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User Manual

Marine Pro.

400 Series

SDU 410 Safety Shutdown Unit, P/N 1006451

auto MASKIN

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1 Preface

1.1 About this Manual

This manual has been published primarily for professionals and qualified personnel.
The user of this material is assumed to have basic knowledge in marine systems, and must be able to carry out related electrical work.

⚠ Work on the low-voltage circuit should only be carried out by qualified and experienced personnel.

Installation or work on the shore power equipment must only be carried out by electricians authorized to work with such installations.

1.2 Responsibilities

⚠ It is the sole responsibility of the installer to ensure that the installation work is carried out in a satisfactory manner, that it is operationally in good order, that the approved material and accessories are used and that the installation meets all applicable rules and regulations.

ⓘ Auto-Maskin continuously upgrades its products and reserves the right to make changes and improvements without prior notice.

All information in this manual is based upon information at the time of printing. For updated information, please contact your local distributor.

The crossed-out wheeled bin symbol indicates that the item should be disposed of separately. The item should be handed in for recycling in accordance with local environmental regulations for waste disposal.

By separating a marked item, you will help reduce the volume of waste sent to incinerators or land-fill and minimize any potential negative impact on human health and the environment.

1.3 Revisions

This User Manual is valid for the following firmware version of the SDU 410.

Firmware Version	**Release**
1.49	November 2020

User Manual revision: **June 2023**

1.3.1 Document History

Revision	Date	Description
1.0	01.09.2011	Initial Release Revision.
1.1	12.12.2016	Updated according to FW 1.48 in addition to other minor changes.
1.2	11.04.2018	Updated according to naming convention and clarified pickup usage.
1.3	18.11.2020	Updated according to FW 1.49.
1.4	27.06.2023	Updated Power threshold limits (new and old versjon)

2 Product Overview

The SDU 410 is a safety shutdown unit. Its main purpose is to shutdown the engine when configured to do so. It can be used standalone, or linked to a DCU Engine Controller in the 200 Series or 400 Series.

The SDU 410, or any other safety shutdown unit in the SDU family, is mandatory in classed installations that are to be type approved.

When linked to a DCU, the DCU will detect the SDU automatically.

2.1 Indication LEDs

2.1.1 Status LEDs

LED	Description		
POWER	Lit (steady) when power is applied and above the **Battery Low** limit. Flashing if voltage is below **Battery Low** limit. Alarm is activated if it stays below this limit for more than 30 seconds. This will also activate the Buzzer and Fault relay.	Old SDU 410 Rev P1D or earlier FW: 1.44 or earlier **Battery Low** 23 V **Battery Fail** 21 V	SDU 410 P1E or later FW: 1.45 or later **Battery Low** 21 V **Battery Fail** 18 V
LOAD REDUCTION	LED lit when SDU is in load reduction state. That is, when any of the configured channels are indicating load reduction.		
RUNNING	LED activates when the SDU senses engine speed above the configured setpoint, typically 400 rpm.		
TACHO 1	LED lit if engine speed is above 5 rpm.		
TACHO 2	LED lit if engine speed is above 5 rpm.		
SHUTDOWN OVERRIDE	The Shutdown Override input channel is activated.		
BUZZER	The built-in buzzer is active.		

LED	Description
COM 1	Flashes when the SDU communicates with a DCU engine panel.
COM 2	Flashes when the SDU communicates on its Modbus RTU interface.
COM 3	Flashes when the SDU communicates on the ethernet interface.

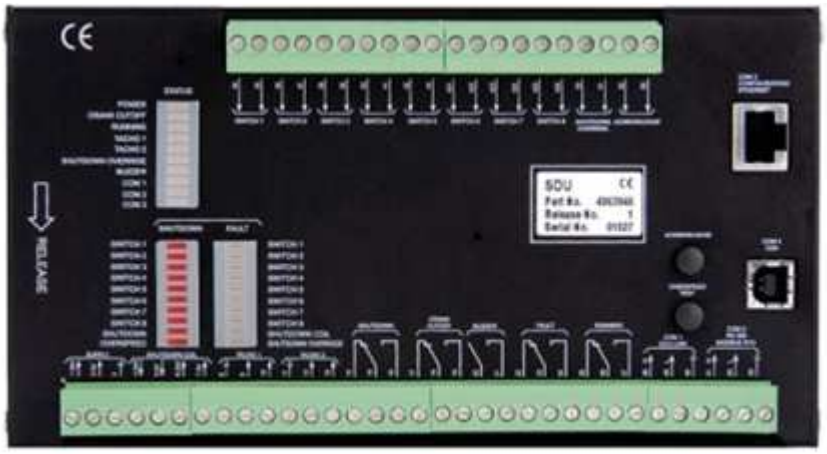
2.1.2 Shutdown and Fault LEDs

LED	ACTIVE	FAULT
SWITCH 1-8	Lit when in load reduction or shutdown.	Lit when channel wiring is faulty.
SHUTDOWN	Lit for any shutdown situation.	Lit if the Shutdown Coil output detects a broken coil.
OVERSPEED	Lit when in Overspeed. **Quick** flash when in Overspeed Test mode.	Lit if the **Shutdown Override** input channel detects faulty wiring.

2.1.3 Flashing and Lit LEDs

Flashing	New and unacknowledged situation.
Steady Lit	Operator acknowledged, but the situation is still present.

2.2 Shutdown Channels



2.2.1 Switch Channels

There are eight switch input channels that can initiate a shutdown situation.

Each channel can be configured with the following parameters:

- **Event** can be Disabled, Load Reduction or Shutdown. Event can also be configured as “Shutdown Override #2”.
- **Delay** before shutdown [0 – 60 sec].
- **RPM dependency** makes the channel activate above a certain engine rpm only.
- **Keep enabled on Shutdown Override** makes it possible to keep the channel enabled in a Shutdown Override situation.
- **On Run Only** keeps the channel from indicating a shutdown while the engine is not running. This is a typical configuration for pressure sensors.
- **Delayed Shutdown** delays the shutdown.

The SDU will disable all switch channels if the power supply is below **Battery Fail** Limit for more than 30 seconds.

2.2.2 Pickup Channels

There are two pickup channels on the SDU. The unit can be configured to use one or two channels.

Some classification societies require the use of both pickup inputs

When a valid pickup signal is received on either channel, the corresponding LED will be lit.

The LED will be lit when the measured engine speed is above 5 rpm.

If two channels are being used, and the measured engine speed on the two channels are different, then the SDU will be “using” the one that indicates the highest engine speed.

If one of the two channels is missing/faulty while the engine is running, then the LED for the missing channel will flash. This is typically caused by a broken wire. If the SDU is linked to a DCU, then the DCU will issue a warning for this situation.

2.3 Shutdown Situations

2.3.1 From Overspeed

If either of the two configured engine speed inputs senses an engine speed higher than the configured max setting, then the SDU will activate the common shutdown outputs.

Shutdown Override

The Shutdown Override input does not disable the Overspeed Shutdown.

Indication

The red LED OVERSPEED will be lit.

The red LED SHUTDOWN will be lit.

Acknowledge

When the engine has stopped, the shutdown can be reset using the Acknowledge button on the SDU.

2.3.2 From Switch

If either of the switches indicates a shutdown, then the SDU will activate the common shutdown outputs.

Shutdown Override

Each switch channel may be configured to disregard the Shutdown Override input command.

Indication

The red LED for the corresponding switch will be lit.

The red LED SHUTDOWN will be lit.

Acknowledge

When the engine has stopped, the shutdown can be reset using the Acknowledge button on the SDU.

2.4 Relays and Other Outputs

2.4.1 Relays

One relay is fixed for SHUTDOWN. The other 4 relays are configurable.

Relay Function	**Description**
SHUTDOWN	Activates for any shutdown. Stays activated until engine has stopped, and the operator command the Acknowledge button.
CRANK CUTOFF	Activates at the configured Engine Run setpoint, typically 400 rpm. Deactivates when the SDU senses that the engine has stopped (<5 RPM).
BUZZER	Activates for any new shutdown or fault. Deactivates when the operator command the Acknowledge button.
FAULT	This is the Common Fault indication.

	Activates for any new fault. Deactivates when all faults are acknowledged and has disappeared.
RUNNING	Activates at the configured Engine Run setpoint, typically 400 rpm. Deactivates when the SDU senses that the engine has stopped.
OVERSPEED SHUTDOWN	Activates if the SDU senses an overspeed shutdown. Deactivates when the engine is stopped and the event is acknowledged.
OVERSPEED TEST MODE	Activates when the SDU is in overspeed test mode.
SHUTDOWN OVERRIDE #1	Activates when the SDU is in shutdown override mode.
SHUTDOWN OVERRIDE #2	Activates if any of the channels are configured as “Shutdown Override #2”, and at least one of these inputs are active.
LOAD REDUCTION	Activates when in load reduction state.
DELAYED SHUTDOWN IMMINENT	Activates when the SDU will perform a shutdown, but the channel has a delayed shutdown configured.

2.4.2 Shutdown Coil

This output activates for any shutdown.

It deactivates when the engine has stopped + eight (8) seconds.

Coil Detection

The SDU indicates a fault if there is a broken wire in the connected relay coil on terminals 4 and 5.

The coil impedance shall be in the range 300 – 700 ohm.

Power Supply

The Shutdown Coil operates from its own separate power supply on terminals 6 and 7.

2.5 Buttons and Other Inputs

2.5.1 Buttons

Button	**Description**
Acknowledge	Whenever there is a flashing LED in the SHUTDOWN or FAULT section,

	this can be Acknowledged by the user by commanding the Acknowledge button.
Overspeed Test	Press and hold until the Overspeed Test LED flashes rapidly. The SDU is now in Overspeed Test mode, where the overspeed setpoint is reduced to 95% of the configured Nominal speed. Now, start the engine. If the Overspeed Shutdown has been disabled in the configuration, then this test will NOT generate a shutdown. The Overspeed Test mode is deactivated by either: ● Performing the test, ending in an Overspeed Shutdown at 95% of the Nominal setpoint. ● Pressing the Overspeed Test button again. ● Automatic timeout after 5 minutes.

2.5.2 Shutdown Override

Connect a normally open (NO) switch, with a 10k ohm resistor across the two terminal inputs 50 and 51.

When activated by closing the switch, the SDU will disable all shutdown channels, unless those configured specifically to work also in Shutdown Override.

An example of the latter is Manual E-Stop, which shall always work.

2.5.3 Acknowledge

This is a remote acknowledge input channel that works exactly as the Acknowledge button.

Connect a normally open (NO) switch, across the two terminal inputs 52 and 53.