

# M3000 Analog Alarm Annunciator

Alarm annunciator for use with all types of analog sensors that provide a current or voltage signal. Features 24 analog/digital inputs and 48 programmable alarms. Ideal for use with signal transmitters, 0-10 V DC or 4-20mA.

- 24 inputs for use with both analog and digital signals
- Each input accepts both current and voltage signals
- 48 alarms with individual reference to any of the 24 inputs
- Programmable 10 character LCD text for each alarm
- Alarm delay programmable within the range of 300 msec. to 10 days
- 24 LEDs with indication of new and acknowledged alarms.
- Each LED can be programmed to annunciate one or more alarms
- 14 open collector outputs provide on/off control of external devices
- Each of the 14 outputs can be assigned to one or more alarms
- LCD provides real time input measurements
- 16 key keyboard for on site configuration and daily operation
- PC based programming through RS232 link
- RS485 interface for field-bus communication
- Standard MODBUS-RTU protocol
- Certified by major marine classification societies

## Application

The M3000 provides a cost-effective solution where multiple analog sensors are to be surveyed. The 24 inputs of the M3000 will accept both current and voltage sources, and almost any type of sensors can be connected through use of standard current transmitters.

## Function

The M3000 features a total of 48 programmable alarms. Multiple alarms can be assigned to the same input to provide annunciation at different input levels and selectable delays. An alarm is annunciated when the input passes above or below a critical level, indicated by the set point.

Annunciation of an alarm can be displayed on any one of the 24 LEDs located on the front plate. Each LED will

indicate new alarms with flashing light and acknowledged (reset) alarms with steady light. The user can acknowledge all new alarms by pressing the "C" key.

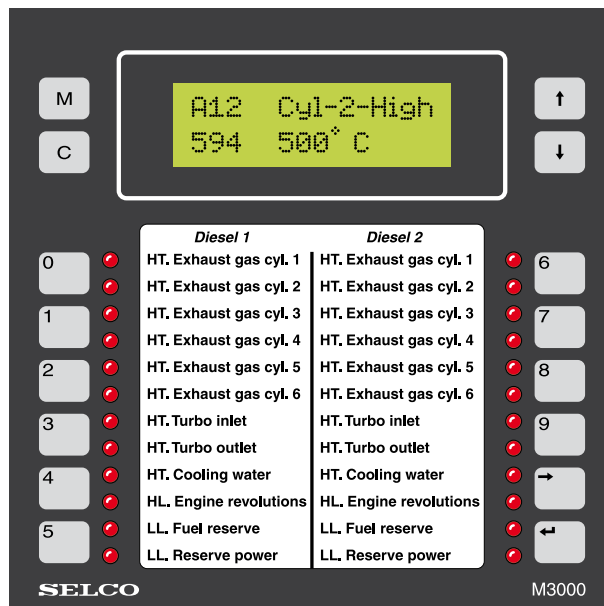
Each alarm can be programmed to control one of the 14 open collector (on/off) outputs provided at the rear connectors of the M3000. The 14 open collector outputs are ideal for controlling devices that require an alarm dependent on/off signal.

Two additional open collector outputs have been provided, one is intended for siren control and the other will activate to indicate that one or more alarms exist. The front plate includes an illuminated LCD display with 2 lines of 16 characters. The LCD provides the user with a 10 character alarm description, the alarm set point and the actual input measurement.

## Connection

The rear of the M3000 annunciator is illustrated on the following page.

The power supply plug-in connector of the M3000 includes 3 terminals, one for +24V DC, one GND reference and one terminal DIM for dimming of the LEDs on the front panel of the unit. For dimming purpose a potentiometer of 100k $\Omega$  is connected between the terminal DIM and the terminal GND.



The M3000 includes two standard interfaces for serial data communication.

The RS232 interface is intended for PC configuration of the unit.

The RS485 is intended for long distance bus communication between multiple units.

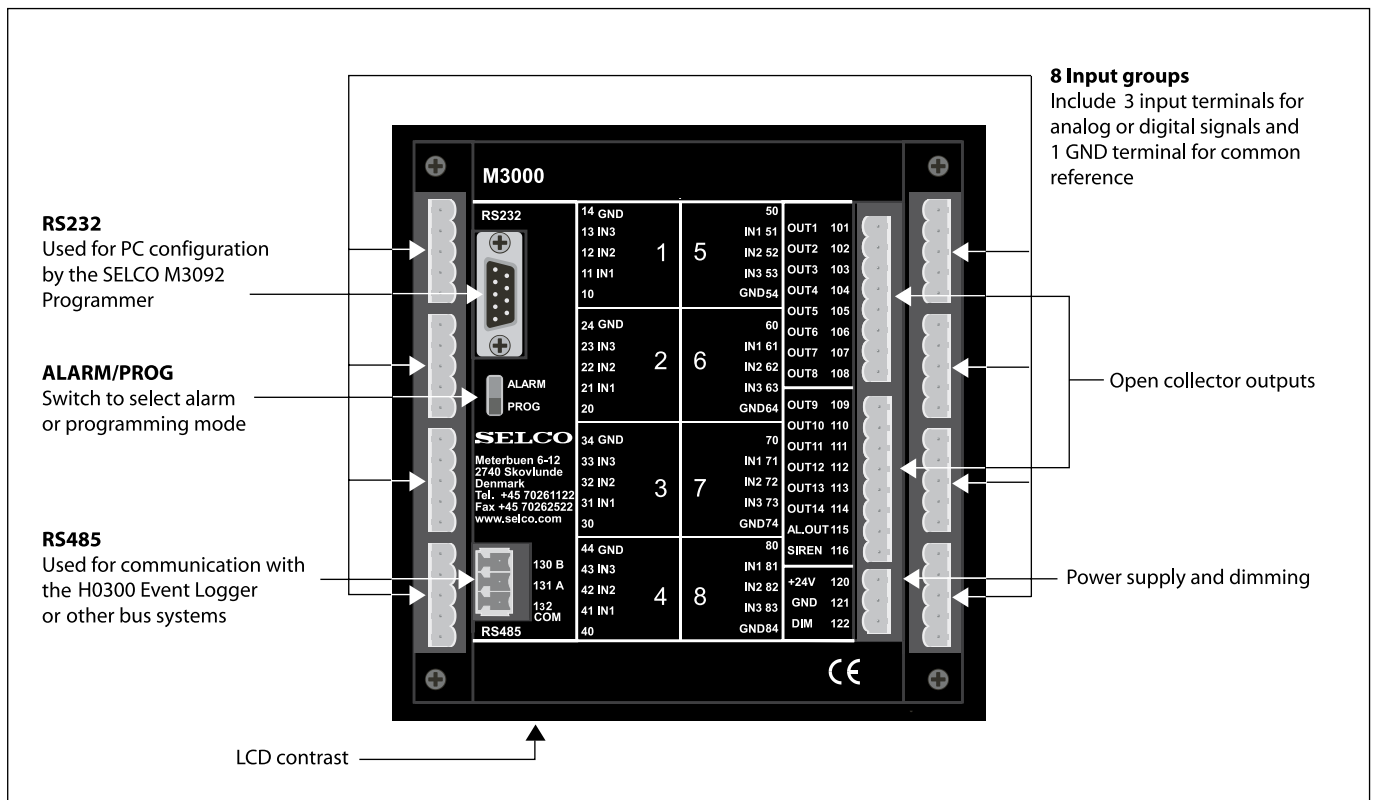
The SELCO H0300 Event Logger can log alarms and events from multiple M1000 and M3000 alarm annunciators, connected to the common 2-wire RS485 bus. The H0300 can survey and log events from up to 63 units. The maximum cable length of the RS485 bus is approximately 1000 metres.

24 inputs can be connected via 8 plug-in connectors.

Two plug-in connectors located on the right side provide terminals for 14 open collector outputs.

The 24 inputs can be connected to sensors with either an analog or a digital output in the form of a current or voltage signal.

The 8 plug-in connectors, each with 3 input terminals, provide the 24 inputs to the M3000. A common ground terminal (GND) has been included in each plug-in connector to provide a negative reference for the 3 inputs.



The input plug-in connectors will later on be referred to as “input groups”. Each input can be configured for current or voltage input. Fig. 1 to 5 illustrate possible input group configurations which can be arranged as follows:

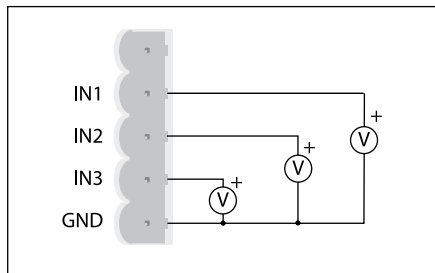


Fig. 1. 3 x Voltage inputs.  
It is possible to connect to three sensors with voltage output to each input group. The output from each sensor must be connected between an input terminal and the negative reference terminal.

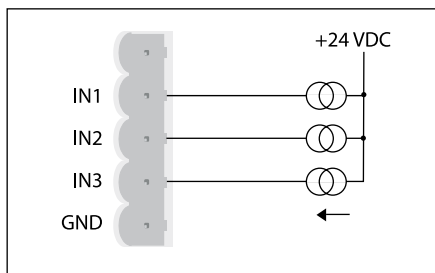


Fig. 2. 3 x Current inputs.  
This configuration shows the connection of three current sources. This configuration is valid for any kind of transmitter that provides a current output in the range 0-20mA.

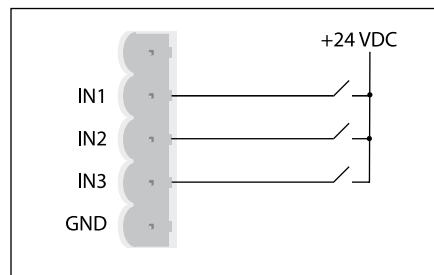


Fig. 3. 3 x Contact inputs.  
The M3000 also accepts the on/off signals provided by potential free contacts. Any input voltage between 0 and 24V DC is accepted.

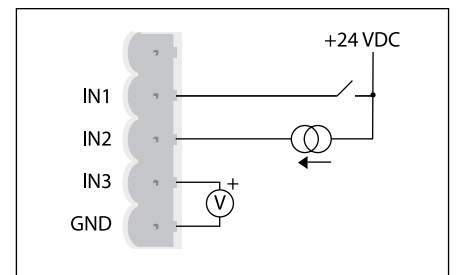


Fig. 4. 3 x Mixed sensor types.  
It is also possible to mix the sensor types within an input plug-in connector. This example shows 3 different sensors connected to the same input plug-in connector.

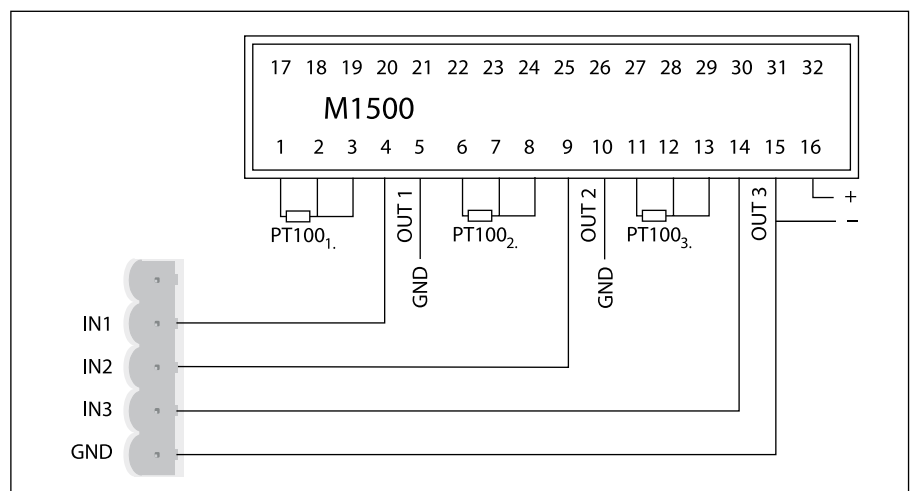


Fig. 5. 3 x PT100 transmitters.  
The SELCO PT100 6 Way Transmitter M1500 provides a cost-effective solution and includes 6 current transmitters in one box to be connected to PT 100 resistors. The unit is intended for mounting near the sensors. This example shows connections to one input group of M3000. For further details see separate data sheet M1595.

## Average Calculation

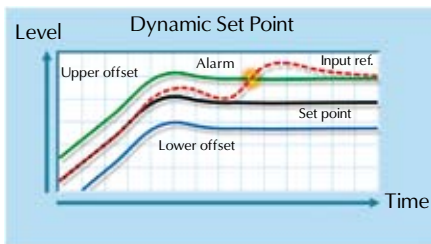


Fig. 6. Average calculation.

The M3000 can perform average calculation, which is useful for monitoring of the exhaust gas temperatures of diesel or gas engines. The average temperature for a number of cylinders is calculated. If the temperature of one of the cylinders deviates from the average of the remaining cylinders more than a preset  $\pm$  offset, a deviation alarm will be reported.

## Programming

The M3000 Analog Alarm Annunciator can be programmed both from the front plate keyboard and from a PC using the Windows based software M3092. The procedure of keyboard based programming is similar to the procedures found on other microprocessor based products. Configuration parameters are selected and modified through multiple choice selections and parameter input from the numeric keyboard.

Programming from the PC using the SELCO M3092 Programmer gives the advantage of a full screen display showing multiple parameters (see Fig. 7). The M3092 is delivered with the M3000 and allows a very easy and flexible configuration of all the parameters in the unit. The M3092 features a "spreadsheet-like" user interface. The software checks and validates all the parameters and gives printouts with a good overview. It is also possible to import / export all parameters into an Excel spreadsheet.

Each of the eight input plugs (groups) described previously relates to a configuration similar to the one shown in Fig. 8.

The first three lines of the group configuration shown include the parameters used to define the configuration of the three input terminals located in the group plug-in connector.

Input parameter details are:

- **InpTp:** The type of signal provided by the connected sensor: 20mA, 10V, 24V and Off - must be "Off" if no sensor is connected to the input.

Fig. 7. M3092 M-Programmer.

- **LCDU:** Four characters used to indicate the unit of measurement in the LCD. Examples: C, F, kW, Bar, Gal, Kg, Volt, Amp. etc.
- **InpLo:** The low reference of the input signal.
- **LCDLo:** The low reference of the displayed measurement. Used together with the "InpLo" parameter to define the relationship between the signal on the input terminal and the measured value displayed in the LCD.
- **InpUp:** The upper reference of the input signal.
- **LCDUp:** The upper reference of the displayed measurement. Used together with the "InpUp" parameter to define the relationship between the signal at the input terminal and the measured value shown in the LCD.
- **InpRf:** The input reference of the alarm. This parameter holds a reference to the surveyed input. Alarm will be disabled if this parameter has been set to "Off".
- **Set:** Defines the input level that will trigger the alarm. The operator (" $<$ " or " $>$ ") defines the area of alarm condition.
- **Text:** A 10 character text is shown in the LCD together with the measurement and the set point.
- **Delay:** In order to trigger the alarm, the input signal must stay above or below the set point for the time period defined by the delay. The delay is defined by the multiplication of a time value and a multiplication factor.
- **LED:** The LED parameter defines which one of the 24 LEDs will annunciate the alarm. Setting this parameter to "Off" will disable LED annunciation.
- **Outp:** Defines which output to activate upon alarm annunciation. Setting this parameter to "Off" will prevent the activation of any output.

Also included in each of the eight group configurations are six alarms. Although placed in the group configuration, the six alarms can be used to survey an input of another group. The description of the alarm configurations is stated below.

| Input: | InpTp: | LCDU:    | InpLo:    | LCDLo:     | InpUp: | LCDUp: |
|--------|--------|----------|-----------|------------|--------|--------|
| Inp:1  | 10V    | Volt     | 0.00      | 0.00       | 10.00  | 10.00  |
| Inp:2  | 20mA   | C        | 4.0       | 0          | 20.0   | 100    |
| Inp:3  | 24V    | Digi     | 0.0       | 0          | 24.0   | 24     |
| Alarm: | InpRf: | Set:     | Text:     | Delay:     | LED:   | Outp:  |
| Alr:1  | 11     | $< 2.0$  | 1 is low  | 25 x 100ms | L01    | O01    |
| Alr:2  | 11     | $> 8.0$  | 1 is high | 25 x 100ms | L02    | O02    |
| Alr:3  | 12     | $< 10$   | 2 is cold | 10 x 1s    | L03    | O01    |
| Alr:4  | 12     | $> 90$   | 2 is warm | 10 x 1s    | L04    | O02    |
| Alr:5  | 13     | $< 12.0$ | 3 is off  | 20 x 100ms | L05    | O01    |
| Alr:6  | 13     | $> 12.0$ | 3 is on   | 20 x 100ms | L06    | O02    |

Fig. 8. Group programming parameters.

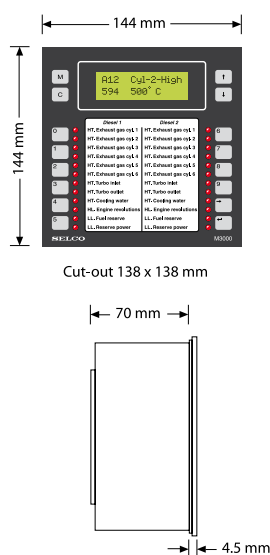


Fig. 9. Dimensions.

### Type Approvals and Certificates

The M3000 has been designed and tested for use in harsh environments. The M3000 carries the CE label and has been approved by the following marine classification societies:



Bureau Veritas  
ClassNK  
Det Norske Veritas  
Germanischer Lloyd  
Lloyd's Register of Shipping  
Registro Italiano Navale  
Russian Register of Shipping

# Specifications

## M3000 Analog Alarm Annunciator

|                                   |                                                                                                |
|-----------------------------------|------------------------------------------------------------------------------------------------|
| <b>Voltage supply</b>             | 24V DC $\pm 30\%$                                                                              |
| <b>Consumption</b>                | Max. 400mA                                                                                     |
| <b>Inputs</b>                     | 24, organized in 8 plug-in connectors                                                          |
| <b>Input types</b>                | 20mA, 10V DC and 24V DC                                                                        |
| <b>ADC resolution</b>             | 12 bits (depending on selected input type)                                                     |
| <b>Alarms</b>                     | 48 with programmable input reference                                                           |
| <b>Alarm delays</b>               | 300 msec. – 10 days                                                                            |
| <b>Outputs</b>                    | 14 on/off open collector outputs, each controlled by one or more alarms. Max. 150mA per output |
| <b>General alarm output</b>       | On/off open collector output. Max. 150mA                                                       |
| <b>Siren control</b>              | On/off open collector output. Max. 150mA. External relay required                              |
| <b>LEDs</b>                       | 24, each controlled by one or more alarms                                                      |
| <b>Alarm annunciation</b>         | Flashing LED for new alarm, steady light for acknowledged alarm                                |
| <b>LED flash frequency</b>        | 1.25Hz $\pm 10\%$                                                                              |
| <b>LCD</b>                        | 2 x 16 characters with background light                                                        |
| <b>Programming</b>                | From front plate keyboard or via RS232 interface                                               |
| <b>Communication</b>              | RS485 interface                                                                                |
| <b>Protocol</b>                   | MODBUS-RTU or SELCO BUS protocol                                                               |
| <b>Baud rate</b>                  | 1200, 2400, 4800, 9600                                                                         |
| <b>Parity</b>                     | None                                                                                           |
| <b>Data bits</b>                  | 8                                                                                              |
| <b>Stop bits</b>                  | 1                                                                                              |
| <b>Operating temperature</b>      | -20 to +70°C                                                                                   |
| <b>Humidity</b>                   | 95% RH at 20°C                                                                                 |
| <b>Vibration test</b>             | 4g RMS according to IEC 60068-2-64                                                             |
| <b>EMC</b>                        | CE according to EN50081-1, EN50082-1, EN50081-2, EN50082-2 and EN61000-2-6                     |
| <b>Approvals</b>                  | Certified by major marine classification societies                                             |
| <b>Burn-in</b>                    | 50 hours before final test                                                                     |
| <b>Weight</b>                     | 0.8kg                                                                                          |
| <b>Dimensions</b>                 | 144 x 144 x 70mm (H x W x D)                                                                   |
| <b>Panel cut out</b>              | 138 x 138mm                                                                                    |
| <b>Protection degree at front</b> | IP54                                                                                           |

The specifications are subject to change without notice.

### Type Selection

| Type       | Supply |
|------------|--------|
| M3000.0010 | 24V DC |

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