Product Data Sheet Mini8® Loop Controller

Characteristics

Range name:	Multi Loop Controller
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Eurotherm®

The Mini8 loop controller is a compact DIN rail mounted multi-loop precision PID controller and data acquisition unit.

It offers a wide choice of I/O and a selection of Ethernet, EtherCAT, DeviceNet® and serial industrial communications protocols.

The controller mounts on 35mm Top Hat DIN Rail. It is designed for permanent installation, for indoor use only, and to be enclosed in an electrical panel or cabinet.

It is delivered pre-assembled with I/O and communications options as specified in the order code.

Eurotherm iTools PC based configuration software is used for commissioning and programming, this is available free of charge from the Eurotherm website.

Environmental sustainability

UKCA/EU RoHS directive	UKCA/EU RoHS declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS regulation	China RoHS declaration
Environmental disclosure	Product environmental profile
Circularity profile	End of Life information

Note: Refer to the Mini8 loop controller Product Information page on the Eurotherm website (www.eurotherm.com) for details.

Environmental specification

Power supply voltage	17.8Vdc minimum to 28.8Vdc maximum
Supply ripple	2Vp-p maximum
Power consumption	15W maximum
Maximum applied voltage any terminal	42V peak
Operating temperature	0 to 55°C (32°F to 131°F)
Storage temperature	-10°C to +70°C (14°F to 158°F)
Relative humidity	5% to 95% RH non-condensing
Altitude	<2000m (<6561.68ft)
Approvals	CE, UKCA UL, cUL
Safety	Meets EN61010-1: 2019 and UL 61010-1: 2012 Installation Category II Pollution Degree 2
EMC	EN61326:2013 Emissions: Class A - Heavy Industrial Immunity: Industrial
Protection	IP20 The Mini8 loop controller must be mounted in a protective enclosure
RoHS compliance	UKCA/EU RoHS REACH WEEE China RoHS

Network communications support

Modbus RTU: EIA-485, 2 x RJ45, user select switch for 3-wire or 5-wire	Baud rates: 4800bps, 9600bps, 19200bps
DeviceNet: CAN, 5-pin standard "open connector" with screw terminals	Baud rates: 125kbps, 250kbps, 500kbps
EtherCAT	Baud rate: 100Mbps full duplex
Ethernet: Standard Ethernet RJ45 connector	Baud rate: 10Base-T
Isolation between RJ45 connector and system	1500Vac
Modbus, DeviceNet, EtherCAT, and Ethernet are mutually exclusive options; refer to the Mini8 loop controller order code.	

Configuration communications support

Modbus RTU: 3-wire EIA-232, through RJ11 configuration port	Baud rates: 4800, 9600, 19200
All versions of Mini8 loop controller support one configuration port. The configuration port can be used simultaneously with the network link.	

Fixed I/O resources

The PSU card supports two independent and isolated relay contacts.	
Relay output types	On/Off (C/O contacts, "On" closing the N/O pair)
Contact current	<1A (resistive loads)
Terminal voltage	<42V peak
Contact material	Gold
Snubbers	Snubber networks are NOT fitted
Contact isolation	42V peak maximum
The PSU card supports two independent and isolated logic inputs.	
Input types	Logic (24Vdc)
Input logic 0 (off)	-28.8V to +5Vdc
Input logic 1 (on)	+10.8V to +28.8Vdc
Input current	2.5mA (approx) at 10.8V; 10mA maximum at 28.8V supply
Detectable pulse width	110ms minimum
Isolation to system	42Vpk maximum

TC8/ET8 8-channel and TC4 4-channel TC input card

The TC8/ET8 supports eight independently programmable and electrically isolated channels, catering for all standard and custom thermocouple types. The TC4 supports four channels to the same specification.

Channel types	TC, mV Input Range: -77mV to +77mV
Resolution	20 bit (ΣΔ converter), 1.6µV with 1.6s filter time
Temperature coefficient	< ±50ppm (0.005%) of reading/ °C (TC4/TC8) <±1µV/C ±25ppm/C of measurement, from 25°C ambient (ET8)
Cold junction range	-10°C to +70°C (14°F to 158°F)
CJ rejection	> 30:1 (TC4/TC8) 100:1 (ET8)
CJ accuracy	±1°C (TC4/TC8) ±0.25°C (ET8)
Linearisation types	C, J, K, L, R, B, N, T, S, LINEAR mV, custom
Total accuracy	±1°C ±0.1% of reading (using internal CJC) (TC4/TC8) ±0.25°C ±0.05% of reading at 25°C ambient (ET8)
Channel PV filter	0.0 seconds (off) to 999.9 seconds, 1st order low-pass
Sensor break: AC detector	Off, Low or High resistance trip levels
Input resistance	>100MΩ
Input leakage current	<±100nA (1nA typical)
Common mode rejection	>120dB, 47 - 63Hz
Series mode rejection	>60dB, 47 - 63Hz
Isolation channel-channel	42V peak maximum
Isolation to system	42V peak maximum

DO8 8-channel digital output card

The DO8 supports eight independently programmable channels, the output switches requiring external power supply. Each channel is current and temperature protected, foldback limiting occurring at about 100mA.

The supply line is protected to limit total card current to 200mA.

The eight channels are isolated from the system (but not from each other). To maintain isolation it is essential to use an independent and isolated PSU.

Channel types	On/Off, Time proportioned
Channel supply (Vcs)	15Vdc to 30Vdc
Logic 1 voltage output	> (Vcs - 3V) (not in power limiting)
Logic 0 voltage output	< 1.2Vdc no-load, 0.9V typical
Logic 1 current output	100mA maximum (not in power limiting)
Minimum pulse time	20ms
Channel power limiting	Current limiting capable of driving short-circuit load
Terminal supply protection	Card supply is protected by 200mA self-healing fuse
Isolation (channel-channel)	N/A (channels share common connections)
Isolation to system	42V peak maximum

RL8 8-channel relay output card

The RL8 supports eight independently programmable channels. This module may only be fitted in slot 2 or 3, giving a maximum of 16 relays in a Mini8 loop controller.

The Mini8 loop controller chassis must be grounded using the protective earth ground stud.

Channel types	On/Off, Time proportioned	
Maximum contact voltage	264Vac	
Maximum contact current	2A ac	
Contact snubber	Fitted on module	
Minimum contact wetting	5Vdc, 10mA	
Minimum pulse time	220ms	
Isolation (channel-channel)	264V max	230V nominal
Isolation to system	264V max	230V nominal

CT3 3-channel current transformer input card

Requires DO8 card to be fitted to allow the controller to be configured.	
The CT3 supports three independent channels designed for heater current monitoring. A scan block allows periodic test of nominated outputs to detect load changes due to issues with the heater.	
Channel types	A (current)
Factory set accuracy	Better than ±2% of range
Current input range	0mA to 50mA RMS, 50/60Hz nominal
Transformer ratio	10/0.05 to 1000/0.05
Input load burden	1W
Isolation	None (provided by CT)

Load failure detection

Requires CT3 module.	
Maximum number of loads	16 Time proportioned outputs
Maximum loads per CT	Six loads per CT input
Alarms	1 in 8 ‘Partial load failure’, over current, SSR short-circuit, SSR open circuit
Commissioning	Automatic or manual
Measurement interval	1 sec - 60 sec

DI8 8-channel digital input card

The DI8 supports eight independent input channels.	
Input types	Logic (24Vdc)
Input logic 0 (off)	-28.8V to +5Vdc
Input logic 1 (on)	+10.8V to +28.8Vdc
Input current	2.5mA (approx.) at 10.8V; 10mA maximum at 28.8V supply
Detectable pulse width	110ms minimum
Isolation channel-channel	42V peak maximum
Isolation to system	42V peak maximum

RT4 Resistance Thermometer input card

The RT4 supports four independently programmable and electrically isolated resistance input channels. Each channel may be connected as 2-wire, 3-wire or 4-wire and either Low or High resistance range.		
Channel types	Low resistance/Pt100	High resistance/Pt1000
Input range	0 to 420Ω, -242.02°C to +850°C (-404°F to +1562°F) for Pt100	0 to 4200Ω, -242.02°C to +850°C (-404°F to +1562°F) for Pt1000
Calibration accuracy	±0.1Ω ±0.1% of reading, 22Ω to 420Ω ±0.3°C ±0.1% of reading, -200°C to +850°C	±0.6Ω ±0.1% of reading, 220Ω to 4200Ω ±0.2°C ±0.1% of reading, -200°C to +850°C
Resolution	0.008Ω, 0.02°C	0.6Ω, 0.15°C
Measurement noise	0.016Ω, 0.04°C peak to peak 1.6s channel filter 0.06Ω, 0.15°C peak to peak, no filter	0.2Ω, 0.05°C peak to peak 1.6s channel filter 0.6Ω, 0.15°C peak to peak, no filter
Linearity accuracy	±0.02Ω, ±0.05°C	±0.2Ω, ±0.05°C
Temp coefficient	±0.002% of Ω reading per deg C ambient change relative to normal ambient 25°C	±0.002% of Ω reading per deg C ambient change relative to normal ambient 25°C
Lead resistance	22Ω max in each leg. Total resistance including leads is restricted to the 420Ω maximum limit. 3-wire connection assumed matched leads.	22Ω maximum in each leg. Total resistance including leads is restricted to the 4200Ω maximum limit. For the 3-wire connection it is assumed that the leads are matched.
Maximum bulb current	300µA	300µA
Isolation channel-channel	42V peak maximum	42V peak maximum
Isolation to system	42V peak maximum	42V peak maximum

AO8 8-channel and AO4 4-channel 4-20mA output card

The AO8 supports eight independently programmable and electrically isolated mA output channels for 4-20mA current-loop applications. The AO4 supports four channels to the same specification. The AO4 and AO8 modules may only be fitted in slot 4.	
Channel types	mA (current) Output
Output range	0-20mA, 360Ω load maximum
Setting accuracy	±0.5% of reading
Resolution	1 part in 10000 (1µA typical)
Isolation channel-channel	42V peak maximum
Isolation to system	42V peak maximum

Recipes

Recipes are a software orderable option.	
Number of recipes	5
Tags	40 tags in total

Toolkit blocks

User wires	Orderable options of 30, 60 120, 250 or 360. 360 Userwires provide access to the Enhanced Toolkit blocks	
User values	32 real values 40 enhanced	
2-input maths	24 blocks 32 enhanced	Add, subtract, multiply, divide, absolute difference, maximum, minimum, hot swap, sample and hold, power, square root, log, ln, exponential, switch
2-input logic	24 blocks 40 enhanced	AND, OR, XOR, latch, equal, not equal, greater than, less than, greater than or equal to, less than or equal to
8-input logic	4 blocks	AND, OR, XOR
8-input multiple operator	4 blocks	Maximum, minimum, average. Input/outputs to allow cascading of blocks
8-input multiplexer	4 blocks 8 enhanced	Eight sets of eight values selected by input parameter
BCD input	2 blocks	Two decades (eight inputs giving 0 to 99)
Input monitor	2 blocks	Maximum, minimum, time above threshold
32 point linearization	2 blocks 8 enhanced	32-point linearization fit
Polynomial fit	2 blocks	Characterization by poly fit table
Switchover	1 block	Smooth transition between two input values
Timer blocks	8 blocks	OnPulse, OnDelay, OneShot, MinOn Time
Counter blocks	2 blocks	Up or down, directional flag
Totaliser blocks	2 blocks	Alarm at threshold value
Transducer scaling	2 blocks	Transducer auto-tare, calibration & comparison calibration
packbit	4 blocks 8 enhanced	Packs 16 individual bits into a 16 bit integer
unpackbit	4 blocks 8 enhanced	Unpacks a 16 bit integer into 16 individual bits
RemoteInput blocks	12 blocks	Used to input remote setpoint values. (Also capable of warning if there is a loss of communications).
Humidity block	1 block	The humidity block calculates the relative humidity and dew point based on Wet and Dry bulb temperature measurements, the atmospheric pressure and psychometric constant of the psychrometer being used.
OR blocks	8 blocks	Performs a logic OR function on up to eight inputs.

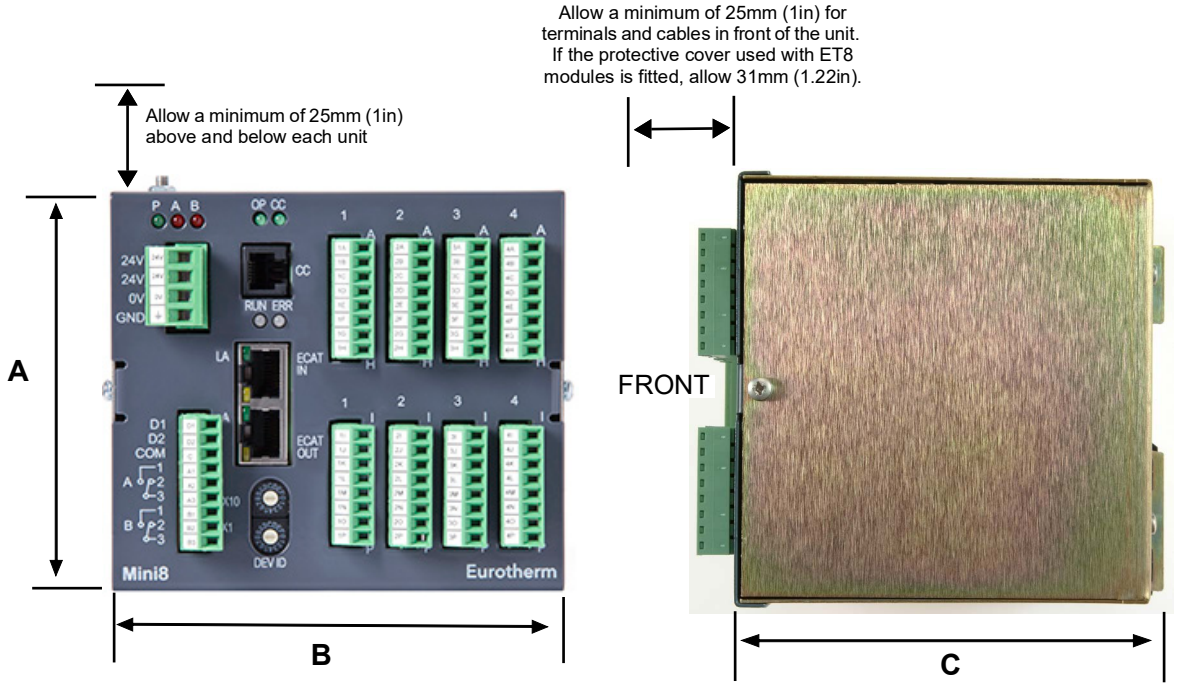
PID control loop blocks (Superloop or Legacy Loop)

Number of loops	0, 4, 8 or 16 Loops (order options). 24 for Superloop
Control modes	On/Off, single PID, dual channel output
Control outputs	Analog 4-20mA, time proportioned logic
Cooling algorithms	Linear, water, fan, or oil
Tuning	Three sets PID, one-shot auto-tune
Auto manual control	Bumpless transfer or forced manual output available
Setpoint rate limit	Ramp in units per second, per minute or per hour
Output rate limit	Ramp in % change per second
Other features	Feedforward, input track, sensor break output, loop break alarm, remote setpoint, two internal loop setpoints, Superloop cascade mode

Process alarms

Number of alarms	64 alarms (configurable as analog, digital, or sensor break)
Alarm types	Absolute high, absolute low, deviation high, deviation low, deviation band, sensor break, logic high, logic low, rising edge, falling edge, falling rate of change, rising rate of change
Alarm modes	Latching or non-latching, blocking, time delay

Dimensions

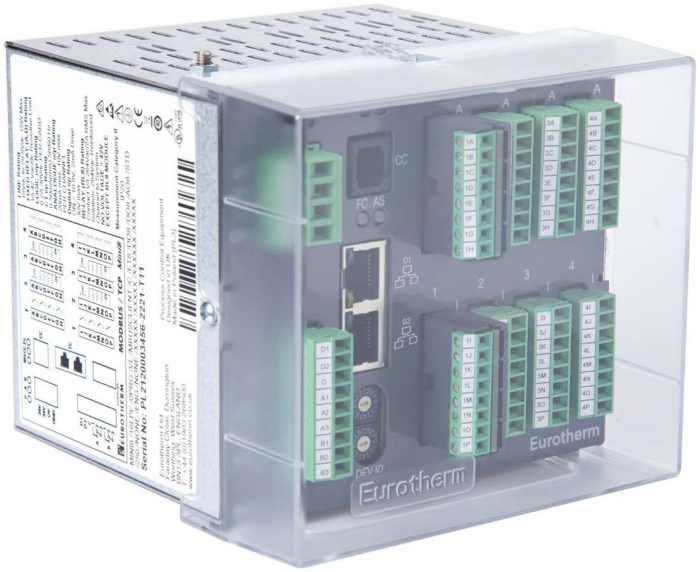


Dimension	mm	in
A	108	4.25
B	124	4.88
C	115	4.53

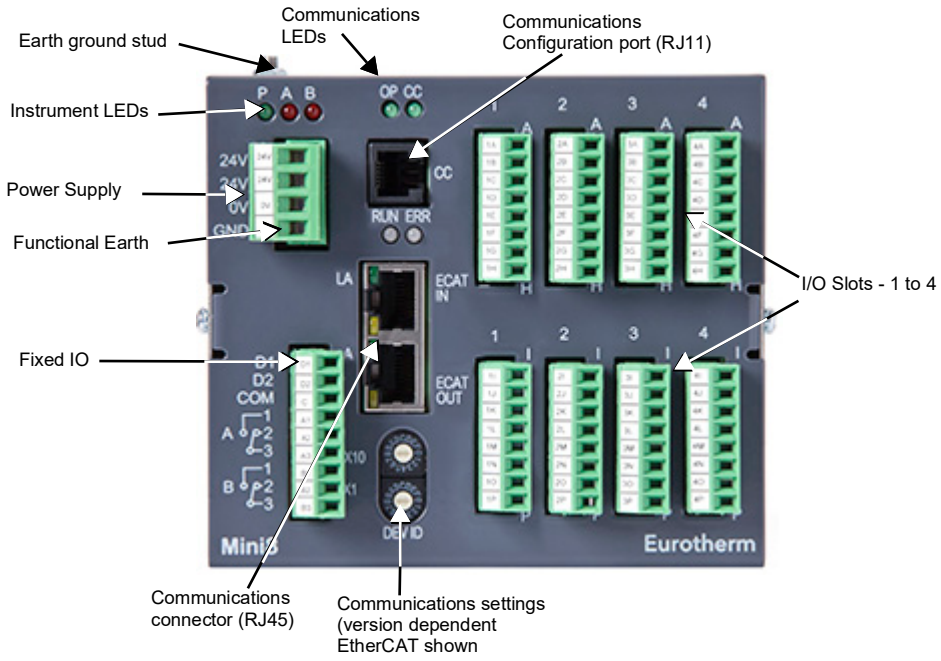
Protective cover

If at least one ET8 module is fitted, the protective cover should be fitted. This provides thermal stability so that the high specification of the ET8 card is met.

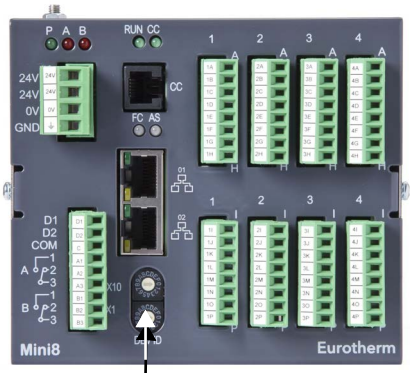
The image below shows the protective cover mounted with the slot at the bottom. To accommodate alternative cabling requirements, this cover can be mounted with the slot at the top.



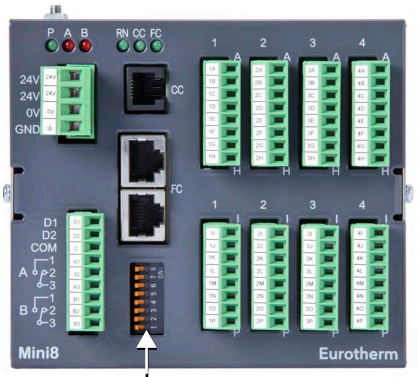
EtherCAT Terminal Layout



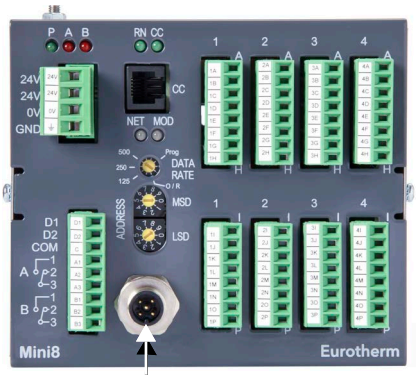
Other Terminal Layouts



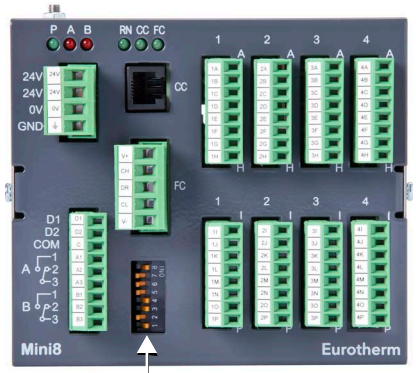
Communications settings
Modbus TCP & EtherNet/IP



Communications settings
Isolated Modbus



Communications settings
Enhanced DeviceNet



Communications settings
DeviceNet

Mini8 loop controller ordering code

1	Basic Product
MINI8	Mini8 loop controller
2	**Control Loops**
ACQE	Data Acquisition only
4LPE	4 Control loops
8LPE	8 Control loops
16LPE	16 Control loops
24LPE	24 Control loops
3	**Programs**
0PRG	No programs

4	PSU	
VL	24Vdc	
5	**Communications**	
ISOLMBUS	Isolated Modbus RTU server	
DEVICENET	DeviceNet server	
ENETMBUS	EtherNet Modbus TCP/IP server	
DNETMI2	DeviceNet server	
ENETIP	EtherNet/IP server	
ETHERCAT	EtherCAT Main and Subordinate Device	
MBCLIENT	Ethernet Modbus TCP/IP Client & Server	
6	**Temperature Units**	
C	Centigrade (Celsius)	
F	Fahrenheit	
7 - 10	**IO Slots 1, 2, 3, 4**	
XXX	No module fitted	
TC4	4-channel thermocouple/mV Input	
TC8	8-channel thermocouple/mV Input	
ET8	8-channel enhanced thermocouple/mV Input (see Note)	
RT4	4-channel RTD input	
AO4	4-channel 4-20mA output	
AO8	8-channel 4-20mA output	(slot 4 only) Not EC8
DO8	8-channel Digital output	
CT3	3-channel CT input (only one CT per Mini8 device)	
RL8	8-channel relay output (slots 2 or 3 only)	
DI8	8-channel logic input	

11	Application
STD	Superloop only
CAS	Superloop only with Cascade enabled
LEG	Mini8 controller Legacy Loop type supplied. Cascade disabled

12	Wires
30	30 user wires
60	60 user wires
120	120 user wires
250	250 user wires
360	360 user wires (includes additional toolkit blocks)
13	**Recipes**
None	No recipes
RCP	Recipes enabled
14	**Manual**
ENG	English (default)
FRA	French
15	**Configuration Software**
NONE	No iTools DVD
16	**Warranty**
XXXXX	3 year standard warranty
WL005	Extended warranty
17	**Calibration Certificates**
XXXXX	None
CERT2	Factory calibration certificate

18	Special
XXXXX	No special
YYNNNN	Special number
19	**Label**
XXXXX	No custom label
YNNNN	Custom label
20	**Configuration Lock Function**
XXX	None
LOCK	Soft wiring & parameter values may be hidden using lock function

Note: If an ET8 module is ordered, an Input Cover (protective cover) will be supplied with the CJC connectors.

Mini8 loop controller upgrade code

1	Control Loops
XX	No change
1	0 Loop to 4 Loops (Legacy or Superloops)
2	0 Loop to 8 Loops (Legacy or Superloops)
3	0 Loop to 16 Loops (Legacy or Superloops)
4	4 Loop to 8 Loops (Legacy or Superloops)
5	4 Loop to 16 Loops (Legacy or Superloops)
6	8 Loop to 16 Loops (Legacy or Superloops)
7	0 Loop to 24 Loops (Superloops only)
8	4 Loops to 24 Loops (Superloops only)
9	8 Loop to 24 Loops (Superloops only)
10	16 Loop to 24 Loops (Superloops only)
2	**Programs**
XX	No change

3	Toolkit Wires
XX	No change
1	30 wires to 60 wires
2	30 wires to 120 wires
3	30 wires to 250 wires
4	60 wires to 120 wires
5	60 wires to 250 wires
6	120 wires to 250 wires
7	30 wires to 360 wires (includes additional toolkit blocks)
8	60 wires to 360 wires (includes additional toolkit blocks)
9	120 wires to 360 wires (includes additional toolkit blocks)
10	250 wires to 360 wires (includes additional toolkit blocks)

4	Recipes
XX	No change
1	Recipes enabled
5	**Applications**
XX	No change
EXT	Extended Mini8 (V5.0 and above)
6	**TCP/IP Communications Protocol**
XX	No change
ENETIP	Enable EtherNet/IP Server (V6.0 and above)
MBCLIENT	Enable Modbus/TCP Client for ENETMBUS units, (V5.0 and above)
7	**Loop Options**
XX	No change
SUP	Switch from Mini8 legacy loop type to Superloop
LEG	Switch from Superloop to Mini8 Legacy Loop type
CAS	Superloop with Cascade Function Enabled
8	**Configuration Lock Function**
XX	No change
LOCK	Soft wiring and parameter values may be hidden using lock function

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