



## PSSU Safety Controllers (Safety Interface Modules)

The **PSSU** series of safety controllers can be used as safety devices for **high-risk** automation and machine control applications. They provide the highest level of safety offered by Tapeswitch, exceeding the requirements of safety category 3 as defined by EN-954-1f, and meeting or exceeding the safety content of the applicable OSHA, ANSI, and RIA Standards for safety interface modules..

PSSU safety controllers have redundant safety output relays, are self-monitoring, and are rated Control Reliable, which means that any fault in the safety-critical components will be detected and the machine will be rendered inoperative until the fault is corrected.

These safety controllers are designed to be used with Tapeswitch low-voltage sensors such as ribbon switches, safety mats, sensing edges, or sensing bumpers. PSSU safety interface modules are available in wall-mounted and DIN rail-mounted versions. Other options include 24 Vdc or 110/220 Vac operation and choice of manual or auto reset.



**DIN Rail Mounted  
PSSU/1, PSSU/2**



**Wall Mounted  
PSSU/3, PSSU/4**



**DIN Rail Mounted  
PSSU/A, PSSU/A2**

### Features & Benefits

- Suitable for high-risk automation and machine control
- Self-monitoring design detects faults anywhere in the safety system components
- Meets or exceeds OSHA, ANSI, & RIA safety standards for safety interface modules
- Automatic and manual reset versions
- Wall mounting or DIN rail mounting models

### Technical Specifications for PSSU Safety Controllers

(Click on model number to see technical manual)

MODEL	<a href="#">PSSU/1</a>	<a href="#">PSSU/2</a>	<a href="#">PSSU/3</a>	<a href="#">PSSU/4</a>	<a href="#">PSSU/A</a>	<a href="#">PSSU/A2</a>
Supply Voltage	110/240 VAC 50/60 Hz	24 VDC	110/240 VAC 50/60 Hz	24 VDC	110/240 VAC 50/60 Hz	24 VDC
Mounting	DIN Rail Mounting		Wall Mounting		DIN Rail Mounting	
Reset Mode	Manual (Remote)				Auto Reset	
Output Relay	2 x Safety Relays (force-guided contacts), Cross-monitored					
Output Contact Rating	6 A @ 240 V, Resistive, Non-Inductive					
Applications	Medium to High Risk Safety (Level of Risk Determined by Sensor)					
Safety Standard	Up to Level 2: DIN 31006-1, Level 2.2: DIN 31006, Category 3: prEN 954-1 Control Reliable, Self-monitoring, <b>UL and cUL listed</b>					



# PSSU Control Unit Installation Instructions

## INTRODUCTION

PSSU control units are designed to be used with Tapeswitch pressure-sensitive sensors, such as ribbon switches, sensing edges, bumpers, and presence-sensing switching mats, to form a complete safety system. A number of sensors can be connected in series.

## CONTROL UNIT TYPES

Four versions of the control unit are available which differ only in their type of enclosure and supply voltage. The PSSU/1 control unit is housed in a DIN rail-mounting enclosure with 16 integral terminals and operates from a 110 or 240 Vac supply.

The PSSU/2 control unit uses the same enclosure but operates on a 24 Vdc supply. Both of the above units are intended to be fitted inside an existing electrical enclosure on the machine. This existing enclosure must be sealed to a minimum rating of IP54.

The PSSU/3 control unit uses a polycarbonate enclosure sealed to IP67 and operates from a 110 or 240 Vac supply.

The PSSU/4 control unit uses the same IP67 enclosure as the PSSU/3 unit but operates from a 24 Vdc supply. Both the above units are intended to be fitted either externally or inside an existing enclosure on the machine.

## SAFETY INTEGRITY

All PSSU control units exceed the requirements of safety integrity level 2 as defined by DIN 31006-1. The control units are self-monitoring, which means that any faults in safety critical components will be detected and will render the machine inoperative until the fault is rectified. However, the safety integrity of the system as a whole depends on the safety integrity of the sensor used, in addition to the proper installation, interface, and application.

## PRINCIPLE OF OPERATION

The control units contain the power supply for the system, the safety output relays and the reset circuit. Figure 1 shows the principle of operation. A 24 Vdc power supply is taken from the control unit to the switching elements in the sensor(s): + $v_e$  to one conductor, - $v_e$  to the other conductor, and back to the control unit where it supplies power to the output relays.

The output contacts of the safety relays are only closed when the output relays are energized. When the sensor(s) is actuated, the 24 Vdc power supply to the output relays is shorted out causing them to de-energize. Furthermore, if the power supply to the output relays is interrupted or shorted out by a fault in the sensor(s) wiring or in the switch elements, power to the output relays will be lost, the relays will de-energize and the output contacts will open. The reset circuit provides start and restart interlock functions as follows:

**Start Interlock** - When power is applied to the system, the output relays cannot be energized until a reset signal has been applied and removed.

**Restart Interlock** - Once the sensor(s) has been actuated and the output relays have de-energized, they cannot be energized again until a reset signal has been applied and removed.

Reset will be prevented while the sensor is actuated, if there is a fault in the reset input circuit or if the two output relays are in disparity. The safety output contacts of the control unit are connected to the machine primary control element(s) in such a way that if either of the safety output relays is de-energized then the machine will be brought to rest regardless of the state of the other relay.

**NOTE:** A machine primary control element or MPCE is defined as an electrically-controlled element which directly controls the normal operating motion of a machine such that it is the last (in time) to operate when motion is initiated or arrested.

In addition, where the machine control system has two MPCEs, these devices can be monitored by connecting normally-closed auxiliary contact from each MPCE in series with the reset input. Disparity between the two MPCEs will prevent a reset.

## INSTALLATION WARNING

**Tapeswitch Safety Systems are designed to protect operators working at or near dangerous machines. They can only perform that function if they are correctly fitted and interfaced to a suitable machine. Every effort has been made to provide comprehensive and accurate information. It is the responsibility of the user to ensure that all persons involved in the installation of the product have the knowledge, training and experience necessary and that they are fully conversant with all laws, rules, regulations and codes of practice at their task.**

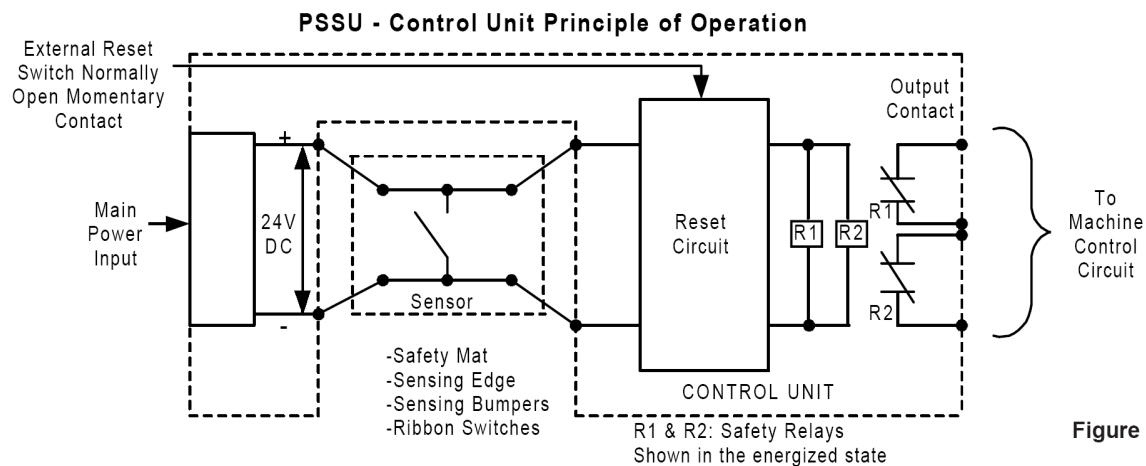


Figure 1

**MECHANICAL**

**PSSU/1 and PSSU/2 Control Units** - should be mounted in the machine control unit on standard 'top hat' terminal rail type DIN EN 50 022-35. The machine control unit must provide sealing to IP54 according to IEC 529. The dimensions of these two units are shown in Figure 2.

**PSSU/3 and PSSU/4 Control Units** - should be mounted on a permanent part of the machine in a position which keeps cabling to a minimum and provides sufficient protection from damage by passing traffic but allows adequate access for servicing. The dimensions of these units and the position of mounting holes are shown in Figure 3.

It will be necessary to punch or drill cable entry holes in the enclosure. These holes should be made in the top and bottom surfaces of the enclosure. It is recommended that the printed circuit board (PCB) assembly be removed while these holes are made. Ensure that the PCB assembly is refitted in its original orientation. For sensors with two 2-wire cables, six holes will be required. For a sensor with a single cable, five holes will be required. See Figure 4 for hole positions.

One hole should be used for (each of) the sensor cable(s), one for the mains supply cable, one for each of the safety output cables, one for the reset input cable and one for the monitor output cable. The holes should be 20 mm diameter to accept PG13.5 cable glands. Six cable glands are supplied with the unit which will accept cable of 5-9 millimeter diameter. If other cable glands are used, they must provide sealing to at least IP54 according to IEC529.

The exact cabling requirements are at the discretion of the installer and depend to a large extent on the siting of the various control system elements and whether the monitor output is used. Generally it is recommended that high voltage cables are routed away from low voltage cables.

**RESET INPUT DEVICE**

A momentary action, normally-open switch, preferably a 22mm industrial pushbutton, should be used to provide the reset input. The switch should be housed in a suitable enclosure and should be mounted in such a position that it is safe from damage by passing traffic and such that the person operating the switch can see all of the dangerous area.

**ELECTRICAL**

**GENERAL** - The connections for each of the control units are shown in Figures 5, 6, 7 and 8. Crimped ferrules should be fitted on all stranded wires. It is recommended that electrical installation be performed in the order described below.

**SENSOR(S) CONNECTION** - Connect the sensor cables to the control unit taking particular care that there are no stray strands which could cause a short between adjacent terminals. A number of sensors can be connected in series, see figures 13-16 for details and limitations. When connecting a number of sensors in series, the PSSU Controller treats these "combined" sensors as a single sensor. When any one of the sensors is actuated the output relays de-energize.

**POWER CONNECTION** - Connect mains power to the control unit. For AC operation on the PSSU/1 and the PSSU/3 units, jumpers will need to be fitted to select the appropriate voltage. The power consumption is 6 VA maximum.

**RESET INPUT CONNECTION** - Connect the reset input to the control unit. If the machine has two MPCEs, a pair of normally closed auxiliary contacts from each MPCE can be connected in series with the reset input as shown in Figure 9. This provides cross-monitoring of the MPCEs such that if they are in disparity due to a fault, reset will be prevented until the fault is rectified.

The reset input can also be used to provide a test input. This is often used in higher risk applications where the actuation of the safety device is simulated every machine cycle to reveal faults in the machine interface. This test input can be provided by connecting a normally open contact in parallel with the reset switch as shown in Figure 10.

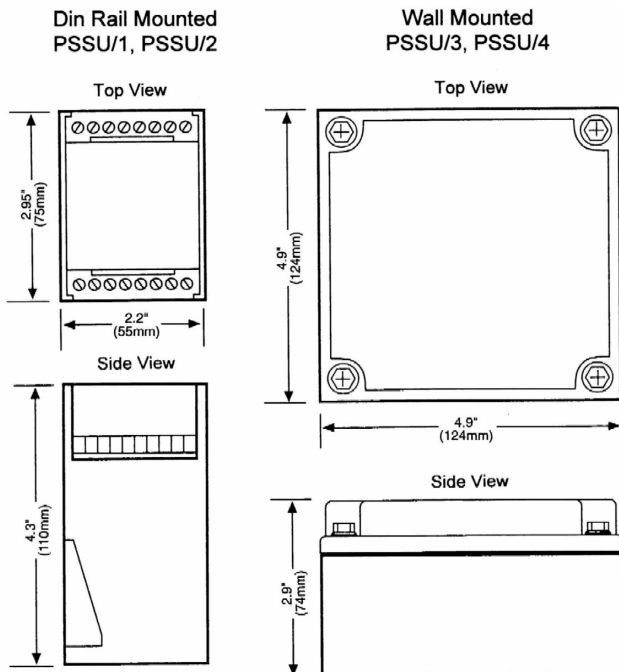


Figure 3

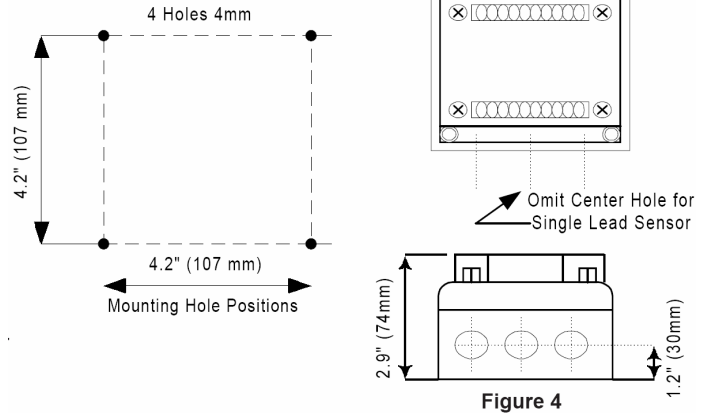


Figure 4

**Table 1**

SENSOR TYPE	SENSOR CONNECTION			
	A	B	C	D
CKP and Armormats	Black	Red	Yellow	White
Mats, Edges, and Ribbon Switch	Black 1	White 1	Black 2	White 2
Any Edge or Ribbon Switch	Ribbed 1	Smooth 1	Ribbed 2	Smooth 2

**Table 2**

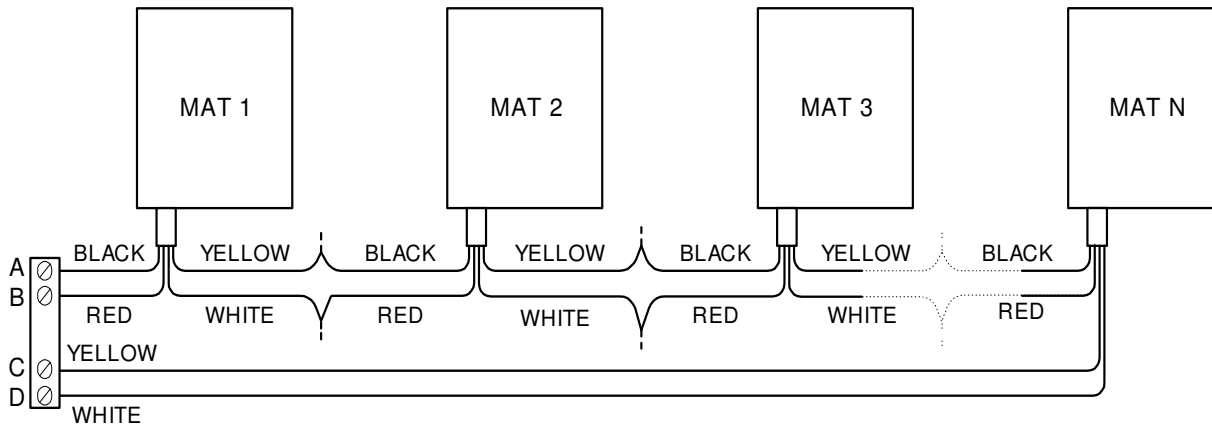
	A	B	C	D	Terminal Numbers
<b>PSSU/1 &amp; 2</b>	15	16	2	1	
<b>PSSU/3 &amp; 4</b>	3	4	5	6	

**TECHNICAL SPECIFICATIONS**

Safety Grade	2 (DIN 31006-1)
Power Consumption	6 VA
Response Time	10 ms
Temperature Range: Operating Storage	0 to 50 degrees C -20 to 70 degrees C
Reset Function	Fitted as Standard
Supply Voltage: PSSU/1, PSSU/3 PSSU/2, PSSU/4	110/240 Vac 24 Vdc
Safety Outputs: Device Type Contact Type/Quantity Contact Rating	Safety Relay, Force-Operated Contacts 2 x Normally Open 5 A @ 240 Vac 5 A @ 24 Vdc } Resistive 0.75 A @ 50 Vdc } Load 1 A @ 24 Vdc } Inductive 0.35 A @ 50 Vdc } Load
Switching Frequency	5 Hz
Monitor Output (PSSU/3 & PSSU/4 Only) Device Type Contact Type/Quantity Contact Rating	Standard Relay 1 x Changeover 5 A @ 240 Vac
Enclosure: Protection Rating PSSU/1 & PSSU/2 PSSU/3 & PSSU/4 Terminal Capacity Material	IP20 IP67 2.5 mm <sup>2</sup> Polycarbonate

**INTERCONNECT DIAGRAMS, DAISY CHAINED/SERIES CONNECTION**

**Multiple Mats with 4 Conductor Standard Color Coded Lead Wire - Figure 13**



**NOTE: Maximum Number of Mats Limited to 100 Square Feet**