PRODUCT DATA – TYPE PCH 1008

DIGITAL DUAL CHANNEL VIBRATION MONITOR

USES AND ADVANTAGES

PCH 1008 is a dual input, all digital, vibration monitor primarily intended for condition monitoring of critical machines in a wide range of monitoring environments. A particular advantage of PCH 1008 is that it offers digital flexibility in your conditioning monitoring system.

PCH 1008 is setup and adjusted digitally, by means of a PC interface and software CHT 1008. This allows the monitor to be set up, by any user, exactly as required at any time. Signal analysis is performed internally by Digital Signal Processing, which can be programmed to perform almost any signal evaluation for a given monitoring application, standard or customized. Furthermore, this simple control of setup and measurements avoids the need for time-consuming analysis of required settings before purchasing the monitor, and you will not have to return the monitor to your supplier for adjustment or upgrade, simply because your monitoring requirements have changed. All settings can be saved for re-use.

The monitor may be set up, either remotely via a long distance interface, or at the mounting location using a laptop PC. The long distance interface (RS-485) can interconnect up to 32 PCH 1008 units, which can be addressed individually. In addition, PCH 1008 features system failure warning, alert / danger functions and DC outputs which make it ideal for permanent safety or condition monitoring of machinery.

Fig 1. The PCH 1008 Digital Dual Channel Vibration Monitor

APPLICATIONS

Typical applications include monitoring of imbalance, fatigue, misalignment, general vibrations and bearing condition in Mills, Rolling Mills, Gas Turbines, Wind Turbines, Pumps, Gearboxes, Engines, Fans, Power Stations, Centrifuges and all types of rotating mechanical machinery.

FEATURES

- PC interface with setup and display facilities running on Windows 98/NT.
- Isolated RS-485 multidrop interface for industrial environment.
- RS-232 Interface for PC Laptop for setting up individual monitors at mounting site.
- All programmed data is retained in the case of power failure.
- Four alarm relays with Make and Break facility for defining consequence of an alarm, for example, to switch off a machine.
- Alarm inhibit digital control on each channel, typically for use when starting machinery.
- Adjustable alarm delay to avoid false alarms.
- System failure relay with Make and Break.
- 28 Low Pass Filters and 21 High Pass filters.
- Choice of acceleration, velocity or displacement parameters.
- Proven CCLD/ICP® differential inputs.
- Optional CVLD, Charge or voltage input and external preamplifier programming allows variances in the monitoring system.
- Transducer sensitivity programming.
- Individual transducer label programming to define monitoring purpose.
- Built-in comprehensive test generator for testing new setups.
- Built-in reference for self-calibration ensures long term stability of measurements.
- True RMS, Peak or Peak-to-Peak measurements giving actual values.
- Vibration level in real units, for instance g or Inch/s.
- 1 Hz to 10 k Hz measurement range.
- Isolated DC outputs: 0/4 to 20 m Amps and 0 to 5 volts avoids ground loops.
- Conditioned and Unconditioned AC outputs for additional signal analysis opportunities.
- 10kHz antimounting resonance Low Pass filters avoids problems relating to mechanical resonance in accelerometers.
- Industrial environment housing IP 67.
- Mains (supply) 85 to 260 Volts AC range.

DIGITAL SETUP

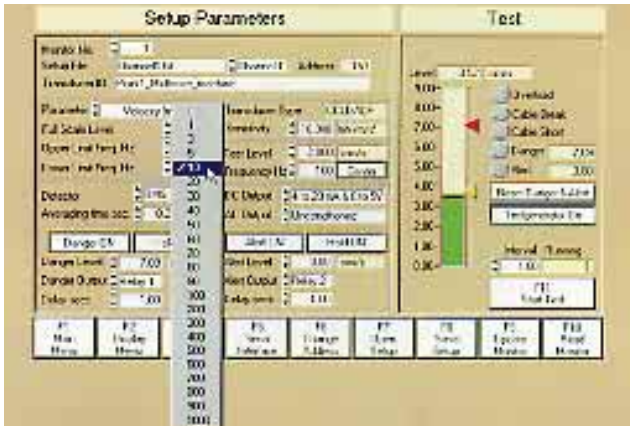

Fig. 2. Setup screen of PCH 1008 / CHT 1008

DIGITAL MONITORING

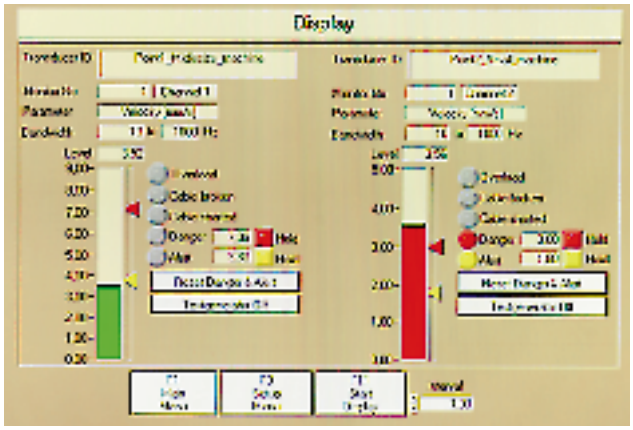

Fig. 3. Display screen of PCH 1008 / CHT 1008

Setup of PCH 1008 is selected through a user-friendly setup menu of the CHT 1008 software, which is provided with each PCH 1008.

Setups may be changed in up to 32 monitors via one RS-485 interface-line. All the Monitors on the line have a specific address number and can be selected from the PC by means of CHT 1008. All selections of monitoring parameters are made from pull-down menus, or entered numerically in fields. Refer to figure 8 for available selections in the standard version.

If you do not use a permanent RS-485 interface installation, you can setup monitors by bringing your laptop PC (with CHT 1008 installed) to the monitoring site and connect it directly to the monitor via the built-in RS-232 socket inside the monitor.

This flexibility enables the user to analyze which setup is the best for the specific machine in question, because the effect of the settings can immediately be displayed. False alarms can be inhibited during the adjustment of a setup by simply switching off the Danger and/or Alert functions, tuning in the monitor, testing it and setting the alarms back to normal.

The CHT 1008 software has easy-to-use facilities that enables the user to display measurements (both levels and errors), two channels at a time from the Display-menu. From the Setup-menu, all of the listed parameters in figure 8 may by altered and saved on disc.

PCH 1008 helps to predict damage or breakdowns before major damage to machinery occurs, thus providing time to find maintenance crews and spare parts and the opportunity to schedule production stops at convenient times.

Once setup, the PCH 1008 will mind its own business by monitoring the machine accordingly, until vibration become severe and an alarm will occur.

For remote monitoring, one or several monitors may be connected to one PC via the RS-485 Multidrop serial bus. Each Monitor, having its own address, is in turn selected by the PC. In addition, you can setup the monitor at the mounting site by connecting individual monitors to a PC via a RS-232 connector inside the monitor.

Two isolated DC outputs provide the vibration level from the two channels. They may be fed to any distributed control system (DCS) accepting either voltage or current loop. For example, moving coil instruments in a control room or Automatic Process control systems that log data via PLCs. Both DC outputs are individually isolated in order to avoid ground loops in remote systems.

For security purposes, the CHT 1008 software is provided with password gates for preventing unauthorized personnel from interfering with the system.

ALERT, DANGER AND SYSTEM FAILURE

Each of the two channels provides Alert and Danger alarms that can be linked to four relays as required, using the flexible setup facilities provided. If a measurement gives a higher value than set on Alert or Danger, it will trigger and pull the appointed relay after the specified delay time has elapsed. If more than one alarm is appointed to one relay, the relay will be pulled if any of the alarms levels are exceeded (OR-function). Hold functions ensure that Alert and Danger may be held until reset, either from the Alarm Reset digital input, or from the PC. This can be set to not-holding, self resetting, as well.

There is an alarm-inhibit input terminal for each channel. This is typically for use when starting or servicing machinery.

A system failure relay warns of an overload, a short or a break in the transducer cable, and a power failure.

All of these indications are of course shown in the display screen as well.

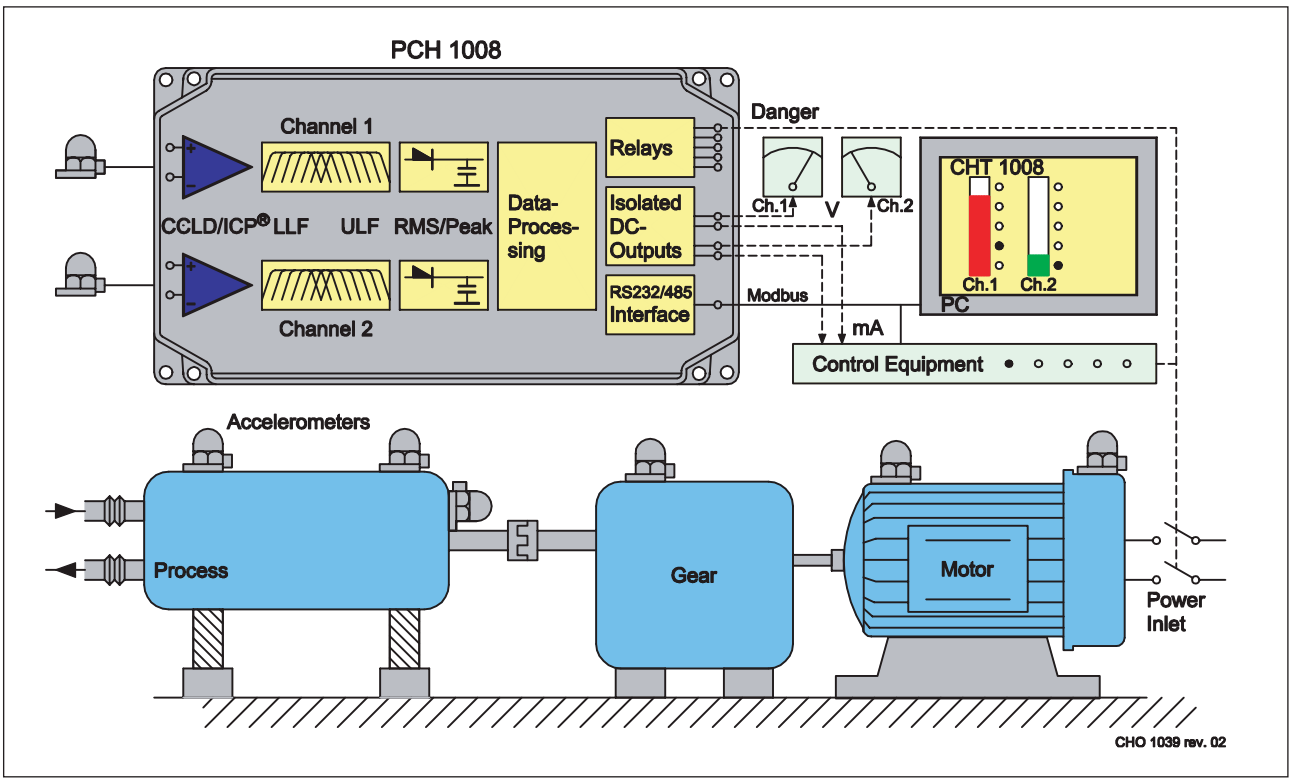

Fig. 6. Schematic diagram showing example setup of PCH 1008

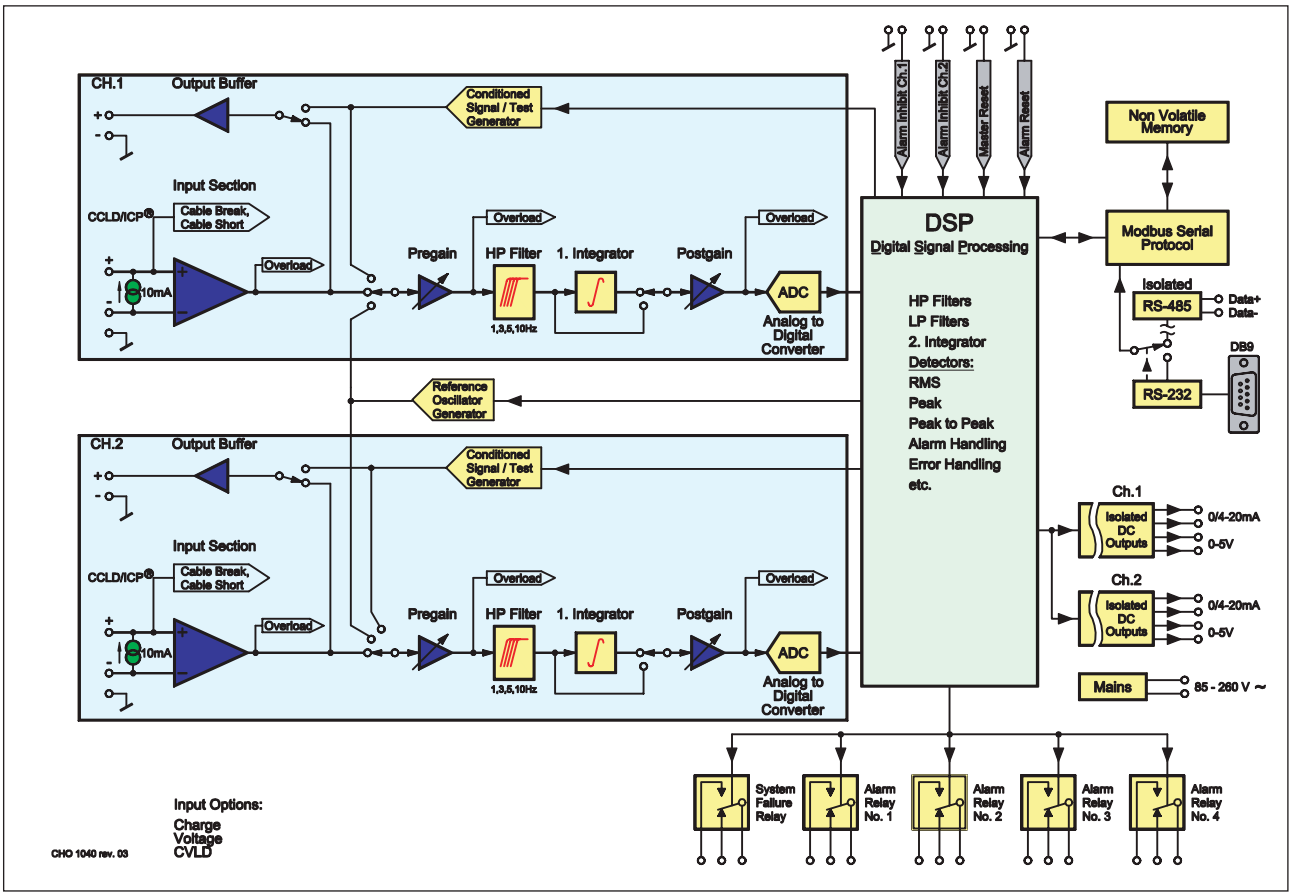

Fig. 7. Simplified block schematic of the PCH 1008 Digital Vibration Monitor

STANDARD PARAMETERS THAT MAY BE ALTERED IN THE MONITOR

Monitor address	1 to 247	
Baud rate	300, 600, 1200, 2400, 4800, 9600, 19200, 38400	
Set-up variables for both channels		Notes
Transducer ID	30 characters, identifier in customer facility	
Setup filename	12 characters, identifier to the file with the set-up	
Parameter		
Acceleration	m/s^2, mm/s^2, g, mg, µg, $Inch/s^2$, $mInch/s^2$, $µInch/s^2$ or	*a
Velocity	m/s, mm/s, µm/s, Inch/s, mInch/s, µInch/s or	*a
Displacement	m, mm, µm, Inch, Mils, µInch	*a
Full Scale Level	1 µ to 1000	*a
Upper Limit Frequency	20, 30.....100, 200, 300.....900, 1 k, 2 k.....10k Hz	
Lower Limit Frequency	1, 3, 5, 10, 20, 30.....100, 200.....1000 Hz	*a
Detector mode	RMS, Peak, Peak to Peak	
Averaging time (RMS)	0.01, 0.02.....to 10 seconds	
Decay Time (Peak)	0.1, 0.2.....to 10 seconds	
Transducer type	CCLD/ICP® (Constant Current Line Drive/Integrated Circuit Piezoelectric) Optinally Charge, Voltage and/or CVLD	
Transducer Sensitivity	1 µ to 1000 [mV/ m/s^2]	*a
Preamplifier Gain	1 µ to 1000 times	*a
Test Generator	On/off	
Test Generator Frequency	10 to 1000 Hz	*a
Test Generator Level	1 µ to 1000, depending on Mode and Frequency Range	*a
Danger	On/off	
Danger Relay No	None, 1, 2, 3 or 4	*b
Danger Delay	0.1, 0.2.....to 100 seconds	
Danger Level	1 µ to 1000	*a
Danger Hold	On/off	*c
Alert	On/off	
Alert Relay No	None, 1, 2, 3 or 4	*b
Alert Delay	0.1, 0.2.....to 100 seconds	
Alert Level	1 µ to 1000	*a
Alert Hold	On/off	*c
DC output	4 - 20 mA & 0 - 5 V or 0 - 20 mA & 0 - 5 V	
AC Output	Unconditioned or Conditioned	

Notes

*a: The Level ranges depends on which parameter is in use.
*b: If one Relay is selected in more than one Alarm, an OR-function is established.
*c: Alarms will be held after appearance and reset from the PC or via a digital input.

Fig. 8.

CUSTOMIZED PARAMETERS

The above mentioned standard parameters can be modified or replaced to individual needs by a corresponding change in the associated software.

If you have a particular monitoring application, please contact PCH Engineering A/S for more information for software options.

Fig. 9.

DIGITAL ANALYSIS

The setup can be altered to monitor differently to perform on-line vibration analysis. Some examples are as follows:

Crest factor measurement - by doing Peak and RMS measurements sequentially and calculate Peak/RMS to test a rolling element bearing.

Narrow band measurement - one way to pick out a specific part of a spectrum is to build a 6. order bandpass filter by tuning both LLF and ULF to the same frequency, testing the sensitivity with the test generator, measuring the level of that specific component and comparing it with earlier measurements to detect whether a component is about to break. In this way, it is possible to tune a setup whenever necessary. Once this is done, you can switch back to the regular monitoring setup.

MEASUREMENTS

PCH 1008 can measure over a wide frequency range - an essential requirement for effective machine condition monitoring. This is important in order to cover a range of vibration frequencies associated with different machine problems.

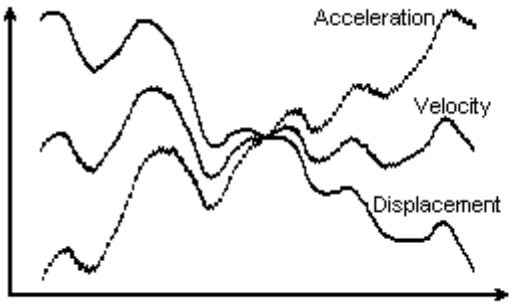

Fig. 4. Spectrum diagram of a typical vibration signal

In general, higher frequencies contain information about bearings and gears, whereas low frequencies are related to misalignments and balancing.

Since the velocity-spectrum is normally the most flat spectrum, it is often preferred because it places the least demands on the dynamic range of the monitor and it provides the easiest way to detect a rising vibration level in a broad frequency band.

Any of the three spectra may be computed from the acceleration signal in PCH 1008.

When detected, some further investigation of the vibration signal may be necessary to point out the exact reason for the increase in vibration - which component is about to break down, the time left before a major problem occurs and so on.

The wide variety of filters in PCH 1008 provides different ways to measure broad or wide band in acceleration, velocity or displacement-mode. This offers a high degree of versatility in adapting the measurement to the spectrum concerned.

All of the listed frequencies may be chosen in combination, while still being in control of the level by means of the built-in test generator.

The dynamic ranges in the PCH 1008 is greater than 1: 2 000 (66 dB) and 1:300 000 (109 dB) on the inputs, providing a great many opportunities to monitor all kinds of machine-vibration.

PCH 1008 gives the measurement results in actual units as programmed in the parameter, thus there is no need for translation to domestically understood parameters.

RELIABILITY

The reliability of the monitor is assured by a number of features. A calibrate-procedure in the monitor may be invoked from the PC whenever needed. The monitor can perform a self-calibration by means of the built in long term stable Reference Generator. The monitor will test the different gain possibilities and store calibration-factors in nonvolatile memory, thus maintaining precision even after a power failure.

The built in Test Generator may be used to check setups at almost all frequencies and levels.

To maintain reliable communication, all data are run through a Cyclical Redundancy Check (CRC) in order to make data transmission failsafe to a very high degree.

A built in anti mounting resonance filter (10 kHz lowpass) ensures optimum bandwidth without getting system failures caused by overloads in the monitor from accelerometer resonance. In addition, any cable damage (broken or shorted) will be detected and system failure is indicated via a relay and the software program CHT 1008.

The monitor is tested according to EMC-directives for use in light or heavy industrial environments and is tested for mechanical vibration. The monitor is also physically robust. It has a sea-water resistant cast enclosure and is water and dust proof to IP 67 standard. It has spring loaded cable terminals, which avoid problems concerning loose screws. It also has a wide mains voltage range to ensure stable monitoring at different power instances.

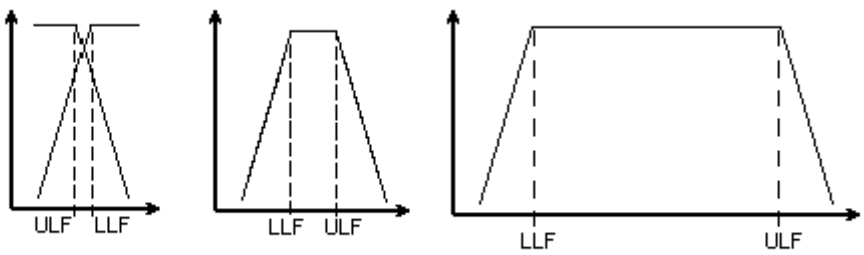

Fig. 5. Diagram showing various sets of Lower and Upper Limit Frequencies

SPECIFICATIONS PCH 1008

CABLING

All cables must be screened with the screen terminated to chassis in the Cable Glands. Cable mounting via springloaded terminals, except the RS-232 interface. Signal GND is connected to Chassis via a pair of diodes.
Current in Signal GND . . . . . .< 1A
Chassis is connected to Sig. GND on delivery.
Wire dimension . . . . . .
AWG 24 to 16, 0.2 to 1.5 #mm (0.5 to 1.4 mm)

INPUT AMPLIFIER (CH. 1 & CH. 2)

Type . . . . . CCLD/ICP®
Differential input only, neither + nor input must be grounded. Optionally Charge, Voltage or CVLD.
Input Impedance . . . . . .100 k Ω
Transducer impedance . . . . . .< 100 Ω
Noise floor (1 to 10.000 Hz) . .< 50 µV RMS
Noise Voltage Density . . . . . .0.4 µV/ $\sqrt{Hz}$
Max. input level . . . . . .+ 7.5 V Peak
Transducer Bias current . . . . . .10 mA DC
Transducer voltage Range . . .8 to 19 VDC
Max. Unterminated voltage . . . . . .27 V DC

AC OUTPUTS

Either Unconditioned or Conditioned.
Max. level . . . . . .6 V Peak
Output Impedance . . . . . .100 Ω
Min. Load impedance . . . . . .10 k Ω
Unconditioned
(-0.2 dB) . . . . . .1 Hz to 30 kHz
(-3 dB) . . . . . .0.2 Hz to 150 kHz
Conditioned
(-0.2 dB) . . . . . .LLF to ULF

ISOLATED DC OUTPUTS

Each Channel is electrically isolated, but terminated with 1 MΩ to Signal GND
Isolation Voltage . . . . . .< 48 VDC Voltage:
DC Voltage:
5 V corresponds to Full Scale Level (FSL).
Voltage Range . . . . . .0-5 V
Precision . . . . . .+ 10 mV
Output Impedance . . . . . .100 Ω
Load Impedance . . . . . .> 10 k Ω
DC Current:
20 mA corresponds to Full Scale Level (FSL).
Current Range . .0 to 20 mA or 4 to 20 mA
Precision . . . . . .+ 0.1 mA
Output Impedance . . . . . .> 10 MΩ
Load impedance . . . . . .< 330 Ω

BANDPASS FILTERS

Type: 3. order . . . . . .+ 18 dB/octave
. . . . . .+ 60 dB/decade
Ripple . . . . . .< 0.2 dB (2.3 %)
High-pass:
Attenuation . . . . . .0.185 (15 dB) at 0.5 LLF
LLF: 3, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 Hz.
Low-pass:
Attenuation:.0.185 (15 dB) at 2 ULF to 5k Hz.
ULF: 0, 30, 40, 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1k, 2k, 3k, 4k, 5k, 6k ,7k ,8k ,9k , 10k Hz.
Standard . . . . . .10 Hz to 1000 Hz
Optionally customized filters can be provided.

DETECTORS

True RMS:
Averaging Time . . . . . .0.010 to 100 Sec.
Resolution . . . . . .0.01 Sec.
Max Peak or Peak to Peak:
Decay Time . . . . . .0.1 to 100 Sec.
Resolution . . . . . .0.1 Sec.

MEASURING PARAMETER

Acceleration . . . . . .m/s², mm/s², g, mg, µg, Inch/s², mInch/s² or µInch/s² *a
Velocity . . . . . .m/s, mm/s, µm/s, Inch/s, mInch/s, µInch/s *a
Displacement . . . . . .
m, mm, µm, Inch, Mils, µInch. *a
Standard . . . . . .Velocity, mm/s

TEST GENERATOR

Frequency Range . . . . . .1 to 10 000 Hz

REFERENCE GENERATOR

Frequency . . . . . .100 Hz
Long term drift error . . . . . .< 0.1% 1 Year

4 ALARMS

Alert and Danger on Ch. 1 and Ch. 2.
Alarm Output:
None, one or more of the 4 Relays.
Level Range . . . . . .1 µ to 1000 units
Hold Time at new Setup. Sec. or 2 x Averaging Time, which ever is greater.

ALARM RELAYS

4 Relays with potential free Make and Break contacts.
Active at none, one or more of the 4 Alarms.
Max. Contact voltage . . . . . .48 V
Max. switching current . . . .8 A AC or DC
Max. switching voltage . .240 V AC or DC
Max. DC power . . . . . .50 to 220 W
Max. AC power . . . . . .2000 VA
Min. DC load . . . . . .6 V, 1mA

SYSTEM FAILURE RELAY

Potential free Make and Break contacts.
Active at: Power Failure, Overloads, Cable Break, Cable Short or Processor Halted.
Max. Contact voltage . . . . . .48 V
Max. switching current . . . .8 A AC or DC
Max. switching voltage . .240 V AC or DC
Max. DC power . . . . . .50 to 220 W
Max AC power . . . . . .2000 VA
Min. DC load 6V, 1mA

DIGITAL INPUTS

All Digital Inputs are active Low ref. to Digital GND.
Pull-up resistance 10kΩ
Unterminated (Inactive) Level . . . . . + 5 V
Low Level . . . . . < 0.9 V
High Level . . . . . > 3.15 V
Max. Input Level . . . . . < +/- 40 V
Transition Time . . . . . Unlimited

ISOLATED RS-485 INTERFACE

Serial Two wire Asynchron Interface complies with IEA - 485 standard. Halfduplex.
Cable Type: 120 Ω Screened Twisted pair.
Transfer Rate (BAUD): 300, 600, 1200, 2400, 4800, 9600, 19200 or 38200 bit per Second.
Input Impedance (receiver) . . . . . .> 12k Ω
Output drive (transmitter) . . . . . .> 35 mA
Output Level . . . . . .> +1.5 V
Input Level . . . . . .< +12 V
Isolation Impedance . . . . . .1M Ω
Isolation Voltage . . . . . .< 48 V
Terminals . . . . . .Data + and Data -

RS-232 INTERFACE

Serial Two wire Asynchron Interface complies with IEA-232 standard.
Cable Type:
Lap-Link or Null Modem 9 Pin female
Socket . . . . . .9 Pin Sub-D male

POWER SUPPLY

Mains Voltage . . . . . .85 to 250 V AC
Mains Frequency . . . . . .47 to 63 Hz
Power Consumption . . . . . .12 VA

DIMENSIONS

Width . . . . . .378 mm
Depth . . . . . .164 mm
Height . . . . . .102 mm
Weight . . . . . .app. 2,5 kg
4 Mounting Holes:
Diameter . . . . . .5 mm
Material thickness . . . . . .8 mm
Hole pattern . . . . . .148 x 363 mm

ACCESSORIES INCLUDED

2 PG7 Cable Glands (mounted) . .DB 3116
4 PG9 Cable Glands (mounted) . .DB 3514
8 PG9 Bindings (mounted) . . . . .DD 0267
2 Spare Mini Fuses 0.4 A Slow .VFP 0005
Users Manual . . . . . .CHF 2008
PC-control program . . . . . .CHT 1008

STANDARD COMPLIANCE

CE mark indicates compliance with EMC Directive and Low Voltage Directive.
Safety: EN6101-1 (1993) and IEC 1010-1 (1990): Safety requirements for electrical equipment for measurement, control and laboratory use.
EMC Emission: EN50081-1 (1992): Generic emission standard part 1: Residential, commercial and light industry. **CISPR 22** (1993): Limits and methods of Radio Disturbance Characteristics of information Technology Equipment. Class B limits. FCC Class B limits.
EMC Immunity: EN50082-2(1995): Generic Immunity Standard part 2: Industrial Environment (1995).
Temperature: IEC68-2-1 & IEC68-2-2: Environmental Testing. Cold and dry heat.
Operating Temperature: -10°C to + 50°C
Storage Temperature: -25°C to + 70°C
Humidity:
IEC68-2-3, Operating: 95 % RH(40°C)
IEC68-2-3, Storage : 90 - 95 % RH(40°C)
Mechanical: Non Operating:
IEC68-2-3: Vibration 0.3mm, 20 ms-2, 10-500 Hz.
IEC68-2-27: Shock: 750 ms^{-2}
IEC68-2-29: Bump: 1000 bumps at 250 ms^{-2}
Enclosure: IP 67 complies with IEC5
Notes:
***a**: The Full Scale Level range depends on which parameter is in use.
***b:** The Test Generator range depends on which parameter is in use.

PCH Engineering A/S reserves the right to change all specifications and accessories quoted in this Product Data sheet without notice.

PCH ENGINEERING

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