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Haptics test system

Description

Haptic from the old greek *hapthai*, means pertaining to the sense of touch. Haptics tests which recently had to be done manually by operators staff, can now be realized by using a 6 axis articulated robot with corresponding measuring device. The measuring of force-displacement is done via an integrated servo unit including a force sensor, which can be controlled over a computer.

Lots of different switch types, safty shutdown mats or contact elements can be tested for various applications. The analysis of the calculated measuring data can be parameterized via graphic tools and consequently offers an adaption to the most different requirements. Furthermore a fully automated functional test of control dials can be realized by exchangeable tools. An MCD test system even implies the complete functional testing and measuring value control of the entire user panel.

Applications

Force-displacement measuring for
- testing of keyboards and user panels
- measuring of mechanical elements

Testing of switch positions

Construction

- Servo drive
- Force sensor with amplifier
- Mechanical mounting
- Optional positioning of the linear motor by robotics

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Function

- Positioning of sensing element
- Approaching for precise contacting on the buttons
- Recording of force-displacement curve for different moving directions with synchronisation between force and displacement
- Shut down by force or displacement
- Immediate or later analysis of measuring values and curve progression by
  - envelope curve
  - window area
  - minimum / maximum
  - et al.
- Integration of controller- and evaluation software into a multitute of windows programs via COM interface (COM Server)
- Parameterized filtering of curve data
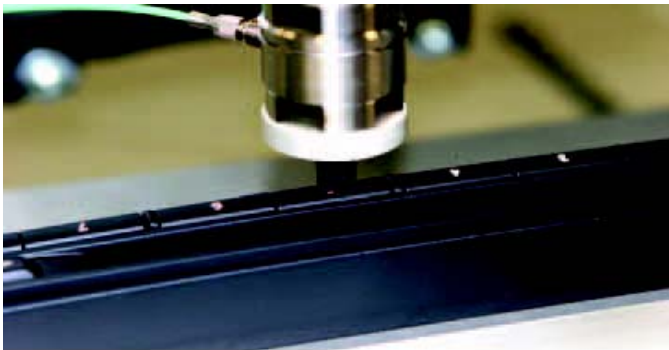
Measuring range

The measuring ranges and ranges of value respectively are pretty much specific to a project and depend on the used drive and force sensor. The ranges of value from a reference project are exemplarily listed in the following table.

Measurand	Unit	range of value	resolution [bit]	resolution / unit	accuracy
force	N	0 N - 20 N	12 bit / 20 N	0,005 N	?
displacement	mm	± 10 mm	11 bit / mm	0,5 µm	?
speed of linear motor	mm/s	0 mm/s – 10 mm/s	11 bit / mm/s	0,5 µm/s	?
speed of moving unit (robot)					
amount of measuring values	-	max. 1000 / moving direction	-	300 / s	

The recording of the force-displacement curve happens on a synchronously tracing of the force- and displacement values during the keystroke. Thereby one way as well as the way back are recorded. The amount of measuring points depend on the measuring speed and the keyboard hub. Regarding the above mentioned example, 300 samples can be recorded and evaluated within one second. According to a keyboard hub of 3 mm and a speed of 2 mm/s, 450 measuring values can be recorded for each moving direction.

Other motors or/and force sensors for higher forces, displacements or accuracy can be used alternatively.
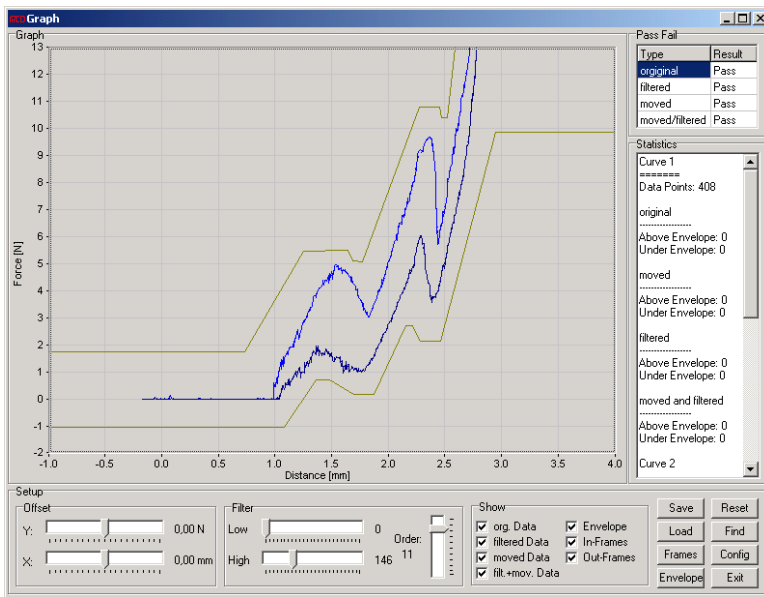
Softline
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Boardline
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Application

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Activation software

The software for activating the hardware and evaluating the measuring values is displayed in 2 standalone Windows applications. One part of the software deals with the control of the optional available robot for positioning the sensing element, the other part exclusively deals with the control of the measuring drive and the recording of the measuring values. Both applications are stand alone programs, which can be controlled directly over the user interface or by different programs via COM interface. The configuration of movements, measurings and evaluations can be done in different ways as e.g.:

- Direct input of single parameters via configuration dialogue in the program
- configuration command via COM interface for parameterizing by other programs
- configuration by parameter files

The evaluation of the recorded measuring values is done by the FBM software. On the other hand measuring points can be exported and evaluated by other programs.

The following mechanisms are available using the FBM software:

Control of force-displacement curve, whether pre-set envelope curves are harmed.
Control that any defined window area is included in the curve progression.
Control that any defined window areas are not touched by the curve progression.
Definition of a curve minimum and maximum in a fix interval for detecting an operating point.

In order to balance environmental influences, the software allows the filtering of recorded measuring values (e.g. for eliminating interference voltage spikes) or the balancing with constant correction-off-sets of measuring values concerning force and displacement. These off-sets may even be determined by the program itself.
Subsequent to the measuring an evaluation of the measuring result (pass/fail) or single measuring values may be requested via COM interface.

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