**HSL-SM6X2
INSIDE SPRAY GUN CONTROL
SIX DUAL-GUN MACHINES**

The Systems Engineering HSL-SM6X2 Inside Spray Gun control provides:

◊ **Reduced Product Cost:** Optimized coating usage is obtained by precise and fine adjustment of spray time and thus spray weight.

◊ **Improved Quality:** By providing highly repeatable and accurate spray gun control and thus uniform film weight.

◊ **Easy to Use Operator Interface:** Allows operator to adjust all spray times and view collected data on a 2-line X 40-character back-lit LCD display with 24 key membrane keypad.

◊ **Quick Pay-off:** With the optimization of coating usage, the HSL-SM6X2 typically pays for itself in just a few months.

Features

- Stand-alone package used to implement spray gun timer control on inside spray machines or high speed front-end upgrade package to interface with existing control system.

- Provides spray gun control for up to 6 machines each equipped with two spray guns.

- Both "on" delay timers and spray "duration" timers are provided for each gun (accurate one millisecond time base for both). "On" delay adjustable from 0 to 999 milliseconds. Spray "duration" adjustable from 0 to 999 milliseconds.

- Additional control functions provided include:

  - Number of spray cycles count and life expectancy alarm for each gun.
  - Can jam detection.
  - Sensor fail alarm.
  - Data Acquisition: Total number of cans coated and total number of spray cycles for each gun.

- High-speed solenoid drivers provided to minimize solenoid response time and maximize repeatability.

- Built-in 2-Line X 40 character sealed display with 24 key membrane keypad allows local viewing of collected data by operator and set-up of all spray times (pass-code protected) by authorized personnel.

- Package provided on two pre-wired sub-panels (one 17" X 17" and one 20" X 17") for mounting inside the existing user's control panel. These sub-panels contain the M4500 spray timer PLC, high-speed solenoid drivers, solenoid power supplies, with a separately mounted spray time adjustment keypad/display.

General Description

The HSL-SM6X2 spray gun control package is a stand-alone package used to implement the spray timer control for up to six dual gun spray machines. Both user adjustable "on" delay and spray "duration" timers are provided for each gun. In addition to the spray gun timer control, the HSL-SM6X2 also provides spray cycle counts with a life expectancy alarm, can jam detection, a sensor fail alarm for each gun and data collection including: Total coated can count for both the current and previous (last) shift.

The package is not a dedicated "black box", but instead is implemented using the high performance Systems M4500 PLC module that allows easy customization by either SEA or the end user. The M4500 PLC incorporates a built-in 2 –line by 40-character back-lit LCD display and is programmed using the DOS based SYSdev software programming package which allows programming in any combination of Ladder Logic or high-level (subset of "C"), as well as perform on-line monitoring and trouble-shooting.

The HSL-SM6X2 can be used on a wide variety dual single indexing spray machines or double indexing machines. In addition the package can be used on single indexing machines for wet-on-wet spray applications.

Spray Gun Control

The HSL-SM6X2 package provides spray gun control for up to six dual gun machines. For each gun, both an "on" delay timer and spray "duration" timer is provided. These are adjustable from 0 to 999 milliseconds in one millisecond increments. The spray times are entered and displayed on the keypad/display of the HSL-SM6X2.

The basic spray gun control is implemented as follows: The "on" delay is triggered at the leading ("off"-to-"on") edge transition of the "timing" sensor only if a can has been detected by the "can" sensor (note that the can "sensor" must see the can prior to the leading edge of the "timing" sensor). Once the "on" delay has timed out, the spray gun is activated "on" for the time entered for the spray "duration". Note that if the "on" delay is set to zero, the spray gun is activated immediately at the leading edge of the "timing" sensor.

Spray Gun Control (cont'd)

The "can" sensor can be located either at the pocket where the spray gun is located (spray station) or multiple pockets ahead of the spray station ("can" sensor sees the can, the machine then indexes one or two more pockets before can is actually sprayed). The number of pockets from the "can" sensor to the spray gun is set through the set-up screen of the keypad/display and can be set from 0 to 3.

Spray Gun Solenoid Drivers

Each spray gun is driven by a separate high speed solenoid driver. This applies a 39 Volt initial turn "on" voltage for a user adjustable number of milliseconds when the solenoid is initially activated and then drops to a holding voltage of 13.5 volts until the solenoid is de-energized. This provides an initial turn "on" voltage that is considerably greater than the rated voltage of the spray gun solenoid which overcomes the inertia of the spool quicker than a standard output would. This results in both a faster and more repeatable solenoid response time. By dropping to a voltage less than the rated voltage once the solenoid is "on", the turn "off" time of the solenoid is also faster and more repeatable since less energy needs to be dissipated from the solenoid.

Spray Gun Cycle Counts/Life Expectancy

The number of spray cycles is accumulated for each gun and can be displayed on the HSL-SM6X2 display. In addition, an expected life cycle count limit can be entered by the user and is used to generate an alarm if the number of spray gun cycles exceeds the entered expected life cycle limit. This feature can be used for preventative maintenance purposes to track the number of spray cycles and flag when a particular gun has exceeded it's rated life. The gun can then be changed prior to incurring spray weight problems due to a worn out gun.

Can Jam/Sensor Fail Alarm

Both the "can" sensor and "timing" sensor are checked for proper operation while the spray machine is running. A "sensor check" input is provided which should be turned "on" when the machine is running and feeding cans (can stop open). With this input "on", both the "can" sensor and "timing" sensor are checked for periodic transitions.

If the "can" sensor fails to transition "off" to "on", a *can jam* alarm is generated for that machine. This indicates that most likely cans are jammed in the infeed track and are not feeding. It could also less likely mean that the "can" sensor itself has failed. Either way, the "can jam" alarm output is latched "on" which should be interlocked back to the existing control system to close the can stop and stop the machine.

If the "timing" sensor fails "on" or "off", a *sensor fail* alarm is generated for that machine. The *sensor fail* alarm output is latched "on" which should be interlocked back to the existing control system to close the can stop and stop the corresponding machine. Both the *can jam* and *sensor fail* alarms are displayed on the HSL-SM6X2 display as well.

Data Collection

The total number of coated cans is collected for both the current shift and the previous (last) shift. This data can be viewed locally on the display either by the operator or production control personnel. This information is updated ("current" shift transferred to "last" shift) based on the change of state of a discrete input.

An optional communications board (S4516) is also available such that this data can be transferred to a host A-B PLC using the DF1 protocol, a MODICON PLC using the MODBUS protocol, or a Siemans (545) PLC using the S3000 network. This allows the collected information to be processed by a plant wide data collection system.

HSL-SM6X2 Keypad / Display

The keypad of the HSL-SM6X2 contains 24 keys consisting of data display commands, setup commands, and a numeric keypad. The display of the HSL-SM6X2 is a 2-line by 40-character back-lit LCD display which displays the selected data and setup menus.

The keypad/display can be used by the operator to view the current and last shift data as well as the total spray cycles for each gun. In addition, the keypad/display is used to set the "on" delay and "duration" times for each spray gun as well as the balance of the set-up parameters. The spray times and set-up parameters are pass-code protected to allow adjustment by authorized personnel only.

Specifications

Power Requirements:
Voltage: 100-240VAC, 50/60HZ
Current: 20 Amps @ 115VAC
          10 Amps @ 230VAC

Temperature Ranges:
Operating: 0 to 55°C
Storage: 0 to 70°C

Solenoid Driver Outputs:
Turn "On" Voltage:	39 Volts DC
Holding Voltage:	13.5 Volts DC
Output Current (initial pulse):	5 Amps
Output Current (hold):	3 Amps
Output Power Rating:	45 Watts

Control Inputs:
Voltage Range: 10-30VDC
Input "On" Voltage (min):   10.0 volts
Input "On" Voltage (max):   30.0 volts
Input "Off" Voltage (max):   5.0 volts
Input Current (max): 15 milliamps @ Vin=30V
Optical Isolation: 1500 Vrms

Standard Outputs:
Voltage Range: 10-30VDC
Output "On" Voltage (min): VCC-2.00 volts
Output "On" Voltage (max): VCC-0.25 volts
Output "Off" Voltage (max): 1.5 volts
Output "On" Current (max-cont): 0.5 Amps DC
Output "On" Current (100msec): 3.0 Amps DC
Optical Isolation: 1500 Vrms

Ordering Information

The HSL-SM6X2 package is provided for back-panel mounting inside the existing user's control cabinet. The order number for the HSL-SM6X2 is as follows:

Part Number	Description
HSL-SM6X2	Inside Spray Gun Control package (Six Dual-Gun Machines) consisting of two pre-wired sub-panels (one 17" X 17" X 8" and one 20" X 17" X 8") for mounting in the existing user's control cabinet including the following:

1ea.   Logic sub-panel with M4500 based PLC module (with required I/O boards) (17" X 17" X 8")
1ea.   Power sub-panel with high speed solenoid drivers and solenoid power supplies (20" X 17" X 8")
1ea.   D4591 Display/Keypad
1ea.   HSL-SM6X2 User's Manual
1ea.   HSL-SM6X2 Program Disk
1ea.   M4500 User's Manual

HSL-SM6X2 Options (*purchased separately*)

The following items can be purchased separately as required or desired:

Part Number	Description
S4516	Communications Board (MODBUS, etc)
S4516-DF1	Communications Board (with A-B DF1 protocol)