



MHC - 4000 Series Sensors

- Smart Sensors for Permanent Installation
- Shaft Speeds above 30 RPM & 0.25 - 60 RPM
- Sigma Sensors for Intermittant Operation

MHC-4000 Series Smart Sensors

The MHC 4000 series sensors from Holroyd are the latest development in smart Acoustic Emission (AE) sensors and incorporate proven MHC technology. MHC-Smart sensors extend your CM tools far beyond the capabilities of other vibration based technologies. Three sensors are available for fixed installation.



Shown is a MHC - Sigma Sensor with Tab mount.

- MHC-Smart Std – smart sensor for use on shaft speeds above 30 RPM.
- MHC-Smart Slo – smart sensor uniquely developed for monitoring shaft speeds from 60 RPM down to 0.25 RPM.
- MHC-Sigma – smart sensor for intermittent or short duration machine operation. Another unique offer from Holroyd.



These three smart sensors represent the distillation of the unique technology that underpins a range of field proven condition monitoring instruments offering clever, cost effective sensors for permanent installation. They represent a breakthrough in miniaturisation incorporating a high frequency transducer, signal conditioning and

MHC-Smart Std - Reliable on-line monitoring for shaft speeds > 30 RPM.



The MHC-Smart Std provides a direct readout of Distress® & dB Level.

Over the last 20 years, it has gained an enviable reputation for the sensitive detection of wear and degradation in rotating machinery. It will even detect inadequate lubrication before permanent damage has occurred. Unlike Vibration Analysis, it is insensitive to other effects such as speed variations, the operation of adjacent machines and changes in operating conditions (such as on / off-line).

- Alarm functions are pre-programmed from your PC into non-volatile memory using the Smart/RT interface.
- The alarm output to a local LED indication of alarm state or input to a PLC or SCADA system.
- Analogue output of Distress® & dB Level for monitoring or trending.

MHC-Smart Slo - Unique on-line monitoring capability for slow rotational speeds 60 RPM to 0.25 RPM.







The MHC-Smart Slo sensor incorporates the extensively proven and patented Super Slo method. It detects early signs of wear and degradation in very slowly rotating machinery with minimum set-up requirements, just enter the time per revolution in seconds. The MHC-Smart Slo uses advanced processing to output any two of the derived parameters of Extent®, Peak, Intensity and dB Level. (Extent is sensitive to generalised damage, Peak to singular defects such as a cracked race & dB Level to constant friction intensity).

- Analogue output and alarm pre-programmed into non-volatile memory from your PC using the Smart / RT interface.
- The alarm output to a local LED indication of alarm state or input to a PLC or SCADA system.
- Analogue output of two selected parameters are also available for monitoring or trending.

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This smart sensor is a ground-breaking solution to monitoring machinery that operates intermittently, randomly or only for short durations (as short as 500 ms). This application has been problematic, typically requiring operation or production to be interrupted while the machine was run continuously in a 'maintenance mode'. Now for the first time, the MHC-Sigma allows continuous, autonomous monitoring of such machinery without any disruption. MHC-Sigma is a complete, stand alone, single channel monitoring and warning system which incorporates the following functions:

-  Signal detection - high frequency transducer & signal conditioning.
-  Signal processing, intelligent signal reconstruction and Distress® & dB Level. Flexible, user configurable alarm settings.
-  Data-logging - automatic non-volatile memory of trended values over the last 384 days.
-  Digital interface enables PC connection via Sigma/RT for set-up & memory download.



2000, 3000 Low profile sensor.

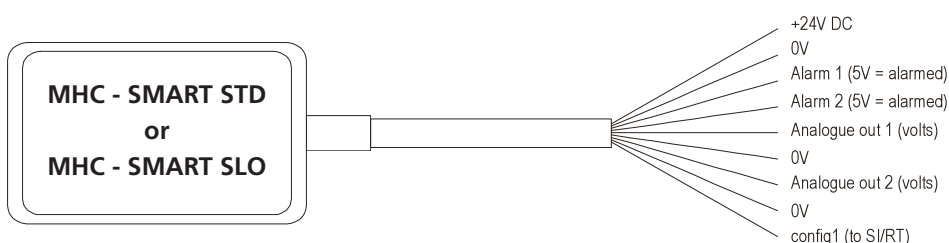
MHC-Sigma further simplifies installation in the following ways:

-  All functions are integrated into a compact stand alone sensor housing (switched output drives LED or relays).
-  Direct connection to PLC (alarm can be directly connected to a 0 to +5V digital input). Direct connection to SCADA (0 to +10 VDC analogue values & 0 to +5 VDC alarm output).
-  Set-up mode when linked to PC gives full visual feedback of settings on actual waveforms.
-  Optional Sigma Interface Unit has LED status indicators, alarm relay driver reset buttons & sockets for quick PC connection via Sigma / RT. to allow sensor set-up and downloading of the sensors 384 day trend.

MHC 4000 Series Sensors (sensors with pre-processed outputs)

Sensors		
4010	Smart Std	Standard mode smart sensor
4015	Smart Std /Tab	Tab mounted Standard mode smart sensor
4011	Smart Std /DP	Standard Mode smart sensor dip coated
4016	Smart Std /Tab /DP	Tab mounted Standard mode smart sensor dip coated
4020	Smart Slo	Super Slo mode smart sensor
4025	Smart Slo /Tab	Tab mounted Super Slo mode smart sensor
4021	Smart Slo /DP	Super Slo Mode smart sensor dip coated
4026	Smart Slo /Tab /DP	Tab mounted Super Slo mode smart sensor dip coated
4040	Sigma	Intelligent sensor for monitoring intermittent & short duration machine operations
4041	Sigma /DP	Dip coated intelligent sensor for intermittent & short duration machine operations
4045	Sigma /Tab	Tab mounted intelligent sensor for intermittent & short duration machine operations
4046	Sigma /Tab /DP	Dip coated, tab mounted intelligent sensor for intermittent & short machine operations
Software and accessories		
4030	Smart View	Set-up software for Smart Std and Smart Slo (requires Smart / RT interface)
4070	Smart/RT	Communications interface between Smart sensors & PC
4050	Sigma View	Sensor set-up software for Sigma sensors
4055	Sigma Pro	Waveform capture & analysis software for use with Sigma sensors
4060	Sigma Interface Unit	2 channel display & human interface unit for Sigma sensors
4080	Sigma/RT	Communications interface between Sigma Interface Unit & PC

Technical Specifications



MHC-4000 Series Smart Sensors

Product	MHC-Smart Std	MHC-Smart Slo	MHC-Sigma
Measurement			
Speed range	>30 RPM	60-0.25 RPM	Stop/start
Interval	10 seconds	9xT where T is selected time per rev.	10 seconds of validated composite signal. Contributing signal segments must have a minimum duration of 500ms.
Measurement	dB Level, 0 to 90 dB in 1 dB steps Distress® 0-40 steps	dB Level, log scaled overall mean level E - % of rotation with high activity. P, Log scaled peak signal level I, Log scaled average activity level	dB Level, 0 to 90 in 1 dB steps Distress® 0-40 steps
Auto detection			Adjustable 5 dB or greater in steps of 1dB
Signal rejection			0-10s Startup 0-10s Slowdown both adjustable using Sigma / RT adapter & Sigma View
Alarm Functions			
Output	2, programmed via Smart / RT + Smart View	2, programmed via Smart / RT + Smart View as dB, E, P or I.	Programmed via Sigma / RT & PC running Sigma View
Electrical	5 V @ 10 mA in alarm for LED or PC input.		
Operating Function	Each alarm acts on Distress® or dB configured as OR function.	Each alarm acts upon the parameters selected by the user from dB, E, P or I as OR function.	Each alarm acts on Distress® or dB configured as OR function.
Action	Output alarm only occurs when signal reaches or consistently exceeds the alarm level for a user set holdoff period of 1 - 255 Intervals.		Output alarm only occurs when signal reaches or consistently exceeds the alarm level for a hold off period of 6 consecutive Intervals.
Analogue Outputs			
Quantity	2	2	2
Measurement	10 seconds	9 x T where T is selected time per rev.	10 seconds of validated composite signal. Contributing signal segments must have a minimum duration of 500 ms.
Electrical	0 - 10 V DC updated every measurement Interval, scaling at 100 mV.		
Analogue 1 output	Distress®	Selectable	Distress®
Analogue 2 output	dB Level	Selectable	dB Level
PC Interface	Smart / RT adapter / PC running Smart View	Smart / RT adapter / PC running Smart View	Sigma / RT adapter & PC running Sigma View
General			
Sensing element	Piezoelectric 100 kHz		
Power requirement	24 V +/- 10% DC at 35 mA when not in alarm. EN6100-6-4, EN6100-6-2 or EN6100-4-5 or compliant		
Operating Temp	-15 to +75°C		
Dimensions LxWxH	54 x 35 x 19		
Weight	75 g inc 1 m of cable.		
Housing material	Painted mild steel. Polyurethane coated on request		Polyurethane coated mild steel
Attachment options	Tab mounted – see sensor specification. Bonded - recommended system - Loctite Structural Adhesive 326 (RS part 496-114) & Activator N Accelerator (RS part 108-716) if bonding to flat metal surfaces		

MHC-4000 Series Smart Sensors

Smart / RT - Smart Sensor PC adapter



Smart / RT allows direct communications between the MHC-Smart Std and Smart Slo sensors and the USB port of a PC running Smart View software. Data to be viewed and analysed on the PC, offline in addition to the usual alarm functions available on the sensors themselves.

Smart View software is supplied with the Smart / RT.

Smart View - Smart Std & Smart Slo Setup Software



Smart View is supplied with the Smart / RT to configure Smart Std or Smart Slo sensors. It is used in conjunction with the Smart/RT unit and a PC to adjust the alarm trip levels for both alarm channels together with a common timeout period (or alarm persistence) to avoid false alarms. When connected to the Smart Slo, the user can make machine specific adjustments and select the alarm output signal for two analogue channels on data collection / SCADA system.

The product also keeps track of what sensor settings for each adjustment are applied.

Sigma / RT - Sigma Sensor PC adapter



Sigma / RT allows direct communications between the MHC Sigma sensors and the USB port of a PC running Sigma View software. It is used in conjunction with the Sigma Interface Unit.

Sigma View and Pro software is supplied with the Sigma / RT.

Sigma Interface Unit - Simplifies connector and use

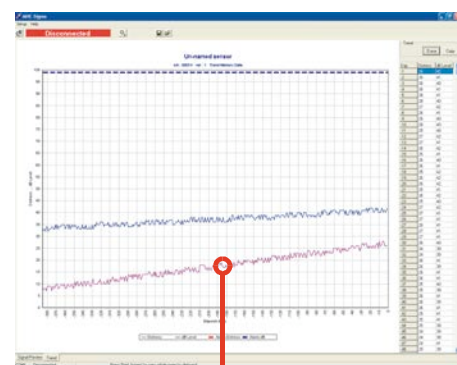


The Sigma Interface Unit has two uses:

- Sigma / RT and a PC will plug into this unit allowing direct communication without the need to move connectors. Sigma View software can be run to configure the sensors or analyse up to 384 days of readings.
- Permanent installation to display alarm readings independent of any PC connection.

Sigma View - Sigma Sensor Set up Software

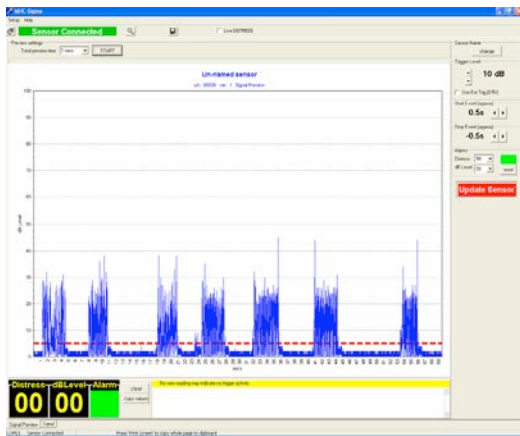
Sigma View is supplied with the Sigma / RT unit and lets the user configure the MHC-Sigma sensor to a particular application. Its primary function is to preview the acoustic signal (or signature) to derive a suitable starting trigger level and associated Start-Up and Slow-Down delays such that stable and reliable readings can be made on intermittently running machines. There is also a "live reading" mode which allows the user to check consecutive readings.



Sensor settings

Historical alarm trend

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A secondary function is to allow the user to download and view the internal trend history stored inside the sensor up to a maximum of 384 days of running. Long term trends become immediately obvious.

With Sigma View you can save the actual signal preview and setup data for future reference or your own records. Sigma View is also used to retrieve this data for later, off-line, post processing using the Sigma Pro software package as described below.

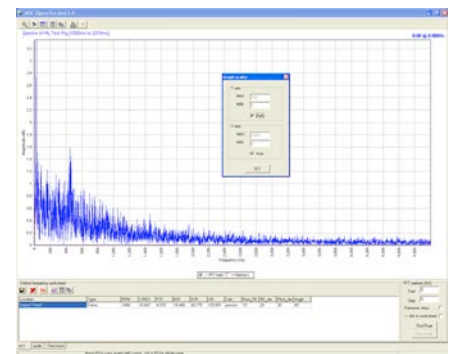
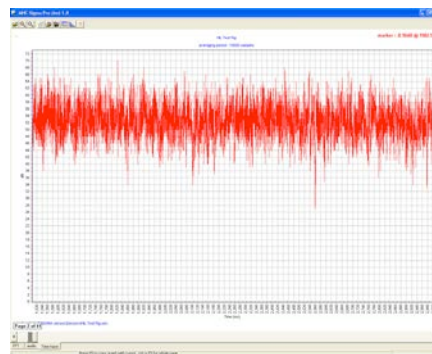
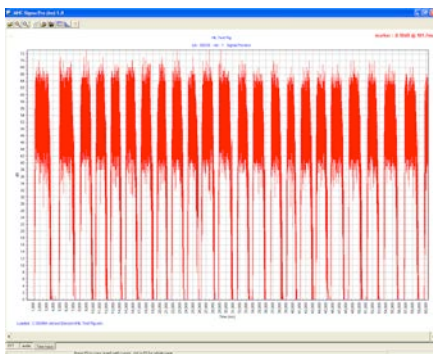
“Data shows AE signal from intermittent operation of an overhead crane primary drive gear box”:

Note - The irregular periods of operation and idle. Sigma sensors are specifically designed for those difficult monitoring applications.




Sigma Pro - Sigma Sensor Data Analysis (FFT) Software

Sigma Pro is also supplied with the Sigma / RT. It is a diagnostic programme that reads files saved from Sigma View to derive time profile, frequency spectra (FFT) and audio playback (acoustic stethoscope) of the data. It uses data previously saved in Sigma View so there is no need to be connected to the sensor. Work can be undertaken offline, typically in the office. It is a misconception to believe you cannot perform FFT analysis using AE sensors. You can using Sigma Sensors and Sigma Pro!

Integrated into the product is a bearing defect calculator which assists you in identifying typical bearing faults (e.g. inner or outer race defects etc) based on shaft speeds and bearing details. This approach will be familiar to anyone with previous knowledge or experience of traditional Vibration Analysis (VA) products and systems.



Examples of data analysis using Sigma Pro:

-  Intermittent machine signal captured by an MHC-Sigma transducer and downloaded to Sigma Pro analysis software.
-  An expansion of a short period of steady state operation within the captured wave form.
-  A FFT analysis of the captured waveform. Note that to maximise signal / noise ratio, the analysis was undertaken on data from a large number of short periods of steady state operation. This is a unique feature of MHC technology.

About Kittiwake Holroyd Ltd

Holroyd are part of the Kittiwake group of companies. If your business is about condition monitoring of machinery, maintenance of industrial fuels and lubricants or monitoring of exhaust gases then Kittiwake operate in your field of expertise. Established in 1993, Kittiwake has grown into a leading global provider of monitoring and testing technology solutions with offices in the UK, Germany, India, USA, and Asia. Innovative technology solutions that make a real difference to your operations.

Have a look at our information center on www.condition-monitoring.com for hints and tips on how to maximize the benefits from your maintenance budget.



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