

Dual redundant  
overspeed trip

# Sapphire II

## DATA SHEET

### Model

- Dual redundant overspeed protection
- Precise & optimum safety for a wide range of steam turbines & reciprocating engine applications



### Overview

The Sapphire II Overspeed Protection device from HEINZMANN Australia has been specifically designed to meet IEC EN 61508 safety device trip response times for integration in applications for rotating machines.

Easily fitted as dedicated overspeed protection for steam turbine and reciprocating engines, the Sapphire II provides a vast array of monitoring, logging and self-test functions all within a simple and intuitive user interface

### Features

- **Display** — The Sapphire II includes a LCD with keypad for local configuration. Users can adjust all unit settings and view statuses, system inputs and outputs, as well as entire alarm, trip, and overspeed logs.
- **Test mode** — The Sapphire II includes inbuilt signal generators for each speed input circuit. The unit can be tested without interrupting machine operation, minimising plant interruptions (TEST 1), or tested with the trip circuit activated, in order to test the shutdown hardware (TEST 2).
- **MPU loss detection** — Each speed-sensor input includes open circuit detection to validate that each MPU is properly connected, even if the machine is stationary.
- **Acceleration detection** — The Sapphire II is equipped with on-board algorithms that monitor machine acceleration. These algorithms can be enabled by the user to provide predictive overspeed protection, shutting down the machine before an overspeed event occurs.

### Key features

Designed to meet IEC EN 61508 safety trip response times

Password protection

Redundancy - dual & independent power supply inputs, speed signal inputs and trip relay outputs

2 analogue inputs

8 digital inputs

3 configurable relay outputs

2 communication ports

LCD display

MPU loss detection

On-board logging of all trips, alarms, trip valve response times and overspeed events

Logged events saved even on loss of power

Can be tested from front panel or via key switch connected to a digital input

Testing can be done while the machine is on-line

User-friendly configuration software

- **Speed differential detection** — The Sapphire II is also equipped with comparators which monitor any difference in input speed signals. Speed sensors can be mounted in different locations on the machine, allowing for detection of differential speeds between the two sensors due to shaft breakage or mechanical failure.
- **Safety output relays** — The Sapphire II is equipped with dual high-speed safety relays for ESV trip circuit integration. The control monitors each safety relay to ensure it has operated correctly, generating an alarm if either relay failed to operate.
- **Trip, alarm & overspeed logs** — The Sapphire II logs all trips, alarms, trip valve response times, and overspeed events. Each log file can be viewed from either the unit's front panel, downloaded via RS-232 port or by removing the micro SD card and inspected remotely. The Sapphire II utilises non-volatile memory to ensure all logged events are saved, even on loss of power.
- **Trip valve response monitoring** — The Sapphire II can be configured to log and monitor the response time of a turbine trip valve, or air flap closure. Using the Sapphire II's ESV response monitoring function, users can connect a position limit switch or pressure transducer to one of the Sapphire II's inputs and configure the Sapphire II to monitor and log the time period between when a trip command was sent and when a ESV closed indication was received.
- **Real time clock** — The Sapphire II utilises a real-time clock to ensure accurate trip/event logging.

## Flexible

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- The Sapphire II may be programmed using the local keypad, or via our PC Configure software service tool, allowing the user to configure the device's inputs, outputs, trip settings and operation to their specific application requirements.
- Password protection is used to safeguard the Sapphire II from unauthorised configuration changes.
- The unit may be programmed to accept either single or dual speed signal.

## Installation

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- Approximate dimensions: 200 x 180 x 66 mm
- Designed to be mounted vertically within a panel or cabinet

- Extend I/O via Mini-Rio or Analogue-Rio (optional)
- Display key pad rated for IP65
- Operating / storage temperature range: -20 °C ... +60 °C

## Input signals

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### Power source (2 independent)

- 2 x low voltage power supply (1A @ 18-32 VDC)

### Speed signals (2 independent)

- 2 x MPU inputs (1000-30000 Hz) @ (1-40 VRMS)
- Gear tooth sensing profile: 20 teeth minimum

### Analogue/logic inputs (10)

- Alarm/trip reset command (fixed logic input 1)
- OST override for mechanical trip test (fixed logic input 1)
- Analogue inputs - configurable (2)
- Digital inputs - configurable (6)

## Output signals

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### Analogue/relay outputs (7)

- Shutdown (safety) relay outputs (2) — Rated for 1 A @ 24 VDC
- Analogue outputs – configurable (2)
- Programmable relay outputs (3)
  - a) Rated for 5 A @ 24 VDC
  - b) Functions - alarm, trip, speed switch, analogue switch, test status, etc.
  - c) 24 VDC, 250 mA auxiliary power available for interposing relay circuits

### Communication ports (2)

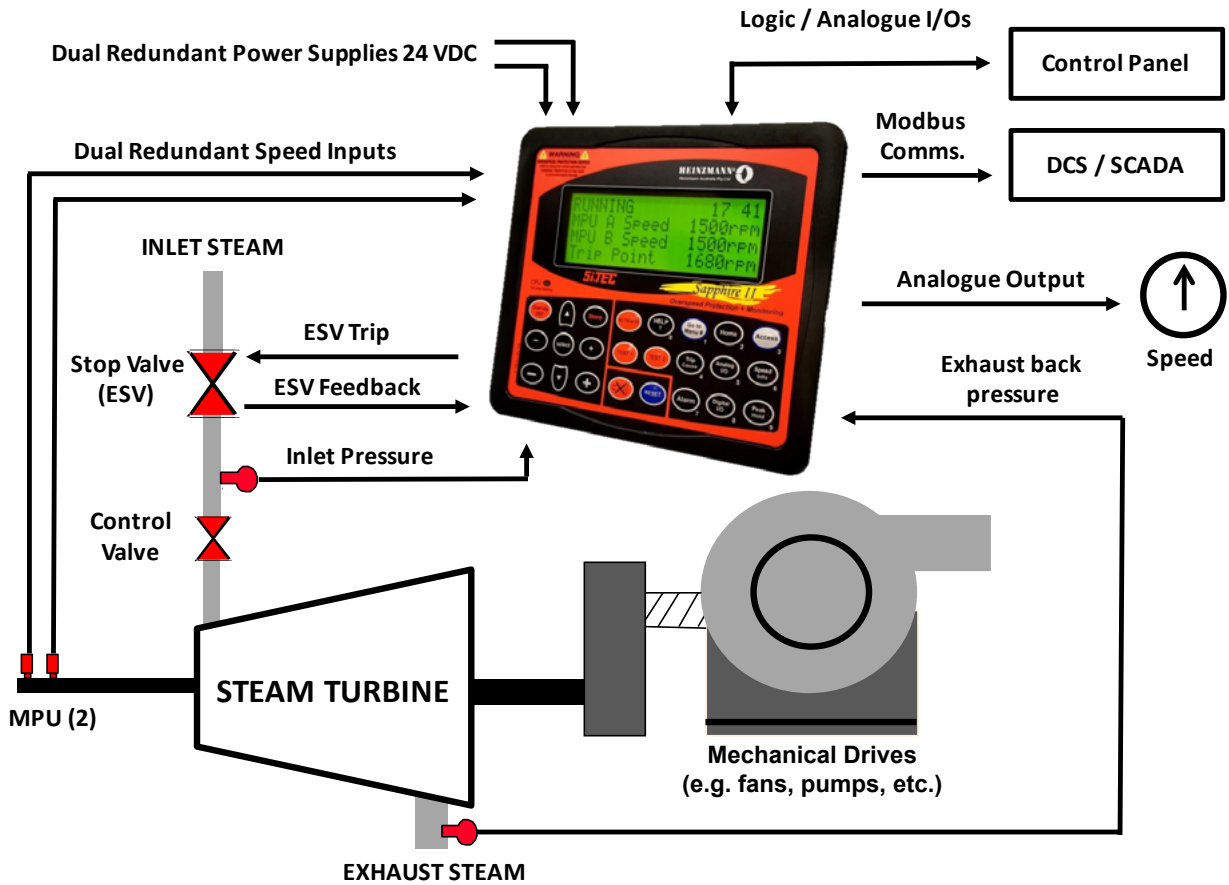
- Serial RS-232 port (1)
- Modbus RS-485 port (1)

## Applications

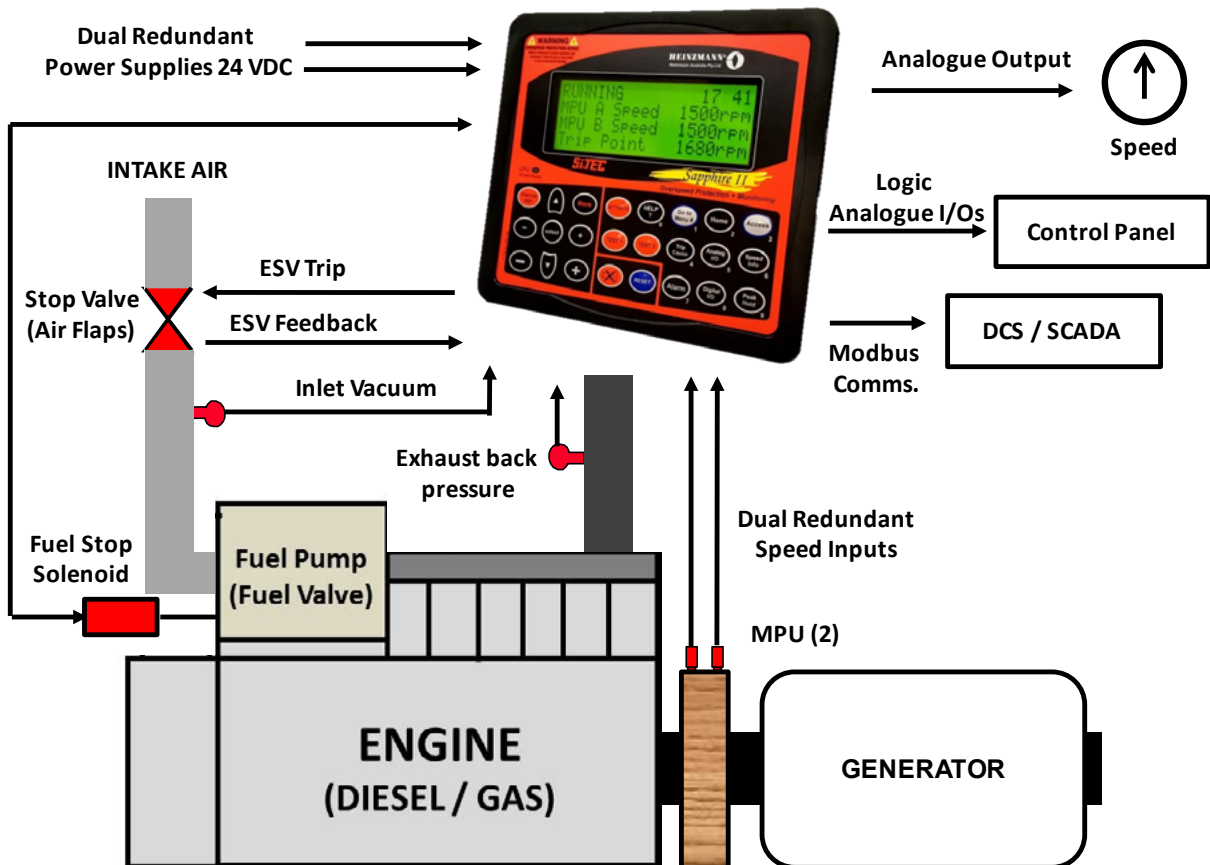
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- Power generation
- Sugar
- Mining
- Oil & gas
- Hospitals

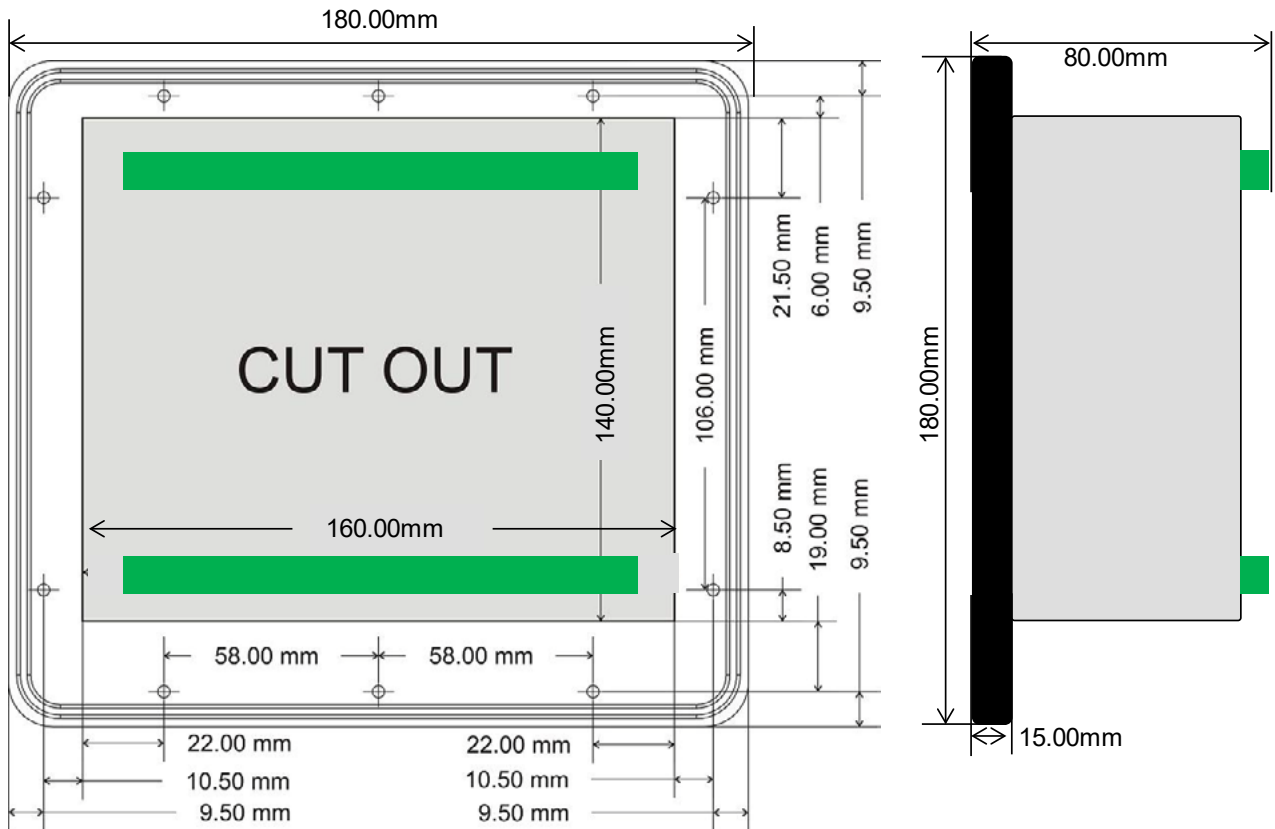
# Sapphire II steam turbine application overview



# Sapphire II engine application overview



## Sapphire II physical dimensions (front & side view)



## Sapphire II certificates

- International certification currently pending
- IECEx Zone II, Category 3, G, Ex nA, IIC, T6, Gc (PENDING)

This certification also applies to the Sapphire II panel mount version as long as the unit is mounted to an ATEX approved IP54 enclosure or better.