

# SC Series Multi-Function PID Controller



Highly visible color graphic LCD  
Intuitive touch panel operation

## SC Series Controllers

- Model SC100 Basic version
- Model SC200 Modbus/NestBus extension

## Controllers with Manual Loader

- Model SC110 Basic version
- Model SC210 Modbus/NestBus extension



FULLY  
PROGRAMMABLE



# Multi-Function

## New Generation of Programmable PID Controllers

- Large fine color graphic LCD  
(4.3-inch TFT, 256 colors, 480 x 272 pixels)
- Intuitive touch panel operation
- DCS in instrument format
  - Advanced computation and sequential control functions
- Ample I/O numbers with a wide selection of signal types
- Easy setting of various engineering functions

## Ideal for Replacing Existing Instruments

- IEC/DIN format \*1 panel cutout size  
(W72 x H144 mm)
- Fully compatible in functions with existing PID controllers



## High Reliability for Demanding Process Use

- Control, display and I/O functions are managed by independent CPUs for enhanced security and reliability.
- Built-in manual loader is available with models SC110 and SC210.

## Excellent Expandability (SC200/210)

- Host communication via Modbus  
(Ethernet TCP/IP or RS-485 RTU)
- Peer-to-peer communication via NestBus to expand number of I/Os
- Stored trend data exportable to a PC via the built-in infrared communication port \*2

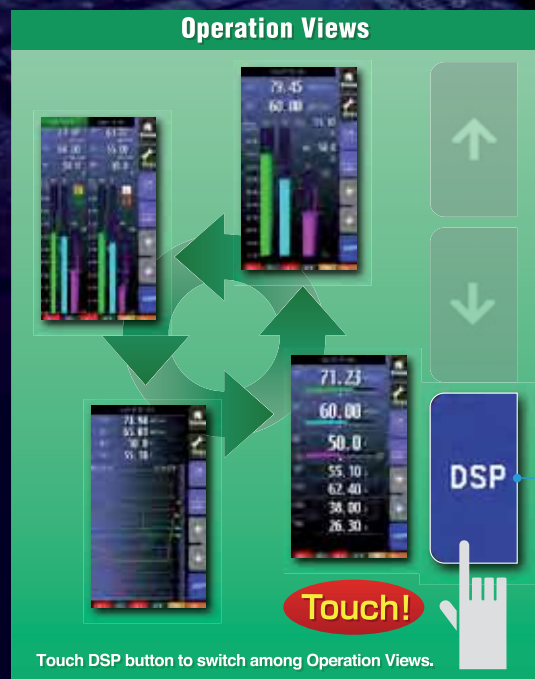
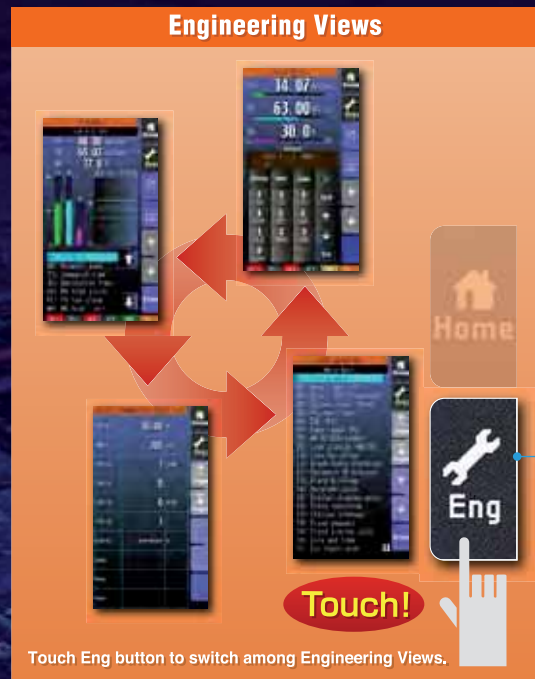
\*1. IEC 61354 (DIN 43700)

\*2. PC Configurator SCCFG is used to convert and export data into CSV format.

Highly visible color graphic LCD

IP 55 front panel

Intuitive touch panel operation



# PID Controller

## Standard I/O Signals

### INPUT

Universal input	2 points
· DC (including 2-wire transmitter)	
· Thermocouple	
· RTD	
· Potentiometer	
DC input (1-5 V)	4 points
Discrete/Pulse input	5 points
High speed pulse input (with sensor excitation)	1 point

### OUTPUT

DC current (4-20 mA)	2 points
DC voltage (1-5 V)	2 points
Relay or photo MOS contact	5 points
RUN relay contact	1 point



Manual loader optional

Independent hardware buttons for manual control operations

Infrared communication port

## Powerful Engineering Tools to Help You Explore the Full Capability of the Controllers

### PC Configuration Software SCCFG

Used to configure display setting, PV and network parameters.



SCCFG

### Loop Configuration Builder Software SFEW3E

Used to program advanced computation and sequential control function block setting.



SFEW3E



Infrared Communication Adaptor COP-IRDA \*3

## Auxiliary Panel Instruments

### Bargraph Indicating Alarm SD10

Independent bargraphs for three analog inputs. Four alarm trip indication and outputs.



### Manual Loader SM10

Backup and manual loading function used in combination with a controller.



\*3. Separately purchased.

# OPERATION VIEWS Ease and Continuity

Four types of operation views, Short Trend, Digital Display, Bargraph and Dual Bargraph, are available to suit various process applications, designed for the sense of ease and continuity for the operators who have been familiar with existing controllers.

## Short Trend



- Tag name
- Home button (Switches to the user's registered view)
- Eng button (Hidden when not used)
- Pause (Touch on the chart to stop)
- 1st/2nd Select button
- Cas/Loc Select button
- SP Value UP button
- SP Value DOWN button
- DSP button
- Alarm indicators
- Operating status indicators
- Auto/Man monitor LED
- Auto/Man selector
- MV value acceleration button
- MV value UP/DOWN button
- Infrared communication port

200 samples for four variables per loop are plotted on the chart (total 8 variables). Sampling interval is selectable between 1 second and 60 minutes. Max. 400 samples of stored trend data can be exported to a PC in CSV format (SC200/210).

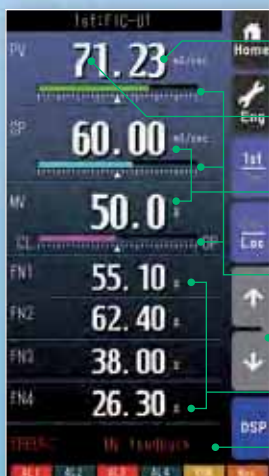
## Bargraph



- Function (FN1...FN4)
- PV value normal range by Hi/Lo alarm setpoints
- Bar color changes by Hi/Lo alarm trips.
- SP value bargraph
- MV value Hi/Lo limits
- Touch on the scale to switch % and engineering unit. (PV, SP)

Loop control parameters (PV, SP and MV) are indicated with bargraphs and on the digital displays. Specific internal computation values can be assigned to FN1...FN4 and indicated on the digital display.

## Digital Display



- PV value display blinks and its color changes in alarm.
- Touch on the scale to switch % and engineering unit.
- Touch on the value to open a numerical keypad to set new values.
- Bargraph display
- Red bar blinks in case of an error.
- FN1 to FN4 display
- Error message

Loop control parameters (PV, SP and MV) are indicated on the digital displays. Specific internal computation values can be assigned to FN1...FN4 and indicated also on the digital displays. An error message appears in case of an error.

## Dual Bargraph



- Tag name display color changes when the loop is selected.
- 1st loop display
- 2nd loop display

Loop control parameters (PV, SP and MV) for two loops are indicated with bargraphs and on the digital displays. Touching 1st/2nd button switches the loop to be manually controlled.

# ENGINEERING VIEWS *Versatility and Flexibility*

PID parameter setting, display and operation setting and function block setting are accessible respectively at Tuning, Configuration and Programming views.

## Tuning



Short Trend Graph: PID parameters can be adjusted while monitoring actual response.

Parameter Display: The parameter and its current setting value are displayed in turn when the item is selected.

PID parameters, PB (proportional band), TI (integral time) and Td (derivative time), are set on the Tuning View. Auto-tuning is also available in this view. Bargraph and digital displays for the loop parameters and the short trend graph are displayed at once.

## Programming

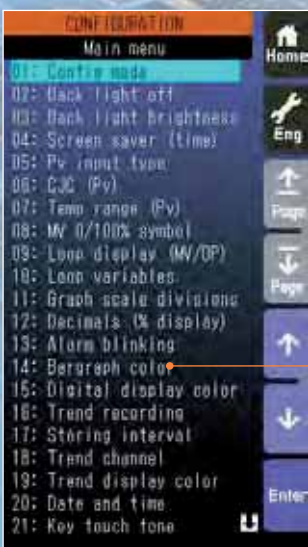


Digital displays are identical to those in Digital Display view. The selected loop status can be monitored in real time during parameter modifications.

The display and the key pad simulates the PU-2A handheld programmer.

Function block parameters are set on the Programming View by simulating operations of the PU-2A Programming Unit. The SFEW3E Loop Configuration Builder software for Windows PC is also available for ease of setting all advanced function block configurations.

## Configuration



### Graph Color Setting



### Color Chart



Display and operation of the Controller are thoroughly adjustable to enhance the user's comfort.

## User's Parameter Table

The screenshot shows the User's Parameter Table view. It displays a table with columns for 'Name', 'Data', and '#'. The table contains the following data:

Name	Data	#
C/E 01	50.00 %	
TMV 01	200 min	
IOV 01	1 HIGH	
IOV 02	0	
IOV 03	0 LOW	
IOV 04	1	
DVA A1	XXXXXXXX	
Name		
Name		

Navigation buttons like Home, Eng, Page, and Enter are visible on the right side.

User's selected parameters are listed, monitored and changed.

## Realtime I/O Monitoring

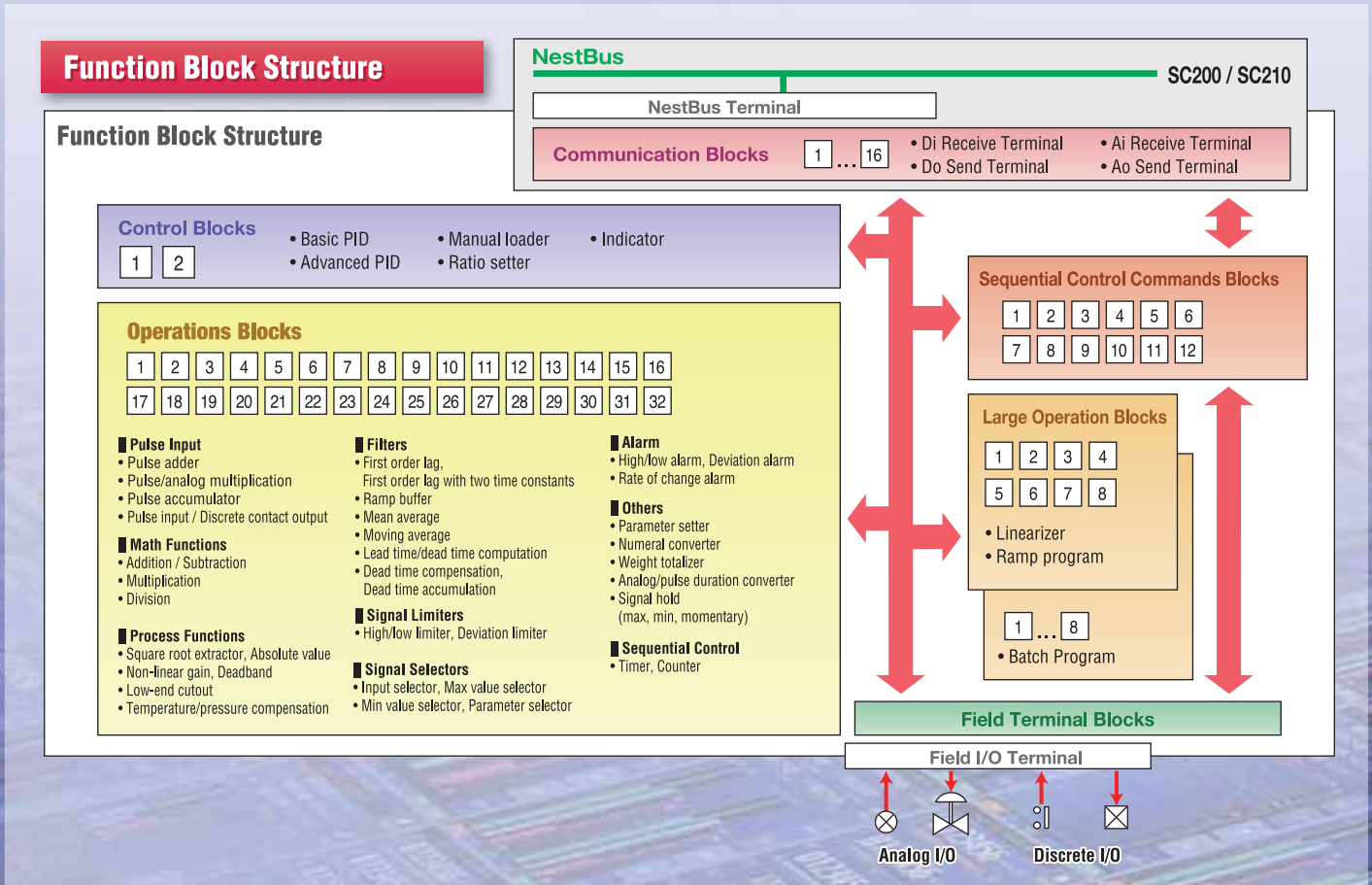
The screenshot shows the Realtime I/O Monitoring view. It displays a table with columns for 'Name', 'Data', and '#'. The table contains the following data:

Name	Data	#
PV1	65.3 %	
Pv2	40.8 %	
A11	10.5 %	
A12	92.0 %	
A13	55.8 %	
A14	70.2 %	
Mv1	60.0 %	
Mv2	50.0 %	
AO1	35.0 %	
AO2	21.0 %	
D11	1	
D12	1	
D13	0	
D14	8523 count	
D15	260 count	
P16	3620 count	
Do1	1	Do4 0
Do2	1	Do5 0
Do3	0	RUN 1

Navigation buttons like Home, Eng, Page, and Enter are visible on the right side.

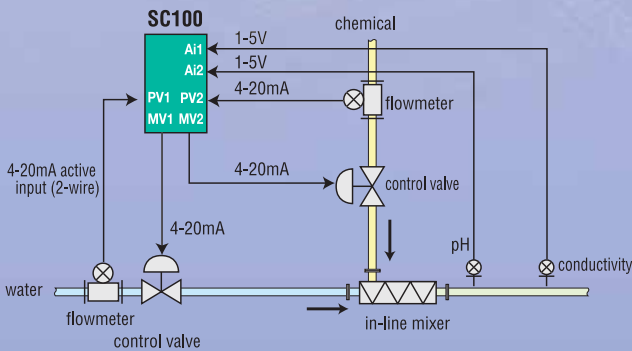
I/O values and error status of all field terminal blocks are displayed.

The control and computation functions are achieved by combining a wide variety of basic to advanced function blocks, which are normally found only in DCS systems. 2 PID blocks, 48 computation blocks and 12 sequential control blocks (1068 commands) are available for all versions of the SC Series, applicable to a wide range of application fields.



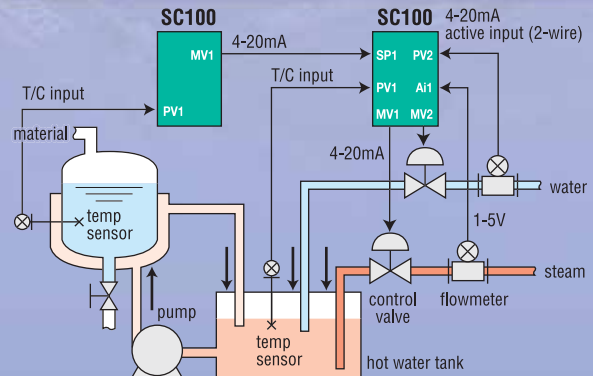
**APPLICATION EXAMPLES**

**Chemical Injection Control**



The SC100 controls two flow loops for water and injected chemical. The chemical flow is controlled in a constant ratio against the water flow. Other signals from pH and conductivity analyzers can be monitored at once.

**Reactor Temperature Control**



An example of temperature control in a batch control reactor. The reactor temperature control loop is connected in cascade to the hot water control loop in the hot water tank. The secondary loop controller controls the valves for hot water and steam.

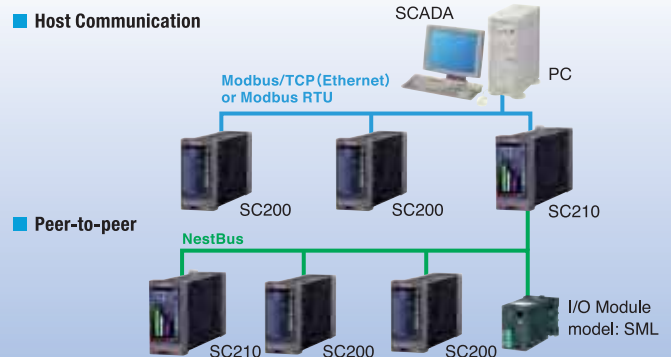
## EXCELLENT EXPANDABILITY

## Peer-to-peer and Host Communication

The SC200/SC210 has Modbus (Ethernet TCP/IP or RS-485 RTU) which enables easy connection to logging or SCADA systems on a host PC for supervising and controlling the local I/O data.

In addition, the RS-485 'NestBus' enables peer-to-peer communication with other controllers and I/O devices for flexibility of I/O points.

### Expanded System Configuration Example



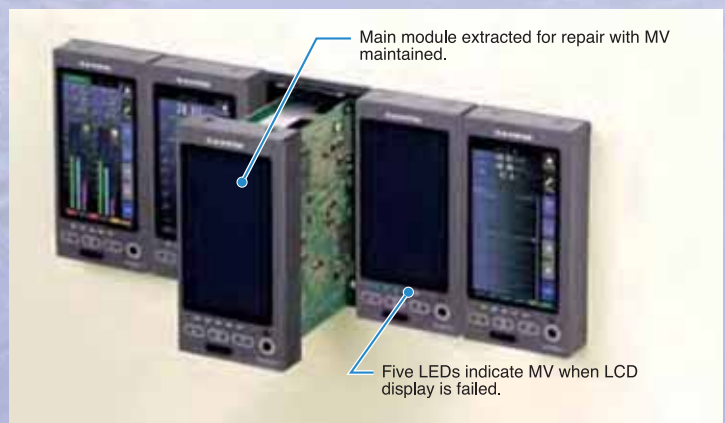
## HIGH RELIABILITY

## For Demanding Process Use

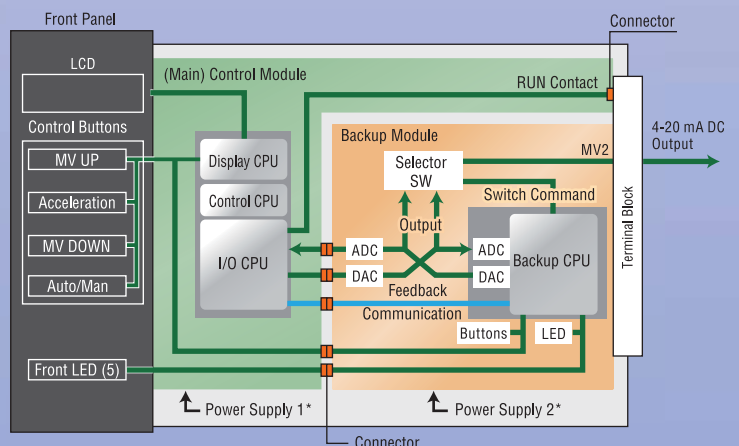
Control, display and I/O functions are managed by independent CPUs for enhanced security and reliability.

The built-in manual loader (SC110/210 option) can be controlled independently even in case of a failure of the main controller module, which can be replaced easily while the backup control is maintained.

- The main module can be disconnected from the backup module and extracted with the front display.
- The front blue LEDs are connected to the backup module, while the front UP/DOWN control buttons are connected to both main and backup in parallel.
- The backup module can be powered independently from that of the main module for further reliability.
- When the control is switched to the backup module either manually or automatically, the MV 2 selector SW is set from Main to Backup.
- Transition of output level is smooth as the backup module has been continuously tracking the control module output in normal status.
- A preset value can be provided also as output in the backup mode.
- The control module output can be tracked either manually or automatically to that of the backup before switching back to the normal mode.



### Backup Function Diagram



\*Independent power supply is optional.

# SC SERIES SPECIFICATIONS

## GENERAL SPECIFICATIONS

SC Series

- Construction:** Panel flush mounting  
**Degree of protection:** IP55 (front)  
**Connection:** M3.5 screw terminals  
**Backup module power supply terminal:** Euro terminal block **SC110/210**  
**Isolation:** Pv1 to Pv2 to supply output to Ai1 or Ai2 or Ai3 or Ai4 to Di1 or Di2 or Di3 or Di4 or Di5 or Pi1 or Pi2 or Pi3 or Pi4 or Pi5 to Pi6 to Mv1 to Mv2 (or Mv2B)<sup>\*1</sup> to Ao1 or Ao2 to Do1 to Do2 to Do3 to Do4 to Do5 to Do6 (to NestBus to Modbus RTU to Modbus TCP)<sup>\*2</sup> to power (to backup module power)<sup>\*1</sup> to FG  
\*1. SC110/210 \*2. SC200/210
- PID control:** Single loop, cascade, advanced  
**Proportional band (P):** 1 to 1000 %  
**Integral time (I):** 0.01 to 100 minutes  
**Derivative time (D):** 0.01 to 10 minutes
- Auto-tuning:** Limit cycle method  
**Alarm:** PV high & low, deviation, rate of change  
**Computation:** 48 functions blocks available for arithmetic operations, time functions, signal selection, limit, alarm and other functions  
**Sequence operation:** Logic sequence and step sequence (max. 1068 commands)  
**Computation cycle:** 50 msec. to 3 sec.  
(control cycle selectable among 1, 2, 4, 8, 16, 32 and 64 times of the computation cycle)
- MV output range:** -15 to +115 %  
**Parameter setting:** With touch panel or PC (Loop Configuration Builder Software model: SFEW3E)  
**Self diagnostics:** CPU monitoring with a watchdog timer  
**RUN contact:** OFF in error detected by diagnostic (including NestBus for SC200/210)  
**Infrared communication:** Transmission distance max. 0.2 meter (for use with the COP-IRDA)  
**Short trend** **SC200/210**  
**Storing interval:** 1, 2, 5, 10, 20, 30 sec., 1, 2, 5, 10, 30, 60 min.  
**Capacity:** 400 points (display 200 points)

## DISPLAY

SC Series

- Display device:** 4.3-inch TFT LCD  
**Display colors:** 256  
**Resolution:** 480 × 272 pixels  
**Pixel pitch:** 0.198 × 0.18 mm (128 × 141 DPI)  
**Backlight:** LED  
**AUTO/MAN indicator:** Green/Amber LED  
**MV output setting indicator:** Blue LED

## EXTERNAL INTERFACE

SC Series

- Host communication:** Modbus RTU (RS-485) or Modbus TCP/IP (Ethernet)  
**Peer-to-peer communication:** NestBus (RS-485)

## INPUT

SC Series

- **Pv 1, Pv 2 (universal input)**  
**DC current:** 4-20 mA DC (250 Ω)  
**Excitation supply to 2-wire transmitter:** 24 V DC, 22 mA max.  
**DC voltage:** -10 to +10 V DC, -1 to +1 V DC, 0-10 V DC, 1-5 V DC, 0-1 V DC  
**Thermocouple:** K, E, J, T, B, R, S, C, N, U, L, P, PR  
**RTD:** Pt 100, JPt 100, Pt 50Ω, Ni 100  
**Potentiometer:** Total resistance 100 Ω to 10 kΩ
- **Ai 1...4:** 1-5V DC
- **Di 1...5 or Pi 1...5:** Dry contact  
**Max. frequency:** 20 Hz  
**Min. pulse width:** 0.33 msec.
- **Pi 6:** Dry contact  
**Max. frequency:** 10 kHz  
**Min. pulse width:** 0.05 msec.  
**Excitation:** 12 V DC ±10 %, 15 mA

## OUTPUT

SC Series

- **Mv 1, Mv 2:** 4-20 mA DC  
**Load resistance:** ≤ 600 Ω
- **Ao 1, Ao 2:** 1-5 V DC  
**Load resistance:** ≥ 10 kΩ
- **Do 1...5**  
**Relay contact:** 250 V AC @1 A (cos φ = 1)  
30 V DC @1 A (resistive load)  
**Photo MOSFET relay:** 200 V AC/DC @0.5 A (resistive load)
- **RUN Output**  
**Relay contact:** 250 V AC @1 A (cos φ = 1)  
30 V DC @1 A (resistive load)

## INSTALLATION

SC Series

- Power input**  
**AC power:** 100-240 V AC; 50/60 Hz  
Control module: Approx. 25 VA at 100 V AC  
Approx. 40 VA at 240 V AC  
**SC110/210** Backup module: Approx. 10 VA at 100 V AC  
Approx. 15 VA at 240 V AC  
**DC power:** 24 V DC, ripple 10 %p-p max.  
Control module: Approx. 500 mA  
**SC110/210** Backup module: Approx. 300 mA
- Operational temperature:** -5 to +55°C (23 to 131°F)  
**Operating humidity:** 5 to 90 %RH (non-condensing)  
**Mounting:** Panel flush mounting  
(high-density mounting available)  
**Panel cutout:** 68 × 138 mm (2.68" × 5.44")  
**Panel thickness:** 2.3 to 20 mm (0.1 to 0.78")  
**Dimensions:** W72 × H164 × D274...624 mm  
(2.83" × 6.46" × 10.79"...24.57")  
**Weight:** Approx. 1.8 kg (3.97 lbs) to 3.0 kg (6.61 lbs)  
depending on the housing depth



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