

OPERATION MANUAL

DIGIFORCE® 9310 Cabinet-mount module

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declares under sole responsibility that the product as originally delivered

Produktname: Prozessmessgerät, Einpress- und Fügeüberwachung DIGIFORCE®
Product Name: Press-Fit Controller

Modellnummer(n) (Typ): 9310
Models Number / Type:

Produktoptionen: Diese Erklärung beinhaltet obengenannte Produkte mit allen Optionen
Options This declaration covers all options of the above product(s)

mit den folgenden europäischen Richtlinien übereinstimmt und entsprechend das CE-Zeichen trägt:
complies with the requirements of the following applicable European Directives, and carries the CE marking accordingly:

2006/95/EC Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen
Low Voltage Electrical Equipment designed for use within certain voltage limits

2004/108/EC Elektromagnetische Verträglichkeit
EMC Electromagnetic Compatibility

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Above named products conform with the following product standards:

Sicherheit: IEC 61010-1:2001 / EN 61010-1:2001 Messkategorie 1 Schutzklasse I;
Safety requirements: CAT 1 (Safety class I) 90 - 230 V~ Kat. II

EMV Störaussendung: IEC/CISPR 11:2003 + A1:2004 + A2:2006 / EN 55011:2007 + A2:2007
EMC Generic emission:

EMV Störfestigkeit: IEC 61326-1:2005 / EN 61326-1:2006 Industrie Bereich
EMC Generic immunity: Industrial environment

Ergänzende Informationen:
Additional Information:

Das Produkt wurde in einer typischen Konfiguration getestet.
The product was tested in a typical configuration.

Diese Konformitätserklärung betrifft alle nach Ausstellungsdatum ausgelieferten Produkte:
This DoC applies to above-listed products placed on the EU market after:

Gernsbach 09.07.2008 i. V. Alfred Großmann
Datum / date Quality Manager

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Preparations for taking into service

Unpacking

The instrument is packed in a shock-resistant package. Unpack it cautiously and check if the delivery is complete. The standard scope of delivery includes:

- Cabinet-mount module: 1 DIGIFORCE 9310-V2XXX
- 1 pcs. DigiControl 9310-P101 Basic version including RS-232 data cable*
- 1 copy of this instruction manual
- 2 Min-D-plug 9 pin for connection of sensors
- 1 Min-D-plug 25 pin for connection to PLC

* An order including several pieces of DIGIFORCE 9310-V2xxx will be delivered with only one PC-Software 9310-P101 (including RS-232 data cable).

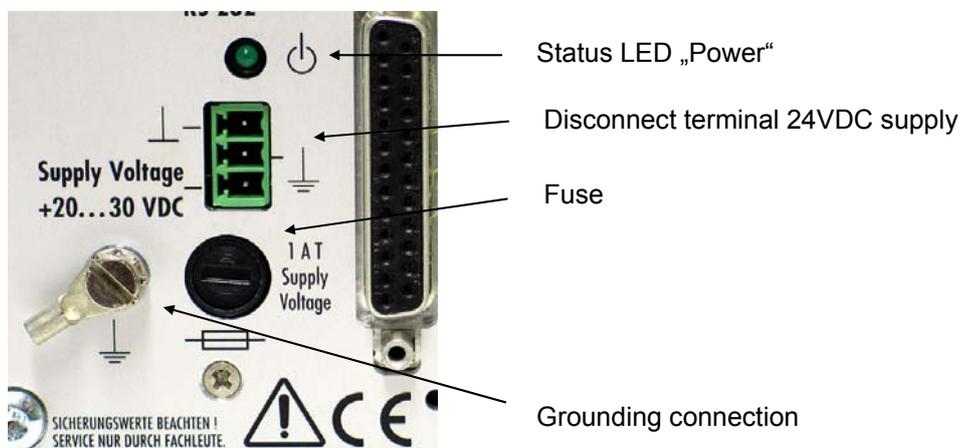
Check the instrument and its accessories. If you estimate a damage during transport please inform the manufacturer as soon as possible. In this case, the packing material is to be kept for checking by the manufacturer/the carrier. The transportation of the DIGIFORCE 9310 may only be effected in the original packing or in an equally suitable packing.

Setting up and mounting

There are no special measures necessary for connecting the device to the power system, but it has to reach a thermally balanced condition. If the storing room is colder than the putting up place the device has to remain switched off for a respective period of time to avoid possible condensation during operation. The putting up place should be chosen in the way that the device is not exposed to extreme temperature (operating temperature range 5 - 40° Celsius resp. changes in temperature. Humidity, dust, oils, chemical substances, aerosoles or strong vibrations are to be avoided. For a rough industrial environment we recommend to use the 9310-Z001 accessory (fixture set for front panel assembly). Mounting in close proximity to strong electromagnetic sources shall be avoided. Especially the connecting cables of the used sensors shall be positioned in such a way that they are not near any electromagnetic sources of great disturbance. Check the power cord on eventual damages. Connect the instrument only with a defect-free power cord to a standard power plug. If you intend to store the device for a longer period of time, pack it into an airtight packing of polyethylene together with a drying substance. Do not expose the device to direct sunlight or other strong light sources. The storage temperature is between 0...60°C.

Power connection

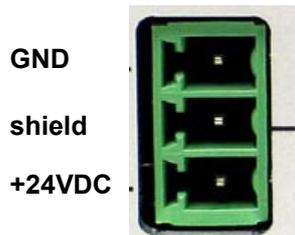
The supply voltage has to be in the range of 20... 30 VDC. Please verify before switching on.



When exchanging the fuse it needs to be verified that the device is completely separated from power supply. Remove the supply plug from DIGIFORCE 9310.

Connecting the power supply disconnecting plug

24VDC power supply



Ethernet interface

DIGIFORCE® 9310 is available with an Ethernet interface. For integration in a customer network there are some network specific configurations necessary. The required parameters for communication like IP address, subnetmask, gateway address and UDP-Port are available from your network administrator. The configuration could be set on the device or with the PC software DigiControl 9310.

The Ethernet interface is assigned for device configuration and data recording. The interface does not replace the process interface (PLC digital I/O or Profibus).

Communication and data security

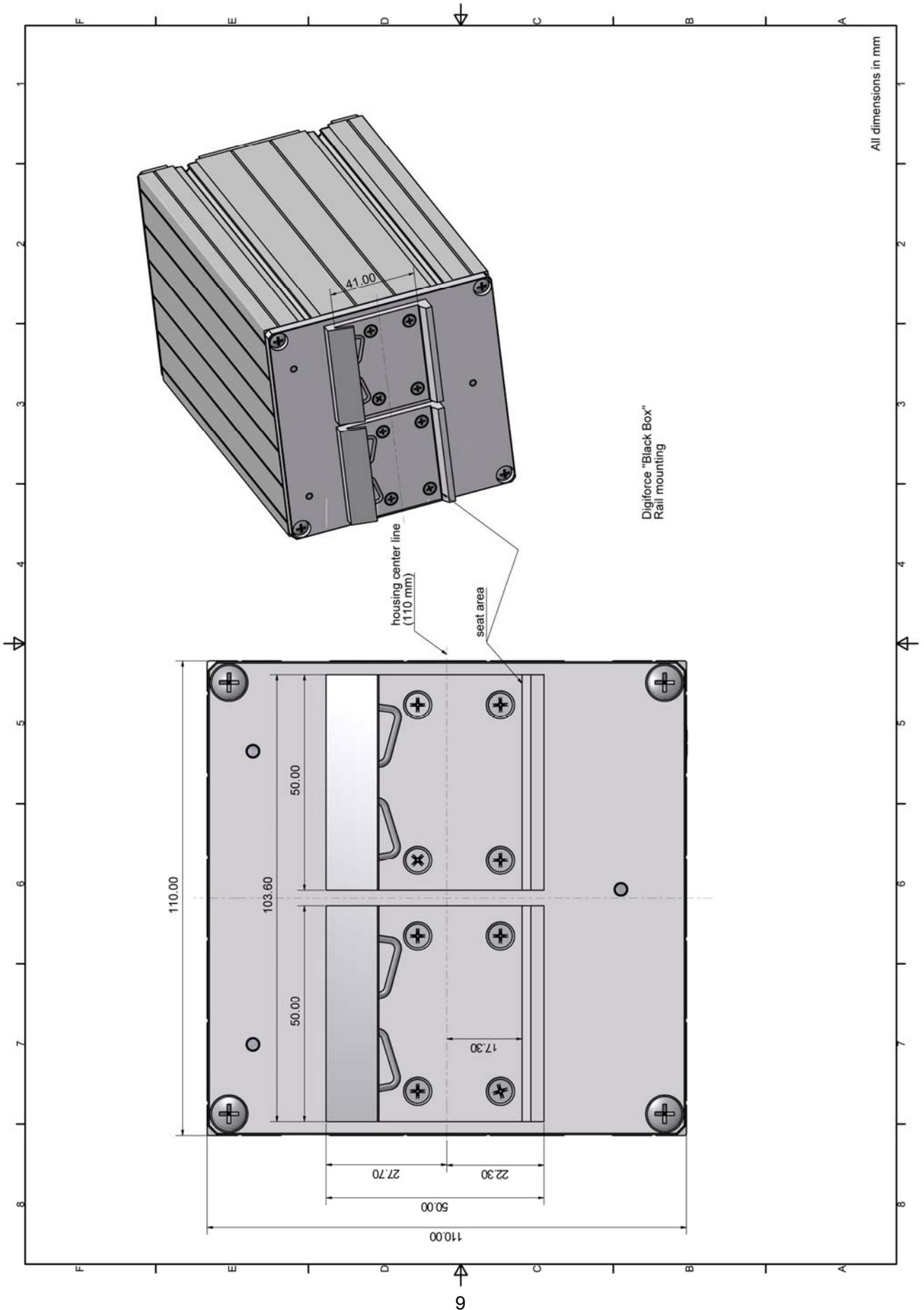
UDP (User Data Protocol) is used as communication protocol within DIGIFORCE® 9310. The data transfer can take place coded or uncoded. The PC software DigiControl 9310 uses exclusively the coded form of the transmission. The supported interface commands are documented and available in a separate manual („DIGIFORCE® 9310 interface manual“). For the protection from unauthorized access a restriction of the host IP addresses can be activated in the device. In case that restriction is active, in the device up to three host IP addresses can be stored exclusively for communication.

Recommendations for the network architecture:

If one or several DIGIFORCE® 9310 are working in an automatized production line it could be meaningful to instal a separate subnet, especially if data recording is used after every production cycle. Due to the lower supply utilization within the subnet a shorter recording cycle can be reached. Thereby DIGIFORCE® 9310 prematurely changes into the READY-condition and is available for a new measurement.

Control Cabinet Installation

The DIGIFORCE 9310-V2xxx (cabinet-mount module) could be mounted on a TS35 DIN mounting rail. The unit is delivered with four rubber stands. Therefore it is possible to use it also as desktop version without display and cursor knobs.



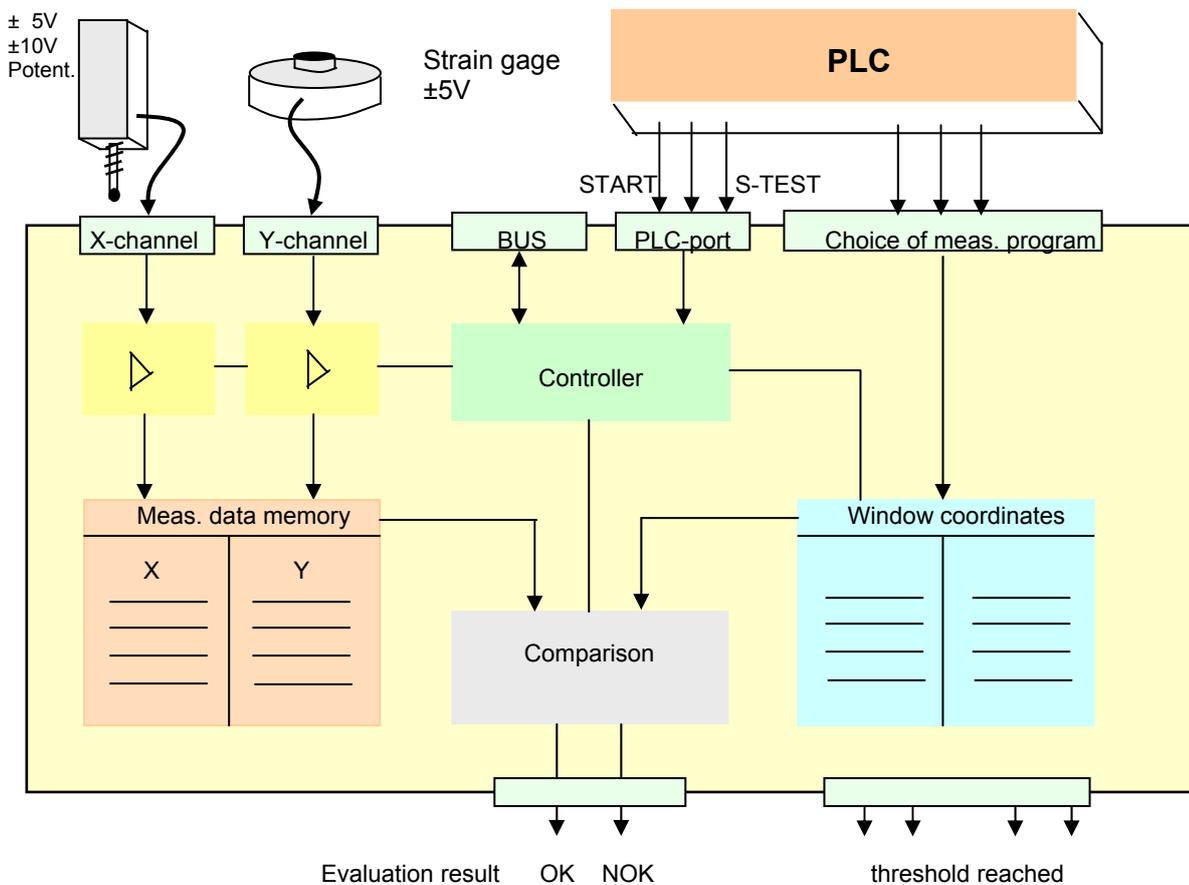
Device Concept

DIGIFORCE® controls processes for which you have to proof a precisely functional relationship between two measurement values. For press-fit in processes, for example, there are such relationships between the press-in force and the press-in displacement, for bolting processes between torque and angle.

A wide field of applications for the DIGIFORCE® are found in the control of press fitting or riveting processes. DIGIFORCE® is universally applicable in such cases. In the lab phase it is used principally to determine the reference curves for the yet unclear curve course. DIGIFORCE® saves it and displays it graphically. After the lab phase the DIGIFORCE® is integrated into the process environment where it fulfills the actual control function in the time cycle of the manufacturing line. Next to the use in full-automatic production lines the DIGIFORCE® is also applicable for more simple manual processes as for example in the spot check at goods quality control for supplied parts.

Fast changes of work pieces is no problem for the DIGIFORCE®. There are 8 work piece parameter sets that can be chosen via PLC or via menu.

Block switch diagram



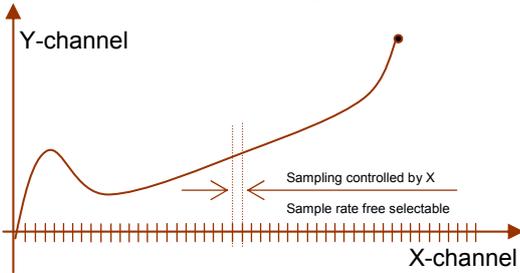
Measuring method

After the START of the instrument, which can be launched by an internal condition or an external control signal, the measurement values attained from the sensors as X-Y-value pairs are written into the internal memory and displayed in form of a measurement curve on the graphical display. This measurement curve is then evaluated by means of evaluation windows. If the measurement curve has passed the windows as defined for an OK-result, the DIGIFORCE® delivers an OK-signal, otherwise a NOK-signal.

Measurement functions

For various applications, the DIGIFORCE® offers three special measurement functions for selection.

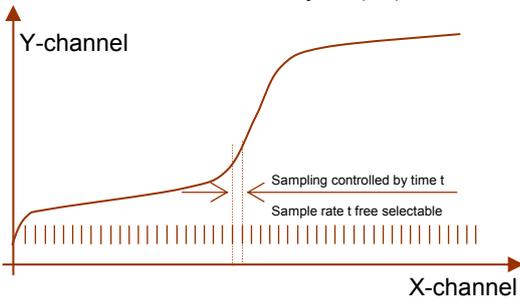
1. Measurement function $y = f(x)$



A Measurement value Y (force) is displayed and evaluated as a function of a measurement value X (displacement). A selectable X-sample rate defines the reading of the X-Y-value pairs.

Advantage: Only X-value changes are recognized. In contrary to the time controlled reading (see below), the measurement value memory is not unnecessarily loaded with data, e.g. during an intermediate stop of the automatic feeding device. For extremely steep curve ascents at which you almost have no change in the X-direction, the function, however, is not suitable. In this case we recommend one of the following functions.

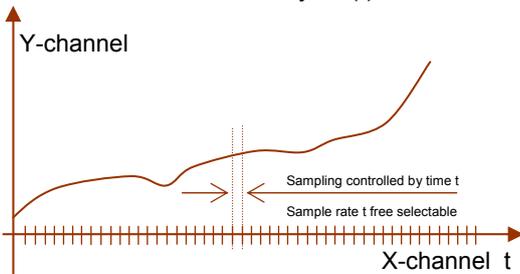
2. Measurement function $y = f(x,t)$



One measurement value Y is saved as a function of measurement value X. A selectable time rate determines the reading of the X-Y-value pairs.

Advantage: Also steep curve ascents where there is practically no change in displacement (e.g. at the block value) are logged without a problem.

3. Measurement function $y = f(t)$



A measurement value on channel Y is logged as a function of time t.

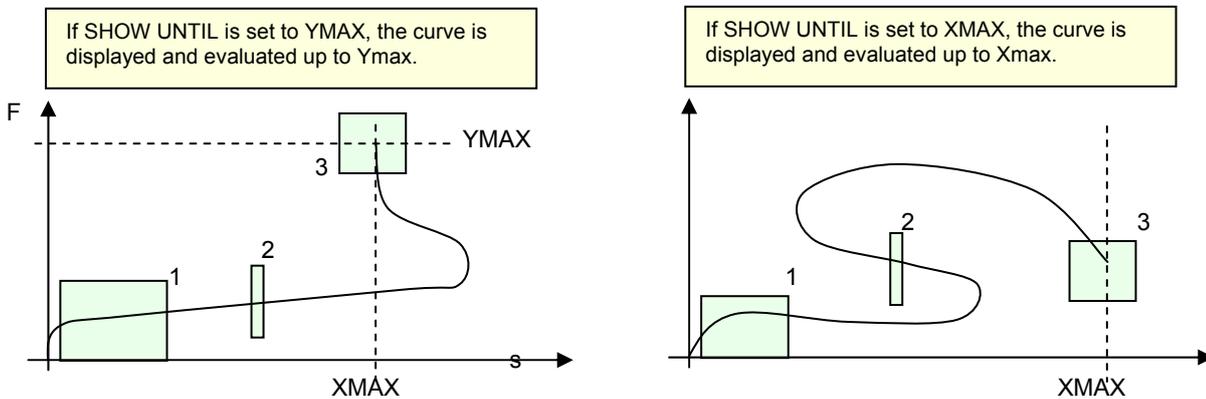
Advantage: The X-sensor is not needed (e.g. the displacement sensor at the press)

Condition: Reproducible feeding speed as the curve would otherwise be clinched or racked in dependency of the time factor!

Evaluation methods

Window technique

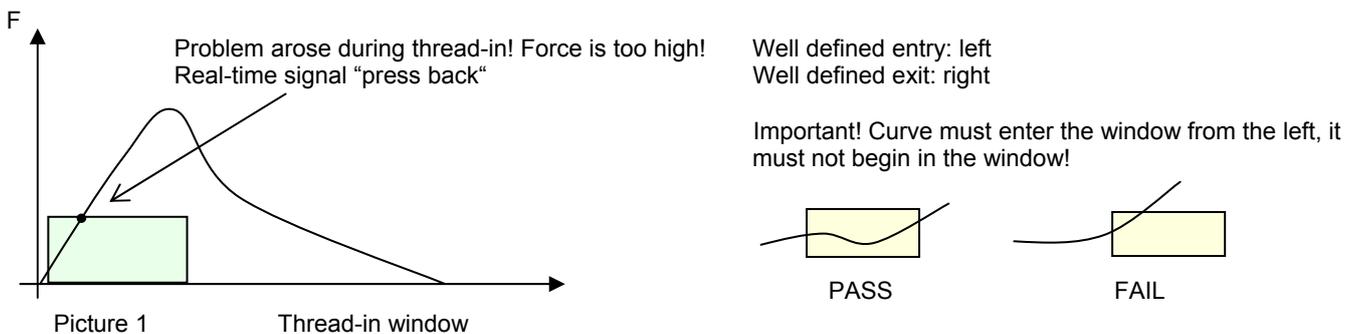
For a universal evaluation of various curve shapes, the DIGIFORCE® 9310 offers three different window types. Per measurement program you can set up in total three windows of these types, also in a mixed constellation. As a measurement curve is displayed only up to XMAX or YMAX the corresponding curve section is also only evaluative up to XMAX or YMAX. Except for the thread-in and block window you can define the entry and exit side for each PASS-type window. The measurement curve must run through the windows then as prevised. If it does not, the DIGIFORCE® sends a NOK-signal to the control.



Types of evaluation windows

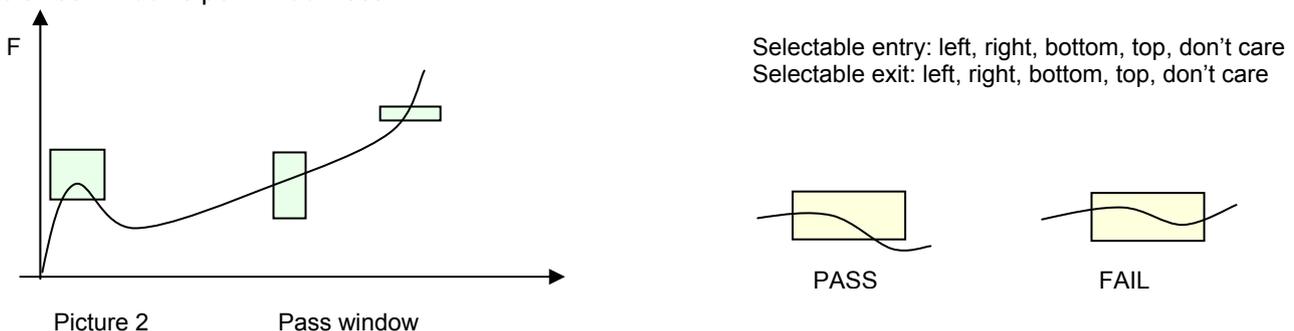
Thread-in window (online-window)

This window type is especially applicable for press-fitting and joining processes. It is positioned in the thread-in area of the press-fit in curve and controls in real-time if the thread-in of the two parts is effected in the required way without canting. This would effect a significant rise in the applied force with the result that the curve would exit the thread-in window on the top. A real-time signal informs about this and could be used to cause the runback of the press. You can set only one thread-in window per window set!



Pass window

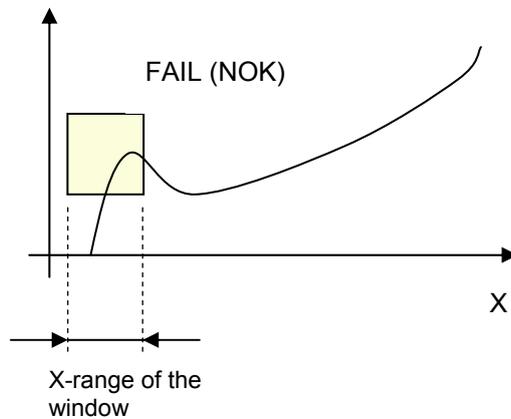
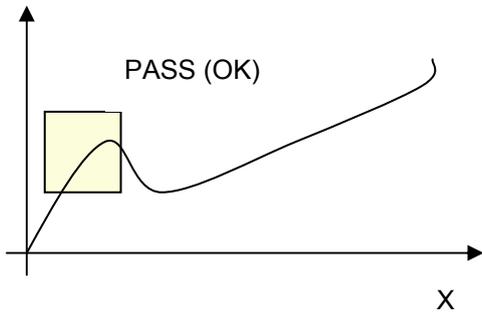
The curve must cross the window from the entry to the exit side with this window type without touching any other sides. Entry and exit sides are free selectable (left, right, bottom, top, don't care). Of the PASS type, you can set up to three windows per window set.





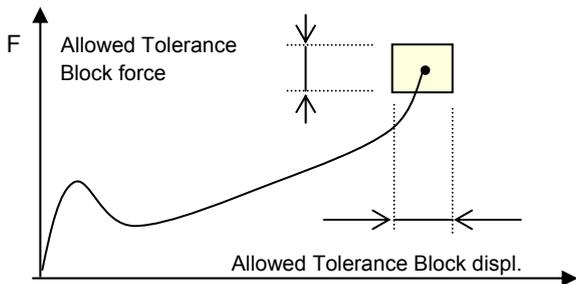
Important! The Measurement Curve must not start in the X-range of the PASS window! Otherwise the DIGIFORCE sends out a NOK-signal although the respective window might have been passed the correct way:

Example: Target: Entry bottom, Exit right



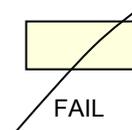
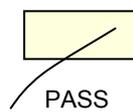
Block window

The block window checks the block force and displacement. The curve must enter on the defined side and must not leave the window again on any side. Only one window can be configured as a block window per window set.



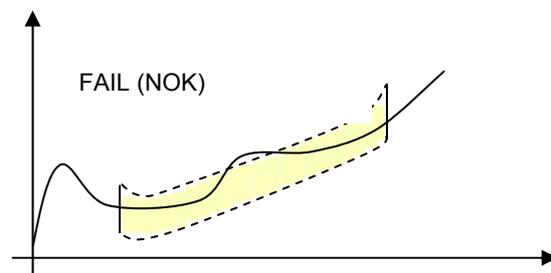
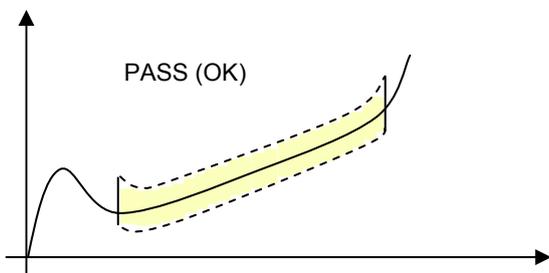
Entry : left, right, top, bottom, doesn't matter (selectable)
Exit : none (fixed)

Example: Target: Entry bottom, Exit none



Envelope

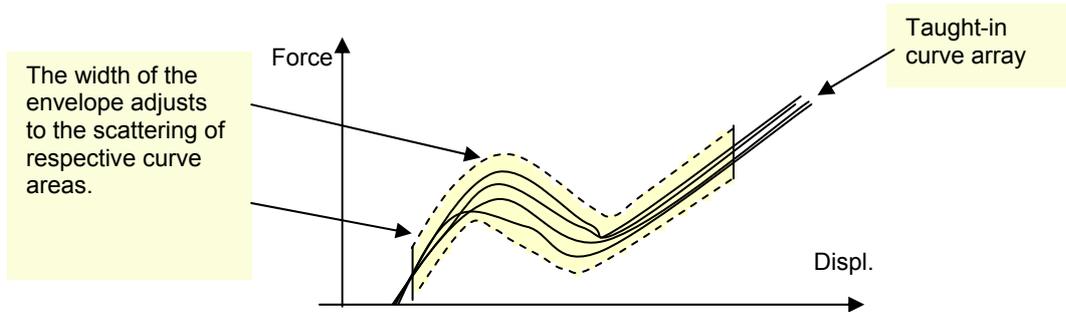
The envelope technique is selectable as an additional evaluation method. To achieve an OK-case the Measurement curve must run through the envelope without touching the borders at any time.



Configuration of the envelope

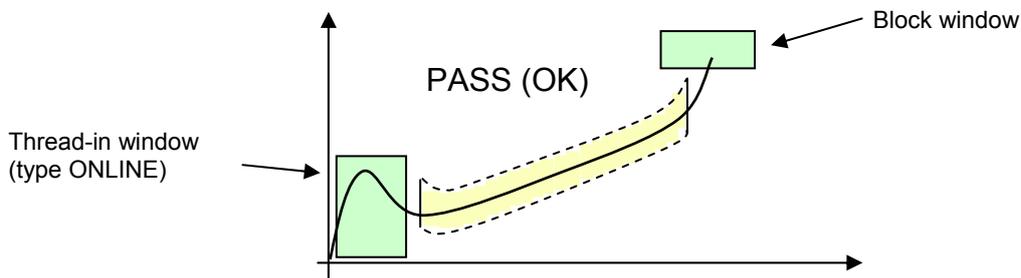
For configuration of the envelope a given quantity of sample parts must be taught in with their curve slopes. It can be decided individually if the curve of the last measured part is included also in the teach-in process. Another mode asks for confirmation for take-over of all parts after the teach-in process.

The envelope basically consists of a gap-less line of many narrow pass windows with determined pass direction (entry left, exit right). The height (Δ Force) of every partial window is relative to the scattering of the taught-in curves in the range of this window. Therefore, every single part of the envelope has an individual width in Y-direction depending on the scattering width of the curve array. This can be widened additionally using the numerical input of a tolerance percentage or by drawing with the arrow keys.



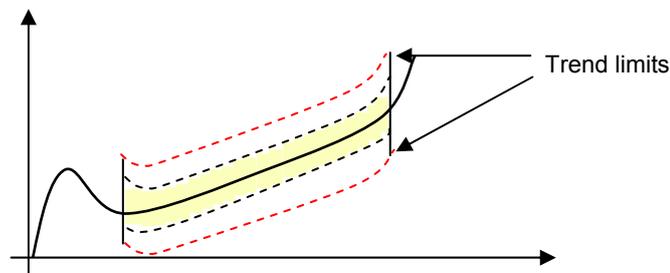
Combine window and envelope technique

In addition to the envelope function up to two windows can help to control the curve slope. In the following example an ONLINE-window controls the correct thread-in of the two parts that are to be joined. The Block window checks and sends the Block force and Block displacement.



Trend tracking

The envelope can be tracked to definable trend limits. These lie as a virtual second envelope on top of the actual envelope. After every press-fit in process a new envelope is calculated and averaged. The influence of one measurement on the shift of the envelope can be set in the additional parameter WEIGHTING.



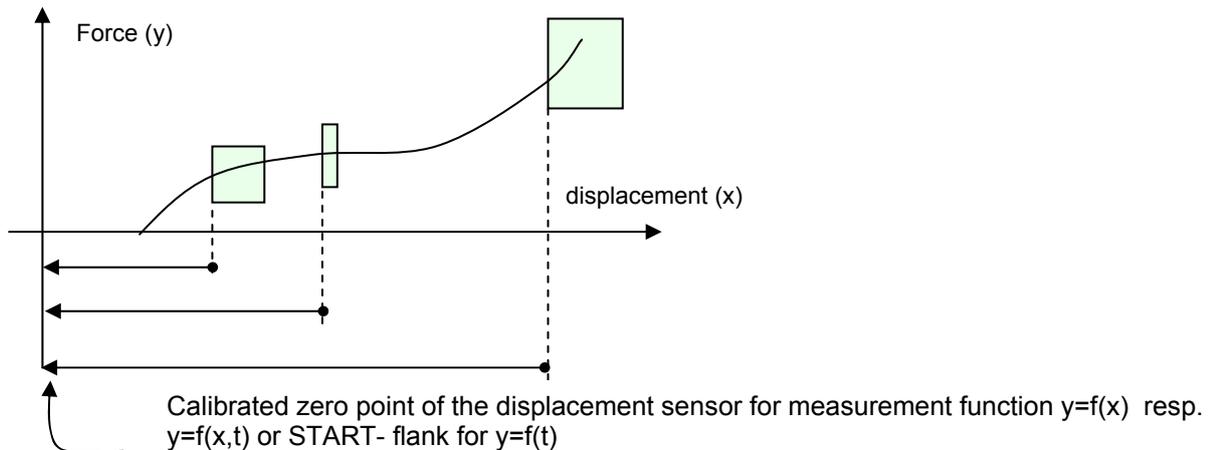
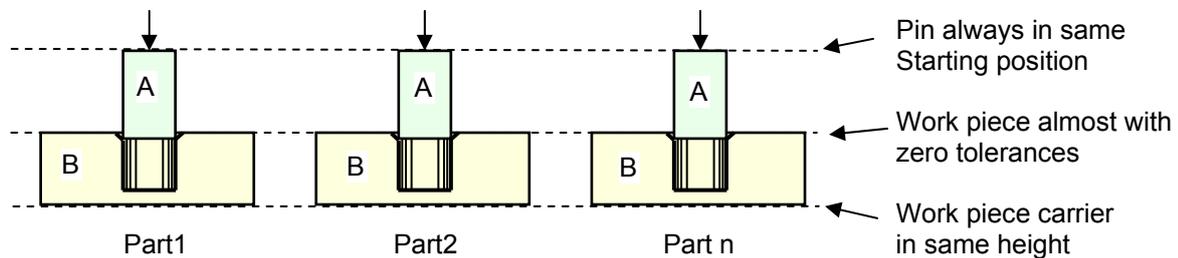
Reference points for the evaluation windows

In many cases the work pieces are not positionable 100% correctly for press fitting. The piece comes a little higher or lower under the press-fit station. This would result in a move of the force-displacement curve in direction of displacement. Although you have produced an OK-part the evaluation windows are not passed in the correct way and the part would be identified NOK. To avoid this the parameter REFERENCE was introduced. Here the user can choose according to his application to which displacement position the evaluation windows should relate to.

DIGIFORCE® 9310 offers four alternatives for the definition of the reference:

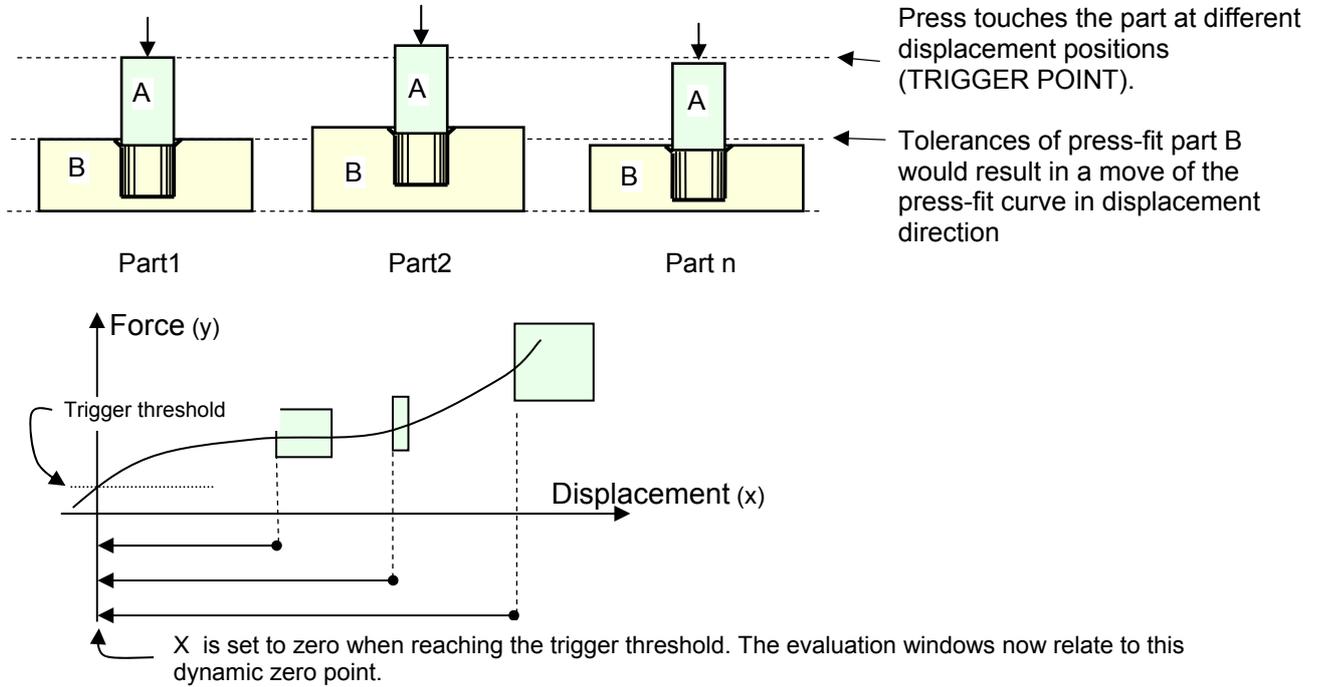
REFERENCE: ABSOLUTE

When it is secured that both press-fit parts can be positioned the same way repeatedly, i.e. the work piece holder delivers the work piece always in the same level, the press-fit parts (A+B) themselves have neglect-able tolerances in press-fit direction and the part A that is to be pressed in has the same starting position in relation to part B, you may choose REFERENCE=ABSOLUTE



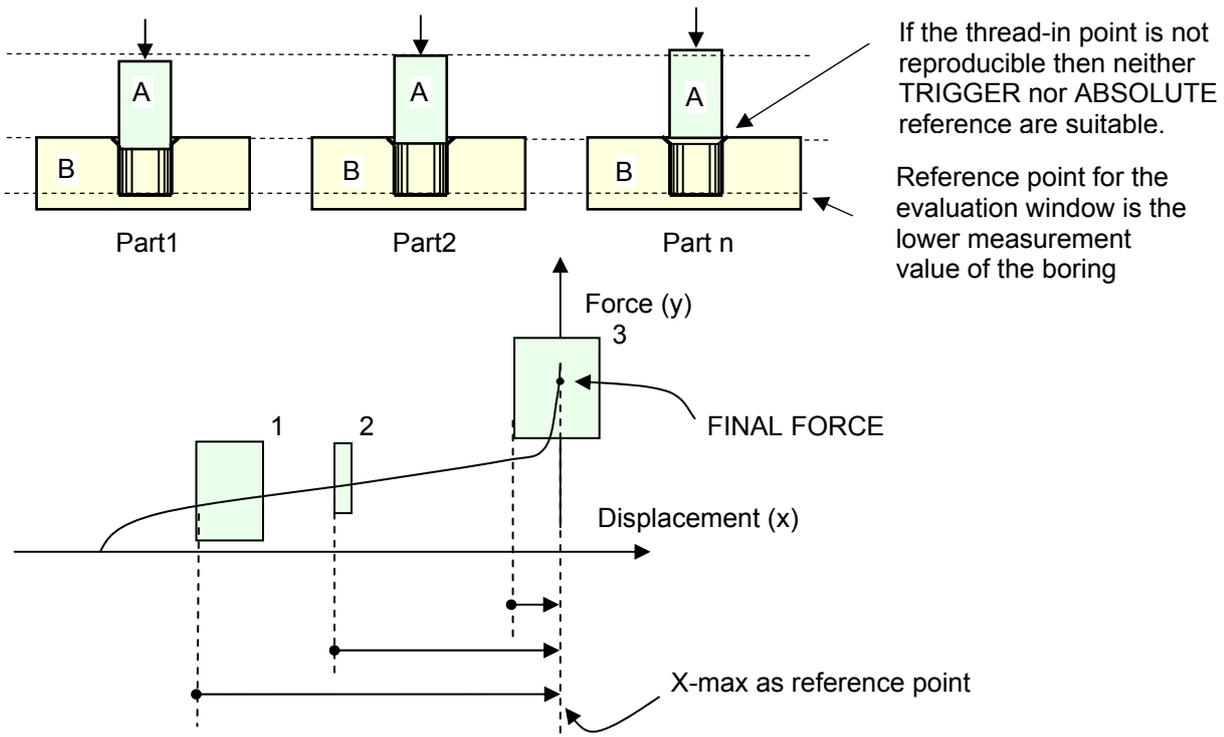
REFERENCE: TRIGGER

If the repeatedly precise work piece positioning of the press-fit parts is not guaranteed due to, for example, the shift of tolerances of one press-fit part (B) on the displacement, one should choose REFERENCE=TRIGGER. The measurement starts not before the press base touches the press-fitting part (A) at the so called trigger point. At the same time the displacement value (channel X) is set to zero. The evaluation windows now relate to this zero point. Without this the press-fit curve would move part-dependent in X-direction which might result in a NOK result for an OK part.



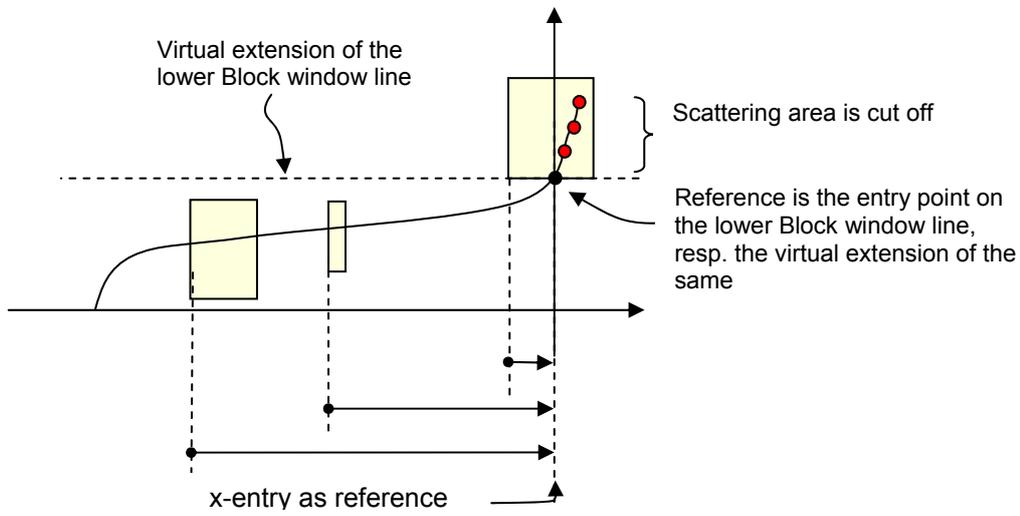
REFERENCE: FINAL FORCE

If neither the conditions for reference ABSOLUTE nor for reference TRIGGER Y are fulfilled (see above) another reference point has to be found. In many cases the depth of the boring in which the press-fit in part is pressed into is known. For REFERENCE = FINAL FORCE the final measurement value for displacement is used as this reference point for the evaluation windows.



REFERENCE: BLOCK WINDOW

If the end force of the press is not constant due to e.g. an inconstant air pressure in the system, it would not make sense to have the evaluation windows relate to a not reproducible final force. For this case the DIGIFORCE® offers the reference BLOCK WINDOW. Here all evaluation windows relate to the point of entry of the curve in the bottom block window line.



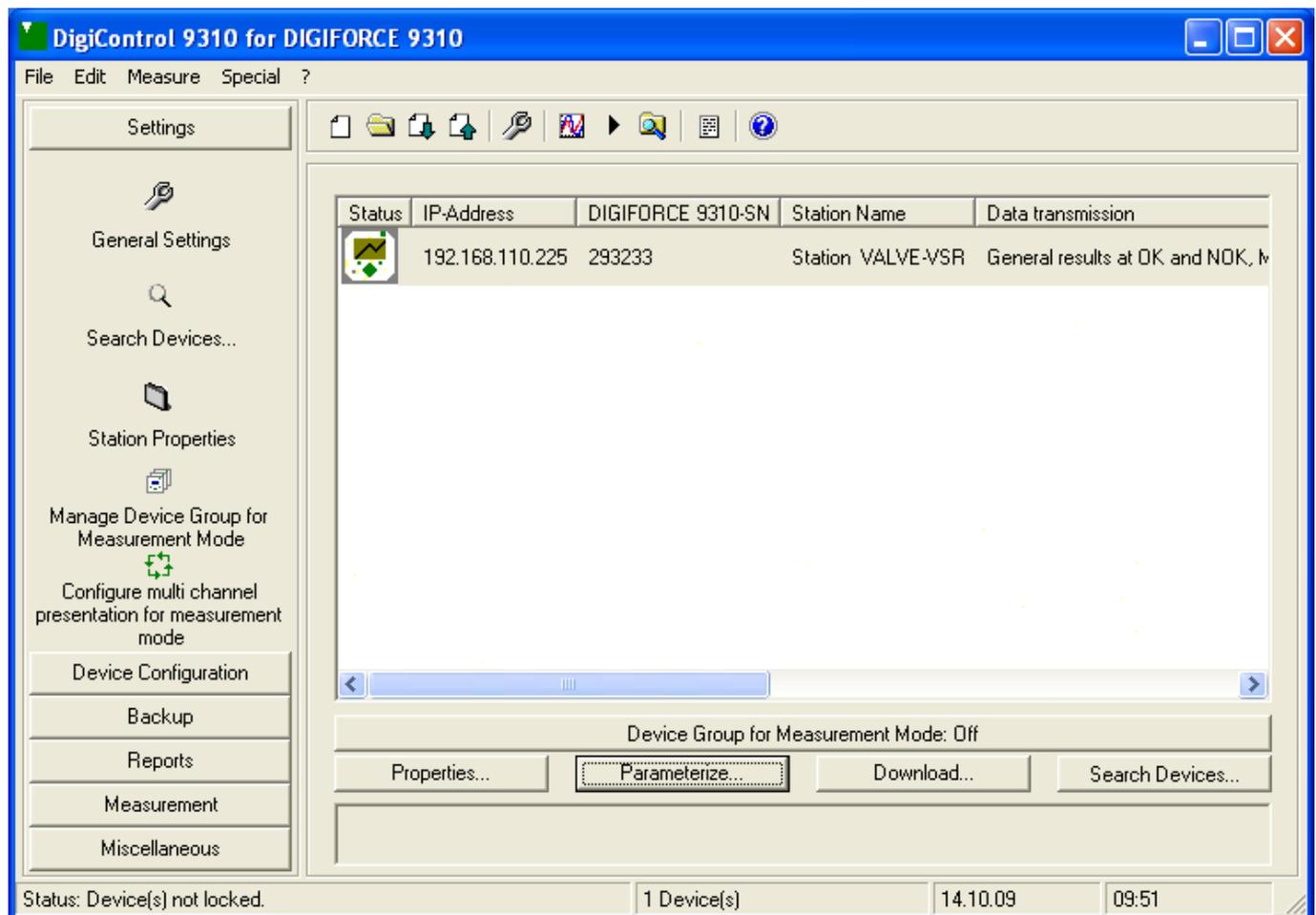
DIGIFORCE configuration with DigiControl 9310 software

General Settings

The DIGIFORCE 9310 control cabinet module (9310-V2xxx) can only be configured via an RS-232 or Ethernet interface. The DigiControl 9310 software 9310-P101, which is supplied with the DIGIFORCE 9310, can be used to perform a complete device configuration. It also includes a backup function for saving all the configuration settings. In laboratory operating mode, measurements can be recorded manually and the data printed out or saved in a log file.

Installation instructions and system requirements for the DigiControl 9310 software are held on the "DigiControl 9310" CDROM supplied with the equipment and in the software documentation held on this CDROM.

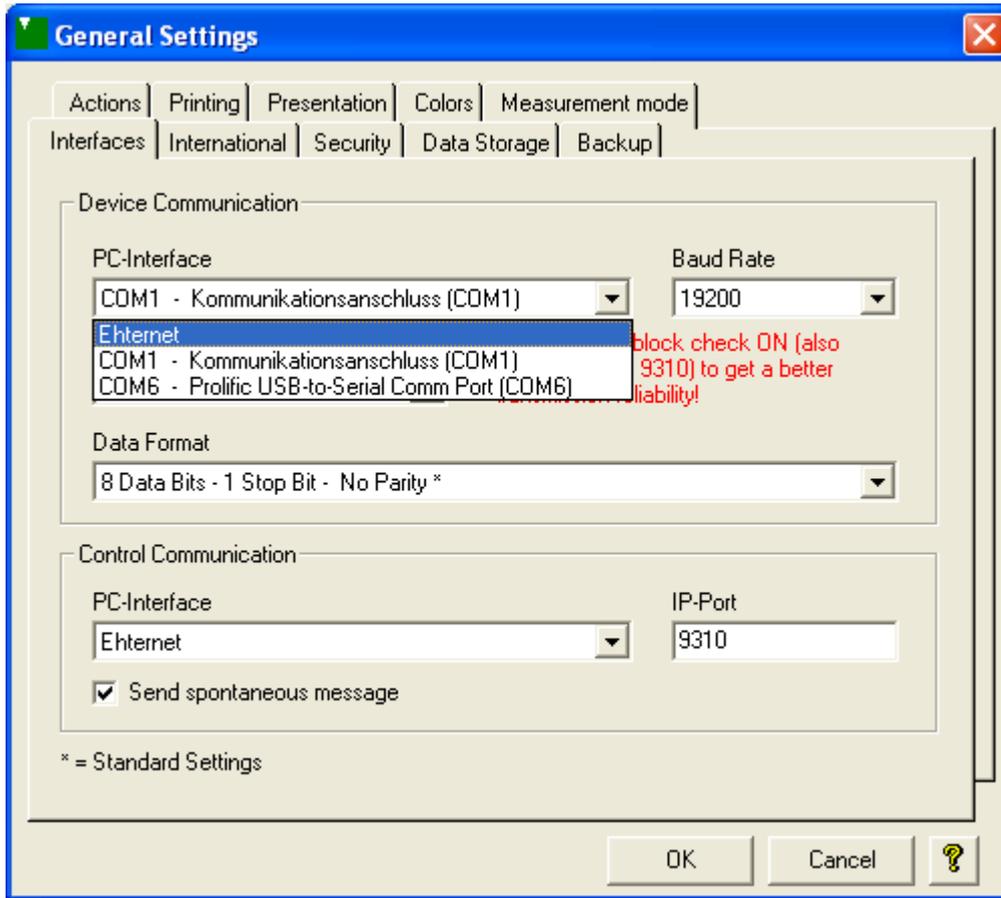
Main page of the DigiControl 9310 PC software (one DIGIFORCE 9310 device listed)



First the port (interface) must be selected under Settings - General Settings to enable communication between the DigiControl software and the DIGIFORCE 9310.

Configuring the DIGIFORCE 9310 Interface

Task menu: General Settings - Interfaces



PC-Interface

Select here the serial COM port or Ethernet interface plus IP port used on the PC for communication with DIGIFORCE devices. In some operating systems (Windows NT, Windows 2000...) the serial port must first be installed / configured in the system.

IP-Port (only if Ethernet selected under PC-Interface)

Select a valid UDP communications port, which must also be set in the DIGIFORCE device. The UDP protocol is used for communication. UDP communication on this port must not be blocked by a firewall. The default UDP port, which is factory-set in the DIGIFORCE and in the DigiControl 9310 software, is port 8364.

Block check (only if serial COM port selected under PC-Interface)

A block check is not used with the control cabinet module (9310-V2xxx) (OFF).

Baud rate (only if serial COM port selected under PC-Interface)

The baud rate is fixed at 19200 baud (19.2 kbaud) for the control cabinet module (9310-V2xxx).

Data format (only if serial COM port selected under PC-Interface)

The control cabinet module 9310-V2xxx has a fixed data format:
8 data bits, 1 stop bit, no parity

RS-232 interface

The serial RS-232 interface of the 9310 control cabinet module (9310-V2xxx) uses fixed interface parameters for communication. This interface is basically provided for initial configuration tasks such as configuring the Ethernet interface. For instance, the RS-232 interface can be used to assign an Ethernet IP address to the device before it is operated in a network. This avoids conflicts arising when first installing a device in a network.



The DIGIFORCE 9310 control cabinet module has fixed interface parameters for the serial RS-232 interface:

Baud rate 19200 baud
Block check OFF
Format 8 data bits, 1 stop bit, no parity

Configuring the Ethernet parameters via RS-232

The interface settings are configured in the DigiControl menu Settings - Properties of station

The screenshot shows a software window titled "Properties of 'Station VALVE-VSR' - (293233)". The "Communication" tab is selected. It contains several configuration sections:

- Serial:** Address: 0
- Ethernet:** IP-Address: 192 . 168 . 110 . 225; Subnet mask: 255 . 255 . 000 . 000; Gateway: 000 . 000 . 000 . 000; UDP-port: 8364; Firmware: V200604; Mac-Address: 00-40-9d-27-c5-bd
- Host IP Limitation:** Three checkboxes for IP Limitation 1, 2, and 3, each with a corresponding IP address field (192 . 168 . 110 . 224, 192 . 168 . 110 . 225, and 192 . 168 . 110 . 226).
- My PC System Information:** IP-Address: 192.168.110.100

Buttons for "OK", "Cancel", and a help icon (?) are at the bottom.

Serial - Adress

In the DIGIFORCE 9310-V2xxx (cabinet module) devices the serial address 0 is preset fix and could not be changed.

With all other device versions the serial address could be changed by the device panel. DigiControl simply shows the DIGIFORCE 9310 serial address and could not be changed directly over it.

Ethernet

If you want to communicate via serial interface with the DIGIFORCE 9310 you can change all parameter of this rubric Ethernet except for the Mac-Address or Firmware and transmit the parameter into device by clicking OK. Maybe the DIGIFORCE performs an ethernet reboot after transmitting the settings which could take some time before the device is reachable via Ethernet interface

If you communicate directly by Ethernet interface with the DIGIFORCE please use the menu "Device Search -> Ethernet Configuration" to change this parameter!



Please consider that the DIGIFORCE could not communicate via ethernet interface while the serial RS232 plug is connected!

Host IP Limitation

IP Limitation 1
192 . 168 . 110 . 224

IP Limitation 2
192 . 168 . 110 . 225

IP Limitation 3
192 . 168 . 110 . 226

Host-IP Limitation

If you want to protect DIGIFORCE devices against unauthorized access you can enter up to 3 chosen Host-IP addresses which activates the limitation. In this case only PC's with the entered IP-Addresses are authorized to access the DIGIFORCE devices.



Note: If the Host-IP Limitation is active the PC's should not be connected via DHCP to the network. They should be assigned a static IP address otherwise it changes from time to time and the communication is not possible by this way!

My PC System Information

IP-Address: 192.168.110.100

My PC System Information

IP-Adress

In this field you see the IP-Address of the own PC system. This is helpful if you want to check or activate the Host-IP-Limitation.

General information on the Ethernet parameters

Ethernet	
1	IP-Address: 192 . 168 . 110 . 225
3	Subnet mask: 255 . 255 . 000 . 000
4	Gateway: 000 . 000 . 000 . 000
5	UDP-port: 8364
	Firmware: V200604
2	Mac-Address: 00-40-9d-27-c5-bd

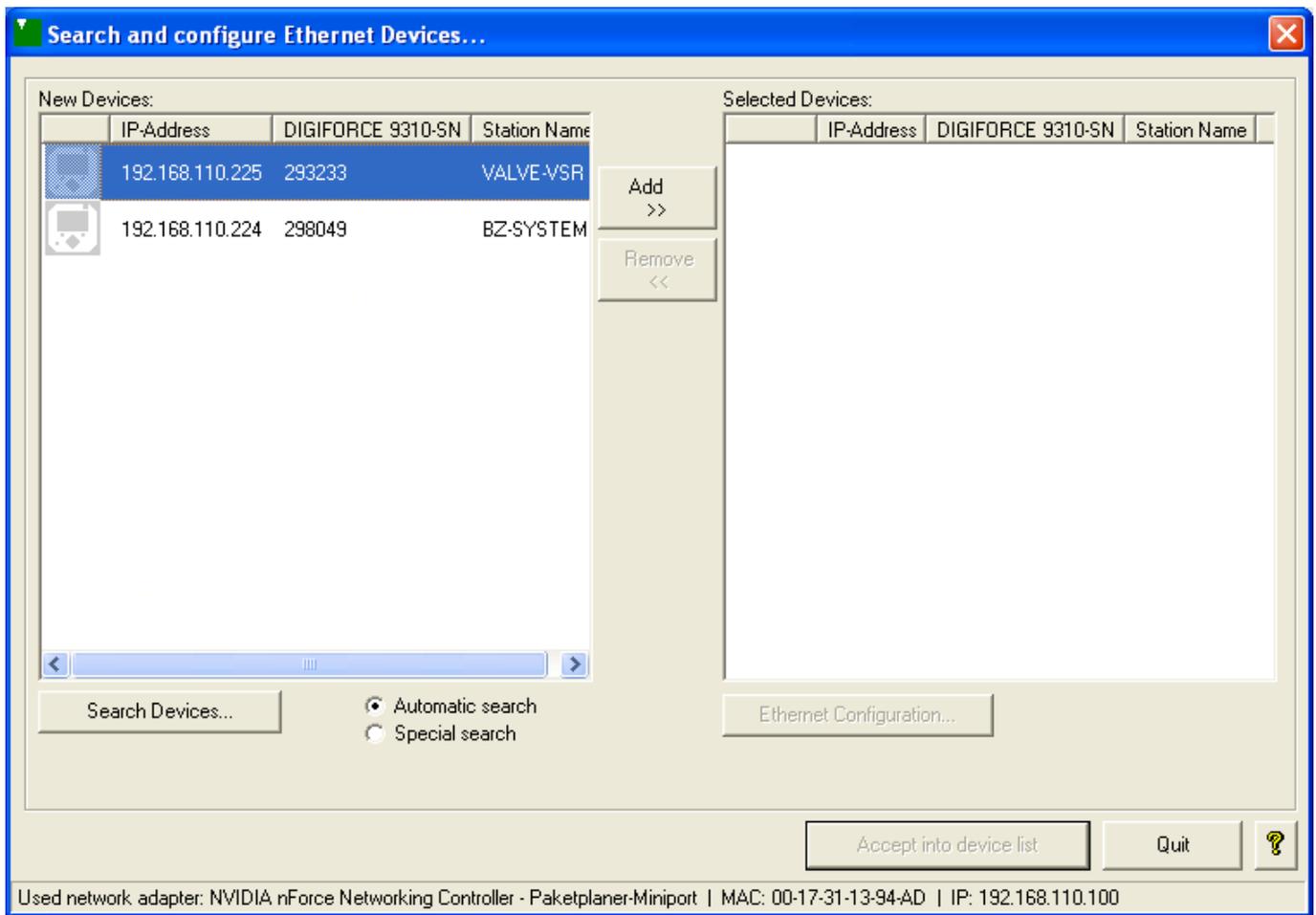
1	IP address	For devices to be able to communicate with each other in an IP network, they must be identified (addressed) by a unique IP address. An IPv4 address is used here. This is written in dot-decimal notation, where the 4 octets of the address are expressed in decimal separated by periods. The decimal value of each octet lies between 0 and 255 inclusive, and between 1 and 255 in the last octet. To ensure reliable operation of the network, the IP address must always be assigned and managed by the network administrator.
2	MAC address	The MAC address is a globally unique hardware address, which is given to all manufactured network devices and is used to identify the device in the network.
	Subnet	A subnet refers to a specific section of the IP address space. A subnet groups together a contiguous area of IP addresses. Subnets are configured by network administrators to produce a hierarchical routing system and to separate the subnets from connected networks in the addressing.
3	Subnet mask	A subnet is created by dividing all possible IP addresses into sub-networks. The subnet mask is therefore defined so as to identify whether an IP address lies in the same sub-network (IP address space). Example: if the IP address is 192.168.0.1 and the subnet mask is 255.255.0.0, then the IP addresses from 192.168.0.1 to 192.168.255.255 belong to this subnet.
4	Gateway	Gateways are interfaces to non-local/private subnets mapped by an IP address. Gateways are also protocol translators that enable networks with different protocols to be interconnected.
	UDP protocol	The User Datagram Protocol is a connectionless application protocol and is based on the Internet Protocol (IP). The shorter header used in the UDP protocol makes UDP much faster than TCP, but means it does not include error detection or correction. Error detection when communicating with DIGIFORCE devices is covered by the device protocol.
5	UDP port	The UDP port is essentially the channel number over which data traffic/communication takes places between two hosts. Select an unused UDP port where possible. Well-known UDP ports include e.g. port 20 for FTP and port 21 for FTP data. Please note: If a firewall is used, the UDP protocol must be enabled on this port. On a PC, only one instance of an active UDP connection (socket) is allowed on the same port number.

Continued: general information on the Ethernet parameters

DHCP	<p>DHCP (Dynamic Host Configuration Protocol) is a protocol used for assigning IP addresses and host parameters. IP addresses can be assigned either statically or dynamically. A statically assigned IP address is an address that is permanently linked to the hardware address (MAC address) of the client. In this case, the client is always assigned the same IP address by the DHCP server. In dynamic address assignment, any IP address from a pre-specified address range is assigned to the client, if applicable using a lease time (period of validity).</p> <p>Please note:</p> <p>The DIGIFORCE devices do not support DHCP, so you should not use IP addresses from the DHCP address range. Furthermore, the PC on which DigiControl is being used should always have the same IP address.</p>
Network cable	<p>Category 5e network cables or better should be used to connect DIGIFORCE devices within a network.</p>
Hub	<p>A hub is a node designed to connect together network segments or even other hubs via Ethernet ports. A hub broadcasts the data from one host to all the other hosts. A hub used in a network is normally wired in a star topology, although in terms of software the hub corresponds to a bus topology. This means that the maximum available bandwidth of a network is not increased by a hub compared with a bus, because collisions can arise from simultaneously transmitting hosts. The advantage of a hub is that it improves system stability. This is because a fault in the connection to one host does not cripple the entire network but only prevents access to the host concerned.</p>
Switch	<p>A switch is similar to the hub described above, but has the advantage that data transport collisions are avoided thanks to its intelligent message routing system, which uses an internally managed address table. There are various switching methods available that can be configured for use in a switch. A switch is slower than a hub, however, because each network packet needs to be read in full to check the address. This loss in speed is usually more than compensated for by the prevention of collisions.</p>
Firewall	<p>A firewall partitions off a network (e.g. LAN, intranet...) from another network (e.g. World Wide Web, remote access ...). The purpose of a firewall is to prevent unauthorized access from outside and to protect data.</p> <p>There are both software and hardware firewalls, often also in combination with gateways. In the firewall, the UDP port used for communication with the DIGIFORCE device must be enabled.</p>

Device search and Ethernet configuration

If Ethernet has been selected as the communications port in the DigiControl 9310 software under General settings – Interfaces, the following dialog opens when the Search Devices option is used:



From this window you can search for DIGIFORCE devices that are accessible in your network via the Ethernet IP interface. You can then add these DIGIFORCE devices to the device list for future communication.

Note that you can only "work" with DIGIFORCE devices that are shown in the main device list.

If the DIGIFORCE devices are new (factory settings) and you have not yet changed the Ethernet communication settings, it is essential that after the device search you open the Ethernet configuration in order to make the relevant changes.

When you open the Ethernet device search, DIGIFORCE devices held in the main device list are automatically placed in the right-hand list of the Search Devices window. These devices are not removed from this list after a search, but merely updated, for instance, if the IP address has changed.

At this stage, there is no check as to whether these devices are currently actually available in the network; this check does not take place until they are transferred to the main device list, or when actual communication takes place e.g. when setting parameters or making measurements.

Search Devices

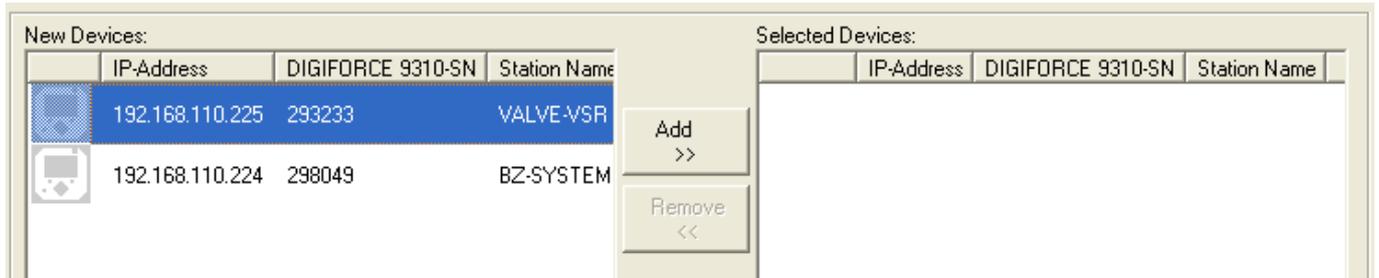
Press the "Search Devices" button to search for new DIGIFORCE devices in the network. Use the Automatic search option to find (by broadcast) all new devices located in the same subnet as the PC. If the device is located in a different subnet and the Ethernet configuration has already been carried out, please use the Special search option and enter the IP address of the DIGIFORCE device in order to address just this device specifically.

Note:

Whenever a device search is carried out, the left-hand list is always cleared, but the entries in the right-hand list are retained.

New devices must be put into operation in the same subnet using the automatic search.

Working with the DIGIFORCE device lists (new devices and selected devices)



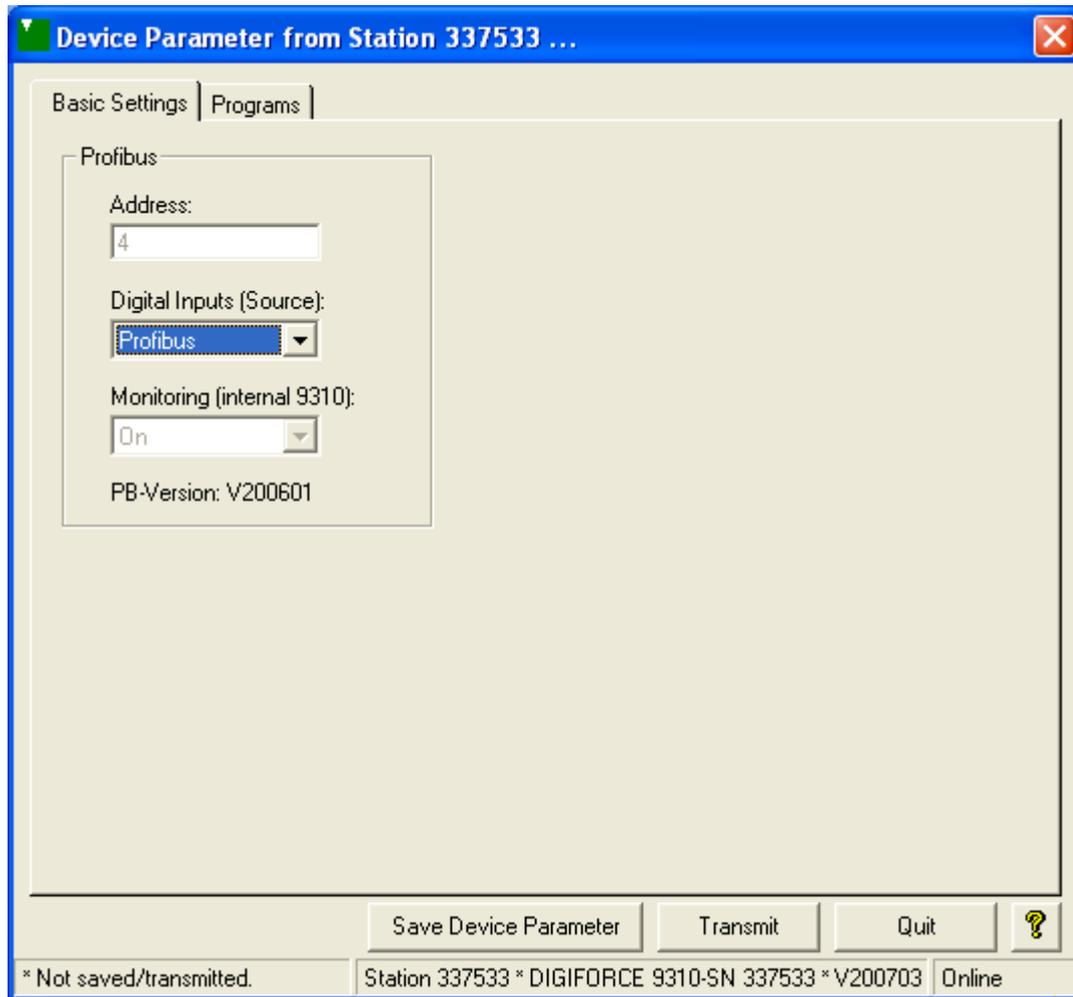
Click on the Add >> button to transfer newly found DIGIFORCE devices from the left-hand list into the right-hand list, or Remove << to remove devices from the right-hand list.

Click on the "Accept into device list" button to transfer the DIGIFORCE devices in the right-hand list to the DigiControl main device list. Use "Quit" to exit the device search again without changing the main device list.

Profibus configuration

On the control cabinet module, the Profibus address can only be set using the mechanical rotary switch (see "Front view with connector ports" on page 56)

The basic settings for Profibus communication can be made via the DigiControl menu "Parameterize device (online)" - Basic settings.



Profibus

Displays the Profibus address setting. This setting can only be made directly on the device using the rotary switch. The address can be set in the range 1 to 125.

Digital Inputs (Source)

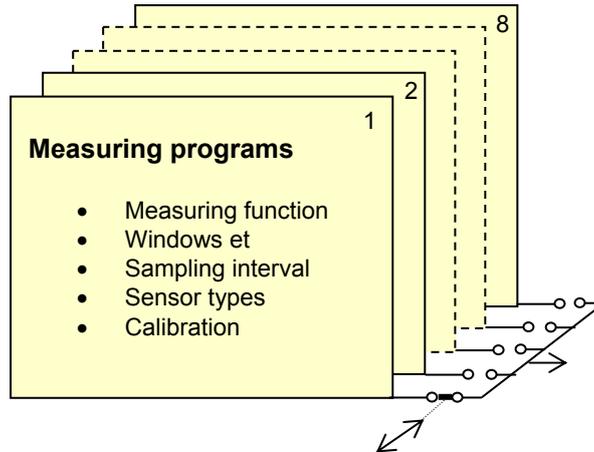
Selection of device control source. Choice of PLC I/Os or Profibus.

Monitoring (internal 9310)

If monitoring is enabled (ON), the Profibus communications processor cyclically polls the measurement processor. In the event of a fault, a status message is sent to the Profibus host. You can find further information on this in the Profibus manual.

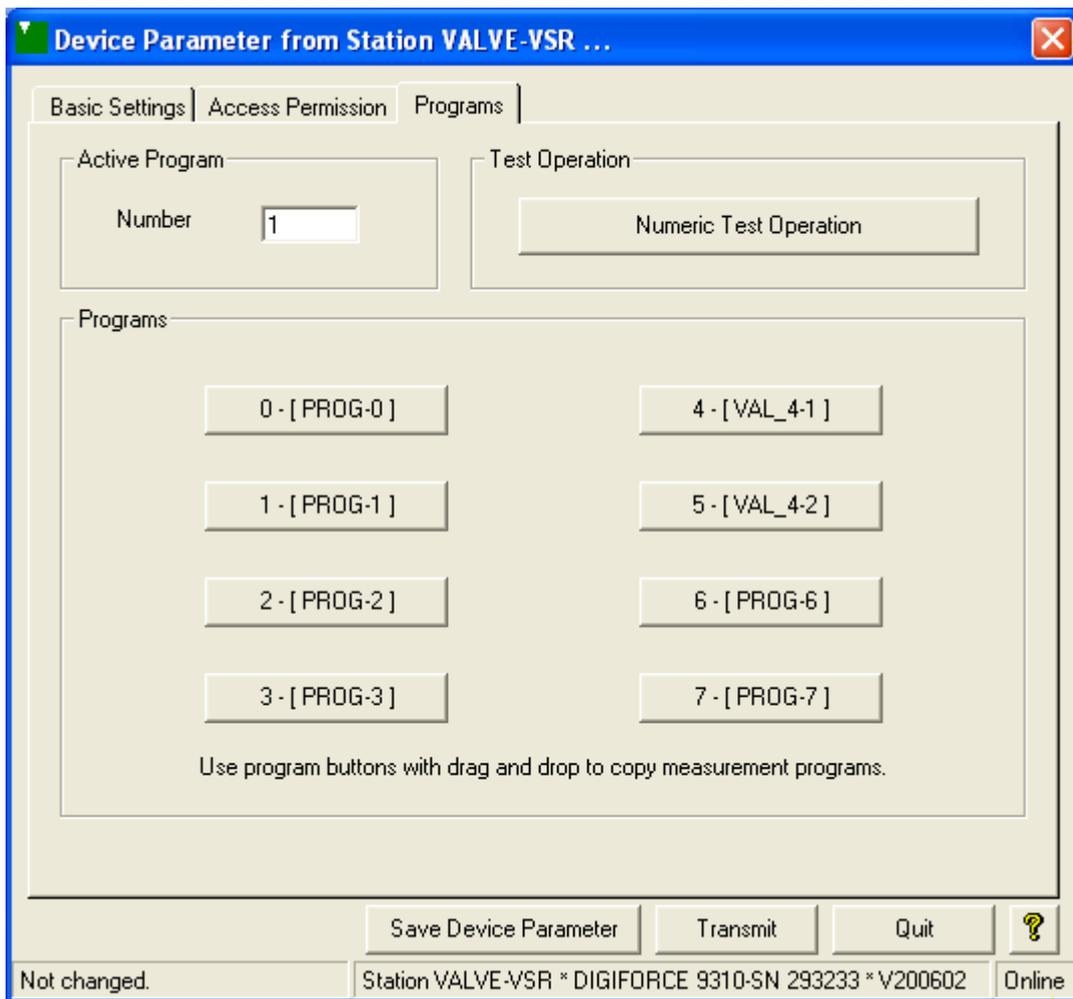
Creating measurement programs

Up to 8 measurement programs can be saved in the DIGIFORCE unit. These programs can be selected via the PLC, RS interface or Profibus. Parts-specific test parameters can be assigned to each measurement program for instance. Then a change of part simply involves switching to another measurement program.



Program management in the DigiControl software

Select the program from the DigiControl menu Device Configuration - Parameterize device (online) - Programs



Active program

The value shown when this dialog window is opened indicates the measurement program that is currently active in the DIGIFORCE. If you wish to activate a different measurement program, enter the measurement-program number (0 – 7) you require in this field.

Programs

To edit a measurement program, select the corresponding program-number button.

If you have connected a DIGIFORCE and are working with the device online, the DigiControl 9310 reads the current program data for the selected program number and displays it in the Program dialog window.

Copying programs

If you wish to copy measurement programs, left-click on the program button of the program you wish to copy. Then, keeping the left mouse button pressed, drag the mouse cursor (copy object) onto the program button where you wish to copy the program to. This function is only possible when parameterizing the device online.

Test Operation

In Numeric Test Operation, the live measured value on the X and Y channel is displayed online, the channels can be tared, the PLC inputs are displayed and the PLC outputs can be set manually.

Make sure that the PLC will not respond to the test signals during Numeric Test Operation.

Save Device Parameter

The device parameters currently being edited can be saved in a backup file. If the file already exists, you have the option to add these device parameters to the file ("Supplement") or else to "Replace" the file completely (the file is then deleted and re-created).

Transmit

All the data in the entire Parameterization dialog window is written to the device (after a confirmation prompt) and the window is closed.

Quit

The dialog window is closed without any change to the device. If you wish to save the data first, click on Save Device Parameter or Transmit.

Please note: as soon as you change any parameters in the Parameterization dialog window, the status changes to Not saved/transmitted. The changes are lost as soon as you press the Quit button (after a warning is displayed, which you can disable and, if required, re-enable in the General Settings - Presentation tab under Message texts).

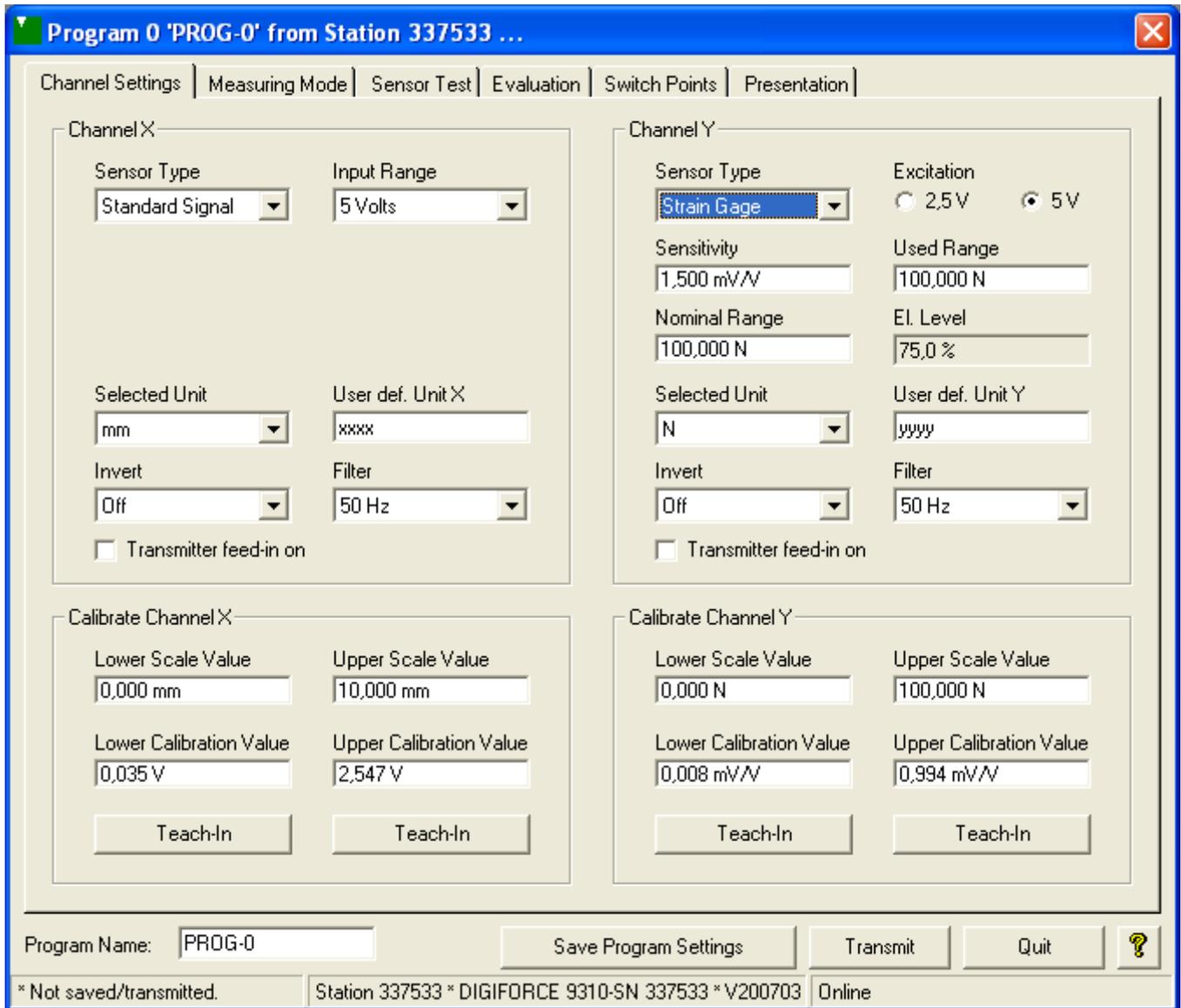
The changes that you make are only transferred to the device if you click on the Transmit button in the Parameterization window, and only saved if you click on Save Device Parameter.

Please note that the Save and Transmit functions in the Parameterization window only save or transmit the data in the Parameterization window (but not the program device parameters of Program 0 to 7).

Configuring the X/Y measurement channels

The program settings can be configured using a choice of methods:

- Create new device parameters (offline)
- Set parameters in a file (offline); a backup file is required for this
- Import parameters from device (online)



Sensor Type, Channel X

Selection of sensor type used (standard signal or potentiometer) for Channel X.

Input Range, Channel X

Selection of input range for a standard-signal type sensor (5 V or 10 V) for Channel X.

Sensor Type, Channel Y

Selection of sensor type used (5 V standard signal or strain gage/piezoelectric sensor) for Channel Y.

Input Range, Channel Y

For a piezoelectric sensor, you can set the input range here for Channel Y (1 nC – 400 nC).

El. Level

For the piezoelectric sensor, this parameter is calculated from the upper calibration value and the input range, and is used merely as a "pocket calculator" function.

This value may differ slightly from the electrical output level at the device because of rounding differences.

Excitation, Channel Y

For a strain gage, you must set here the sensor excitation for Channel Y (2.5 V or 5 V).

Selected Unit, X/Y

You have the option to choose the default units or select you own units for each channel independently. If you enter your own units in the User def. Unit X/Y field, you still need to enable/select these units in the Selected Unit field. This will be the first option in the list.

User def. Unit X/Y

Field for entering user-defined units for each channel independently. These units can then be selected in the Selected Unit field for the X/Y channel.

Sensitivity, Channel Y

For a strain gage, you need to enter the rated sensitivity of the sensor here. Please use the value from the sensor data sheet.

Nominal Range, Channel Y

For a strain gage, you can enter the upper scale value for the sensor here. Please use the value from the sensor data sheet. Please note that the value entered for the Nominal Range must be greater than or equal to the Used Range.

Used Range, Channel Y

For a strain gage, you can enter the working range of the sensor here. This is the range in which you will actually use the sensor. Please note, however, that the Nominal Range must be greater than or equal to the Used Range. By setting the Used Range to be narrower than the Nominal Range, it is possible to optimize the electrical output level of the analog measuring chain in the 9310 and hence improve the resolution.

Invert, Channel X/Y

The DIGIFORCE can only analyze positive values on the X and Y channels. In certain applications, either channel X or channel Y, or even both channels, may supply negative values. This Invert option is intended just for these cases. It should be handled with extreme caution!

Enabling the Invert option will invert the measured values from the channel concerned.

Transmitter feed-in, Channel X/Y

If this transmitter supply option is enabled, the DC supply of the control cabinet module (protected by an extra fuse) is switched across the connecting sockets of the sensor channels. The transmitter supply can be enabled independently for both channels X/Y.

Filter, Channel X/Y

Definition of the software filter used in the DIGIFORCE. The filter can be disabled, or selected from a list of values between 5 Hz and 400 Hz. The filter can be set independently for each channel. The filters for the sensor channels are factory-set to 50 Hz.



Experiment with different filter factors. Watch the immediate effect on the curve shape. Be aware that certain filter settings could distort the dynamic measurement curve, and that steep changes may appear less steep than in reality.

Lower/Upper Scale Value, Channel X/Y

Specify the lower and upper scale value for the X and Y channel, related to the sensor used.

Please note that the lower scale value must always be smaller than the upper scale value.

Please note: the lower calibration value is the output value of the sensor at the lower scale value – the upper calibration value is correspondingly the output value of the sensor at the upper scale value.

Lower / Upper Calibration Value, Channel X/Y

Enter the calibration value, if it is known, directly in the numeric fields. If you want to perform a teach-in online directly on the device, then click on the Teach-In button below the numeric field.

Please note that the lower calibration value must always be smaller than the upper calibration value

Please note: the lower calibration value is the output value of the sensor at the lower scale value – the upper calibration value is correspondingly the output value of the sensor at the upper scale value.

Teach-In, X/Y

If you are parameterizing a DIGIFORCE online, you can perform a separate teach-in in each case for the lower value and upper value on channel X and the lower value and upper value on channel Y. The teach-in values are displayed in the numeric fields when a teach-in is run. These values are only transferred to the device by pressing the Transmit button, or saved in a backup file by pressing the Save Program Settings button.

Only for Piezo version of the DIGIFORCE: for piezoelectric devices, a teach-in for the lower calibration value must be performed first for channel Y. This briefly discharges the DIGIFORCE charge amplifier and sensor.

The teach-in for the upper calibration value can only be performed after the teach-in for the lower value.

Save Program Settings

The parameters of the measurement program currently being edited (the program number is displayed in the title bar) can be saved in a backup file. If the file already exists, you have the option to add the data from this measurement program to the file ("Supplement") or else to "Replace" the file completely (the file is then deleted and replaced by the parameters in this measurement program):

Transmit

The data in the measurement program currently being edited (the program number is displayed in the title bar) is written to the device (after a confirmation prompt) and the window is closed.

Quit

The dialog window is closed without any change to the device. If you wish to save the data first, click on Save Device Parameter or Transmit.

Please note:

As soon as you change any parameters in one of the Parameterization dialog windows (Channel Settings, Measuring Mode, Sensor Test, Evaluation, Switch Points or Presentation), the status changes to Not saved/transmitted.

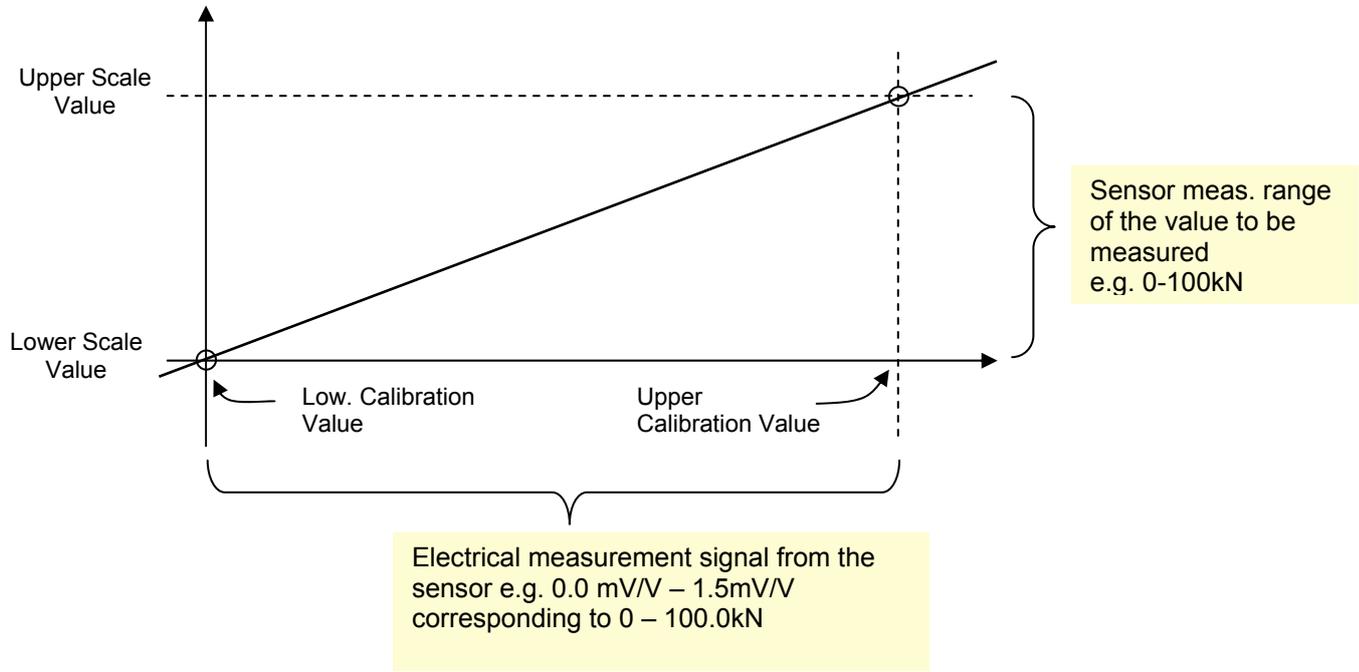
The changes are lost as soon as you press the Quit button (after a warning is displayed, which you can disable and, if required, re-enable in the General Settings - Presentation tab under Message texts).

The changes that you make relating to the program (0-7) currently being edited are only transferred to the device if you click on the Transmit button in the Program window, and only saved if you click on Save Program Settings.

Please note that the Save and Transmit functions in the Program window only save or transmit the data in the current program (0-7) (irrespective of the Parameterization window).

General remarks on the calibration

In the following text the relation between the electrical measurement signal of the connected strain gage sensor (LOWER CALIBRATION VALUE, UPPER CALIBRATION VALUE) and the measurement value to be displayed (LOWER SCALE VALUE, UPPER SCALE VALUE) is determined. It is, in fact, a simple two-point calibration. However, you need to configure the measurement channel hardware.

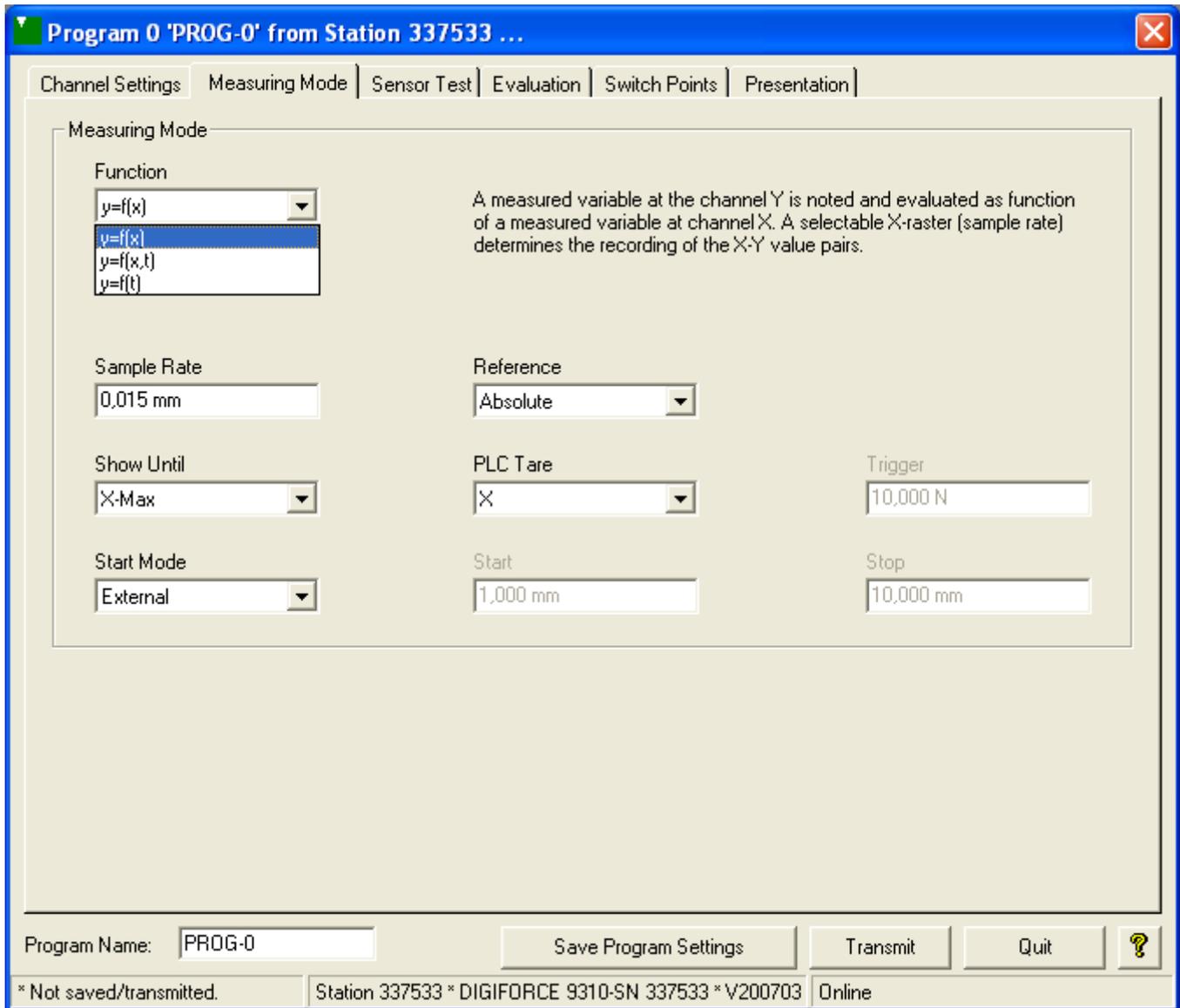


Following relations are valid: LOWER SCALE VALUE ↔ LOWER CALIBRATION VALUE
 UPPER SCALE VALUE ↔ UPPER CALIBRATION VALUE

Configuring the measuring mode

The DIGIFORCE 9310 supports three different measuring modes (see "Measuring Method" section):

$Y=f(X) \leftrightarrow Y=f(X,t) \leftrightarrow Y=f(t)$



Function

Select from one of the listed functions. Note that certain parameters cannot be set for particular functions and are therefore disabled or reset depending on the selection.

Sample Rate

The sample rate (sample interval) can have a value between 0.000 and 1000.0 for the function $y=f(x)$. If $y=f(t)$ or $y=f(x,t)$ is selected, however, then the value must be set between 0.2 and 500.0. Any value set outside this range will therefore be reset when switching to this function.

Reference

You can select between Absolute, Trigger, Final force and Block window. Absolute means recording the raw, unadulterated measurements from the device. Trigger (Y-trigger) means that X is tared (set to "0") when a preset Y-value is reached. Final force means that X is tared at the position of the last displayed measurement point. Block window means that X is tared at the position where the Y-value first exceeds the Y-min value of the block window (may also be outside the block window area). The choice of reference also affects other parameters in the program. For instance the trigger value can only be set if Trigger has actually been selected as the reference.

Trigger

The trigger value can only be set when the Trigger reference is selected. It has no effect for other references.



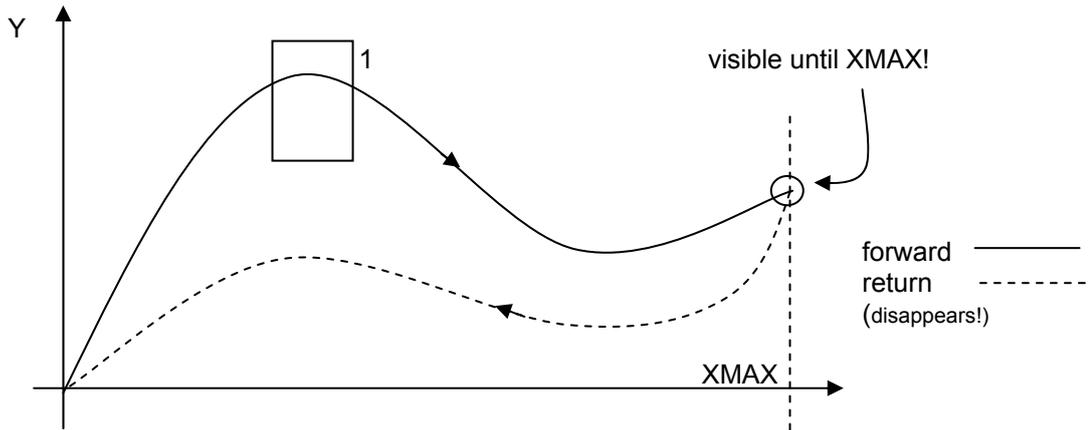
Important: during a measurement, the START condition must already have been met when the TRIGGER POINT is reached (see Start mode). Otherwise the measurement curve will not be recorded.

Show the measurement curve Until

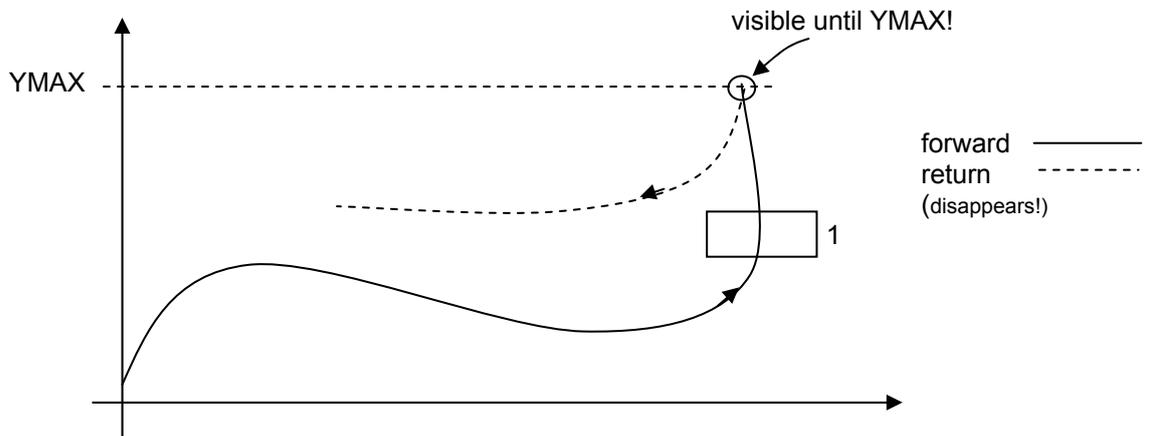
Here the user can select if the measurement curve shall be displayed up to Xmax or Ymax.

Pressing the <↓> key will take you to SHOW UNTIL:

Show Until → **XMAX (selected when XMAX is significant)**



Show Until → **YMAX (selected when YMAX is significant)**



PLC Tare

Specify here the tare function for the PLC interface. You can choose from one of the listed options.

Start Mode

Choice of External or Internal. For an Internal start mode, the start and stop values must be defined.

START refers to the general readiness of the DIGIFORCE to record measurements. It does not necessarily mean that when the START condition is met, recording of the measurement curve will begin straight away. For instance, if the TRIGGER reference is selected, recording is delayed until the TRIGGER point is reached.

Start

Enter a numerical value here at which measuring is meant to begin. Only possible for an internal start.

Stop

Enter a numerical value here at which measuring is meant to stop. Only possible for an internal start. If this value is not reached, the measurement is stopped when the value drops below the start value. If the stop condition cannot be definitely defined, set the value higher that can possibly be reached; the measurement then continues until the measurement value falls below the start condition again (or the max. number of measurements is reached).

Save Program Settings

The parameters of the measurement program currently being edited (the program number is displayed in the title bar) can be saved in a backup file. If the file already exists, you have the option to add the data from this measurement program to the file ("Supplement") or else to "Replace" the file completely (the file is then deleted and replaced by the parameters in this measurement program):

Transmit

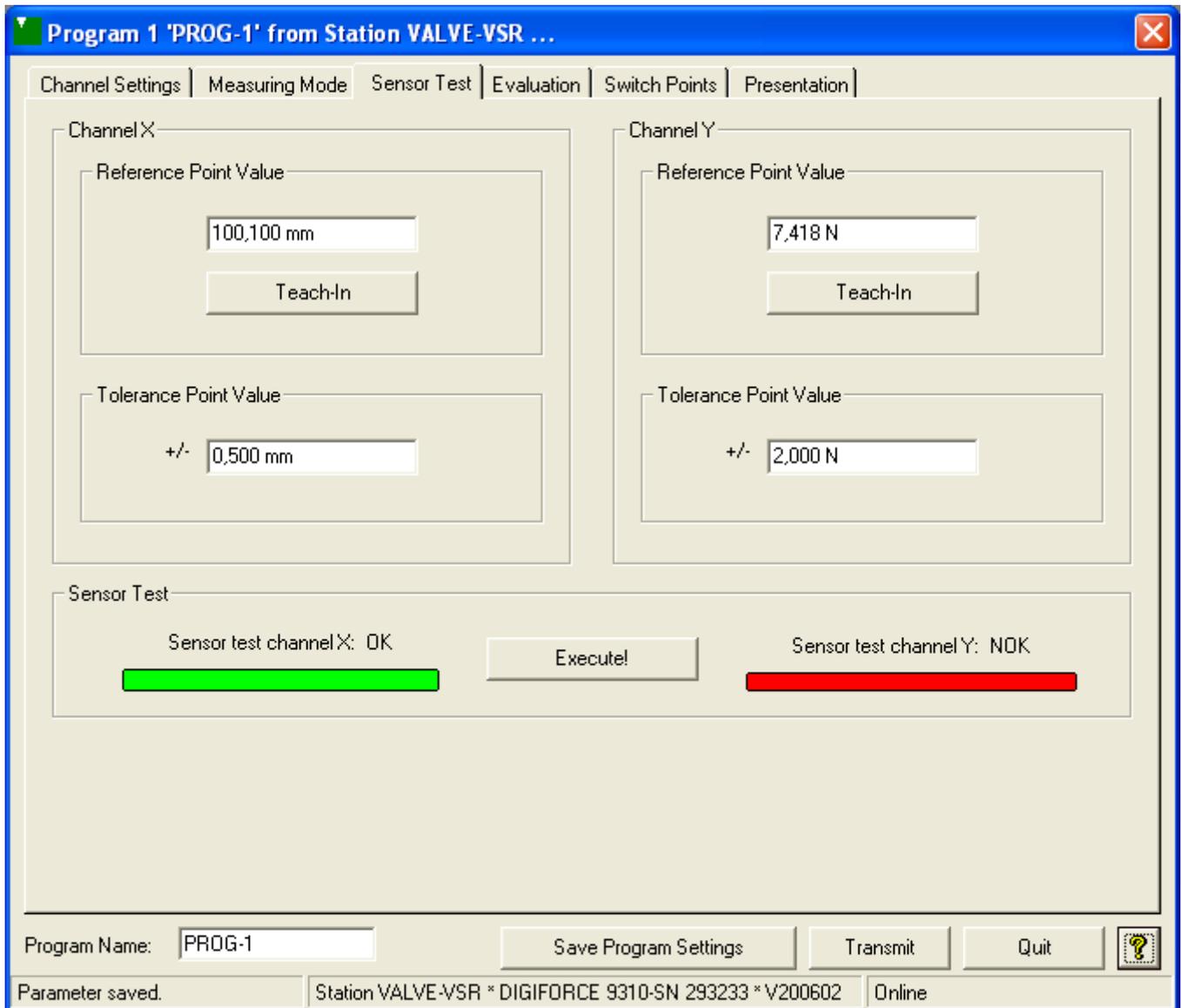
The data in the measurement program currently being edited (the program number is displayed in the title bar) is written to the device (after a confirmation prompt) and the window is closed.

Quit

The dialog window is closed without any change to the device. If you wish to save the data first, click on Save Device Parameter or Transmit.

SENSOR TEST

Regular checking of sensors plays a crucial role in the test reliability of a quality control system. In the DIGIFORCE unit, this check is done by applying known physical quantities to the sensors and evaluating the electrical signals they produce. To obtain the teach-in values for these checks, the feed unit moves into a repeatable position e.g. the top end stop on the press. In this position, the values measured on both channels are recorded and given tolerance ranges. At certain intervals, the PLC sends a control signal (SENSOR-TEST) to run a sensor check at precisely this position. If a sensor lies outside the tolerance ranges, DIGIFORCE sends a warning signal to the PLC (IO-S-TEST = 0). This practically eliminates any erroneous measurements from faulty or drifting sensors.



Reference Point Value

Enter here the reference points (Channel X and Y) e.g. at a fixed press position. This might be the top end stop on the press, for instance.

Teach-In

Online teach-in of the reference point value using the DIGIFORCE device, performed separately for Channel X and Y.

Please note: the value is measured directly in the DIGIFORCE. The previous value is still retained in the DIGIFORCE. Only after pressing the Transmit button does the new teach-in value actually take effect in the device.

Tolerance Point Value

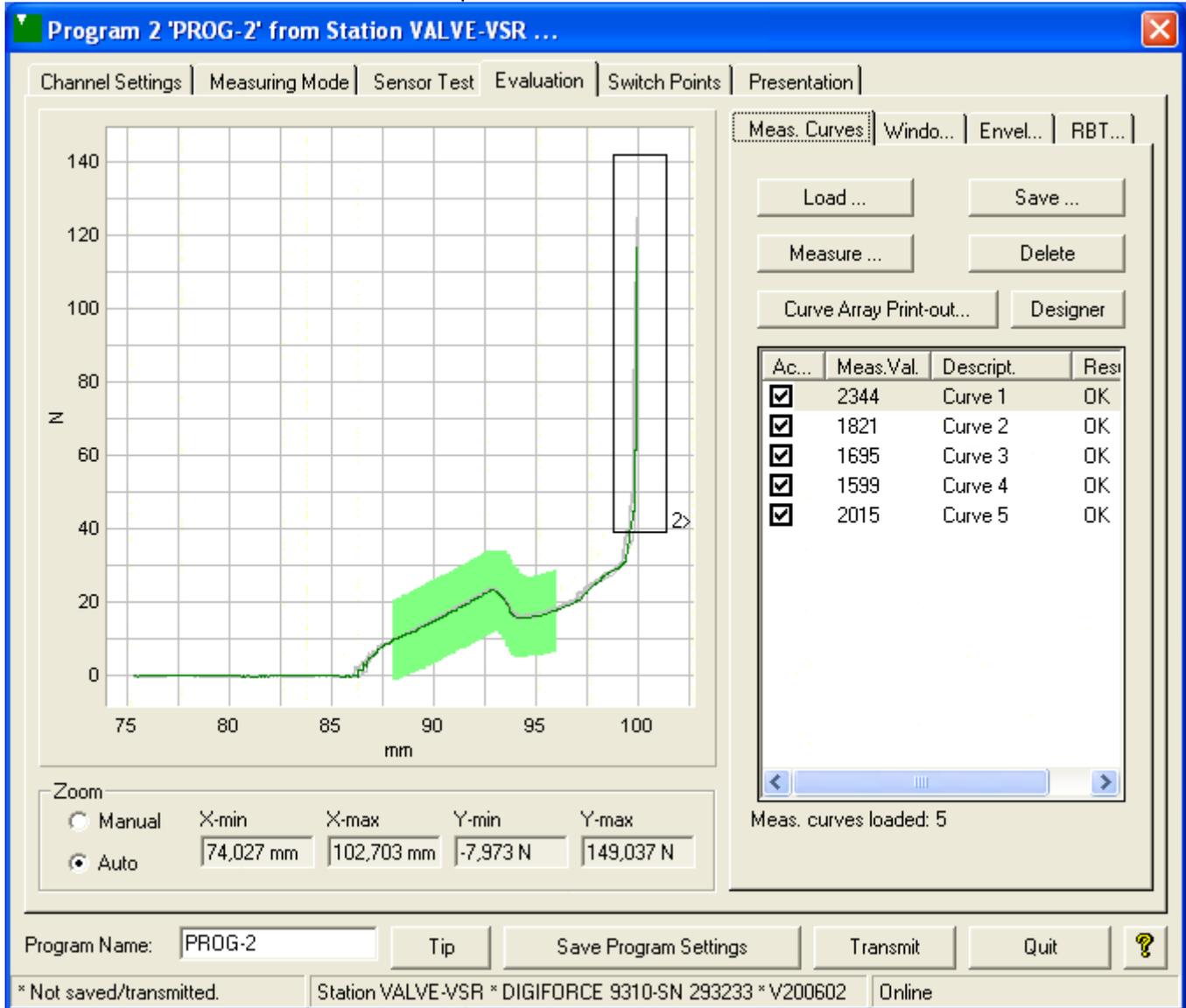
You can enter a tolerance range (+ / -) for the reference point for Channel X and Y independently.

Sensor Test

To run an online sensor test, click on the Execute! button. A sensor test is performed online and the result displayed. The sensor test can also be launched via the PLC interface.

Evaluation

In the Evaluation menu, you can read measurement curves from the device, and use them as reference curves to define evaluation windows and/or an envelope.



Measurement Curves

Measure

Pressing this button opens the Measure dialog window. You are now in Test Operation. You can take measurements with the device, record and display measurement curves and show the measurements in a list. You can use these measurement curves, for example, to set the position of the evaluation windows and the zoom region of the graph (autoscale).

In Test Operation, you can see e.g. the number of measurement values contained in the curves. If required, you can specify in General Settings (under "curve array") the number of measurement curves that are displayed.

Please note: evaluation windows and the envelope are elements of a measurement program.

Curve arrays (sets of measurement curves) are used solely to position the evaluation windows and to generate envelopes. Curve arrays are saved separately from the measurement program; sometimes, however, a curve array only makes sense with the associated measurement program.

Changes to the evaluation windows or the envelope must be transferred to the device before measuring a set of curves, otherwise these changes will not be reflected in the evaluation result.

Load/Save

You have the option to save as a file a set of curves that you have previously measured, so that you can re-load them at a later date.

Please note that the larger the number of measurement curves (curve array setting under General Settings), the larger the size of the curve array file.

Delete

Each of the curves in the curve array are listed in the curve list. Click on Delete to remove all the measurements contained in the list.

Curve Array Print-out

If you wish to print out an opened curve array, click on the button "Curve Array Print-out". The standard print windows open.

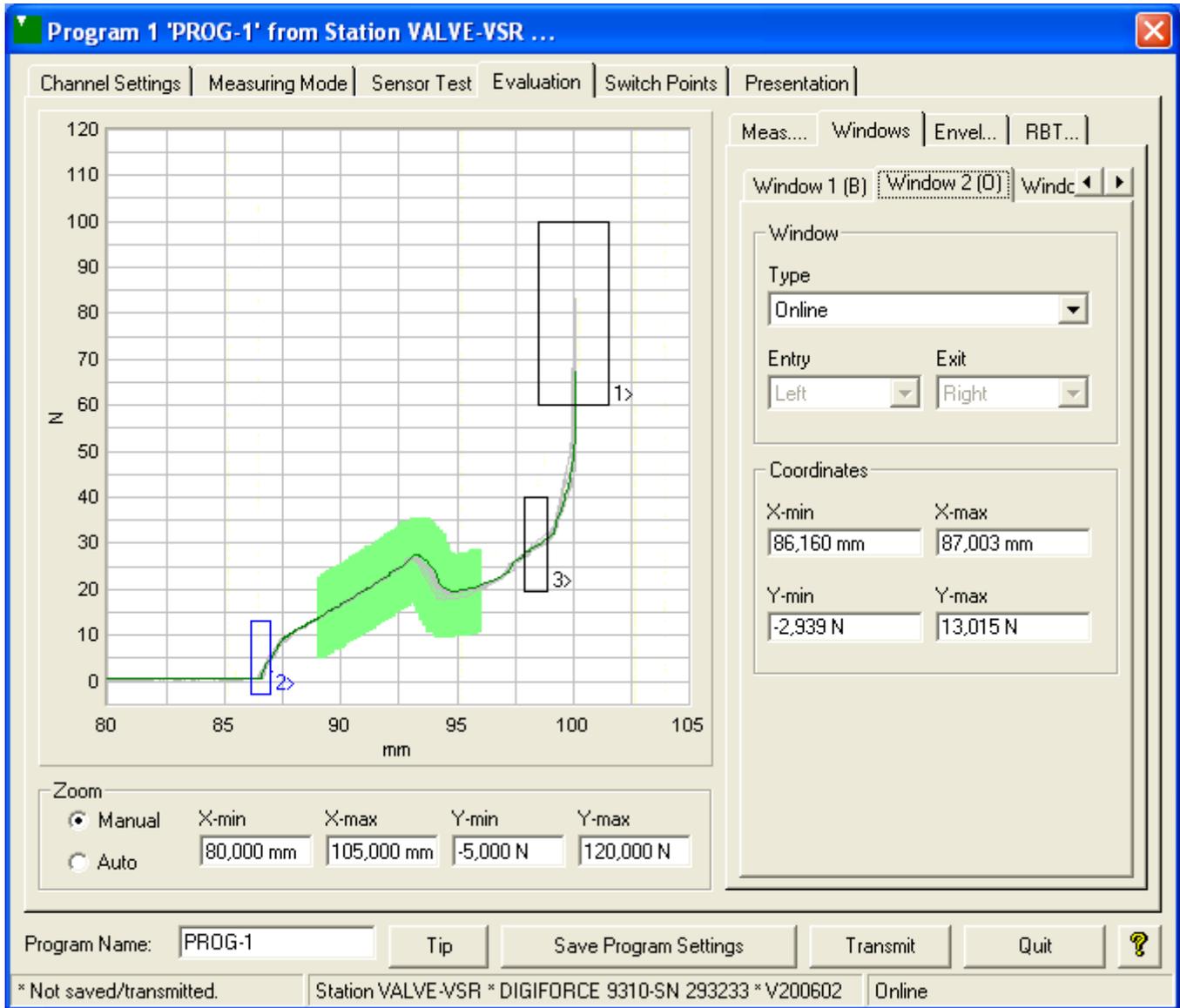
Curve list

The measurement curve list contains the column "Active". Only those measurements that contain a check mark in the Active column are actually included in the following functions:

- Save
- Curve Array Print-out...
- Envelop New...

Evaluation Windows

Before specifying the type, select the number to be assigned to the window concerned. You can do this by clicking on a tab (Window 1 – Window 3). If this window has already been defined, all the data for this window will be displayed and the window will be shown in blue in the graph. The following settings always relate to the window number whose tab is currently active. To first define a window, you can use the mouse to position and move the window and also change the size graphically. Afterwards you can then edit the numerical values of the window limits (Coordinates), for instance to apply custom values.



Type

You can select from the following window types:

- Pass Through (P)
- Online (O)
- Block (B)

When a window type is activated, a start value is initialized in the lower area of the graph. To de-activate a window, select "Off" in the Type field, otherwise a type is defined for this window.

Evaluation criteria (window Coordinates, Entry, Exit) can be specified for each evaluation window. The evaluation result is only OK if all the defined criteria set here are met in a measurement. If one of the evaluation criteria fails to be met then the window is evaluated as NOK.

Entry

Specify here the side on which the curve shall enter the current evaluation window. If an actual measurement curve does not enter the window by the side specified in the Entry field, the evaluation result for this window, and hence also the entire measurement, is NOK. You can only define the entry side for pass-through and block windows; for the online window this setting is fixed.

Exit

Specify here the side on which the curve shall exit the current evaluation window. If the measurement curve does not subsequently exit the evaluation window on the side specified here as the Exit, then the evaluation result for this window, and hence also the entire evaluation, is NOK. You can only define the exit side for the pass-through window type; for the online window the Right exit side is always set, and for the block window there is no exit.

Coordinates

For "fine adjustment" of the window positioning, simply enter the coordinates in the Xmin, Xmax, Ymin and Ymax numeric fields. The window is then initialized with the new value and placed in the corresponding position in the graph as soon as you confirm the value with Enter or click in another data field.

Please note:

If, for example, a max. value is smaller than a min. value, the values are automatically swapped over when confirmed (pressing the Enter key or leaving the value field). If the window values lie off-scale for the graph, then you may only be able to see part of the window or no window at all. In this case, use the Auto(zoom) function.

Draw, move windows

You can draw evaluation windows inside the graph area. You can use the mouse to perform the following functions directly in the graph:

Move evaluation window: left-click on the active window (shown in blue) and move (only possible on Window tab).

Change size of evaluation window: right-click inside the active window (shown in blue), then click on the grab handles and change the size (only possible on Window tab).

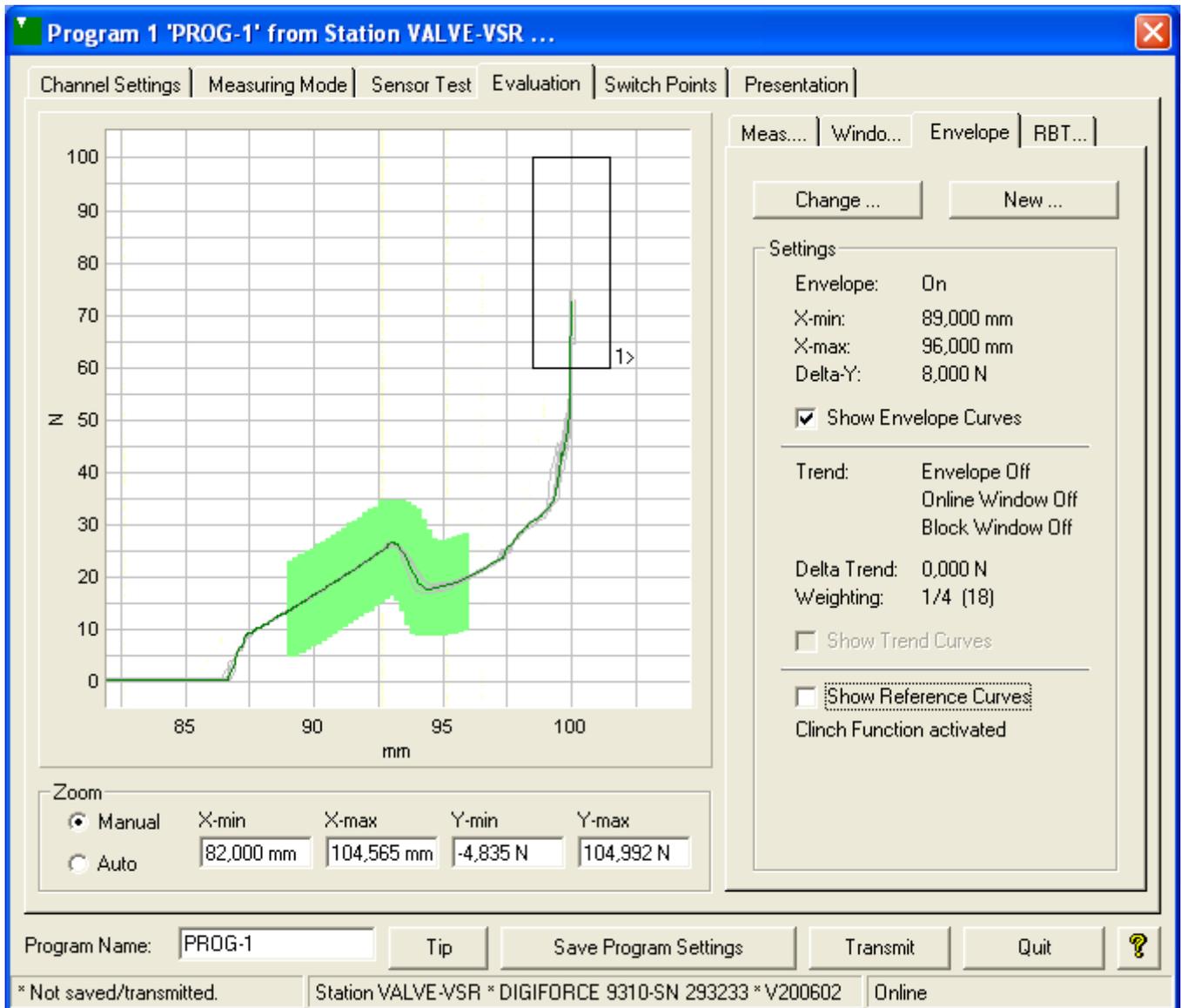
Draw evaluation window: to draw a window from scratch, press and hold the right mouse button while dragging the mouse to draw the window (only possible on Window tab). Capture zoom area: press and hold the left mouse button while also pressing the [CTRL] key to draw a box around the zoom area you require.

Envelope

If you have loaded a measurement program from a file or directly from the DIGIFORCE that contains an envelope, you can view the envelope settings. In order to be able to edit these settings, you must click the Change button. This opens the Edit envelope window.

In order to create an envelope from scratch, you need a set of curves (a curve array), which you can either measure or, if available, load from a curve array file. You can use the Show Envelope Curves and Show Reference Curves options to show/hide an existing envelope and/or reference curve in the graph. Note, however, that this does not affect the actual logic status (On/Off) of the envelope.

To change the display settings for the envelope, you can open the General Settings - Presentation or General Settings - Colors window.



Zoom

The Zoom function is used to scale the measurement curve graph. You can choose between Manual and Auto.

Manual

In Manual mode, the visible region of the graph is defined by the parameters X-min / X-max / Y-min / Y-max.

Auto

In Auto-zoom mode, the graph is always shown with the optimum scale in which all active curve types are shown in full. Note that in this mode, even after using navigation functions, any change in a parameter always automatically zooms to the best scale.

X-min / X-max / Y-min / Y-max

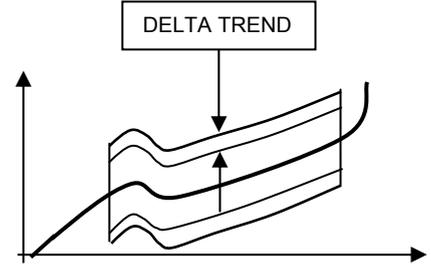
The current scale settings for the graph are displayed in these numeric fields. In Manual zoom mode you can edit these values and also enter your own values manually.

Activate TREND- tracking on the envelope curve

DIGIFORCE offers the possibility to track the envelope band to a slowly drifting measurement curve. This can be necessary, for example, if the joining tool wears off gradually, but the quality of the joint connection is not yet reduced. Only after the trend limiting value is passed, the NOK signal is given. Activate the TREND-function only if you are acquainted well enough with the function of the instrument. With active TREND tracking of the envelope it is also possible to track the Block and Online window (the Pass Rthrough window could not be used with active TREND tracking). If you want to activate TREND now please switch the parameter TREND to ON

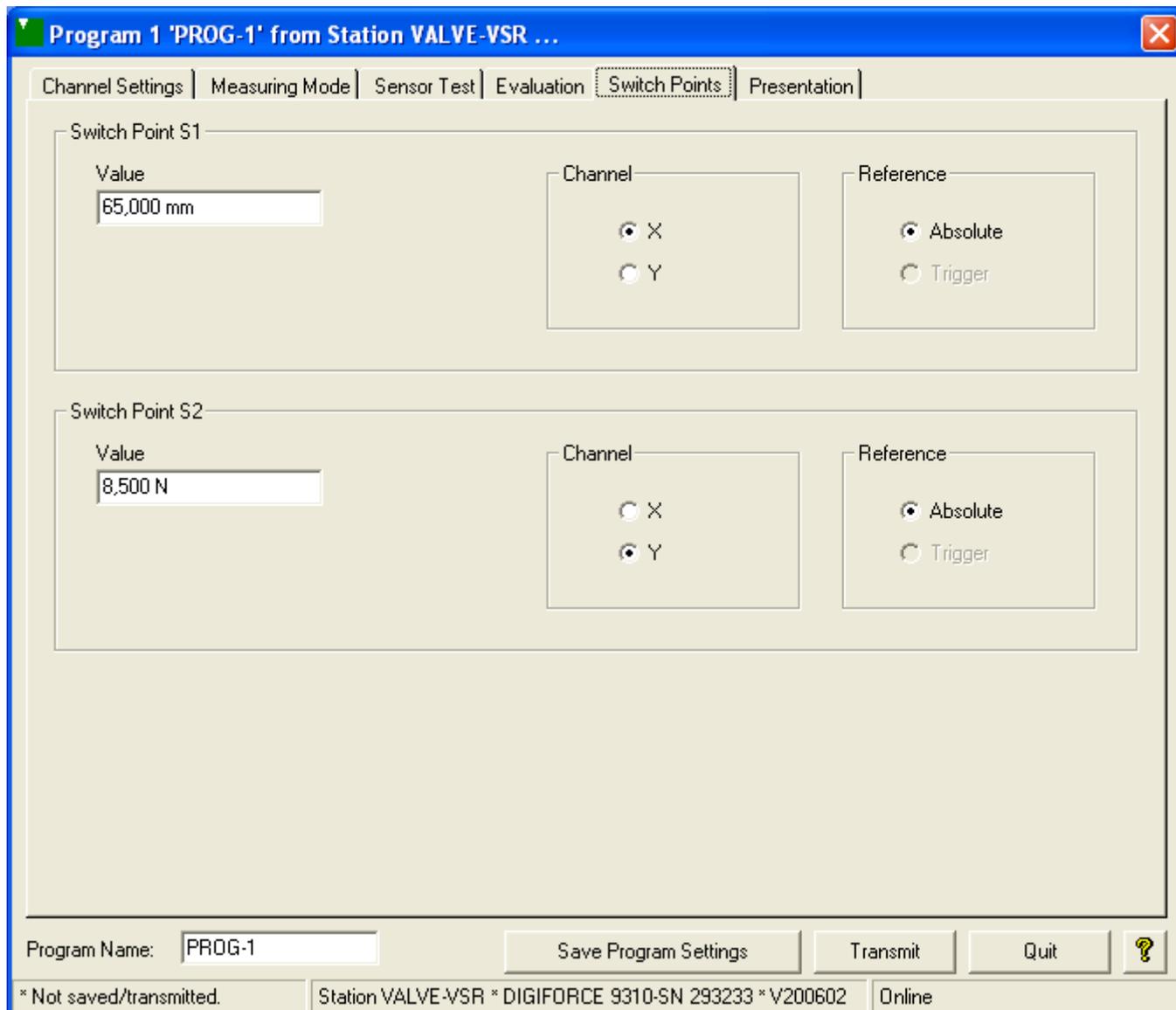
Theory on Trend Tracking

First of all, a so called reference curve is produced for the teach-in process of the tolerance band. It is based on the average values of all taught-in measurement curves and is used to calculate the band. The limits of the tolerance band thus depend on the taught-in reference curve. When TREND = OFF the reference remains unchanged, i.e. the tolerance band stays as it is. When TREND = ON, however, the average values present measurement curve are taken into consideration with the already existing reference curve so that it changes accordingly with the process values. The value WEIGHTING determines the effect that the present measurement curve has on the change of the reference curve as well as the tolerance band (influence on trend tracking).

<p>Trend tracking Envelope</p>	<p>OFF: The Envelope has a fixed position ON: Trend tracking is active</p>																																											
<p>Trend tracking ONLINE WINDOW</p>	<p>OFF: The Onlinewindow has a fixed position ON: The Onlinewindow is tracking like the envelope</p>																																											
<p>Trend tracking BLOCK WINDOW</p>	<p>OFF: The Blockwindow has a fixed position ON: The Blockwindow is tracking like the envelope</p>																																											
<p>DELTA TREND The Delta-value relates to the envelope curve limits. A value of 2.00 N means that the trend limit has a vertical distance of 2 N from the envelope curve band. If the trend limits are reached later on by the envelope curve then a OK_SENSORTEST is sent to the PLC. Please note! The output OK-SENSORTEST has a double meaning since the quantity of pins is restricted!</p>																																												
<p>WEIGHTING Indicates the influence of the present measurement curve on the tracking of the envelope curve band. WEIGHTING = 1/2 means the biggest influence on the movement of the envelope curve, WEIGHTING = 1/256 the least influence from the present measuring curve on the trend tracking.</p>	<table border="1"> <thead> <tr> <th>WEIGHTING</th> </tr> </thead> <tbody> <tr><td>1/2</td></tr> <tr><td>1/3</td></tr> <tr><td>1/4</td></tr> <tr><td>1/5</td></tr> <tr><td>1/6</td></tr> <tr><td>1/7</td></tr> <tr><td>1/8</td></tr> <tr><td>1/9</td></tr> <tr><td>1/10</td></tr> <tr><td>1/11</td></tr> <tr><td>1/12</td></tr> <tr><td>1/13</td></tr> <tr><td>1/14</td></tr> <tr><td>1/15</td></tr> <tr><td>1/16</td></tr> <tr><td>1/17</td></tr> <tr><td>1/32</td></tr> <tr><td>1/64</td></tr> <tr><td>1/128</td></tr> <tr><td>1/256</td></tr> </tbody> </table>	WEIGHTING	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/32	1/64	1/128	1/256	<table border="1"> <thead> <tr> <th>Averagings</th> </tr> </thead> <tbody> <tr><td>2</td></tr> <tr><td>3</td></tr> <tr><td>4</td></tr> <tr><td>5</td></tr> <tr><td>6</td></tr> <tr><td>7</td></tr> <tr><td>8</td></tr> <tr><td>9</td></tr> <tr><td>10</td></tr> <tr><td>11</td></tr> <tr><td>12</td></tr> <tr><td>13</td></tr> <tr><td>14</td></tr> <tr><td>15</td></tr> <tr><td>16</td></tr> <tr><td>17</td></tr> <tr><td>32</td></tr> <tr><td>64</td></tr> <tr><td>128</td></tr> <tr><td>256</td></tr> </tbody> </table>	Averagings	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	32	64	128	256
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Real-time signals (Switch Points)

DIGIFORCE lets you monitor a total of two limits on the X-channel or Y-channel in quasi real time. You can edit these limits, which are referred to as Switch Points, to suit. When a switch point is reached, the assigned switching output goes high. The limits for the X-channel can be referenced to the absolute (calibrated) zero point or the relative (trigger) zero point.



Value

Enter here a numerical value that must be exceeded by the measured value on the X-channel or Y-channel in order to switch the logic signals. The switched signal remains in the active state until the value for the switch point is reached again.

Channel

Select here the measurement channel (X or Y) to which you wish to assign the relevant switching output.

Reference

If the switching signal is assigned to channel X, you must select the reference (zero) point for this switching signal. This reference can be the absolute (calibrated) zero point or the trigger point.

If Trigger is selected as the reference, the switch points do not respond until the measurement has started and the trigger level exceeded.



Note that the switching signals are only set when actual measurements are being recorded. This will not be the case, for instance, if you have selected the $Y=f(X)$ function and the change in the measured value on channel X is smaller than the interval entered for Sample Rate. Even if the switch point entered here is reached "mechanically" by the sensor, there will be no corresponding switching signal at the switching output. In this case you would be advised to select the function $Y = f(X,t)$ and a suitably short sampling time.

Test Operation

It is often helpful to be able to see the values currently being measured by the sensors. For instance, after you have calibrated the measurement channels, you can immediately look here to check what effect this has had; e.g. move the displacement sensor systematically using a calibrated gauge block while watching the Channel X display. If the value is plausible, the calibration procedure was successful. You can do the same check with the load cell (Channel Y).

DigiControl 9310 menu: Device Configuration – Parameterize Device (online)

Device Parameter from Station VALVE-VSR ...

Basic Settings | Access Permission | Programs

Active Program

Number

Test Operation

Numeric Test Operation

Programs

0 - [PROG-0] 4 - [VAL_4-1]

1 - [PROG-1] 5 - [VAL_4-2]

2 - [PROG-2] 6 - [PROG-6]

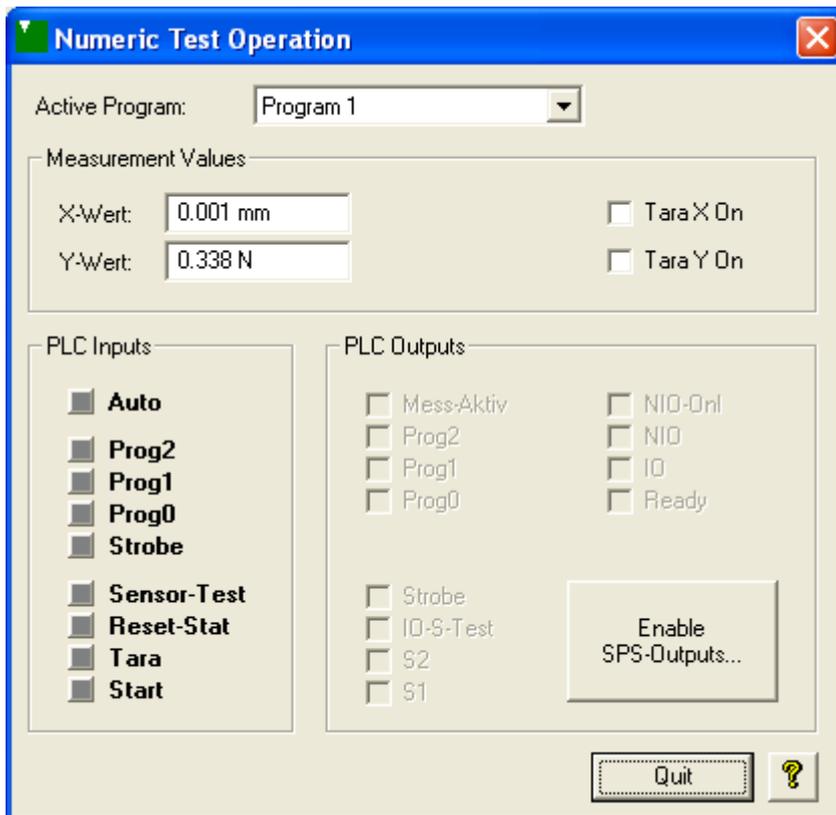
3 - [PROG-3] 7 - [PROG-7]

Use program buttons with drag and drop to copy measurement programs.

Save Device Parameter Transmit Quit ?

Not changed. Station VALVE-VSR * DIGIFORCE 9310-SN 293233 * V200602 Online

Numeric Test Operation



Numeric Test Operation lets you check the sensor measurement data and the tare settings in all measurement programs. In addition, you can read the status of the PLC inputs and optionally actuate the PLC outputs. The tare status is stored in the device for each program, but is reset again after uploading a backup and after transferring device parameters to the corresponding measurement programs. A tare operation can also be initiated via the controller interface (see section „Initiate Tare externally“)



Important note: During Numeric Test Operation, simulated values are used for the PLC output signals. Make sure a connected PLC will not respond to these test signals during this period. The outputs can only be set/reset statically. The actual logic state of the signals, for instance the state of the READY signal, cannot be viewed here.

Handle this function with care! Before you set/reset the outputs, you must be aware of what impact this will have. It must not be possible to actuate components that have safety implications, such as press-fit spindles, solely by these signals. Suitable safety devices, not linked to the DIGIFORCE, such as light curtains, must guarantee the safety of such equipment.

Save DIGIFORCE 9310 device configuration (Backup)

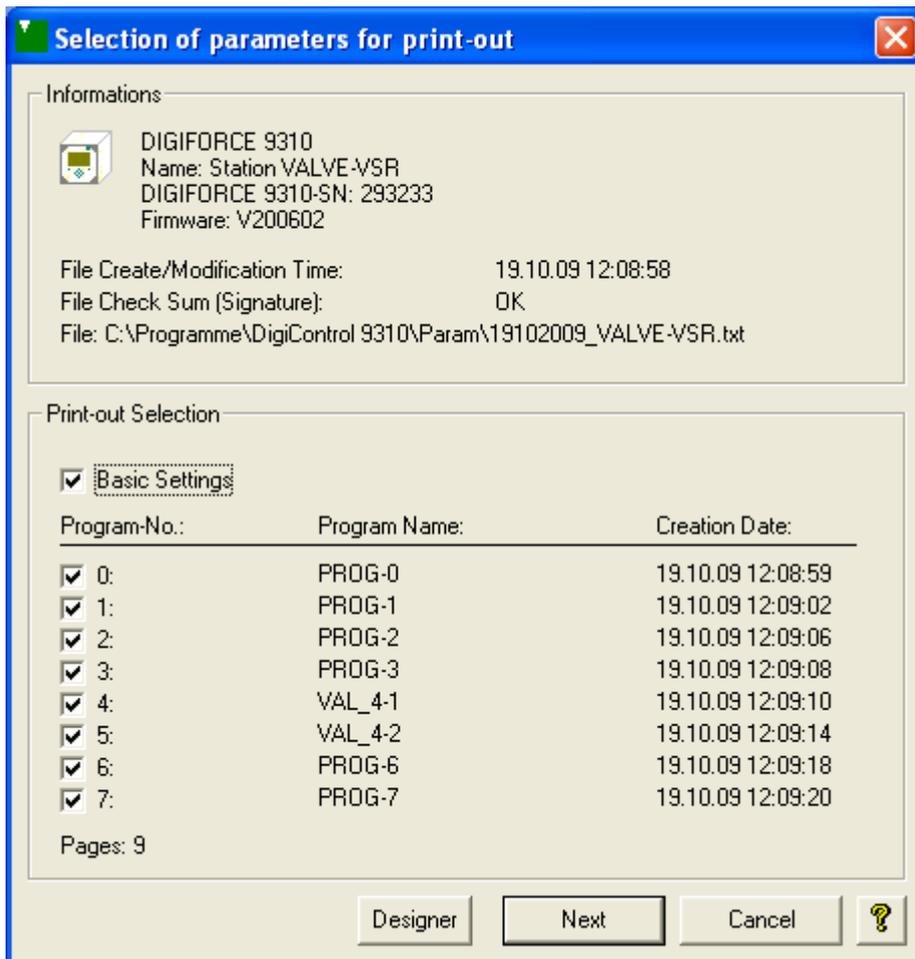
The DigiControl 9310 PC software can be used to back up a complete device configuration of a DIGIFORCE 9310 and save it in a backup file. This can also be a useful option, for example, if the eight measurement programs of the 9310 are not enough. By managing a set of different backup files, an unlimited number of measurement programs can be created. Where the DigiControl 9310 is configured for communication with a controller, for instance a PLC, then management of the backup files can also be automated via a COM or TCP/IP link. The DigiControl 9310 documentation "Controller communication for DigiControl 9310" contains further details on this.

DigiControl 9310 menu: Backup – Download (DIGIFORCE 9310 → Backup file)

Printing the parameters from a backup file

A parameter print-out can be used to provide a clear hard-copy record of the entire device configuration or to create a PDF document. A parameter print-out can only be generated from a previously created backup file.

DigiControl 9310 menu: Reports – Parameter print-out



Upload backup file to DIGIFORCE 9310

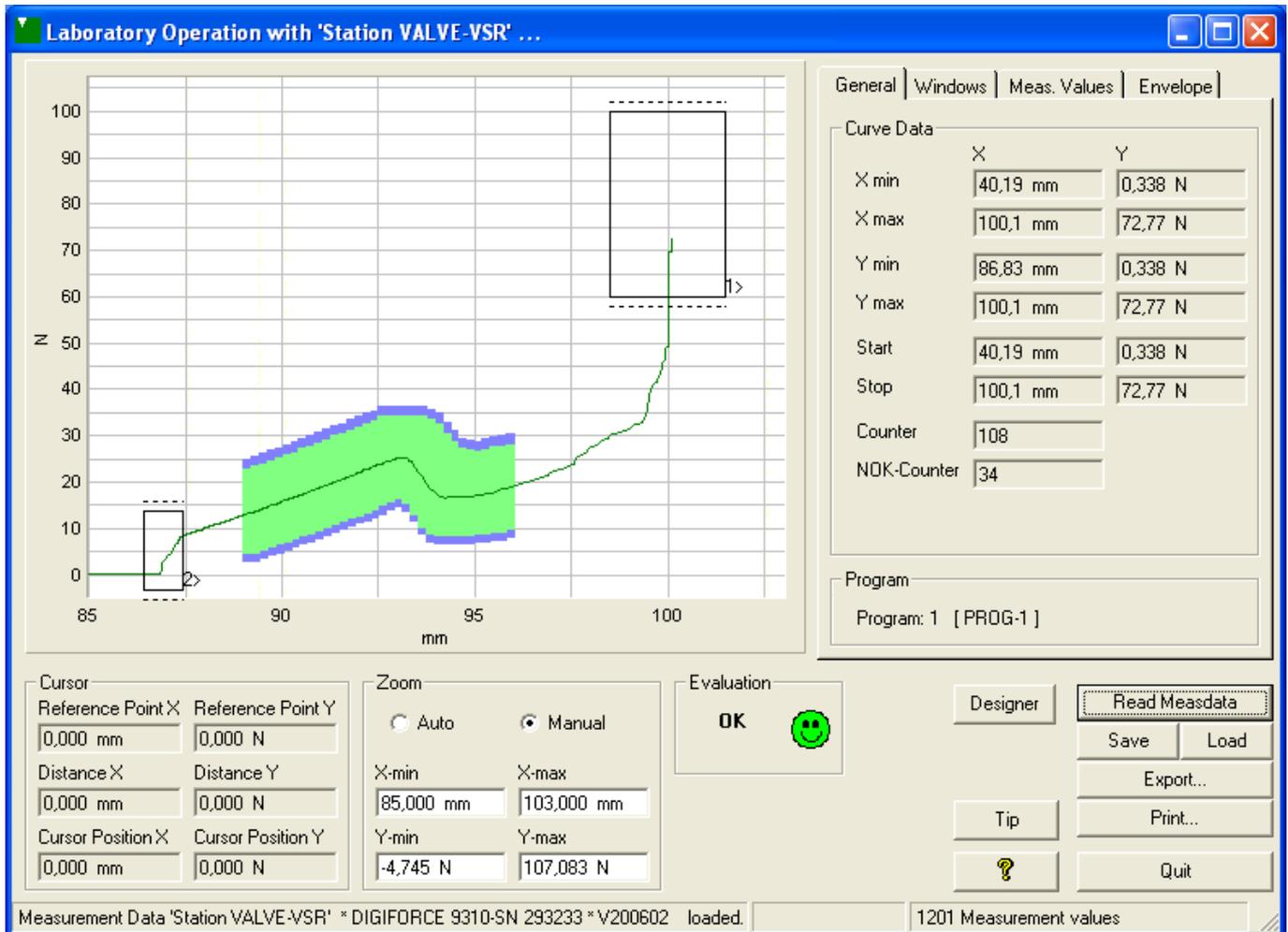
If a backup has been created after configuring a device, this can be sent to the DIGIFORCE 9310 again using the upload function.

DigiControl 9310 menu: Backup – Upload (Backup file → DIGIFORCE 9310)

Curve data recording – Laboratory Operation

The DigiControl 9310-P101 configuration software supplied with the DIGIFORCE 9310 control cabinet module supports manual recording of measurement curves in "Laboratory Operation". Automated recording of measurement data, for example to log data on all the parts in a production process, is only supported by the full DigiControl 9310 version P100. You need the 9310 P100 upgrade to activate the full version.

DigiControl 9310 menu: Measurement – Laboratory Operation Mode



Here you can read measurement data from the DIGIFORCE, display this data, take readings from the graph, print out the data and save it in a log file. You can then re-load this log file at any time.

Read Measdata

Press the Read Measdata button to retrieve the readings from a measurement that has been taken.

A message is displayed if there are no measurement readings available in the device.

Reading the measurement data can take several minutes if the interface parameter settings are not ideal and there are a large number of curve values. While data transfer is, active a data transmission section is displayed.

Export

Click on the Export button to export e.g. to an Excel file the measurement data retrieved from the DIGIFORCE. You can then select the required plug-in for the data export before proceeding.

Save

The displayed measurement data can also be saved in a special format that can be read by the DigiControl 9310 software. Press the Save button if you wish to do this. You can then use the Load button to re-display this measurement data in the Laboratory Operation window at a later date. When saving measurement data, a digital signature is created that can be used to indicate if the file has been tampered with. You can specify the default destination directory for the measurement data in the General Settings (Data storage).

Load

Measurement data previously saved using the Save button can be re-displayed in the Laboratory Operation window using the Load button. You can specify the default destination directory for the measurement data in the General Settings (Data storage).

Print

Press the Print button to output a measurement to the configured printer. The dialog window for entering information on the measurement is displayed. After confirming with Next, the Printer selection window appears for selecting the printer to be used for printing.

Evaluation

After retrieving the measurement data from the DIGIFORCE, you receive information on the evaluation result (OK/NOK) in three ways:

- Smiley: green (OK), red (NOK)
- Text: OK or NOK, NOT (NOK trend)
- Measurement curve: the color can be set according to the evaluation result.

General

The General tab contains readings for the Min and Max values (X/Y) of the current measurement and shows the program name.

Windows

If evaluation windows have been defined for the active measurement program, then the settings appear in the top section with the results in the lower section.

Measurement Values

You can see the individual measurement values of the curves in the Measurement Values tab. By double-clicking on an individual measurement-value entry in the list you can track this value in the measurement curve graph. The reference cursor appears automatically. If you wish to disable this cursor again just right-click with the mouse. You can scroll through the curve values in the measurement-value list using the up and down keys on the keyboard; the reference cursor tracks the value that is currently selected in the list. If you wish to change the presentation of the measurement curve or customize the colors, you can do this in the General Settings.

Envelope

If an envelope is provided and enabled as an evaluation criterion in the measurement program used, the Envelope tab is also displayed.

If trend tracking is enabled then extra trend information is also shown on this tab.

Zoom

Zoom refers to the scale for the measurement curve graph. You can choose between Manual and Auto here. In Manual zoom mode, the scale set in the numeric fields X-min / X-max / Y-min / Y-max is not changed. In Auto-zoom mode, the graph is always shown with the optimum scale in which all active curve types are shown in full. Note that in this mode, even after using navigation functions, any change in a parameter always automatically zooms to the best scale.

X-min / X-max / Y-min / Y-max

The current scale settings for the graph are displayed in these numeric fields. In Manual zoom mode you can edit these values and also enter your own values manually.

Cursor

Two cursors are provided for taking readings from the graph: a reference cursor and the mouse cursor. You can use these cursors to read off coordinates and point separations from the graph.

The cursors can be enabled/disabled as follows:

- Reference cursor (Cursor 1): right-click with mouse
- Mouse cursor: always active

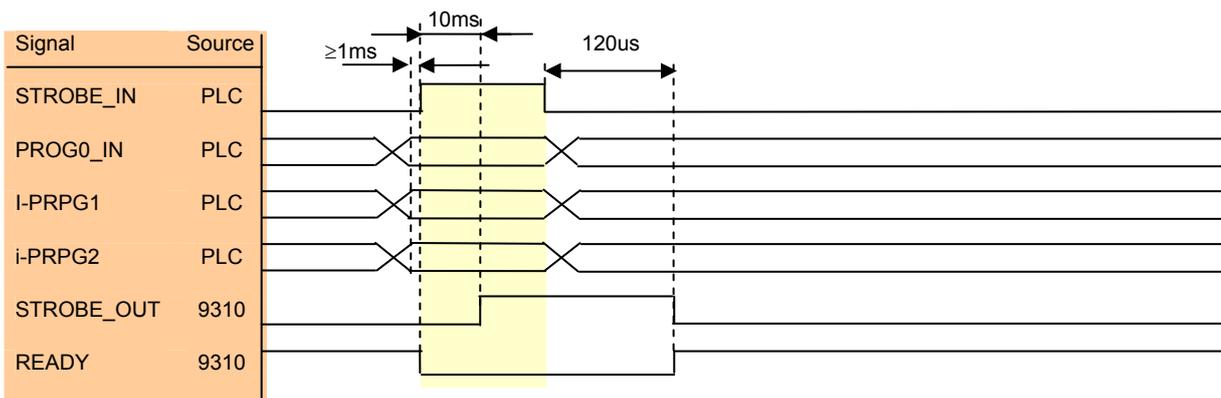
Signal flow diagram

Switch Measurement Programs

In order to adjust to the changing measurement tasks, the measurement programs can be switched manually via keyboard or via external control signals PROG0_IN ...PROG2_IN. The following binary codes have to be put on these control inputs and made valid with STROBE_IN = 1:

PROG2_IN [PROG2_OUT]	PROG1_IN [PROG1_OUT]	PROG0_IN [PROG0_OUT]	Measurement Program Number
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

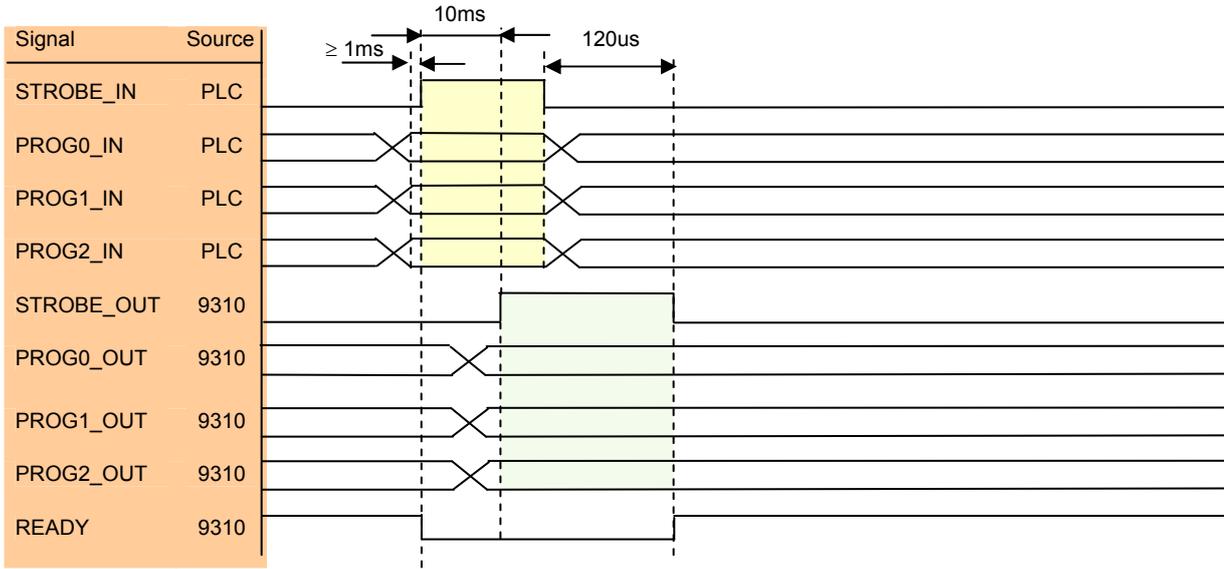
Handshake for Change of Measurement program without acceptance of program



1. The PLC sends the required program number in binary code on inputs PROG1_IN to PROG2_IN and makes them valid after the transient oscillation with STROBE_IN = 1.
2. DIGIFORCE accepts the switching of measurement program with STROBE_OUT = 1.
3. The PLC resets the valid signal STROBE_IN back to „0“.
4. DIGIFORCE resets STROBE_OUT to „0“

Handshake for Change of Measurement program with acceptance of program

To control the success of switching the Measurement program, e.g. for especially safety relevant parts, the Measurement program number can be demanded from the DIGIFORCE. It is on outputs PROG0_OUT to PROG2_OUT and is made valid by STROBE_OUT = 1.

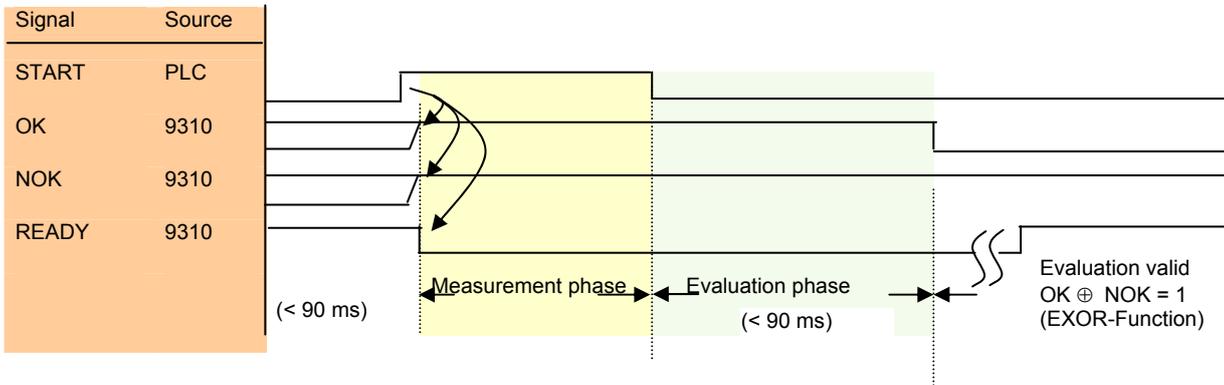


Initiate START externally

You have chosen STARTMODE EXTERNAL. In order to initiate the measurement, the instruments await an external START-signal!

Handshake for START - EXTERNAL:

Example: Evaluation result NOK



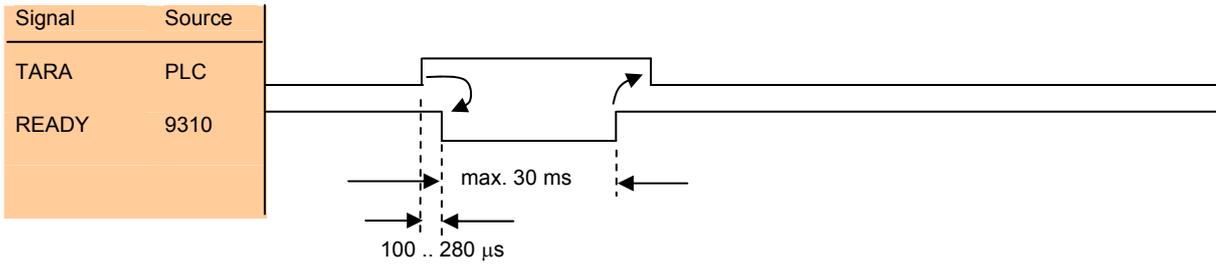
Sequence:

1. The measurement is started by START = 1.
2. DIGIFORCE responds with OK = 1 and NOK = 1 (IO ⊕ NIO = 0 (EXOR!)) and READY = 0
3. The end of measurement is marked by PLC with START = 0.
4. Subsequent begins the evaluation phase. It is finished when one of the evaluation signals OK or NOK switches to "0", depending on the evaluation result. The valid evaluation result remains with NOK = 1 or OK = 1.
5. The signal READY jumps back to „1“ only after the curve graphic appears completely on the screen. For short cycle times we recommend to use the condition OK ⊕ NOK = 1 as "evaluation valid" and to signal resummoned measurement readiness.

Initiate Tare externally

Next to the manual Tare (in “Test Operation” on page 28) there is the possibility to tare the Channel X or Y or X+Y via input TARE externally after setting the parameter PLC TARE in the menu Measurement Mode.

Handshake for external TARE

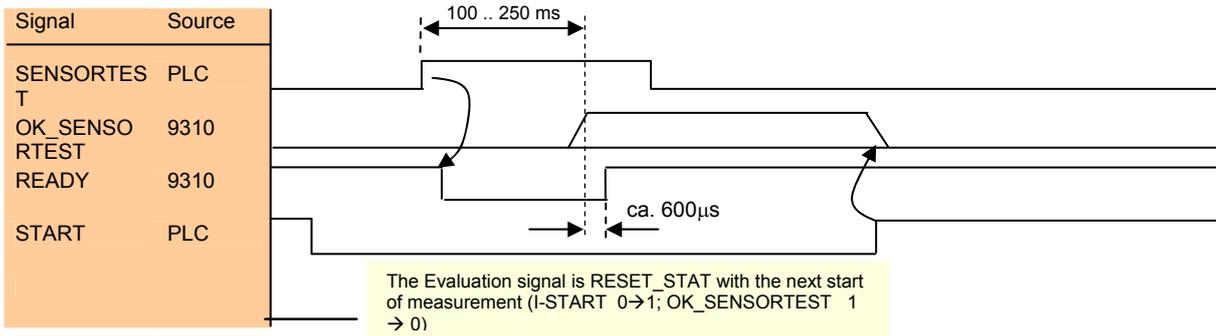


1. The PLC initiates the Tare process with TARA = 1
2. DIGIFORCE responds with READY = 0.
3. The end of the Tare process is signaled with READY = 1
4. The PLC resets TARA to „0“

Initiate Sensor test externally

The test of sensors may be realized via the signal SENSORTTEST externally also.

Handshake für external Sensor Test:



Sequence:

- The PLC initiates function Sensor Test with I-STEST = 1
- DIGIFORCE responds with READY = 0.
- The end of the Sensor Test is signaled with READY = 1. The evaluation signal OK_SENSORTEST is therefore valid.
- The PLC RESET the statistics, the SENSORTTEST back to „0“.
- With the flank START 0 → 1 resp. START INTERNAL 0 → 1, i.e. OK_SENSORTEST is set back at the beginning of the next measurement



Attention! The output OK_SENSORTEST has a double meaning! On the one side it is used to signal that the sensor test was ok, on the other side it has the meaning that the Trend limit is reached.

Signal that Trend Limit is reached

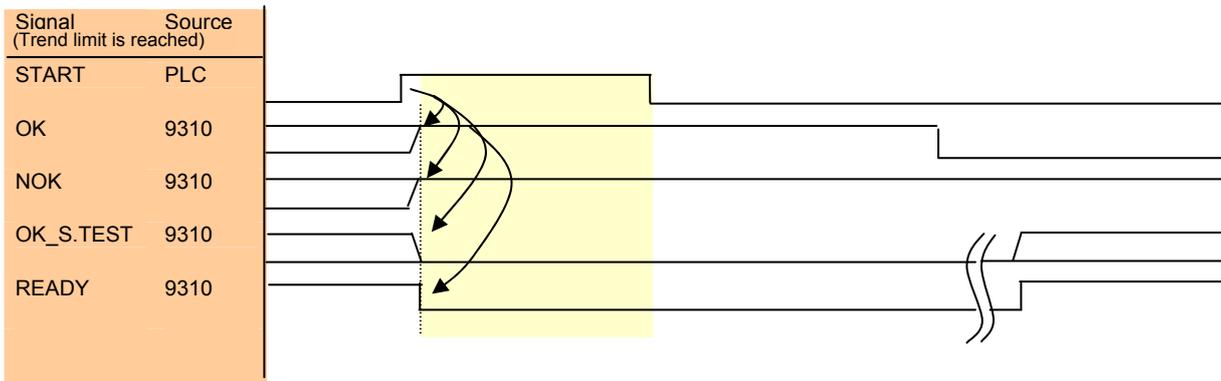
You evaluate the measurement curve with the envelope band and have activated the trend limit control (TREND=ON). If the trend limit is then reached by the drifting envelope band, the output OK_SENSORTEST=1 informs about this event!



Attention! The output OK_SENSORTEST has a double meaning! On the one side it is used to signal that the Trend limit is reached (as a.m.), on the other side it has the meaning that the sensor test was ok.

Handshake for the signal OK_SENSORTEST with its meaning „Trend Limit is reached“

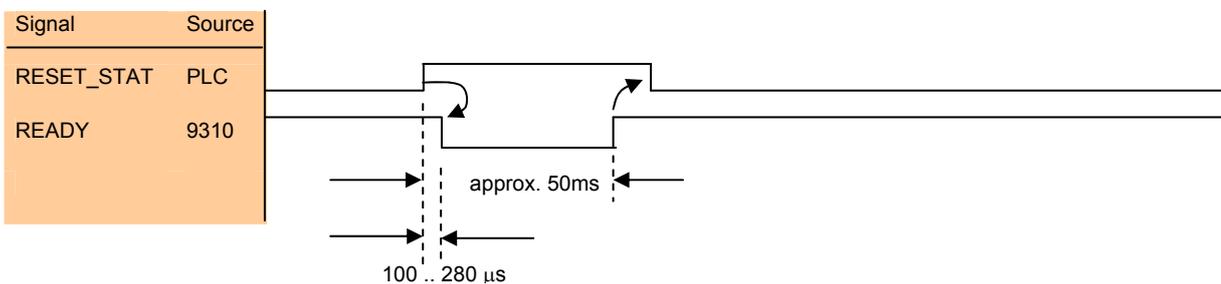
Example: Evaluation result NOK



Initiate RESET_STAT externally

The statistics can be reset either manually or via Input RESET_STAT.

Handshake for external reset:



Sequence:

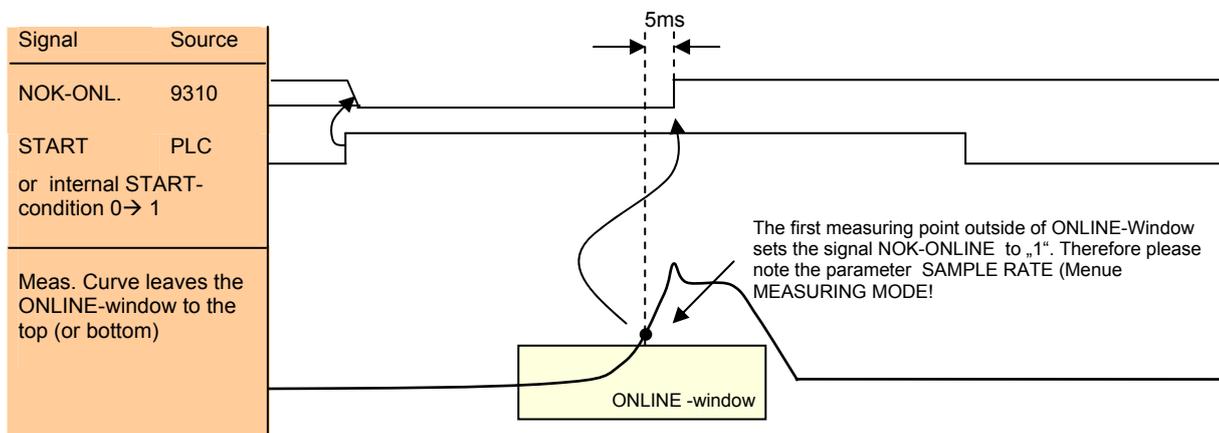
1. The PLC initiates function reset with RESET_STAT = 1
2. DIGIFORCE responds with READY = 0.
3. At the end of the reset-process, READY switches back to „1“
4. The PLC takes back RESET_STAT to „0“.

Reaction of Online signals

Online window

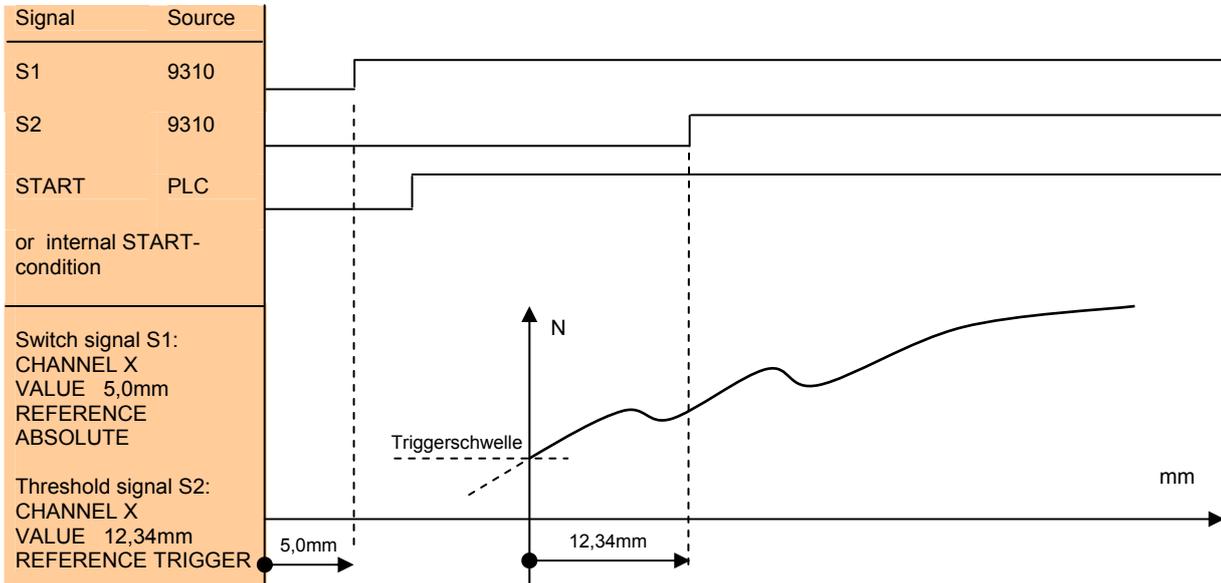
The Online- or Thread-In window is positioned at the thread-in portion of the press-fit in curve and controls in real-time if the two parts are being joint in the correct way and do not cant/block. If it is left to the top (or to the bottom) the signal NOK-ONLINE switches to „1“. The reset to „0“ is effected when the next START-condition is fulfilled. (internally or externally).

Signal flow diagram for NOK-ONL:



Threshold value signals Channel X

The function of the threshold value signals shall be explained with the following example: A feeding unit shall switch from „fast“ forward to „slow“ at 5 mm after the absolute zero point (before reaching a pin to be pressed in) Threshold value signal S1 is used for this. When the feeding unit actually touches the pin (the trigger limit is reached and the displacement is set to zero) it shall continue up to 12,34 mm and press-in the pin by this distance. The signal S2 stops the feeding unit at 12,34 mm in reference to the trigger zero point.



Absolute zero point for displacement

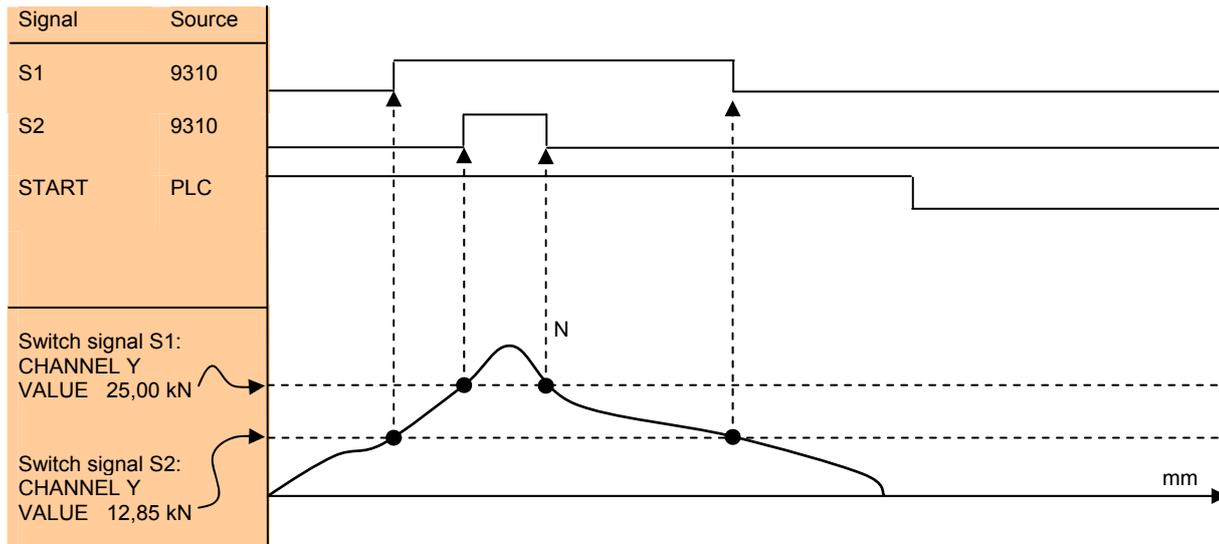
Trigger-Zero Point. When touching the part with the press stamp (trigger limit is reached) the displacement is set to ZERO. The condition START = 1 must be fulfilled for generating the switch signal with REFERENCE TRIGGER. At START=0 the maximum sample rate is captured. As a result, the corresponding switch output reacts faster, too. At START=1, however, the capture of measurement data can only reach a maximum sample speed limited by the setting in the parameter sample rate (SAMP. RATE). The switch output would react in accordance. The parameter SAMP. RATE (sample rate) has an influence that should not be ignored. The smaller the value of SAMP. RATE, the closer lies the switch signal to the threshold value limit identified under VALUE.

Please note that mechanical inertness and electrical runtime of the system make it very difficult to reach such exact positions. After reaching the displacement position, at least 5 ms will pass before setting the threshold signal



Safety relevant components such as press-in spindles must not be Initiated or controlled directly via the switch signals S1 / O-S2. Adequate protection installations which are independent from DIGIFORCE® 9310 must take care of safety separately for such installations.

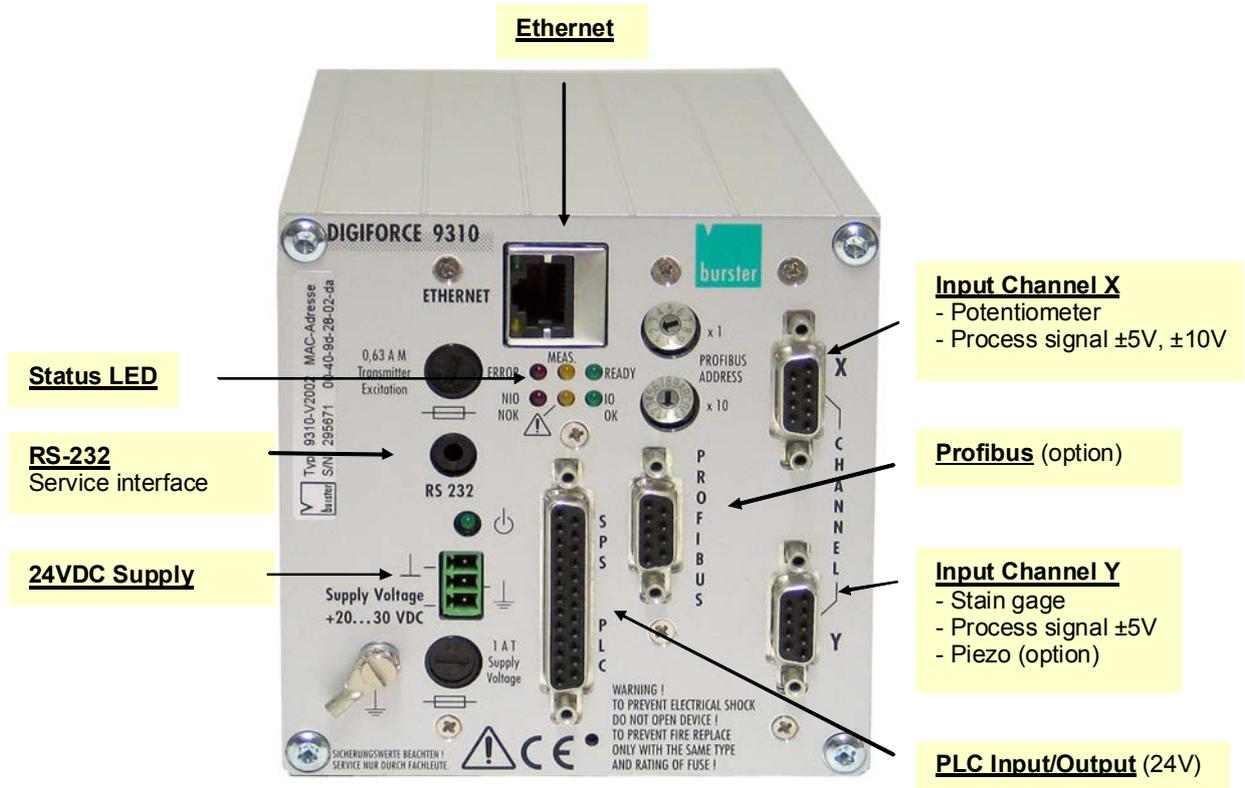
Threshold value signals Channel-Y



For a Channel-Y-related switch signal, the START signal defines whether the sample rate is 10000 /s (START = 0) or the sample rate defined in AB-SCHRITT (START = 1) is used for read-in of the measurement values.

Connect DIGIFORCE 9310-V2xxx

Front view with connector ports



Connecting the power supply disconnecting plug

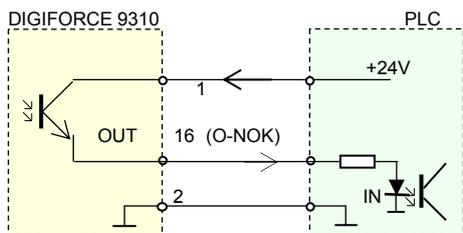
24VDC power supply



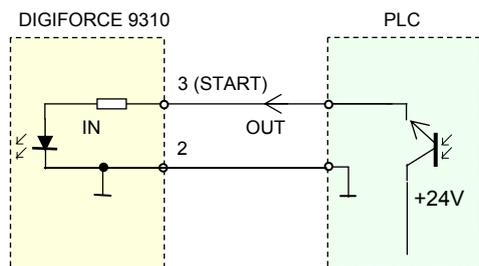
Connecting to PLC

Pin	Signal name	Description
1	+VEXT-ST	+ External voltage supply from PLC (+24VDC)
2	GND EXT	GND from PLC (Ground 24VDC)
3	START	Input – Start of a Measurement (START = 1)
4	TARA	Input - Tare X or Y or X+Y - Channel
5	RESET_STAT	Input - RESET the statistics
6	SENSETEST	Input - Initiate Sensor Test
7	STROBE_IN	Input – Signal for choice of Measurement program (PROG0_IN..PROG2_IN)
8	PROG0_IN	Input - Bit 0 for choice of Meas. Program
9	PROG1_IN	Input - Bit 1 for choice of Meas. Program
10	PROG2_IN	Input - Bit 2 for choice of Meas. Program
11	AUTO	Input - AUTO = 1 : Device switches from configuration to Measuring mode
12	+18VOUT	+18V / 40 mA max. Supply voltage for external consumers (unregulated)
13	GND 18VOUT	GND for 18V-Supply Voltage
14	READY	Output - Ready for new Measurement
15	OK	Output – Total evaluation result „OK“
16	NOK	Output – Total evaluation result „NOK“
17	NOK_ONLINE	Output - Thread-In or Online-Window „NOK“
18	S1	Output - Limiting value 1 is reached
19	S2	Output - Limiting value 2 is reached
20	OK_SENSETEST	Output - Sensor Test „OK“ (page 80) or trend limit reached (page 81)
21	STROBE_OUT	Output - Takeover signal for confirmation Measur. Program choice (PROG0_OUT..PROG2_OUT)
22	PROG0_OUT	Output - Bit 0 of the mirrored Measurement program no.
23	PROG1_OUT	Output - Bit 1 of the mirrored Measurement program no.
24	PROG2_OUT	Output - Bit 2 of the mirrored Measurement program no.
25	MEASURING	Output - Measurement in process. Can be used for erasing external piezo amplifiers.

OUTPUT-configuration with „NOK“ example



INPUT-configuration with „START“ example



Status LED

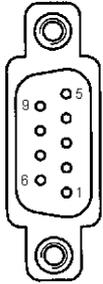
Available LED for visualisation of the DIGIFORCE device status:

LED	Farbe	Bedeutung
IO-STEST	yellow	Sensor Test „OK“ (page 80) or trend limit reached (page 81)
MEAS.	yellow	Measurement is active
READY	green	Ready for new Measurement
NIO / NOK	red	Total evaluation result „NOK“
IO / OK	green	Total evaluation result „OK“
ERROR	red	DIGIFORCE 9310 device error (error code on interface available)

Connect sensors to Channel X

X-Channel plug configuration (9 pin D-Sub bushing)

X



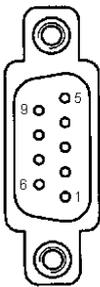
Rear view on 9 pin D-sub bushing

PIN	Meaning
1	+ Supply Poti
2	+ Sense Poti
3	24VDC transmitter supply*
4	GND Poti
5	GND Poti
6	+ Signal (Poti or Standard signal)
7	N/A
8	GND transmitter supply*
9	GND (Poti or Standard signal)

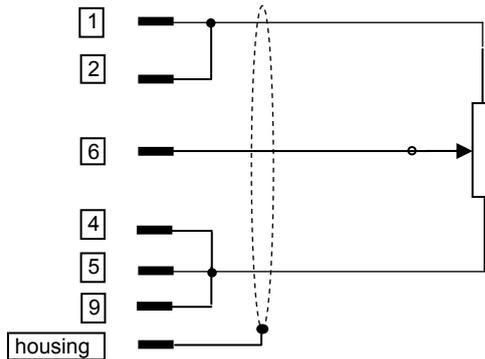
* the transmitter supply could be switched on/off by software (default: OFF) – only available in version 9310-V2xxx

Connect potentiometric sensors

X

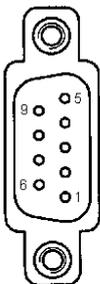


Rear view on bushing

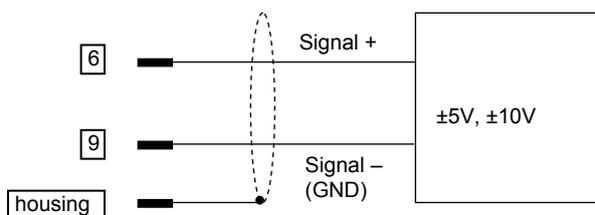


Connect sensors with standard signal

X

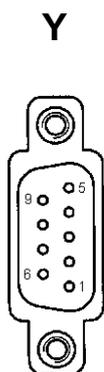


Rear view on bushing



Connect sensors to Channel Y

Configuration of pins on 9 pin bushing “Y”

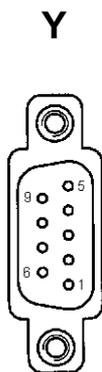


Rear view on bushing

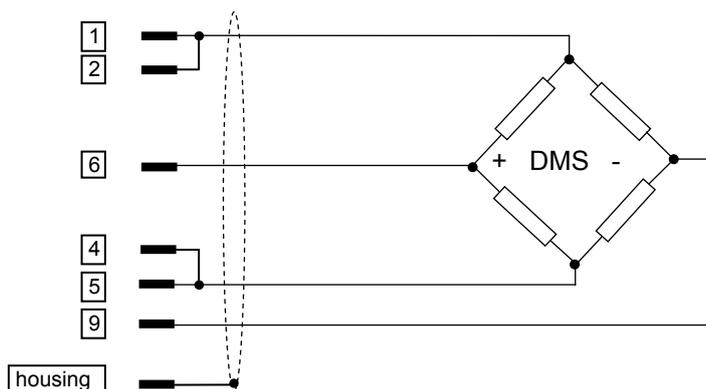
PIN	Meaning
1	+ Supply strain gage
2	+ Sense strain gage
3	24VDC transmitter supply*
4	- Sense strain gage
5	- Supply strain gage
6	+ Signal (st.gage/Stand. Input)
7	N/A
8	GND transmitter supply*
9	- Signal (st.gage/Stand. Input)
Housing	Shield

* the transmitter supply could be switched on/off by software (default: OFF) – only available in version 9310-V2xxx

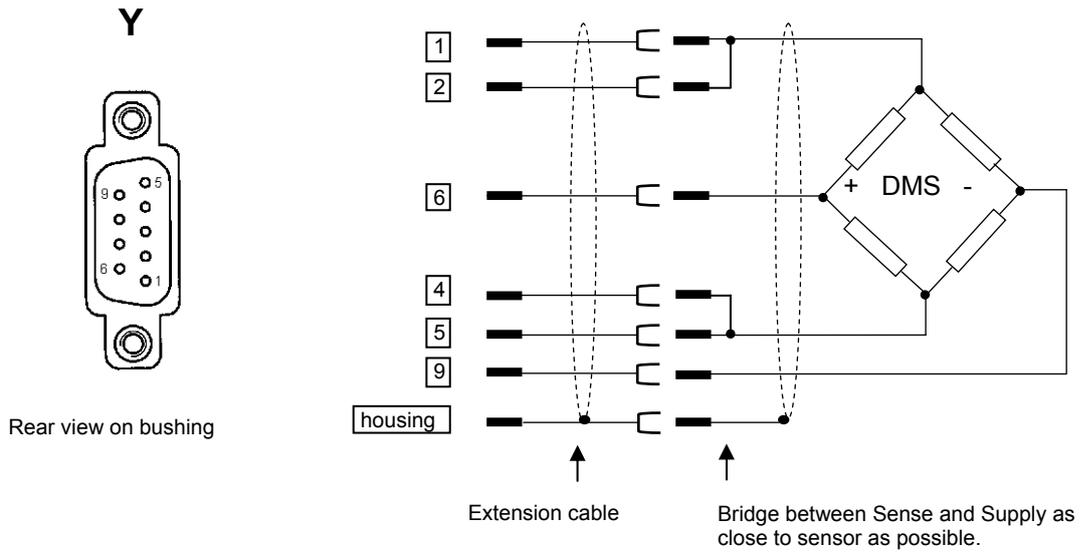
Connect strain gage sensors without sense line



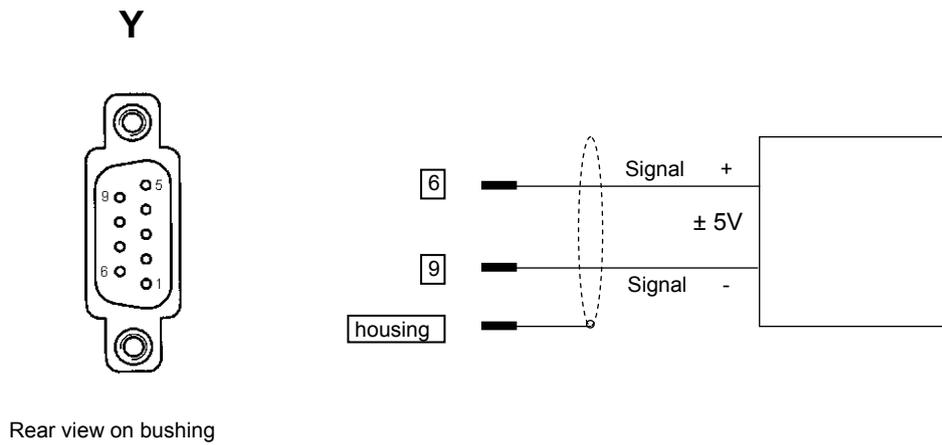
Rear view on bushing



Connect strain gage sensors with sense line



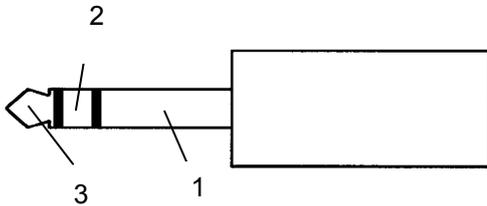
Connect sensors with standard signal output



RS232-interface (Jack)

There is a RS232-interface available on the instrument. It is prevised for connection to a PC (COMi) and can be used e.g. for configuration and for backup with the means of the PC-program DIGICONTROL® 9310 (Model no. 9310-P10x).

A data cable is included in the scope of delivery of a DIGICONTROL 9310, but can also be purchased separately with model no. 9900-K343.



Jack 3,5 mm 3-pin (Stereo)
Model-No.: 14408-3
Manufacturer: RENDAR (Farnell)

Digiforce 9310		PC/PLC	
Pin	Meaning	Pin	Connection
1	GND	5	GND
2	RxD	3	TxD
3	TxD	2	RxD
		4	DTR
		6	DSR
		8	CTS

PC/PLC-sided you must connect Pin 4, 6 and 8 together

Interface command RS232/RS485/Ethernet

If it is not available you should demand the separate manual „DIGIFORCE9310-interface manual“. In urgent cases you can demand it in pdf format at telephone no. +49-7224-645-0!

PROFIBUS

If it is not available, yet, you should demand the separate manual „DIGIFORCE9310-Profibus manual“. In urgent cases you can demand it in pdf format at telephone no. +49-7224-645-0!