

## Software package for STEVAL-BFA001V1B

Demonstrations		Applications		
Condition Monitoring	Predictive Maintenance	Acoustic Analysis	Vibration Analysis	Environmental Monitoring
Middleware	Vibration Signal Processing		Audio Lib	
Hardware Abstraction	STM32Cube Hardware Abstraction Layer (HAL)		Board Support Package	
Hardware	ISM330DLC, HTS221, LPS22HB, MP34DT05-A, M95M01-DF			
	STEVAL – IDP005V1			

### Features

- Set of firmware examples to build applications for condition monitoring and predictive maintenance based on 3D digital accelerometer, environmental and acoustic MEMS sensors
- Middleware including algorithms for advanced time and frequency domain signal processing for vibration analysis
  - Programmable FFT size (512, 1024 or 2048 points)
  - Programmable FFT averaging and overlapping
  - Programmable windowing (Flat Top, Hanning, Hamming)
  - Speed RMS moving average, acceleration max peak
- Middleware integrating microphone algorithms for:
  - PDM to PCM
  - Sound pressure
  - Audio FFT
- Firmware package developed for STM32F469AI with easy portability across different MCU families
- PC data monitoring through any free terminal emulator
- Sample demonstration firmware to communicate with STEVAL-IDP004V1 IO-Link-master-capable multi-port evaluation board and dedicated PC GUI

### Description

The firmware package is designed to help you develop industrial predictive maintenance solutions based on condition monitoring.

The software runs on the STM32F469AI microcontroller and includes drivers for sensor devices HTS221, LPS25HB, ISM330DLC (support for accelerometer only), MP34DT05-A and M95M01-DF.

The package integrates complete middleware with algorithms for accelerometer data signal processing to enable monitoring of rotating equipment such as motors, pumps and fans in time and frequency domains, up to the maximum bandwidth function of the accelerometer output data rate (up to  $ODR/2=3.3\text{kHz}$ ).

The package includes audio lib middleware to perform acoustic emission analysis.

You can monitor environmental, acoustic and vibration data through a terminal emulator.

The software comes with different demonstrations and applications to monitor sensor data and output algorithm results. One demonstration is based on programmable thresholds for warning and alarm conditions in the time domain and in spectral bands.

The package is IO-Link capable (IO-Link stack is not included) with a demonstration that includes communication with the STEVAL-IDP004V1 IO-Link-master-capable multi-port evaluation board.

#### Product summary

Capacitive digital sensor for relative humidity and temperature [HTS221](#)

iNEMO 6DoF inertial module for Industrial Applications. Ultra-low power and high accuracy [ISM330DLC](#)

Piezoresistive absolute pressure sensor, 260-1260 hPa, digital output barometer, I2C, SPI [LP25HB](#)

1-Mbit SPI bus EEPROM with high-speed clock [M95M01-DF](#)

MEMS audio sensor omnidirectional digital microphone, 64 dB SNR, -26 dBFS sensitivity, top-port, 122.5 dB SPL AOP [MP34DT05-A](#)

High-performance advanced line, ARM Cortex-M4 core with DSP and FPU, 2 Mbytes Flash, 384+4 kB of RAM, DMA controller, up to 17 timers [STM32F469AI](#)

## 1 Detailed description

### What is STM32Cube?

STMCube™ represents the STMicroelectronics' initiative to make developers' lives easier by reducing development effort, time and cost. STM32Cube covers STM32 portfolio. STM32Cube includes:

- The STM32CubeMX, a graphical software configuration tool that allows the generation of C initialization code using graphical wizards
- A comprehensive embedded software platform specific to each series (such as STM32CubeF4 for the STM32F4 series), which includes:
  - the STM32Cube HAL embedded abstraction-layer software, ensuring maximized portability across the STM32 portfolio
  - a consistent set of middleware components such as RTOS, USB, TCP/IP and graphics
  - all embedded software utilities with a full set of examples

### How does this software complement STM32Cube?

The proposed software is based on the STM32CubeHAL hardware abstraction layer for the STM32 microcontroller. The package extends STM32Cube by providing a board support package (BSP) for the STEVAL-IDP005V1 (main board in the STEVAL-BFA001V1B kit).

The drivers abstract low-level details of the hardware and allow the middleware components and applications to access sensor data in a hardware-independent manner.

The package includes applications for environmental parameter monitoring, and vibration and acoustic analysis. These also include a data logger application to monitor and store data to your PC so you can start experimenting with the code. You can use any freeware terminal emulator on your PC to monitor the data

A sample demonstration to experiment with vibration analysis is provided on top of vibration signal processing middleware. You can use it to monitor time and frequency domain vibration parameters and to set suitable thresholds in spectral bands and in time domains, to test the status of your own motor equipment.

The package includes a condition monitoring demonstration to show IO-Link capability (IO-Link stack is not included) and connect the STEVAL-IDP005V1 with the STEVAL-IDP004V1. A dedicated GUI (included) can be used to display and store sensor data and algorithm output data.

## Revision history

**Table 1. Document revision history**

Date	Version	Changes
04-Jul-2018	1	Initial release.

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