General Specifications

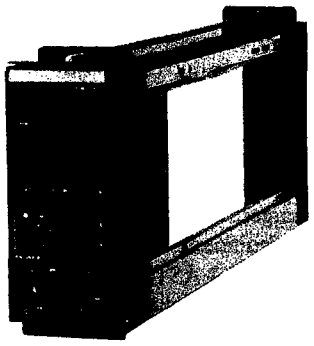
Model SLCC (Style E) Blending Controller

YEWSERIES 80

The SLCC Blending Controller is designed for high-resolution in-line blending systems. It separately totalizes both a set point signal and the process variable signal, and performs PI control such as to keep the ratio of the two totalized values constant at a preset blend ratio. The SBSD Batch Set Station or the SLBC Batch Controller can be used with the SLCC Blending Controller.

The controller functions include:

- *Scaling, instantaneous flow display, repeater for flow signal.*
- *Analog inputs and outputs, and compensation computation functions.*
- *Various totalizer functions. Totalizer parameters are easy to set, and totalizer totals may be viewed.*
- *Communications functions — the instrument is easy to design into a system, it can communicate with a central operator station or supervisory computer. DDC or SPC operation is possible.*
- *Self-diagnostic functions.*



STANDARD SPECIFICATIONS

Input Signals

Process Variable Pulse Input Signal: 0 to 6 kHz, zero elevation not possible, minimum pulse width 50 μs. Pulse input from two-wire/three-wire transmitter, or voltage transition/contact signal.

Input From Transmitter: SLCC contains distributor, voltage is switch-selectable — distributor supplies 12 V/24 V ±10%, current up to 50 mA. For two-wire transmitter, load resistance is switch selectable — 200 Ω, 510 Ω or 1 kΩ.

Voltage (Transition) Pulse:
Voltage LOW Level (E_L): −1 V to +8 V DC.
Voltage HIGH Level (E_H): +3 V to +24 V DC.
Amplitude of Pulse Signal ($E_H - E_L$): At least 3 VV.
Input Resistance: At least 10 kΩ.

Contact Pulse: Relay/switch contact or transistor switch.
Contact ON: Source resistance up to 200 Ω.
Contact OFF: Source resistance at least 100 kΩ.
Contact Rating: At least 30 V DC, 30 mA.

Filter for Contact Pulse Input: Switch-selectable, time constant 10 ms.

Flow Set Point Pulse Input Signal and Status Inputs: Flow set point input is 0 to 1 kHz, zero elevation not possible, minimum pulse width 350 μs. Status input minimum pulse width 220 ms. Voltage (level) or contact signals.

Voltage (Level) Input:
Voltage LOW level (E_L): −1 V to +1 V DC (status ON).
Voltage HIGH level (E_H): +4.5 V to 25 V DC (status OFF).

Contact Input: Relay/switch contact or transistor switch.
Contact (Status) ON: Source resistance up to 200 Ω.
Contact (Status) OFF: Source resistance at least 100 kΩ.
Contact Rating: At least 5 V DC, 20 mA.

Analog Input Signals (Process Variable, Set Point and Compensation Signals): 1 to 5 V DC, input resistance 1 MΩ.

Analog Input Conversion Accuracy: ±0.2% of span.

RTD Input Signal (for Temperature Compensation): (SLCC-301 only): JIS specification Pt 100 Ω 3-wire RTD, lead wire resistance up to 10 Ω/wire.

Temperature Compensation Accuracy: ±0.2% of span.

Burnout Function: Provided; scaleout time up to 60 s.

Output Signals

Pulse Output Signal (Flow Repeater Signal): Transistor contact signal, rating 30 V DC, 200 mA.

Frequency: 0 to 1 kHz; **Duty Cycle** 50% (for connecting to YewSeries BCS Instrument), or **Fixed Pulse Width** — selectable (one of 0.5, 1, 20, 33, 50 or 100 ms) — for electromechanical counter.

Status Output Signals (Totalizer Deviation Alarm — two points — and Fail Signal): Transistor contact signals, rating 30 V DC, 200 mA.

Analog Output Signal (Flow Repeater Signal): 1 to 5 V DC, load resistance at least 2 kΩ.

Analog Control Output Signal: 4 to 20 mA DC, load resistance 0 to 750 Ω.

Analog Output Conversion Accuracy: ±0.3% of span.

Isolation

Contact (pulse/status) I/O signals are isolated from internal circuitry; analog signals are not. Pulse I/O signals are isolated from each other; status inputs, status outputs and analog I/O signals use separate common negative lines. Power supply is isolated from internal circuitry.

Input Processing Functions

Process variable and set point inputs may be either voltage or pulse signals, compensation input may be either a voltage or RTD signal.

Input Filter (for Process Variable Pulse Input and Flow Set Point Input: First order lag filter, time constant adjustable 0 to 9999 s.

Totalizer Scale Factor: Scaler for pulse or analog signal input (constant K number of pulses for every flow unit totalized). K (K_1, K_2) are 5-digit fixed point numbers, of maximum value 32767.

Voltage Flow Signal Processing: Span setting (4-digit fixed point number) corresponding to input signal range of 1 to 5 V DC; low-input cutoff (for inputs under 1% of span) and square root function selectable.

Compensation Computations

Can compensate the process-variable flow signal for liquid density changes with temperature. Other types of compensation are also possible (see below).

SLCC has the following 4 ASTM compensation.

- Old ASTM No. D1250 (edit in 1952)
- New ASTM No. D1250 (edit in 1980)

for crude oils, fuels & solvents and lubricating oils.

Temperature Compensation:

Temperature unit is selectable (°C or °F).

Input Signal: Platinum RTD (Pt 100 Ω) or 1 to 5 V DC.

Temperature Range: For platinum RTD (Pt 100 Ω); −50 to +250°C.

For a 1 to 5 V DC signal: Arbitrary.

Computation Format: ASTM equation or general quadratic equation.

ASTM Equation: $V_0 = V[\,(1+\alpha)\,f(\rho\,,\,t)\,]$

General Quadratic Equation:

$$V_0 = V[\,(1+\alpha)\{1+\beta(t-t_0)\times10^{-2}+\gamma(t-t_0)^2\times10^{-6}\}\,]$$

V_0: Volumetric flow at reference temperature t_0.

V: Volumetric flow (process variable flow signal) at temperature t.

t_0: Reference temperature (°C), t_0 = 15°C for ASTM.

t: Flow sensor temperature (°C).

α: Flow transmitter compensation coefficient, (−99.99 to +99.99).

β: First order compensation coefficient, (−99.99 to +99.99).

γ: Second order compensation coefficient, (−99.99 to +99.99).

ρ: Specific gravity, (0.5000 to 1.2000)

Note: For density (specific gravity) compensation, coefficients α and ρ are used to convert volumetric flow to ASTM standard conditions t_0 = 15°C.

General Compensation Computations:

Computation Format: $V_0 = V[\,(C_{max}-C_{min})\,C+C_{min}]$, C ranges from 0 to 1 − its value corresponds to the compensation input signal: a voltage in the range 1 to 5 V DC. C_{max} and C_{min} are maximum and minimum compensation coefficients respectively, and may be set independently in the range 0 to 9999.

Flow Signal Repeater Function

Outputs pulse and analog signals corresponding to the flow signal process variable input.

Pulse Output: Output pulse rate may be scaled by a factor K_3, a 5-digit fixed point number, of maximum value 32767.

Pulse Output ON Time: Selectable − one of 0.5, 1, 20, 33, 50 or 100 ms − or duty cycle of 50% (for Yew Series BCS Instruments; up to ten may be connected in parallel with output).

Analog Output: 1 to 5 V DC.

Totalizer Functions

Four totalizers are built in − two 6-digit batch flow totalizers and two 8-digit (cumulative) totalizers:

- O Flow totalizer (process variable only).
- O Flow totalizer (process variable, with compensation computation).
- O Cumulative flow totalizer.
- O Cumulative flow totalizer (with compensation computation).

Flow totalizers are reset by reset input signal. Cumulative flow totalizer may be reset manually by entering other data for totalizer value.

Data Display and Data Setting Functions

Data Display:

Upper display is blend ratio set data, 6 digits.

Lower display is selectable data, 6 digits.

Selectable data (displayed in lower display) may be major data item or auxiliary data item:

Major Data Item: Displayed data type is indicated by a lamp next to a data item label on the front panel. Process variable value (with compensation), totalizer deviation (between process variable and set point), blend ratio and instantaneous flow may be displayed.

Auxiliary Data Item: Data type is indicated by code displayed in upper display. Uncompensated totalizer value and various control parameters may be displayed. A table of data that may be displayed is on the instrument side panel.

Instantaneous Flow Display: 5-segment bar graph.

Data Setting:

Displayed Data Selection: Selected by push buttons. One switch (on side panel) changes from major data display to auxiliary data display.

Data Setting: Uses push button switches. Data setting may be inhibited (disabled) by an inhibit/enable switch on the side panel.

Flow Ratio Control Functions

This Blending Controller separately totalizes both a set point signal and the process variable signal, and performs PI control such as to keep the ratio of the two totalized values constant at a preset blend ratio. When batch end input turns off, output is set to −20%.

Blend Ratio Set Point: 5 digit fixed point number, maximum 327.67%.

Totalizer Deviation: 4 digit display.

Control Modes: A (Auto), M (Manual). These correspond to SPC and DDC respectively in computer (remote setting) mode.

Auto mode: PI control.

Proportional band 6.3 to 999.9%.

Integration time constant 1 to 9999 sec.

Manual mode: Two speed operation.

Slow − 40 sec./full span change.

Fast − 4 sec./full span change.

Control Mode Transfer: A/M transfer, using front-panel switch or contact input (contact status OFF: Manual mode), is bumpless and balanceless.

Manipulated Variable Output Indication: Horizontal scale 39 mm long, one pointer, with two memory indexes and valve open/close direction marks.

Indicator Accuracy: ±2.5% of span.

Control Period: 0.2 sec.

Alarm Functions

Totalizer Deviation Limit Alarm: ALM lamp lights, alarm output contact opens. Two (4-digit) deviation set points are provided; there is a single contact output for each deviation alarm. The 1st stage totalizer deviation alarm output can be used as master pacing input to SBSD or SLBC instruments.

Communication Functions

The SLCC can communicate (via LCS card in field control station/unit) with a central YEWPACK/CENTUM CRT-display operator station and supervisory computer. Maximum length of (SCCD) cable to LCS card is 100 m (328 ft).

Data Transmitted: Instantaneous flow, flow totalizer value (with compensation computation), blend ratio set value, totalizer deviation, manipulated variable output, control mode, totalizer deviation alarm status, compensation coefficients.

Data with Remote Setting: Flow totalizer value (with compensation computation), blend ratio set point, manipulated variable output (in manual or DDC modes), control mode, compensation coefficients. Remote setting (from YEWPACK/CENTUM operator station or supervisory computer) can be disabled.

Control Functions:

Power Failure Time: Less than 2 sec.: HOT mode start
2 sec. or more: COLD mode start

(Note)

HOT mode start: Not affected by power failure (same as directly before power failure)

COLD mode start: Control is restarted from MV=0%.

puter or from a remote operator station. During SPC/DDC operation from a supervisory computer, only the "C" (Computer) lamp is lit. During local operation, or remote operation from the YEWPACK UOPS operator station, the "A" or "M" lamps are lit.

Power Fail/Restart Functions

Totalizer Value: Not changed by power failure.

Control Functions: Not affected by power failure (same as directly before power failure).

Data Memory Backup During Power Failure: By internal battery. All contact outputs are OFF during a power failure.

Life of Internal Battery (temperature up to 45°C):
At least five years (normal operation).
At least one year (backup operation).

Self-Diagnostic Functions

The cause of the alarm is indicated as a numeric code.

Computation and Control Circuit Abnormal Alarm: FAIL lamp lights and fail contact output opens. (Manual operation is possible).

Input Signal Abnormal, Manipulated Output Open, Power Failure, Pulse Repeater Overflow, Data Setting Overrange: ALM lamp lights.

Memory Backup Battery Low: ALM lamp flashes.

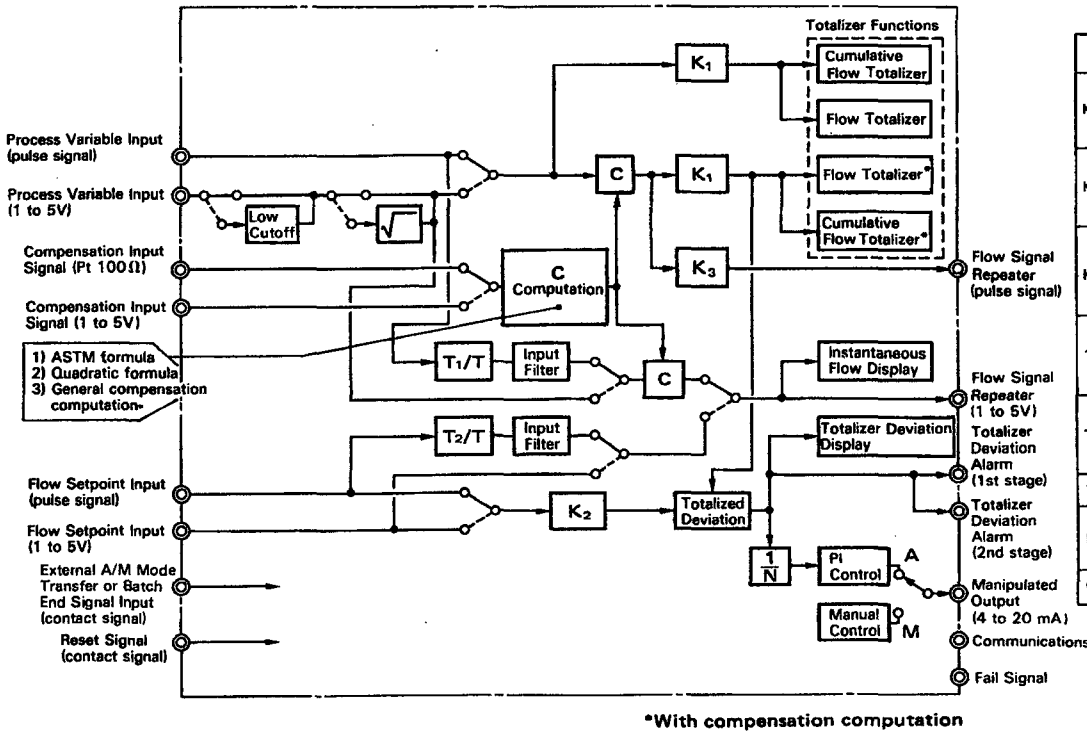
Communications Abnormal: Applies to computer (remote) mode. "C" lamp flashes (and SLCC reverts to backup mode — Auto or Manual selectable) while abnormal.

Simulation Functions

In simulation mode, flow signal is internally generated, and control and totalizer functions may be checked.

Normal Operating Conditions

Ambient Temperature: 0 to 50°C (32 to 122°F).



	Pulse input	1 to 5V input
K_1	$\frac{\text{Dilution ratio}}{\text{K factor for flow process variable}}$	$\frac{\text{Flow process variable span} \times \text{Totalizer scale factor}}{\text{day or h or min}}$
K_2	$\frac{\text{Blend ratio}}{\text{K factor for flow setpoint}}$	$\frac{\text{Flow set span} \times \text{Totalizer scale factor} \times \text{Blend ratio}}{\text{day or h or min}}$
K_3	$\frac{\text{Repeater pulse K factor}}{\text{Flow process variable K factor}}$	$\frac{\text{Flow process variable span} \times \text{Totalizer scale factor} \times \text{Repeater pulse K factor}}{\text{day or h or min}}$
T_1	$\frac{\text{day or h or min}}{\text{Flow process variable span} \times \text{Totalizer scale factor} \times \text{K factor for flow process variable}}$	
T_2	$\frac{\text{day or h or min}}{\text{Flow set span} \times \text{Totalizer scale factor} \times \text{K factor for flow setpoint}}$	
T	Period of input pulse	
N	$8 \times \frac{\text{Flow process variable span} \times \text{Totalizer scale factor}}{\text{day or h or min}}$	
C	Compensation computation	

*With compensation computation

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

Maximum Power Consumption:

	24 V DC	100 V AC	220 V AC
SLCC-201	540 mA	22.6 VA	28.5 VA
SLCC-301	560 mA	23.2 VA	29.4 VA

Insulation Resistance:
Between I/O terminals and ground: 100 MΩ/500 V DC.
Between power and ground: 100 MΩ/500 V DC.

Withstanding Voltage:
Between I/O terminals and ground: 500 V AC for one minute.
Between power and ground:
1000 V AC for 1 minute (100 V version).
1500 V AC for 1 minute (220 V version).

Wiring:
Signal Wiring to/from the Field: ISO M4 size (4 mm) screws on terminal block.

Power and Ground Wiring:
100 V version: JIS C 8303 two-pin plug with earthing contact. (IEC A5-15, UL498).
220 V version: CEE 7 VII (CENELEC standard) plug.
Power Cable Length: 30 cm (11.8 in).

Mounting:
Flush panel mounting. Instruments are in housings, and may be mounted individually or side-by-side.
Rear of instrument may be up to 75° below front (indicator zero may need readjustment).

Nameplate:
Size: 8 × 65.3 mm, cream semi-gloss finish.
Lettering: In black, one or two rows each up to 14 alpha-numeric characters long.

Front Panel Finish: Dark green (Munsell 2.5GY 3/1).

Bezel: Aluminium diecast, black baked-enamel finish.

Housing: Open front, with connector for SPBD Portable Manual Station.

Housing Dimensions: 182.5 (H) × 87 (W) × 480 (D: depth behind panel) (mm) (7.2 × 3.4 × 18.9 in).

Weight:
Instrument body: 3.2 kg (7.0 lb) (excluding housing).
Housing: 2 kg (4.4 lb) (excluding mounting kit).

OPTIONS

/DL: With data set as per data sheet, and corresponding data label attached.
/A2ER: For "220 V version" power supply.
/MTS: 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, plug-in instrument module only. See GS 1B4F1-E to order housing separately.
/NPE: Letters engraved on front panel nameplate.

ACCESSORIES

1A fuse, quantity one.
Engineering units labels, one set.

MODEL AND SUFFIX CODES

Model	Suffix codes	Style	Option codes	Description
SLCC	.....	.....	.....	Blending Controller with communication and compensation functions
Compensation Input	-2	.....	.....	1 to 5 V DC
	-3	.....	.....	Pt 100 Ω RTD
	01	.....	.....	Always 01
Style Code		*E	.....	Style E
Options			/DL	With data sheet
Common Options			/A2ER	220 V power supply*
			/MTS	With mounting kit
			/SCF-G□M	Bezel color change
			/NHS	Without housing
			/NPE	Nameplate engraving

* Specify /A2/NHS to order without housing.

TERMINAL CONNECTIONS

Terminal Designation	Description	Terminal Designation	Description
1		17	+ Communication *2
2	Process variable input, pulse signal *1	18	−
3		19	+ Demand pulse input
4	B	20	−
5	B RTD input*3 + Compensation input, 1 to 5V DC *4	21	− Fail output (− terminal)
6	A −	A	+
7	+ Process variable input, 1 to 5V DC	B	− Manipulated output, 4 to 20mA DC
8	−	C	+
9	+ Flow setpoint input, 1 to 5V DC	D	− Flow signal repeater (pulse output)
10	−	F	
11	+ Reset input	H	
12	+ A/M transfer input	J	+
13	− Common	K	− Flow signal repeater (1 to 5V output)
14	+ Totalizer deviation alarm output (1st level)	L	
15	+ Totalizer deviation alarm output (2nd level)	M	
16	− Common	N	+ Fail output (+ terminal)

*1:

Terminal Designation	Contact, or Voltage-Transition Pulse	2-wire Transmitter *5	3-wire Transmitter *5
1	+ Transmitter	− Transmitter	Sig
2	−	+	− Transmitter
3			+

*2: Use shielded twisted-pair cable (SCCD see GS 34B6T1-01E).
*3: For Model SLCC-301 only.
*4: For Model SLCC-201 only.
*5: 12V/24V distributor for transmitter built into SLCC.

ORDERING INSTRUCTIONS

When ordering, specify the following:
1. Model, suffix and option codes.
2. Nameplate marking, if required (option /NPE).
3. Mounting kit (option /MTS) if the instrument is to be mounted individually.
4. Fill out the appropriate data sheet if data labels are required.

RELATED EQUIPMENT

Related Instruments

SBSD Batch Set Station ..... GS 1B4E1-E
SLBC Blending Controller ..... GS 1B4E3-E
STLD Totalizer ..... GS 1B4E4-E
SPCM Pulse Computing Unit ..... GS 1B4L4-E
UFCH Field Control Unit ..... GS 34B6G1-01E
SCCD Communications Cable ..... GS 34B6T1-01E

Related Spare Parts

Memory Backup Battery ..... Part No. E9711DH