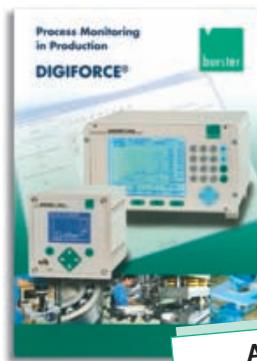


# Universal Test System for Press-Fit, Joint, Torque and Process Control DIGIFORCE®

Model 9306

Code: 9306 EN  
Delivery: ex stock  
Warranty: 24 months

**PROFI**<sup>®</sup>  
PROCESS FIELD BUS  
**BUS**



Ask for our new  
DIGIFORCE® brochure.

## Application

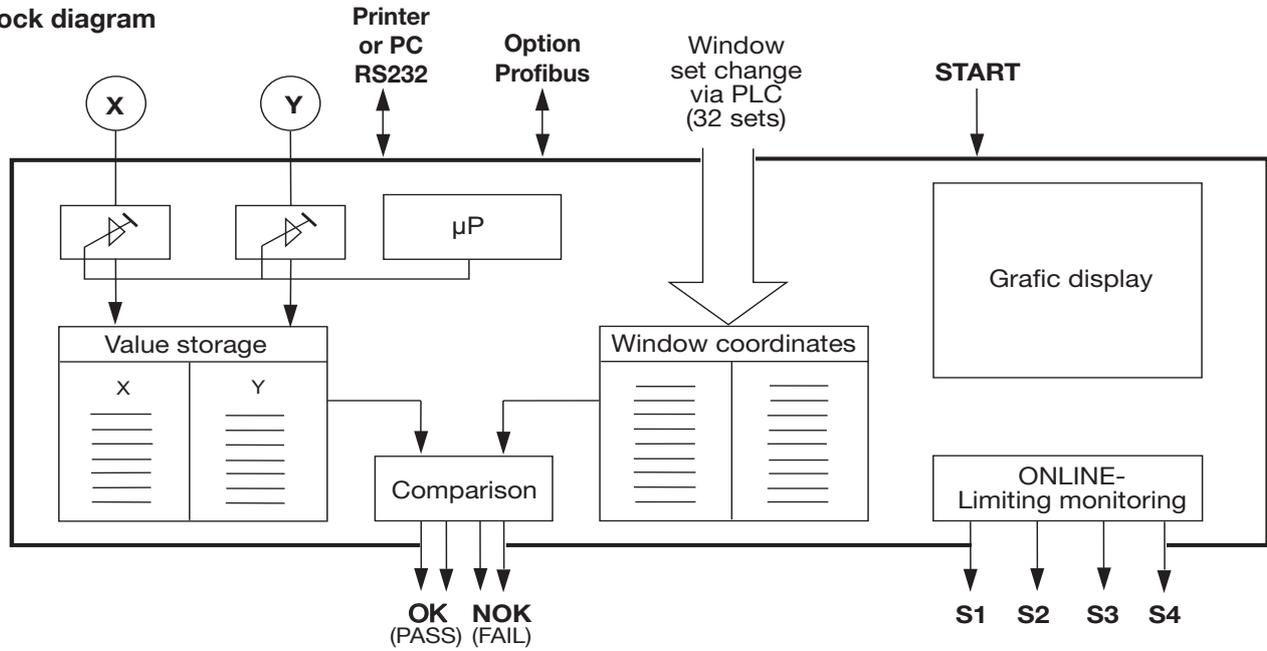
DIGIFORCE® controls processes in which precisely defined functional relationships between two measurement variables must be demonstrated. For example such relationships exist between force and displacement during pressing, and between torque and angle of rotation during bolting. DIGIFORCE® is used widely in the monitoring of fastening, riveting, and caulking operations, as well as in torque control in production of hinges, seat back adjustment mechanisms, rotary switches, etc. DIGIFORCE® is universally applicable. It is used first of all in the design and development phase for determining the set point characteristics of yet undetermined curves. DIGIFORCE® computes and displays these curves graphically. Such a curve can be stored at any time and be re-used as a reference curve.

- Controls operations involving press-fit, rotating and panning, such as force and displacement, torque and angle, etc.
- Windows check threading, curve characteristics, hysteresis, gradient, final force and position
- Controls up to 10 work pieces per second
- 32 different models of work pieces in 32 measuring programs, fast change by PLC
- Provides extensive data about process status
- Easy-to-use diagnostic tools for counter-measures
- Built-in statistical functions
- All normal sensor interfaces included as standard
- Profibus DP and DPV1 (option)
- Comfortable data recording with PC software DigiControl

In a later phase, DIGIFORCE® is integrated in the production environment and fulfills its primary monitoring function in full synchronization with the production system. In addition to being used in fully automated production lines, DIGIFORCE® can also be found assisting many manual tasks such as acceptance sampling in shipping and receiving. Quick work piece changes are no problem for DIGIFORCE®. Up to 32 work piece-specific parameter sets are available, which can either be controlled by PLC or by menu. The highly comprehensive diagnostics screens provide the user with constant data on the production process. Trend curves allow the user to tell when and how a process is running awry.

**9306 EN**

**Block diagram**



**Testing procedure**

After initiating START on the device, the sensors measure the X-Y coordinates in form of a curve, write them to memory, display them as a graph, and evaluate them by means of a special window technology. If a curve measurement passes through the windows as defined, DIGIFORCE® returns a PASS (OK), otherwise a FAIL (NOK) signal. For universal evaluation of various types of curves, DIGIFORCE® offers 7 different models of windows. A total of 10 different windows of various models can be allocated to each curve measurement.

The windows can read and evaluate positive (from left to right) and negative (from right to left) curve directions. In the example below, windows 1 through 4 are positive and 5 and 6 are negative. The windows only evaluate the curve for the direction that has been assigned to them, regardless of whether the curve also runs through the same window in the other direction (as in the case of window 4).

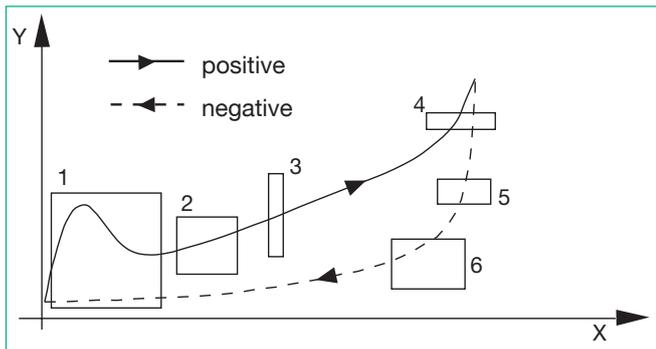


Figure 2 Window sets with positive and negative windows

**Testing criteria and window models**

**Pass-through Window**

This model of window checks the characteristics of the curve within the range of the window. The curve has to pass through the defined entrance and exit sides of the window without violating any of the other window boundaries. The entry and exit side can be specified (left, right, up, down).

**Threading Window**

This model of window is specially designed for pressing and fastening routines. It checks whether the fastened parts have been threaded properly and have not jammed. A real-time signal indicates this event and can be used, for example, to activate the upward stroke of the press.

**Block Window**

The block window monitors the block dimension and the block force of a pressing operation, for example. For this type of window, the curve must enter the pre-determined side of entry and must not exit the window.

**Hysteresis Window**

This type of window evaluates a progressive or retrograde curve of Y values for a random point on the x-axis. These hystereses are used, for example, as quality characteristics in hinged elements, switches, etc.

**Gradient Window**

Evaluates the slope of a curve segment between two programmable values of X.

**Never Window**

If the curve enters this model of window a FAIL (NOK) signal is returned.

**Last-point Window**

The last value of the curve must be within the window.

**Process data**

The operator can cycle through the following diagnostics screens while the machine is running.

1. NOK occurrence among all windows in form of a histogram
2. Trend curves of the window entrance and exit values
3. Frequency distribution of the entrance and exit values
4. Graph of last curve measurement
5. Display of Y-Min-Max values of all evaluation windows
6. Y-Min and Y-Max values and also X-Max of the whole measuring curve
7. Textual instruction for the user (can be entered through PC software DigiControl)

**Measuring functions**

DIGIFORCE® offers 5 measurement functions for different applications:

**y = f(x)**

A variable Y is logged and evaluated as a function of the variable X. A selectable X-interval determines the input of X-Y coordinates. The advantage: Input only occurs when the X variables change.

**y = f(x,t)**

A variable Y is logged and evaluated as a function of the variable X. A selectable X-interval determines the input of X-Y coordinates.

**y = f(t)**

A variable at channel Y is logged as a function of time factor t. Advantage: The X-sensor reading can be disregarded (e.g. the displacement sensor on a press).

**x = f(t)**

A variable at channel X is represented as a function of time. This allows for example, to monitor displacement or angle characteristics only.

**Classifying X or Y**

Variables at channel X, such as length, thickness, diameter, or at port Y, such as force, weight, torque, etc., can be divided into 5 classification groups. Each group is allocated to a switching signal. For example this allows a fully automatic sorting of spring characteristics according to an elastic constant.

**Limit monitoring in real-time**

For channels X and Y, two limits can each be assigned and monitored in real-time. Each limit is assigned to a switching signal. This allows you, for example, to change the press setting from "fast" to "slow".

**Reference point for the evaluation window**

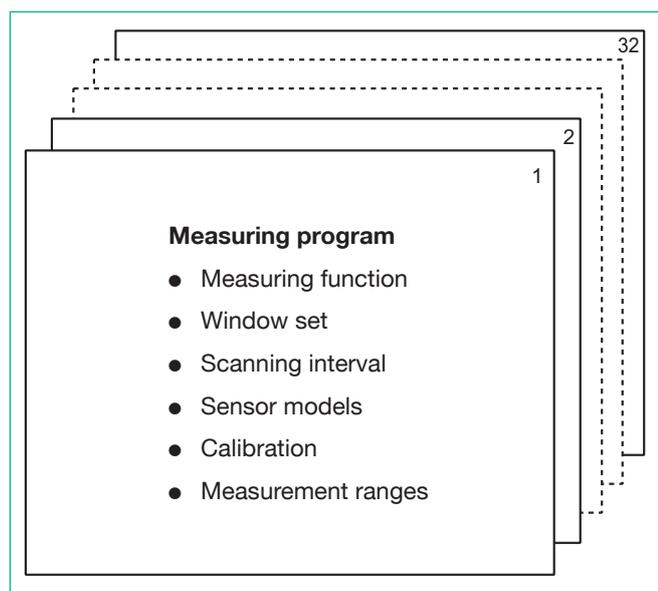
TRIGGER, BLOCK or ABSOLUTE selectable.

**Filtering external tolerances**

External tolerances, which can occur in the case of varying positioning heights of work piece fixtures, are suppressed by DIGIFORCE® in a so-called trigger mode. Measurements begin only when assignable trigger threshold values have been reached e.g. if a shaft which should be mounted is touched. At this time the displacement is set to zero.

**Measurement programs**

For fast work piece changes, DIGIFORCE® can store up to 32 measurement programs, which can be executed either by PLC or by hand.



Changeover via parallel I/O, Profibus, menu or RS232/485

**Adjusting measurement channel settings**

Adjustments in the sensor interfaces (model of input, amplification, voltage supply, etc.) are carried out by menu commands. No adjustments in the hardware are necessary. There are no jumpers or adjustment switches!

**Calibrating the measurement channels**

Three methods: 1. Teach-in calibration  
2. According to sensor protocol  
3. Shunt calibration

**Control via PLC**

Two optional logical cards (refer to part number):  
p-switched (mainly Europe)  
n-switched (mainly USA)

All input and output channels are optodecoupled.

**Process Data****On display:**

Data from windows: - Entrance/exit values  
- Peak values  
- Normal distribution of entrance/exit values  
- Trend curve of entrance/exit values  
Data from the curve: - Selectable e.g. y min, y max, x min ...

**Through PLC interface:**

**OK** successful pass-through of all windows  
**NOK** at least one window violation  
**NOKA** error during threading, online signal

**Real-time signals for system control**

**S1 ... S4** optionally connectable to channel X or Y.

**Serial interfaces** RS232

RS485 (full duplex)

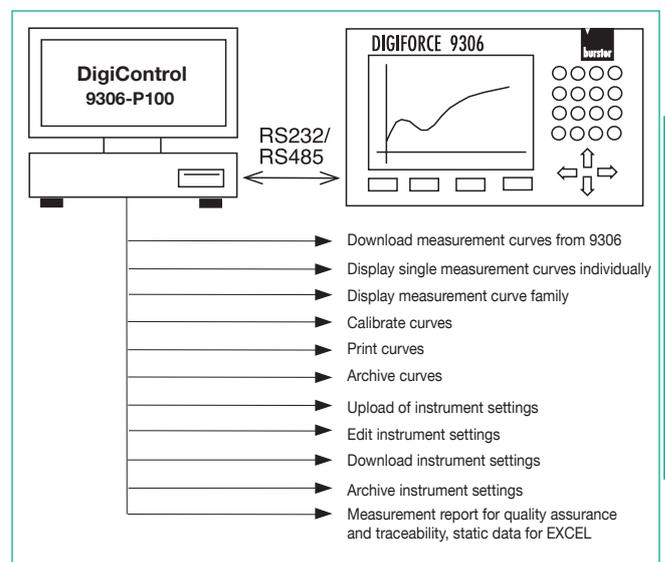
Curve measurements, statistical data, and device settings can all be sent to a master computer or to a printer connected directly to the device.

**Protocol**

Standard: ANSI 3.28  
Option: Profibus DP to 12 MBaud

**PC software DigiControl**

DIGIFORCE® is a self-contained device and can be operated without any external tools. However, the PC software DigiControl, obtainable as an accessory, offers a number of practical tools:



## Sensors for Y-channel

### Strain gauges

Parameters:	$\pm 0.2 \dots 25 \text{ mV/V}$
Bridge resistance:	$120 \Omega \dots 5 \text{ k}\Omega$
Excitation voltage:	2.5 V or 5 V
Current:	25 mA
Kind of excitation:	2 excitation lines, 2 sense lines
Cut-off frequency in levels:	5 Hz ... 5 kHz selectable
Total error:	< 0.1 %

### Piezo sensors

Measurement range:	$\pm 1 \text{ nC} \dots \pm 500 \text{ nC}$
Cut-off frequency in levels:	5 Hz ... 5 kHz selectable
Total error:	< 1 %

### Process signals

Signal range:	$\pm 5 \text{ V}, \pm 10 \text{ V}$
Cut-off frequency in levels:	5 Hz ... 5 kHz selectable
Total error:	< 0.1 %

## Sensors for X-channel

### Potentiometers, DC/DC sensors, process signals

Signal range:	$\pm 5 \text{ V}, \pm 10 \text{ V}$
Excitation voltage:	5 / 10 V
Current:	approx. 100 mA max.
Cut-off frequency:	approx. 5 kHz (-3 dB)
Total error:	< 0.1 %

### Incremental sensors

You can connect sensors with or without reference makers, whose coding consists of pulse strings phase-displaced by 90 degrees.

### Sinusoidal current output

Signal:	7 ... 16 $\mu\text{A}_{\text{ss}}$
Excitation voltage:	+ 5 V, 300 mA, -5 V, 300 mA
Cut-off frequency:	max. 50 kHz
Counting range:	16 bit
Interpolation:	four times

### Using a TTL-channel

Signal:	5 V
Excitation voltage:	+ 5 V, 300 mA, -5 V, 300 mA
Terminating resistor:	open
Cut-off frequency:	max. 100 kHz
Counting range:	16 bit
Interpolation:	four times

### LVDT and differential position sensors (option)

Signal range:	$\pm 25 \dots 1000 \text{ mV}$
Sensor excitation voltage:	$1.5 V_{\text{eff}}$
Frequency:	5 kHz
Current:	max. 50 mA
Resistance:	above $50 \Omega$
Cut-off frequency:	1 Hz ... 1 kHz selectable
Upper range drift:	50 ppm/K
Total error:	< 0.1 %

## Order Information

### DIGIFORCE®

 Model 9306 - V     -   

#### Standard

Desktop-rack housing IP40	0	0	0	0
Wall-mounted IP65 (option)	0	0	0	0
Standard interfaces (Strain gauge/Piezo/Poti/Incr./ $\pm 10 \text{ V}$ )	1	0	0	0
Additional LVDT interface (option)	0	1	0	0
IO Port, p-switched, power supply 230 VAC	0	0	0	0
IO Port, n-switched, power supply 115 VAC (option)	0	0	1	0
IO Port, p-switched, power supply 115 VAC (option)	0	0	2	0
IO Port, n-switched, power supply 230 VAC (option)	0	0	3	0
without Bus, only RS232/485	0	0	0	0
Profibus DP, DPV1 (auxiliary RS232)	0	0	0	2
2 x DIGIFORCE® 9306 in one common housing 19" housing IP40	0	0	0	DUO

## General Technical Data

Scanning rate max. at $y = f(x)$ :	10 000 value pairs/sec.
Sample rate at $y = f(t)$ , selectable:	500 $\mu\text{s} \dots 6.5 \text{ s}$
Digitalization:	12 bits (11 bits + sign bit)
Memory:	8 000 pairs for measurement curve
Computing time:	40 - 110 ms
Range of operating temperature:	+ 5 ... $\pm 23$ ... + 50 °C
Range of storage temperature:	0 ... + 60 °C
Power excitation:	230 VAC / 25 VA or 115 VAC / 25 VA
Online switching points delay S1 ... S4:	2 - 10 ms

## Housing

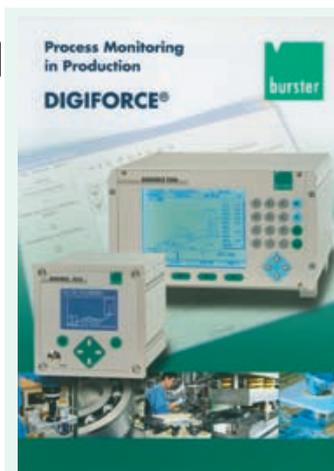
Desktop/rack housing	Protection class:	IP40
	Dimensions [W x H x D]:	235 x 133 x 255 [mm]
Duo version	Dimensions [W x H x D]:	450 x 133 x 255 [mm]
Wall mounted housing	Protection class:	IP 65
	Dimensions [W x H x D]:	265 x 150 x 325 [mm]
Display	Dimensions:	120 x 88 [mm]
	Pixel:	320 x 240

## Accessories

Implementation assistance	<b>Model 9306-I002</b>
PC Software DigiControl	<b>Model 9306-P101</b>
<ul style="list-style-type: none"> <li>for upload/download of instrument settings</li> <li>for editing of instrument settings</li> </ul>	
PC Software DigiControl Plus like 9306-P101 plus:	<b>Model 9306-P100-V002</b>
<ul style="list-style-type: none"> <li>logging of measurement results</li> <li>static file</li> <li>connection to QS-STAT</li> </ul>	
Ask for our DEMO version 9306-P100-DEMO!	
Converter from RS232 to RS485 with cable set	<b>Model 9900-K452</b>
Converter set USB/RS232	<b>Model 9900-K351</b>
Profibus connector, 9 pin, Min D, 12 Mbaud, for version 9306-0xx2	<b>Model 9900-V181</b>
Multiplexer unit, 2-4 pairs of cable	<b>on request</b>
Mounting set for front panel mounting	<b>Model 9305-Z003</b>
Data cable for connection of DIGIFORCE® and PC	<b>Model 9900-K333</b>

## The CAD drawing (3D/2D) for this device can be imported online directly into your CAD system.

Download via [www.burster.com](http://www.burster.com) or directly at [www.traceparts.com](http://www.traceparts.com). For further information about the burster traceparts cooperation refer to data sheet 80-CAD-EN.



Ask for our new Brochure

**"DIGIFORCE® Process Monitoring in Production"**

It contains many applications, a detailed product description and an overview table of all fitting sensors.