Polytec

Automated laser vibrometer measurements

Solutions for efficient measurement and evaluation

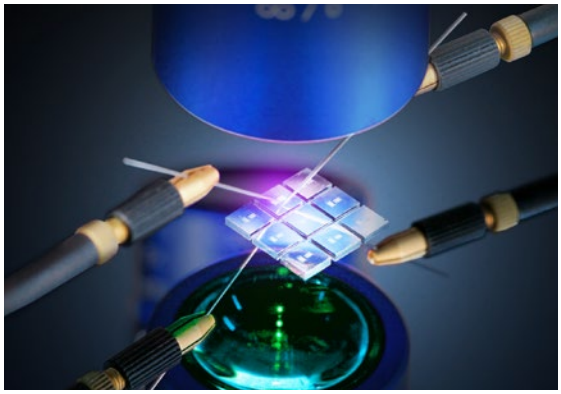
Product brochure

Automated optical vibration measurement – More efficient testing

Laser Doppler vibrometers are essential when scientists and developers measure and optimize dynamics and acoustics. Because they measure optically and therefore at a distance and without influencing the measuring object, 100% quality control also benefits from this technology. With real-time measurement data, high repeatability and low operating costs, they fit into any automation environment.

Use precision efficiently

The automation of measurement processes and evaluations relieves tedious routines and enables production deployment. When a developer can translate test plans into program code, it increases efficiency. Laser vibrometers in quality control support short cycle times and flexible installation conditions. Measurement ranges, focus, and status values are exchanged through interfaces between testing software and the sensor. In the end, quality is efficiently measured and passed on to the customer.



Automation and remote control

Polytec provides intuitive and powerful interfaces and options for remote control and automation of measurement data acquisition and data analysis:

- The Basic macro language integrated in the Polytec system software is the easiest way to automate measurement and analysis and to communicate with other software programs.
- External programs control the Polytec system software via the COM/DCOM automation Interface or use the freely available API Polytec File Access to read in Polytec measurement data.
- With Polytec Device Communication, a dedicated hardware driver is available for many Polytec sensors, allowing the measurement devices to be remotely controlled and data to be transparently streamed, for example, from test bench software. The costs, programming effort, and potential sources of interference of an additional analog data acquisition are eliminated.

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Highlights

- Automation of recurring measurements and evaluations
- Integration into your own testing software via driver
- Remote adjustment of measurement settings
- Querying and monitoring the device status
- Better data quality through direct use of digital data

Three ways for automation

01 Basic Engine

Using the integrated macro programming

Do you want to make your tests in research and development more efficient? With the integrated macro language of Polytec system software, you can automate measurements and evaluations. The easy-to-use Basic® macro language gives you access to all important functions in an object-oriented programming environment. For example, the macros set measurement settings, start measurements, apply mathematical operators to the measurement data, write them to files or to a separate channel ("User defined data set") of the measurement file. Batch processing of your measurement data is also possible. The use of macros significantly increases the productivity of your Polytec measurement system.

02 COM/DCOM Automation Interface

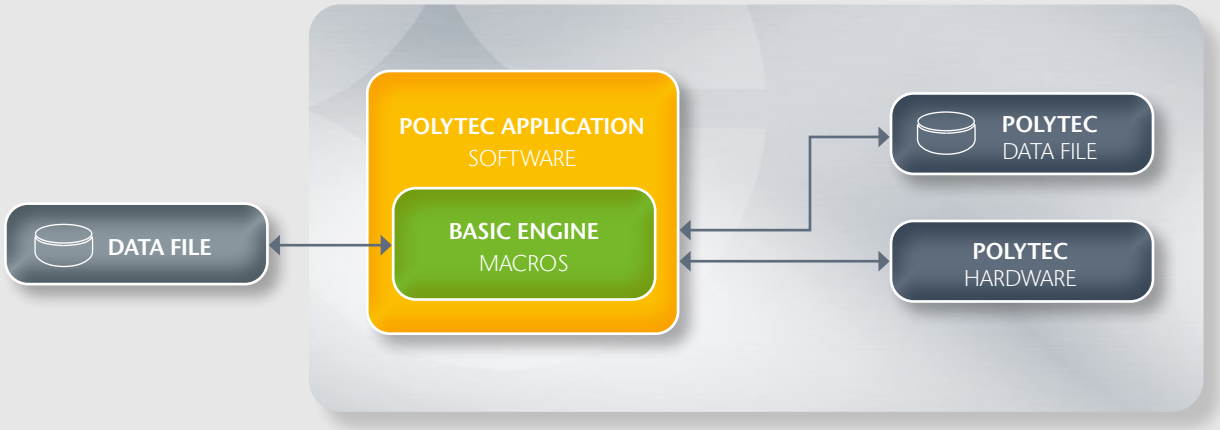
Control the Polytec system software by external applications

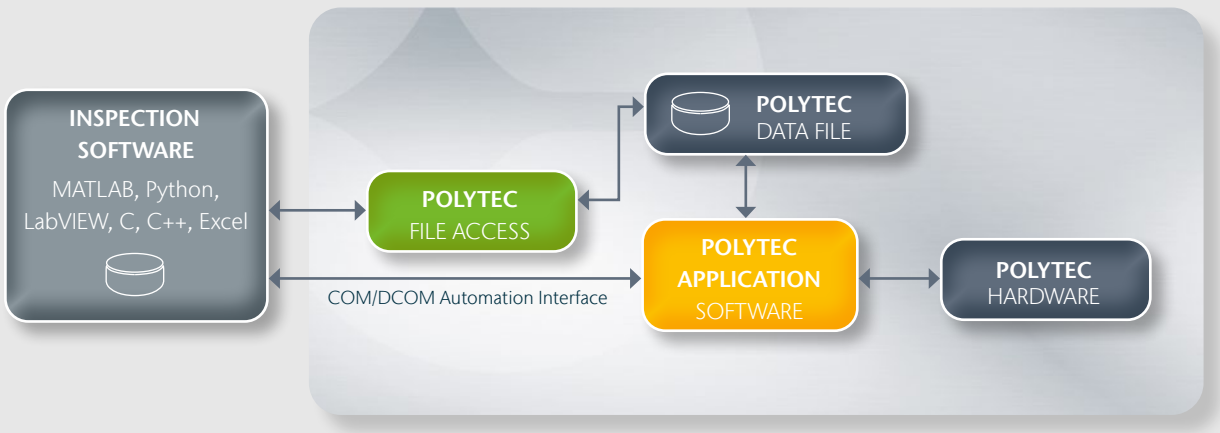
In your research department, if you value the flexibility of established programming tools such as MATLAB or Python, you can seamlessly integrate with the Polytec system software to control the measurement system via a COM/DCOM interface. Well-documented objects and methods can be easily incorporated into your code. Full access to measurement data, including all properties such as geometry and measurement parameters, is provided through the freely available API Polytec File Access. Extensive object references and example programs make it easy to get started quickly.

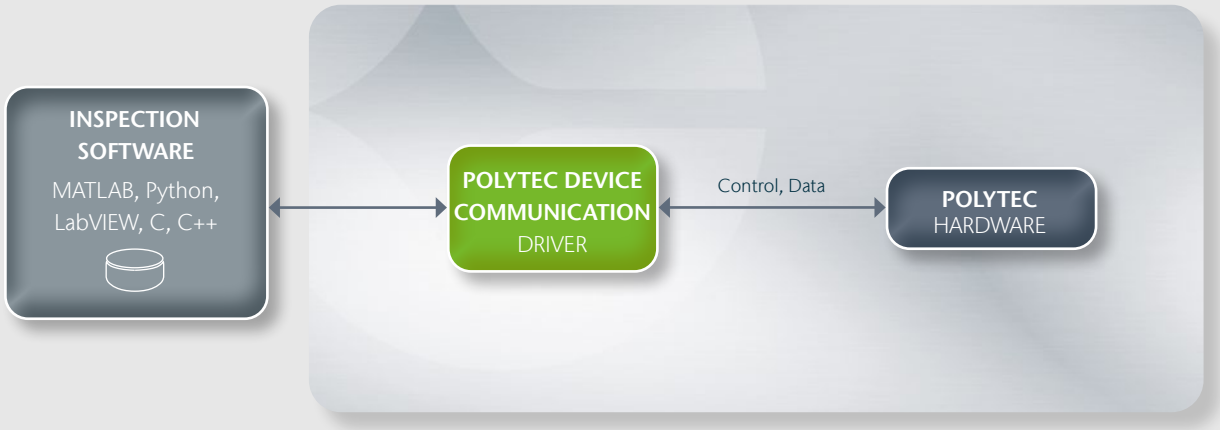
03 Polytec Device Communication

Direct integration of devices in your application

Wondering how to seamlessly integrate live measurement data into your test program without the hassle of dealing with data files? Polytec Device Communication offers an open-source, cross-platform driver compatible with Microsoft Windows and Linux for Polytec laser sensors. Equipped with practical example programs and a comprehensive object reference, you can effortlessly program data access, control hardware, and retrieve the operating status of Polytec sensors. The TCP/IP interface guarantees robust communication, facilitating the streaming of digital vibration data up to the MHz range. This simplifies the automation of vibration-based test benches with laser vibrometry.


POLYTEC APPLICATION
SOFTWARE
BASIC ENGINE
MACROS
DATA FILE
POLYTEC
DATA FILE
POLYTEC
HARDWARE


INSPECTION
SOFTWARE
MATLAB, Python,
LabVIEW, C, C++, Excel
POLYTEC
FILE ACCESS
POLYTEC
DATA FILE
POLYTEC
APPLICATION
SOFTWARE
POLYTEC
HARDWARE
COM/DCOM Automation Interface


INSPECTION
SOFTWARE
MATLAB, Python,
LabVIEW, C, C++
POLYTEC DEVICE
COMMUNICATION
DRIVER
Control, Data
POLYTEC
HARDWARE

Your benefits – an overview

	Basic Engine/Makros	COM/DCOM Autom. Interface, Polytec File Access	Polytec Device Communication
Save on analog data acquisition, especially for high-frequency measurements [1]			x
Automate recurring measurements and evaluations	x	x	x
Better data quality through direct use of digital data (no AD conversion)	x	x	x
Live data/streaming – no intermediate storage on the measuring system necessary [1]			x
VibroLink TCP/IP – robust communication [1]			x
Direct integration into your own test software		x	x
LabView: Integration of the hardware as VI [1]		x	x
Querying the device status	x	x	x
Can be ported for different operating systems			x
Remote adjustment of the measurement settings depending on the test task	x	x	x
Individual measurement parameters, evaluation algorithms and limit values depending on the test task	x	x	x
Synchronization of data from other measuring systems with the measurement data using a trigger signal [1]	x	x	x
Transmission of measurement data and communication with the process control system	x	x	x

[1] depending on device

Use cases	Basic Engine/Makros	COM/DCOM Autom. Interface, Polytec File Access	Polytec Device Communication
Research & Development	x	x	(x)
Production integrated quality control		x	x
OEM applications			x

Technical information

	Basic Engine/Makros	COM/DCOM Autom. Interface, Polytec File Access	Polytec Device Communication
Description	Integrated macro language for the automation of measurement tasks and evaluations within Polytec applications. Supports programming language dialects that are compatible with Visual Basic for Applications (COM) and Visual Basic.NET®	COM based APIs ■ The COM/DCOM Automation Interface of the Polytec system software enables device control by external applications for the automation of measurement sequences ■ enables access to measurement files by external applications for the automation of data evaluations	The Polytec Device Communication driver provides an interface to compatible Polytec measurement hardware. Control of all properties of the hardware and access to the measurement data stream
Requirements	The macro programming language is an integral part of the PSV software (VibSoft, PSV software)	Support for COM object model by trages application ■ Polytec File Access: installed on client	Connection of application computer with sensor/ hardware via Ethernet/ Wi-Fi [4]
Software protection	Dongle or license file of the Polytec system software Basic applications (*.bas) can be used and distributed without restrictions	■ COM/DCOM Automation Interface: Dongle or license file of the Polytec system software ■ Polytec File Access: no software protection Applications can be freely distributed	License: LGPL v.3 The source code is portable C++ code Applications can be freely distributed
Licensing options	Integrated in PSV or VibSoft Software	■ COM/DCOM Automation Interface: Integrated in PSV or VibSoft Software ■ Polytec File Access: Download via Polytec Website	Download license

	Basic Engine/Makros	COM/DCOM Autom. Interface, Polytec File Access	Polytec Device Communication
Scope of delivery	Basic Editor, Object-referenz; integrated inthe Polytec system software	Polytec File Access: ins-tallation file, object refe-rence, code examples for Python, C++, MATLAB®, .NET® and Microsoft Excel	source code in C++, DLLs, installation file, object reference, code examples for Python, C, C++, LabVIEW™
Features	Access to all hardware properties, measurement data, mathematical func-tions, UI functions, such as cursors of the respective Polytec application. Crea-tion of dialog elements for user guidance. Reading and saving data, measure-ment settings and images	Access to all hardware properties, measure-ment data. Libraries for mathematical functions. Direct reading and saving of data, measurement settings and images from proprietary Polytec file formats	Access to all hardware properties and all channels of the measure-ment data stream
Compatible applications	■ Polytec VibSoft ■ Polytec PSV software	■ .NET® compatible applications ■ C, C++ ■ Python ■ LabVIEW™ ■ MATLAB® ■ Microsoft Excel	■ C, C++ ■ Python ■ LabVIEW™ ■ MATLAB®
Compatible sensors (hardware control)	All measuring systems that can be remotely controlled via VibSoft or PSV software; see Polytec website	All measuring systems that can be remotely controlled via VibSoft or PSV software; see Polytec website	■ VibroFlex Series [1] ■ VibroOne [1] ■ IVS-500 [1] ■ VibroGo [1,2] ■ PSV-500, PSV QTec [1,3]
Operating system	Microsoft Windows; version according to the requirements of the respective Polytec system software	Polytec File Access: Microsoft Windows 11 64-Bit or Microsoft Windows 10 64-Bit, local administrator rights required for installation	Microsoft Windows 11 64-Bit or Microsoft Windows 10 64-Bit, portable to Linux

[1] VibroLink Ethernet
[2] Wi-Fi
[3] device control only, no digital data transfer
[4] depending on device

Application examples

Basic Engine / Makros

COM/DCOM Automation Interface

Quality assurance of sonotrode for ultrasonic welding

Uniform energy distribution along the active surface of a welding sonotrode is crucial for medical and food safety. To ensure the best welding results, the amplitude values are measured at predefined points using a PSV scanning vibrometer. The maximum peak values for each point are stored in a database together with quality indicators for each sonotrode serial number tested.

A macro tailored to the quality assurance task with a specific user interface guides the operator through the testing and documentation process.

Sensor data fusion enables integrated data models

What if, in addition to vibration data, other measured variables are required for each measuring point? Researchers at KAIST combine a PSV scanning vibrometer with a scanning distance meter to expand the database for condition monitoring on bridges. To do this, the scanning measurement beams of both measurement systems have to be precisely synchronized. The COM/DCOM automation interface of the PSV is used to move to defined measuring points from a central server, focus the laser beam and trigger the measurements. The collected measurement data from both measurement systems are merged by the server into a central data set during the measurement.

The COM/DCOM automation interface enables simple and effective access to all system functions of the vibrometer.

Image above, source: Herrmann Ultraschalltechnik GmbH & Co. KG

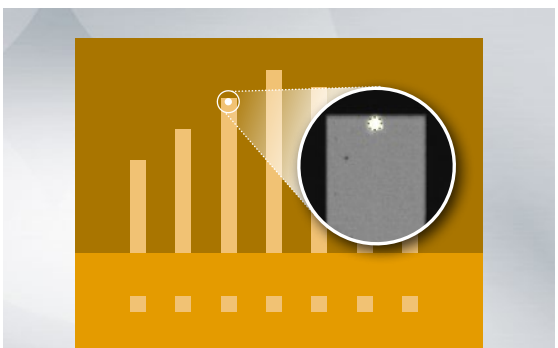
Basic Engine / Makros + Polytec File Access

Poltyec Device Communication

Increased calibration accuracy thanks to automation

Mathematica® is a registered trademark of Wolfram Research, Inc.

Researchers at NIST have developed a highly accurate calibration standard for atomic force microscopes (AFM). The stiffness of each of the 50 µm narrow AFM cantilevers is characterized using an MSA Micro System Analyzer. The accuracy achieved depends critically on the measuring position of the laser on the cantilever. To this end, the researchers developed a macro that recognizes the edge of the cantilever based on the signal level and positions the measuring laser at a defined distance from this edge with high repeatability. The automation with macro also saves considerable measuring time when characterizing all 4368 cantilevers of a wafer. Polytec File Access forms the interface for reading the measurement data into Mathematica® and efficiently determining all stiffness values.

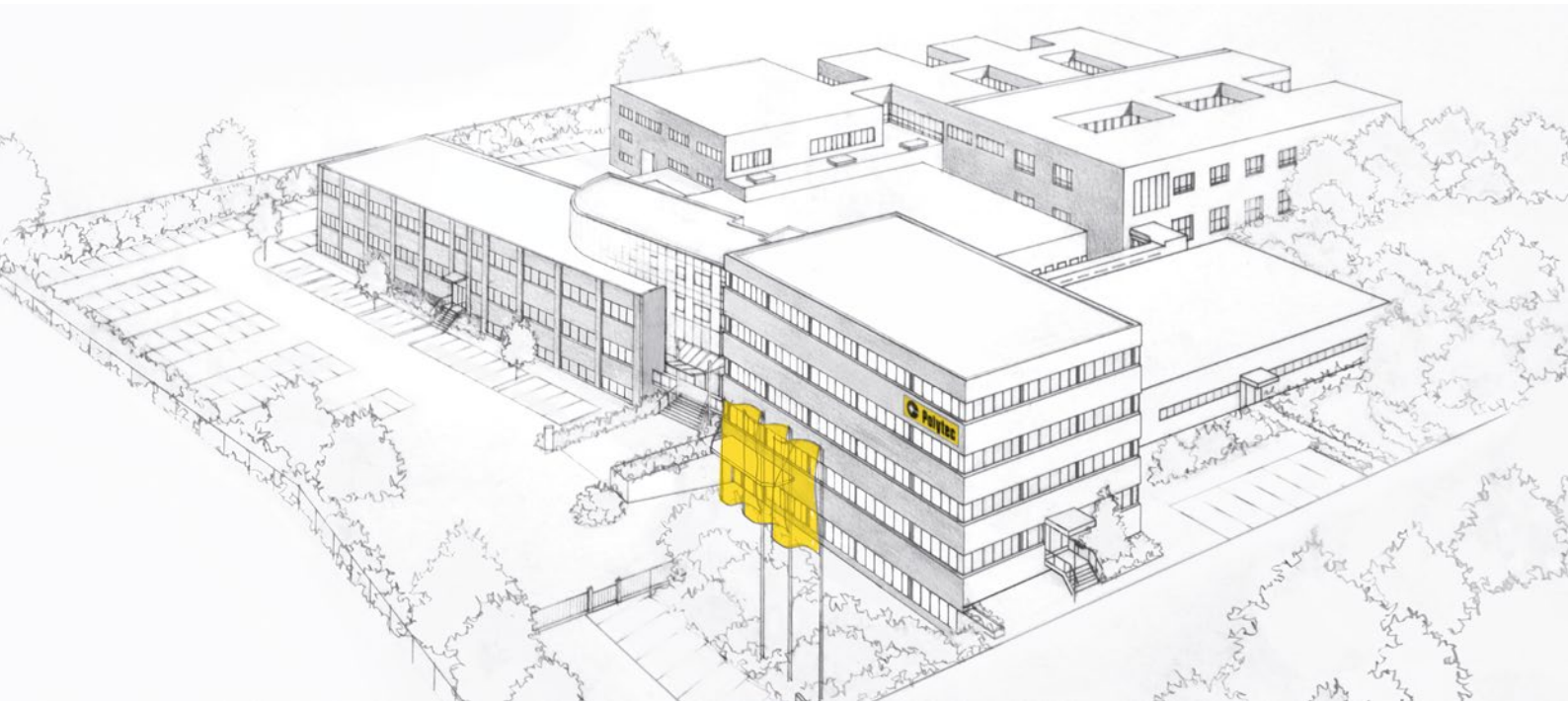


Zero-defect production of rolling bearings

Rolling bearings, crucial high-precision machine components manufactured in large quantities, are subject to stringent quality control. SKF, the global market leader, has utilized Polytec's industrial vibrometers for over 15 years in its zero-defect strategy for fully automated 100% quality control on the production line. The demanding cycle times, measured in seconds, necessitate highly efficient testing systems. The Polytec Device Communication driver facilitates seamless integration of the laser vibrometer into SKF's test bench software, allowing for the digital transmission of measurement parameters and vibration data via the Ethernet interface.

In addition to the pass/fail test, the measurement data enables detailed fault diagnosis for defective parts.

Image left, source: Gates RS, Osborn WA, McLean MJ, Shaw GA, Filliben JJ (2022) Certification of Standard Reference Material® 3461 Reference Cantilevers for AFM Spring Constant Calibration. (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication 260 (NIST SP 260) NIST SP 260-227-upd1. https://doi.org/10.6028/NIST.SP.260-227-upd1



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