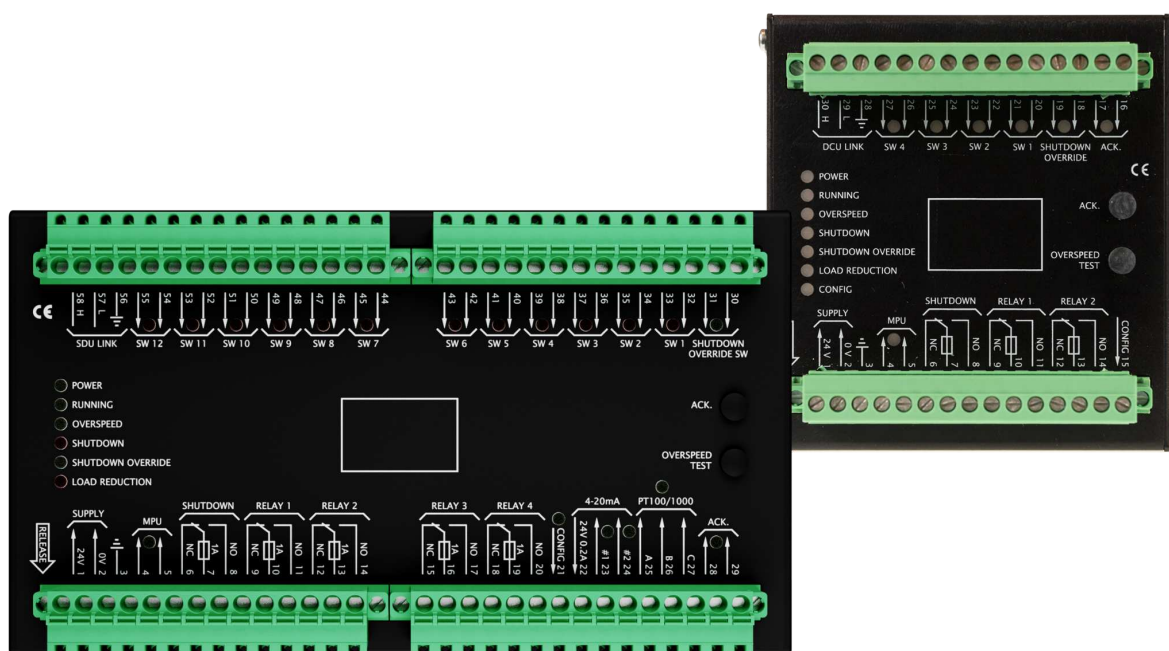# Installation Manual

Marine Pro.

400 Series

SDU 404 Safety Shutdown Unit, P/N 1006418
SDU 420 Safety Shutdown Unit, P/N 1500158

auto
MASKIN

Table of contents

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

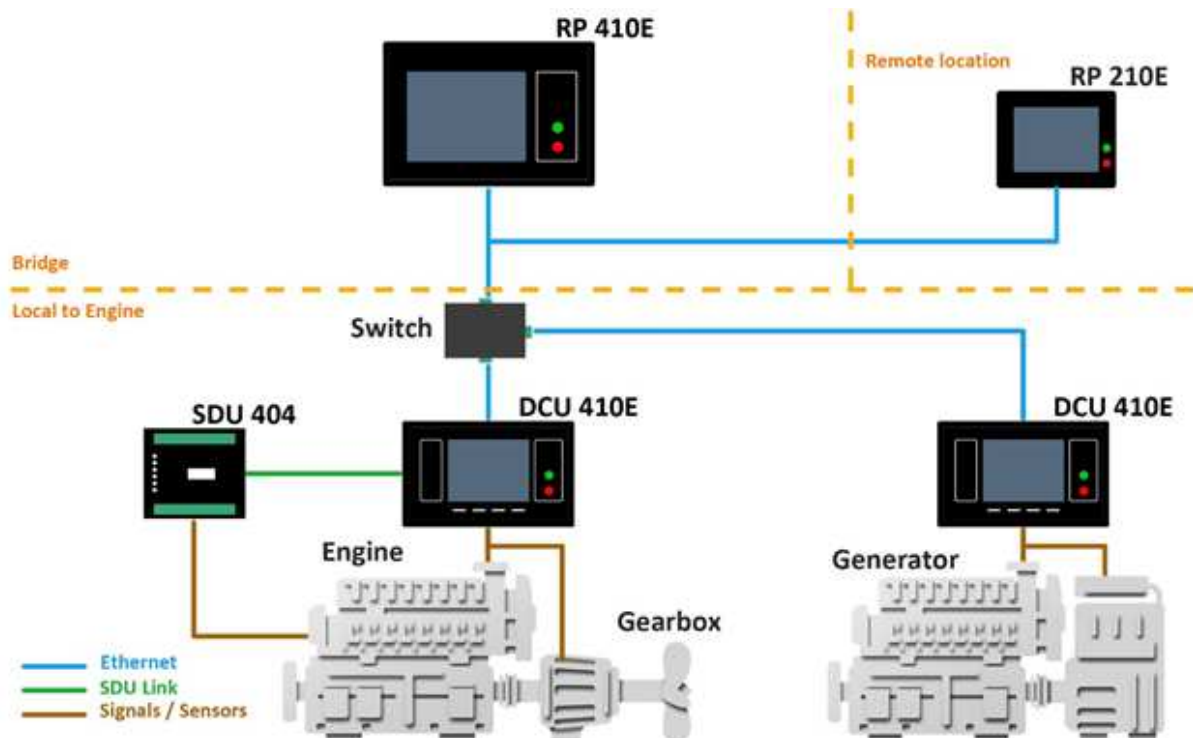Installation Manual revision: **January 2022**

2 Ordering Information

The Marine Pro covers a wide range of compatible products within both the 200- and 400 Series. Please visit our website for more information.

http://auto-maskin.com/marine/

3 System Overview

The figure below shows a typical layout with the SDU included for one engine.

3.1 DCU Engine Controller

The DCU Engine Controller is the main building block in the Marine Pro family.

Engine sensor values are displayed on the colour touch screen, and commands and other user interaction is also here.

3.2 RP Remote Panel

The optional RP Remote Panel brings the DCU data and interface to a remote location with no need for any configuration.

3.3 Ethernet Switch

It's recommended to always use an Ethernet switch even though direct connection between DCU and RP will work. PC connection for configuration and setup is also more convenient with the Ethernet switch available.

4 Installation

This chapter covers the installation of the SDU 404 and SDU 420.

4.1 General

The SDU 404 and SDU 420 are engine safety modules. They are primarily designed to be used together with the Marine Pro family, although stand-alone operation[1] is possible.

They can be installed separate from the DCU or in the same cabinet. The SDU units are intended to be mounted on a DIN rail.

The engine shutdown switches shall be wired to the switch input channels on the SDU.

The *two-wire* SDU Link shall be established between the DCU and the SDU.

4.1.1 LED Overview

Details regarding indicators are described in the User's manual but the illustration and the following table has a brief description.

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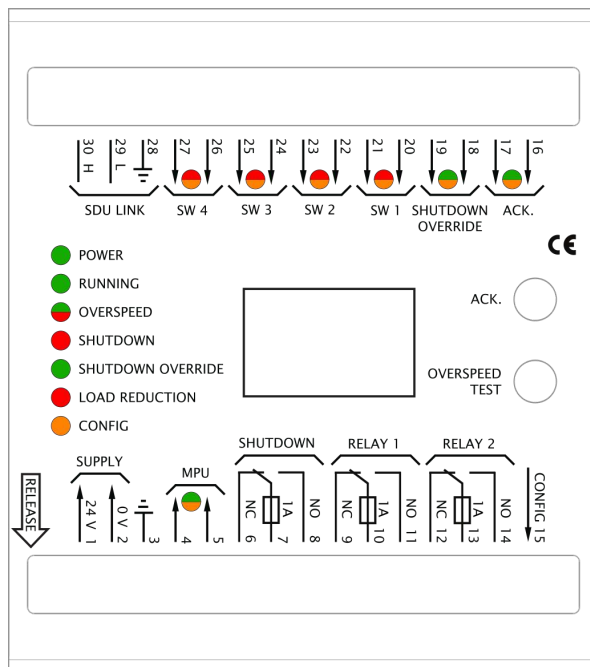
[1] Use a DCU for configuration.

LED	Color	Description
Power	Green	Steady lit when power supply is OK. Flashing when below the configurable "very low threshold".
Running	Green	Steady lit when the engine is running.
Overspeed	Red	Flashing when unacknowledged overspeed. Steady lit when acknowledged overspeed.
	Green	Test mode
Shutdown	Red	Flashing when unacknowledged shutdown. Steady lit when acknowledged shutdown.
Shutdown Override	Green	Steady lit when active.
Load Reduction	Red	Flashing when unacknowledged load reduction. Steady lit when acknowledged load reduction.
Config	Amber	Flashing when unacknowledged fault. Steady lit when acknowledged fault.
MPU	Amber	Flashing when unacknowledged fault. Steady lit when acknowledged fault.
	Green	Steady lit when MPU connected.
ACK.	Amber	Flashing when unacknowledged fault.

		Steady lit when acknowledged fault.
	Green	Active.
Shutdown Override Switch	Amber	Flashing when unacknowledged fault. Steady lit when acknowledged fault.
	Green	Active.
SW 1-12	Red	Flashing when unacknowledged shutdown/load reduction. Steady lit when acknowledged shutdown/load reduction.
	Amber	Flashing when unacknowledged fault. Steady lit when acknowledged fault.
4-20 mA 1-2	Red	Flashing when unacknowledged shutdown/load reduction. Steady lit when acknowledged shutdown/load reduction.
	Amber	Flashing when unacknowledged fault. Steady lit when acknowledged fault.
PT100 / PT1000	Red	Flashing when unacknowledged shutdown/load reduction. Steady lit when acknowledged shutdown/load reduction.
	Amber	Flashing when unacknowledged fault. Steady lit when acknowledged fault.

4.2 Wiring

Follow these wiring guidelines.

4.2.1 DC Supply

Connect 24 V_{DC} to terminals 1 (24 V) and 2 (0 V). Connect a ground connection to terminal 3.

(!) SDU supply wires shall have a minimum area of 0.5 mm^2.

4.2.2 Switch Channels

Switch channels are configurable for loop monitoring and short circuit.

All switch channels use a two-wire layout, where both wires from the switch are to be routed to the SDU.

(!) Switch wires shall have a minimum area of 0.5 mm^2.

4.2.2.1 Broken Wire Detection

Requirement for type approved installations. Each switch shall have a 10 kΩ resistor connected across.

(!) The 10 kΩ resistors shall be connected directly *at the switch*, and not at the SDU.

Switches shall be normally open (NO), and shall close to indicate engine shutdown.

4.2.2.2 Short Circuit Detection

Each switch shall have a 10 kΩ resistor connected in series.

(!) The 10 kΩ resistors shall be connected directly *at the switch*, and not at the SDU.

4.2.3 Analog Channels

Analog channels are available for shutdown configuration.

The 4-20 mA channels shall be powered from terminal 22.

The PT100 / PT1000 channels shall be connected according to the image below, depending on whether it is a two wire or three wire sensor.
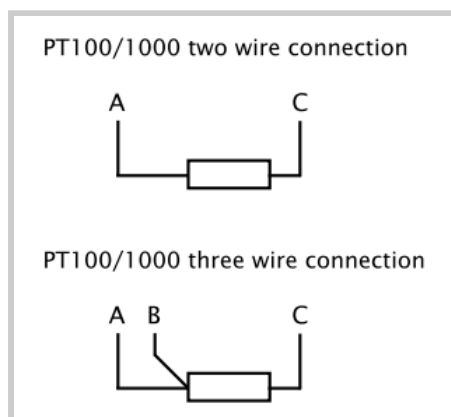
(!) Analog channel wires shall have a minimum area of 0.5 mm^2.

4.2.3.1 Fault Detection

Validity	4-20 mA	PT100	PT1000
Sensor Fault	< 2 mA	< 90 ohm	< 900 ohm
Crop to min value	2-4 mA	90-100 ohm	900-1000 ohm
Valid reading	4-20 mA	100-377 ohm	1000-3770 ohm
Crop to max value	20-22 mA	377-390 ohm	3770-3900 ohm
Sensor Fault	> 22 mA	> 390 ohm	> 3900 ohm

4.2.4 Pickup Channel

The SDU can operate with a magnetic or active pickup source. In case of an active pickup source, the SDU needs to be configured properly.

Connect the pickup to terminals 4 and 5, with shield to terminal 3.

(!) Make sure the cable shield is connected at the SDU side and not at the pickup side.

4.2.5 Shutdown Override & Acknowledge Inputs

This is to be wired exactly like a Switch Input, that is; it shall be a normally open switch. Close the switch to activate the function.

(!) If broken wire detection is desired, connect a 10 kΩ resistor across the switch. If short circuit detection is desired, connect a 10 kΩ in series with the switch. Make sure the SDU configuration is matching this setup.

Typically, the Shutdown Override switch input is configured to detect broken wire.

Typically, the Acknowledge input is configured for no wire break detection.

4.3 DCU Communication

Depending on the DCU model, connect the wires in the shielded communication cable to the terminals as shown in the table below:

| SDU 404	SDU 420	DCU 410E / DCU 408E	DCU 210E / DCU 208E	DCU 210 / DCU 208
28 (Shield)	56 (Shield)	60 (Shield)		22 (Shield)
29 (L)	57 (L)	61 (L)	C1.5 (L)	23 (L)
30 (H)	58 (H)	62 (H)	C1.6 (H)	24 (H)

(!) Only connect the cable shield at one end.

To minimize the effect of external noise it is recommended to use twisted pair wires.

(!) The SDU Link shall be terminated with a 120 ohm resistor at the end of the communication link. Note that the DCU is already terminated internally.
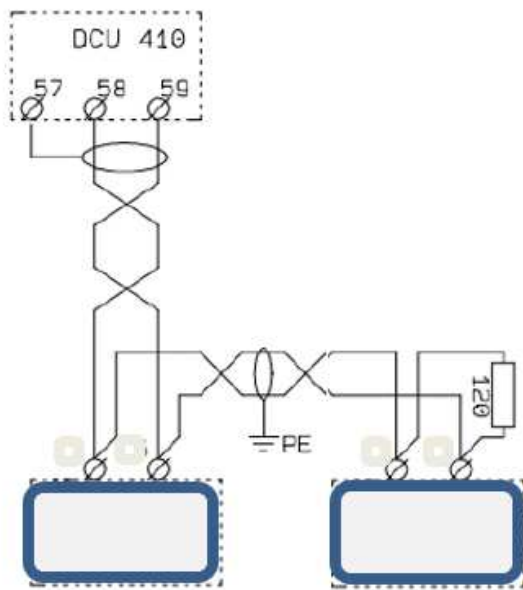
If there are several units attached to the link then connect the 120 ohm resistor together with the last unit on the bus only.

4.3.1 Connection Parameters

The two-wire *SDU Link* has fixed communication parameters.

The Baud rate is 19200 baud.

- 8 data bits
- 1 stop bit
- Even parity

	SDU 404	SDU 420
Modbus Address	104	120

When properly connected, the DCU will find the SDU automatically. To start using the SDU, enable it via the DCU web interface.

ⓘ The communication parameters are only relevant if using a 3rd party equipment to communicate with the SDU.

4.3.2 Configuration Mismatch Warning

When the SDU is connected to the DCU, the DCU will analyze the configuration in the SDU and compare it to the stored configuration in the DCU. If these do not match, the DCU will give a "Configuration Mismatch" warning.

The warning can be acknowledged, but DCU login rights are required to reset this warning. With login rights, the configuration can be copied from the DCU to the SDU, or vice versa.

Please see the relevant Marine Pro manual for further details.

4.4 Buttons

4.4.1 Acknowledge

This button is used to acknowledge alarms and faults. See User's Manual for more details.
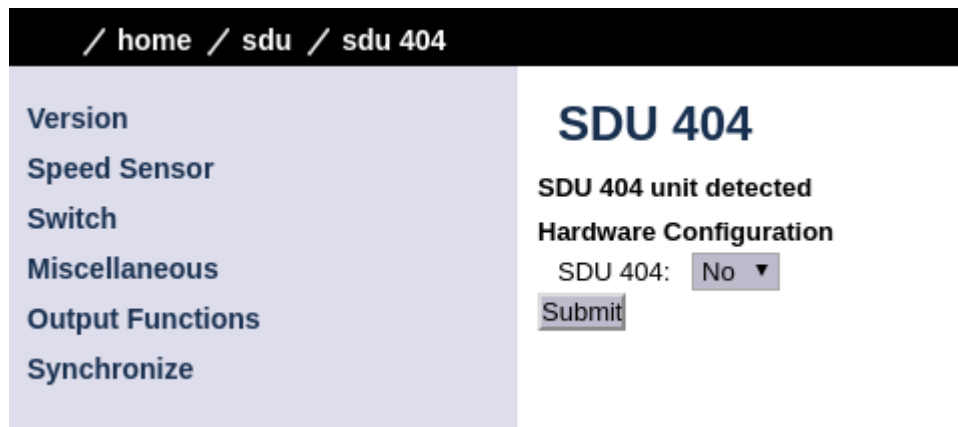
4.4.2 Overspeed Test

Press and hold the "Overspeed Test" button for more than two seconds to enter the overspeed test mode. See User's Manual for more details.

5 Configuration

5.1 Configure SDU using the DCU

The recommended method of configuring the SDU is to login to the DCU via the web interface.

When logged in, enter the SDU section and configure the SDU.

Next, from the menu on the left, select the sub-section to be configured.

Press the **Submit** button after each configuration change.

> The configuration is stored in the DCU's current *active configuration file*. If a new SDU is connected to the DCU the configuration is transferred to the SDU when it is connected.

For more configuration information, please consult the Marine Pro 400E/200E Series Configuration Manual.

5.1.1 Version

This page gives information about the hardware and software version of the SDU.

5.1.2 Speed Sensor

This page has the configuration of the pickup channel.

5.1.3 Switch

This page has the configuration for each of the four switch channels.

Type

Select the type of short circuit and broken wire detection.

Type 1: Short circuit and broken wire detection. A 10 kΩ resistor to be connected in series and a 10 kΩ resistor to be connected in parallel over the switch.

Type 2: Broken wire detection. Minimum requirement for type approved installations.
A 10 kΩ resistor to be connected in parallel over the switch.

Type 3: No fault detection.

Event

Select the event (Shutdown and/or Load Reduction) that will be activated when the switch is closed.

On Run Only

Enable this if the event shall be enabled only when the engine is running.

This is typical for all pressure channels.

Requires In Gear

Enable this if the event shall be enabled only when in gear. Note that the gear information must be provided using the configurable inputs.

Shutdown Override Disabled

Enable this if the event shall be triggered even if SDU is in shutdown override state.

This is typical for a manual E-stop button.

Delay Before Load Reduction

Set the number of seconds until load reduction.

Delay Before Shutdown

Set the number of seconds until shutdown.

Initial Delay

Set the number of seconds until the switch channel is activated for monitoring.

The "Initial Delay" countdown starts when all criteria ("Engine is running" and "Speed Limit") are met.

Speed Limit Enabled

Set if Speed limit is enabled or not. The actual engine speed is set in the Speed limit [RPM] section.

Speed Limit [RPM]

- If the engine speed is above the set value, then the channel is enabled.
- If the engine speed drops 50 RPM below the set value, then the channel is disabled.

Delayed Shutdown

Set the number of seconds the shutdown will be delayed.

5.1.4 Analog[2]

This page has the configuration for the analog channels.

Event

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[2] Analog sensors are only available on SDU 420.

Select the event (Shutdown and/or Load Reduction) that will be activated when the switch is closed.

Sensor Min / Sensor Max[3]

Defines the sensor value at 4 mA and 20 mA.

Load Reduction Threshold and Type

Set the threshold value and threshold type.

Shutdown Threshold and Type

Set the threshold value and threshold type.

On Run Only

Enable this if the event shall be enabled only when the engine is running.

This is typical for all pressure channels.

Requires In Gear

Enable this if the event shall be enabled only when in gear. Note that the gear information must be provided using the configurable inputs.

Shutdown Override Disabled

Enable this if the event shall be triggered even if SDU is in shutdown override state.

Delay Before Load Reduction

Set the number of seconds until load reduction.

Delay Before Shutdown

Set the number of seconds until shutdown.

Initial Delay

Set the number of seconds until the switch channel is activated for monitoring.

The "Initial Delay" countdown starts when all criteria ("Engine is running" and "Speed Limit") are met.

Speed Limit Enabled

Set if Speed limit is enabled or not. The actual engine speed is set in the Speed limit [RPM] section.

Speed Limit [RPM]

- If the engine speed is above the set value, then the channel is enabled.
- If the engine speed drops 50 RPM below the set value, then the channel is disabled.

Delayed Shutdown

Set the number of seconds the shutdown will be delayed.

5.1.5 Miscellaneous

- Set input voltage warning levels.
- Enable "Allow Load Reduction Override" to override load reductions via the shutdown override switch.
- Enable "Automatic Buzzer Off" to make the SDU buzzer silence automatically after five seconds.
- "Shutdown Override Switch" and "Acknowledge Switch" configuration.

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[3] Only for 4-20 mA channels.
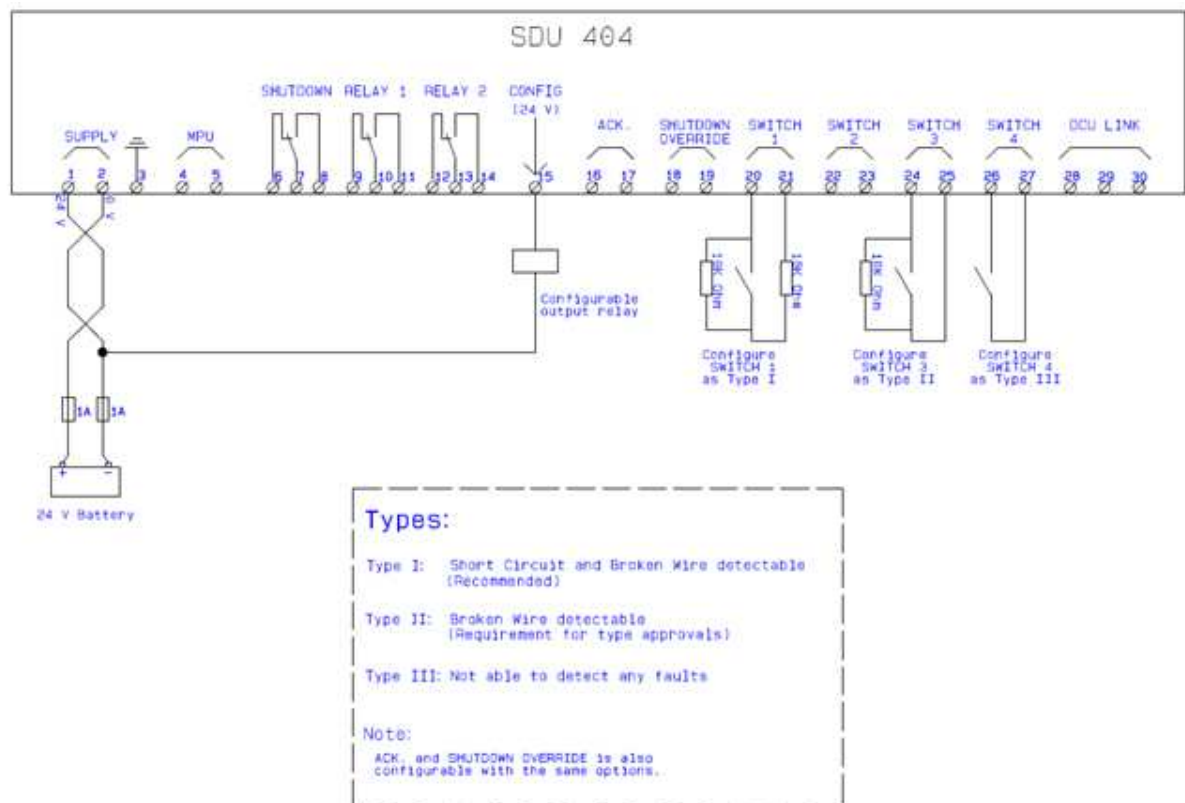
5.1.6 Output Functions

Configuration of relays and digital output.

5.1.7 Synchronize

Synchronization of DCU and SDU configuration.

6 Appendix A - Wiring

The diagram below shows recommended wiring for SDU 404 including 3 different types of Switch inputs. The SDU 420 is similar to this diagram.

7 Appendix B - Front & Back