Data Sheet

On-line Vibration Monitoring System Adash 3600

Application:

- Machinery protection systems
- On-line vibration monitoring of bearings, motors, fans, pumps, gearboxes, …

Characteristics:

- Measurement of RMS values:
  - LF - velocity [mm/s] in band 10-1000Hz (optionally 1-1000Hz)
  - LIN - acc [g] (9,81 m/s^2) in band 0,8Hz-16 kHz
  - HFE - acc HFE [g] (9,81 m/s^2) in band 5-16 kHz (bearing condition)
  - ENV - envelope [g] (9,81 m/s^2) in band 5-16 kHz (bearing condition)
- Measurement of Time signals and spectra evaluation
- Measurement on max. 64 vibration channels
- Create vibration limits which can operate relays if levels are exceeded
- Measured quantities are exported as output current loops 4-20 mA
- Well arranged display for the presentation of all data
- Easy connection to a process control and reliability systems (PLC)
- Indication of overload and sensor or cable error
- Simple installation on a DIN rail

Introduction:

The Adash 3600 system is an on-line vibration monitoring system, which is intended for process control and reliability systems, machinery protection systems and generally for all the applications concerning the maintenance and monitoring of machinery condition. Thus, a large variety of applications are possible for motors, fans, pumps, gearboxes, small turbines, bearing diagnostics etc.

The Adash 3600 system has been developed as an easy-to-use measurement system, which can in particular evaluate the level of vibrations and bearing condition.

The basic types of measurements are as follows:

- vibration velocity RMS in the band up to 1 kHz [mm/s] (from 0.8Hz or 10Hz);
- vibration acceleration RMS in 0.8-16,000 Hz band [g_{RMS}];
- vibration acceleration RMS in 5-16 kHz band [g_{RMS}] (bearings condition analysis);
- vibration envelope acceleration RMS in 0.8-16,000 Hz band [g_{RMS}].

For each type limit values of Alert and Danger can be set up. If these values are exceeded, the output relays switch. At the Adash 3600 output there are current loops 4-20 mA, which may assigned to any measured quantity.

The Adash 3600 system outputs (relays, current loops, …) enable an easy connection to other process control systems (SCADA, PLC and others). The system is easy to install on a DIN rail.

The measured values are clearly presented on the display, which enables the machine operator to check the machinery condition at any time.

There exists new feature now. The time signals and spectra measurements are possible in two paths: velocity (up to 1kHz) and acceleration (up to 16kHz). All results are saved into MEM module memory or transfered directly to computer via COM/ DATA module.

The Adash 3600 system is intended to be used wherever machinery conditions must be continuously evaluated. The system is intended in particular for the monitoring of electrical engines, turbo-generators of lower capacities, hydro-generators, pumps, fans, gearboxes, internal combustion engines, etc. The application of the Adash 3600 system enables a safe operation of such mechanisms since vibration limits can be set up: if these are exceeded, relays are operated which could be used to stop the machine. In conjunction with a process control system, a very efficient and powerful means ensuring a safe and trouble-free operation can be created. In the event of distant workplaces, where machinery is run without human operators, Adash 3600 is, in conjunction with the Ethernet communication, a perfect solution.

Adash 3600 Is a Box of Bricks

Like a construction is made of individual bricks, also the Adash 3600 system consists of many optional components. This solution enables the user to build a system to meet performance and budgetary requirements. The following list contains names and a brief description of function of all the existing units:

MAIN - This module is the heart of the system; it must always be included. It does all the measurements and their evaluation. It includes one vibration input, 2 output current loops, 4 relays and

binary inputs for process definition (see the detailed description of the unit).

MPX - This module connects up to 8 channels which are scanned by the MAIN unit. Up to 8 MPX units can be connected to one MAIN unit, i.e. up to 64 channels can be monitored.

COM - This unit controls communication along the RS 232 bus with an external PC. The bus enables to set up the entire system. The system is set-up using the 3600 Setup program, which is a standard part of each delivery. The COM unit includes a BNC output of vibration of the selected channel for connection to an external analyser.

COM/ DATA - The unit is similar to the COM unit, but COM/DATA enables measured data transfer via RS232 or Ethernet (option) to external DDS 2000 database.

REL - This unit containing 8 pairs of relays. It is intended to be used in parallel with the MPX unit. Thus, each measured channel has its own output relay pair: for instance, to be used as the indication of Alert and Danger.

LOOP - A unit containing 8 pairs of current loops 4-20 mA. It has a similar purpose as the REL unit. In the event of more-channel monitoring, LOOP enables each channel to have two current loops on which the measured values can be exported to other process control systems.

MEM - A memory module for storage of measured data. The core is a Compact Flash card with the possibility to store up to 4 Gbytes of data.

All the units are inter-connected via an addressable bus, which enables simple co-operation of all the inter-connected units. External communication and control is possible through RS232 or using the Ethernet LAN network.

The Most Simple Set

The most simple Adash 3600 system is a single channel vibration monitor. It consists of only the MAIN and COM units. The vibration sensor is connected directly to the MAIN unit, the COM unit is only used to connect a PC for the system setup and includes a BNC output where the vibration signal is supplied for other analysis. The MAIN unit offers relays and current loops. The single channel system is suitable for applications where it is sufficient to measure only at one measurement point and by means of a suitable setup of vibration limits to ensure the trouble-free operation of the monitored equipment.

Typical Set for the Monitoring of One Machine

The monitoring of one machine usually requires measurements of more channels. A possible solution is a set consisting of the MAIN, MPX and COM units to connect up to eight vibration sensors. The MPX unit presents each channel in turn to the MAIN unit, which measures and evaluates. The Alert and Danger relays are then switched when any channel exceeds the set limit, which may be different for each channel. If the REL module is added to the set, then each channel has its own two relays. By adding the LOOP module, two current loops are assigned to each channel.

Connection to the Process Control System

The Adash 3600 system has been designed to enable an easy connection to process control systems. The basic elements included in the Adash 3600 set are an output relay and output current loops 4-20 mA. The purpose of the relay is to switch if the set limits are exceeded (2 relays), one relay indicating any system failures and one relay switching in the OK state (i.e. vibrations are under the limits). The measured value of vibration signal can be assigned to each output current loop. The measured values can continuously be read in the process control system and, for instance, displayed or stored in the memory (for trend evaluation). The Adash 3600 system can also receive information. Binary TTL signals can be connected that can distinguish up to 5 machinery process conditions (for example, outputs 100 %, 75 %, 50 %, 25 %, 0 %). This function provides different alarm levels for different operating conditions.

Transfer of Measured Data

An important feature of the Adash 3600 system is the possibility to transmit data to a PC, where the data can be stored and further evaluated. There are several possible ways of data transfer. The easiest way is the MEM module, which stores data to a Compact Flash memory card. If needed, the FLASH card can be removed and data can be transmitted in the office to a PC or, if a reader for the FLASH card is not available, transfer is possible from the MEM module via RS-232 to a notebook or a laptop. Another way is by on-line connection via a bus RS-232. Data can then be continuously transmitted to the PC and stored. If also the MEM module is used, the data storage is not impaired even in the event of PC failure. The MEM module functions as a data buffer that stores the measured data in its memory if they cannot be immediately transmitted into the PC. The MEM module has also functions that reduce the oldest data and therefore it is possible to cover also a longer transfer failure. The most efficient possibility for on-line data transfer is the COM/DATA - Ethernet module which connects the entire Adash 3600 system to an Ethernet network. Data transfer is thus reliable and fast.

Transfer Control and Data Storage

The Adash 3600 Data Manager is intended for transfer control and data storage. It can control several connected systems in parallel (max. 16). All the transmitted data are stored in a database. For simple applications the MS Access database (file .mdb) can be used. For more complex applications or in the event of higher reliability requirements the SQL Server is used. If system uses for data saving the Compact Flash Card, then A3600 Download software is created for simple export in text format.

PC Data Processing - DDS 2000 Software

If data are transmitted and stored in the database, they can be further processed as follows:
- Development of trends of the measured quantities;
- A collective display to identify the correlation between the measured places;
- Print of reports on the measured machine condition.

For all the necessary functions DDS 2000 software has been developed. It enables the organisation of all the measured machines into a tree structure and is characterised by an easy and fast orientation in the data display. DDS2000 is not a special program that can work only with data from the Adash 3600 system. It is a general software system intended for the processing of vibration diagnostics data. Data can

be imported from various devices and can process not only simple quantities (trends) but also more complicated types of data (spectra, time signals, cascade graphs, coast down, run-up etc.).

Simple Installation - Connection to the System

The Adash 3600 system can be delivered pre-wired and in its base "demo" configuration by Adash. All the customer then has to do is to unpack the system, connect the power supply and all functions will be operational. All the units are interconnected and the entire system is functional immediately without having to study the user's manual. This way of delivery completely eliminates problems arising if individual components are delivered and when a perusal of the manual is inevitable. In addition, this way of delivery precludes any possible mistakes or wrong connections, which may result in system malfunctions. We know that the relation between the manufacturer and the customer should start with a fully functional connection of the system.

Detailed Description of Individual Units

The Adash 3600 system consists of independent components that, after being connected, create a functional set. The following part describes the function of the individual units in detail.

3600 MAIN

This unit is the basis of each set and the system cannot be assembled without this unit. It ensures both measurement and communication functions. Each unit is able to exchange information with another unit, however always through 3600 MAIN. It is therefore a common MASTER unit, the others are SLAVE. 3600 MAIN is, in terms of measurement, a single channel unit that enables to process output signal in several ways. An accelerometer with the ICP supply with any sensitivity can be connected. The most frequently used value is 100mV/g

The types of measurement are as follows:
1. Wide-band vibration speed RMS in the band up to 1,000Hz, the lower frequency limit is either 0.8 Hz or 10 Hz (it needs to be specified in the order);
2. Wide-band vibration acceleration RMS in 0.8-16,000Hz band;
3. Wide-band vibration acceleration RMS in 5,000-16,000Hz band for the diagnostics of bearings condition.
4. ENV in 5,000-16,000 Hz band for the diagnostics of bearings.
5. Time signal - measurement in all paths 1-4.
6. Spektrum - FFT spectrum through all paths 1-4.

ISO vibration velocity (type 1) is always measured, the other measurements can be brought in by the operator (see description of 3600 Setup). On the front panel of the 3600 MAIN unit there are two large and easily legible LED displays: the left one always shows the measured velocity value (type 1), the right one can display any other measured value (types 2, 3, 4). Two limits can be set up for each measured value (types 1 - 4): Alert and Danger. If they are exceeded, the LED on the front panel switches on. Concurrently, also the corresponding relays are switched. Limit conditions are evaluated for all the measurement types simultaneously. If any level exceeds its alarm limit, the entire unit passes to the corresponding condition (Alert or Danger). To identify exactly which measurement caused the limit exceeding, the measured values must be compared to the set limits either manually at the unit or, if the data are transmitted to the PC, simply by means of a suitable software.
The unit contains two output 4-20mA current loops. One of them continuously shows the velocity measurement value (type 1) and the other shows one of the measurement values of types 2, 3, 4. The transfer to the current loop is digital (16 bit). The other loop is assigned and the maximum value is defined (i.e. relation which value corresponds to 20mA) by means of the 3600 Setup program.
Possible uses of the unit for a continuous comparison of the measured values with the set limits are however much broader than it has been described. Various limit values may be defined for up to five various process conditions of the machine. What is meant by the process condition of the machine? If the machine fails to work continuously with the same operational parameters, then the machine has various operational conditions defined by these parameters. For example, when monitoring turbo-sets, various operational conditions can mean for instance standard operation at nominal revolutions, run-up, coast down and condition when the machine does not work. For any such condition various limit conditions may be set up, for instance, if at the start there is a short operation at resonances, then higher limit values can be set up so that the unit does not evaluate each start as a breakdown condition. There is a vast number of possibilities of configuration. The 3600MAIN unit contains process binary inputs: if at one of them the voltage of 4 - 30 V occurs, then the unit begins to work with limit values that correspond to this process. Process type signals must therefore be available in the process control system and then connected to the 3600MAIN unit. The information on the set process type is indicated on the front panel via the LED.
All the requested types of measurements are carried out continuously one after another. One cycle lasts approx. 1sec. The internal software continuously controls whether all the unit functions are correct. In the event of any defect (for instance, interrupted sensor cable), the unit immediately passes to the System Failure condition, which is indicated by an LED and at the same time an independent relay is switched. The 3600MAIN unit thus fulfills requirements concerning the use as a protective system.

3600 MPX

This unit is a programmable switch of eight input channels. It can be used to connect up to 8 accelerometers which are switched by the unit to an output channel connected to the 3600MAIN unit. The 3600MAIN unit does all the measurements and evaluations. The use of the 3600MPX unit therefore expands measurement possibilities of the system. It is very important to note that one 3600MAIN unit can control up to eight 3600MPX units working in parallel providing expansion up to 64 channels.
On the front panel of the 3600 MPX unit there is a large LED display, which continuously displays the number of the channel whose vibration values are being displayed at the 3600MAIN unit. By means of a switch the user can select various types of operation of the unit. In the basic operating mode (ALL) all the selected channels switch automatically and cyclically (by

means of 3600 Setup only some channels can be defined as active). In the USER mode one particular channel can be selected whose vibration values are continuously (without switching) displayed at the 3600 MAIN unit. The MAX mode displays continuously the channel where the highest vibration values are measured (vibration velocity in the band up to 1 kHz). To understand better, it must be said that the measurement itself is performed on all the channels (selected by means of the 3600 Setup software), therefore also the evaluation of possible exceeded vibration limits is carried out on all the selected channels. The various modes (ALL, USER, MAX) mean only the selection of measurement results presentation on the LED display. The 3600MPX unit is a very important member of the Adash 3600 family by increasing the number of channels which can work with one MAIN unit and therefore reduce the per-channel price.

3600 COM, COM/DATA

The 3600 COM unit is useful if the user wants to have the facility of PC set-up but does not want to link the 3600 to a network.
The difference between the COM and COM/DATA units consists in the fact that the COM unit serves for system setup only (using the serial bus RS 232), whereas the COM/DATA unit enables setup (3600 Setup software) and measured data on-line transfer via RS232 or the Ethernet network (optional 3600 Ethernet unit) to a higher system. We speak here only about data digital communication, connection to the process control system is directly from the 3600 MAIN unit using the relay outputs and current loops. Another function of these units is to provide an output of the vibration signal which can be used for external analysis (for instance, FFT spectrum). If the MPX module is used, the user can select the number of the channel at the MPX module whose signal is then brought to the output connector of the COM module.

3600 REL

When describing the 3600MAIN unit, it was mentioned that for each unit condition (OK, ALERT, DANGER) there is a relay at the output. If the MPX is used and more channels are connected, it is not possible to distinguish via the relay at the MAIN unit on which channel the set limit was exceeded.
Consequently, there is the 3600 REL unit, which contains 8 pairs of relays intended to indicate precisely which channel vibration limits were exceeded. It is therefore supposed that the REL unit whose relays are assigned to some output channels can be assigned to several MPX units. For each selected channel precise information is available about the exceeded limits, which can be easily connected to the process control system. The individual pairs of relays are precisely set up and assigned to the selected channels by means of the 3600 Setup program.

3600 LOOP

Two current loops are available at the MAIN unit for the output of the measured values. If the 3600 MPX unit with eight input channels is used, it is insufficient since one channel must be selected using the 3600 Setup software whose values will be transmitted to the current loops.
The 3600 LOOP unit contains 8 pairs of current loops, which can be alternatively assigned (using 3600Setup) to the controlled input channels. The process control system has thus exact information available concerning the measured vibration values at the selected channels.

3600 PWR

This unit only serves to supply the entire system. The requested supply voltage for the entire Adash 3600 system is 5V DC stabilised. If at the place of installation this voltage is available from another supply unit, the PWR unit does not have to be used.

3600 MEM

The module serves to store the measured data to a removable FLASH card. Currently, these media enable to store up to 4 Gbytes of data. It is the identical medium commonly used in digital cameras. The MEM unit can be used in two ways (also parallel). If the 3600 system is not continuously connected to a data PC and data are not transmitted on-line (the COM/NET has to be used), they are continuously stored to the FLASH card where they are cyclically overwritten once the memory capacity is full. The algorithm of storage functions in a sophisticated way. In the event of sudden changes in values, all the measured data are stored, whereas under steady operational conditions and if the measured values are stable, the quantity of the stored data is lower. If needed, the FLASH card can be removed and data can be transmitted to the PC.
To evaluate the data, our DDS 2000 software is used, which enables working with the data in a very comfortable way. If the user requires the data to be exported only to a txt file, then a simple A3600DL software is available. In the event of the on-line connection, the MEM module serves as a backup medium if data transfer is interrupted. As soon as the data transfer is restored, data are transmitted either using directly the bus (RS232 or Ethernet) or the FLASH card can be brought directly to the data PC and data can be transmitted directly there. If the on-line connection does not function for a longer period of time, the card can contain a large volume of data whose transfer using RS232 would be too long. Then it is advisable to use the other possibility: to remove the card and transmit the data directly in the PC.

System Setup - 3600 Setup Program

If all the units of the Adash 3600 system are interconnected, they have to be set up. It means in particular:
- To set up the characteristics of the connected channels (for instance, sensitivity);
- To select measurement types for each connected sensor (type 1-4);
- To set up limits for the Alert and Danger conditions for each channel;
- To assign and set up relays from the 3600 REL unit to the selected channels;
- To assign and set up current loops from the 3600 LOOP unit to the selected channels and types of measurement,

The program communicates with the system through the COM or NET units (depending on the type of connection - see description of the COM, NET units).
The full version of the program can be downloaded at www.adash.cz; all the features and possibilities can be tested in the DEMO mode on the virtual Adash 3600 system. The 3600 Setup program works under MS-Windows 95, MS-Windows 98, MS-Windows 2000, MS-Windows NT operating systems.

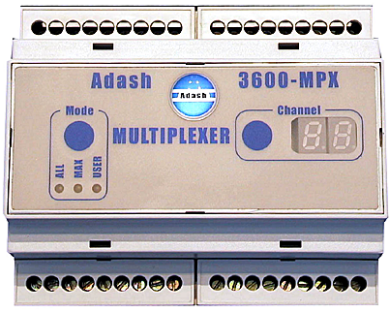
Evaluation of the Transmitted Data - DDS 2000 Software.

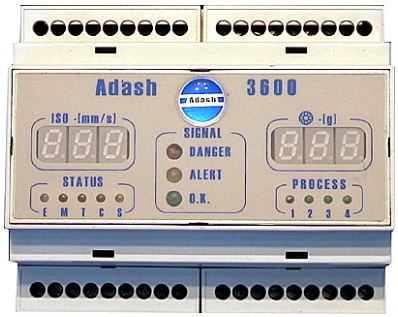
To evaluate the transmitted data, a diagnostic software focused in particular on vibration diagnostics use DDS 2000. It is a complete software system which integrates 3600 communication with that of other portable data collection systems (see complete information at www.adash.cz).
The program can create a hierarchic tree structure of the measured machines and store the measured values automatically to the tree structure. The evaluation of the data obtained from the 3600 system requires in particular work with trends of values, automatic messages if the limit values are exceeded or the limit changes are exceeded against the reference, possibilities to display various time windows, report creation, graph printing, etc. The DDS 2000 software provides storage of all measured data with comparison independent of data source. DDS2000 can have several on-line systems, several data-collectors and other vibration analysers. All the data can then be evaluated in one way, mutually compared etc. For more information on the product contact us at dds2000@adash.cz requesting a demo, which will be sent to you immediately.

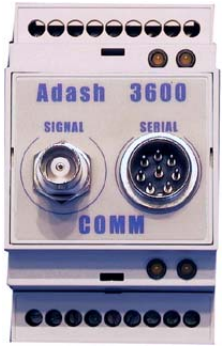
Adash - Your On-line Consultancy:

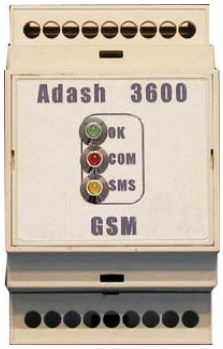
If you need to help with data acquisition of vibration signals, our consultancy staff are ready to make additional analysis. The results are sent by email to you immediately. Contact our Customer Service via info@adash.cz.

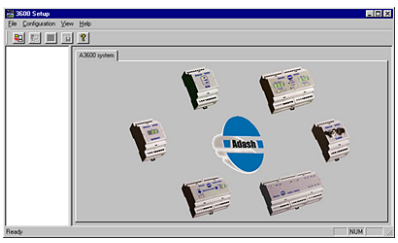
Pictures gallery

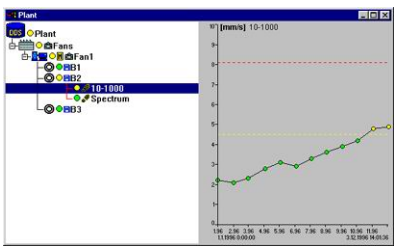












ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

🗁 General Technical Specification:

Inputs:	ICP for vibration sensors (sensitivity 1-1000mV/g), max 64 channels with 3600 MPX units	
	DC for temperature sensors (range +/- 3V, user calculation), max 64 channels with 3600 MPX units	
	4 binary inputs for process definition	
Outputs:	2 relays for ALERT and DANGER, max 64 pairs with 3600 REL and MPX units	
	1 system relay	
	2 current loops 4-20mA controlled by RMS vibration values, max 64 pairs with 3600 LOOP and MPX	
	AC signal output for external analyser	
Meas.Ranges:	velocity RMS (1-1000Hz or 10-1000Hz):	0-999 mm/s,
	acc RMS (5kHz-16kHz):	0-999 g,
	acc RMS (0,8Hz-16kHz):	0-999 g,
	acc ENV RMS (5kHz-16kHz):	0-999 g,
	peak-peak ICP:	+/-6V PEAK,
	peak-peak DC:	+/-3V PEAK.
Measurements:	overall values, time signals, spectra	
Sensors:	accelerometers with ICP powering (typical sensitivities: 10mV/g, 100mV/g, 500mV/g)	
Display:	2x LED display for vibration values	
	LED indication of limits exceeding	
	LED indication of binary inputs	
	LED indication of system status	
Communication:	internal system interface - RS485	
	RS-232 for system setup and data transfer (3600 COM)	
	ETHERNET 10Mb/s for system setup and data transfer (3600 COM/DATA)	
Data Memory:	standard CF I cards (Compact Flash)	
	capacity up to 4GB	
Power:	5V DC, powering of isolated I/O (current loops, binary inputs) 8-30V DC	
	standard 3600 PWR:5V/2A + 15V/0,6A	
Dimensions:	35mm DIN rail; 53 x 90 x 58 mm, 106 x 90 x 58 mm or 160 x 90 x 58 mm	

🗁 Order Information:

Select all components for your 3600 system. Do not hesitate contact us with any question (www.adash.cz/ contacts).

Related optional accessories:

1100 - standard measurement pads (length=26mm, height=15mm, with a plastic protective cover)
1101 - measurement pads for electric motors (special pads, they are glued between the ribs)
1109 - special glue (two-component, to glue the pads)