COBOSAFE®

CoboSafe-CBSF

Measuring System for the Validation of Transient and Quasi-Static Forces and Pressures of Collaborative Robots

In conformance with ISO/TS 15066, EN ISO 10218-1, EN ISO 10218-2 and RIA TR R15.806-2018

Developed in conjunction with: DGUV

GTE Industrieelektronik GmbH

COBOSAFE

Force and Pressure Measuring System CoboSafe

Demand-driven measuring technology in HRC applications: the modular system enables a custom-fit and expandable composition of measuring sets.

In any human-robot collaboration (HRC) application without separating protective equipment, collisions between humans and robots cannot be completely ruled out. The permissible thresholds for force and pressure according to applicable standards must be observed as they ensure the safe operation of HRC work areas. Regarding occupational safety different requirements arise for applications of collaborative robots. Collision prevention and detection, torque monitoring and force limitation have to achieve a similar level of protection like separating protective fences.

The force and pressure measurement system CoboSafe meets all the requirements that are necessary to verify the adherence of thresholds and is tailor-made for a variety of application areas. Depending on the requirement and objective, a set with up to nine force gauges with different spring constants can be set up. The combination of the spring constants (K2) with one of the additional damping elements (K1) allows the biomechanical properties to be configured according to
- EN ISO 10218-1 and EN ISO 10218-1,
- EN ISO/TS 15066,
- DGUV (German Social Accident Insurance),
- information „FB HM-080“

and „RIA TR R15.806-2018“ specified by the Robotic Industries Association of the American National Standards Institute.

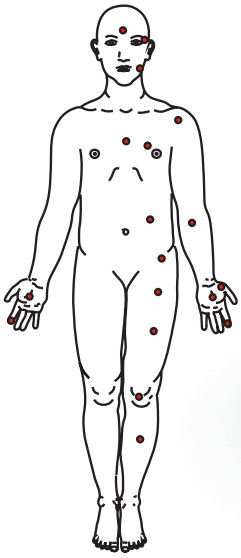
Two systems are available for pressure measurement that meet the testing requirements of operators, manufacturers and testing institutions.

1. Software CoboSafe-Vision

The CoboSafe-Vision software is used to visualize and evaluate the measurement results. It calculates and determines the values for the transient and quasi-static forces. An assessment of the pressure distribution image is possible by means of the two and three-dimensional representation and by using the filters. Individual reporting is also possible, such as csv-export.

CoboSafe Components:

1. PC-Software CoboSafe-Vision
2. Force gauge CoboSafe-CBSF: composition of nine variants with different spring constants
3. Set CoboSafe-Scan: pressure measurement by scanner or set CoboSafe-Tek: pressure measurement using film sensors



Damping elements K1

2. Force Measurement: CoboSafe-CBSF

A calibrated CBSF force gauge is available for each of the spring constants specified inin applicable standards for checking biomechanical thresholds and is ready for immediate measurement without further preparation. The heart of the aluminum-made force measurement device is the force sensor with linear-guided measuring mechanism. The mechanics guarantee optimum measuring accuracy and reproducibility, while the integrated electronics analyze and save the measured values. The transient and quasi-static measured values are shown on the display. Data transmission to the CoboSafe-Vision evaluation software is wireless or alternatively via USB interface. The small dimensions allow easy positioning of the device.

10 N/mm | 25 N/mm | 30 N/mm | 35 N/mm | 40 N/mm | 50 N/mm | 60 N/mm | 75 N/mm | 150 N/mm

3. Pressure Measurement Sets CoboSafe-Scan and CoboSafe-Tek

The CoboSafe-Scan set is based on FUJIFILM Prescale pressure measurement films and enables the recording of pressure distribution and maximum pressure.

The films react to the pressure and indicate the pressure distribution. The pressure is determined by the intensity of the discoloration of the pressure measuring films. Using a scanner and a specially developed calibration sheet, the pressure image is imported into the CoboSafe-Vision software and evaluated automatically. As a result, the pressure distribution is displayed in color grades, the maximum pressure value is also shown. The set includes a scanner, calibration sheet and films.

The CoboSafe-Tek set supplies maximum pressure and pressure distribution as well as a pressure sequence via electronic film sensors.

The system is particularly suitable for applications that require very detailed results. The collision pressure is recorded as a ‚film'. By synchronizing with the force curve, the pressure values and the pressure distribution can be determined and visualized for the required transient and static pressure. With this system, all requirements can be fully represented. It consists of various film sensors, a handle for picking up the foils and a hub (interface). The film sensors are ultra-thin, flexible PCBs with circuits and pressure-sensitive cells that can be used multiple times.

Scanner, calibration sheet and films

VersaTek™ hub, handle and films

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Technical Data

	Measuring range	Spring constant	Height (mm)	Weight (g)
CBSF - 10	20 N ... 300 N	10 N/mm	107	935
CBSF - 25	20 N ... 500 N	25 N/mm	89	840
CBSF - 30	20 N ... 400 N	30 N/mm	75,5	770
CBSF - 35	20 N ... 500 N	35 N/mm	76	775
CBSF - 40	20 N ... 500 N	40 N/mm	73,5	780
CBSF - 50	20 N ... 500 N	50 N/mm	65	730
CBSF - 60	20 N ... 500 N	60 N/mm	64	740
CBSF - 75	20 N ... 500 N	75 N/mm	62	745
CBSF - 150	20 N ... 500 N	150 N/mm	60	760

Measuring surface	80 mm Ø
Maximum measuring error	± 3 % FS
Measuring inaccuracy	typ. ± 1 % FS
Sampling rate	≥ 1 kHz
Capacity of internal memory	> 100 single measurements
Supply voltage	DC 3,7 V (integr. LiPo battery)
Current consumption	500 mA
Interface	USB/wireless
Temperature range	+10 °C ... +30 °C
Relative humidity	20 % ... 90 % RH (non-condensing)
Protection class	IP10

Set CoboSafe-Scan

Measuring inaccuracy	typ. ± 10 % oder less (measured at 23 °C, 65 % RH)
Temperature range	+20 °C ... +35 °C
Relative humidity	35 % ... ~ 80 % RH
Meassuring range Film LLW	50 N/cm² ... 250 N/cm²
Meassuring range Film LW	250 N/cm² ... 1000 N/cm²

Set CoboSafe-Tek

Pressure sensor type	9500	5051	5151	5101	5027
Pressure range [N/cm²]	827	242	242	242	345
Measuring surface [mm x mm]	70 x 70	56 x 56	165 x 165	112 x 12	28 x 28
Sensors per cm²	3,9	62,0	7,1	15,5	248,0
Measuring inaccuracy	< 10 %	< 10 %	< 10 %	< 10 %	< 10 %

Optionally available

- CBSF-Basic with handle and display
- CBSF-XS for measurements on grippers or in situations with small gap widths
- Mounting kits

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