

# SC-700

## Multi-function Preselect Counter

# COUNTALINE

ELECTRONIC COUNTERS



### ORDERING CODE

TYPE	MODEL	VOLTAGE	POWER SUPPLY	RELAY	SENSOR TYPE
SC	700	230	AC	SPDT	D

SEE PAGE 126 FOR ORDERING OPTIONS

## Features

- Large 3-digit LED display.
- User friendly keypad programming.
- Selectable ADD, SUBTRACT or ADD / SUBTRACT count modes.
- Separate up and down count inputs in ADD / SUBTRACT mode 1.
- Separate count and count direction inputs in ADD / SUBTRACT mode 2.
- Dividing prescale programmable from 1 to 250.
- Relay hold time programmable from 0,1 to 25 seconds in 0,1 second increments.
- High speed count input (1kHz) with selectable positive or negative active edge.
- Independent low speed count input (30Hz).
- Count input overspeed indication.
- LED indication of relay output and both count inputs.
- Error message for indication of power supply interruption of less than 1 second.
- Reset achieved via front panel push-button, via external switch or via NPN sensor.
- Gate input for ignoring high speed count input pulses.
- DC (NPN/PNP) or Namur sensor compatible high speed and gate inputs (order option).
- Sensor leads can be connected directly as the SC-700 has an internal power supply.
- Output: 10ASPDT Relay or Solid State Relay (order option).
- Retention of displayed and programmed parameters for 10 years using an EEPROM.
- Tamper-proof keylock feature for protection of programmed parameters.
- 11 Pine plug-in format.

## Description of Operation

The **SC-700** is a fully programmable 3-digit pre-select counter designed with the latest microcontroller technology. Incorporating many features and input options, the counter is very versatile and easy to use. All programming is performed via the keypad and the user is guided through by the large and clear LED display and user friendly installation instructions.

### Low and High Speed Inputs

**Low speed count input (Input1):** This input can be activated by either a switch or an NPN sensor. It is designed to ignore contact bounce from mechanical switches by limiting the input frequency to 30Hz. When in ADD mode, the low speed input increments the displayed count value. When in SUBTRACT or ADD / SUBTRACT mode 1, the low speed input decrements the displayed count value.

**High speed count input (Input 2):** This input can be activated by either an NPN / PNP sensor (i.e. DC option), or a Namur sensor (i.e. Namur option). When in the ADD or ADD / SUBTRACT mode 1, the high speed input increments the displayed count value. Incrementing or decrementing can be set to occur on a rising edge or falling edge of each input pulse. The input frequency is limited to 1kHz (500 Hz in ADD / SUBTRACT mode 1).

**Input 1 and Input 2:** In the ADD / SUBTRACT mode 2, the count direction of the high speed input is determined by the active state of the low speed input. The high speed input increments the displayed count value when the low speed input is held high, and decrements when it is held low.

**Gate inputs:** The gate input can be activated by either an NPN / PNP sensor (i.e. DC option), or a Namur sensor (i.e. Namur option). The counter ignores the high speed count input pulses and will therefore not register any count while the gate input is activated.

**Reset:** The counter is reset by momentarily depressing the reset button on the front panel, or by the activation of an external switch or NPN sensor for less than 2 seconds. When in the ADD or both ADD / SUBTRACT modes, a reset returns the present value (PV) to zero. When in SUBTRACT mode, a reset return the PV to set value (SV).

### Display

**Present value:** The present value (PV) displays the present count value and is indicated by the PV LED. This value is always displayed on power up.

**Set value:** The set value (SV) is entered from the keypad and is only displayed when the SV LED illuminates.

### Functions

All function settings are entered from the keypad.

#### Function 1 (Count mode)

**ADD mode:** The present value (PV) increments from zero until it equals the set value (SV). At this point the relay energises for a period set in function 3 and the PV reset to the SV.

**SUBTRACT mode:** The present value (PV) decrements from the set value (SV) until the PV equals zero. At this point the relay energises for a period set in function 3 and the PV reset to zero.

**ADD / SUBTRACT mode 1 (differential):** The PV simultaneously increments, via pulses received from the high speed input, and decrements, via pulses received from the low speed input, until the PV equals the SV. At this point the relay energises. When the PV drops below the SV, the relay de-energises.

**ADD / SUBTRACT mode 2 (count direction):** The PV increments, via pulses received from the high speed input, when the low speed input is held high. The PV decrements when the low speed input is held low.

**Note:** For the ADD mode and the SUBTRACT mode the high speed and the low speed cannot be used simultaneously and must therefore be selected. However in Add/Subtract mode 1 and 2 both the low and the high speed inputs are used together.

#### Function 2 (Active edge):

This function allows for the selection of either a positive (leading) or a negative (trailing) active edge on both the high and low speed count input.

## Description of Operation Continues

### Function 3 (Relay hold time):

**Time relay pulse mode:** The time that the relay remains energised is set here. This value must be entered at ten times the desired time.

For example, for a relay on time of 5.2 seconds, the value entered must be 52.

**Non-Cycling Modes:** If the value is set at zero then the relay remains energised and only release when the reset pulse is received.

### Function 4 (Prescaler):

The integer dividing prescaler can be set from 1 to 250. The prescaler divides the count input pulse by this integer value. Thus the PV only increments or decrements once the prescaled number of pulses have been received on the count input. For example, if the prescaler is set at 5 and the counter is in ADD mode, the PV only increments after every fifth count input pulse is received. The prescaler can be used in all function modes except on the SUBTRACT count of the ADD / SUBTRACT mode 1.

### Input integrity indication:

#### Brief power failure:

The counter stores the PV, SV and all function parameter in the non-volatile memory when power supply to the unit is lost. A power failure of duration less than 1 second is indicated by the flashing of all the decimal points on the display.

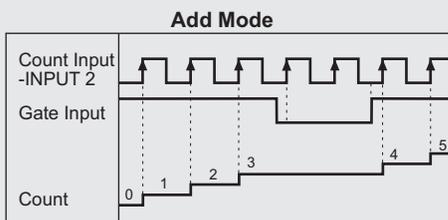
#### Overflow:

If the maximum input frequency is exceeded on either input, an error message is displayed by continuously illuminating the decimal points. In both a brief power failure and an overflow condition, the error message indicate a possible miscount and can be cleared by depressing and holding the reset button until the decimal points disappear from the display. The PV value displayed will not be cleared and the counting can continue.

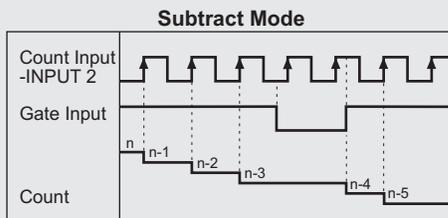
#### Program lock:

The UP, DOWN and ENTER keys can be disabled, using the program lock feature to prevent accidental tampering of settings. Once the program lock has been activated, only the reset on the front panel will function. See installation instruction for details.

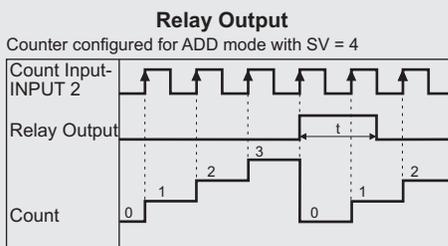
## Operational Diagrams



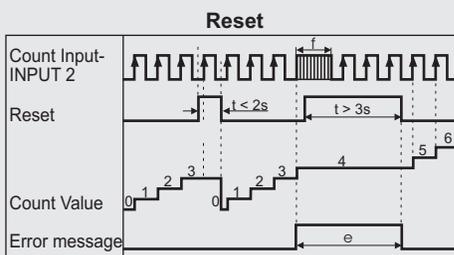
Note: PRESCALE = 1



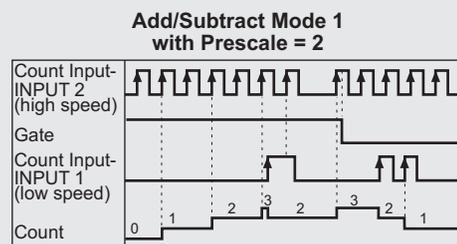
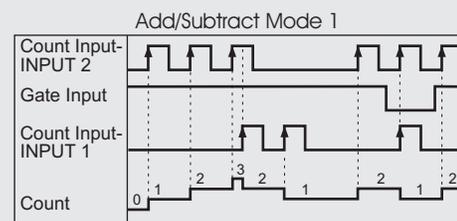
Note:  $n = \text{SET VALUE (SV)}$   
PRESCALE = 1



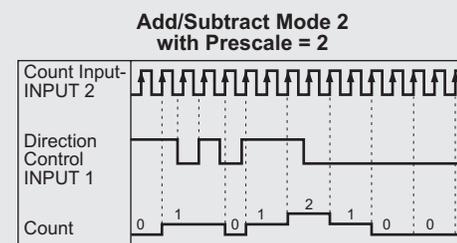
Note:  $t = \text{Relay hold time}$



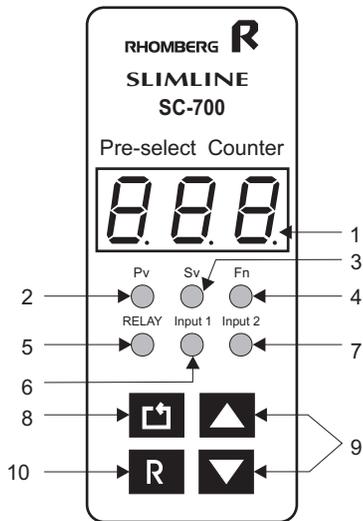
Note:  $f = \text{overspeed on input of greater than 1kHz}$   
 $e = \text{error message indication}$   
(all decimal points illuminate continuously)



Note:  $t_1 = 500\text{ms}$   
In ADD/SUBTRACT mode 1 the Gate and Prescale functions can only be used on the high speed (INPUT 2) count input.



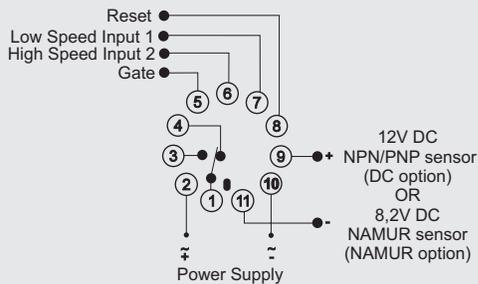
## Description of Controls



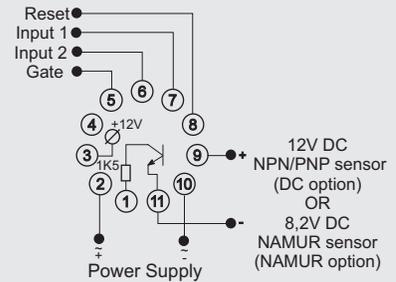
- 1: The **3-Digit Display** exhibits either the present value, set value or one of the function numbers or their setting.
- 2: The green **Present Value (PV)** LED illuminates when the PV is displayed.
- 3: The green **Set Value (SV)** LED illuminates when the SV is displayed.
- 4: The green **Function (FN)** LED illuminates when any function number or function setting is displayed.
- 5: The red **Relay** LED illuminates when the relay is energised.
- 6: The red **Input 1** LED illuminates whenever the high speed count input is activated.
- 7: The red **Input 2** LED illuminates whenever the low speed count input is activated.
- 8: Each press of the **Enter** key successively selects the display of the following: PV, SV, Fn2, Fn3 or Fn4. Depressing the enter key while Fn4 is displayed reverts the display back to the PV.
- 9: The **Up and Down** keys are used to change the SV and the function settings. Depressing either key constantly enables quick scrolling in SV mode only.
- 10: The **Reset** key has two functions: If the Reset key is depressed momentarily, the PV will reset to zero for the ADD and both ADD / SUBTRACT modes while it will revert to the SV value for the SUBTRACT mode. If the reset key is depressed and held for more than 3 seconds, any decimal point error message present will be cleared without affecting the PV.

## Wiring and Connection

### SPDT RELAY OUTPUT OPTION

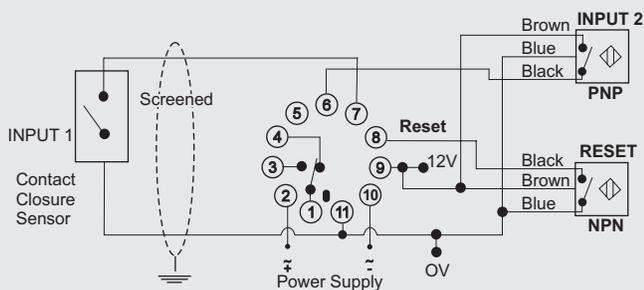


### SOLID STATE RELAY OUTPUT OPTION



*Note: The SC-700 is available for DC or NAMUR sensor inputs and should therefore be specified in the ordering code.*

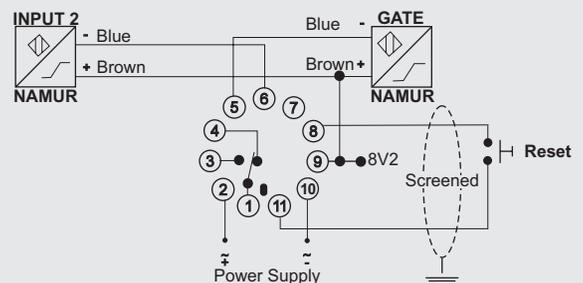
### DC OPTION



#### APPLICATION 1

DC OPTION - NPN / PNP sensor connection available in INPUT 2 and GATE input.

### NAMUR OPTION



#### APPLICATION 2

NAMUR OPTION - NAMUR sensor connection available in INPUT 2 and GATE input.



## ■ Technical Specifications

### **Power Supply:**

AC:	Supply voltage:.....	110, 230, 400, 415, 525V ±15%
	Isolation (sensor input to power supply):.....	2kV
	Power consumption:.....	6VA
DC:	Supply voltage:.....	12V ±15%
	Isolation:.....	No galvanic isolation (common negative)
	Power consumption:.....	100mA
AC/DC:	Supply voltage:.....	24V ±15%
	Isolation:.....	No galvanic isolation (common negative)
	Power consumption:.....	100mA

### **General Technical Data:**

Display:.....	3-digit, 7 segment LED display
Display colour:.....	Red
Digit height:.....	10mm
<b>Decimal point warning signals:</b>	
Maximum count frequency exceeded.....	3 decimal points illuminating
Power supply interruption < 1 second.....	3 decimal points flashing
Relay ON time:.....	Adjustable range: 0.1 to 25 seconds. If set to 0 then relay remains energised until reset resolution: 0.1 second repeatable ±1%
Set-up and data retention:.....	Approx. 10 years (EEPROM)
EMC protection rating:.....	IEC 255-22-1, Class II, 1500V, 1Mhz (conducted susceptibility) CISPR 11, Class B (radiated emission)

### **Low speed count input (Input 1):**

Input type:.....	potential-free contact or NPN sensor (open collector output)
Maximum count frequency:.....	30Hz
Minimum pulse width:.....	16.7ms
Active pulse edge:.....	positive or negative (Programmable on function 2, Fn2)
Mode in which PV increments:.....	ADD
Mode in which PV decrements:.....	SUBTRACT or ADD/SUBTRACT mode 1

### **High speed count input (Input 2)**

Input type:.....	Namur sensor DIN 19234 (Namur option) or NPN/PNP sensor (DC option) (option to be specified in ordering code)
<b>Maximum count frequency:</b>	
Minimum pulse width:.....	1kHz (in ADD, SUBTRACT and ADD/SUBTRACT mode 2)
Active pulse edge:.....	500Hz (in ADD/SUBTRACT mode 1)
Mode in which PV increments:.....	500 microseconds
Mode in which PV decrements:.....	positive or negative (Programmable on function 2, Fn2) SUBTRACT or both ADD/SUBTRACT modes.

### **Gate input:**

Input type:.....	Namur sensor DIN19234 (Namur option) or NPN/PNP sensor (DC option)
Maximum frequency:.....	1kHz
Minimum pulse width:.....	500 microseconds
Activation of gate function:.....	low level on input

### **Reset input**

Input type:.....	potential-free contact or NPN sensor (open collector output)
Minimum pulse width:.....	500 microseconds
Active pulse edge:.....	negative: hold count value positive (if low for < 2 sec.): resets PV and clears error messages positive (if low for < 3 sec.): clears error messages but not PV

**Note:** When the reset is low, the PV does not continue to count.

### **Sensor interface:**

#### **Built-in sensor power supply**

Namur sensor option:.....	8.2V DC / 10mA
DC (NPN/PNP) sensor options:.....	12V DC / 50mA
Maximum NPN sensor saturation voltage:.....	2V DC (high speed count and gate inputs)
	2.5V DC (low speed count input)
Maximum PNP sensor saturation voltage:.....	2V DC (high speed count and gate inputs)

### **Output Options:**

#### **Relay:**

SPDT:.....	See page 118
Solid state relay:.....	12V at 10mA (positive on pin 1 and negative on pin 3)

Additional information in Section J, page 131.