Sapphire III

DATA SHEET

Model

- Triple redundant overspeed protection (Certified SIL-3)
- Precise & optimum safety for a wide range of steam turbines & reciprocating engine applications

Overview

The Sapphire III ODS (Overspeed Detection System) from Heinzmann Australia is specifically designed to meet SIL 3 functional safety standards, as well as API 670 and API 612, for a wide range of rotating machine applications.

The Sapphire III seamlessly integrates ISTEC's SpeedSys 300 overspeed system into this fully functional, hot swapable safety device while also offering the customer user-friendly flush mounted HMIs for clear and precise monitoring information.

Applications

The Sapphire III ODS is designed for overspeed and acceleration detection for critical and semi-critical rotating machinery, including steam turbines, gas turbines, hydro turbines, reciprocating engines, compressors, pumps, etc.

The Sapphire III's 8-millisecond hardware response time and very wide frequency range ensures that it is designed for versatility and scalable to any application.

Key features

- 2-out-of-3 voting
- High reliability
- IEC 61508:2010 SIL-3 certified
- API 670 & API 612 compliant
- Acceleration detection
- Simple and robust design
- <= 10ms total response time
- 2 safety relays + 1 safety analog output per module
- Digital input and outputs
- TCP-IP Modbus communications
- Suitable for all common speed sensor types
- External voting for redundant configurations
- Advanced self-monitoring and diagnostics
- 10 years proof test interval (typical)
- User-friendly HMI for clear display.

Features

- **SIL-3 modules** — 3 x in-built ISTEC modules SIL-3 certified and API 670 & API 612 compliant.
- **Display** — 3 x 7.0" HMI touchscreens for userfriendly graphical interface.
- **Sensor loss detection** — Each speed sensor input includes open-circuit.
- **Acceleration detection** — The Sapphire III is equipped with on-board algorithms that monitor machine acceleration.
- **Safety output relays** — Each module is equipped with 2 x safety output relays that are SIL approved for critical machine protection
- **Analog output** — Each module is equipped with 1 x analog output (4-20mA) that is SIL approved for critical machine protection
- **Response times**

  Measurement time: Dependent on signal frequency and averaging, typically +/- 2ms

  Hardware response time: Relays <= 8 ms, Analog output <= 100 ms

  Total response time: Relays, typical <= 10 ms, Analog output, typical <= 100 ms

Installation

- Approximate dimensions: 360mm x 484mm x 160mm (Cutout 332mm x 456mm)
- Designed to be mounted vertically within a panel or cabinet
- Operating/storage temperature: – 20 to 60 deg C (– 4 to 140 deg F)
- Operating/storage humidity: 5 to 80% RH (non-condensing)

I/O Specification

Input signals per module

2 x 24 VDC redundant power supply inputs	(18 to 36 VDC range)
1 x digital input	(open collector input) for reset & proof test
1 x Speed sensor input	0.03 Hz to 35 kHz range; 0.05% measurement accuracy
Speed sensor types	Hall effect sensor: 3-wire voltage input, open circuit detection, cable range up to 300m.
	MPU sensor: 2-wire voltage input, open circuit detection, cable distance 30m to 500m
	Proximity sensor: 2-wire current input (dynamic eddy current probe only), open circuit & short circuit detection, cable distance up to 1000m

Output signals per module

Safety relays (relay 1 & 2)	2 x SIL safety relays (relay 1 & 2)
	Type DPST (double pole single throw)
Non-safety relays (relay 3 & 4)	2 x relays
	Type SPST (single pole single throw)
1 x Digital output	Open collector output (requires 2.4 kOhm pull-up resistor)
	For critical machine protection applications
1 x Analog output (SIL Safety)	Type: 4 to 20 mA current loop.
	Function: User configurable range to transmit the current output value equivalent to the measured speed.
Communication ports (2)	USB-B mini serial port for programming and status reading
	Modbus TCP-IP communication

Approvals

Conformities
EU: CE
UK: UKCA

Electromagnetic compatibility / EMC
EFCC 47 CFR, part 15 (according to ANSI 63.4)
EN 61326:2017
EN 55011:2016/A1:2016

Electrical equipment (safety) / LVD
EN IEC 61010-1:2010/A1:2016

Environmental / RoHS
EN IEC 63000:2018

Hazardous areas / ATEX
EN IEC 60079-0:2018 (see section: Hazardous Areas)

Functional safety
SIL 3 capable according to IEC 61508:2010A

API conformity
Suitable for compliance to API 670 and API 612

Hazardous Areas

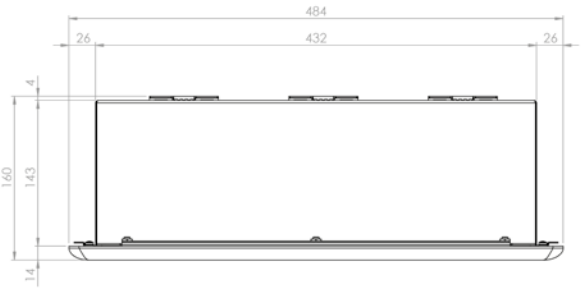
Type of protection
Ex ia; intrinsic safety (speed sensor inputs)

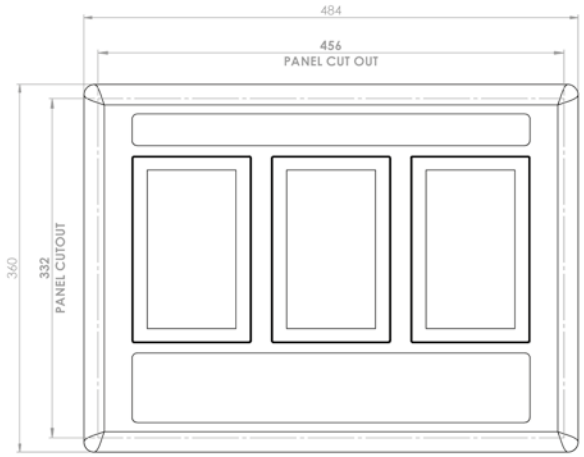
Approval marking
Ex II (1)G [Ex ia Ga] IIC (Gas)
Ex II (1)D [Ex ia Da] IIIC (Dust)
EN 55011:2016/A1:2016

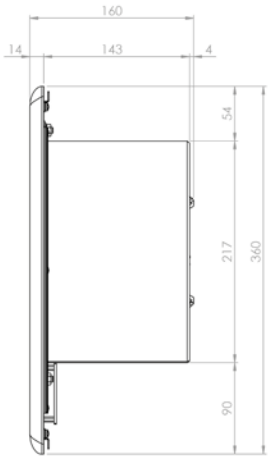
Identifiers
IECEx IBE 20.0045
IBExU20ATEX 1157

Important information
Hazardous certification refers to sensor input only. Refer to the certificates for specific parameters of the mode of operation and special conditions of use

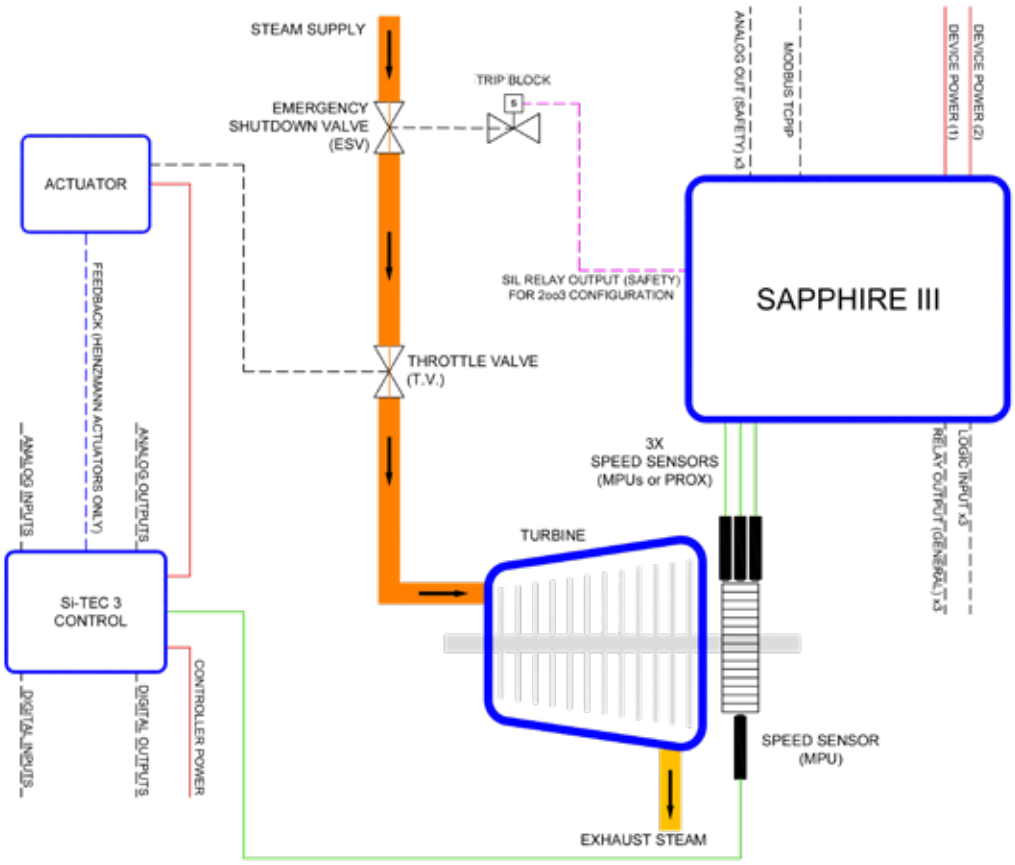
Sapphire III dimensional drawing



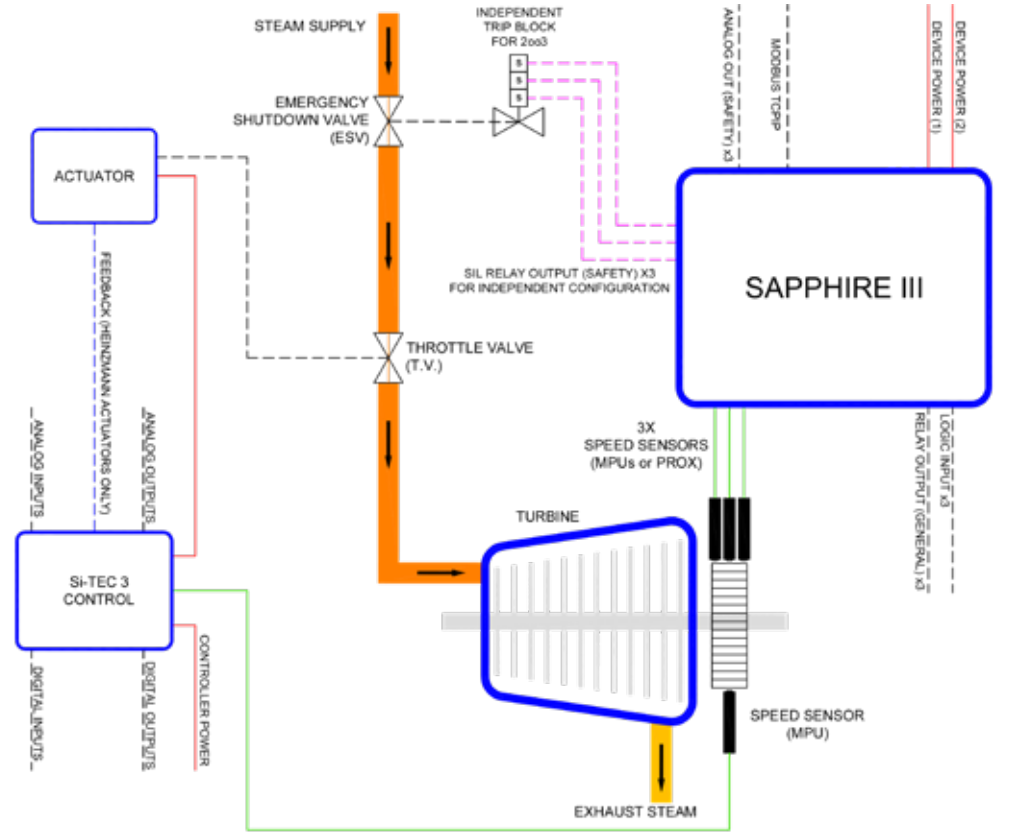




Sapphire III application overview (for 2oo3 configuration)



Sapphire III application overview (for independent configuration)



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