General Specifications

Model SLMC (Style E)
Programmable Indicating Controller
With Pulse Width Output

YEWSERIES 80

GS 01B04C03-01E

■ GENERAL

The Model SLMC Programmable Indicating Controller with Pulse Width Output is a microprocessor-based, user-programmable instrument which allows powerful computational functions to be combined with control functions.

This controller is mainly used in neutralization and flow-control applications - it provides UP/DOWN pulse width outputs for motor-driven valve actuators.

- *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 - and front panel PF key and lamp.*
- *Functions such as remote setting, feedforward control and output tracking are supported.*
- *Communication functions allow the SLMC controller to be used with a central CRT-display operator station. DDC or SPC operation is also possible. The SLMC can also be combined with an SCMS Programmable Comput -ing 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	5	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	
		Source	ON: –0.5 to +1 V DC (low)
			OFF:+4.5 to +30 V DC (high)
	Min.pulse width	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)	
Manipulated output signal	Pulse width	UP and DOWN pulse output (1 each) (Note2)	

Note 1: If the SLMC fails, the output is held at the same position as immediately before the failure. The user should, however, provide an interlock circuit using the fail signal output.
Note 2: 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.

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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 indexs 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 element (PI control, sample-and-hold PI control) to any of a variety of computational function modules (described below).

Basic PI Control Element:
P (Proportional band); 6.3 to 999.9 %
I (Integral time); 1 to 9999 seconds

Sample-and-Hold PI Control Element:
The control algorithms are executed after each input scan (sampling) cycle, and the output is then held constant (until after the following scan). This is useful for process with dead time (P and I are the same as above).
Sample and Control Period Setting: 0 to 9999 seconds
Min.Actual Sample and Control Period: 0.2 second

Pulse Width Output Parameters:
Valve Travel Time (full stroke): 0 to 9999 seconds
Dead Zone: 0 to 100 %
Min.Output Time Span Setting: 0 to 100 % of full stroke.
Actual Output Resolution(min.pulse width): 0.01 second
Backlash Compensation: 0 to 100 %
Output Bias (up): 0 to 100 %
Output Bias (down): 0 to -100 %
Valve Opening Feedback: possible

Control Functions:
The control elements, described above, may contain the following commmon functions: output tracking; manipulated valve output limiter (with feedback from valve); alarms for process variable limit (-6.3 to 106.3 %), deviation (0 to 100 %) and velocity limit (0 to 100 %/sec.); non-linear control (dead band) gain: 0 to 1.0, dead band width: 0 to 100 %).

Programming

Program Size:
For main program, 99 steps (Note 1).
For subprograms, total of 99 steps (Note 1).
Number of subprograms, 30 max.
Note 1: 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 writen to UV EPROM (Erasable Programmable Read Only Memory).

Control/Computational Period:
0.2 sec.

Computational Coefficients/Parameters

(preset by user):
16 registers for general use, plus 22 for 10-segment line-segment functions.

Constants: 16

Temporary Registers:
16 numerial, 10 for status flags.

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	–*–
Functions with unit addresses	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
	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.

Communication Functions

Item	Function/Specification
Interface	via LCS card in field control unit
	via LCS card in field control station
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 is100 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
SLMC				Programmable Indicating Controller
Indicator	-1			Moving coil type
Functions	4			Enhanced model
	0			Always 0
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.

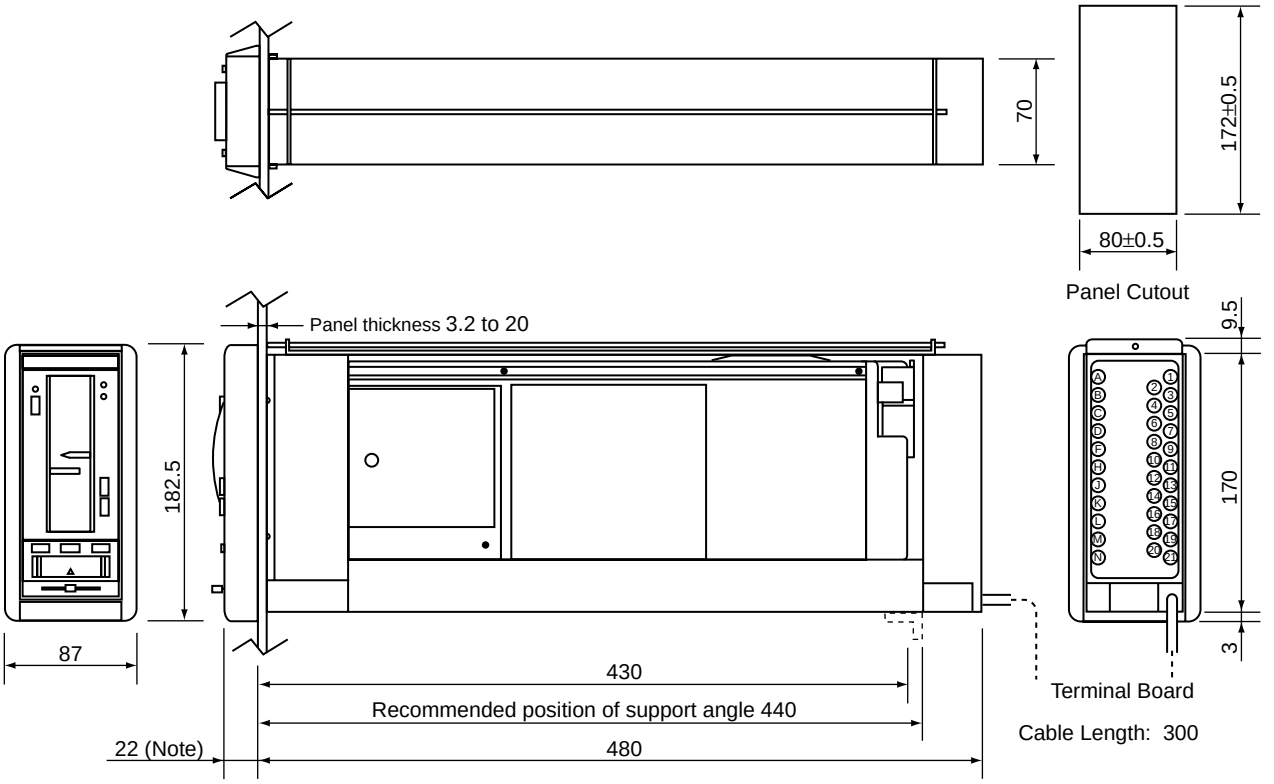
■ TERMINAL CONNECTIONS

Terminal Designation	Description
1	+ Analog input 1 (1 to 5 V DC)
2	–
3	+ Analog input 2 (1 to 5 V DC)
4	–
5	+ Analog input 3 (1 to 5 V DC)
6	–
7	+ Analog input 4 (1 to 5 V DC)
8	–
9	+ Analog input 5 (1 to 5 V DC)
10	–
11	+ Status signal 1 (DI1, DO6)
12	–
13	+ Status signal 2 (DI2, DO5)
14	–
15	+ Status signal 3 (DI3, DO4)
16	–

Terminal Designation	Description
17	+ Communications (Note1)
18	–
19	+ Status signal 4 (DI4, DO3)
20	–
21	– Fail output (neg. terminal)
A	+ Analog output 1 Note 2(4 to 20 mA DC)
B	–
C	+ Analog output 2 (1 to 5 V DC)
D	–
F	+ Analog output 3 (1 to 5 V DC)
H	–
J	+ Manipulated output No.1
K	–
L	+ Manipulated output No.2
M	–
N	+ Fail output (pos. terminal)

Note 1: Use shielded twised-pair cable Model SCCD.
Note 2: If these terminals are not used, connect them together.

■ EXTERNAL DIMENSIONS



Note: The length is 34 when including the projection on the faceplate.

Unit: mm
(approx. inch)

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.