Process Monitoring in Production

DIGIFORCE®

The new **DIGIFORCE® 9307** – the process monitoring of the next generation

The new DIGIFORCE® 9307 – more applications, new analysis procedures, innovative menu tools, and as reliable as ever

In the new DIGIFORCE® 9307 your application experience has been thoroughly implemented to define new standards. With the new DIGIFORCE® 9307 we have developed a high-end universal controller on the basis of a more powerful hardware and software architecture. It combines the strengths of the 9306 with yet more flexible evaluation routines and new measuring procedures. Intuitive operation, using clear, graphical menu tools, quickly leads the user to the goal. The precise control of jointing, riveting and calking procedures and of process monitoring are still among its core capabilities. New application possibilities in the fields of torque and haptic testing, universal signal testing, leak measurement and many others provide an enormous extension to the range of applications.

It's a question of the analysis

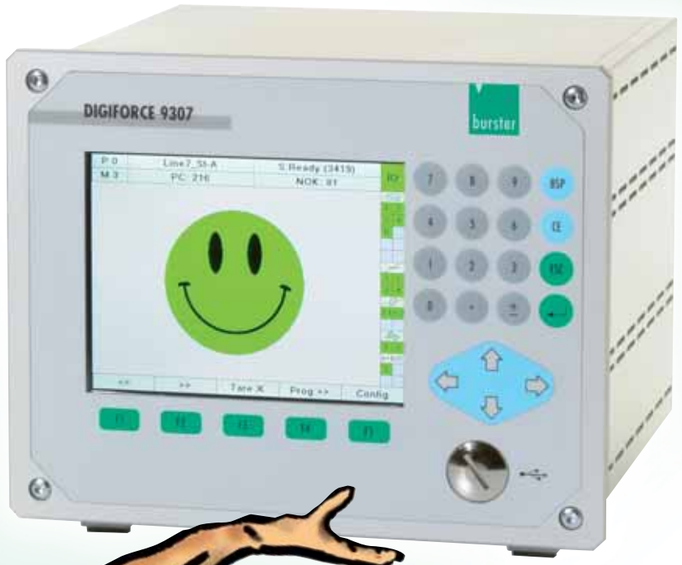
At one glance you get not just a global view, but also detailed OK/NOK evaluations of the process status. Processes can be monitored precisely thanks to new, graphical evaluation elements such as thresholds, trapeziums, windows, envelope curves and additional, freely parameterizable mathematical combinations. Informative, flexible diagnostic pages support differentiated process observation.

DIGIFORCE® 9307 is at home in any process environment

Programmable I/Os, independent start/stop mechanisms for the measurement, and a powerful fieldbus interface via Profibus or Ethernet-based fieldbus protocols permit fast, reliable implementation.

Take the time to have a good look!

With a precision of 0.05 for strain gage and analog process signals, your quality control system is on the safe side. DIGIFORCE® 9307 can also record and evaluate two, synchronous processes using an intelligent, combinable sampling of ∆t, ∆X and ∆Y. With the DIGIFORCE® 9307 you even have manufacturing processes with high component variance firmly under control. Up to 128 measuring programs can be selected and conveniently managed. An internal memory allows a variety of measurement curves to be stored for reference purposes. Analog sensor interfaces such as strain gages, potentiometers, piezo signals, and implementations with DC process signals are supported along with high-resolution incremental systems and absolute displacement transducers generating SSI or EnDat 2.2 output interfaces.



Supported sensors

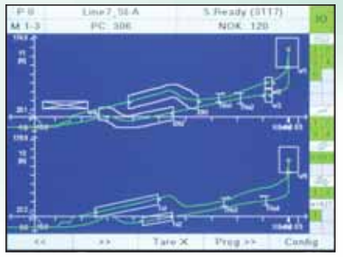
- Friction torques
- Press-insertion

- Haptic testing
- Rotary movements

- Spring testing

- Jointing processes
- Signal testing

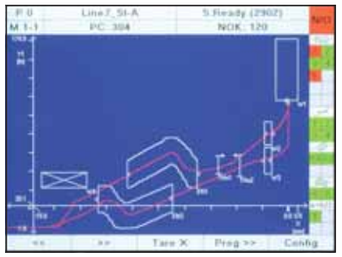
- Precise process monitoring
- Leaks



- Monitoring **two synchronous processes**
- **128 measuring programs** for high component variance
- Intelligent **signal sampling**

- Extensive **diagnostics and statistical analysis**
- **Ethernet, USB, standard RS232**
- Transfer of **process, component and worker information**

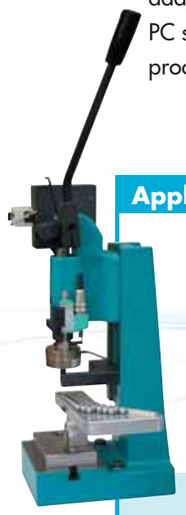
- **Programmable I/O functions** and function keys
- Very high **measurement precision down to 0.05 %** at sampling rates up to 10 kHz
- Strain gage, potentiometer, standard signals, piezo, absolute transducer – **all usual sensor interfaces**



- **Comprehensive process monitoring** through innovative evaluation elements (windows, thresholds, trapeziums, envelope curves and freely definable mathematical operations)
- Fast evaluation of **dynamic processes**
- **Flexible process integration** through variable fieldbus interfaces

DIGIFORCE® 9310: Process monitoring of single or multiple channel applications critical to price

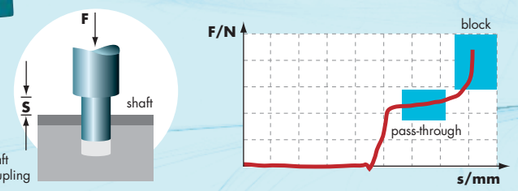
DIGIFORCE® 9310 is an especially inexpensive solution for gapless monitoring of press-insertion, joining and clinch processes. As a decentralized individual control system or as a multi-channel monitoring system, the DIGIFORCE® 9310 can be used in almost any process environment as a panel, table or control cabinet module with snap rail adapter. In addition to backup and configuration, the user-oriented PC software DigiControl enables logging and displaying production process data.



Application: Monitor force-displacement curve

100 % monitoring at a manual workstation for motor shaft mounting

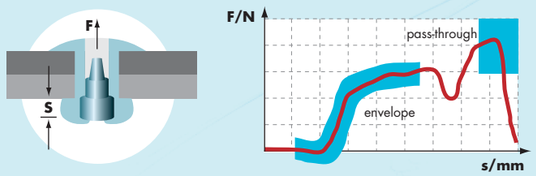
- Gapless control of the press-insertion curve
- Block window secures full actuation of the press stroke
- Signalization of OK/NOK parts via DIGIPILOT 5510 with optional press locking in the case of NOK assessment
- Unit counter integrated



Application: Monitor riveting procedure

Monitoring the set process in riveting processes for ABS components

- Full monitoring even with very short cycle rates
- Recognition of false material properties, tolerance, missing connection partners or wrong rivet types
- Very fast program parameter change
- Convenient setup help via DigiControl 9310 PC software



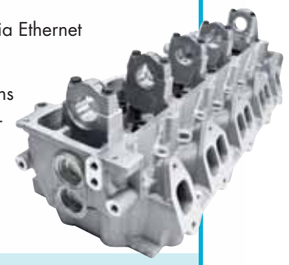
DIGIFORCE® 9310

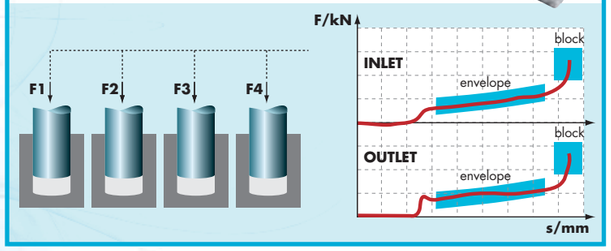
- For DMS, piezo, potentiometric sensors and process signals
- Curve evaluation using flexible window or envelope techniques and trend tracking
- For manual workstations and automated systems
- 8 measurement programs for 8 different parts
- Networkable via RS485, Ethernet or even optionally via Profibus
- Control via parallel IO ports or Profibus
- Graphical display of the press-fit curve
- Clear operating concept even for novice staff
- Multi-channel capability, PC measurement data recording software DigiControl, formation of device groups
- Optional clinch-point monitoring with recording and evaluation of the remaining plate thickness
- Can be delivered as panel, table and control cabinet version
- Auxiliary supply 100 V ... 240 VAC, control cabinet module 24 V DC

Application: Monitor joints

Ethernet based multiple channel joint monitoring in cylinder head assembly

- Inexpensive multiple-channel setup via cascading of the DIGIFORCE® 9310 control cabinet module
- Evaluation results are transmitted via Profibus DP to the PLC
- A host computer logs all measurement data via Ethernet and creates a clear parts reference
- Monitoring of time-critical process progressions via displacement and time triggered measurement functions up to 0.2 ms sampling
- Multi-channel measurement data visualization with DigiControl PC software

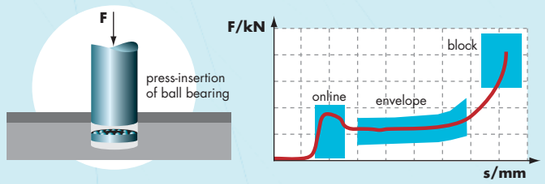




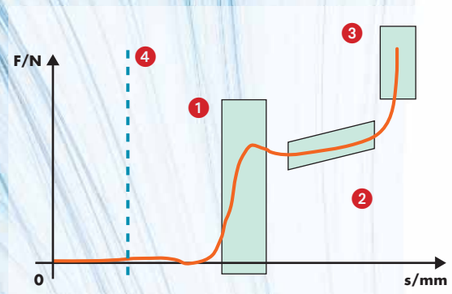
Application: Monitor press-insertion

Press-insertion of ball bearings in bearing cups

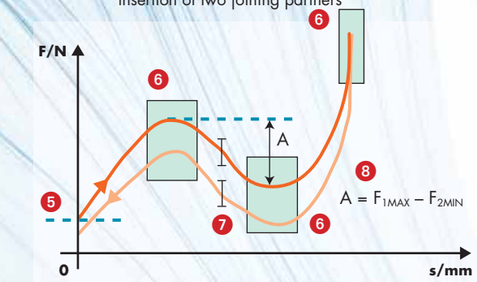
- Inexpensive monitoring in engine and drive production
- Online window can result in preliminary cancellation in the case of faulty process and thus protect tools and components
- Transmission of measurement quantities relevant to the process via Profibus DP
- Envelope and window evaluation for process evaluation can be combined
- Management of up to 8 different parts parameter sets
- Different displacement references can be configured



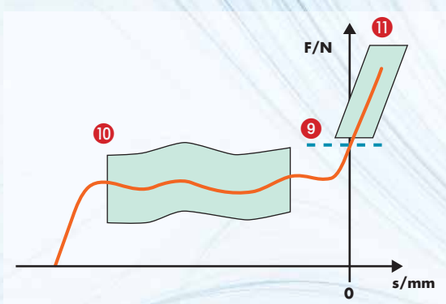
DIGIFORCE® all-inclusive package: Versatile evaluation procedure and PC software



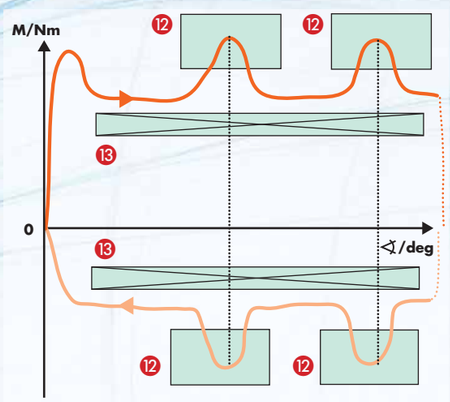
Example a) Traditional measurement curve during press insertion of two joining partners



Example b) Stopping characteristics of a vehicle fitting control element



Example c) Joining procedure with dynamical reference



Example d) Ventilation flap with several stops (supply and return)

Evaluation procedure

DIGIFORCE® 9307 supports numerous measurement procedures and evaluation techniques. The measurement quantity and the sampling interval are defined first using the measuring procedure and the channel settings. The reference selected here is the zero point of the measurement curve. The absolute reference to the displacement or angular measurement system can be created for example. All other reference points are determined dynamically e.g. via a force-trigger-threshold. Various evaluation elements like windows, thresholds, trapezium windows and envelopes can be used to monitor a full curve, determine quantities relevant to the process and thus quickly signalize a good/bad decision.

a) In this force-displacement curve with an absolute displacement reference, a threading window first monitors ❶ proper feed-in of the parts to be joined. The right characteristic is checked here using a trapezium window ❷ with defined entrance and exit sides. As an alternative the increase in force could be monitored here. Adherence to block dimension and block force is ensured by the block window ❸. The motion profile of the press is switched from express stroke to joining stroke using the displacement sensor switching signal ❹.

b) The snapping behavior of this control element is recorded with trigger reference ❺ using a force threshold. The ideal curve is monitored using pass-through windows ❻ and thresholds ❼ which also determine process values such as local minimum and maximum values, which constitute the haptic behavior of the switch. In addition to this, the hysteresis and the difference force A (in the example forward curve) between the forward and return curve could be monitored and evaluated by means of mathematical functions ❽.

c) If neither component tolerances nor a trigger threshold provide a reproducible reference position, then either the end force or the excess of an adjustable threshold ❾ can serve as the reference point for measurement. Across the entire curve, the trained or freely editable envelope ❿ can monitor the process. If the curve does not show an infinite force increase in the block section a trapezium window ⓫ can ensure the process.

d) In order to check torque angular displacement applications, the DIGIFORCE® 9307 supports either an incremental transmitter interface or an absolute transducer with SSI or EnDat interface to record angle information. A total of 20 evaluation elements as pass-through windows ⓬, thresholds, trapezium windows and envelopes can be active for each measurement curve. This makes it possible to evaluate even complex curves. Impermissible reduction of the torque during rotation is monitored here using an inspection window ⓭.

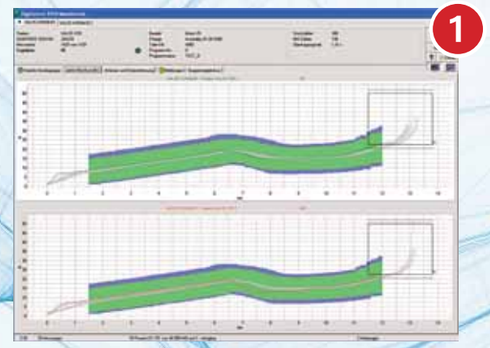
PC software

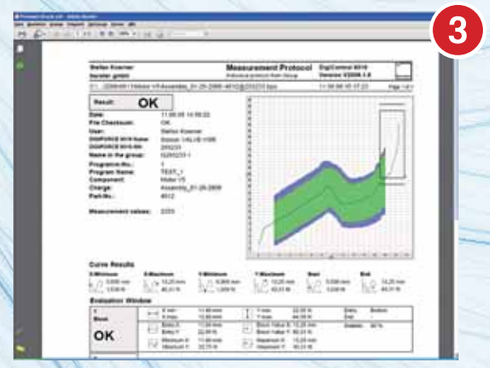
DIGIFORCE® and DigiControl PC software – a high-performance package

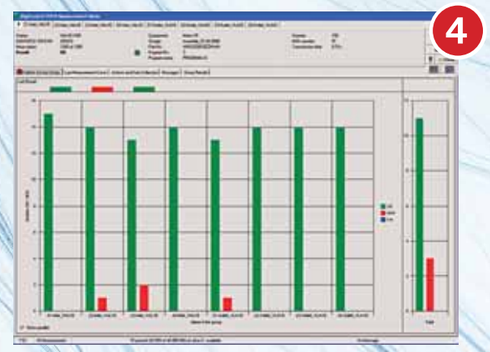
DIGIFORCE® is a fully autonomous test controller that displays status information and evaluation results in most applications, which can also be transmitted to a controller. The high-performance software package DigiControl has additional functions to further increase process availability and reliability.

Even the **basic version** supports full device configuration, creation of backups, reading and displaying measurement curves including all evaluation results and statistics storage. An especially convenient feature is the definition of envelopes or evaluation window limits and conditions based on a set of curves of measured master or reference parts.

In addition to the basic functions, the **Plus version** of the DigiControl PC software provides an automatic production mode, which logs production measurement data with clear parts reference for example. The resulting measurement logs are not only available in the internal program format, but can also be imported into ASCII, EXCEL or Q-DAS. In addition to the DIGIFORCE® device interface, it also supports an additional control interface for more complex tasks. Thus device configurations can be reloaded or component designations can be transferred for measurement data logging for example.







1. The "measurement mode" shows the curve and status information of the most recent measurement. This can be displayed for multiple channels as well. The corresponding log is automatically saved in the background.
2. Clearly structured configuration dialogs enable convenient device setup. Modification can be made either at file level or directly with DIGIFORCE® in a step-by-step manner.
3. A protocol browser enables the filtered selection and display of saved measurement protocols. This can be used for very convenient analysis of process related spreads or the causes of NOK evaluations. A protocol printout with component information, curve and all evaluation results can be generated or each individual measurement protocol.
4. Live statistics in measurement mode inform of the current process status. In the example, an increased NOK assessment of the third joining station in a multi-channel application is detectable.

DIGIFORCE® all-inclusive package: Connection options, system environment and service

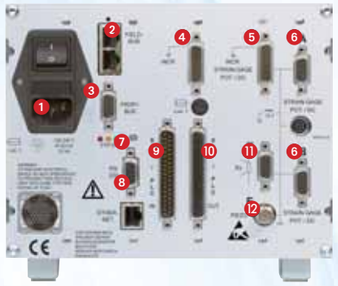
Connection options

DIGIFORCE® 9310

1. Power connection (wide range 100…240 VAC)
2. Ethernet 10/100 MBit, RS232 (standard)
3. Status LED (in model with Ethernet)
4. PLC I/O interface 24 VDC
5. Profibus DP (optional)
6. Sensor channel X (potentiometer, process signal)
7. Sensor channel Y (strain gauge, process signal), piezo input (optional)

↳ RS232 interface at the front panel

DIGIFORCE® 9307



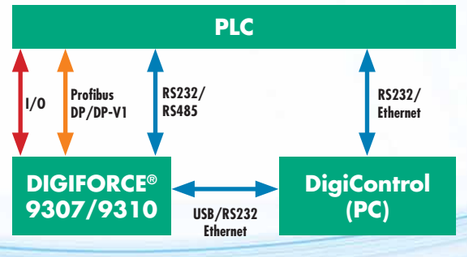
1. Power connection (wide range 100…240 VAC)
2. Ethernet based fieldbus (optional)
3. Profibus DP-V0/DP-V1 (optional)
4. Incremental interface, EnDat, SSI
5. Analog combined channel interface/INC2 (optional)
6. 2 standard analog interfaces (strain gauge, potentiometer, process signal)
7. RS232 interface
8. Ethernet interface
9. PLC input 24 VDC
10. PLC output 24 VDC
11. Resistance measurement channel (optional)
12. Piezo input (optional)

↳ USB interface at the front panel

	DIGIFORCE® 9307	DIGIFORCE® 9310
General technical data		
Sampling rate	10 kHz @ Y=F(X) 0,1 ms @ Y=f(X,t)	10 kHz @ Y=F(X) 0,2 ms @ Y=f(X,t)
Memory depths/value pairs	5,000	4,000
Digitalization	16 bit	12 bit
Weighting time (milliseconds)	typ. 20-30 ms	typ. 90 ms
Display	5.7" TFT	3"
Display languages	DE/EN/FR/ES/IT	DE/EN/FR/ES/IT
Measurement channels	3	2
	Y1/x und Y2/x	Y/(x)
Measurement programs	32 or 128 adjustable	8
Sensor interface		
Strain gauge	0.05 % 120 Ω … 5 kΩ	0.5 % 350 Ω … 5 kΩ
Displacement, potentiometer, DC/DC and process signal	0.05 % ± 5V ± 10V	0.40 % ± 5V ± 10V
Incremental (displacement, angular displacement)	TTL or EnDat, SSI	–
Counter depth/Cut-off frequency	32 bit/1 MHz	–
Resistance	100 mΩ … 100 kΩ	–
Evaluation procedure	max. number	max. number
Windows	10	3
Trapezium windows	4	–
Envelopes	2	1
Thresholds	4	–
Mathematical functions	110 / assessable: 6	–
Limit value monitoring, real time	4	2
Storage	FIFO 50 curves	–
Communication interfaces	Ethernet 10/100 Bit USB, RS232	Ethernet 10/100 Bit RS232/485
Fieldbus interfaces		
SPS E/A	23E/31A	9E/12A
Profibus	DP-V0/DP-V1	DP
Profinet	yes	–
Housing combines tabletop/ control-cabinet installation	IP30/IP65	IP20/IP65

System environment DIGIFORCE® – control (PLC) – PC

All DIGIFORCE® systems can be integrated in almost all control or host environments. In addition to the classic I/O interface, Profibus DP-V0 is available for transferring the measurement results to the PLC. DIGIFORCE® 9307 also supports an acyclical Profibus service (DP-V1). This not only enables full device configuration or reading out entire measurement curves in addition to the normal evaluation results, but also the transmission of unique parts information for logging on the PC side.



Not only the DIGIFORCE® test controller, but also the DigiControl PC software can take on commands from the PLC. Thus a new backup can be loaded, the batch designation and serial numbers for the following measurement data logging can be transmitted or the limits of an evaluation window can be adjusted for example. For device configuration and data logging, the connection to the PC is made via Ethernet, USB or RS232, depending on the DIGIFORCE® version. In active measurement mode of the DigiControl PC software, the PLC is synchronized via the READY signal. Thus it can be ensured that the subsequent measurement only begins once the previous measurement has been fully saved.

Services

Application support

Do you not yet know the precise implementation of your application? Talk to us! Our engineers and technicians as well as our international partners worldwide possess many years of experience monitoring processes and will be happy to consult you in implementing your measurement requirements.

Training

We offer user training for our products, including a full set of training documentation, either on-site or at our factory. Training can be tailored to your special application.

Preparing for use

DIGIFORCE® allows users to perform startup themselves with its clear operating structure. Startup support by our service technicians can be sensible in more complex system environments and individual application modifications. They ensure that existing sensors are properly connected, set up and adjusted, ensure ideal device configuration and can define secure process monitoring in the DIGIFORCE® using sample parts for example. We can provide startup support around the world. Please contact us!

Calibration services

Regular inspection of your measurement and test equipment is fundamental to ensuring dependable quality assurance. Our accredited calibration center provides ideal service for initial calibration and recalibration of your DIGIFORCE® controller and, of course, of the accompanying sensor systems. We can provide factory or DAkkS (German Calibration Service) calibration certificates quickly following scheduling. We will also be happy to perform calibration on location for you. Our experienced service technicians as well as our international partners worldwide will provide support in detailed examination. We will be glad to provide you with a standard replacement device so you can continue production during calibration or servicing. We guarantee outgoing shipment on business days within 48 hours.

Service contact

Contact your local representative via
www.burster.com ► Sales ► International Sales Offices
or send us an email to **service@burster.com.**

DIGIFORCE® all-inclusive sensor package: Selection of tried and tested sensors

DIGIFORCE® has an integrated sensor interface, to which two sensors can be connected simultaneously. It supports sensors that function according to the following measurement principles: resistive with strain gage, piezoelectric, LVDT, DC/DC, incremental, potentiometric or sensors that emit standard signals. You can use sensors from various different manufacturers. If you would like to use the tried and test products from our range, we can recommend the following sensors:

Miniature load cell 8402

Measuring ranges from 0...1 kN to 0...100 kN, especially small dimensions, perfect for dynamic load measurements, standardized sensitivity, very good for spatially restricted installation situations

Load cell 8451 for manually operated and pneumatic presses

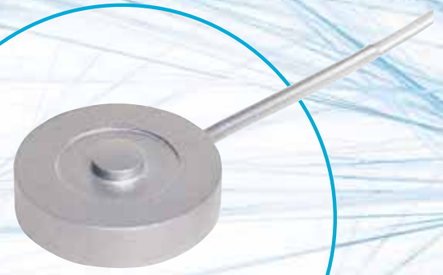
Measuring ranges from 0...500 N to 0...100 kN, simplest assembly on press ram, for all standard presses with a ram bore of 10 H^7 or 20 H^7, exceptionally robust and compact design, small measuring ranges with overload protection, protection class IP 67

Precision miniature load cell 8431/8432

Measuring ranges from 0...2.5 N to 0...100 kN, for tension and compression load, high measurement accuracy, designed to eliminate the effects of off-axis loads, measuring ranges up to 2 kN with bi-directional overload stop, optionally temperature compensated up to 160 °C

Compression load cell 8526

Measuring ranges from 0...100 N to 0...200 kN, very flat and compact design, protection class IP 64, laser welded stainless steel construction, fastening using 3 threaded bore holes in bottom, standardized sensitivity, can be used anywhere



Tension/compression load cell 8524

Measuring ranges from 0...500 N to 0...200 kN, for static and dynamic tensile and load forces, simple user-friendly installation, various options available, high-strength stainless steel, measuring ranges up to 20 kN with overload protection

Potentiometric displacement sensor 8711/8712

Measuring ranges from 0...10 mm to 0...150 mm, non-linearity up to 0.05 % of input, adjustment speed up to 10 m/s with plug or cable output, long service life, easy-to-install fastening brackets, durable friction bearings with narrow tolerances for reliable low-friction measurement operation

LVDT displacement sensors 8739/8740/8741

Measuring ranges from 0...1 mm to 0...150 mm, high measurement accuracy, vibration and impact resistant, sensor diameters from 8 mm, customer specific designs, wear-free, protection class up to IP 67, various different standard signal outputs possible, versatile mechanical assembly accessories

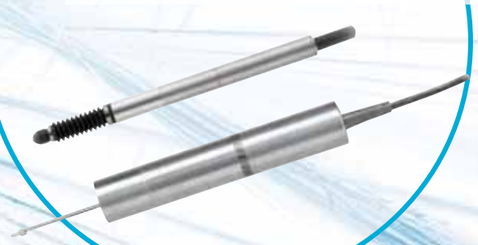
You can obtain detailed information and an extended selection at www.burster.com or in our sensor catalog. Our experienced product specialists will be glad to consult you.

Precision torque sensor 8661

Measuring ranges from 0...± 0.05 Nm to 0...± 200 Nm, high linearity of ≤ 0.05 % F.S., optionally with angle measurement and/or rotary speed measurement, analog output signal ± 10 VDC rated torque, optionally with USB, very compact built, rotary speed up to 25.000 1/min, intelligent operating state indicator

High-precision incremental displacement sensor 8738

Measuring ranges from 0...2 mm to 0...100 mm, diameters up to 8 mm, measurement accuracy up to 0.5 µm, exceptional shock and vibration resistance, protection class to IP 66, resolution to 0.1 µm, various mechanical and electrical options available



Process and reference calibration instruments in the burster range

Switch tester DIGISWITCH model 5410 for production and laboratory

- Haptics testing of switch elements
- Entry and evaluation of switching point, return switching point, supply and return displacement and difference displacement
- Optional with precision actuator model 5490
- Live logging with PC software DigiControl
- Profibus DP/DPV1 (option)

SENSORMASTER model 9163

- Single or multiple channel model for DMS, potentiometer, process signal, Pt100 and TC
- Various mathematical functions
- Measurement accuracy 0.1%
- Measurement rate 500/s
- RS232, RS485 or USB interface
- Compatible with PC software DigiVision

Universal calibrator DIGISTANT® model 4423

- Documenting calibration for mechanical, electrical and thermal values
- Measurement of forces, torques and displacement via the Smart Sensor Interface 7160
- Plug & Measure concept for all connected sensors
- Universal reference measurement chain with DKD (German Calibrator Service) or factory calibration certificate (option)
- PC software DIGICAL

The fast track to further information:

burster gmbh & co kg
high-precision measuring equipment

Talstrasse 1-5, 76593 Gernsbach, Germany
Phone +49-7224-645-0 · Fax +49-7224-645-88
info@burster.com · www.burster.com

770-930710EN-5372-031514