

General Specifications

Model SLPC (Style E) Programmable Indicating Controller

YEW SERIES 80

GS 01B04C02-01E

■ GENERAL

The Model SLPC Programmable Indicating Controller is a microprocessor-based, user-programmable instrument which allows powerful computational functions to be combined with control functions:

- New intelligent self-tuning model automatically optimizes PID parameters.
- One SLPC can replace two conventional controllers in applications such as cascade loops, and high or low auto-selector control.
- The user can write sophisticated programs by combining calculator-like instructions and functions- I/O instructions such as "read analog input" or "set contact-status output", computational functions and signal-processing functions such as square root with "low-signal cutoff", linearization and dead-time compensation- with control modules. Conditional branching and subroutines are supported.
- There are six status I/O points; each may be user-defined as either input or output.
- Functions such as remote setting, feedforward control and output tracking are supported. Adjustable setpoint filtering allows response to setpoint changes to be optimized.
- Communication functions allow the SLPC controller to be used with a central CRT-display operator station. DDC or SPC operation is also possible. The SLPC can also be combined with an SCMS Programmable Computing Station.
- Incorporates I/O signal level checks and self diagnostics.



■ STANDARD SPECIFICATIONS

Analog Input/Output Signals

Item	Signal	Points	Specification
Analog inputs	1 to 5 V DC	4	Input resistance at least 1M Ω
Analog outputs	1 to 5 V DC	2	Load at least 2k Ω
Analog outputs	4 to 20 mA DC	1	Load up to 750 Ω

Input Conversion Accuracy: ± 0.2 % of span.

Output Conversion Accuracy:

For current output, ± 1 % of span.

For voltage output, ± 0.3 % of span.

Status I/O Signals

Programmable Status I/O Signals:

6 points, each user-defined as either input or output. (The program can read the status of contact or voltage status inputs, and set the status of contact status outputs).

Fail Output Signal:

1 point, contacts open during power failure.

Status input signal (Note1) (Tr.Contact)	Non-voltage status input	Contact rating at least 5 V DC, 20 mA
	Source	ON: up to 200 Ω OFF: at least 100k Ω
	Voltage input	Max. input voltage 30 V DC
Min.pulse width	Source	ON: -0.5 to +1 V DC (low) OFF: +4.5 to +30 V DC (high)
	Status rating	220 ms (for 0.2 sec. scan period) 120 ms (for 0.1 sec. scan period)
Status output signal (Note1) (Tr.Contact)	Status rating	Transistor open collector contact 30 V DC, 200 mA (resistive load)

Note 1: The program can read the status of contact or voltage status inputs, and set the status of contact status outputs.

Isolation

Isolation	Each analog circuit	Not isolated (-line common)
	Between analog circuit and internal circuit	Not isolated
	Each status circuit	Isolated
	Between status circuit and internal circuit	Isolated
	Between signal circuit and power supply	Isolated

Function Key Status Input:

One key.

Function Lamp:

May be turned on/off by program, like status output.

Indicators

Process Variable & Set Point Indicators:

Moving coil meter, Vertical scale.

Common Specifications:

Indication Range: 0 to 100 %

Scale: 100 mm long, interchangeable.

Scale Marking:

Signal scale with units marking.

Major divisions are marked.

Moving Coil:

Dual index (dual pointer) meter.
 Index Color: Process variable-red, Set point-blue.
 Indicator Accuracy: ± 0.5 % of span.

Output Indicator:

Moving coil type, with two memory indexes for limits, and with valve open/close marks.
 Horizontal scale.
 Scale: 39 mm scale with 20 equal divisions.
 Indicator accuracy: ± 2.5 % of span.

Mode Transfer:

By cascade (C) /Auto (A)/Manual (M) switches on front panel. Mode indicator lamp is built into each switch button. Mode can also be set by contact input or remotely (see "Communication Functions" below).
 Transfers between cascade, auto and manual modes are bumpless and balanceless.

Set point:

Manual, cascade or remote setting (side panel switch selects whether the set point comes from analog input or via communications bus - see "Communication Functions" below).
 Manual SET buttons (on front panel) vary set point at rate of 40 sec./full scale.

Manual Output:

Set by two-speed level action.
 SLOW: 40 seconds/full scale
 FAST: 4 seconds/full scale

Setting Computational Coefficients/Parameters and**Selecting Display Data:**

Uses a 16-key keypad on the tuning panel (side panel).
 A side-panel switch enables/inhibits parameter changes.
 Communication functions available for remote setting (see below).

Side-Panel Digital Display:

Parameter or Data Label: 3-digit alphanumeric
 Parameter or Data Value: 4-digit numeric
 Input data and some variable parameters are in engineering units (but units are not displayed).

Control Functions

The control functions of the controller are decided by writing a program which "interconnects the terminals" of a (software) control module to any of a variety of computational function modules (described below).
 One of three control modules may be selected:

Basic Control Module:

A single control module.

Cascade Control Module:

Two control modules connected in cascade. One SLPC controller can implement a cascade loop.

Signal Selector Control Module:

Two control modules connected in parallel. One SLPC controller can implement an auto-selector control loop.

Control Elements:

A control module comprises one of three control elements: Basic PID control element, Sample-and-hold control element or PID control element with batch switch. These control elements, described below, may contain the following common function: output tracking, manipulated value output limiter and process variable limit alarms (-6.3 to 106.3 %), deviation (0 to 100 %) and velocity limit alarms, non-linear control (dead band gain: 0 to 1.0, dead band width: 0 to 100 %).

Basic PID Control Element:

P (Proportional band): 2.0 to 999.9 %
 I (Integral time): 1 to 9999 sec.
 D (Derivative time (Derivative of Process Variable)):
 0 to 9999 sec. (Note1)
 Scan and Control Period: 0.2 or 1.0 sec.
 Note1: Action range is 2 to 9999 sec. (0 & 1: OFF)

PID Control Element with Batch Switch:

When the control deviation exceeds a preset band - e.g. during startup - a fixed (preset) value is output. When the deviation decreases to within the preset band, a bias is added to or subtracted from the output (depending whether the control action is direct or reverse) and the controller switches to PID control. Control does not revert from PID to manual control unless the deviation exceeds (deviation set point + lock up band).
 High or low limit batch control may be selected:
 Deviation Set Point: 0 to ± 100 %
 Basic Set Point: 0 to 100 %
 Lockup Band: 0 to 100 %

The PID parameters and scan/control period are the same as for basic control (above).

Sample-and-Hold PI Control Element:

The control algorithms are executed after each input scan cycle, and the output is then held constant (until after the following scan). This is useful for processes with dead time.

Sample Period: 0 to 9999 sec.
 Control Period: 0 to 9999 sec.

The PI parameters and scan period are the same as for basic control (above).

Adjustable Filter

For set point changes

Filter can be used with the following control functions:

Standard control function
 Cascade control function (for each set point)

Autoselector control function (for each set point) in this case, the following control elements can be selected for the above control functions:

Standard PID control for up to two set points.
 Sample-and-hold PI control for up to two set points.

Self-tuning can be used with:

Standard control function (Note2)
 Cascade control function (Note2)
 (tune secondary, then cascade loop)
 Auto-selector control function (Note2)
 (tune selected controller)

Note2: For self-tuning, only the standard PID control element can be used in the above functions.

Computational Functions:

Functions	Function name	Max. no. of times function may be used in program	
General functions	Addition, Subtraction, Multiplication, Division, Magnitude (absolute value), Square root, with "low-signal cutoff", High selector, Low selector, High limiter, Low limiter	—*— —*— —*— —*— —*—	
	10-segment transfer function (break points user-definable)(two functions)	2	
	Transfer function with user-definable number of segments	2	
	High limit alarms	4	
	Low limit alarms	4	
Functions with unit addresses	First order lag	8	
	First order lead	2	
	Dead time, velocity computations and moving average	3 total	
	Velocity limiter	6	
	Timers	4	
	Program set unit	1	
	Detection of status change	8	
	Pulse input counter	4	
	Pulse rate output	2	
	Logical functions	AND, OR, XOR, NOT, CMP (test if greater than or equal)	—*—
		Branching, Conditional branching, Subroutine calls	—*— —*—
		Signal switching	—*—

Note: When limits are indicated by a dash "—" above, this means that there is no preset limit.

Variable registers: 4

Computational Coefficients/Parameters

(preset by user):

16 registers for general use, plus 22 for 10-segment line-segment functions.

Constants: 16

Temporary Registers:

16 numerical, 10 for status flags.

Programming

Program Size:

For main program, 99 steps (Note3).
For subprograms, total of 99 steps (Note3).
Number of subprograms, 30 max.

Note3: Control instructions, arithmetic functions and data read/write instructions each take one step.

Programming:

The SPRG Programmer is connected, and the program is entered using a calculator-like language.
The completed program is written to UV EPROM (Erasable Programmable Read Only Memory).

Control/Computational Period:

0.1 or 0.2 sec.
Max. Number of Steps (including subrouting calls):
Can execute approx. 60 steps in 0.1 sec. period,
Can execute approx. 240 steps in 0.2 sec. period.

Communication Functions

Item	Function/Specification
Interface	via LCS card in field control unit via LCS card in field control station
	Connected to both an LCS card and SCMS
Communication parameter	Process variable (Note), set point (Note), manipulated output, instrument mode, output limits, PID constants
	Remote parameter setting can be disabled.
Cascade mode	Cascade signal can be local or remote. (transmitted from a supervisory computer)
DDC/SPC mode	Remote setting of manipulated output in DDC mode.
	Remote setting of set point in SPC mode.
Backup mode selection	If the communications or supervisory computer systems fail, the YS80 system reverts to backup mode.
	Backup AUTO mode and Backup MAN mode
Comm. distance	Max. length of SCCD cable to LCS card is 100 m (328 ft).

Note: For a cascade loop, or where selector functions are involved, these apply to the primary loop.

Power-Fail/Restart Functions

For a Power Failure of Up to Approx. Two Seconds:

Status prior to power failure retained.

For Power Failure Longer than Approx. Two Seconds:

Restart mode can be selected from the following by a switch on the side panel.

HOT (Computational data and status prior to power failure preserved).

COLD (Status reset to manual mode, 4 to 20 mA manipulated variable outputs set to - 20 %)

Data Memory Backup During Power Failure:

By internal battery.

Life of Backup Battery:

(temperature up to 45 °C), At least 5 years (normal operation), At least 1 year (backup operation)

Self-Diagnostic Features

Computation and Control Abnormalities:

"FAIL" lamp lights, "FAIL" contact output opens. (Fail contact is also open during power failure).
Manual operation is possible.

Input/Output Signal Abnormalities

(Input overflow, current output wire open circuit): "ALM" lamp lights.

Memory Backup Battery Low:

"ALM" lamp flashes.

Communications Abnormal:

"C" lamp flashes (during communications).

For diagnostic purposes, numeric error codes corresponding to faults can be displayed on side panel display.

■ MOUNTING AND APPEARANCE

Mounting:

Flush panel mounting. Instruments are in housings, and may be mounted individually or side-by-side.

Instrument may be inclined with front up to 75 ° from vertical (rear of instrument lower than front). (Indicator zero may need readjustment).

Nameplate

Size: 8 × 65.3 mm, cream semi-gloss finish.
lettering in black, one two rows each up to 14 alphanumeric characters long.

Front Panel Finish:

Dark green (munsell 2.5GY 3/1)

Bezel:

Aluminium diecast, black baked-enamel finish.

Housing:

Open front, connector for SPBD portable manual station

Wiring

Signal Wiring: ISO M4 size (4mm) screws on terminal block.

Power and Ground Wiring

100 V version: JIS C 8303 two-pin plug with earthing contact(IEC A5-15, UL458)

220 V version: CEE 7 VII(CENELEC standard) plug. Cable Length: 300 mm (11.8 inch).

External Dimensions:

182.5 (H)×87(W)×480 (D) depth behind panel (mm)

7.2 (H)×3.4(W)×18.9 (D) depth behind panel (inch)

Weight

Instrument weight: 3.4 kg (7.5 lb) less housing

Housing weight: 2.0 kg (4.4 lb) excluding mounting kit

STANDARD PERFORMANCE

Maximum Power Consumption

- 340 mA with 24 V DC supply
- 16.0 VA with 100 V AC supply
- 20.0 VA with 220 V AC supply

Insulation Resistance

- Between I/O terminals and Ground: 100 MΩ/ 500 V DC
- Between Power and Ground: 100 MΩ/500 V DC.

Dielectric Strength

- Between I/O terminals and Ground: 500 V AC for 1 minute.
- Between Power and ground: 1000 V AC for 1 minute(100 V version) 1500 V AC for 1 minute(220 V version)

NORMAL OPERATING CONDITIONS

Ambient Temperature:

0 to 50 °C (32 to 122 °F)

Ambient Humidity:

5 to 90% relative humidity(non-condensing)

Power Supply:

Two versions, for “100 V” (standard) or “220 V”(option /A2ER). Both versions may use AC or DC, without change to the instrument:

Version	100 V	220 V
DC (polarity reversible)	20 to 130 V	120 to 340 V
AC (47 to 63 Hz)	80 to 138 V	138 to 264 V

OPTIONS

- /A2ER: For “220 V version” with power supply plug.
- /A2: For “220 V version” without power supply plug.
- /MTS: Controller supplied with kit for individual mounting. For mounting in groups, see GS 1B4F1-E.
- /SCF-G_M: Mounting kit bezel color change from standard color (Black). Choose color from set of optional colors (see GS 22D1F1-E). Specify color code in space.
- /NHS: No housing, instrument only. See GS 1B4F1-E to order housing separately.
- /LH: Long housing type with power supply terminal.
- /NPE: With letters engraved on front panel nameplate. (see GS 22D1C4-E)
- /HTB: For “100 V version” with power supply terminal.

ACCESSORIES

- 1A fuse, quantity one.
- Data memory backup battery, parts no. E9711DH.

MODEL AND SUFFIX CODES

Model	Suffix codes	Style	Option codes	Description
SLPC				Programmable Indicating Controller
Indicator	-1			Moving coil type
Functions	5			Enhanced model, with adjustable filter
	8			Enhanced model, with adjustable filter and self-tuning
	1			Always 1
Style code		*E		Style E
Options			/NPR	Unprogrammed
			/UPR	With user's program
Common options			/A2ER	220 V version with plug
			/A2 (Note)	220 V version without plug
			/MTS	With mounting kit
			/SCF-G□M	Bezel color change
			/NHS	Without housing
			/LH	Long housing with terminal
			/NPE	Nameplate engraving
		/HTB	Screw terminal for housing	

Note: Specify /A2/NHS to order without housing.

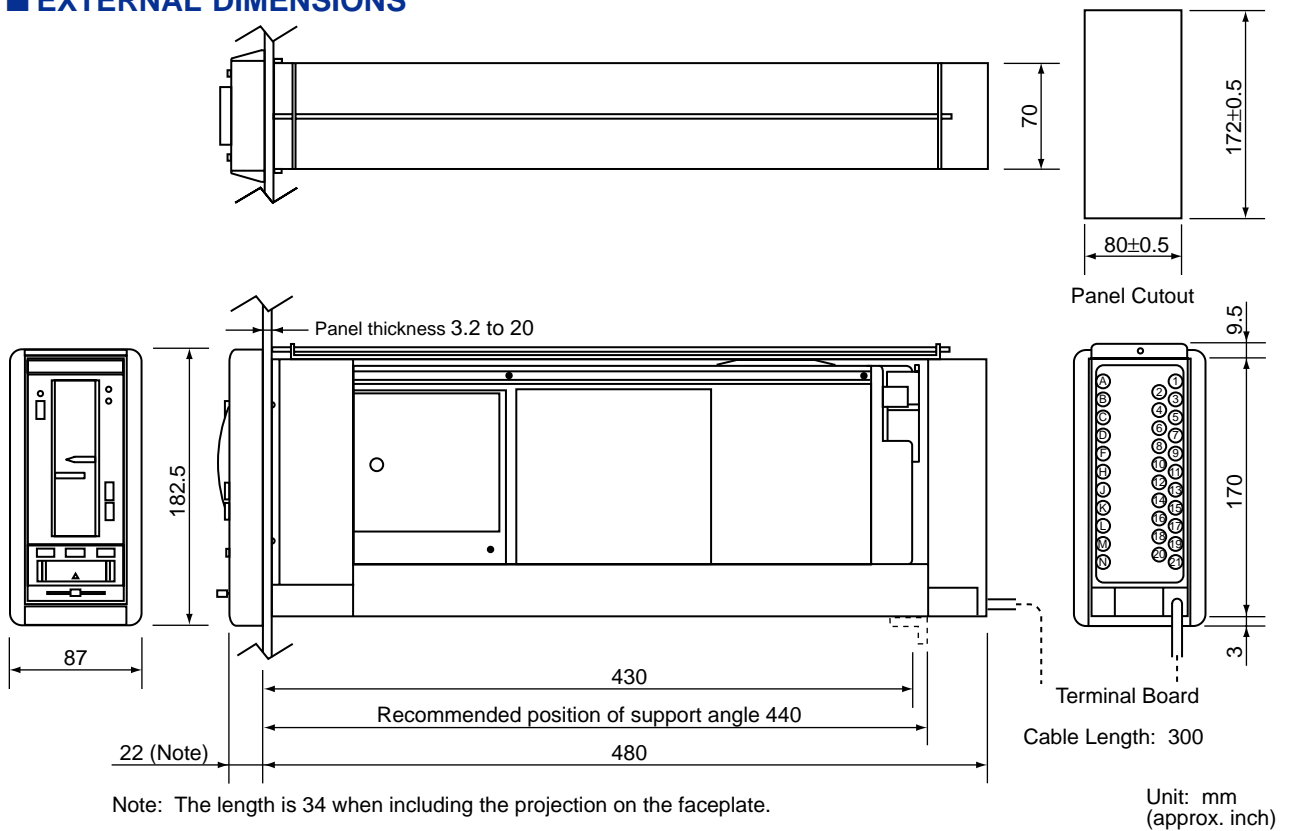
■ TERMINAL CONNECTIONS

Terminal Designation	Description	Terminal Designation	Description
1	+> Analog input 1 (1 to 5 V DC)	17	+> Communications (Note1)
2	-> Analog input 2 (1 to 5 V DC)	18	+> Status signal 4 (DI4, DO3)
3	+> Analog input 3 (1 to 5 V DC)	19	- Fail output (neg. terminal)
4	+> Analog input 4 (1 to 5 V DC)	A	+> Analog output 1 Note 2(4 to 20 mA DC)
5	+> Analog input 5 (1 to 5 V DC)	B	+> Analog output 2 (1 to 5 V DC)
6	+> Status signal 1 (DI1, DO6)	C	+> Analog output 3 (1 to 5 V DC)
7	+> Status signal 2 (DI2, DO5)	D	+> Status signal 6 (DI6, DO1)
8	+> Status signal 3 (DI3, DO4)	F	+> Status signal 5 (DI5, DO2)
9		H	+ Fail output (pos. terminal)
10		J	
11		K	
12		L	
13		M	
14		N	
15			
16			

Note 1: Use shielded twisted-pair cable Model SCCD.

Note 2: If these terminals are not used, connect them together.

■ EXTERNAL DIMENSIONS



ORDERING INSTRUCTIONS

Specify the following when ordering:

1. Model and suffix codes and option codes, if necessary.
2. Main scale and engineering units marking (see GS 22D1C1-E).
3. Nameplate marking, if required (option /NPE).
4. Mounting kit (option /MTS), if the instrument is to be mounted individually (see OPTIONS above).
5. Fill out program worksheets and data sheets if a special user's program is required.