Micro-DCI™
53SL6000 Micro-Mite Single Loop Controllers

■ Flexible Control Logic

■ Ready to Use "Out of the Box"

■ On-Board Signal Conditioning

■ Built in Self-Tuning

■ Password Security

■ Expandable I/O Option

■ Universal Analog Input Modules

■ Communication Options

■ Easy to Install Option Modules

■ Quick Connect I/O and Power Connectors

■ Rugged, Environmentally Hardened Packaging

Series 53SL6000
Single Loop Controller

Micro-Mite™
Single Loop Controller

Introduction

Often users need to provide control for smaller applications, or provide single loop integrity for more critical processes. Typically, these users have been faced with the dilemma of whether to choose a low cost controller and sacrifice performance, flexibility and capability; or choose a high cost, high performance controller that may actually provide more functionality than they really need.

The Series 53SL6000 **Micro-Mite** Single Loop Controller there is no dilemma! Small yet powerful, this versatile panel-mount controller is the cost-effective solution for a wide range of control loop applications, from basic to complex. Though the **Micro-Mite** is nominally a single loop controller, it also performs cascade and override control. In addition, the **Micro-Mite** controller's expandable I/O capability allows it to be used in ways not possible with other single loop controllers. The standardized control strategies and the capacity for customization also maximize flexibility.

This low cost controller is compact and lightweight, but rugged enough for use on the plant floor, as well as in the control room. The **Micro-Mite** controller provides a big, bright display for reading process variable, setpoint, and controller output at a glance. The user-friendly front panel, with large pushbutton keys and tactile feedback, makes changing setpoint, output, alarm limits and other parameters fast and easy.

Benefits

Performance vs. Price: The **Micro-Mite** controller is a great value: the purchase price is low, the reliability is high, and installation is quick and convenient. Because of its flexibility, the **Micro-Mite** controller is ideal for use in a host of applications.

Minimal Training Needed: The 53SL6000 is simple to configure and simple to use. A highly visible display makes it easy to view process data while large front panel push-buttons make it easy to operate, even while wearing work gloves.

Reduced Set-Up Time: The **Micro-Mite** controller is designed with the user in mind. Configuration is fast and easy, using either panel push-buttons or a personal computer running our user-friendly 53HC2600 graphical configuration software under Microsoft® Windows.

Flexibility and Expandability: Unlike comparably priced single loop controllers, the 53SL6000 allows control strategy customization and I/O expandability. This means that it can be used for more than just simple single loop applications.

Low Cost Installation: With a standard case that is less than three inches deep and detachable terminal blocks, this 140x72 mm controller is easy to install, even in rear-access cabinets only six inches deep. Fully loaded with option modules it weighs only 3.3 lt (1.5 kg), so it is ideal for closely spaced mounting on lightweight panels.

Usable in Almost Any Environment: Developed for use in the control room and on the plant floor, the 53SL6000 features a NEMA 4 faceplate, permitting front panel washdown.

Operator Interface

The 53SL6000 **Micro-Mite** Single Loop Controller's display is designed to maximize the information available to the operator. Presented both numerically and graphically, all relevant process data can be viewed with a single glance. In addition, large easy-to-see pushbuttons provide positive tactile feedback when pressed, making the controller extremely easy to operate. **The controller's operator interface features:**

Bar Graph Displays: Two forty-segment bar graph displays show the Process Variable (PV) in red and the Setpoint (SP) in green. The highly visible bar graph displays show the process information in percent.

Digital Read-Out Displays: During normal operation, the 53SL6000 **Micro-Mite** controller provides four-character digital read-out displays of Process Variable (PV) in red and Setpoint (SP) in green. These values are displayed in terms of configured engineering units. The current value of the Control Output (CO) in percent is displayed as a yellow, three-character digital read-out.

When the controller faceplate is being used to configure or tune the controller, the names of the function blocks, database parameters, and the parameter values appear in place of the PV, SP, and CO.

LED's: The LED's on the controller faceplate indicate the source of the controller setpoint (remote or local), the mode of the controller (auto or manual), alarm conditions, watchdog status, loop selected (when performing cascade or override control), Easy-Tune status, and the logical status of the discrete outputs, which can be used instead of the analog current as the output of the control algorithm.

Push-Button Keys: The large 10 x 10 mm pushbuttons on the controller faceplate are used to:
 • change the SP and CO
 • select auto or manual mode
 • select setpoint source (local or remote)
 • select operation (operate, configure parameters, or program the functionality)
 • select which loop to display (during cascade and override control)

Configuration

Ease of configuration of the **Micro-Mite** Single Loop Controller is a major advantage to the user. "Out of the box" the 53SL6000 is ready to perform single loop PID control. The only thing left to do is set the controller parameters (i.e. PV and SP limits, alarm limits, etc.). Use of another strategy, or control strategy customization, is easily accomplished. Because the **Micro-Mite** controller was designed for easy implementation and quick installation, there are two methods available for configuration:

Configuration From the Controller Faceplate is fast and easy. The push-buttons on the faceplate can be used to enter configuration mode, to display parameter names and their current values, and to modify the values. To simplify the process, the controller is configured using a hierarchical approach. Moving through the various options and parameter lists is quick and easy. Parameters are grouped logically by function block.

To configure the controller, the user cycles through the list of function blocks until the name of the desired block appears, then steps through the parameters list, filling in values as required. For example, the Analog Input Function Block contains parameters such as zero, span, input current range, filtering constant, etc. With this simple and straight-forward configuration scheme, the **Micro-Mite** unit can be up and running in a matter of minutes, regardless of the type of control needed.

Micro-Mite Configuration Software (53HC2600) provides an even easier configuration method, while documenting the controller strategy at the same time. Powerful, yet low cost, this graphical configuration tool runs under Microsoft® Windows™ 3.1. A "point and click" approach is used to configure the controller using this software. As a bonus, the control strategy can be printed in the form of configuration logic drawing and parameter list.

Extremely user-friendly, the 53HC2600 software can be used to configure the controller on-line or off-line. On-line the controller can be configured "real-time", and controller configurations can be uploaded and downloaded over an RS-232/RS-485 link using a **Micro-Mite** communication option module. In addition to the configuration drawing, a window mimicking the faceplate is available. The "buttons" on the window are live; clicking on one is the same as pressing the faceplate pushbutton. Off-line a control strategy may be configured without connection to a controller. The strategy configured at a personal computer can be saved to a file and downloaded later over an RS-232/RS-485 link.

Control Strategies

A key element of the 53SL6000 **Micro-Mite** controller's value is its versatility, enabling it to be used in a variety of process applications. As a basis for implementing control logic, the 53SL6000 comes standard with six basic control strategies. These basic control strategies are:

Single Loop PID with Remote Setpoint: The Micro-Mite unit comes out of the box configured for standard PID control. In this configuration a continuous output signal is calculated based on the difference between the process variable feedback from the field device
and the setpoint. The setpoint may be received from a remote source or specified locally at the controller.

Ratio Control: Implementing this control strategy enables the 53SL6000 to automatically maintain the control output in proportion to a "wild" variable. In this strategy both the control process variable feedback
and the "wild" variable are input to the 53SL6000. The controller then compares the values, calculates the correction signal necessary to maintain the desired ratio between the two signals, and then sends the output to the field element. The ratio value is set locally.

Auto/Manual Selector: When the **Micro-Mite** controller is used as an Auto/Manual station, the control signal is passed through the 53SL6000 when operating in automatic. The signal may be conditioned or adjusted, but no PID control is performed. When placed in manual mode, the station performs as a Manual Loader. In this mode the output signal is controlled directly from the faceplate.

Single Station Cascade Control: The Micro-Mite controller can be used as a cost-effective substitute for a two loop controller for many cascade control applications requiring a single output signal. Internally, the 53SL6000 performs PID control on both the primary and secondary loops. In this scheme the output of the primary controller is used as the setpoint signal for the secondary controller. The output of the secondary loop is used to drive the field device. Selection and control of both loops is managed from the 53SL6000's faceplate.

Single Station Override Control: When using this strategy, two standard PID loops, primary and limiting, operate interdependently to control a single final element. With this strategy, neither variable may exceed a safe limit: the primary loop is in control unless its output tries to exceed the high or low limit defined by the limiting loop. If the high limit is exceeded, the controller will select the lower of the two output values as the override signal to drive the field device. If the low limit is exceeded, the controller will select the higher of the two output values as the overriding output signal.

Dual Indicator with Re-Transmitted PV: In this mode, the **Micro-Mite** controller operates as an Indicator Station displaying a maximum of two analog values. In addition, either one of the two signals may be selected for use as the station's output value.

Micro-Mite Front Panel
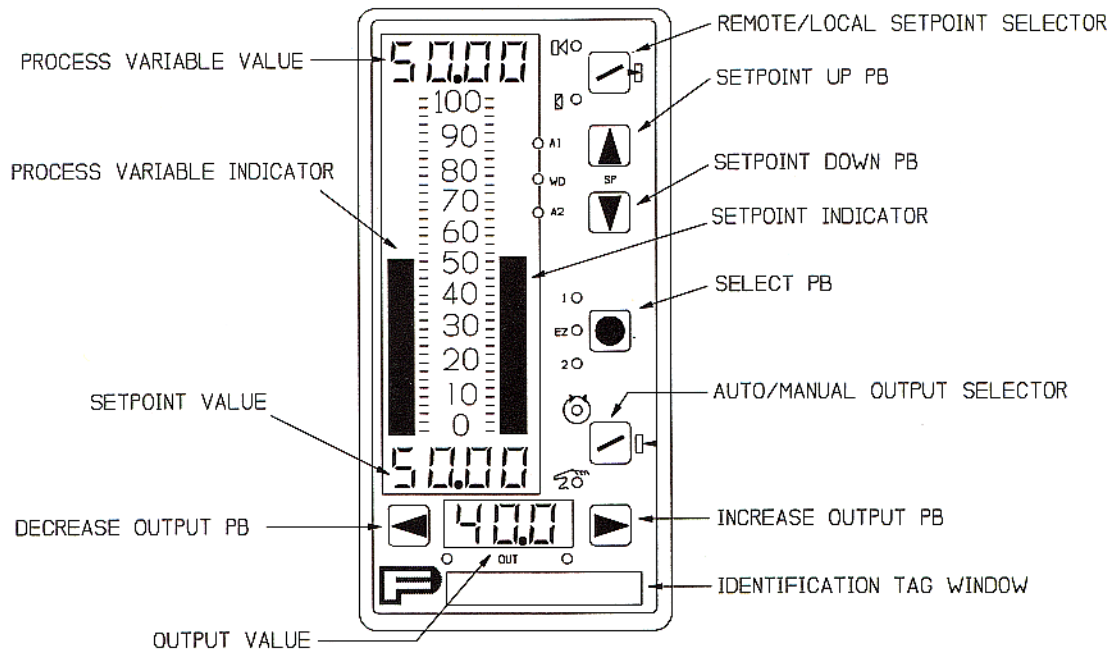
Additional Control Capabilities

Along with the control strategies described above, the 53SL6000 can also be customized to perform operations such as:

Direct Digital Control/Analog Backup - In this scheme the control signal driving the final element comes from a remote source. The **Micro-Mite** controller acts as a signal selector and backup should the signal source fail; in that event, the 53SL6000 automatically assumes control.

PID Controller with Three-Step Output - When a motorized valve, or a heating or cooling unit, is a two-or three-state device requiring discrete input signals,

the **Micro-Mite** controller can be used to achieve control. A duty cycle generator capable of producing time-proportioned three-state outputs, configurable between 1 and 9999 seconds at a 50 msec resolution, is part of the 53SL6000 standard functionality.

The **Micro-Mite** controller also provides **setpoint ramp and hold,** manipulation of signals using **algebraic equations,** and a thirteen-segment **signal characterizer** (function generator).

	Model Code	53SL6	_	_	_	**A**	_	**0**
		01 - 05	06	07	08	09	10	11
Micro-DCI Controller		53SL6						
Power Supply								
120/240 Vac 50/60 Hz with Transmitter Supply			0					
Option Slot A								
None				0				
Single Universal Analog Input				1				
Dual Universal Analog Input				2				
Option Slot B								
None					0			
Two Digital In + Two Digital Out					3			
Design Level						A		
Communication Options								
None							0	
RS-485							1	
RS-232							2	
Enclosure								
Standard Panel Mount								0

The 53SL6000 Micro-Mite controller is a versitile, cost effective panel mounted controller which can provide a wide range of control loop applications, from basic to complex. While normally a single loop controller this device can provide control function such as Override and Cascade control. The Micro-Mites standarized control strategies and expandable I/0 allows flexibility not found in other single loop controllers of its class.

General Information:

Note 1:
Communication between a PC running the 53HC26000 LoopMaster configuration software and the 53SL6000 Micro-Mite controller may be done either through a point-to-point connection via RS-232 or through a Micro-DCI multidrop DataLink communication network over RS-485. Communication requires that an RS-232 or RS-485 communication module be installed on the 53SL6000 controller. The communication module may be ordered as part of the 53SL6000 controller (through the model number) or as an upgrade. An RS-232 (only) module may be ordered as part of this software package. When ordering the communications module as an upgrade, refer to the price list below or the 53SL6000 Expansion Parts PriceList.

Interconnection diagrams showing the various communications cabling options/configurations may be found in the 53SL6000 Instruction Bulletin as well as 53HC2600 Instruction Bulletin.

Communication Interface Option (1):
Use this option to connect a single controller that already has an RS-232 Communications Module Option installed. The cable is 7 feet long with a 9-pin female D connector on the computer end and a 5- position terminal plug on the controller end.

Communication Interface Option (2):
Use this option to connect to a single controller that does not have an RS-232 Communications Module Option. The cable is the same as (1) above. An RS-232 Communications Option module (682A552U02) is included for installation on the controller.

Communication Interface Option (3):
Use this option when connecting to a network of 1 to 32 controllers which have RS-485 interface modules. An RS-232 to RS-485 Interface Terminal Board (686B720U01) is supplied along with a 7 foot long cable for connecting the interface to the computer. The cable has a 9-pin female D connector on the computer end. The user must supply wiring between the RS-232/485 Interface Terminal Board and the first controller and between controllers.

Note 2:
Selecting the correct communications cable depends on the communications module being used. Communications between a PC running the 53HC26000 Loop Master software and the 53SL6000 Micro-Mite controller using the RS-232 communications module should use cable part number 698B239U01. Communications between a PC running the 53HC2600 Loop Master software and the 53SL6000 Micro-Mite controller using the Micro-DCI RS-485 multi-drop communication module should use cable part number 698B240U01.

When using the RS-485 multi-drop Micro-DCI Datalink option with the 53SL6000, communication to the controller over the RS-485 Datalink network (from a PC using the RS-232 Serial Communication port) requires the use of an RS-232/RS-485 converter. MicroMod's RS232/485 Interface Terminal Board may be used or a commercially available converter may be purchased from a separate vendor.

Interconnecting the 53SL6000 RS-485 Micro-DCI Datalink can be simplified by using Communication Interface Terminal Board. This ITB provides terminal connections that can be wired to the 53SL6000 and provide "phone" connector style plugs for interconnection. Standard length Communications cables are then used to "daisy chain" units together.

686B622U01	Communications Interface Terminal Board
677B943U01	Communications Cable 2.5 ft.
677B943U02	Communications Cable 5 ft.
677B943U03	Communications Cable 25 ft.

Note 3:
Custom EPROM support for this product is not available.

Specifications

Input Signals

Analog Inputs - Standard
(referenced to power common)

Quantity	2
Signal Range	0 to 20 mA or 4 to 20 mA
Input Impedance	250 Ω
Measurement Error	≤ ±0.02 mA

Analog Inputs - Additional Options

Quantity	1 or 2 (depending on whether single or dual Universal Analog Input Module is used.)
Current Single Range	0 to 20 mA 4 to 20 mA
Voltage Signal Range	0 to 5 V, ±5.3V 1 to 5 V 0 to 83 mV, ±83 mV
Frequency Signal Range	0.5 Hz to 30 kHz 2.5 Hz to 100 kHz 8 Hz to 100 kHz
Pulse Input Frequency Range (Pulse Counter)	0 to 100 kHz
Minimum Pulse Width Duration	5 microseconds
Thermocouples (cold junction compensated)	J,K,T,E,R,S,B,N,U,L,F,C,G,D, Chineese E and S, PLII
RTD	Platinum 100 Ω (0.00385, 0.00392, and 0.00391) Copper 10,53,100 Ω (all 0.00427) Nickel 100 Ω (0.00618), 120 Ω (0.00672)
Common Mode Voltage	250 Vrms
Common Mode Rejection	160 dB
Filter Time Constant	25 ms
Measurement Error	≤±0.2% of full scale
Input Sampling Range	300 ms

Digital Input (dry contact or voltage input)

Quantity	Standard: 2 (reference to power common) Optional: 2 additional inputs

Voltage input	Off: 0 to 1 V dc; On: 4 to 24 V dc
Recognition Level Input Impedance	1000 Ω
Contact Recognitation Duration	50 ms minimum

Output Signals

Analog Output

Quantity	1
Signal Range	0 to 20 mA or 4 to 20 mAdc
Load Range	0 to 750 Ω
Output Accuracy	±0.2%

Digital Output - Standard (referenced to power common)

Quantity	2
Closed Contact (ON)	
Operating Voltage	30 Vdc maximum
Voltage Drop	2.0 V dc maximum
Operating current	50 mA dc maximum
Short Circuit Current	100 mA maximum
Open Contact (OFF)	≤1 mA leakage

Digital Output - Additional Optional (isolated)

Quantity	2
Contact	Switching Voltage: ≤250 V
Load	Switching Current: ≤5 A
Capacity	Switching Power: ≤1250 V ac; ≤30 W @ 250 Vdc; ≤100 W @ 24 Vdc
Type	Form C

Communications - Optional

RS-485 Module	Allows networking of up to thirty-two instruments on a four-wire bus (Micro-DCI Datalink).
RS-232 Module	Provides point-to-point communication on a three-wire interface (TxD, R, S, com); suitable for connecting 53SL6000 to a personal computer running 53SL600 to a personal computer running 53HC2600 graphical configuraiton software under Microsoft® Windows™.

Microprocessor Sampling and Update

Computation Rate	Program executed once per 50 ms
Input Signal Sample Rate	50 ms
Display Update	50 ms
Output Signal Update	50 ms

Power Supply Requirements

Voltage Range	93.5 to 276 Vac
Frequency Range	47 to 63 Hz

Power Consumption

Without Optional modules; transmitter supply not active	Power/apparent power (capacitive): 8W/14 VA
With power modules; with transmitter supply active	Power/apparent power (capacitive): 20 W/35 VA

Transmitter Supply (to drive two 20 mA transmitters; referenced to power common)

Rated Voltage	+25 V ±1 V
Ripple	≤ 200 Mv P-P
On-load Current	≤ 50 mA (short-circuit protected)

Physical Characteristics

Weight	1.5 kg (3.3 lb)
Dimensions	Bezel - 72 x 140 mm (2 53/64 x 5 43/64 in.) Case - 67 x 137 mm (2 5/8 x 5 13/32 in.) depth behind panel, including optional, Modules; 118 mm (4 21/32 in), depth behind panel, without option modules: 51 mm (2 in)

Certification

CSA	Approved for Class I, Division 2
FM	FM Approved for Class I, Division 2
CE	

Environmental Characteristics

Ambient Temp.	Operation: -5 to 50ºC (23 to 122ºC)
Limits	Storage & Transport: -40 to 85ºC (-40 to 185ºF)
Relative	Operation: 5 to 95%
Humidity	Storage & Transport: 5 to 100%
Barometric	Operation: 82.7 to 103.4 kPa
Pressure	Storage &Transport: 13.8 to 103.4 kPa
Physical Shock	Operation: 15 g, 1/2 sine wave, 11 ms
Storage & Transport: ASTM D4169, DC1	
Vibration	Operation: point-to-point constant displacement 0.76 mm, 5 to 14 Hz; 0.3 g, 14 to 200 Hz Stoarge & Transport: ASTM D999; B 3-100 Hz 0.5g
Corrosion	ISA S71.04 airborne contaminants G3 for 10 years.
Enclosure Rating	Faceplate: NEMA 4 (IP64) Housing: NEMA 1 (IP20)

Notes:

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AUTOMATION

Application-smart control solutions