DATA SHEET

vibro-meter®

SpeedSys300 ODS3000 overspeed detection system rack

SpeedSys300 ODS3000 system rack
(standard turbine version with 2oo3 voting logic)

CE UK CA Ex IECEx SIL Safety

KEY FEATURES AND BENEFITS

- From the vibro-meter® product line
- Overspeed detection and protection system racks with 2oo3 or 1oo2 voting logic
- Complete turnkey solutions integrating SpeedSys300 ODS301 modules for protection and a PLC module for monitoring, with an optional touch-screen display
- 19" rack with a standard height of 3U
- Protection: overspeed, underspeed and/or acceleration detection
- Monitoring: dynamic speed monitoring, "creep" / "zero speed" detection, rotation direction and/or high-level configuration checks
- Separate protection (SpeedSys300 ODS301 modules) and monitoring (PLC module) configurations and functionality
- SIL 3 capable in accordance with IEC 61508, for use in functional safety contexts (certified "by design")
- SIL 3 solution with 3 × SpeedSys300 ODS301 modules (speed measurements) and 2oo3 voting logic

KEY FEATURES AND BENEFITS *(continued)*

- SIL 3 solution with 2 × SpeedSys300 ODS301 modules (speed measurements) and 1oo2 voting logic
- Up to 3 × SpeedSys300 ODS301 modules per rack providing up to 3 × independent/ redundant speed measurement channels
- Compatible with all common speed (tachometer) sensors, notably proximity (eddy current), electronic (Hall-effect) and magnetic (variable reluctance)
- Galvanically separated speed (tachometer) inputs support sensors / measurement chains installed in hazardous areas
- Independent measurements, protection and monitoring per input / measurement channel
- Frequency range: 0.025 Hz to 35 kHz
- Response time: 10 ms
- Alarm limit checking with safety relays and analog outputs (4 to 20 mA) for critical protection
- Alarm limit checking with non-safety relays for non-critical alarms and/or remote status monitoring

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KEY FEATURES AND BENEFITS *(continued)*

- Safety outputs: 2 × safety relays (DPST) and 1 × analog output (4 to 20 mA) per SpeedSys300 ODS301 module
- Non-safety outputs: 2 × relays (SPST) and 3 × frequency (speed) outputs per SpeedSys300 ODS301 module
- Additional outputs: 8 × relays (SPST) per PLC module for monitoring functionality
- Advanced self-monitoring and diagnostics to detect sensor / measurement chain and rack (module) problems
- Proof-test interval: 10 years
- Ethernet (Modbus TCP) interface for data sharing with external systems
- Front-panel status LED indicators on SpeedSys300 ODS301 modules
- Optional touch-screen display under PLC module control for local display of protection and monitoring data and status information
- Fully software configurable
- Redundant power supply inputs for improved availability
- Live insertion and removal of modules (hot-swappable)
- Removable screw-terminal connectors

APPLICATIONS

- Complete turnkey overspeed protection and monitoring solutions for critical rotating machinery, such as gas, steam and hydro turbines
- Suitable for use in functional safety contexts in accordance with IEC 61508, for example: SIL 3 solutions with 3 × SpeedSys300 ODS301 modules and 2oo3 voting logic
- Easy and cost-effective retrofit of obsolete overspeed solutions such as the Jaquet FT3000 and equivalent systems
- API 670 and API 612 applications

DESCRIPTION

Introduction

The SpeedSys300 ODS3000 overspeed detection system racks are complete turnkey solutions for overspeed protection and monitoring from Meggitt's vibro-meter® product line.

SpeedSys300 ODS3000 system racks are dedicated safety systems for critical rotating machinery, designed using the latest technology and standards. Using redundant SpeedSys300 ODS301 modules, these racks accurately and reliably detect overspeed, underspeed and/or acceleration in order to be able to automatically shutdown a machine – thereby protecting plant and personnel.

In addition to the essential protection functionality, SpeedSys300 ODS3000 system racks also incorporate a PLC module in order to provide basic monitoring functionality that helps ensure the cost-effective operation and maintenance of machinery.

SpeedSys300 ODS3000 overspeed detection system racks

A SpeedSys300 ODS3000 overspeed detection system rack is a fundamentally simple and highly robust system, designed for ease of use and reliable operation, with an exceptionally long proof-test interval.

As a complete solution, a SpeedSys300 ODS3000 system rack consists of the following main system components:

- A robust all-aluminium 19" rack (3U)
- Up to three SpeedSys300 ODS301 modules to provide the protection functionality
- One PLC module to provide the monitoring functionality, including the Ethernet interface to the rack
- An optional touch-screen display.

DESCRIPTION *(continued)*

Protection – SpeedSys300 ODS301 modules

SpeedSys300 ODS3000 system racks use up to three SpeedSys300 ODS301 overspeed detection system modules to provide the overspeed protection functionality required by an application.

Note: The number of SpeedSys300 ODS301 modules (three or two) depends on the level of safety that must be achieved, which is generally determined by the criticality/importance of the machinery being monitored. Contact Meggitt SA for further information.

Each SpeedSys300 ODS301 module is connected to its own speed (tacho) sensor / measurement chain but runs an identical configuration. The sensor / measurement chain pulses (frequency) are counted by the module and converted to rotational speed and acceleration measurements. The module then compares these measurements against the configured alarm limits, and will activate the safety relays and additional (non-safety) relays should a measurement exceed a limit.

In general, the SpeedSys300 ODS301 module safety relays are used for critical alarms and the additional relays are used for non-critical alarms or other alarm/status information for the module. The safety relays can be hard-wired to implement the required voting logic and produce an output signal that is used to initiate the shutdown ("trip") of a machine, for example, by an emergency shutdown system (ESD). Alternatively, the required voting logic can be implemented by an external control system, such as a safety PLC.

In this way, the individual SpeedSys300 ODS301 modules operate redundantly to provide parallel speed measurements and associated safety relay outputs that are combined depending on the safety architecture and voting logic demanded by the application.

Each SpeedSys300 ODS301 module provides the following outputs (per installed module) that can be configured to meet the requirements of an application: 2 × safety relays, 2 × additional (non-safety) relays, 1 × analog output, 3 × frequency (speed) outputs and all of its configured measurements.

Each SpeedSys300 ODS301 module also uses the measured shaft rotational speed to drive its analog 4 to 20 mA current loop output and update its frequency (speed) outputs, so that the information can be shared with external third-party systems such as a DCS or PLC, or even a simple display.

Note: Only the safety relays and analog outputs (4 to 20 mA) are safety outputs. More specifically, they are SIL certified and can be used for critical functions in machinery protection applications, such as initiating the shutdown ("trip") of a machine.

For more detailed information on the operation of the SpeedSys300 ODS301 modules, refer to the *SpeedSys300 ODS301 overspeed detection system (module) data sheet*.

Monitoring – PLC module

In addition to the protection functionality provided by the SpeedSys300 ODS301 modules, SpeedSys300 ODS3000 system racks use a PLC module to provide additional monitoring functionality.

This rugged industrial PLC module monitors and communicates with each of the installed SpeedSys300 ODS301 modules in order to add dynamic speed monitoring, "creep" / "zero speed" detection, rotation direction and high-level configuration consistency checks.

More specifically, the PLC module monitors the frequency (speed) output and the binary (status) output signals from the SpeedSys300 ODS301 modules, and communicates with the modules internally via their Modbus RTU outputs. It uses the information obtained to calculate and provide the monitoring outputs.

Note: A SpeedSys300 ODS301 module's Modbus RTU interface is read only and cannot be used to change the configuration or operation of the module.

The PLC module provides the following outputs (per SpeedSys300 ODS3000 system rack) that can be configured to meet the requirements of an application: 8 × relays, 1 × Ethernet (Modbus TCP) interface and all of its configured measurements.

Importantly, the SpeedSys300 ODS3000 system rack (PLC module) can also make this information available externally via its Ethernet (Modbus TCP) interface. In this way, the data can be shared with external third-party systems such as a DCS or PLC. In addition, selected information can also be made available via an optional touch-screen display on the front-panel of the rack.

DESCRIPTION *(continued)*

SIL safety

SpeedSys300 ODS301 overspeed detection system modules are certified as SIL 2 and SIL 3 capable "by design". Accordingly, the SpeedSys300 ODS301 module includes advanced self-monitoring and diagnostics (also known as built-in self-test (BIST)) to detect problems.

More specifically, the module's diagnostics can detect problems with the sensor / measurement chain, the cabling and the module itself. Should a SpeedSys300 ODS301 module detect any problems that could prevent it from implementing the configured safety function, the module will drive the safety relays and the analog output to their safe states (de-energised and "zero" respectively) in order to ensure that the machine being monitored is always safe. Any SpeedSys300 ODS301 module problems are also detected and reported/signalled by the PLC module.

For example, a SpeedSys300 ODS3000 system rack is SIL 3 capable when using SpeedSys300 ODS301 modules in a redundant 2oo3 architecture. To implement the 2oo3 voting logic required by SIL 3 safety applications, the safety relay outputs from three SpeedSys300 ODS301 modules can be wired directly together. Alternatively, the safety relays can be connected to an external system such as a safety PLC so that the required logic can be evaluated before initiating a shutdown, if required.

Safety related and non-safety related functionality

While for each SpeedSys300 ODS301 module, the two safety relays and analog output provide the safety related outputs, other module functionality and outputs provide additional monitoring capability.

Two additional (non-safety) relays are available (per installed SpeedSys300 module) for alarm/ status use depending on the requirements of the application. For example, the additional relays can be used to indicate when a measurement exceeds a non-critical limit or to communicate module status information, as configured using the SpeedSys300 software.

Three digital frequency (speed) outputs are also available (per installed SpeedSys300 module) providing digital outputs equivalent to the measured speed processed by the module.

Note: Frequency (speed) outputs are typically used with panel-mounted displays in order to have local digital readouts of the speed for the machine being monitored.

In addition, the PLC module provides eight additional relays that provide further monitoring capability. These additional (PLC module) relays can be used for any purpose, as determined by the PLC module's configuration. They are typically used to interface with an external control system and communicate data/information regarding monitoring functionality such as Dynamic speed monitoring, "creep" / "zero speed" detection, rotation direction and/or high-level configuration checks.

Further, the SpeedSys300 ODS3000 system rack (PLC module) provides an Ethernet (Modbus TCP) interface for the sharing of data with external third-party systems such as a DCS or PLC. In addition, selected information can also be made available via an optional touch-screen display on the front-panel of the rack.

During normal operation, the PLC module dynamically monitors the measured speed as reported by each installed SpeedSys300 ODS301 module. That is, one frequency (speed) output per installed SpeedSys300 module is monitored and reprocessed by the PLC module. Based on these separate speed measurements, an absolute difference between the measurements is computed and compared to a setpoint, in order to indicate if a system deviation/ divergence has been detected.

Note: For a SpeedSys300 ODS3000 system rack, dynamic speed monitoring is active as long as each installed SpeedSys300 ODS301 module reports "Diagnostic OK". Dynamic speed monitoring does not automatically bypass ("skip") a measurement based on the status of the safety relays / voting logic, as this requires another separate safety voting logic at a higher level.

While the proof-test interval of an individual SpeedSys300 ODS301 module is typically 10 years (depending on the application), digital proof-test control inputs are available to effectively bypass each module's safety relays for test purposes. This supports the proof test of a complete system using a SpeedSys300 ODS3000 system rack, for

DESCRIPTION *(continued)*

example, external systems such as an external control system or safety PLC.

Note: During a proof test, the SpeedSys300 ODS3000 system rack (SpeedSys300 ODS301 modules) cannot provide its normal machinery monitoring and protection functions. Accordingly, it is highly recommended that proof tests are only performed in accordance with the operating procedures for the machinery being monitored and that appropriate precautions are taken at the control system level (such as DCS or PLC).

The PLC module does not need to be proof-tested as it provides monitoring functionality only, that is, it is not part of the essential protection functionality.

Touch-screen display (optional)

Optionally, a SpeedSys300 ODS3000 overspeed detection system rack can include a touch-screen display, mounted on the front-panel of the rack, in order to provide a local display for a SpeedSys300 ODS3000 system rack.

The touch-screen display is controlled by the PLC module, so it is highly-configurable, and is typically used to display overview/summary information, such as current speeds, alarm limits and status information, in a "Mimic" type arrangement, as required by the application.

Software

The SpeedSys300 ODS3000 overspeed detection system rack is fully software configurable in two stages.

Firstly, the individual SpeedSys300 ODS301 modules are configured using SpeedSys300 software. Each module is configured in turn using a direct USB connection to the front of the module. This configuration primarily determines the protection functionality.

Secondly, the PLC module is configured using a web-based application or Automation Studio software. The PLC module is configured using a Ethernet connection to the front of the system rack. This configuration primarily determines the monitoring functionality.

In typical SpeedSys300 ODS3000 overspeed detection system rack applications, the software (SpeedSys300 software and web-based application / Automation Studio software) is connected to a system rack for configuration and commissioning only, after which the system operates standalone.

Note: Copies of both the SpeedSys300 software and the web-based application / Automation Studio software are provided with each SpeedSys300 ODS3000 overspeed detection system rack in order to allow modification of the configurations, as required.

Hardware

The SpeedSys300 ODS301 module hardware and firmware (embedded software) are designed and certified for SIL 2 and SIL3 capability, and include advanced self-monitoring and diagnostics (BIST) with redundant processing and data comparison. The SpeedSys300 ODS3000 overspeed detection system rack (internal modules) also uses redundant power supplies throughout for improved availability.

The SpeedSys300 ODS3000 system rack supports a hot-swap mechanism that allows SpeedSys300 ODS301 modules to be replaced with interrupting power to the rack. More specifically, each individual SpeedSys300 ODS301 module is DIN-rail mounted onto a support plate with position guides and a 32-pin interface connector that mates with the system racks interface panel (backplane). Similarly, the PLC module and its components are easily accessible/replaceable from the front panel of the rack (when the touch-screen display is removed).

The SpeedSys300 ODS3000 system rack also features removable screw-terminal connectors (rear of rack) that can unplugged from the main body of the housing to simplify installation and mounting.

Application information

SpeedSys300 ODS3000 overspeed detection system racks solve overspeed safety requirements in a simple, reliable and cost-effective way. They are simple to install, configure and integrate into existing monitoring and protection applications.

For critical rotating machinery that requires monitoring and protection of both overspeed and vibration, a SpeedSys300 ODS3000 system rack complements the VM600^{Mk2}/VM600 and VibroSmart® machinery monitoring systems.

As the safety critical speed system (SpeedSys300 ODS3000) and any other systems (vibration and/or combustion) are completely

DESCRIPTION *(continued)*

separate ("segregated"), a SpeedSys300 ODS3000 can always be relied upon to shut down a machine, even in the event of a problem with the other systems.

For example, the standard turbine version of the SpeedSys300 ODS3000 system rack (3 × SpeedSys300 ODS301 modules with 2oo3 voting logic) is an ideal solution for the critical overspeed protection of gas turbines, steam turbines, hydro turbines and other critical assets that demand the highest safety integrity levels (SIL 3) using redundant speed inputs.

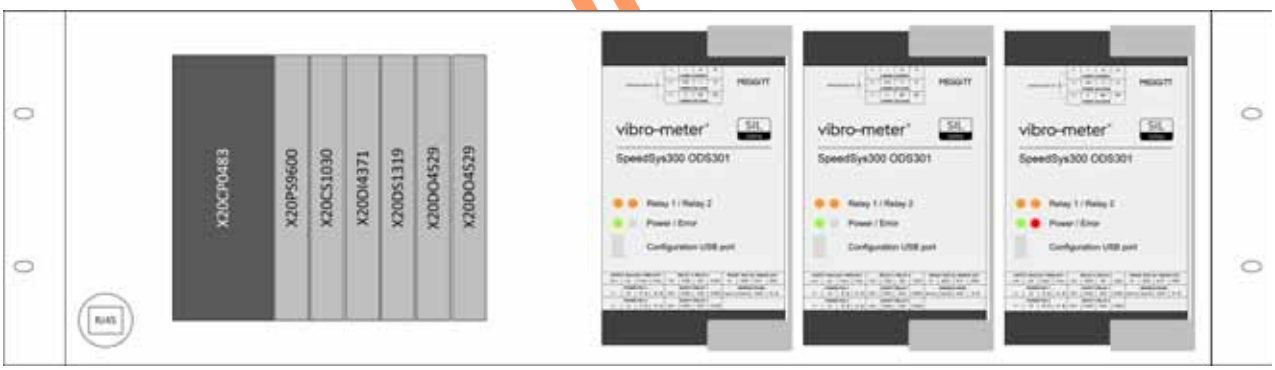
And because the SpeedSys300 ODS3000 overspeed detection system racks are SIL certified "by design", they are not limited to specific applications and there are fewer restrictions compared to equivalent "proven in use" systems. Being a new design, it uses the latest technology so there are no component supply or obsolescence issues. Accordingly, a SpeedSys300 ODS3000 system rack is a superb choice when replacing aging overspeed protection systems such as the Jaquet FT3000 or equivalent solutions.

For specific applications, contact your local Meggitt representative.

RACK/SYSTEM COMPONENTS

SpeedSys300 ODS3000 system rack (front view) – main rack/system components

SpeedSys300 ODS3000 system rack (front view) – functionality



Monitoring

The PLC module implements
the rack's machinery monitoring functionality.

Protection

The SpeedSys300 ODS301 modules implement
the rack's machinery protection functionality.

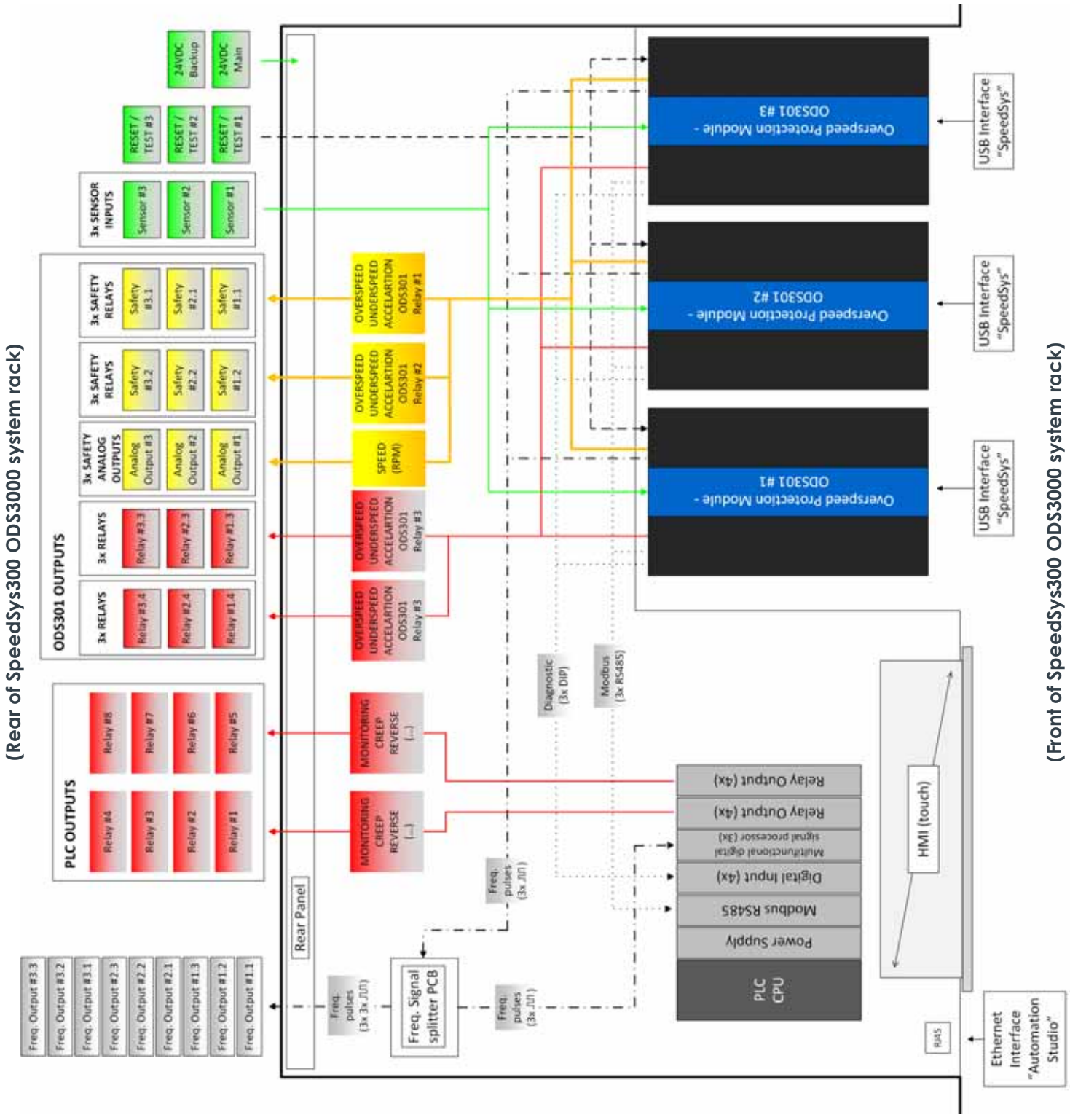
Notes

A SpeedSys300 ODS3000 system rack can include up to three SpeedSys300 ODS301 modules (#1 to #3), as shown above. For example, the standard turbine version consists of 3 × SpeedSys300 ODS301 modules with 2oo3 voting logic.

To prioritise machinery protection and help meet stringent cybersecurity and API 670 requirements, the SpeedSys300 ODS3000 system rack segregates machinery protection and monitoring functionality by using separate rack/system components with separate configurations.

During normal operation, the PLC module reads various information from the SpeedSys300 ODS301 modules, which is then made available via Ethernet (Modbus TCP) and/or the touch-screen display (optional). With this architecture, the PLC module (monitoring) cannot interfere in the operation of the SpeedSys300 ODS301 modules (protection).

INTERFACE DIAGRAM



SPECIFICATIONS

Overall rack

Supported sensors

Compatible with a wide range of industry-standard speed sensors / measurement chains:

Proximity sensors

- Description : Proximity (eddy current) sensors use a coil of wire to generate an electromagnetic field which induces eddy currents in a metal target. As the distance to the target changes, the electrical characteristics of the magnetic circuit (sensing element) change, which the signal conditioner converts into a proportional analogue signal. Accordingly, these sensors provide an accurate measurement of the distance to the speed wheel.
  Note: Meggitt vibro-meter® TQxxx proximity measurement sensors/ systems with a current output are supported by the SpeedSys300 ODS301 module and are suitable for signal transmission up to 1000 m – further than any other solution.
- Interface type : 2-wire current signal (analogue)
- Sensor power supply (output) : −20 to −32 V_{DC} / 25 mA max.
- Input current range : −15.5 mA (min. gap) to −20.5 mA (max. gap)

Electronic sensors

- Description : Electronic (Hall-effect) sensors contain a magnet and a semiconductor material. The semiconductor detects changes in the magnetic field strength, proportional to the distance to the target, and uses signal conditioning to generate a fixed amplitude output voltage. As the sensing element (semiconductor) measures the strength of the magnetic field (that is, they depend on magnetic flux density and do not require a changing signal), they can be used for low-speed applications and zero-speed detection. However, the built-in electronics does limit operating temperatures.
  Note: Electronic sensors are typically suitable for signal transmission up to 300 m.
- Interface type : 3-wire voltage signal (digital)
- Sensor power supply (output) : 10 to 30 V_{DC} / 14 mA max.
- Input voltage range : <1.5 V_{DC} (low) to >(supply − 2.5) V_{DC} (high)

Magnetic sensors

- Description : Magnetic (variable reluctance) sensors contain a magnet and a coil. The coil detects changes in the magnetic field, proportional to the distance to the target, and generates a varying amplitude output voltage. As the sensing element (coil) detects changes in the magnetic field (that is, they depend on the rotational speed of the target), they are not suitable for low-speed applications or zero-speed detection. However, due to their simplicity (passive design), they are inherently reliable and suitable for high-temperature applications.
  Note: Magnetic sensors are typically suitable for signal transmission up to 30 m.
- Interface type : 2-wire voltage signal (analogue)
- Sensor power supply (output) : None
- Input voltage range : Bipolar voltages up to 80 V_{DC}

Note: The advanced self-monitoring and diagnostics (BIST) of the SpeedSys300 ODS301 module incorporates line-fault (open-circuit or short-circuit) and incorrect power consumption checks for proximity sensors and electronic sensors, and line-fault (open-circuit or short-circuit) checks for magnetic sensors.

SPECIFICATIONS *(continued)*

Input channel(s)

Number of independent speed (tachometer) channels	: Per SpeedSys300 ODS301 module: • Three separate interfaces for different types of sensor / measurement chain. Note: Only one sensor / measurement chain per SpeedSys300 ODS301 module at any one time.
Frequency/speed measurement range	: 0.025 Hz to 35 kHz
Maximum measurable frequency	: 35 kHz
Measurement accuracy (frequency)	: 0.05%
Input range	
• Voltage	: 20 mV_{RMS} to 80 V_{RMS} / 100 kΩ
• Current	: 200 mA max.
Trigger level	: 0 to 5 V (configurable using the SpeedSys300 software)
Over-voltage and overload protection	: Yes (protection fuse)

Note: The input channel interfaces for all sensor types (proximity, electronic and magnetic) are galvanically separated in order to allow a direct connection to a sensor / measurement chain installed in a hazardous area (potentially explosive atmosphere), eliminating the need for additional external safety barriers such as Zeners.
See **Potentially explosive atmospheres on page 10**.

Environmental

Temperature	
• Operating	: −20 to 60°C (−4 to 140°F)
• Storage	: −40 to 85°C (−40 to 185°F)
Humidity	
• Operating	: 0 to 90% relative humidity (RH), non-condensing
• Storage	: 0 to 95% relative humidity (RH), non-condensing
Protection rating	: IP20 (in accordance with IEC 60529)
Indoor use	: Limited to indoor use only

Note: The SpeedSys300 ODS3000 system rack is suitable for indoor use only unless it is installed in an industrial housing or enclosure that ensures a higher level of environmental protection.

Potentially explosive atmospheres

Ex certified input channel interfaces for use with sensors / measurement chains in hazardous areas

Inputs

Type of protection Ex ia: intrinsic safety		
Europe	EU type examination certificate	II (1) G [Ex ia Ga] IIC (outside of Ex Zone) II (1) D [Ex ia Da] III IBExU 20 ATEX 1157
International	IECEx certificate of conformity	[Ex ia Ga] IIC (outside of Ex Zone) [Ex ia Da] IIIC IECEx IBE 20.0045

⚠ **For specific parameters of the mode of protection concerned and special conditions for safe use, refer to the Ex certificates that are available from Meggitt SA.**

Note: Refer also to the *SpeedSys300 ODS301 overspeed detection system (module) data sheet*.

SPECIFICATIONS *(continued)*

Approvals

Conformity	: European Union (EU) declaration of conformity (CE marking). United Kingdom (UKCA) declaration of conformity.
Electromagnetic compatibility (EMC)	: EN 61000-4-2:2009, EN 61000-4-3:2006/A1:2008/A2:2010, EN 61000-4-4:2012, EN 61000-4-5:2014/A1:2017, EN 61000-4-6:2009, EN 61000-4-16:2011, EN 61000-4-29:2000. EN 61326-1:2013, EN 61326-3-1:2017 (SIL). EN 55011:2016/A1:2017.
Electrical safety	: IEC 61010-1:2010, IEC 61010-1:2010/AMD1:2016. CAN/CSA-C22.2 No 61010-1 + Amd 1 / UL 61010-1 (3rd Ed.); Am. 1.
Environmental management	: RoHS compliant (2011/65/EU, 2015/863/EU, EN IEC 63000:2018)
Hazardous areas	: Ex approved (see **Potentially explosive atmospheres on page 10**). EN IEC 60079-0:2018, EN 60079-11:2012.
Functional safety	: SIL 2 and SIL 3 capable (in accordance with IEC 61508:2010)
American petroleum institute (API)	: Compliant with API 670 (machinery protection systems) and API 612 ("steam turbines")

Note: Refer also to the *SpeedSys300 ODS301 overspeed detection system (module) data sheet*.

Power supply (input)

Input voltage range	: 24 V_{DC} nominal, −15% / +20% (20.4 to 28.8 V_{DC})
Redundancy	: Two separate inputs to support external power supply redundancy
Current consumption (with nominal 24 V_{DC} supply)	: 1 A approx.
Power consumption	: 24 W max. (at 24 V_{DC})
Reverse-voltage protection	: Yes

Power supplies to sensors / measurement chains (output)

Number of independent sensor / measurement chain power supplies	: Per SpeedSys300 ODS301 module: • One sensor / measurement chain power supply output
Sensor power supply output	: Current, voltage or none – depending on the sensor type (input channel configuration). See **Supported sensors on page 9**.
Short-circuit protection	: Yes

Communications interface (external)

Number / type	: Per SpeedSys300 ODS3000 system rack: • One Ethernet interface. Note: Available on Ethernet interface connector (front of rack). See **Connectors on page 12**.
Network interface	: 10BASE-T/100BASE-TX
Data transfer rate	: Up to 100 Mbps
Maximum distances	: System Ethernet communications can support distances up to 100 m at 100 Mbps, depending on Ethernet cabling. For distances greater than the specified maximum, the Ethernet interface operates at reduced data transfer rates.
Operation (protocols)	: Ethernet (Modbus TCP) interface to share SpeedSys300 ODS3000 system rack information with external systems such as a DCS or PLC. Note: The information available to be shared is defined by the SpeedSys300 ODS3000 system rack's separate monitoring and protection configurations (See **Configuration on page 12**).

SPECIFICATIONS *(continued)*

Configuration

Fully software configurable : See **Protection functionality on page 13** and **Monitoring functionality on page 16**.

Connectors

Front of rack

- Ethernet (1) : 8P8C (RJ45) modular jack (female), with hinged protective cover. Used for Ethernet-based communication with the rack (PLC module) via Modbus TCP and for rack (PLC module) configuration.
- USB (up to 3) : USB Mini-B connector (female). Used for USB-based communication with the individual SpeedSys300 ODS301 modules. Note: One USB connector per SpeedSys300 ODS301 module. These USB connectors are typically only used for module configuration, as during normal operation the PLC module reads various information from the modules, which is then made available via Ethernet (Modbus TCP) and/or the touch-screen display (optional).

Rear of rack

- Various : Various multi-pin screw-terminal connectors (TBD). Used for SpeedSys300 ODS3000 system rack interfacing, such as:
  - Rack power supply inputs
  - Proof test inputs
  - Sensors / measurement chains inputs, including sensor / measurement chain power supply outputs
  - Safety outputs such as SpeedSys300 ODS301 module safety relays and analog outputs
  - Outputs (non-safety) such as SpeedSys300 ODS301 module relays and frequency (speed) outputs, and SpeedSys300 ODS3000 system rack relays.

Electrical connections (screw-terminal connectors)

- Cross section : 1.5 mm^2 / 16 AWG (nom.)
- Rated voltage / current : 160 V / 8 A (typ.)
- Tightening torque : 0.2 to 0.5 N•m (0.15 to 0.37 lb-ft)

Note: All inputs and outputs (rear of rack) use removable screw-terminal connectors that can be unplugged from the main body of the housing to simplify installation and mounting of the SpeedSys300 ODS3000 system rack.

Physical

Housing : Extruded aluminium frame and solid aluminium structural parts

Colour : Aluminium

Dimensions : 19" rack with a standard height of 3U. See **Dimensions (mechanical drawings) on page 18**.

Weight : xx.x kg (xx.x lb) approx. (TBC)

Mounting : For installation in a 19" rack cabinet or equivalent enclosure

SPECIFICATIONS *(continued)*

Protection – SpeedSys300 ODS301 modules

Protection functionality

Main component : Up to three SpeedSys300 ODS301 modules (#1 to #3) operating in parallel: with separate sensors / measurement chains but identical measurement processing.
Note: For example, the standard turbine version of a SpeedSys300 ODS3000 system rack consists of 3 × SpeedSys300 ODS301 modules with 2oo3 voting logic.

Measurements : Overspeed, underspeed and/or acceleration

Outputs : Per SpeedSys300 ODS301 module:
- 2 × safety relays
- 2 × additional (non-safety) relays
- 1 × analog output
- 3 × frequency (speed) outputs
- Configured measurements.

Note: The behaviour of the protection outputs depends on the configuration of the SpeedSys300 ODS301 modules. For example, the safety relays are typically configured to initiate the shutdown ("trip") of a machine upon the detection of an overspeed condition.

Configuration : The protection functionality of the SpeedSys300 ODS301 modules is fully software configurable using the SpeedSys300 software (via/over USB).
Note: Each SpeedSys300 ODS301 module is configured in turn using a direct USB connection to the front of each module.
See also **Ordering information on page 19**.

Voting logic : For protection functionality, the required voting logic (such as 2oo3 or 1oo2) is critical as it can be used to initiate the shutdown ("trip") of a machine. Accordingly, protection voting logic is implemented by hardwiring the safety relay outputs of individual SpeedSys300 ODS301 modules, as required by the application.
See also **Monitoring functionality on page 16**.

Response times

Measurement time : Depends on input frequency and SpeedSys300 ODS301 module configuration (averaging, etc). That is, the SpeedSys300 ODS3000 system rack's protection configuration.
Contact Meggitt SA for further information.

Hardware reaction time : ≤8 ms

Total response time : 10 ms (typical)

Safety relays

Number : Per SpeedSys300 ODS301 module:
- 2 × safety relays (safety relay 1 and safety relay 2)

Type and contact arrangement : Double-pole single-throw (DPST) safety relays – certified for SIL safety loops.
2 × COM and 2 × NO contacts available per relay.

Switching voltage : 30 V_{DC}

Switching current : 2 A max. (resistive load) / 100 mA max. (inductive load)

SPECIFICATIONS *(continued)*

Response time	: See **Response times on page 13**
Operation	: The SpeedSys300 ODS301 module's safety relays are user-configurable except for the safe state, which is always normally de-energised (NDE). In general, the SpeedSys300 ODS301 module compares the measured speed against the configured limits and will put the safety relays into the safe state should the measured value exceed a critical alarm limit related to overspeed, underspeed and/or acceleration.
Safe state	: In the safe state, the safety relays are activated (de-energised) so that there is an open-circuit between the COM and NO contacts. Note: The SpeedSys300 ODS301 module's safety relays follow the "de-energise to trip principle", that is, they are normally energised (NE) during normal operation and are normally de-energised (NDE) to indicate a problem.

⚠ **The SpeedSys300 ODS301 module's safety relays are SIL certified and can be used for critical functions in machinery protection applications, such as initiating the shutdown ("trip") of a machine.**

Additional (non-safety) relays

Number	: Per SpeedSys300 ODS301 module: • 2 × additional (non-safety) relays (additional relay 3 and additional relay 4)
Type and contact arrangement	: Single-pole single-throw (SPST) relays. 1 × COM and 1 × NO contact available per relay.
Switching voltage	: 30 V_{DC}
Switching current	: 2 A max. (resistive load) / 100 mA max. (inductive load)
Operation	: The SpeedSys300 ODS301 module's additional (non-safety) relays are user-configurable including for the default state, which can be either normally energised (NE) or normally de-energised (NDE). In general, the SpeedSys300 ODS301 module can use these additional relays to indicate overspeed, underspeed and/or acceleration conditions or other alarm/status information for the module. For example, a relay can be used to indicate when a measurement exceeds a non-critical alarm limit or to communicate module status information.

⚠ **The SpeedSys300 ODS301 module's additional (non-safety) relays are not SIL certified and must not be used for critical functions in machinery protection applications.**

Analog outputs

Number	: Per SpeedSys300 ODS301 module: • 1 × analog output
Type	: 4 to 20 mA current loop – certified for SIL safety loops
Measurement accuracy (frequency)	: 0.1%
Resolution	: 16 bit
Operation	: The SpeedSys300 ODS301 module updates the analog output to transmit a current value in the configured range, equivalent to the measured speed. Note: The analog output can be bypassed (effectively disabled) if not required by an application.

SPECIFICATIONS *(continued)*

Safe state	: In the safe state, the analog output is de-activated, that is, driven to a configurable "zero" value. For example, 3.6 mA.

⚠ **The SpeedSys300 ODS301 module's analog output is SIL certified and can be used for critical functions in machinery protection applications.**

Frequency (speed) outputs

Number	: Per SpeedSys300 ODS301 module: • 3 × frequency (speed) outputs There is one frequency (speed) output from each SpeedSys300 ODS301 module which is buffered/split in the SpeedSys300 ODS3000 system rack in order to support three identical frequency (speed) outputs per SpeedSys300 ODS301 module in a SpeedSys300 ODS3000 system rack. Note: Frequency (speed) outputs are typically used with simple panel-mounted displays in order to provide local digital readouts of the speed for the machine being monitored.
Type	: Digital
Levels	: Open-collector output signal up to 24 V_{DC} / 100 mA
Operation	: Digital output equivalent to the measured speed processed by the SpeedSys300 ODS301 module

⚠ **The SpeedSys300 ODS301 module's frequency (speed) output is not SIL certified and must not be used for critical functions in machinery protection applications.**

Control inputs

Number	: Per SpeedSys300 ODS301 module: • One proof test (control) input
Proof test (control) input	: Control input signals to support the proof test of a complete system containing SpeedSys300 ODS301 modules, for example, external systems such as a safety PLC
Operation	: Low (<5 V_{DC}) enables the proof test for an individual SpeedSys300 ODS301 module, that is, the module's safety relays are put into the safe state. High (>15 V_{DC}) disables the proof test for an individual SpeedSys300 ODS301 module, that is, the module resumes normal operation.

Status indication

LEDs	: LEDs on the front panel of each individual SpeedSys300 ODS301 module indicate the status of the protection functionality (that is, the status of each individual SpeedSys300 ODS301). See also **Touch-screen display (optional) on page 18**.
Relay 1 / Relay 2 (2 × LEDs)	: Indicates the status of safety relay 1 and safety relay 2
Power / Error (2 × LEDs)	: Indicates the status of the power supply to the SpeedSys300 ODS301 module and the operational status of the complete system (sensor / measurement chain, the cabling and the module itself)

Note: Refer also to the *SpeedSys300 ODS301 overspeed detection system (module) data sheet*.

SPECIFICATIONS *(continued)*

Monitoring – PLC module

Monitoring functionality

Main component	: PLC module
Measurements	: Dynamic speed monitoring, "creep" / "zero speed" detection, rotation direction and/or high-level configuration checks
Outputs	: Per SpeedSys300 ODS3000 system rack: • 8 × relays • 1 × Ethernet (Modbus TCP) interface • Configured measurements. Note: The behaviour of the monitoring outputs depends on the configuration of the SpeedSys300 ODS3000 system rack. For example, the relays are typically configured to indicate measurements exceeding alarm limits. In addition, the PLC module reads various information from the SpeedSys300 ODS301 modules, which is then made available via Ethernet (Modbus TCP) and/or the touch-screen display (optional). See also **Communications interface (external) on page 11**.
Configuration	: The monitoring functionality of the SpeedSys300 ODS3000 system rack (PLC module) is fully software configurable using a web-based application or Automation Studio software (via/over Ethernet). See also **Ordering information on page 19**.
Logic	: For monitoring functionality, any required logic is non-critical and so it can be implemented by configuring the SpeedSys300 ODS3000 system rack's PLC module, as required by an application. Note: In comparison, protection functionality voting logic is critical and must be implemented by hardwiring safety relay outputs. See also **Protection functionality on page 13**.

Additional (PLC module) relays

Number	: Per SpeedSys300 ODS3000 system rack: • 8 × additional (PLC module) relays (relay 1 to relay 8)
Type and contact arrangement	: Single-pole double-throw (SPDT) relays. 1 × COM, 1 × NC and 1 × NO contact available per relay.
Nominal voltage	: 30 V_{DC} / 115 V_{AC}
Maximum voltage	: 125 V_{AC}
Switching voltage	: 110 V_{DC} max. / 125 V_{AC} max.
Nominal output current	: 1 A at 30 V_{DC} / 0.5 A at 115 V_{AC}
Operation	: The SpeedSys300 ODS3000 system rack's additional (PLC module) relays are user-configurable including for the default state, which can be either normally energised (NE) or normally de-energised (NDE). In general, the SpeedSys300 ODS3000 system rack can use these additional relays for any purpose, as determined by the PLC module's configuration.

⚠ **The SpeedSys300 ODS3000 system rack's additional (PLC module) relays are not SIL certified and must not be used for critical functions in machinery protection applications.**

SPECIFICATIONS *(continued)*

Control outputs

Number : Per SpeedSys300 ODS301 module:
- 1 × binary (status) output

Binary (status) output : Control output signal to indicate the status of an individual SpeedSys300 ODS301 module in a SpeedSys300 ODS3000 system rack.
Note: The binary (status) output signals are not made available externally directly but are connected as inputs to the PLC module. Accordingly, the PLC module can be used to indicate the status of the SpeedSys300 ODS3000 system/rack (and any of the main rack/system components), as required by an application.
See also **Control inputs on page 15**.

Operation : The SpeedSys300 ODS301 module's advanced self-monitoring and diagnostics (BIST) continuously checks and monitors the status of the sensor / measurement chain, the cabling and the module itself, and uses the binary output to indicate the status of the module, where:
- Low indicates a problem with an individual SpeedSys300 ODS301 module.
- High indicates the normal operation of an individual SpeedSys300 ODS301 module.

Note: If a SpeedSys300 ODS301 module safe state is the result of a system problem, the binary (status) output indicates this.
For example, during normal operation, the PLC module reads the binary status (output) bit from each individual SpeedSys300 ODS301 modules. This information can subsequently be used and shared via the SpeedSys300 ODS3000 system rack's Ethernet (Modbus TCP) communications interface, touch-screen display (optional) and/or additional (PLC module) relays.

Status indication

Ethernet (Modbus TCP) and/or touch-screen display (optional) : The PLC module can be used to indicate the status of the SpeedSys300 ODS3000 system/rack (and any of the main rack/system components), as required by an application.
For example, during normal operation, the PLC module reads various information from the SpeedSys300 ODS301 modules, which can subsequently be used and shared via the SpeedSys300 ODS3000 system rack's Ethernet (Modbus TCP) communications interface, touch-screen display (optional) and/or additional (PLC module) relays.

See also **Status indication on page 15**.

SPECIFICATIONS *(continued)*

Touch-screen display (optional)

Display type	: Colour TFT display and touch screen
Size	: 4.3" (11 cm)
Resolution (aspect ratio)	: 480 × 272 (16:9 WQVGA), landscape format
Colours / contrast	: 16.7 million / 350:1 typical
Viewing angles	: 70° typical (L / R direction). 50° typical (U direction) and 70° typical (D direction).
Backlight type / brightness	: LED / 450 cd/m^2 typical
Touch-screen type / technology	: AMT / analog resistive
Storage temperature	: −20 to 70°C (−4 to 158°F)
Storage humidity	: 0 to 85% relative humidity (RH), non-condensing
IP20 (in accordance with IEC 60529)	: IP65 (front) and IP20 (back)
Indoor use	: Limited to indoor use only

Note: The touch-screen display is an optional component that provides a front panel display for a SpeedSys300 ODS3000 system rack, where demanded by an application. The display is controlled by the PLC module, so it is highly-configurable, and is typically used to display overview/summary information, such as current speeds, alarm limits and status information, in a "Mimic" type arrangement.

DIMENSIONS (MECHANICAL DRAWINGS)

Note: All dimensions in mm (in) unless otherwise stated.

ORDERING INFORMATION

To order please specify

Type	Designation	Ordering number (PNR)
SpeedSys300 ODS3000	Different versions of the overspeed detection system (rack):	
	– Standard turbine version 3 × SpeedSys300 ODS301 modules with 2oo3 voting logic.	TBC
	– Basic turbine version 3 × SpeedSys300 ODS301 modules with 2oo3 voting logic. Note: The "basic" version has a reduced feature set in order to support more cost-sensitive applications. It consists of the 19" rack and SpeedSys300 ODS301 modules only (that is, there is no PLC module, no touch-screen display and hot-swap is not supported).	TBC
	– Standard machinery version 2 × SpeedSys300 ODS301 modules with 1oo2 voting logic.	TBC
	– Basic machinery version 2 × SpeedSys300 ODS301 modules with 1oo2 voting logic. Note: The "basic" version has a reduced feature set in order to support more cost-sensitive applications. It consists of the 19" rack and SpeedSys300 ODS301 modules only (that is, there is no PLC module, no touch-screen display and hot-swap is not supported).	TBC

Notes

Contact Meggitt SA for further information on different versions of the SpeedSys300 ODS3000 overspeed detection system (rack) with options such as the touch-screen display or "basic" versions.

SpeedSys300 ODS3000 systems (racks) are supplied with a complete set of screw-terminal connectors for the module and a USB cable (USB Type-A to USB Mini-B) that is suitable for connecting the individual ODS301 modules to a computer. It is also supplied with access (via FTP) to a copy of the SpeedSys300 software, proprietary Windows® software for the configuration and operation of ODS301 modules.

It is important to note that the SpeedSys300 ODS3000 overspeed detection system (rack) is a highly-configurable product and that the main rack/system components (SpeedSys300 ODS3000 modules, PLC module and optional touch-screen display) must be configured according to the intended application before it is installed and used for the first time. In general, the rack components are normally configured (hardware and software) for the application in a Meggitt factory before delivery of the system. Contact Meggitt SA for further information.

RELATED PRODUCTS

SpeedSys300 ODS301	Overspeed detection system (module)	: Refer to corresponding data sheet
TQ9xx, EA90x and IQS900	Proximity measurement chains	: Refer to corresponding data sheets

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In this publication, a dot (.) is used as the decimal separator and thousands are separated by thin spaces. Example: 12345.67890.

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