The Key to
Efficient Automation

M90 & M91 Micro-OPLCs

Operator Panel and
Programmable Logic Controller

UNITRONICS

The M90.
Is it an HMI?
Is it a PLC?
It's Both.

The M90 & M91
Each Micro PLC includes:

- Onboard I/O configuration. Add I/Os via a range of I/O expansion modules
- Integral HMI, including LCD & keypad
  M91 LCD: 2 16-character text lines
  M90 LCD: 1 16-character text line

Perfect control for any application

- Water treatment
- Alarm systems
- Traffic signal control
- Automated production
- Process control (thermal, level, pressure)

GSM Control

Conveyor belts

Building and Environment control

Packaging

Oven control

High-speed counters

pnp/npn Digital inputs

Analog/ Thermocouple/ PT100 inputs

RS232/RS485

Analog output

High-speed outputs

Transistor/Relay outputs

M91   M90   M91   ...   M90

MODBUS (M91)   CANbus (M90/M91)

4 PID Loops* with Auto-tune

Pump management

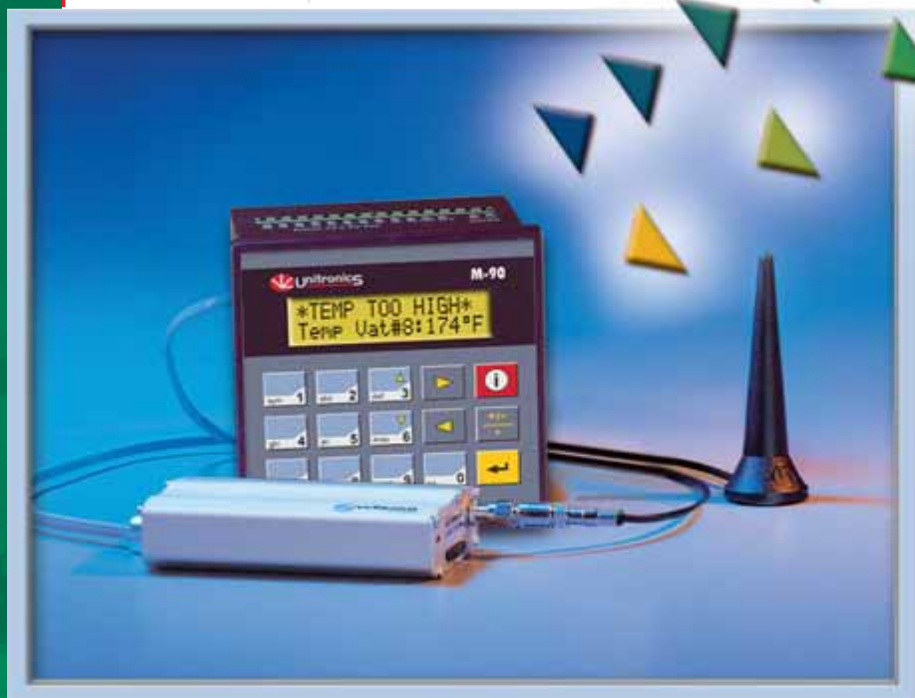**Energy control**

Up to 96 additional I/Os

Expansion Modules

*Auto-tune is provided via an external PC based application.

unitronics   M-90

M90 PLC & HMI
Key to Control

sym 1   abc 2   def 3
ghi 4   jkl 5   mno 6
pqrs 7   tuv 8   wxyz 9   0

OPLC
Operator Panel & PLC

Communication & Networking

SMS Control

**Use your GSM cell phone to implement real-time remote control in your application.**

Remote control:

Send SMS messages from your GSM phone to monitor and modify set-points or run-time parameters in your system.

Remote trouble-shooting:

The M90/M91 can send SMS messages to your GSM cell phone to notify you of system faults.

The GSM-enabled M90/M91:

- Sends and receives SMS messages containing both fixed text and variable data
- Sends messages to different GSM cell phones
- Can route different messages to different phone numbers
- Protects your system: prevents unauthorized callers
- Auto-acknowledges received messages
- Answers data requests from your cell phone
- Contains up to 1k of user-defined messages
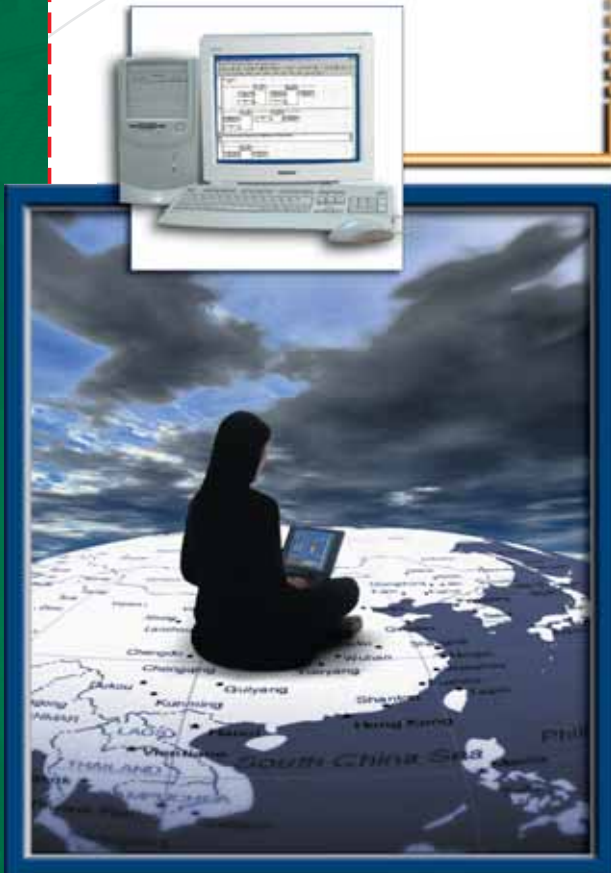- Sends system updates to any local or remote serial printer, via GSM
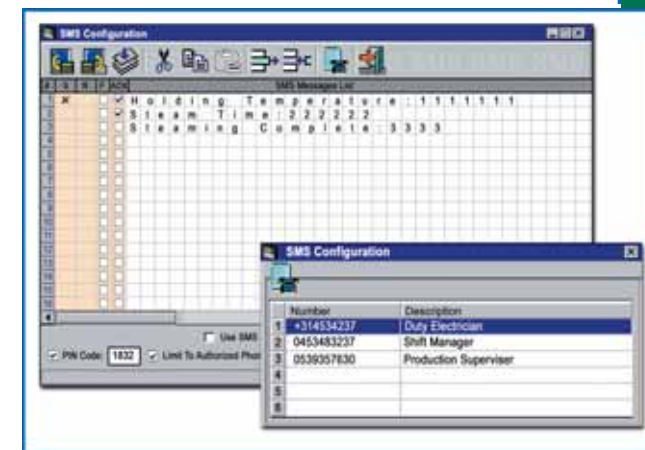
Remote GSM control requires:

An M90/M91 unit (one of the 10 GSM-enabled models) plus a GSM kit; a selection of modems is available.

The kit includes:
- ◀ GSM modem
- ◀ Magnetic antenna and cable
- ◀ PLC to modem adapter
- ◀ Power supply cable

Communication & Networking

Remote Access utilities

Use your PC to access remote M90/M91 units, via network connections & GSM/landline modem.

- Download, upload, or debug remote M90/M91 Ladder programs
- Operate the controller's panel via remote PC
- View real-time parameters

Use Stand-alone Remote Access software to:

- View and operate several controllers on your PC screen, simultaneously, in real-time
- Read, write, and store online operand values—plus M90/M91 database values
- Run, reset, or initialize a remote controller

Remote Access runs independently of the Ladder software, and hence protects your program from unauthorized users
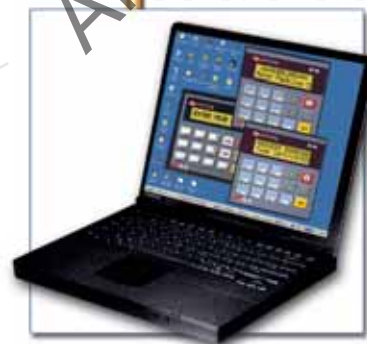
DataXport

This powerful software utility captures PLC application data, then exports it to Excel files for processing.

Data is exported according to a user-defined schedule.

Use DataXport to:

- Log PLC application data to Excel according to a date/time-based schedule
- Simultaneously log data from one or more Unitronics PLCs, whether networked or stand-alone
- Access PLCs and log data either directly, via network, or via GSM/landline modem connection
- Pull data manually, to view current parameter status
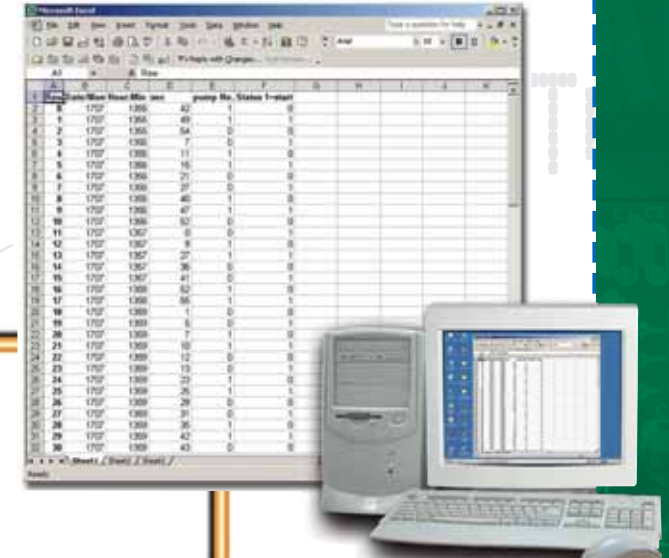
MODBUS

Use MODBUS* to create a multi-device network, and establish master-slave communication between M91 OPLC™ units and any connected device that supports the MODBUS protocol (SCADA systems, servos and other peripheral devices). Networks can also include Vision graphic OPLC™ units. Any M91 in the network may function as either master or slave.

*MODBUS is a feature of the M91 line

RS232/RS485

Serial Communication
Use RS232/RS485* to:

- Gain PC access to stand-alone and networked controllers

- Communicate with external serial devices, such as modems, and serial printers

- Implement MODBUS commands with any MODBUS-supported device

*RS485 is a feature of the M91 line

OPC/DDE

SCADA   MS-EXCEL™

RS232
▼

CANbus

Do you need a distributed control system?
CANbus enables efficient inter-PLC data exchange on your network. Use Unitronics' CANbus protocol to integrate up to 63 M90/M91 units into one high-speed network. Networks can include Vision Graphic OPLC™ units.

OPC Server

Unitronics' OPC/DDE Server enables the OPLC™ to exchange data with any Windows-based application. Use it to interface with SCADA systems, or to Read/Write PLC data from/to Excel, Access, or other applications.
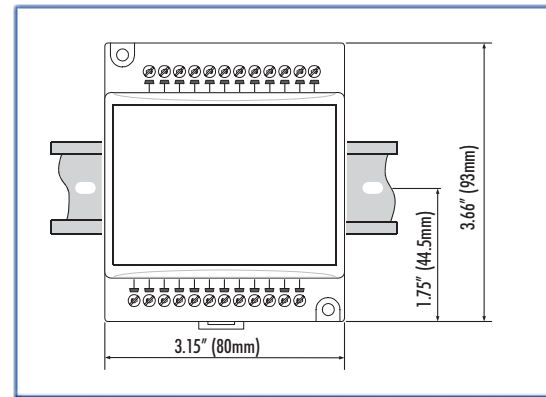
Expand your I/O capacity

Mechanical dimensions

3.66" (93mm)
1.75" (44.5mm)
3.15" (80mm)

DIN-rail mounting
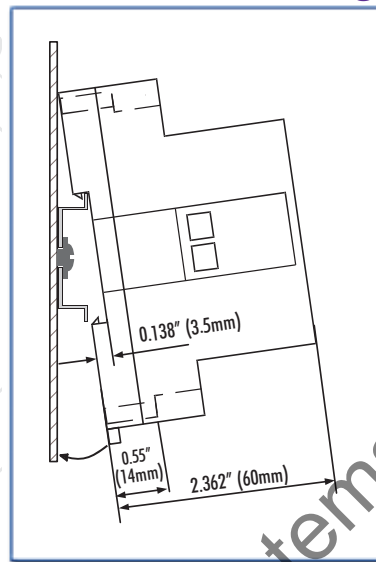

0.138" (3.5mm)
0.55" (14mm)
2.362" (60mm)

Plug-in I/O expansion modules increase your control—and control your budget.

- Add up to 96 digital I/Os
- Additional analog I/Os, temperature and weight measurement inputs
- Up to 8 modules may be connected to a single M90/M91, via an expansion adapter
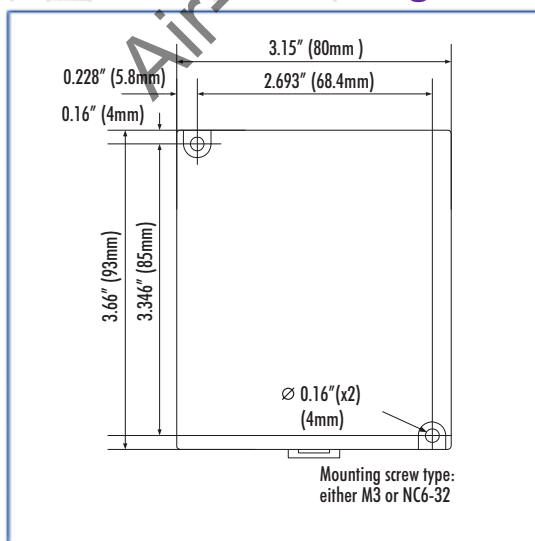- DIN-rail or screw mounting

Screw mounting

3.15" (80mm)
0.228" (5.8mm)
2.693" (68.4mm)
0.16" (4mm)
3.66" (93mm)
3.346" (85mm)
⌀ 0.16"(x2) (4mm)
Mounting screw type: either M3 or NC6-32

20 Compact I/O Expansion models:

Digital modules

IO-DI8-T08
24VDC
8 Digital Inputs, pnp/npn, including one High-speed Counter
8 pnp Transistor Outputs

IO-DI8-R08 NEW
24VDC
8 Digital Inputs, pnp/npn, including one High-speed Counter
8 Relay Outputs

IO-DI8-R04
24VDC
8 Digital Inputs, pnp/npn, including one High-speed Counter
4 Relay Outputs

IO-DI16
24VDC
16 Digital Inputs, pnp/npn, including one High-speed Counter

IO-T016
12/24VDC
16 pnp Transistor Outputs

IO-R08
24VDC (power supply)
8 Relay Outputs

IO-R016
24VDC (power supply)
16 Relay Outputs

EX90-DI8-R08 [1]
24VDC
8 Digital Inputs, pnp, including one High-speed Counter
8 Relay Outputs

EX-A1
Expansion adapter.
Used to link between the PLC and up to 8 expansion modules.
Supports both 12/24VDC.

Analog and Temperature measurement

IO-AI4-A02
24VDC (power supply)
4 Analog Inputs, 12 bit, 0-10V, 0-20mA, 4-20mA,
2 Analog Outputs, 12 bit+sign ±10V, 0-20mA, 4-20mA

IO-A06X
24VDC (power supply)
6 Isolated Analog Outputs,
0-10V, 0-20mA, 4-20mA
12 bit

IO-PT4
4 PT100 Inputs,
Range: -58°F ÷860°F,
(-50°C ÷460°C)
12 bit

IO-ATC8
8 Thermocouple/Analog Inputs,
T/C J, K, T, B, E, N, R, S,
0.1° Resolution
0-10V, 0-20mA, 4-20mA,
12/14 bit

Weight/Strain measurement

IO-LC1 [2]   IO-LC3 [2]
12/24VDC (Power Supply)
1-3 Loadcell / Strain gauge Inputs
Input voltage ranges:
± 20mV, ± 80mV
Excitation: AC/DC
1 Digital pnp Input
2 Setpoint pnp Outputs
*Not supported by all OPLCs™ (Note 2).

CE   c(UL)us LISTED

12VDC is supported by these models: IO-DI8-T08-L, IO-DI8-R08-L, IO-DI8-R04-L, IO-DI16-L, IO-R08L, IO-R016-L. IO-PT4 & IO-ATC8 support any voltage.

[1] The EX90 is housed in an open casing. Only one EX90 can be connected per PLC, as a single expansion module; EX-A1 adapter not required.

[2] IO-LCx modules are currently supported by the Vision & M91 series; IO-LCx is not supported by the M90 series. IO-LCx are not yet UL certified.
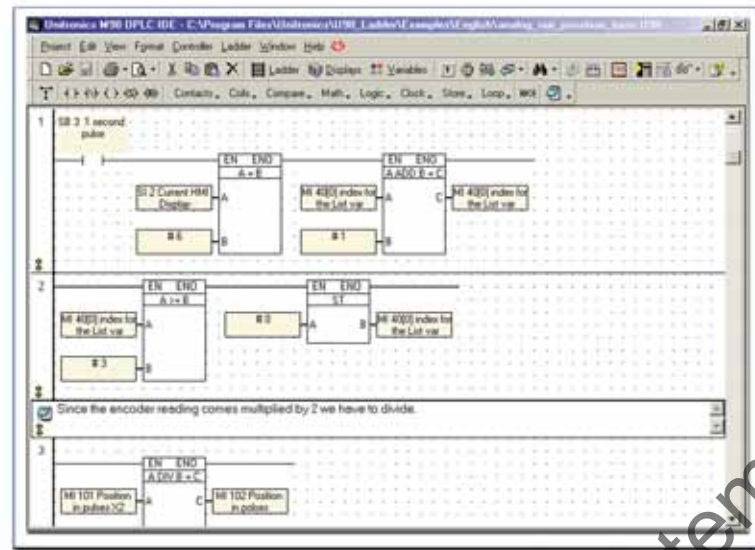
Two in One

U90 Ladder software

Develop both your HMI and PLC control applications in one graphic Windows-based environment.
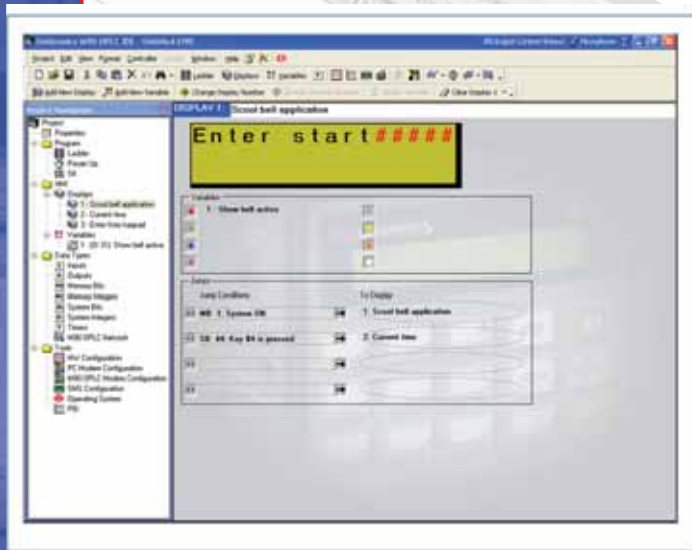
Use U90 Ladder software to:

- Program your application
- Drag-and-drop contacts, coils, timers and function blocks (math, logic, clock)
- Test and debug programs

Use the HMI editor to:

- Design your operator interface
- Compose operator instructions
- Assign functions to keys
- Create and display variables

Integrated HMI:
A built-in advantage

Economical

- Cuts programming time
- Less wiring
- Saves space

Convenient

- A single programming environment for both PLC and HMI applications

Reliable

- Built-in Panel-PLC communication

Use the operator panel to:

- Display conditional messages - Multilingual support available
- Insert data via the M90/M91 keypad
- Show time, date, bit status, timer and integer values (up to 64 HMI variables)
- Display up to 80 user-designed screens
- Add display power: "List" Variables add up to 2K's worth of HMI capacity
- View I/O status, integer values, and system data via Info mode
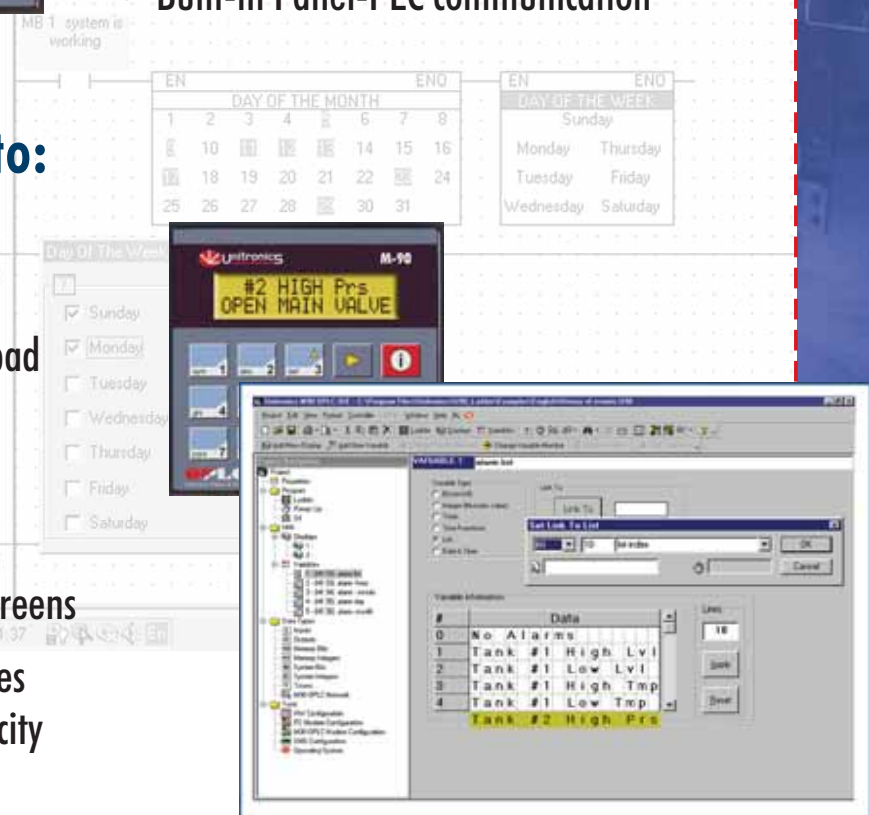
A world of features

High-speed output

Step on it:
Choose any one of the 5 M90/M91 models that include **high-speed outputs** (1.5 to 2 kHz), to control your Stepper motor or PID based application, via PWM.

Shaft encoder

Speed up!
Use the M90/M91's **high-speed counters/ shaft encoders/frequency measurers**. Up to 3 integral 10 kHz high-speed counters/ frequency measurers or direct connections to shaft encoders in any M90/M91 unit.

Print via RS232

Print it out!
Put system data and log events on paper with the **Print** utility. The M90/M91 can send regular or event-provoked messages to any serial printer, either directly or via GSM/landline modem.

4 PID loops with Auto-tune [1]

Flexible PID.
Built-in 4 **PID** loops with Auto-tune[1]. The M90/M91's direct PT100/Thermocouple inputs, analog or high-speed I/Os enable you to establish highly flexible process control.

[1]Auto-tune is provided via an external PC based application.
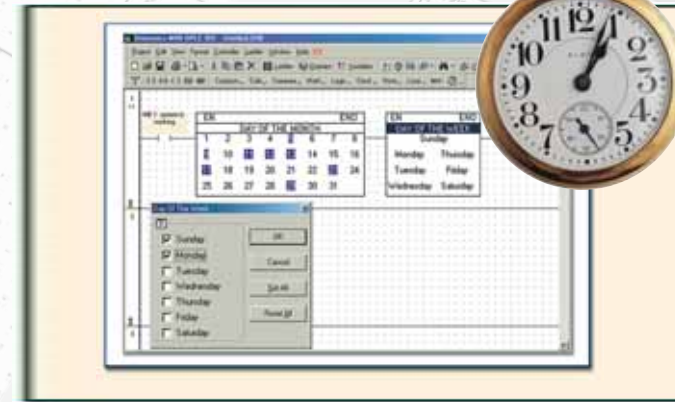
Time-based control

Mark the calendar:
Do you need a specific task to be performed at a specific time and date?

Simply mark the hour, weekday and date in your program, and you have **time-based control**.

List variable

Choose a recipe:
Define recipes/menus for different tasks. The **List Variables** enable you to easily scroll, choose and activate the desired task via the HMI.

Upload

Misplaced the program? Don't know which version is it?
Upload the program from the PLC's Flash memory. Password-protected **Full source** upload option enables you to restore the application, as if it was just saved on your PC (including notes, remarks and symbols).
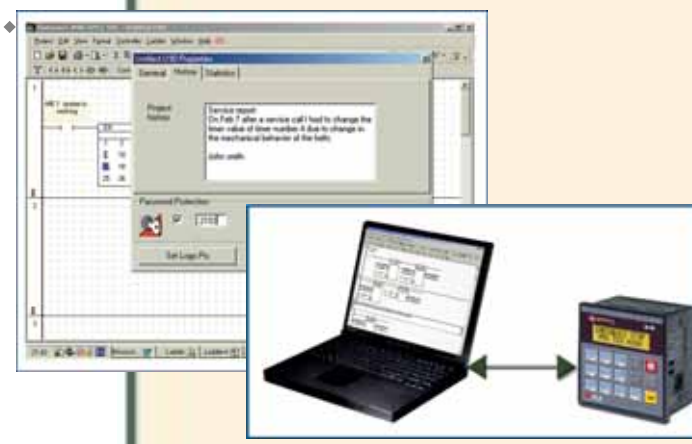
Database

Keep track.
Do you need to record production quantities? Record temperature to monitor refrigeration?

You need the M90/M91's **database** – 1024 integers, to log any required data.
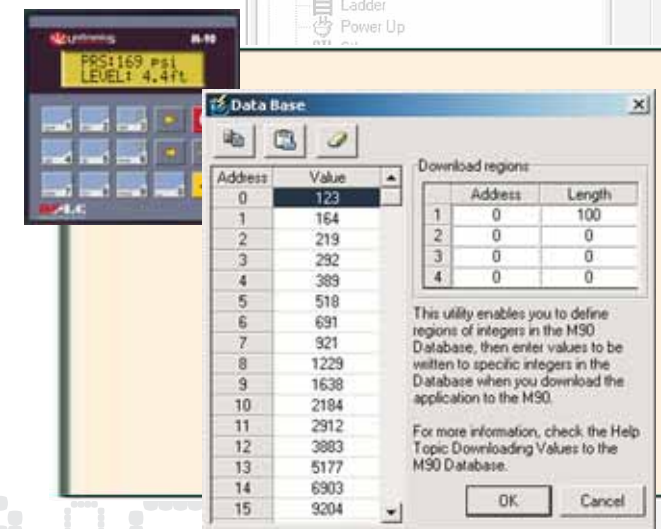
*Certain features may vary according to model.

All in One Package:

- ▶ **OPLC™ Controller**
- ▶ **User Guide**
- ▶ **U90 Ladder software**
- ▶ **Panel-mounting brackets**
- ▶ **Rubber seal for panel-mounting**
- ▶ **Programming cable**
- ▶ **Plug-in I/O connectors**
- ▶ **5 pin plug-in CANbus connector (for CAN models)**
- ▶ **Terminating resistor (for CAN models)**

C **UL** US
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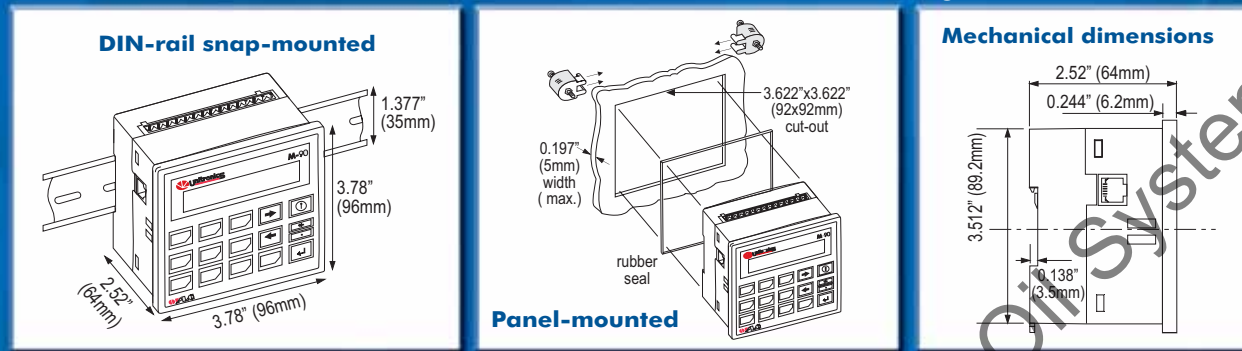## M90/M91 dimensions and mounting

DIN-rail snap-mounted

1.377" (35mm)
3.78" (96mm)
2.52" (64mm)
3.78" (96mm)

0.197" (5mm) width (max.)
3.622"x3.622" (92x92mm) cut-out
rubber seal

Panel-mounted

Mechanical dimensions

2.52" (64mm)
0.244" (6.2mm)
3.512" (89.2mm)
0.138" (3.5mm)

M90/M91 optional accessories:

- ● **GSM Kits**
  Article No.: GSM-KIT-22 (including Wavecom modem)

- ● **RS232 communication cable for GSM modem** (modem to PC)
  Article No.: MJ10-22-CS32 (for Wavecom)

- ● **I/O expansion cable,** length 0.5 to 6m
  Article No.: EX1-CA050 to EX1-CA600

- ● **Power supply**
  1.1 Ampere, 24V Switching Power Supply. DIN-rail or surface mounted.
  Article No.: PS-24-11A

- ● **RS232 to RS422/485 converter**
  Article No.: M90-19-R4

- ● **RS485 connector** (for M91/V120 series)
  Article No.: MJ10-22-CS66

- ● **USB to RS232 converter**
  Article No.: MJ10-22-CS35

About Unitronics

Unitronics design manufactures, and markets quality PLCs for the global market.

Easy to use, efficient, and affordable, our products have been automating processes and stand-alone applications since 1989.

Via our Israeli headquarters and U.S. subsidiary, Unitronics supports a global marketing network of over 100 distributors.

Unitronics' field-proven OPLC™ controllers automate many thousands of installations in diverse fields: petrochemical, automotive, food processing, plastics and textile, energy and environment, water and wastewater management: anywhere automated processes are required.

Our products are installed in:

- ● **Coca-Cola**
- ● **General Motors**
- ● **Michelin**
- ● **Tupperware**
- ● **Intel**
- ● **Bayer**
- ● **Colgate-Palmolive**
- ● **Bosch-Rexroth**
- ● **ABB**
- ● **Land Instruments**
- ● **Mercedes**
- ● **Agfa**
- ● **Tyson Foods**
- ● **Pirelli**
- ● **Fiat**
- ● **Samsonite**

Table 1

	M90-T	M90-TA2-CAN	M90-19-B1A	M91-2-R1	M91-2-R2C
	8 Digital Inputs 6 Transistor Outputs	10 Digital Inputs 8 Transistor Outputs 2 Analog Inputs 1 Analog Output	10 Digital Inputs 6 Relay Outputs 1 Analog Input	10 Digital Inputs 6 Relay Outputs 1 Analog Input	10 Digital Inputs 6 Relay Outputs 2 Analog Inputs
Inputs					
Digital inputs	8 pnp (source) 24VDC	10 pnp (source) 24VDC	10 pnp (source) 24VDC	10 pnp/npn (source/sink) 12/24VDC	10 pnp/npn (source/sink) 12/24VDC
High-speed counter/ Shaft-encoder/ Frequency measurer[3]	One 10 kHz, 16 bit resolution	One 10 kHz, 16 bit resolution	One 10 kHz, 16 bit resolution	Three 10 kHz, 16 bit resolution	Three 10 kHz, 16 bit resolution
Analog input types	None	Two 10 bit inputs: 0-10V	One 10 bit input: 0-5V, 0-10V, 0-20mA, 4-20mA	One 10 bit input: 0-10V, 0-20mA, 4-20mA	Two 10 bit inputs: 0-10V, 0-20mA, 4-20mA
Temperature measurement	None	None	None	None	None
Outputs					
Digital outputs	6 pnp (source)	8 pnp (source)	6 relay outputs	6 relay outputs	6 relay outputs
High-speed outputs/PWM	None	None	None	None	None
Analog outputs	None	One 10 bit output 0-10V	None	None	None
Program					
Ladder code memory (virtual)	24K	24K	12K	36K	36K
Execution time for bit operations	12µS	12µS	12µS	12µS	12µS
Bit/Coils	256				
Integers/Registers (16 Bit)	256				
Timers	64				
Database	1024 integers (indirect access)				
Display					
Type	STN LCD display, LED backlight				
Display size	**1 line x 16 characters**				
HMI displays	80 user-designed displays available				
Variables	50 HMI variables enable the conditional display & modification of text, numbers, dates, times & timer values. List Variables can add up to 120 conditional text messages.				
Keypad					
Number of keys	15 sealed membrane keys, including 14 programmable keys				
Communication					
Serial communications	RS232 port				
CANbus	None	Yes	None	None	Yes
GSM support	None	Enables SMS messages, containing text and variable data, to be communicated to and from many different phone numbers. Up to 1K of user-defined messages.			
MODBUS	None	None	None		
General					
Power supply	24VDC	24VDC	24VDC	12/24VDC	12/24VDC
I/O expansion option	Up to 64 additional I/Os		None		
PID	None	4 independent PID loops with Auto-tune[4]			
Clock (RTC)	Real-time clock functions (date and time)				

Table 2

	M91-2-R6C	M91-2-R34[1]	M91-2-T1	M91-2-T38[1]	M91-2-T2C	M91-2-UN2	M91-2-UA2
	6 Digital Inputs 6 Relay Outputs 6 Analog Inputs	20 Digital Inputs 12 Relay Outputs 2 Analog/Digital Inputs[2]	12 Digital Inputs 12 Transistor Outputs	22 Digital Inputs 16 Transistor Outputs	10 Digital Inputs 12 Transistor Outputs 2 Analog/Digital Inputs[2]	10 Digital Inputs 12 Transistor Outputs 2 PT100/TC/Analog/ Digital Inputs[2]	10 Digital Inputs 10 Transistor Outputs 2 TC/Analog/Digital Inputs[2] 2 Analog Outputs
Digital inputs	6 pnp/npn (source/sink) 24VDC	22[2] pnp/npn (source/sink) 24VDC	12 pnp/npn (source/sink) 12/24VDC	22 pnp/npn (source/sink) 24VDC	12[2] pnp/npn (source/sink) 12/24VDC	12[2] pnp/npn (source/sink) 12/24VDC	12[2] pnp/npn (source/sink) 24VDC
High-speed counter/ Shaft-encoder/ Frequency measurer[3]	One 10 kHz, 16 bit resolution	Three 10 kHz, 16 bit resolution	Two 10 kHz, 16 bit resolution	Two 10 kHz, 16 bit resolution	Three 10 kHz, 16 bit resolution	Two 10 kHz, 16 bit resolution	One 10 kHz, 16 bit resolution
Analog input types	Six 10 bit inputs: Two 0-10V, 0-20mA, 4-20mA; Four 0-20mA, 4-20mA	Two[2] 10 bit inputs: 0-10V, 0-20mA, 4-20mA	None	None	Two[2] 10 bit inputs: 0-10V, 0-20mA, 4-20mA	Two[2] 14 bit inputs: 0-10V, 0-20mA, 4-20mA	Two[2] 14 bit inputs: 0-10V, 0-20mA, 4-20mA
Temperature measurement	None	None	None	None	None	Two[2] PT100 or Thermocouple inputs	Two[2] Thermocouple inputs
Digital outputs	6 relay outputs	12 relay outputs	12 pnp (source)	16 pnp (source)	12 pnp (source)	12 pnp (source)	10 pnp (source)
High-speed outputs/PWM	None	None	First 2 outputs can function as HSO, 2 kHz maximum				
Analog outputs	None	None	None	None	None	None	Two 12 bit Outputs, 0-10V, 4-20mA
Ladder code memory (virtual)	36K	36K	36K	36K	36K	36K	36K
Execution time for bit operations	12µS	12µS	12µS	12µS	12µS	12µS	12µS
Bit/Coils	256						
Integers/Registers (16 Bit)	256						
Timers	64						
Database	1024 integers (indirect access)						
Type	STN LCD display, LED backlight						
Display size	**2 lines x 16 characters**						
HMI displays	80 user-designed displays available						
Variables	64 HMI variables are available to conditionally display and modify text, numbers, dates, times and timer values. The user can also create a list of up to 120 variable text displays, totaling up to 2K.						
Number of keys	15 sealed membrane keys, including 14 programmable keys						
Serial communications	RS232/RS485 port (selectable)						
CANbus	Yes	None	None	None	Yes	None	None
GSM support	Enables SMS messages, containing text and variable data, to be communicated to and from many different phone numbers. Up to 1K of user-defined messages.						
MODBUS	Supports MODBUS protocol, Master-Slave						
Power supply	24VDC	24VDC	12/24VDC	24VDC	12/24VDC	12/24VDC	24VDC
I/O expansion option	Up to 96 additional I/Os						
PID	4 independent PID loops with Auto-tune[4]						
Clock (RTC)	Real-time clock functions (date and time)						

[1] M91-2-R34 and M91-2-T38 are not yet UL certified.

[2] In these models certain inputs can function as either digital, analog, thermocouple or PT100 inputs (model-dependent). When using these inputs as thermocouple or PT100, the number of free digital inputs is reduced to 8 or 7, respectively.

[3] Certain inputs can function as high-speed counters, shaft-encoder inputs, frequency measurers, or normal digital inputs.

[4] Auto-tune is provided via an external PC based application.

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