANEL CUT-OUT

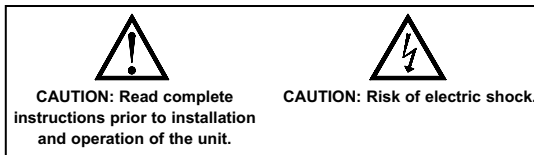


Product Features Continued

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the controller to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the controller. An independent and redundant temperature limit indicator with alarm outputs is strongly recommended.



General Specifications

- DISPLAY:** 2 Line by 4-digit, LCD negative image transmissive with backlighting.

Top (Process) Display: 0.3" (7.6 mm) high digits with red backlighting.

Bottom (Parameter) Display: 0.2" (5.1 mm) high digits with green backlighting.

- ANNUNCIATORS:**

Status Annunciators:

- O1 - Main control output is active.
- O2 - Cooling output is active (when Alarm 2 is used for cooling).
- A1 - Alarm 1 output is active.
- A2 - Alarm 2 output is active.
- °F, °C - Temperature units.
- %PW - Output power percentage is shown in Bottom display.
- MAN - Controller is in Manual Mode.
- R - Ramping Setpoint indicator.
- % - Percent indicator (P16 models only).

Display Messages:

- OL OL** - Measurement exceeds + sensor range
- UL UL** - Measurement exceeds - sensor range
- OPEN** - Open sensor is detected (T16 only)
- SHRT** - Shorted sensor is detected (RTD only)
- ERR5** - Measurement exceeds controller limits (P16 only)
- ddd** - Display value exceeds + display range
- ddd** - Display value exceeds - display range

- POWER:**

Line Voltage Models:

85 to 250 VAC, 50/60 Hz, 8 VA

Low Voltage Models:

DC Power: 18 to 36 VDC, 4 W

AC Power: 24 VAC, ±10%, 50/60 Hz, 7 VA

- CONTROLS:** Three rubber push buttons for modification and setup of controller parameters. One additional button (F1) for user programmable function. One external user input (models with alarms) for parameter lockout or other user programmable functions.

- MEMORY:** Nonvolatile E²PROM retains all programmable parameters.

- ISOLATION LEVEL:**

AC power with respect to all other I/O: 300 V working (2300 V for 1 minute)

Sensor input to analog output: 50 V working (500 V for 1 minute)

Relay contacts to all other I/O: 300 V working (2300 V for 1 minute)

DC power with respect to sensor input and analog output: 50 V working (500 V for 1 minute)

- CERTIFICATIONS AND COMPLIANCES:**

SAFETY

EN 61010-1, IEC 1010-1

Safety requirements for electrical equipment for measurement, control, and laboratory use, Part I

ELECTROMAGNETIC COMPATIBILITY

Immunity to EN 50082-2

Electrostatic discharge	EN 61000-4-2 Level 2; 4 kV contact
Electrostatic discharge	Level 3; 8 kV air
Electromagnetic RF fields	EN 61000-4-3 Level 3; 10 V/m ¹
	80 MHz - 1 GHz
Fast transients (burst)	EN 61000-4-4 Level 4; 2 kV I/O
	Level 3; 2 kV power
RF conducted interference	EN 61000-4-6 Level 3; 10 V/rms ²
	150 KHz - 80 MHz
Power frequency magnetic fields	EN 61000-4-8 Level 4; 30 A/m
Simulation of cordless telephone	ENV 50204 Level 3; 10 V/m
	900 MHz ± 5 MHz
	200 Hz, 50% duty cycle

Emissions to EN 50081-2

RF interference	EN 55011	Enclosure class A
		Power mains class A

Notes:

¹ Self-recoverable loss of performance during EMI disturbance at 10 V/m:

Measurement error exceeds unit specifications.

For operation without loss of performance:

Mount unit in a metal enclosure (Buckeye SM7013-0 or equivalent)

Route power and I/O cables in metal conduit connected to earth ground.

² Self-recoverable loss of performance during EMI disturbance at 10 V:

Measurement error exceeds unit specifications.

For operation without loss of performance:

Install a line filter for input power cables:

Schaffner part number FN610-1/07 (RLC #LFIL0000)

Schaffner part number FN670-1.8/07

Corcom part number 1 VR3

Route power and I/O cables in metal conduit connected to earth ground.

Refer to the EMC Installation Guidelines section of this bulletin for additional information.

- ENVIRONMENTAL CONDITIONS:**

Operating Temperature Range: 0 to 50°C

Storage Temperature Range: -40 to 80°C

Operating and Storage Humidity: 85% max relative humidity (non-condensing) from 0°C to 50°C

Altitude: Up to 2000 meters

- CONNECTION:** Wire-clamping screw terminals

CONSTRUCTION: Black plastic alloy case and collar style panel latch. Panel latch can be installed for vertical or horizontal instrument stacking. Black plastic textured bezel with transparent display window. Controller meets NEMA 4X/IP65 requirements for indoor use when properly installed. Installation Category II, Pollution Degree 2.

WEIGHT: 6.3 oz (179 g)

Input Specifications

1. SENSOR INPUT:

Sample Period: 100 msec (10Hz rate)

Step Response Time: 300 msec typical, 400 msec max to within 99% of final value with step input.

Failed Sensor Response:

Main Control Output(s): Programmable preset output
Display: "OPEN"

Alarms: Upscale drive

Analog Output: Upscale drive when assigned to retransmitted input.

Normal Mode Rejection: >40 dB @ 50/60 Hz

Common Mode Rejection: >120 dB, DC to 60 Hz

Overvoltage Protection: 120 VAC @ 15 sec max

2. THERMOCOUPLE INPUTS: (T16 only)

Types: T, E, J, K, R, S, B, N, C, and Linear mV

Input Impedance: 20 MΩ for all types

Lead Resistance Effect: 0.25 μV/Ω

Cold Junction Compensation: Less than ±1°C typical (1.5°C max) error over ambient temperature range.

Resolution: 1° for types R, S, B and 1° or 0.1° for all other types

TYPE	DISPLAY RANGE	WIRE COLOR		STANDARD
		ANSI	BS 1843	
T	-200 to +400°C -328 to +752°F	(+) Blue (-) Red	(+) White (-) Blue	ITS-90
E	-200 to +750°C -328 to +1382°F	(+) Violet (-) Red	(+) Brown (-) Blue	ITS-90
J	-200 to +760°C -328 to +1400°F	(+) White (-) Red	(+) Yellow (-) Blue	ITS-90
K	-200 to +1250°C -328 to +2282°F	(+) Yellow (-) Red	(+) Brown (-) Blue	ITS-90
R	0 to +1768°C +32 to +3214°F	No standard	(+) White (-) Blue	ITS-90
S	0 to +1768°C +32 to +3214°F	No standard	(+) White (-) Blue	ITS-90
B	+149 to +1820°C +300 to +3308°F	No standard	No standard	ITS-90
N	-200 to +1300°C -328 to +2372°F	(+) Orange (-) Red	(+) Orange (-) Blue	ITS-90
C W5/W6	0 to +2315°C +32 to +4199°F	No standard	No standard	ASTM E988-96
mV	-5.00 mV to 56.00 mV	N/A	N/A	N/A

3. RTD INPUTS: (T16 only)

Type: 2 or 3 wire

Excitation: 150 μA typical

Lead Resistance: 15 Ω max per input lead

Resolution: 1° or 0.1° for all types

TYPE	INPUT TYPE	RANGE	STANDARD
385	100 Ω platinum, Alpha = .00385	-200 to +600°C -328 to +1112°F	IEC 751
392	100 Ω platinum, Alpha = .003919	-200 to +600°C -328 to +1112°F	No official standard
672	120 Ω nickel, Alpha = .00672	-80 to +215°C -112 to +419°F	No official standard
Ohms	Linear Resistance	0.0 to 320.0 Ω	N/A

4. TEMPERATURE INDICATION ACCURACY: (T16 only)

± (0.3% of span, +1°C) at 23 °C ambient after 20 minute warm up. Includes NIST conformity, cold junction effect, A/D conversion errors and linearization conformity.

Span Drift (maximum): 130 PPM/°C

5. SIGNAL INPUT: (P16 only)

INPUT RANGE	ACCURACY *	IMPEDANCE	MAX CONTINUOUS OVERLOAD	RESOLUTION
10 VDC (-1 to 11)	0.30 % of reading +0.03V	1 MΩ	50 V	10 mV
20 mA DC (-2 to 22)	0.30 % of reading +0.04mA	10 Ω	100 mA	10 μA

* Accuracies are expressed as ± percentages over 0 to 50 °C ambient range after 20 minute warm-up.

6. USER INPUT: (Only controllers with alarms have a user input terminal.) Internally pulled up to +7 VDC (100 KΩ), $V_{IN\ MAX} = 35\ V$, $V_{IL} = 0.6\ V$ max, $V_{IH} = 1.5\ V$ min, $I_{OFF} = 40\ \mu A$ max

Response Time: 120 msec max

Functions: Programmable

Output Specifications

1. CONTROL AND ALARM OUTPUTS:

Relay Output:

Type: Form A

Contact Rating: 3 A @ 250 VAC or 30 VDC; 1/10 HP @ 120 VAC (inductive load)

Life Expectancy: 100,000 cycles at max. load rating
(Decreasing load and/or increasing cycle time, increases life expectancy)

Logic/SSR Output (main control output only):

Rating: 45 mA max @ 4 V min., 7 V nominal

2. MAIN CONTROL:

Control: PID or On/Off

Output: Time proportioning or DC Analog

Cycle Time: Programmable

Auto-Tune: When selected, sets proportional band, integral time, derivative time, and output dampening time. Also sets input filter and (if applicable) cooling gain.

Probe Break Action: Programmable

3. ALARMS: (optional) 2 relay alarm outputs.

Modes:

None

Absolute High Acting (Balanced or Unbalanced Hysteresis)

Absolute Low Acting (Balanced or Unbalanced Hysteresis)

Deviation High Acting

Deviation Low Acting

Inside Band Acting

Outside Band Acting

Heat (Alarm 1 on Analog Output models only)

Cool (Alarm 2)

Reset Action: Programmable; automatic or latched

Standby Mode: Programmable; enable or disable

Hysteresis: Programmable

Sensor Fail Response: Upscale

Annunciator: "A1" and "A2" programmable for normal or reverse acting

4. COOLING: Software selectable (overrides Alarm 2).

Control: PID or On/Off

Output: Time proportioning

Cycle Time: Programmable

Proportional Gain Adjust: Programmable

Heat/Cool Deadband Overlap: Programmable

5. ANALOG DC OUTPUT: (optional)

Action: Control or retransmission

Update Rate: 0.1 to 250 sec

OUTPUT RANGE **	ACCURACY *	COMPLIANCE	RESOLUTION
0 to 10 V	0.3% of FS + ½ LSD	10 kΩ min	1/8000
0 to 20 mA	0.3% of FS + ½ LSD	500 Ω max	1/8000
4 to 20 mA	0.3% of FS + ½ LSD	500 Ω max	1/6400

* Accuracies are expressed as ± percentages over 0 to 50 °C ambient range after 20 minute warm-up.

** Outputs are independently jumper selectable for either 10 V or 20 mA. The output range may be field calibrated to yield approximately 5% overrange and a small underrange (negative) signal.

Ordering Information

MODEL NO.	MAIN CONTROL*	2 ALARMS & USER INPUT	PART NUMBERS	
			18-36 VDC/24 VAC	85 to 250 VAC
T16	Relay	—	T1610010	T1610000
	Relay	Yes	T1611110	T1611100
	Logic/SSR	—	T1620010	T1620000
	Logic/SSR	Yes	T1621110	T1621100
	Analog Out	Yes	T1641110	T1641100
P16	Relay	—	P1610010	P1610000
	Relay	Yes	P1611110	P1611100
	Logic/SSR	—	P1620010	P1620000
	Logic/SSR	Yes	P1621110	P1621100
	Analog Out	Yes	P1641110	P1641100

* Analog out may be used for retransmitted signals.

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBERS
TP16	Programming Kit 1 : Includes Software, Comms Module w/ 9-pin connector and cable, and 115 VAC Power Adapter	TP16KIT1
	Programming Kit 2 : Includes Software, Comms Module w/ 9-pin connector and cable	TP16KIT2
RLY	External SSR Power Unit (for Logic/SSR models)	RLY50000
	Single Phase Din Rail Mount Solid State Relay	RLY60000
	Three Phase Din Rail Mount Solid State Relay	RLY70000

BLOCK DIAGRAM

