

Process Monitoring in Production



DIGIFORCE®



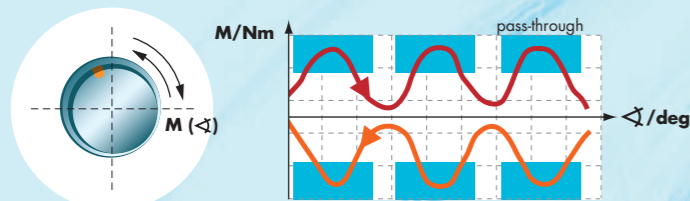
DIGIFORCE® 9306: Universal test controller for your quality assurance

DIGIFORCE® 9306 can be used anywhere where high-precision control of press-insertion, joining, riveting and caulking processes or torque characteristics is required. It is used as early as the development and construction stages to determine reference curves and, in ongoing production, it serves for precise monitoring of manual workstations or fully automated production lines even with fast cycle rates or changes in workpiece type. High-performance ongoing process diagnosis makes it possible to detect when a process goes wrong so that countermeasures can be implemented quickly.

Application: Monitor torque

Torque / angular displacement control for vehicle control elements

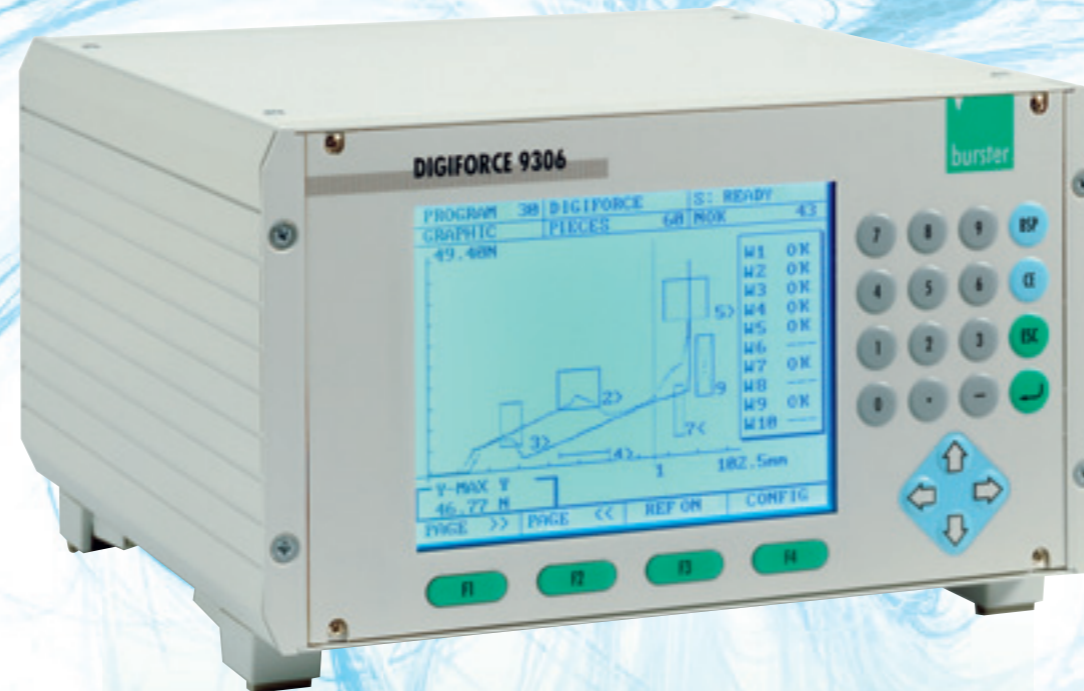
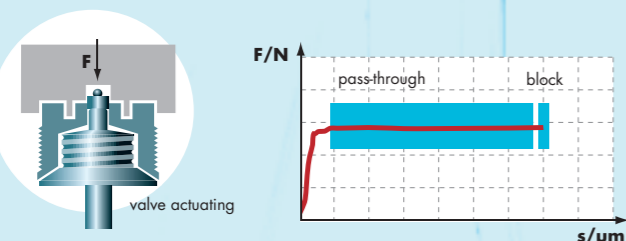
- Monitoring the haptics of rotary switches
- TORQUE connection for torque sensors with integrated angular displacement measurement
- Recording and evaluation of clockwise and anticlockwise movement in a single measurement



Application: Monitor force-displacement curve

Press-insertion and precise positioning of the valve actuating elements in the assembly of common-rail injectors

- Force measurement in accuracy class 0.1
- Support of high-resolution, incremental displacement measurement with accuracies of less than 1 µm
- Measurement rate with up to 10,000 value pairs per second
- The results of the measurement are transmitted via Profibus DPV1
- Direct fast selection of 32 program configurations for managing various parts



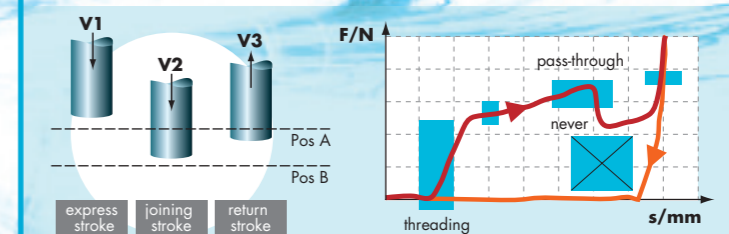
DIGIFORCE® 9306

- Monitors press-insertion, joining, milling and swivel procedures such as force-displacement, torque-angle characteristics, etc.
- All normal sensor interfaces are included as standard
- 32 different workpiece types in 32 measurement ranges, fast replacement via PLC conversion
- Controls up to 10 workpieces per second
- With RS232, RS485 and Profibus interface
- Window inspection of feed-in, progress, hysteresis, increase, block dimension and block force
- Provides extensive information via process progress
- Convenient diagnosis tools for countermeasures
- Statistical preparation in the device
- Convenient data logging via the PC software DigiControl
- User administration for different access rights

Application: Monitor joint axes

Separate process monitoring at electrical joint axes and actuators

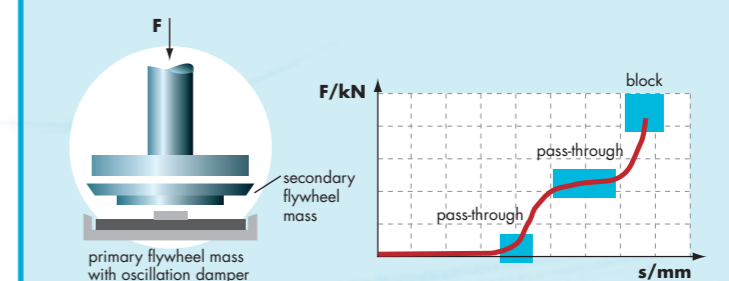
- Displacement information via transmitter emulation at servo regulators or separate linear displacement measurement system
- Monitoring of various profile records of the joint axis in individual DIGIFORCE® measurement programs
- Recording of complex measurement curves with up to 8,000 measurement pairs in supply and return displacement



Application: Monitor press-insertion

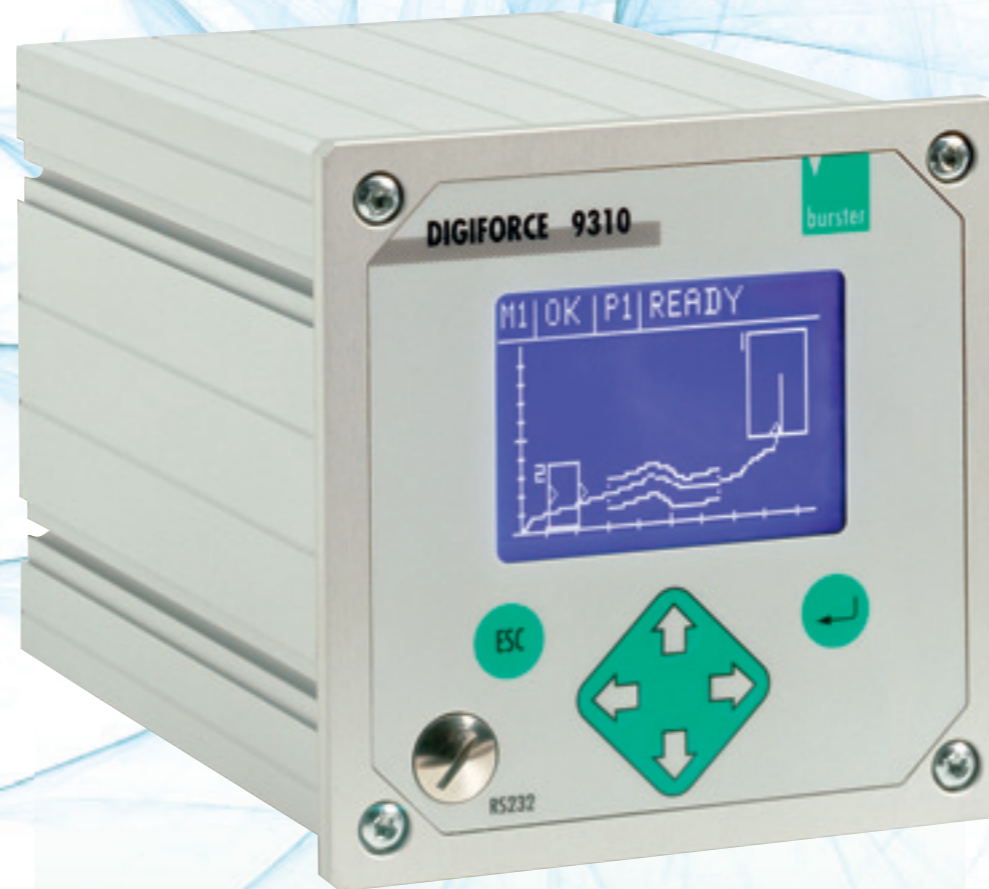
Monitoring primary and secondary flywheel mass of a dual mass flywheel during assembly

- New configuration of the assessment elements during machine startup and during parts replacement via Profibus DPV1
- The overall OK/NOK result and numerous measurement values relevant to quality are available approximately 100 ms following measurement via Profibus DP
- Extensive statistics information pertaining to ongoing production can be displayed directly on the DIGIFORCE® 9306
- Software supported unique component logging with serial number reference



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

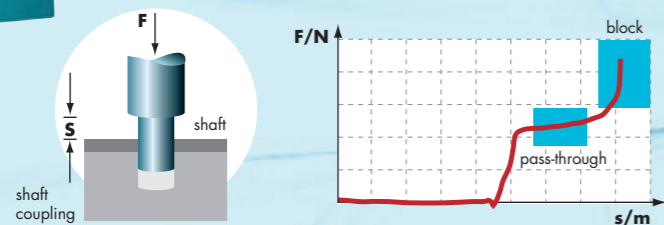
DIGIFORCE® 9310 is an especially inexpensive solution for gapless monitoring of press-insertion, joining and clinch processes. As a decentralized individual control system or as a multi-channel monitoring system, the DIGIFORCE® 9310 can be used in almost any process environment as a panel, table or control 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

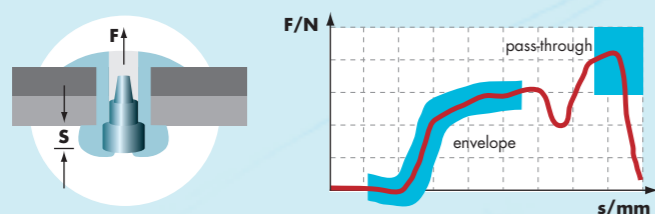
- Gapless control of the press-insertion curve
- Block window secures full actuation of the press stroke
- Signalization of OK/NOK parts via DIGIPILOT 5510 with optional press locking in the case of NOK assessment
- Unit counter integrated



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



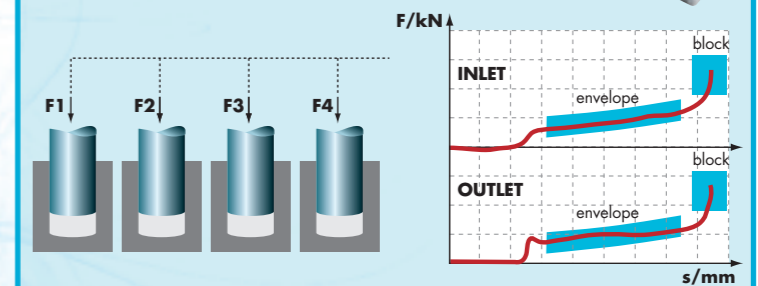
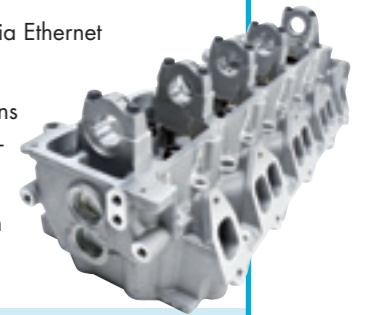
DIGIFORCE® 9310

- 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 V, control cabinet module 24 V DC

Application: Monitor joints

Ethernet based multiple channel joint monitoring in cylinder head assembly

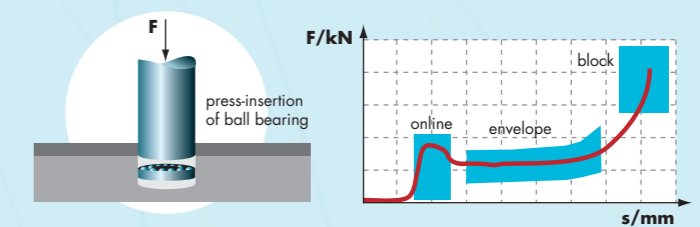
- Inexpensive multiple-channel setup via cascading of the DIGIFORCE® 9310 control cabinet module
- Evaluation results are transmitted via Profibus DP to the PLC
- A host computer logs all measurement data via Ethernet and creates a clear parts reference
- Monitoring of time-critical process progressions 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

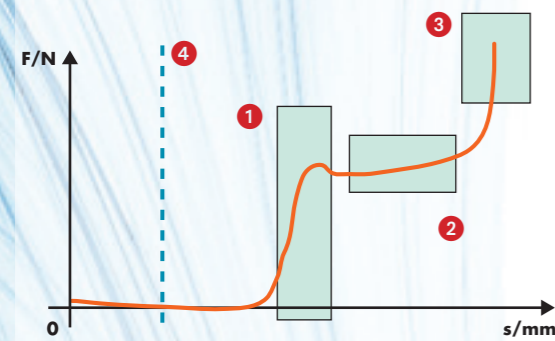
Press-insertion of ball bearings in bearing cups

- 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

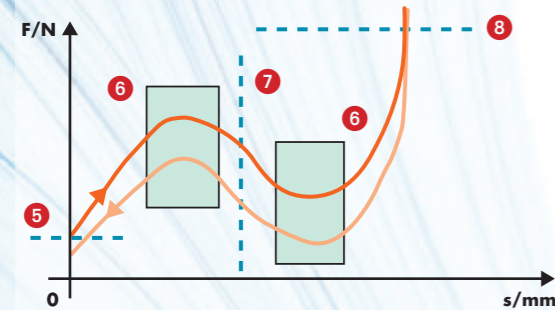


DIGIFORCE® all-inclusive package: Versatile evaluation procedure and PC software

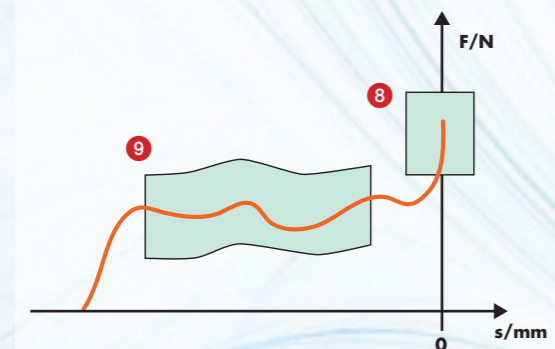
Evaluation procedure



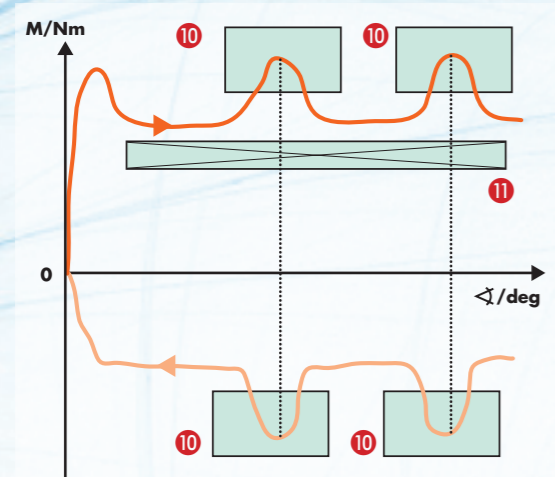
Example a) traditional measurement curve during press insertion of two joining partners



Example b) Stopping characteristics of a vehicle fitting control element



Example c) joining procedure with reference to block position



Example d) ventilation flap with several steps (supply and return)

DIGIFORCE® supports numerous measurement procedures and evaluation techniques. The measurement quantity and the sampling interval are defined first using the measuring procedure. 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 either with a force/torque trigger, via end force or block window reference. Various evaluation 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 **1** proper feed-in of the parts to be joined. The right characteristic is checked here using a pass-through window **2** with defined entrance and exit sides. As an alternative, a gradient window could monitor the increase in force. Adherence to block dimension and block force is ensured by the block window **3**. The motion profile of the press is switched from express stroke to joining stroke using the displacement sensor switching signal **4**.

b) The snapping behavior of this control element is recorded with trigger reference **5** using a force threshold. The ideal curve is monitored using pass-through windows **6**, 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 between the forward and return curve is recorded and evaluated with the hysteresis window **7**. The real-time signal of the force switching threshold **8** triggers the return stroke of the actuating elements.

c) If neither component tolerances nor a trigger threshold provide a reproducible reference position, then either the block force or entry into the block window **8** can serve as the reference point for measurement. Across the entire curve, the trained or freely editable envelope **9** can monitor the process. The optional envelope curve trend tracking can be used to detect minimal process changes.

d) In order to check torque angular displacement applications, the DIGIFORCE® 9306 supports an incremental transmitter interface to record angle information. A total of 10 evaluation windows (e.g. multiple pass-through windows) **10** 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 **11**.

PC software

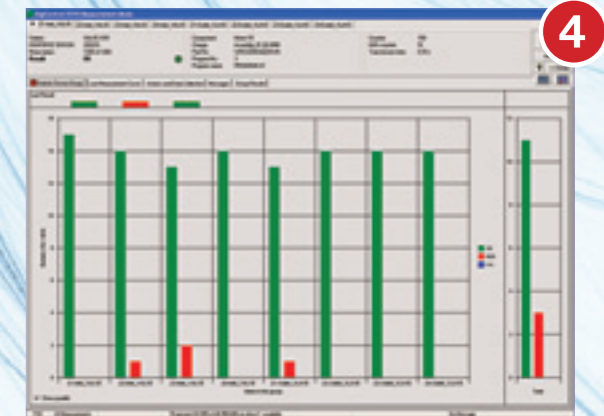
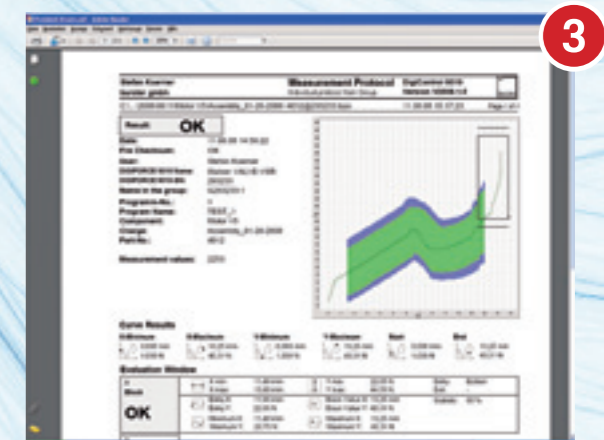
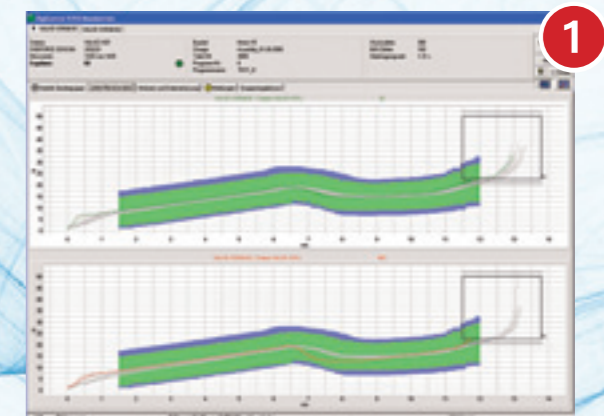
DIGIFORCE® and DigiControl PC software – a high-performance package

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.

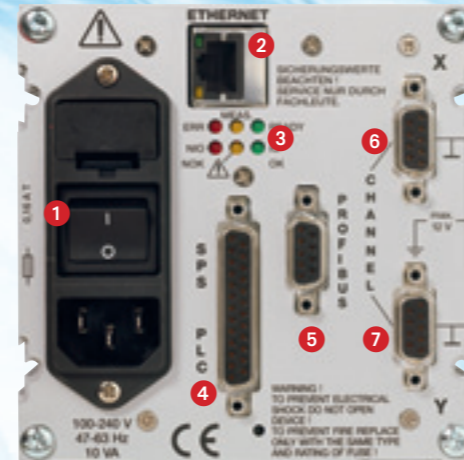


DIGIFORCE® all-inclusive package: Connection options, system environment and service

Connection options

DIGIFORCE® 9310

- 1 Power connection (wide range 100...240 VAC)
- 2 Ethernet 10/100 MBit (optional), RS485 (standard)
- 3 Status LED (in model with Ethernet)
- 4 PLC I/O interface 24 V DC
- 5 Profibus DP (optional)
- 6 Sensor channel X (potentiometer, process signal)
- 7 Sensor channel Y (DMS, process signal), piezo input (optional)



DIGIFORCE® 9306

- 1 Power connection (230 VAC/115 VAC)
- 2 Profibus DP/DP-V1
- 3 PLC inputs 24 VDC
- 4 PLC outputs 24 VDC
- 5 RS485 interface (two)
- 6 RS232 interface
- 7 Digital incremental interface
- 8 LVDT interface (optional)
- 9 X channel (potentiometric displacement sensor, process signal)
- 10 Torque / angular displacement input
- 11 Monitor output
- 12 Y channel (DMS, process signal)
- 13 Analog incremental interface
- 14 Piezo input

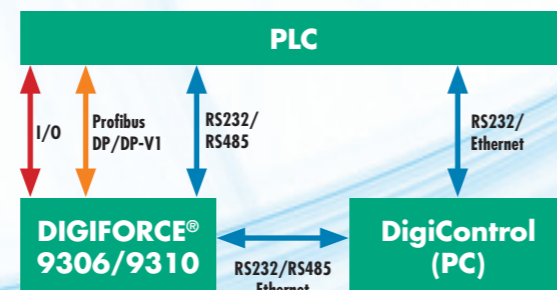


System environment DIGIFORCE® – control (PLC) – PC

All DIGIFORCE® systems can be integrated in almost all control or host environments. In addition to the classic I/O interface, Profibus DP is available for transferring the measurement results to the PLC. DIGIFORCE® 9306 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, RS232

or RS485 and even via USB using a converter depending on the DIGIFORCE® model. 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.



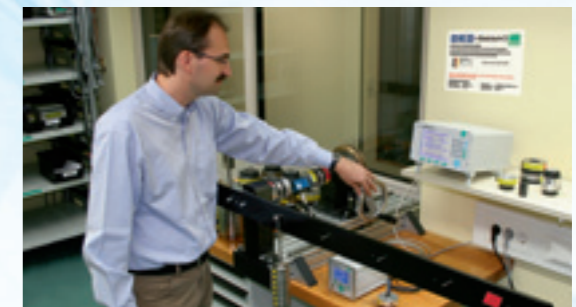
Training

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 DKD (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 pressure sensor 8402

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



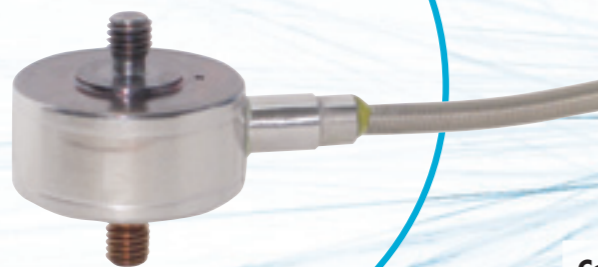
Load cell 8451 for manually operated and pneumatic presses

Measuring ranges from 0...500 N to 0...100 kN, simplest assembly on press mandrel, for all standard presses with a mandrel bore of 10 H7 or 20 H7, exceptionally robust and compact design, small measuring ranges with overload protection, protection class up to IP 67



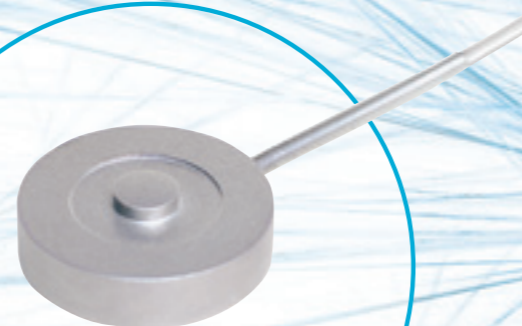
Precision miniature load cell 8431/8432

Measuring ranges from 0...2.5 N to 0...100 kN, for tensile and load forces, high measurement accuracy, minimum shear force sensitivity, measuring ranges up to 2 kN with bi-directional overload protection, optional for temperatures 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, standardized sensitivity, can be used anywhere



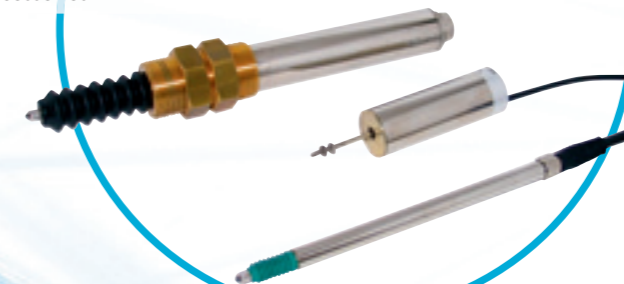
Tension/compression load cell 8524

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



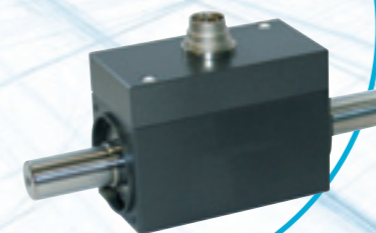
LVDT displacement sensors 8739/8740/8741

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



FM torque sensor 8651

Measuring ranges from 0...± 0.02 Nm to 0...± 1000 Nm, high linearity 0.1 % of input, optional with angular displacement or speed measurement, analog output signal of ± 10 V DC at nominal torque, very compact design, speeds up to 30,000 rpm, requires no maintenance



Potentiometric displacement sensor 8711/8712

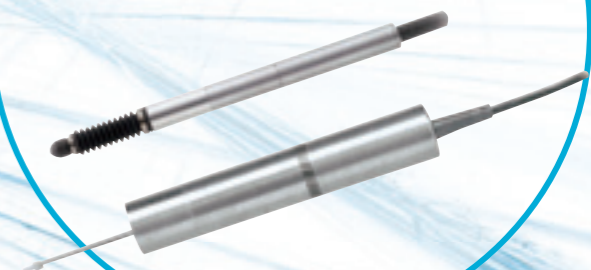
Measuring ranges from 0...10 mm to 0...150 mm, non-linearity up to 0.05 % of input, adjustment speed up to 10 m/s with plug or cable output, long service life, easy-to-install fastening brackets, durable friction bearings with narrow tolerances for reliable low-friction measurement operation



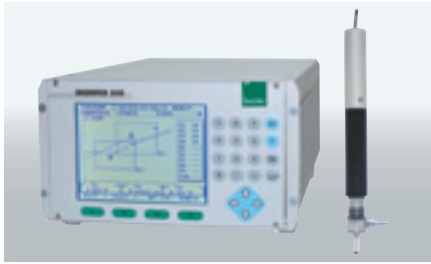
You can obtain detailed information and an extended selection at www.burster.com or in our sensor catalog. Our experienced product specialists will be glad to consult you.

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)



Sensor master 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

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