Series 3400 Multi-Loop Process Controller

Series 3400:
Multi-Loop Process Controller, Data Acquisition System Distributed System Component

Overview

The series MDE-3400 is a powerful, programmable process control system that includes control, setpoint programming, data acquisition, logic and networking in one integrated package.

The 3400 models range from the **3400-000**: (4 PID loops, 8 sensor inputs, 2 Digital I/O, 6 analog outputs) to the **3400-021**: (24 PID loops, 30 sensor inputs, 64 Digital I/O, 18 analog outputs). Additional expansion is available through the Ethernet port.

Sensor inputs types include thermocouples, RTDs, linear voltage/current and pulse inputs. Output types include 16 bit linear analog, Time Proportioning Burst Mode, digital on/off, and pulse width modulation.

Controller recipes provide the user the ability to program any controller parameter as a function of time. Setpoints, alarm limits, PID parameters, outputs or calculations can be included in a recipe for total system control.

The 3400 series is designed for the networked factory with Ethernet/TCP-IP standard on all models. The network provides a wide variety of control architectures, ranging from a stand-alone controller with a local User Interface to a complete distributed control system networked to a PC.

Choose from a variety of User Interface devices such as PC, PDA or LCD touch screen. Each UI device functions asa network node, providing for the ability to place user interaction wherever it's needed. Each UI device can be configured to interact with a single controller or an entire network of controllers, making it ideal for OEMs.

The included **SUPERVIEW** Windows software provides controller setup, graphical ramp/soak recipe building, and data monitoring and acquisition tools. The software also provides for control system monitoring from a corporate network or via the Internet.

Applications:
- Environmental Lab instrumentation
- Multi-zone ovens
- Autoclaves (see 3402)
- Engine Test Stands
- Semiconductor processing equipment
- Control and data acquisition in a single instrument (see 3401)

Features and Benefits

Combine control, data acquisition, and alarming in single unit:
- Eliminate extra equipment and increase process reliability
- Document all your control results graphically and in Excel compatible files
- Single vendor makes product support easy

Module system components:
- Get only the features you need for today's requirements
- Add functionality later for future requirements

Built-in high speed, modern, standard Ethernet with TCP/IP:
- Get the data much faster and more reliably than with serial links
- Isolated Ethernet eliminates ground loops and problems
- Connect into your corporate network for maximum efficiency
- Provides multiple user interfaces locally or remotely where needed

Universal High Resolution Isolated Analog I/O (16 bit):
- Isolated inputs provide stable and highly accurate readings
- Retransmit parameters with high accuracy analog outputs
- Control critical processes with high precision

Burst Mode Digital Outputs:
- Up to 32 Burst Mode (DZC) outputs keeps your costs low
- No separate converter required
- Maximizes power usage and increase product quality

Controlling the Networked Factory

Maschoff Design Engineering, Inc.
St Paul, MN 55125
www.mdeeng.com

Recipes

- Set up the entire process easily with a recipe
- A Recipe can set any controller parameter as a function of time:
  - Ramp/Soak/Hold Setpoint
  - Set Output values (Analog) or Digital (On/Off)
  - Calculate the Process Variables
  - Vary the PID parameters
  - Set different Alarm Values dynamically
  - Switchover to different sensors
  - Perform and Integrate Logic and Control
  - Retransmit any parameter to high resolution analog output
  - Set Loops to Auto/Manual
  - Enable/Disable Guaranteed Soak
  - View Recipe Graphically (using SuperView software)
  - Turn on/off Data Logging (using SuperView software)
  - Prompt the Operator (using SuperView software)
  - Operator can change the Recipe while it's running to respond to system events

Control

- 0 to 24 control loops
- Selectable number of outputs per Loop
- Selectable Control Mode: Reverse, Direct, Bimodal, Cascade, Blended Cascade
- Fast loop updates
- Use any input as a Process Variable
- Calculate the Process Variable using multiple inputs and the Calculation feature
- Latched or Unlatched Loop Alarms:
  - High Process Variable
  - Low Process Variable
  - High Deviation
  - Low Deviation
  - Hysteresis setting for each alarm

Monitoring

- Monitor any input
- Alarm on any input(separate from Loop Alarms)
- Perform calculations on inputs with Calculation feature
- Retransmit to an Analog Output
- Link an Alarm to a digital output
- Log Data to file (with Superview software)
- View Data as a Dynamic Graph (with SuperView software)
- View Archived Data (with SuperView software)

Calculations

- Perform Logic calculations (OR/AND/NOT and more)
- Perform Math calculations (AVERAGE/HIGHEST/LOWEST/LINEARIZE/SCALE and more)
- Custom Calculations and sensor linearization available from factory
- Set Calculation inputs dynamically via Recipe
- Link Calculation outputs to I/O dynamically via Recipe

Analog Inputs

- Select from: Thermocouples, RTD, Voltage, Current
- Cold Junction Compensation built-in for Thermocouples
- Electrically Isolated for stable readings and ground loop elimination
- Use inputs for Control, Monitoring, Logging or Remote Setpoint
- Latched or Unlatched Alarm for each inputs:
  - High Input
  - Low Input
  - Hysteresis setting for each alarm

Analog Oupts

- Up to 18 per system
  - Max of 6 16 bit ouputs (0.0015%)
  - Max of 12 12 bit outputs (0.02%)
- Electrically Isolated for stable readings and ground loop elimination
- Use inputs for Control Outputs, Retransmits, Generate Remote Setpoint

Flex I/O

- I/O points that are configurable to be:
  - Output
    - Digital Output (5-24Vdc)
    - Pulse Width Modulated Output
    - Distributed Zero Cross (aka Burst Mode) output
    - Time Proportioning Output
  - Input
    - Digital Input (5-24 Vdc)
    - Frequency Input (0-500khz)
    - High Speed Pulse Counting (16 bit counter)

Digital I/O

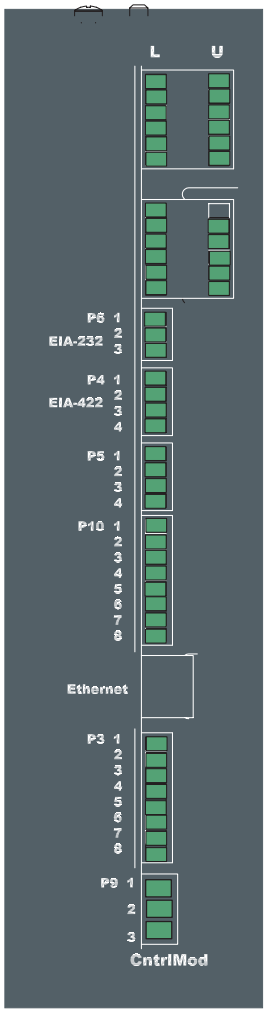
- 32 Outputs
  - Digital Output (5-24Vdc)
  - Burst Mode (DZC) available on all outputs
  - Time Proportioning Output available on all outputs
  - Configurable Polarity (Normally On/Off/Normally Off)
- 32 Inputs
  - Digital Inputs (5-24Vdc)
  - Pulse Counting (16 bit counter)
  - Configurable Polarity (Normally On/Normally Off)

Base Unit:

Base unit includes:

- Metal Enclosure (6" x 10.5" x 6") supporting 4modules max.
- 1 Control Module: Control Module required per controller
- System Power (12-30 VDC) 30 W (typical)
- Optional: 120/240 AC supply module (requires additional module slot)
- Operating Temperature(0°C to 50°C) (32°F to 122°F)
- Storage Temperature (-25° C to 85°C (-13°F to 185°F)
- Relative Humidity (0 to 90%, non-condensing)

Control Module:



Control Module

- Maximum Control Modules per enclosure: 1
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- 1 MB Flash, 500kB RAM expandable to 2 Mbytes (battery backed)
- Software updates easily via email and PC program (included)
- Communications ports (3 total):
  - 10 mbs Ethernet (twisted pair with RJ-45 female connector)
  - EIA-232 (3 wire, XMT, RECV, GND) 19200 baud max
  - EIA-422 (4 wire, XMT+, XMT-, RECV+, RECV-) 19200 baud max EIA-485
  - All 3 communication ports can be used at the same time
- Protocols:
  - Ethernet: full TCP/IP support
  - Serial ports: ACK/NAK/ENQ with checksum

Analog Inputs (10 single-ended or 5 differential)**:**

- Thermocouples (cold junction compensated, open detection)
- 3 wire 100 ohm RTD (max of 4 per Control Module)
- Wet Bulb/Dry Bulb Relative Humidity Calculation built in
- Voltage: 0-100mv, 0-20mv, 0-1v,0 - 10VDC, 0-5VDC
- Analog Input Isolation: Inputs divided into 2 isolation groups with the following:
  - 500 VDC isolation from input group to input group
  - 500 VDC isolation from an input group to power common
  - 500 VDC isolation from an input group to earth ground

Analog Inputs: **(cont'd):**

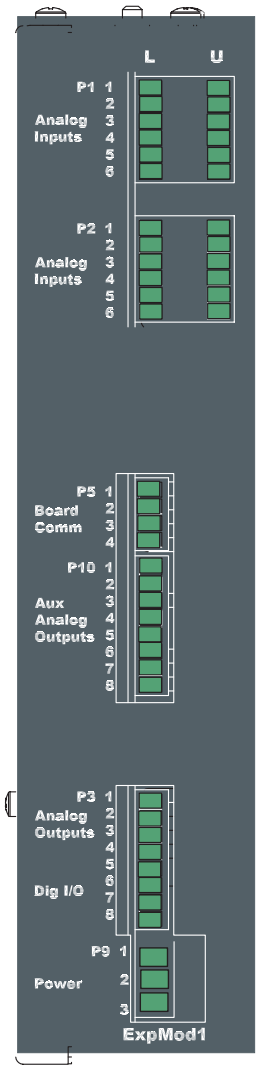
- Any linear input can be scaled to any Engineering Units
- Adjustable digital filter of each input
- High/Low Alarming available on every input
- Resolution: > 16 bits
- Sample Rate: 60 milliseconds
- Calibration accuracy: 0.1% of reading (± 0.3° C)
- Common Mode Rejection at 120Vac > 130db
- High/Low Alarming available on every input
- Any input can be Process Variable for Control Loop
- Any input can be used as Monitoring point.
- Any input can be used as Remote Setpoint for a Control Loop
- Custom sensors interfaces available (consult factory)

Analog Outputs (6 total):

- 4 outputs with 12 bit resolution (0.024%) (0-20ma,4-20ma, 0-10vdc)
- 2 outputs with 16 bit resolution (0.0015%) (0-20ma,4-20ma, 0-10vdc)
- Current output compliance voltage: 15 Volts
- Short-circuit protection
- Any output can be also be Time Proportioned as Control Output (Cycle Time: 1 to 100 seconds)
- Each output scalable to any engineering units span and zero
- Can be used to Retransmit any internal parameter
- Analog Output Isolation:
  All analog outputs in a single isolation group
  - 500 VDC isolation from output group to any input group
  - 500 VDC isolation from group to power common
  - 500 VDC isolation from group to earth ground

Flex I/O (2 total):

- Each point can be either an input or output
- Maximum voltage on each digital point: +24vdc
- Input logic levels: <0.6Vdc = Low, > 3.8Vdc = High)
- Available input configurations:
  - Pulse/Counter:: 1 MHz max., Count range: 32 bits
  - Frequency input (0 - 1 MHz)
  - Standard digital input
- Available output configurations:
  - PWM Output (pulse width modulation 32 bit resolution)
  - Time Proportioned as Control Output (Cycle Time: 1 to 100 seconds)
  - Output current: Each output can sink 75ma.



Expansion Module

Analog Expansion Module:

- Maximum Analog Expansion Modules per enclosure: 2
- Minimum Analog Expansion Modules per enclosure: 0

Analog Inputs (Same as for control module. See control module for details).

Analog Outputs (6 total):
(Same as for control module. See control module for details).

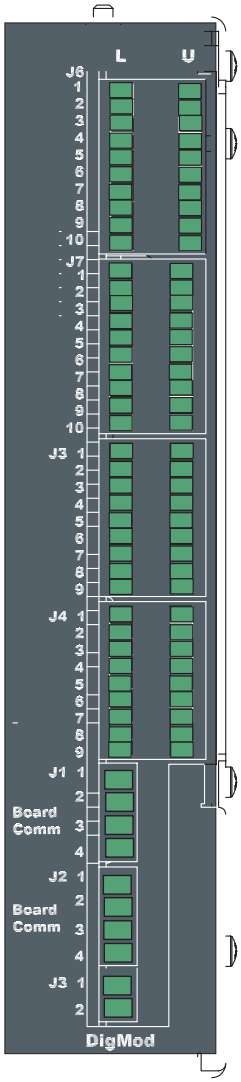
Flex I/O (2 total):
- Each point can be either an input or output
- Maximum voltage on each digital point: +24vdc
- Input logic levels: <0.6Vdc = Low, > 3.8Vdc = High)
- Output current: Each output can sink 75mA.
- An output can be also be Time Proportioned as Control Output (Cycle Time: 1 to 100 seconds)

Digital Expansion Module:

- Maximum Digital Expansion modules per enclosure: 1
- Minimum Control Modules per enclosure: 0

Digital Inputs (32 total):
- Maximum voltage on each digital point: +24vdc
- Input logic levels: <0.6Vdc = Low, > 3.8Vdc = High)
- Can be patched to any system logic input (Hold, Alarm, Status or Logic Blocks)
- Red LED status indicator for each input

Digital Outputs (32 total):
- Maximum voltage on each digital point: +24vdc
- Green LED status indicator for each output
- Output can source or sink current.
- Any output can be Time Proportioned as Control Loop Output (0-100 seconds Cycle Time)
- Selectable 50/60hz Burst Mode outputs (Distributed Zero Cross)
- Each output can be patched to any system logic output (Events, Alarms, Logic Blocks)



Digital Expansion Module

Sensor Input Specifications

Table 1. Input Types/Ranges:

	Celsius		Fahrenheit		
THERMOCOUPLE	**Min**	**Max**	**Min**	**Max**	**Accuracy (± °C)**
J	-20	760	0	1400	0.35
K	-20	1370	0	2500	0.45
T	-200	400	-328	752	0.35
R	-20	1760	0	3200	1.00
S	-20	1760	0	3200	1.00
E	-270	1000	-454	1832	2.25
N	-20	1300	0	2370	0.60
Platinel II	0	1420	32	2580	0.50
NiNiMoly	0	1300	32	2408	0.50
B	47	1820	116	3300	6.00
G	-20	2315	0	4200	3.40
C	-20	2315	0	4200	1.50
D (G3)	-20	2315	0	4200	1.45
RTD 100 ohm (European or American Alpha)	-200	630	-328	1166	0.27

	Range	Overall Accuracy @72F(F)	@22 C(C)	Temperature Coefficient F (Per F)	C (Per C)
LINEAR					
Millivolt	0mV to +10 mV 0mV to +50 mV 0mV to +100 mV	0.02%FS		0.002	0.001
Voltage	0v to +1v 0v to +5v 0v to +10v	0.02%FS		0.0002	0.001
Current	0mA to +20 mA 4mA to +20 mA	0.02%FS		0.002	0.001
SENSOR INPUT RANGE		**RANGE**			
Pressure	0-100mV	0 - 250 PSI			

Ordering Information

Part #	Description
Controllers	
3400-000	CPU Module (includes SuperView)
	3 Slot Enclosure
	4 Loops, 10 Ains, 6 Aout, 2 Flex I/O
3400-100	CPU Module (includes SuperView)
	3 Slot Enclosure w/internal Power Supply
	4 Loops, 10 Ains, 6 Aout, 2 Flex I/O
3400-001	CPU Module (includes SuperView)
	Digital I/O Module
	3 Slot Enclosure
	4 Loops, 10 Ains, 6 Aout, 2 Flex I/O
	32 Digital Inputs, 32 Digital Outputs
3400-101	CPU Module (includes SuperView)
	Digital I/O Module
	3 Slot Enclosure w/internal Power Supply
	4 Loops, 10 Ains, 6 Aout, 2 Flex I/O
	32 Digital Inputs, 32 Digital Outputs
3400-010	CPU Module (includes SuperView)
	Expansion I/O Module
	3 Slot Enclosure
	8 Loops, 20 Ains, 12 Aout, 4 Flex I/O
3400-110	CPU Module (includes SuperView)
	Expansion I/O Module
	3 Slot Enclosure w/internal Power Supply
	8 Loops, 20 Ains, 12 Aout, 4 Flex I/O
3400-011	CPU Module (includes SuperView)
	Expansion I/O Module
	Digital I/O Module
	3 Slot Enclosure
	16 Loops, 20 Ains, 12 Aout, 4 Flex I/O
	32 Digital Inputs, 32 Digital Outputs
3400-111	CPU Module (includes SuperView)
	Expansion I/O Module
	Digital I/O Module
	3 Slot Enclosure w/internal Power Supply
	16 Loops, 20 Ains, 12 Aout, 4 Flex I/O
	32 Digital Inputs, 32 Digital Outputs
3400-020	CPU Module (includes SuperView)
	(2) Expansion I/O Modules
	4 Slot Enclosure (Requires Ext Pwr Supply)
	24 Loops, 30 Ains, 18 Aout, 6 Flex I/O
3400-021	CPU Module (includes SuperView)
	(2) Expansion I/O Modules
	Digital I/O Module
	4 Slot Enclosure (Requires Ext Pwr Supply)
	24 Loops, 30 Ains, 18 Aout, 6 Flex I/O
	32 Digital Inputs, 32 Digital Outputs
340x-xx	Custom Controller

Individual Modules	
1000-001	CPU Module (includes SuperView)
	4 Loops, 10 Ains, 6 Aout, 2 Flex I/O
1000-000	CPU Module (without SuperView)
1001-000	CPU w/single row input connectors option adder
2000-000	Expansion Module
	10 Ains, 6 Aout, 2 Flex I/O
4000-000	Digital I/O Module
	32 Digital Inputs, 32 Digital Outputs
0001-004	Enclosure
	4 Slot Enclosure
0001-020	Internal +24VDC Power Supply 20 watt (1 slot)
	20 watt supply (requires 1 slot)
0001-050	External +24VDC Power Supply
	50 watt Universal Input
5000-000	LCD Color Touch Screen User Interface
	Includes Windows CE 5.0

Software	
8000-001	SuperView (included w/Controller)
	Communication to 1 Controller
	Profile Editor
	Configuration Tool
	Data Logging,Graphing
8000-0xx	SuperView with Controller Networking
	Communicate to Multiple Controllers
	(xx in part # is # of controllers in network)
8001-000	NetView option for SuperView
9000-001	PocketView Software (Base Package)
	Communication to 1 Controller
	Parameter Monitoring/Changing
	Calibration Tool
	Data Logging
9000-0xx	PocketView for Controller Networking
	Communicate to Multiple Controllers
	(xx in part # is # of controllers in network)
8100-0xx	OmniLink with Controller Networking
	Number of Controllers in Controller Network:
	Communicate to Multiple Controllers
	(xx in part # is # of controllers in network)
80x2-xxx	Custom OEM SuperView Version
90x2-xxx	Custom OEM PocketView
8102-xxx	Custom OEM OmniLink Version