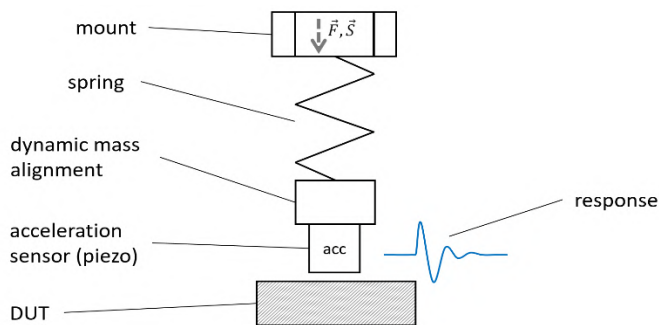


■ Application

Automotive interior control elements like buttons and rotary switches are increasingly being replaced by touch-sensitive surfaces. In order to provide both an intuitive interface and a safe control of the vehicle, touch-sensitive controls generate haptic feedbacks like impulses or brief vibration of the surface. The Force-Feedback-Module (FFM1) of the PANOVO tec GmbH is a measurement system that enables the user to verify force feedback in both laboratory and end of line test systems. To reproduce human haptic experience by an automated measurement the test finger has a mechanical impedance adapted to a human finger.

■ Measurement procedure

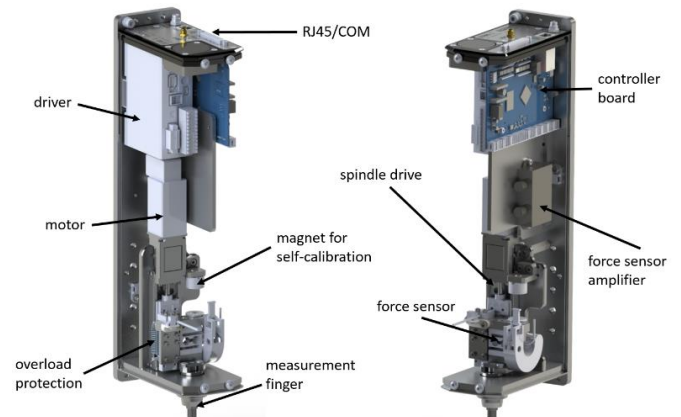
The module moves the test finger to the surface of the device under test (DUT) until a user-defined force is reached. In this state, a spring pushes the front end of the finger to the surface and ensures a stable connection. At the same time, the connection to the rest of the measurement module is suspended to make sure that the accelerometer measures the vibration of the examined surface exclusively.



The measurement velocity is adjustable from 0,1 to 60 mm/s to optimize the needed time for measurements or to emulate the movement of real operation. Furthermore, the system is able to record the force that is applied by the finger with an additional high-precision force sensor. Hereby the system can detect the actuating force to trigger haptic feedback.

■ Structure of the Force-Feedback-Module

The FFM consists of a control PCB, a linear axis to actuate the DUT and a test finger for acceleration and force measurement.



■ Calibration of the FFM1

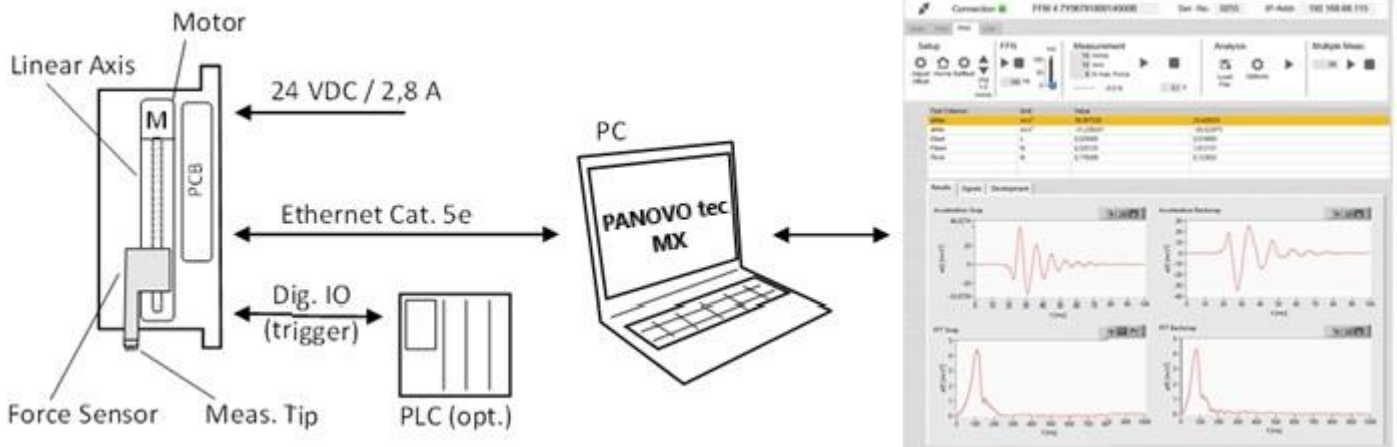
The FFM1 is calibrated in different ways depending on the measurand, which are calibrated in the factory. In case of doubt or once in the calibration interval, the customer using the integrated self-testing mechanism can calibrate the system on its own. In this way, it is simply possible to calibrate static mass, dynamic mass, stiffness and natural frequency.

■ Technical Data

Supply voltage	24 V DC
Max. current consumption	2,8 A
Meas. frequency	10 kHz
Meas. range force	± 15 N
Meas. range acceleration (depending on sensor)	± 50 g
Measurement velocity	0,1 - 60 mm/s
Data interfaces	Ethernet, Dig. I/O
Operating temperature	15 – 35 °C
Dimensions (l x b x h)	135x 70 x 359 mm

■ User Interface

The PANOVO tec Measurement Explorer (PANOVO tec MX), an intuitive measurement software is provided to control the FFM1 and to analyze measurements.



■ Dimensions and installation

The electrical interface of the Force-Feed-Back-Module are located on the upper side.

The module may be installed from the front and the backside. Mounting angles for installing the module on a base plate are available upon request.

