Vallen - Systeme GmbH

The Acoustic Emission Company

Low-Cost Single Channel AE System for USB-Bus:

ASCO-DAQ2

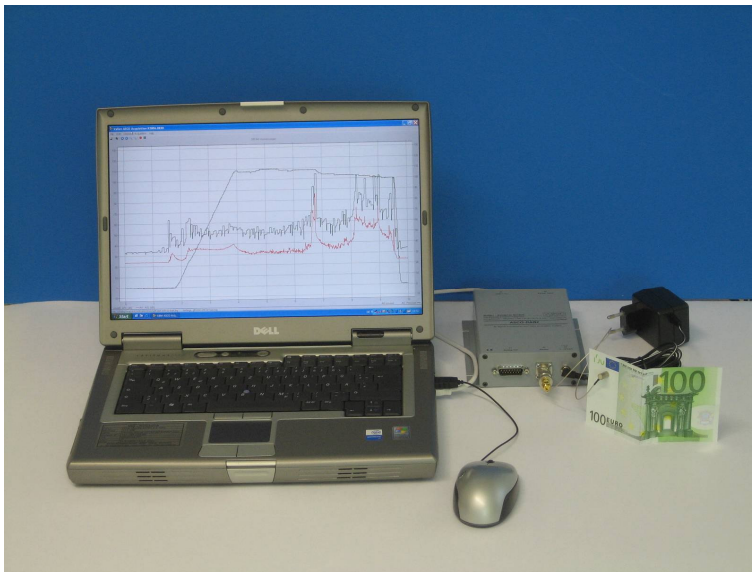## 1   Applications and Features

Fig. 1 ASCO-DAQ2 system with: Notebook, ASCO-DAQ2, ASCO-NTE (power supply), USB-cable, super-low-weight VS700-D sensor clamped to a piece of paper by a magnet.

Applications:
- Production process monitoring e.g. the crimping process.
- Detection of partial discharges.
- Crack detection, e.g. during the scratch test.
- Quality assessment, e.g. of paper.
- Optimization of process parameters.
- Testing the suitability of AE in an unknown application.

Main Features:
- Low cost & easy to use
- Robust design for industrial applications
- Threshold independent
- For continuous and burst AE
- Can discriminate up to 1000 hits/s

2   Basic Functions

ASCO-DAQ2 is a data acquisition module (**DAQ2**) in a rugged box designed to also house an **A**E **S**ignal **Co**nditioner (**ASCO-P**). ASCO-DAQ2 includes the versatile, ready-to-use **AscoDaq** software package and detailed technical documentation.

ASCO-P converts the peak amplitude of a short AE-burst (µs-range) to a voltage pulse of $40mV/dB_{AE}$ amplitude and 50ms or 0,5ms pulse width. This output signal is called **APK**. An additional output, **ASL**, represents the average of the logarithm of the AE signal over a certain time window and is an indicator for background noise and signal strength of bursts.

Controlled by a PC and **AscoDaq** software the 4-channel data acquisition module **DAQ2** samples APK, ASL, an external stress and/or a strain parameter in a programmable sampling rate, stores the data to file, and presents it in a real time diagram. For repetitive production cycles, data recording and display can be started and stopped by a process parameter, e.g. pressure. The measurement results can be compared against user defined limits. Thereby an immediate good/warning/bad display is possible. Examples of displays are shown in **Fig. 2**.
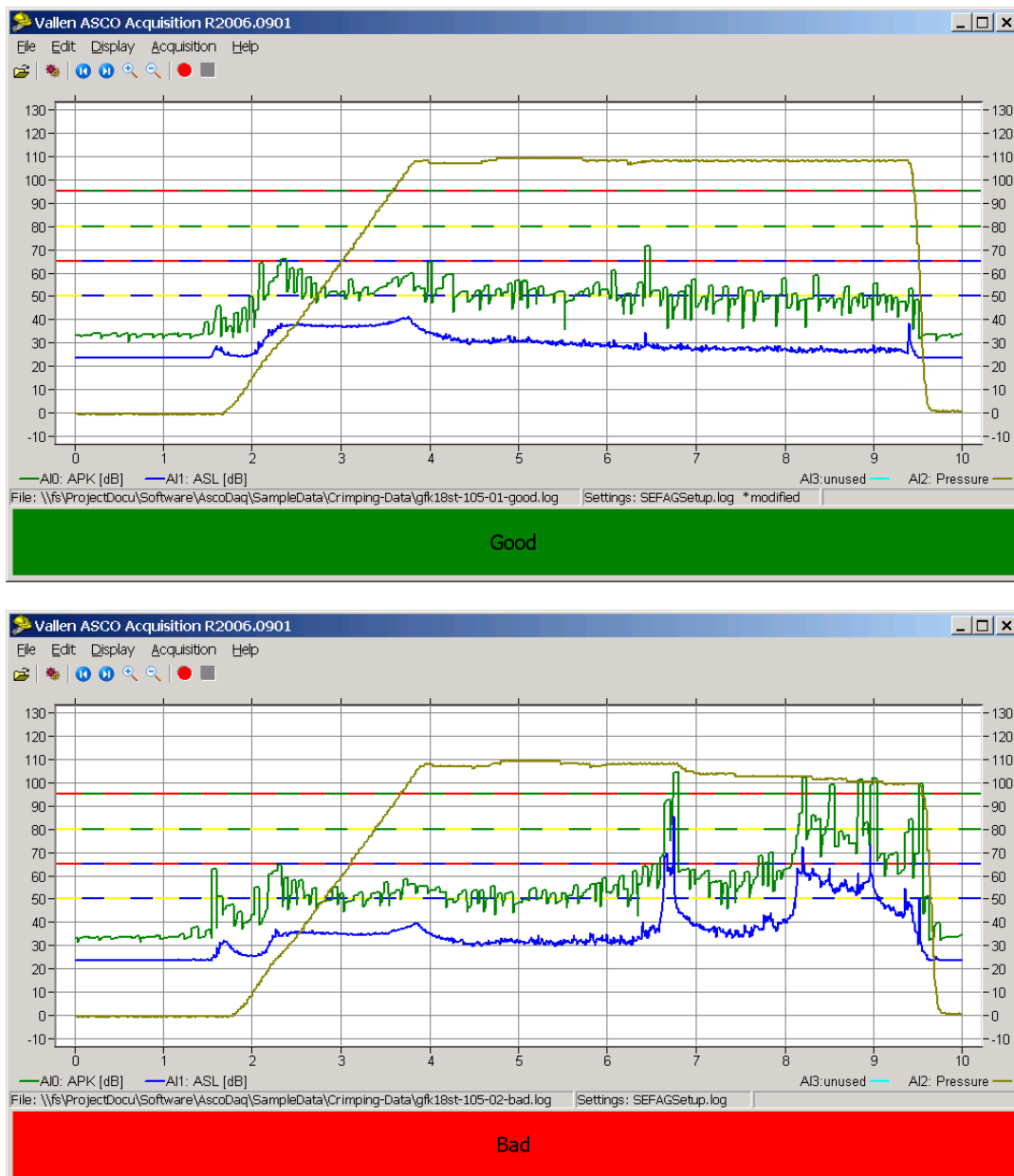
Fig. 2: Screens of a good and a bad crimping process.

Below the diagram are left- and right-hand legends. The right-hand legend indicates that AI2 measures pressure, results in a brown curve. Its scaling is on the right. The left-hand legend indicates that APK is shown in green, ASL in blue. The scaling of both is on the left.

Four dual-colored horizontal lines indicate the alarm and warning levels. One color identifies the input: Green for APK, blue for ASL. The other color identifies the level type: Yellow for warning, red for alarm. The PC's audio system can play the corresponding wave file "good.wav", "warning.wav", or "alarm.wav" as an audible signal of the monitoring result.

Data Acquisition can be started manually or by a threshold crossing trigger on APK. Once started, the acquisition is fully independent of the threshold. The AscoDaq software stores up to 10'000 scans per second on the hard disk of a standard PC.

3   Application Example: Monitoring the Crimping Process

Fig. 5: High Voltage Isolator

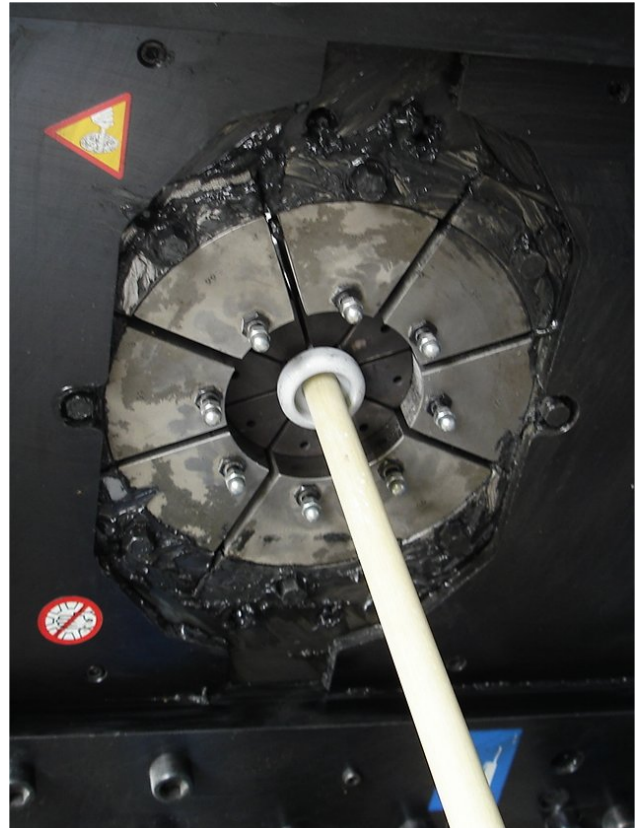**Fig. 6:** Fitting on bare fiber glass rod

Fig. 7: Joining a fitting and a fiber glass rod by a crimping process

For the production of high voltage isolators (**Fig. 5**) that shall carry heavy overhead power lines, a metallic fitting is crimped onto a fiber glass rod (**Fig. 6**). The crimping process (**Fig. 7**) must be well adjusted. Most important process parameters are hydraulic pressure and duration of pressurization. If the crimping pressure is too low, the mechanical joint might fail under tension. If pressure is too high, the brittle fiber glass rod might become damaged and also fail under tension.

Fig. 8: Example for sensor placement

The AE method detects any damaging of the fiber glass rod in real time, during the crimping process. ASCO-DAQ2 is the most efficient solution for this application: simple to use, highly accurate, and reasonably priced.

The operation is very easy: After setting up and starting data acquisition, the beginning and end of AE monitoring, data recording and diagram display is controlled over the crimping pressure: It is started when the pressure exceeds a limit and stopped when it falls below a limit. No further action is needed to monitor the next crimping process.

4   ASCO-Derivatives

There are a number of application dedicated **ASCO-P derivatives** available. One ASCO-P derivative can be mounted into the ASCO-DAQ2-box and can be easily exchanged by the user against another derivative to fit ASCO-DAQ2 to a specific application. One ASCO-DAQ2 can be used with different application specific ASCO-P derivatives.

Some application specific derivatives and sensor configurations are shown below:

Application	ASCO-PXY	Freq.[kHz]	PST[ms]	Sensor (recommended)
Scratch Testing	-P1, -PN1	100-300	50	VS150-M
Crimping Monitoring	-PH3	240-710	50	VS900-M
Paper Tensile Testing	-PH5	90-1300	0,5	VS700-D
Leak Monitoring	-P2,-PN2	20-85	50	VS30-V
Partial Discharge Detection (Transformers)	-PH1	100-300	0,5	VS150-M

5   Requirements

To complete an operational single channel AE system, the following is required:

- **ASCO-DAQ2** Data acquisition unit
- **ASCO-PXY** application specific ASCO-P derivative
- **ASCO-NTE** Power supply: 12V (100mA), (available only for 230V with Euro connector)
- **Standard PC**, minimum requirements: 800MHz CPU, 512MB RAM, 5 GB free HDD space, Windows XP® (English or German), one free USB port type A
- **AE sensor**, single ended, fitting the frequency range of the selected ASCO-PXY, without (!) integrated preamplifier
- **Couplant** to ensure good acoustic coupling between sensor and surface to which it is mounted, e.g. SIK (adhesive, for permanent mounting) or HVF (silicon grease, for easy sensor removal)
- **SEC** Cable to connect the AE sensor with BNC-connector J2 of ASCO-DAQ2

Options:
- **DAQ2-cbl**, cable to connect 2 external parameter voltages to ASCO-DAQ2

For monitoring crimping processes of metal fittings onto fiber glass rods for high-voltage insulators ask for our special **ASCO-Crimp-Package.**

6   Summary:

ASCO-DAQ2 is an economic solution for AE tests where the peak amplitude of AE bursts, and/or a more or less continuous signal level is of interest. Operation is simple and does not need an AE expert or a complex setup. Everyone who can operate a PC can setup the ASCO-DAQ2.

By additional software, events can be counted and analyzed. Please contact us for more details.