PROGNOST
Intelligence on Duty

PROGNOST®-SenSim

Sensor signal simulation instead of stimulation

7 different signal types

static and dynamic signal simulation
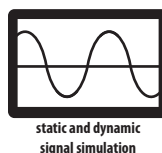
2ooX Voting schemes
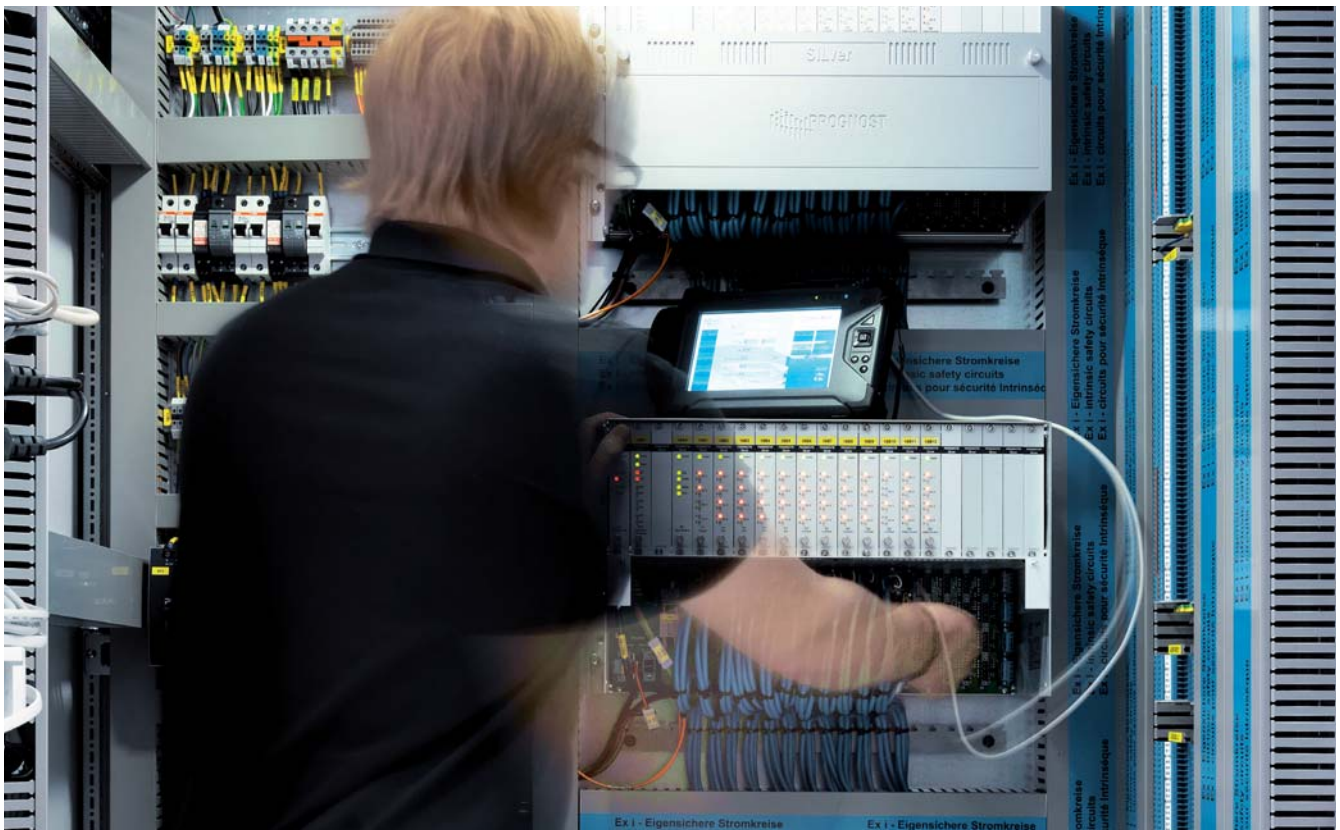
Enhance Safety Proof Test Intervals (PTI)

Safety Instrumented Systems (SIS) perform specified functions to achieve a safe state of process when dangerous conditions occur. It is their aim to mitigate consequential events. Loops of Safety Instrumented Systems consist of

• Sensors
• Logic solvers (processing the sensor signal and giving outputs)
• Final elements (taking action to bring the process to a safe state, e.g. safety shutdown)

Regulatory requirements

According to the IEC 61511 Lifecycle Concept, many SIS-specific monitoring and test activities are required to maintain the desired level of safety integrity, i.e. Safety Integrity Level (SIL). This validation is called Proof Test Interval (PTI) and has to be carried out on a regular basis. Proof tests must be conducted as defined procedures that ensure tests are done correctly and systematically. Failed devices must be repaired or exchanged to achieve completely reliable process safety.

Monitoring rotating equipment

The population of rotating equipment in the process industry is huge. Pumps, compressors and auxiliary systems are integral parts of the production process. Many of these are rated as "critical" and call for a reliable and adequate safety protection system. The most commonly used method for condition monitoring and safety protection of rotating machines is vibration analysis with velocity, acceleration and proximity sensors. PROGNOST®-SenSim is the first and only product available that is able to simulate sensor outputs, including their electrical behavior producing realistic static and dynamic signals.

One device for all testing routines

PROGNOST®-SenSim is a portable device for the simulation of sensorsignals. It simulates static and dynamic signals for measuring loop test routines.

Sensor simulation capabilities

- Simulation of sensors with separate setting for static and dynamic signal components
- Simulation of full sensor measuring range
- Predefined Sensor library including most commonly used Eddy Current and Acceleration / Velocity Sensor Types
- User conveniently apply values in units they regularly deal with (g's, inch/sec, mil, bar etc.) eliminating the need for complex electrical conversion into mV, mA etc.

PROGNOST®-SenSim simulates sensors with the following signal types:
- 4 ... 20 mA – Simulates for example pressure, temperature, flow, level transmitters.
- *ICP/IEPE – Simulation of dynamic ICP/vibration signals. The signal is phase-referenced, i.e. simulated per revolution over 360° crank angle.
- Eddy Current – Overlaying static signals with dynamic signals allows to simulate the dynamic piston rod position of a reciprocating compressor and dynamic shaft position of other rotating equipment (e. g. centrifugal compressors, gas turbines or pumps).
- Voltage – Simulation of +/– 10 V voltage for norm signals in the field of measurement and control technologies.
- Trigger – Rotation speed simulation, from 30 up to 65.000 rpm is possible.

- Pulse (Lube Oil) – for simulation of lubrication instrumentation, e.g. Loft 600, KIS and Kracht.
- Strain Gauge – indirect pressure measurement at high pressure compressors (Hyper).

* ICP (integrated circuit piezoelectric)
  IEPE (integrated electronics piezoelectric)

## Realistically testing of safety protection functions and algorithms
- 2ooX voting
- Signal plausibility check
- Counting of consecutive revolutions with safety limit violation (phase referenced signal)

Eliminating the risk of sensor damage
The testing procedures can be carried out without taking off the sensors. This eliminates all associated risks, such as sensor damage or recalibration issues.

## Adjustable to any desired frequency and amplitude
The defined and precise violation of real safety limit-settings makes the execution of PTI (Proof Test Interval) compliant to IEC regulatory requirements (no manipulation of safety limits to initiate Alert / Shutdown / Unsafe conditions).
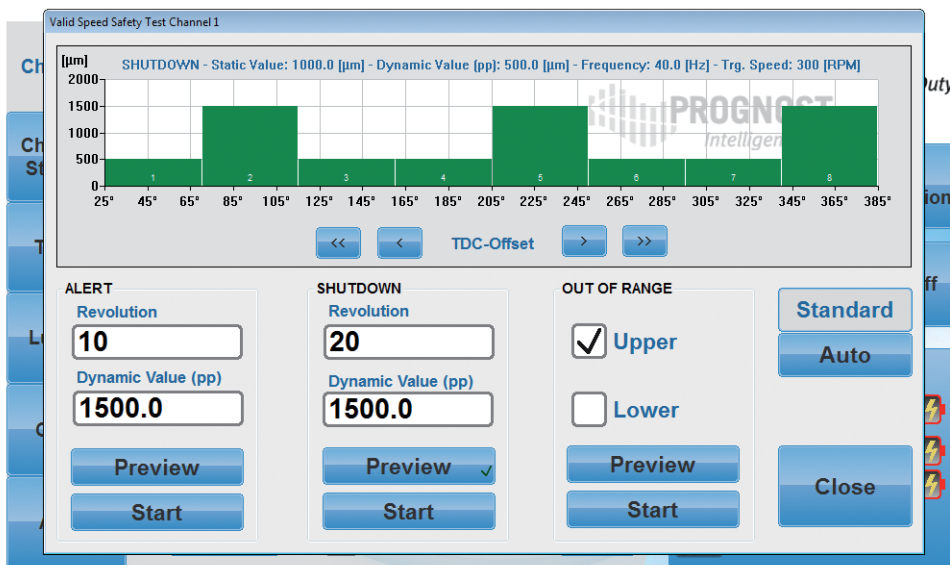
VSST sample for a Rod Position signal (8 segments)

VSST (Valid Speed Safety Test)

The VSST is especially designed for performing the PTI on systems designed for monitoring reciprocating machinery with Segmented Vibration Monitoring. While PROGNOST®-SILver monitors every revolution subdivided into 36 or 8 segments, this functionality helps to realistically simulate ALERT and SHUTDOWN situations by violating a selected number of segmented safety limits over a defined number of consecutive revolutions. Additionally it can simulate a signal out of range situation, important to test the systems capability of detecting UNSAFE conditions of the monitoring system itself. The TDC offset setting helps to configure the Trigger signal exactly referenced to the TDC of the cylinder under test.
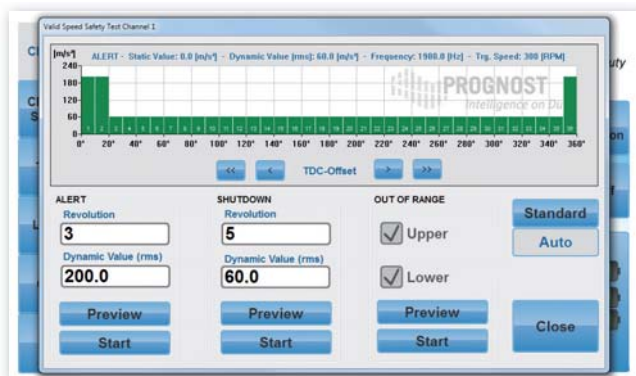
2ooX voting logic

Testing of voting routines such as 2ooX are supported by the 2-channel architecture of PROGNOST®-SenSim. 2ooX architectures with large X-values typically indicate applications where unacceptable process conditions can occur in multiple distinct locations. Proof testing this architecture requires two different signals of the same kind in parallel. PROGNOST®-SenSim simulates concurrently the following sensor signals fully phase referenced (one channel each sensor).

- ICP/IEPE
- 4 ... 20 mA
- Eddy Current
- Voltage

Signal shaping

PROGNOST®-SenSim provides unmatched signal shaping options:

- Simulation of sensor physics (signal spread)
- Definable amplitudes on every part of the revolution
- Realistic simulation of static and dynamic sensors up to 10 kHz
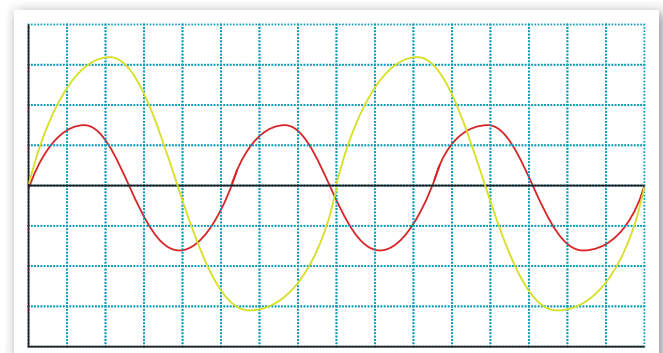
PROGNOST®-SenSim Generator

Technical data	
Battery	Lithium Polymer battery pack (3.7 V, 2600 mAh, 9.7 Wh), up to 5 hrs. run time, charging time 3 hrs.
Environmental conditions	
Operating Temperature	-20 °C to +60 °C (-4 °F to +140 °F)
Storage Temperature	-20 °C to +60 °C (-4 °F to +140 °F)
Relative Humidity	5 % to 95 % non-condensing
Protection Class	as per IEC 529 (EN60529) IP 50
Dimensions	135 mm x 125 mm x 38 mm (5.31 inch x 4.92 inch x 1.49 inch)
Weight	630 gr (1.367 lbs)

Technical data per channel	Minimum	Standard	Maximum	Unit
ICP/IEPE				
Signal Range	6		16	V
Bias Voltage		11		V
Frequency Range	0		10	kHz
ICP/IEPE current	2		10	mA
Resolution		12		Bit
Linearity Error (full range)			0.5	%
4 ... 20 mA				
Signal Range	4		20	mA
Frequency Range	0		10	kHz
Output Impedance			100	Ohm
Resolution		12		Bit
Linearity Error (full range)			0.5	%
Eddy Current				
Signal Range	-19		-1	V
Frequency Range	0		10	kHz
Output Impedance			100	Ohm
Load Current	7		9	mA
Resolution		12		Bit
Linearity Error (full range)			0.5	%
Voltage				
Signal Range	-10		10	V
Frequency Range	0		10	kHz
Output Impedance			100	Ohm
Resolution		12		Bit
Linearity Error (full range)			0.5	%
Trigger Namur				
Metal detected			1.2	mA
Metal not detected	2.1			mA
Switching Frequency	0.5		50	Hz
Input Voltage		10		V
Trigger Eddy Current				
Metal detected		-7		V
Metal not detected		-13		V
Switching Frequency	0.5		50	Hz
Load Current	7		9	mA
Strain Gauge				
Signal Range	-2		2	mV/V
Excitation Voltage	1	2.5	5	V (AC/DC)
Frequency Range	0		10	kHz
Bridge Resistance		350		Ohm
Resolution		10		Bit
Linearity Error (full range)			0.5	%
Lube Oil				
Input Voltage		24		V
Pulses per Minute	0.6		600	Hz
Load Current			20	mA

PROGNOST®-SenSim Handheld

Technical data	
Processor	Intel® Atom Processor N2600 (1.6 GHz) Dual Core, Passive cooling
RAM	2 GB DDR3 800
Display	7" TFT LCD with resistive touchscreen and LED-backlights, 1024 x 600 Pixel
	Sunlight readable display
Battery	2x Lithium Ion battery pack
	Up to 8 hrs. run time, hot-swappable, charging time around 3 hrs.
Power (Charging Unit)	Input: 100 V - 240 V, 50 Hz - 60 Hz
Environmental conditions	
Operating Temperature	-20 °C to +65 °C (-4 °F - 149 °F)
Storage Temperature	-45 °C to +60 °C (-49 °F - 140 °F)
Relative Humidity	95 % @ 60 °C (140 °F) 5 x 48 hrs. cycles
Protection Class	IP65
Dimensions	225 mm x 145 mm x 39.8 mm (8.85 inch x 5.7 inch x 1.5 inch)
Weight	1.3 kg including 2 batteries (3 lbs including 2 batteries)

PROGNOST®-SenSim Starter Kit

Hardware

- PROGNOST®-SenSim Generator
- PROGNOST®-SenSim Handheld
- Charger (Multi Country)
- Outdoor case with shoulder strap

Cable

- Cable Handheld/Generator
- Cable Channel 1/Channel 2 Cut End
- Cable Trigger/Namur Cut End
- Short circuit plug Channel 1/Channel 2
- Short circuit plug Trigger (Namur and Eddy Current)
- Cable Strain Gauge-Cut End
- Cable Lube Oil-Cut End

Go online for additional cable options and individual product configuration: www.prognost-sensim.com

It all adds up to PROGNOST®-SenSim

1 Configuration

2 Proof Test

3 Verification

ALERT SHUTDOWN UNSAFE

Time savings and flexibility

One device for the simulation of all types of sensors, e.g.
- Vibration
- Position/Displacement
- Temperature
- Level
- Flow
- Pressure

Damage simulation
Realistic signals up to 10 kHz allow simulation of real-life conditions.

Risk avoidance
No calibration issues or damage of sensors due to disassembly, mechanical stimulation and reassembly. Eliminates the need of mechanical signal stimulation, e.g. shaker.

Regulatory compliance
Proof Test Interval of SIS/Safety Protection systems with real safety limits and check of safety algorithms, e.g. voting, consecutive revolutions.

Reliable and user friendly

With PROGNOST®-SenSim Handheld, users are able to configure the PROGNOST®-SenSim Generator for simulating signals. After configuration, data is applied to the Generator which is then ready to be used independently from the Handheld.

After connecting the measuring loops, the Generator will produce the previously configured simulation values in order to check the measuring loop and safety protection systems.

PROGNOST®-SenSim Starter Kit

Item number	
3000062	**PROGNOST®-SenSim Starter Kit**
	PROGNOST®-SenSim Generator with power supply
	PROGNOST®-SenSim Handheld with power supply
	Connecting cable Generator - Handheld
	Sensor cable Trigger (Namur)
	Short circuit plug Trigger (Namur)
	Sensor cables Cut End, Channel 1 & Channel 2 (2 pcs.)
	Short circuit plug Channel 1 & Channel 2
	Outdoor case
	User manual

Configure your PROGNOST®-SenSim online   **www.prognost-sensim.com**

Single items, spare parts, additional cable options

Item number	
1 002 053	PROGNOST®-SenSim, Case1
3 000 060	PROGNOST®-SenSim, GD1 Generator
3 000 061	PROGNOST®-SenSim, HH1 Handheld
3 000 062	PROGNOST®-SenSim, SK1 Starter Kit
3 000 063	PROGNOST®-SenSim, PG1 Power Supply Generator
3 000 064	PROGNOST®-SenSim, PH1 Power Supply Handheld
3 000 065	PROGNOST®-SenSim, GD1-HH1 cable 2.0m
3 000 070	PROGNOST®-SenSim, CH1/2-Cut End cable 2.5m
3 000 071	PROGNOST®-SenSim, CH1/2-Vibration MIL cable 2.5m
3 000 072	PROGNOST®-SenSim, CH1/2-Pressure M16 cable 2.5m
1 003 593	PROGNOST®-SenSim, CH1/2-Pressure M12 cable 2.5m
3 000 073	PROGNOST®-SenSim, Ch1/2 Ch2-Short Circuit plug
3 000 074	PROGNOST®-SenSim, Trigger Namur-Cut End cable 2.5m
3 000 075	PROGNOST®-SenSim, Trigger Namur-M12 cable 2.5m
3 000 076	PROGNOST®-SenSim, Trigger Eddy-Cut End cable 2.5m
3 000 077	PROGNOST®-SenSim, Trigger-Short Circuit plug
3 000 078	PROGNOST®-SenSim, Strain Gauge-Cut End cable 2.5m
3 000 079	PROGNOST®-SenSim, Strain Gauge-M8 cable 2.5m
3 000 080	PROGNOST®-SenSim, Lube Oil-Cut End cable 2.5m
3 000 081	PROGNOST®-SenSim, Lube Oil-Loft600 cable 2.5m
3 000 083	Power Cable, Type B (US, JP, CU, MX, CA, TH)
3 000 084	Power Cable, Type G (GB, HK, KE, IE, MY, CY, LK, MT, SG, AE)
3 000 087	Power Cable, Type F (DE, FR, BE, CZ, PL)
3 000 088	Power Cable, Type I (AU, NZ, AR)
3 000 089	Power Cable, Type J (CH, LI)
3 000 120	PROGNOST®-SenSim, Manual English
3 000 121	PROGNOST®-SenSim, Manual German

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