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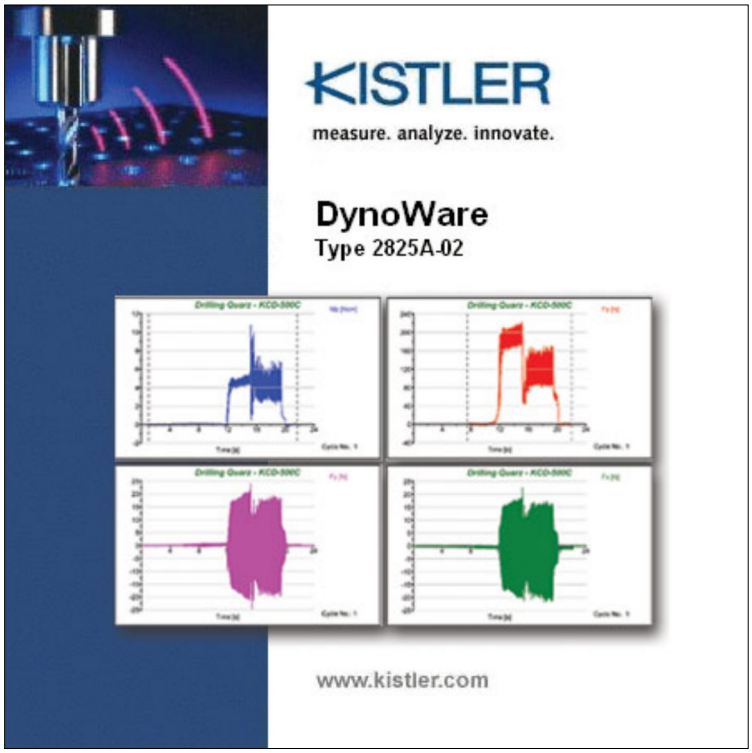

Instruction Manual

DynoWare
Type 2825A…

2825A_002-195e-10.13

Foreword

This manual is written for DynoWare, a general-purpose data acquisition and analysis software.

Information in this document is subject to change without notice. Kistler reserves the right to change or improve its products and make changes in the content without obligation to notify any person or organization of such changes or improvements.

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1. Introduction

We thank you for choosing a Kistler quality product. Please take the time to thoroughly read this instruction manual. It will help you with the installation, maintenance, and use of the DynoWare system.
To the extent permitted by law Kistler does not accept any liability if this instruction manual is not followed or products other than those listed under *Accessories* are used.
DynoWare is an easy-to-use data acquisition and manipulation program. The typical Windows controls apply to the graphs and dialog boxes in DynoWare. This section will give you a quick overview of the capabilities of DynoWare.

The menu bar is your access to all areas of DynoWare. It is divided into sections covering specific functions such as file handling, data acquisition configuration, hardware configuration, data viewing, window control, and obtaining help. In addition to the menu bar, there is a toolbar similar to those found in word processing and spreadsheet programs. The toolbar consists of icons that execute a specific function when clicked.
The user has full control over data acquisition. Sampling rate and length of trials, as well as amplifier range and trigger options are all easily accessible. The units of data acquisition can be customized to the desired physical data being measured.

The graphs are designed to be easy to read, and can be fully customized. The number of graphs to view is flexible, along with default parameters so each trial is readily viewed in a format that is most useful to the user.

If you have questions at any time while in DynoWare, simply press the F1 key and the DynoWare on-line help window appears. Help is also available from the menu bar.

Kistler offers a wide range of products for use in measuring technology:
- Quartz crystal sensors for force, torque, strain, pressure, acceleration, shock, vibration and acoustic-emission
- Piezoresistive pressure sensors and transmitters
- Signal conditioners, indicators and calibrators
- Electronic control and monitoring systems as well as application-specific software for measuring technology

Kistler also develops and produces measuring solutions for the application field engines, vehicles, manufacturing, plastics and biomechanics.
Our product and application brochures will provide you with an overview of our product range. Detailed data sheets are available for most products.

1.1 Getting Software Help

DynoWare software takes advantage of an online help system to offer you quick assistance.

To receive immediate help from wherever you are in DynoWare, press the F1 key and a window will pop up with specific advice about where you currently are in the software.

Help is also accessible through the menu bar found at the top of the screen.

If you need additional help beyond what can be found either on-line or in this manual, please contact Kistler's extensive support organization.

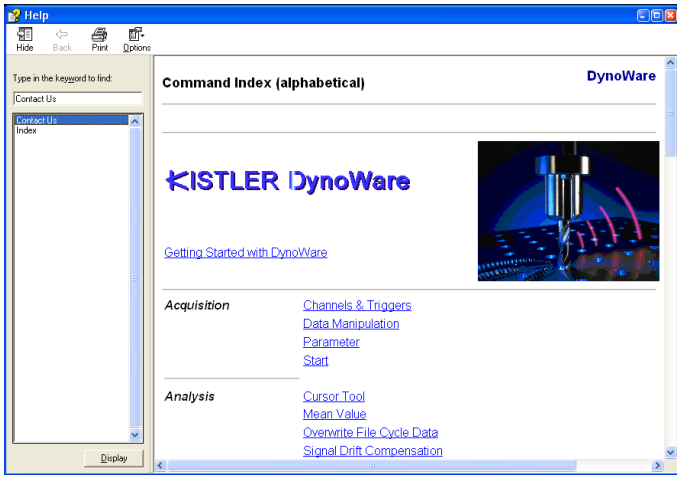


Fig. 1: Help is available by pressing the F1 key or by selecting the Help from the menu

1.2 Customer Support

The worldwide Kistler service organization is available for any special questions or problems that you may have after your careful study of these instructions.

Note, refer to sections 1.3 through 1.6 for general policies on customer support. Before you call, please be ready to fully explain your problem. If you are experiencing a problem with DynoWare software, please try to duplicate the problem and take a snapshot of the screen by pressing the "print screen" button. This copies the screen to the clipboard so that it can be pasted into a word processing program and printed. You can e mail this picture to Kistler.

1.3 Service and Assistance

The customer is responsible for proper DynoWare installation and operation. DynoWare must be installed as per instructions provided in sections 4 and 5. If modifications to these instructions are necessary for a particular purchaser site, Kistler recommends the purchaser contact a Kistler representative for input and advice regarding these changes.

Installation problems and subsequent system performance difficulties can be adverted by timely communication. Often, questions can be answered through email or telephone conversations. The purchaser is encouraged to email or call the appropriate Kistler organization in the event of such questions.

We welcome comments and suggestions for future features and enhancements.

1.4 License Agreement

Please refer to the Software License Agreement packet containing your DynoWare software and to the license presented during installation. This packet thoroughly details the Software License Agreement.

You may permanently transfer the software to another user provided you notify Kistler in advance, transfer the documentation and all disks, and notify the new user of the terms and conditions of the license agreement.

1.5 Warranty

Kistler warrants DynoWare to be free from defects in material and workmanship as stated in the software license agreement. It is warranted only under normal use and service. The period of warranty is twelve (12) months from date of shipment.

When returning items under warranty, said equipment shall be returned to Kistler Instruments prepaid. Full details relative to the claim or malfunction shall accompany the shipment. No action will be taken until these details are received. Please contact Kistler or your Kistler representative for a Return Authorization Number before returning goods.

Settlement will be made at Kistler's discretion, either through repair or replacement of the item in question or through issuance of full credit. Damage occurring through misuse or mishandling, will not be covered by this warranty.

This warranty is in lieu of all warranties expressed or implied, and of all obligations or liabilities on the part of Kistler Instruments for damages following the use or misuse of items supplied. Any unauthorized disassembly or attempt at repair shall void this warranty.

No agent or representative is authorized to assume for the Corporation any liability except as set forth within this warranty document.

1.6 Claims

Claims relating to goods delivered must be made within 14 days of receipt of goods. After fault determination by Kistler, settlement will be made either by the carrier, insurer, or Kistler. Means will be through replacement, repair or credit

2. Important Information

Please practice common sense safety rules at all times.

2.1 For your Safety

Prior to any installation and repair work or cable changes, you must disconnect all power sources from the instruments.
Observe all local safety regulations concerning the handling of line-powered electrical and electronic equipment.
When it must be assumed that safe operation is no longer possible, the computer, charge amplifier, etc. must be taken out of operation and secured against unintentional use.
Whenever opening covers or removing parts, except where this can be done by hand, use caution where parts under hazardous voltage are exposed.

2.2 Warning

Any breakage of the ground conductor inside or outside the instruments, or loosening of the ground conductor connection may render the instrument dangerous.

The power plug must be inserted in to a socket with a ground connector. The protection must not be nullified by an extension line lacking a protective ground connector.

When changing the signal conditioner fuses, only the standard type with the specified amperage rating must be used. Use of repaired fuses or short-circuiting the fuse holder is expressly forbidden.

2.3 How To Use This Manual

This manual will take you through the installation and setup of the DynoWare software, and a complete reference to all of the features of this software.

If you are eager to begin operation of DynoWare we recommend section 5 of this manual for a quick start guide. Remember that on-line help is always available by pressing the F1 key from anywhere in the software.

3. Description of DynoWare

3.1 General

DynoWare is a general-purpose data acquisition and display software package suitable for cutting force and general sensor / dynamometer applications. DynoWare lets you quickly setup, record, and display reaction forces and torques. Although development concentrated on measurement of cutting forces in mechanical machining, the measurement data acquisition and analysis functions can also be used for other measurement tasks. Depending on the data acquisition card, up to 28 channels are available for measurement acquisition. The software supports data acquisition cards for the PCI bus, PC cards for notebooks and the USB data acquisition system for DynoWare Type 5697A.

Fig. 2: The DynoWare splash screen appears for a few seconds when the application starts

All components have been included with the system (i.e., software, cables, and A/D card). A typical piezoelectric measuring chain consists of many components, each specific to the user's application. These include:

- Dynamometer
- Charge amplifier
- Data acquisition system for DynoWare (ex.Type 5697A with integral A/D card from Measurement Computing Inc)
- DynoWare software and manual
- All necessary cabling

3.2 System Requirements

Recommended Computer Specifications:

- Microsoft Windows® XP Professional, Vista, Windows® 7 (32 bit and 64 bit versions)
- Pentium PC, 1 GHz or higher
- At least 512 MB of RAM
- Graphics card with at least 800x600 pixels and 256 colors
- At least 100 MB of free hard-disk space
- One free slot for the A/D card (PCI)
  or
- One USB 2.0 port for DAQ-System Type 5697A
- Adobe® Reader® for printing out measurement data
- Color printer (recommended)

4. Installation

This chapter will show you how to install the data acquisition card, the DynoWare software, configure the data acquisition hardware, as well as connect the cable from the A/D card to the signal conditioner.

4.1 DynoWare Software Installation

DynoWare software consists of one CD-ROM media disk containing an automatic installation procedure. To install DynoWare perform the following procedure:

Some antivirus software packages can adversely affect the DynoWare installation process. Temporarily disable your antivirus software prior to installation.

1. Insert DynoWare Disk into your CD-ROM drive.

With many CD-ROM systems the *Autorun* function is activated and the splash routine opens the installation window automatically as soon as the CD-ROM is recognized. In this case you can go straight to step 4.

2. (If your CD-ROM is setup to auto play you can skip this step.) From the Start menu, choose **Run**, in the dialog box, type "d\:kistlersetup" (without the quotes) substitute your CD-ROM drive letter for "d" above, choose OK.
3. The "kistlersetup.exe" program presents general information on installing DynoWare. We recommend reading this information prior continuation. The options presented are to "Browse Technical Notes", "Browse Documentation", "View System Requirements" and "Install DynoWare Software".
4. When ready to install DynoWare, select the "Install DynoWare Software" option.
5. Follow the onscreen instructions.

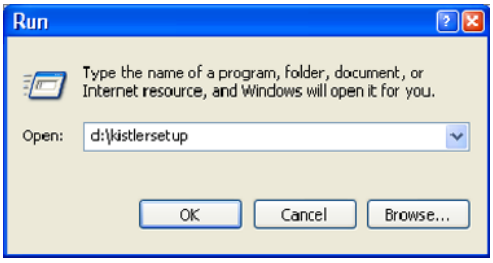


Fig. 3: Start Setup program

Alternative method of installation

Another way of installing the program if it is not started automatically is to manually click the file 'kistlersetup.exe' in the root folder of the CD-ROM. The installation window is opened and you can go straight to step 4.

The first installation screen will present you with a choice of the default language.

You can switch the user language of DynoWare at any stage of operation.

Then you will be presented the License Agreement. Confirming acceptance displays the readme and user information, and the destination folder for programs and data can be specified. The Setup Type dialog allows you to choose between Complete and Custom installation. Normally, Setup Type should be set to "Complete"

The Setup Type "Complete" will install the DynoWare application, the HASP Runtime License Drivers, the driver of the data acquisition system and the driver of the USB interfaces to the connecting box Type 5697A.

We always recommend to install the "complete" version of this software.

Pressing "Install" starts the actual installation. Follow the instructions. Finally, to apply the drivers the PC must be restarted.

4.2 HASP Key Installation

Without a hardware key or "dongle" DynoWare only starts in the demonstration mode.

The dongle (HASP key, runtime license) is needed to acquire data and exploit the various possibilities offered by DynoWare. This dongle is the only way of legitimizing the software.

If you are using the DAQ-System Type 5697A you can go straight to section 4.3.3.

Install the runtime license as follows:

1. After installing DynoWare insert the dongle in a free USB port on your computer.

The relevant drivers are installed automatically.

4.3 Installing Data Acquisition Card

The data acquisition card should be installed by someone who is familiar with installing internal computer peripherals. If you are unsure how to open your personal computer or if your system is warranted under a service contract, please have a qualified technician install the card.

The installation CD-ROM contains card specific Installation Technical Notes for the various A/D card supplied by Kistler. See these technical notes as well as the information below. The procedure to install and configure the card is highly dependent on the specific card purchased with DynoWare.

Make sure to disconnect the power source from your computer before opening it.

Protect the system and A/D card from static discharge by touching the computer chassis to ground yourself prior to handling the A/D card.

4.3.1 PCIM-DAS1602/16

The following steps are recommended for A/D card installation:

Make absolutely sure to take note of the technical information in the file K20.302-4e PCIM-DAS1602.pdf on the installation CD before inserting the PCIM-DAS1602/16 card.

1. With the power off and the power cord unplugged, remove the computer PC cover to gain access to the system's expansion slots. Avoid touching any components inside the PC.
2. Touch the metal computer chassis prior to handling the A/D card to avoid inducing static shocks.
3. Set the on-board switch to BIP (bipolar) (see your card manual).
4. Set the on-board switch to 8 channels (differential).
5. Select an available PCI slot, and remove the back plate metal covers with a screwdriver.

6. Carefully insert the A/D card into the slot making sure that it seats correctly into the computer. Replace the slot cover screw, fastening the edge of the card to the chassis of the PC.
7. With the A/D card properly installed, replace the cover of the computer and tighten the screws.
8. Restart the computer. The card will be auto-detected by the plug-and-play operating system. If prompted for the driver, insert the DynoWare CD-ROM containing the CBI95.INF file.
9. Follow the instructions in sections 4.4.1.

4.3.2 PC-CARD-DAS16/16

The following steps are recommended for A/D card installation:

Make absolutely sure to take note of the technical information in the file K20.302-6e PC-CARD-DAS16.pdf on the installation CD before inserting this card.

1. Ensure DynoWare is fully installed (see 4.1).
2. With the power on and Windows running, insert the PC-CARD-DAS16/16 into a PCMCIA type II slot.
3. Windows will recognize this device as a new device and will prompt you to enter the disk with the manufacturer's drivers. This is the CD-ROM with the DynoWare installation program and containing the file CBI95.INF. Insert the disk into the drive and continue.
4. Windows will load the necessary PC-CARD drivers and configure the PC-CARD-DAS16/16.
5. Follow the instructions in section 4.4.2

4.3.3 Type 5697A DAQ-System for DynoWare (USB2533)

The following procedure is recommended for installing the A/D card:

Make sure to take note of the technical information in the file K20.302-11e Type 5697 DAQ.pdf on the installation CD before inserting this card.

1. Ensure DynoWare is completely installed (see section 4.1).
2. Power up the data acquisition system with the switch in the OFF position. The outer ring of the connector must be tightened clockwise beforehand.
3. Connect the acquisition system to the PC with the included USB cable.
4. Insert the USB runtime license dongle (HASP key) into the matching slot in the data acquisition system.
5. Switch the data acquisition system for DynoWare on (ON position) after starting the Windows operating system.
6. Windows detects the device and installs its drivers. If Windows is searching for drivers, insert the DynoWare installation CD-ROM then follow the instructions.
7. Windows loads the required drivers and configures them for the Data Acquisition System Type 5697A.
8. Follow the instructions in section 4.4.3.

Older cards can be activated manually. Whenever the DAQ-System Type 5697A is removed from the computer and reconnected, or switched off and on again, INSTACAL must be started to allow loading of the necessary drivers.

4.4 A/D Card Configuration

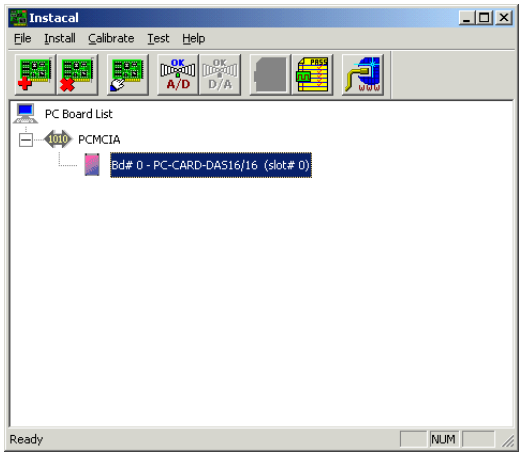


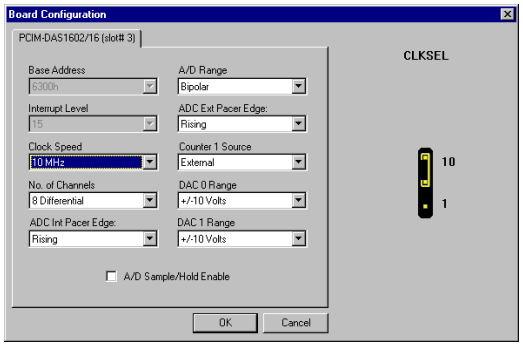
Fig. 4: Instacal board configuration program

The software configuration process involves two steps. In the first the card and data acquisition drivers are configured with INSTACAL. This requires certain routines from the manufacturer of the acquisition card. In a second step this setup must be exported to DynoWare.

INSTACAL can be started under the **Measurement Computing** group of programs. The program configures the driver and A/D card setup for you. Look for the **Measurement Computing** group of programs (Start menu → (All) Programs) and choose the **Instacal** icon.

The Instacal card configuration program will automatically identify and plug-and-play capable data acquisition cards. Manually add any non plug-and-play cards.

Selecting the Instacal program **Calibrate** menu option will reconfigure the card's factory calibrated parameters and affect the accuracy of your measurements. **Do Not run the Calibration routine.**



Instacal will automatically identify any installed plug-and-play cards. Any non plug-and-play card will have to be manually added by selecting the **Install** menu option and then selecting the desired card from the list. Instacal should be run any time a card is removed from a computer (even for PCMCIA cards).

Fig. 5: Configuration for the PCIM-DAS1602/16

DynoWare will use the card configured in Instacal as board zero. By default, the "DEMO-BOARD" is installed as board zero. Remove the "DEMO-BOARD" and reconfigure the desired **card** to be number zero (See section 4.5). This applies to all of the A/D cards listed here.

Once the card is installed it will need to be configured. Right click on the card and select **Configure…** or double click the card.

4.4.1 PCIM-DAS1602/16

See technical note K20.302-4e PCIM-DAS1602.pdf contained on the installation CD-ROM for detailed information.

The following parameters should be set:

Channels	Select 8 channels, differential mode (note: Instacal setting must match hardware switch setting).
Input Mode	Bipolar (note: Instacal setting must match hardware switch setting).
Clock Speed	Select 10 MHz (note: Instacal setting must match hardware switch setting).

4.4.2 PC-CARD-DAS16/16

See technical note K20.302-6e PC-CARD-DAS16.pdf contained on the installation CD-ROM for detailed information.

The following parameters should be set:

Channels	Select 8-channel differential mode (note: Instacal automatically controls hardware setting).
Input Mode	Bipolar (note: Instacal automatically controls hardware setting).
Clock Speed	Select 10 MHz (note: Instacal automatically controls hardware setting).

4.4.3 Type 5697A DAQ-System for DynoWare (USB2533)

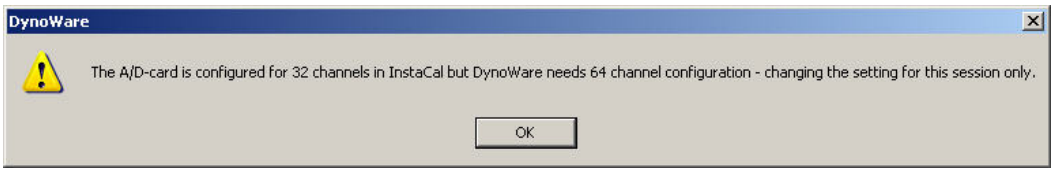
See technical information K20.302-11e Type 5697 DAQ.pdf on the installation CD-ROM for more detailed information.

The following values must be set:

Channels

Choose 64 channels, **single-ended mode** (note: Instacal automatically controls the hardware setup).

If the card is not set to 64 channels single-ended, the following message is displayed when DynoWare is started up:



DynoWare automatically switches to 64 channels single-ended.

4.5 Set Card Number to Zero

DynoWare operates using the Instacal card configured as card number zero. By default, "DEMO-BOARD" is installed as card number zero. Right click the card zero "DEMO-BOARD" and select either Delete (to remove it completely) or Change Board# to reconfigure it at a different card number. Then Right click the desired card and select Change Board# to reconfigure it as Board zero. Your card is now properly configured to operate with DynoWare.

The A/D bits, Available channels, Acquisition mode and Maximum Channels will be automatically set reflecting the card type selected. The gain can be selected in DynoWare to your specifications. The gain setting changes the scale on the card itself, so the lower the scale means the better the resolution. However, it also means a lower overall measurement force range, so the user must be careful not to choose too high of a gain such that saturation occurs (i.e., be sure the forces to be measured do not exceed the measuring range of the system. If this occurs, choose a lower gain such as ±10 V).

4.6 Running DynoWare

To run DynoWare, open the Kistler Group in the Programs extension of the Start Menu and click on the **DynoWare** icon. It is possible to change the program language, see section 7.2.

4.7 Connecting the Measurement Signal Cable ("Analog Input")

4.7.1 PCIM-DAS1602/16 and PC-Card-DAS16/16

There is one (1) 37-pin cable that connects the junction box or amplifier to the data acquisition card. To properly connect the cable:

1. Shut down the computer and turn off the power to the computer and the amplifier.
2. Connect the 37-pin cable from the A/D card to the junction box or amplifier.
3. Be sure to tighten any cable-fastening screws by hand to secure the cable connections and prevent slippage (do not overtighten).
4. Turn the amplifier and computer on.

If the cables are not long enough, additional cables could be connected to the original ones to extend their lengths. Excessively long cables are not recommended because insulation may not be adequate to prevent interference and loss of signal.

4.7.2 Type 5697A DAQ-System for DynoWare

NOTE

DAQ-System, Type 5697A, with DynoWare allows for acquisition of up to 28 channels simultaneously, by using both "Analog Input" connections.

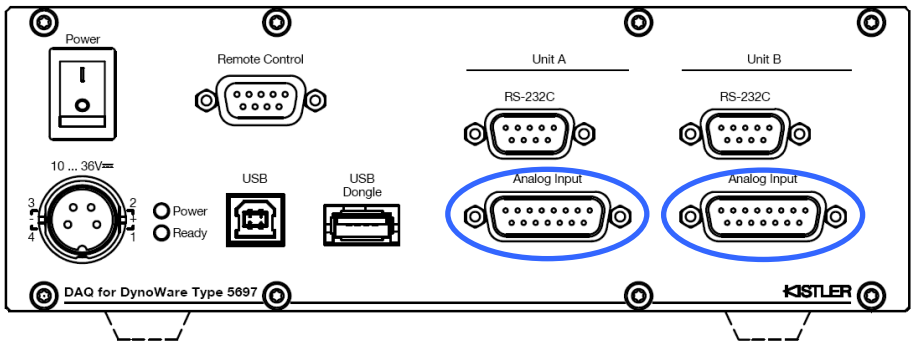


Fig. 6: Connections on DAQ-System Type 5697A

A 15-pole low-resistance measurement signal cable Type 1700A111A2 or type 1700A113A2 connects the connecting box of the DAQ-System for DynoWare Type 5697A to the charge amplifier or signal conditioner. Connect the cable as follows:

1. Switch the connecting box and the amplifier or signal conditioner off.
2. Connect the 15-pole cable Type 1700A111A2 from the connecting box to the connector box or the amplifier.
3. Tighten the screws on the connector to secure the connections (however, to avoid damaging the thread do not overtighten).
4. Switch amplifier and connecting box on.

4.8 Connecting RS-232C Interface Cable

A RS-232C interface cable Type 1200A27 or Type 1475A3 (see section 9) is required to control the charge amplifier or signal conditioner. If the A/D card PCIM-DAS1602/16 or PC-Card-DAS16/16 is being used this connection is made directly to the PC or notebook, if the DAQ-System Type 5679A is being employed it is made directly to the connecting box.

4.8.1 Connecting to PC / Notebook

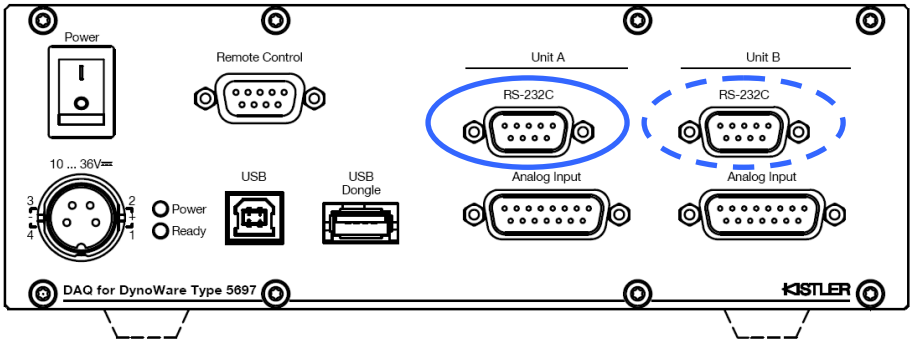
If there is an RS-232C interface on the PC or notebook, the corresponding interface cable (see section 9) is connected directly to the notebook. Notebooks in particular often no longer have an RS-232C port, and therefore have to be used with a USB-RS-232C converter. We recommend also purchasing this adapter from Kistler (Type 2867). When using such an adapter also ensure the matching software is installed.

4.8.2 Connecting to Connecting Box Type 5697A

The connection between signal conditioner or charge amplifier and DAQ connecting box is also made with an RS-232C cable. This is connected directly to the RS-232C of Channel 1 on the connecting box.

NOTE

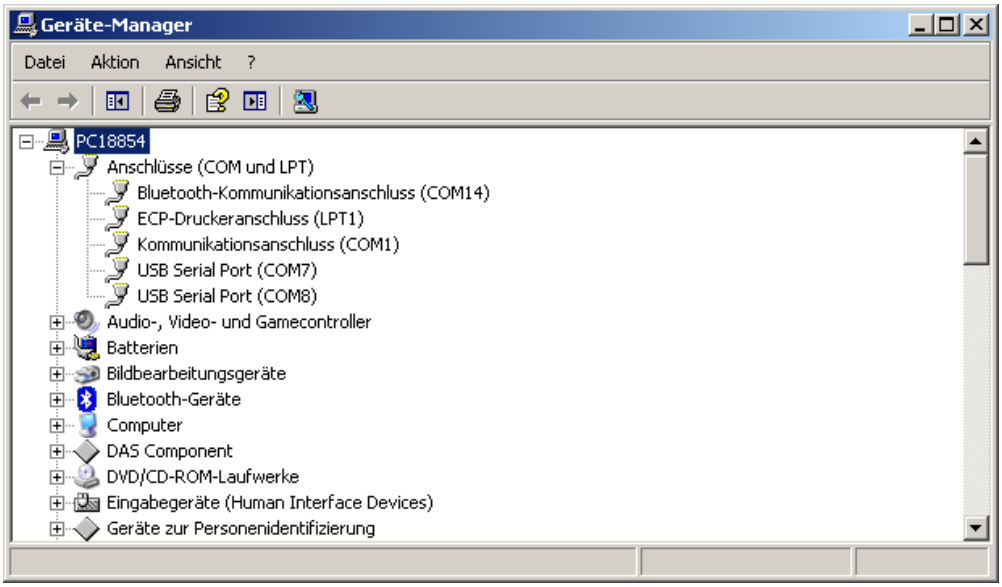
DynoWare is not capable of controlling two charge amplifiers or two signal conditioners via DAQ-System Type 5697A. Due to that it is not recommended to use both RS-232C connectors in parallel. To avoid communicating complications, either the RS-232C connector of "Unit A" or of "Unit B" should be used to connect the amplifier.



NOTE

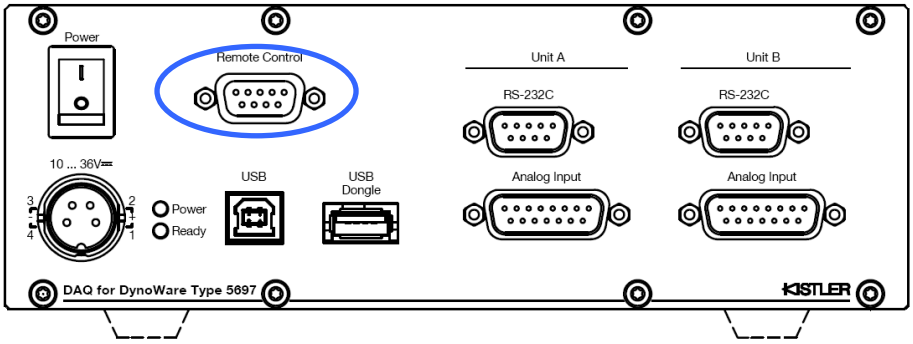
The used COM-ports of the two serial interfaces of DAQ-System Type 5697A can be found in the Device Manager of Windows. For the case shown below the serial port of Unit A is on COM7, the serial port of Unit B on COM8.

COMx has to be defined in the Hardware settings (see chapter 6.2.1) to communicate with charge amplifiers or signal conditioners.



4.9 Using Remote Control Interface on DAQ-System Type 5697A

The measuring chain can be triggered via the 'Remote Control' interface on the DAQ-System Type 5697. This is possible with, for example, the inductive proximity switch Type 2233B from Kistler. The pin allocation is to be found in section 8, the necessary DynoWare setup in section 6.2.2.2.



4.10 Important Issues Regarding Piezoelectric Dynamometers

Please take care to follow these rules applying to installation and handling of dynamometers and connections:

- Protect the signal conditioner and cable connector ends from dust and moisture. Close end caps.
- Dynamometer mountings must be level and properly secured.
- Use caution connecting and removing the cables. Also take care to not step on the cable connections to avoid shearing off the cable.

4.11 Charge Amplifiers

DynoWare automatically controls the range selection, filter selection and operate/reset functions of several types of Kistler charge amplifiers. Charge amplifiers should be allowed to warm up sufficiently for most accurate measurements, with 30 minutes being a minimum. Unplug the amplifier if it is not to be used for a very long time.

5. Quick Start

This section will help familiarize the new user with DynoWare.

Data cannot be acquired until the hardware is properly configured. This section is meant as an overview to the features of DynoWare that will be applied to acquired trials and graphs once the proper configurations have been performed. For more information on configuring DynoWare, refer to section 6.2.

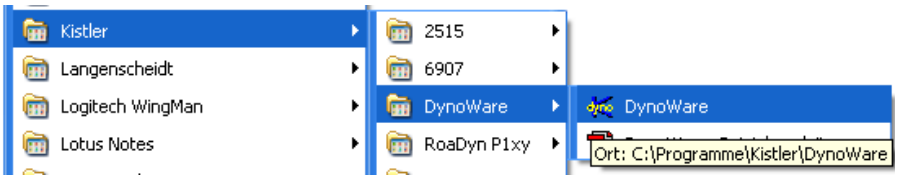


Fig. 7: Running DynoWare from the Start menu

Start DynoWare by choosing:
Start → (All) Programs → Kistler → DynoWare → DynoWare.

The splash screen appears briefly and shows current application version and product type information.

Fig. 8: DynoWare "Splash Screen"

The **File** menu allows you to open stored trials, print, save, export, manage configurations and exit the program. The print setup can be customized here also. Feel free to open some of the supplied trials (by default: C:\Kistler\DynoWare\Data) and manipulate them to help familiarize you with the program's capabilities.

The **Acquisition** menu is where hardware is configured and where data acquisition is performed. Choosing Acquisition → Hardware will bring up the Hardware Dialog Box (Fig. 9) showing the configuration settings. Choosing Acquisition → Setup allows the user to configure data acquisition specific parameters (Fig. 10). Acquisition → Start will begin the acquisition process.

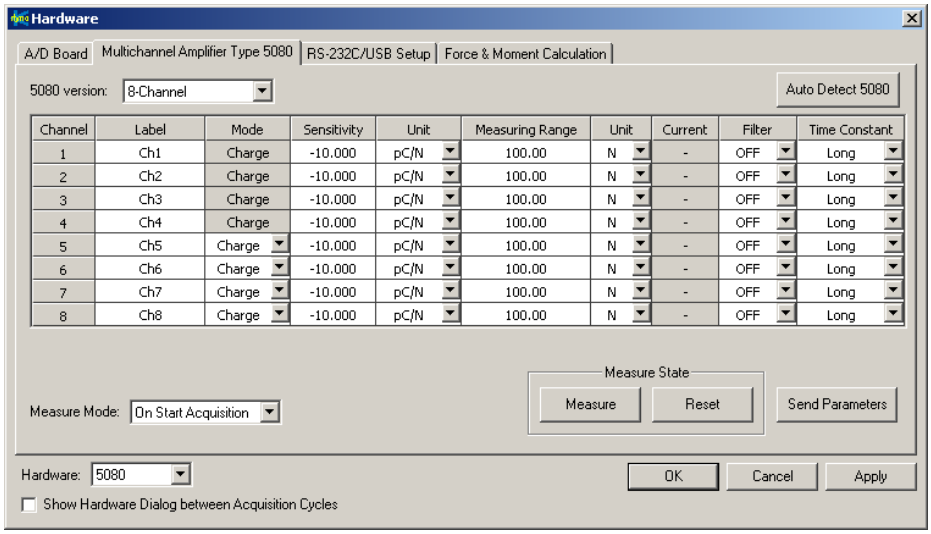


Fig. 9: Hardware setup dialog box

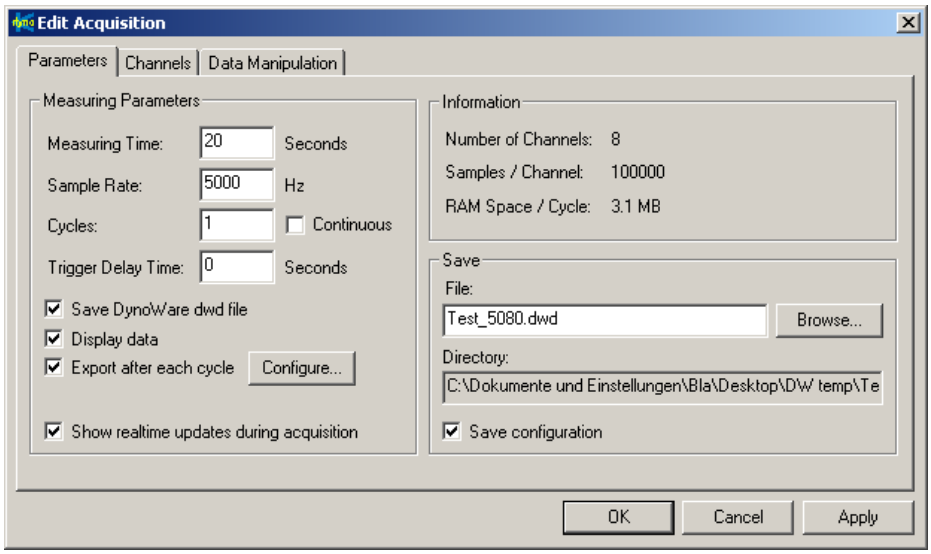


Fig. 10: Edit Acquisition

The **View** menu allows the user to configure DynoWare graphic preferences and to edit the trial documentation. Selecting View → Setup (section 6.3.3) allows configuration of the default graphs that appear when a file is opened or a trial is acquired. With View → Edit the content of an individual graph can be changed.

Double clicking on a specific feature of the graph (title, legend or axis title) provides editing capability.

The view can be changed at any time without adversely affecting the data in any way. A user may also zoom the displayed area, enable/disable grid lines, display a moving cursor, and edit labels and documentation information from the **View** menu.

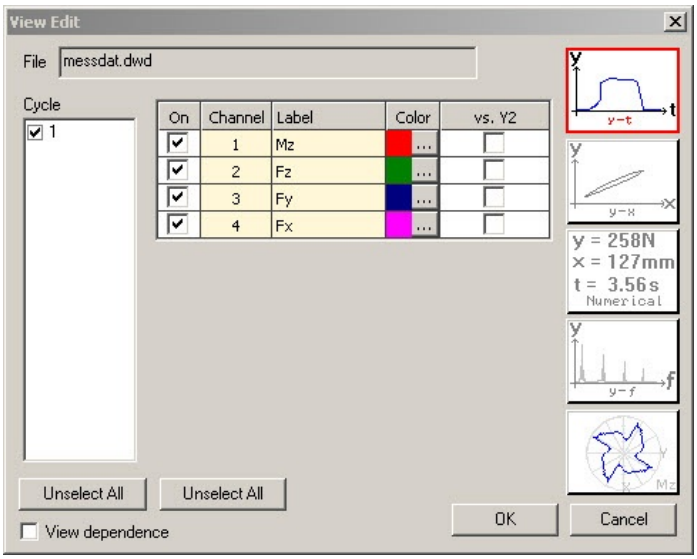


Fig. 11: View Edit

The **Analysis** menu gives options for smoothing or filtering data, statistic options and data manipulation.

The **Tools** menu provides two methods for displaying real-time voltage data: Oscilloscope and Voltmeter. These tools are designed for simple troubleshooting of the system.

The other menu that appears when a graph is shown is the **Window** menu. The **Window** menu uses standard Microsoft Windows commands to arrange active windows.

6. Reference

This section describes the menus used in DynoWare.

6.1 File...

Depending on whether or not a graph is open on the screen, the **File** menu will have a different appearance. If no graph is open, there will only be commands to **Open, Configuration, Export** and **Exit** DynoWare.

6.1.1 Open…

This will bring up a **file open** dialog box where the desired trial can be selected for viewing. The default directory is the data directory, though the dialog box can be easily navigated using standard Windows techniques to browse other drives, directories, and network computers. The extension for the trials are "*.dwd". Files stored in DynoWare 1.x format will automatically be converted and loaded.

If a valid configuration file exists, the **Load Configuration File** check box will be available and the user can choose to load the configuration options associated with the file (hardware setup, data acquisition, and view setups). If a configuration was not stored for the data file, this option will be disabled and appear grayed out.

6.1.2 Save modified file

The operations **Smoothing on** (see section 6.4.4), **Filtering on** (see section 6.4.6) and **Signal Drift Compensation** (see section 6.4.3) display temporary changes to a data set. These operations do not permanently affect the data stored in a file. To permanently archive these changes, select **Save modified file** from the **File** menu.

This operation allows the user to apply several different functions to a data set. For instance, data can be compensated for drift; the changes save in the file, and then Mean value analysis can be done. Normally the drift compensation and mean value functions are mutually exclusive (cannot be done at the same time).

Overwritten changes cannot be undone and permanently modify the data in the file. The original data file will be saved as "*.bak.dwd".

6.1.3 Configuration...

The Hardware, Data Acquisition and View settings can be loaded or stored to a file. The default extension for configuration files is "*.cfg".

6.1.3.1 Load...

To load the Hardware, Data Acquisition and View settings from a configuration file select **Configuration Load**. This will overwrite the existing DynoWare configuration settings. A standard Windows file open dialog box (see Fig. 12) will be presented to select the appropriate configuration file to load. To load a configuration file automatically when a data file is opened enable the **Load configuration file** option in the File Open dialog box (See chapter 6.1.1).

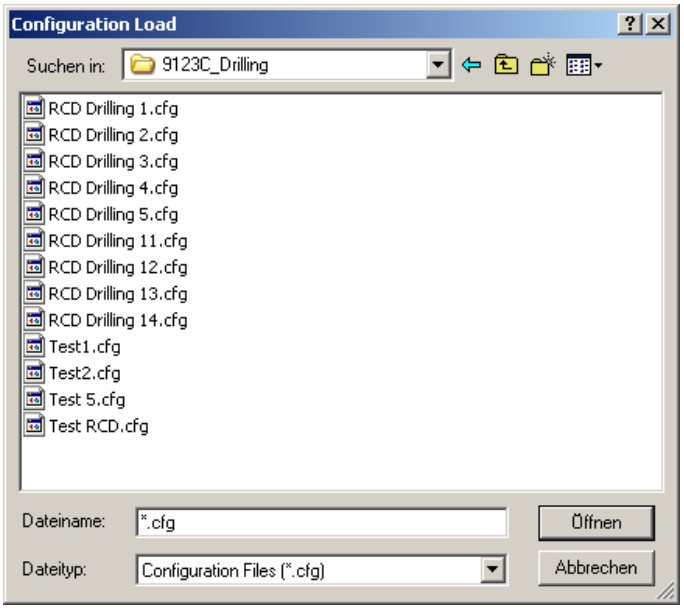


Fig. 12: Configuration Load

6.1.3.2 Save...

To store the Hardware, Data Acquisition and View settings to a configuration file select **Configuration Save**. A standard Windows file save dialog box will be presented to select the appropriate configuration file name to save the current settings. The default extension of configuration files is "*.cfg". Configuration files can be saved automatically by checking the **Save configuration** option in the **Acquisition Edit** dialog box.

6.1.4 Export…

Files may be exported to ASCII delimited text files by selecting File Export (e.g. for further evaluation in Microsoft EXCEL). The Export Dialog allows for the selection of the cycles to export, and the channels to export. All measurements are exported with **Every sample**.
The setting **Every n-th sample** results in only every n-th measurement being exported and the intermediate measurements being lost.
The setting **Export mean value of group (of n samples)** results in the mean of n measurements being exported rather than individual measurements. Values from 2 to 100 can be entered for n.
The option **Export partial time interval** exports data of a defined time frame.
The original DynoWare file is not changed by such data reduction; it is just that fewer data points are exported. This simplifies importation of Excel spreadsheets, whose row count is limited to 65 000. Fig. 13 makes it possible to select which channels and which measuring cycles are to be exported. The user can choose the data delimiter or enter one of their own. If **Comma** is chosen as a separator the extension of the file is changed to "*.csv" automatically.

The destination of the export file can be chosen by selecting **…** in Fig. 13. To export data confirm settings with **OK**. A new box is displayed to show progress. An example of an exported file is shown below.

Use the **Select All** / **Unselect All** on Fig. 13 buttons to select the required channels and measuring cycles faster.

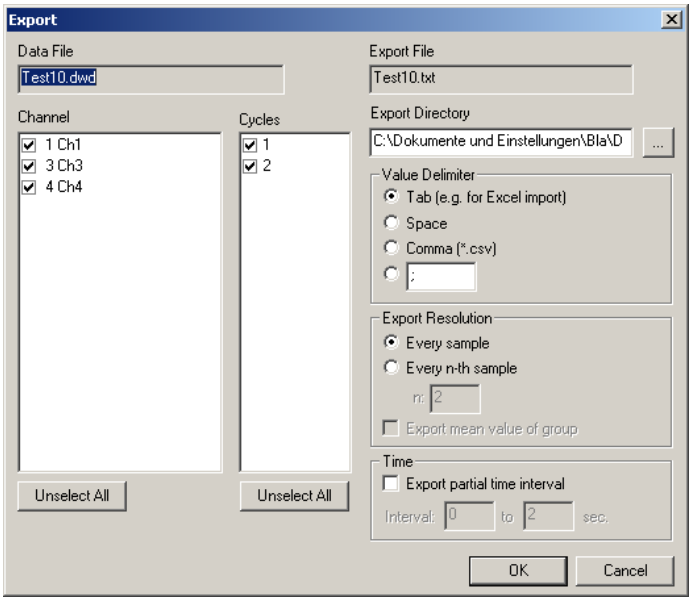


Fig. 13: Export dialog box

Tip:

Using tabs as delimiters allows the export file to be opened directly in Microsoft Excel.

DynoWare uses the American number format with a period "." as decimal separator and comma symbol "," for digit grouping. If the country setting for numbers on Control Panel is set otherwise problems can arise when the export file is opened in Excel, as some numbers will be read as date.

Example of an exported file:

File Header Information

FILE TYPE:		
Path:	C:\DynoWare_Data\IPL-Tagung\	
Filename:	5A-Fraesen_Aussen_2.dwd	
Config ID:	5A-Fraesen_Aussen_2.cfg	
Setup ID:	0	
Manipulated:	0	
Filename 1:		
Filename 2:		
Date:	Monday, 12 September , 2000	
Time:	13:43:19	
Sampling rate [Hz]:	3000	
Measuring time [s]:	90	
Delay time [s]:	0	
Cycle time [s]:	0	
Cycles:	1	
Samples per channel:	270001	
Cycle interval:	0	
Channel enabled:	1	1
Cycle No:	1	
Time [s]	Fz	Mz
0	-2.83203	2.44E-03
3.33E-04	-3.11523	-4.88E-03
6.66E-04	-3.11523	-2.44E-03
1.00E-03	-3.11523	-2.44E-03
1.33E-03	-2.83203	-2.44E-03
1.67E-03	-2.54883	-2.44E-03
...	...	...
2.67E-03	-2.54883	-2.44E-03

File Header Information

File Data

6.1.5 Print...

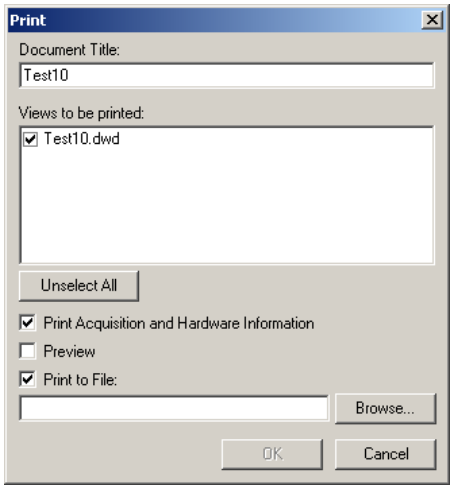


Fig. 14: Print dialog

Shortcut: **Ctrl+P**

Print... brings up the Print dialog box (Fig. 14) using the default print settings. The user selects the views to be printed by clicking on the views in the list. The Document title appears as the default graph title but the user can change the title here. Pressing the **Select All** button will select all open views to be printed. **Print Acquisition and Hardware Information** enables the printing of the Amplifier and Acquisition configuration at the bottom of the printout, previewing the printout on screen prior to making a hardcopy, and printing to a file for later viewing.

Some printout information will be disabled if the selected view contains Multiple cycle data.

After selecting **OK**, the Printer selection dialog will appear allowing the user to change the printer and select the number of copies to print.

If the **Preview** option was checked the print preview screen will appear (see section 6.1.6).

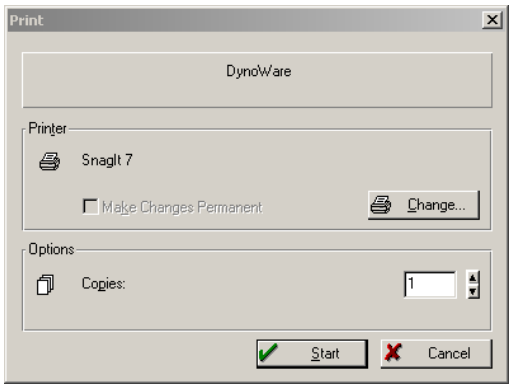


Fig. 15: Printer selection

6.1.6 Print Preview…

The **Print Preview…** is identical to the Print function above except the output appears on the monitor. This allows the user to see what the printout will look like on the prior to printing so that any necessary changes can be made before the print function is carried out. From this dialog box you can zoom in on the image for a closer look, create a **print file**, directly email a **print file** and execute the hardcopy Print function.

A print file is a special "*.ll" file that can be viewed with a special viewer. The special viewer, LLViewer, is available on the installation CD-ROM in the LLViewer subdirectory or in the installation directory – by default C:\Kistler\Dynoware\. Run the LLView.exe installation program and follow the onscreen instructions. Files directly emailed will need the LLViewer to view the email contents.

KISTLER

9129 Stahl Schruppen

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Printed on 21. December 2010 at 09:00

Measuring File

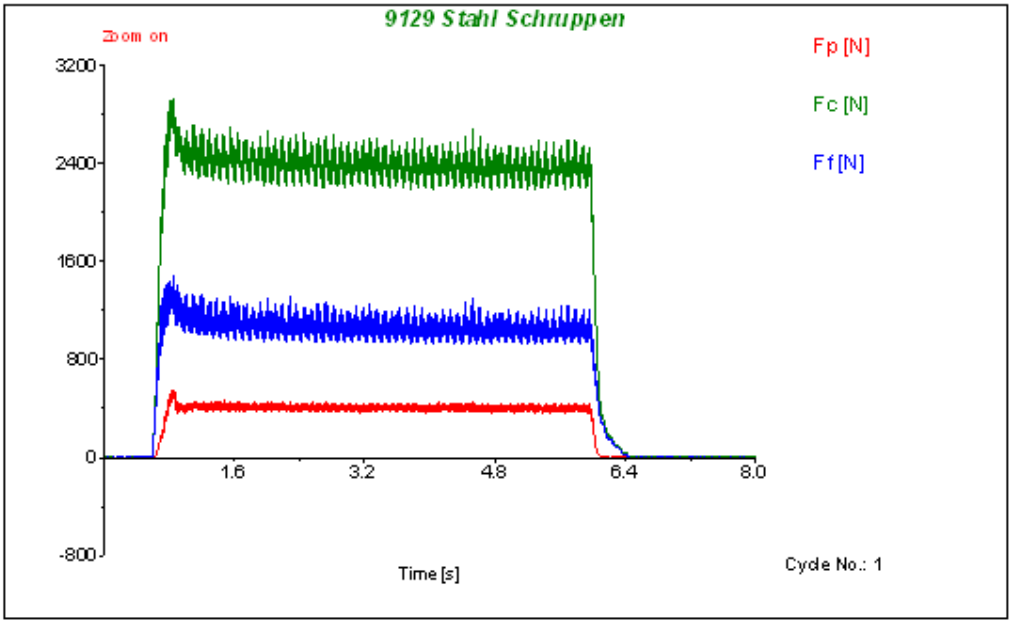
Path: \\int.kistler.com\kistler-dfs\X-Teams\087-Kraft-Schnittkraft\Messungen Bla\9129A
Cycle: ETHZ\9129_Stahl\9129_Stahl_VZyl_Schruppen_1.bak.dwd
Date: 1 of 1
Size: Thursday, 12 March 2009, 14:52:39

Documentation

Remark: Mit TP-Filter
Material: Automatenstahl 9SMnPb28K
Tool: Iscaar CNMG 432-GN, IC9015

vc = 170 m/min | f = 0.5 mm/rev | ap = 4 mm
n = 730 rpm | vf = 365 mm/min | ae = - mm

Measuring Data



Acquisition Parameters

Measuring Time:	20.0	s
Sample Rate:	4000	Hz
Number of Cycles:	1	
Delay Time:	0.0	s

Amplifier / Signal Conditioner Setup

Channel	Label	Sensitivity	Units	Range	Units	Filter [Hz]	Time Const.
1	Fp	8.077		1000.00	N	300 Hz	Long
2	Fc	4.133		4000.00	N	300 Hz	Long
3	Ff	8.059		2000.00	N	300 Hz	Long

KISTLER DynoWare - Type 2825B-1-2x2.5.0

Fig. 16: Print preview

6.1.7 Print Setup…

Print Setup… allows the user to configure the printing specifications. Standard setup functions are to select the printer, paper size and tray (if applicable), and the paper orientation. A **Properties** button allows further customizing of printer settings.

6.1.8 Copy to Clipboard

This will copy the active window contents to the Windows clipboard. The graph can then be pasted into a word processing or spreadsheet application as a graphic.

6.1.9 Exit

Exit closes DynoWare. Since changes to the data are continuously stored in the file, no extra question is necessary about saving changes.

6.2 Acquisition

The **Acquisition** menu is where all data acquisition and hardware configuration is performed.

6.2.1 Hardware…

Shortcut: **Alt+H**

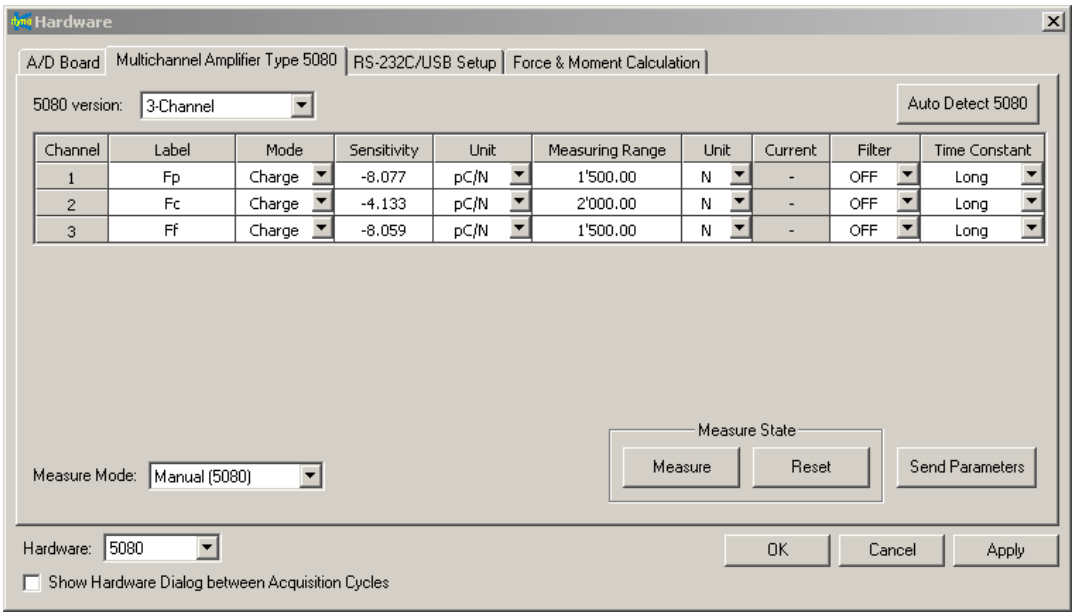


Fig. 17: Hardware configuration

The **Hardware…** dialog box allows the user to customize specific equipment used in the system. The dialog has several different tabs dependent upon the specific amplifier configured in the system. There are up to four major items that can be configured: The A/D card, the amplifier and the dynamometer plus force & torque calculation and communication interface settings specific to an amplifier.

6.2.1.1 A/D Card

The A/D card is automatically selected from the INSTACAL board configuration program from Measurement Computing (see section 4.4). This tab shows the configured A/D card (board in Instacal) and allows the user to edit the A/D board gain selection (A/D Board Full Scale measurement range in volts).

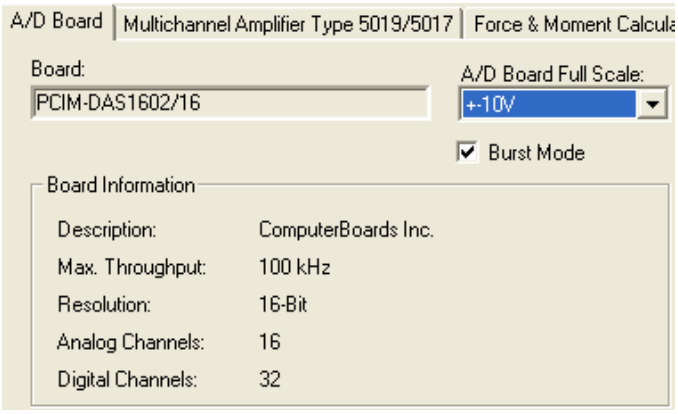


Fig. 18: A/D card setup

Information displayed is:

Board — Displays the A/D card that is configured in the INSTACAL program.

Full Scale — The **A/D Board Full Scale** input defines the resolution of the A/D card: Small Full Scale = more resolution per volt, Note: All input voltage signals to the card must be smaller than the defined Full Scale.

Burst Mode — Normally, the sampling clock runs at 1/(sample rate * number of channels). This results in some fixed latency in sampling time between individual channels. To minimize latency, **Burst Mode** allows each channel bank to be scanned / sampled at the full rate of the card.

Example:

Sampling 2 channels @ 50 Hz, max. throughput 100 kHz.

Non Burst Mode Channel to Channel latency time = 1/(50*2) = 0,01 s = 10,0 ms

Burst Mode Channel to Channel latency time = 1/(100 000) = 0,000001 s = 0,01 ms

When burst mode is enabled, the system closely approximates Simultaneous Sample and Hold.

If the PC-CARD-DAS16/16 is being used, DynoWare disables the burst mode for data throughputs greater than 33 kHz, as this card cannot be operated in the burst mode at such high rates.

If the DAQ-System Type 5697A is being used, DynoWare automatically enables the burst mode without any necessity for additional settings.

Description	Description of the A/D card manufacturer.
Max. Throughput	Displays maximum throughput of the A/D card.
Resolution	Displays resolution of the A/D card.
Analog Channels	Displays the maximum number of the analog channels available.
Digital Channels	Displays the maximum number of the digital channels available.

6.2.1.2 Show Hardware Dialog between Acquisition Cycles

If enabled, the hardware dialog will appear prior to acquiring data for a cycle. The checkbox enables or disables this option. Only changes to the amplifier settings, and operate/reset state are allowed after switching to the data acquisition mode. Select the **Acquisition → Hardware option** to re-enable this option, or to make extended changes to the configuration.

6.2.1.3 Amplifier Selection

The user should first choose the **amplifier** selection from the bottom of the dialog, Supported amplifiers are the Type 5017/5019, Type 5011/5015, Type 5018, Signal Conditioner Type 5223 to RCD Type 9123… and 9124…, Signal Conditioner Type 5237 for HS-RCD Type 9125A…, Signal Conditioner Type 5238 and Amplifiers Type 5070 and 5080.

The entry **Others** offers a free choice for other amplifiers.

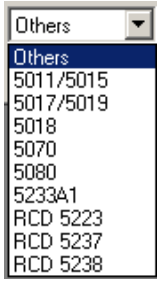


Fig. 19: Amplifier selection

6.2.1.4 Configurations using Amplifier Type 5017/5019

Selecting 5019/5017 in the amplifier selection (see section 6.2.1.3) will enable the multichannel 5017/5019 tab, the RS-232C Setup tab, and the Multicomponent Measurement tab.

6.2.1.4.1 Multichannel Amplifier Type 5017/5019

The multichannel configuration tab allows for customization of Type 5017 or 5019 multichannel charge amplifier. There are several configurable parameters associated with this amplifier:

Channel	Channel number displays the specific channel number ranging from 1 up to 8.
Label	Enter any label for each channel. This label will appear on graphs and reports.
Measuring Range	Enter the Measuring Range (Maximum measurable amount) [M.U.] of each channel (M.U. = Mechanical Unit).
Unit	Enter the display units of each channel.
Scale	The Scale setting for the amplifier is automatically determined from the Measuring Range and the full scale output capability of the amplifier. Scale [M.U./V] = Measuring Range [M.U.] / 10,0 V
Sensitivity	Enter the sensitivity of a sensor (see calibration sheet).
Filter	Select the desired low-pass filter (internal filter in the signal conditioner) to be used.
Time Constant	Select the desired Time Constant (internal high-pass filter in the signal conditioner) to be used.
Measure	Transmit the command to place the amplifier into the measure (operate) mode.
Reset	Transmit the command to switch the amplifier to reset mode.
Send Parameters	Transmit the command to set the appropriate per channel configuration for Sensitivity, Range, Filter, and Time constant settings.
Reset/Operate	Enable automatic control (via RS-232C interface) of the Operate/Reset commands during a typical acquisition cycle. Amplifier will be automatically set to operate at the start of a cycle, and will return to reset after the acquisition has completed for any given cycle. In some cases, this automatic control of Reset/Operate is not desired and the selection box should remain unchecked.

6.2.1.4.2 RS-232C Setup

The RS-232C configuration must be properly configured using the RS-232C Setup Tab for Type 5017 or 5019 to function properly.

Serial Port	Selects the COM port used to control the signal conditioner. This is the port on the PC to which the serial cable is connected.
Baud Rate	Selects the data transmission rate used to communicate with the signal conditioner. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.
Data Bits	Selects the number of data bits used in the data communication protocol. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.
Stop Bit	Selects the number of stop bits in the data transmission protocol. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.
Parity	Selects the parity checking used during communication with the signal conditioner. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.
Handshaking	Selects the handshaking method used during communication with the signal conditioner. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.

Typically the communication is configured for COM x, 9 600 baud, 8 data bits, 1 stop bit, no parity, and no handshaking.

See chapter 4.8 to figure out what COM-port is currently used.

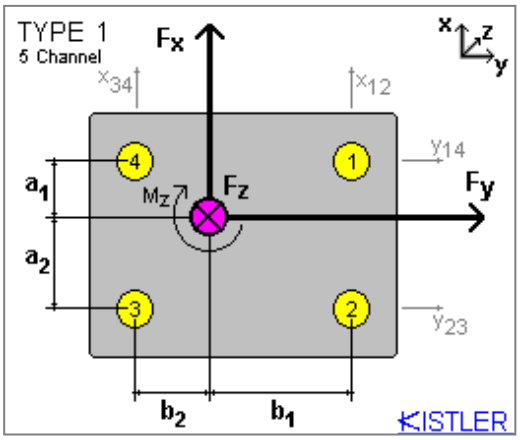
6.2.1.4.3 Force & Torque Calculation

With the multichannel Amplifier Type 5017 and the appropriate hardware, additional software calculations can be performed. These calculations can provide resultant forces and torques for various types of dynamometers, in a variety of applications. If a multichannel calculation is enabled, the user can no longer enable/disable channels in the configuration (Section 6.2.2.2). Select the **Multicomponent Mode** calculation type from the list presented corresponding to your specific hardware dynamometer.

6.2.1.4.3.1 Mode Off

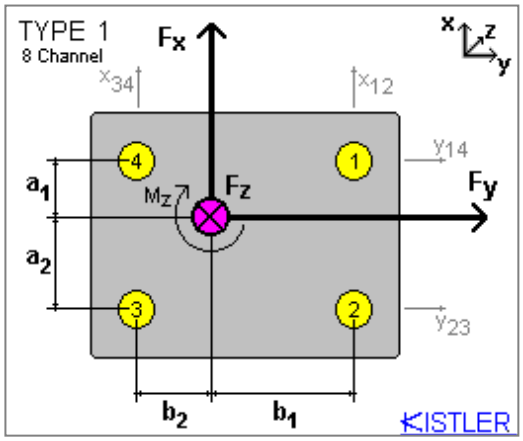
Force & Moment calculations are disabled.

6.2.1.4.3.2 Type 1



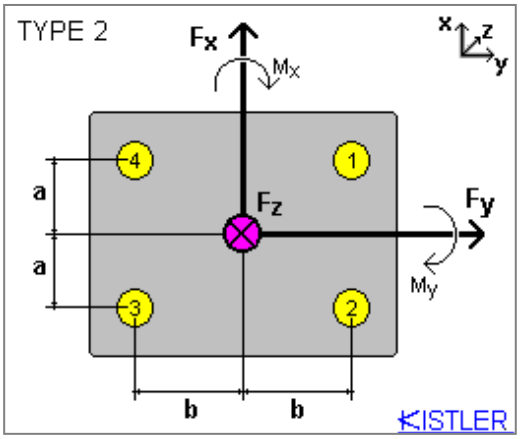
The type 1 dynamometer measures 4 shear components and 1 vertical component. From the raw components F_x, F_y, F_z and M_z are calculated. The user must configure the a_1, a_2, b_1, and b_2 distances.

6.2.1.4.3.3 Type 1a



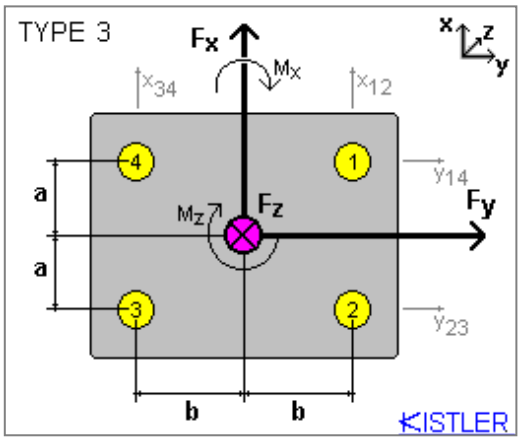
The type 1a dynamometer measures 4 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_z are calculated. The user must configure the a_1, a_2, b_1, and b_2 distances.

6.2.1.4.3.4 Type 2



The type 2 dynamometer measures 2 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y are calculated. The user must configure the distances a and b.

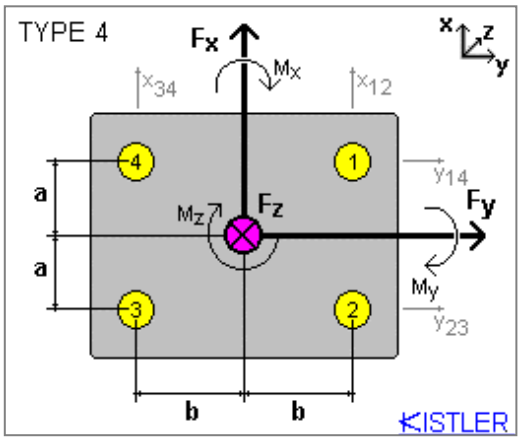
6.2.1.4.3.5 Type 3



The type 3 dynamometer measures 4 shear components and 2 vertical components. From the raw components F_x, F_y, F_z and M_x, M_z are calculated. The user must configure the distances a and b.

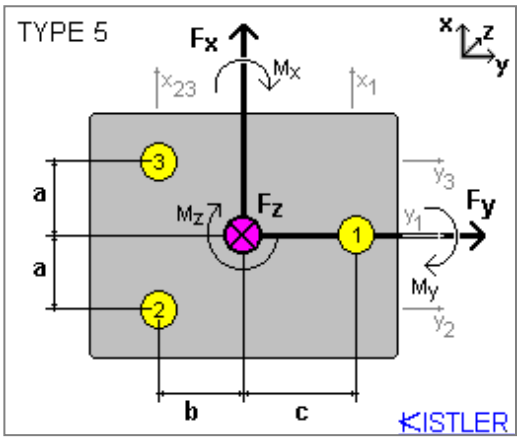
The type 3 dynamometer is for Type 9265C... only.

6.2.1.4.3.6 Type 4



The type 4 dynamometer measures 4 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y, M_z are calculated. The user must configure the distances a and b.

6.2.1.4.3.7 Type 5



The type 5 dynamometer measures 5 shear components and 3 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y, M_z are calculated. The user must configure the distances a, b and c.

Sensor Distances	Enter the distances between sensors from the drawing given for the appropriate dynamometer type. All distances are entered in millimeters [mm].
Dynamometer Top View	This window shows a drawing defining the coordinate system, and sensor layout for the selected dynamometer. Use this as a guide when entering sensor distances, configuring your system and interpreting data.
Output Window	The output window shows channel allocation for acquired and calculated channels. This should be used as a guide when configuring graphs.

6.2.1.5 Configurations using Type 5011/5015 amplifiers

Selecting Type 5011/5015 in the amplifier selection (see section 6.2.1.3) will enable the Charge Amplifier Type 5011/5015 tab.

6.2.1.5.1 Charge Amplifier Type 5011/5015

The following parameters should be set when using 5011/5015 charge amplifiers in DynoWare:

Communications Selection	The user can select the remote control mode, either via RS-232C (in which case only channel 1 can be remotely controlled) or via IEEE-488 (in which case all channels can be remotely controlled). If RS-232C is chosen, a RS-232C Setup tab will appear to allow custom configuration of the communication parameters. If IEEE-488 is chosen, an IEEE-488 (GPIB) Setup tab will appear to allow selection of the communication library.
Channel	Channel number. Channels range from 1 to 8.
Label	Enter any label for each channel. This label will appear on graphs and reports.
Measuring Range	Enter the Measuring Range [M.U.] of each channel (M.U. = Mechanical Unit).
Unit	Enter the display units of each channel.
Scale	The Scale setting for the amplifier is automatically determined from the Measuring Range and the full scale output capability of the amplifier. Scale [M.U./V] = Measuring Range [M.U.] / 10,0 [V] Output; (M.U. = Mechanical Unit)
Sensitivity	Enter the sensitivity of a sensor (see calibration sheet).
Filter	Select the desired low-pass filter (internal signal filter in the signal conditioner) to be used.
Time Constant	Select the desired high-pass filter Time Constant (internal signal filter in the signal conditioner) to be used.

IEEE Address	Enter the IEEE-488 address of the selected Type 5011/5015. The selected channel address must match the address configured in the 5011/5015. Please refer to Type 5011/5015 user manual for information on configuring the IEEE-488 address. Each device must have a unique address. This applies only if IEEE communication mode is selected.
Measure	Transmit the command to place the amplifier into the measure (operate) mode.
Reset	Transmit the command to place the amplifier into reset mode.
Send Parameter	Transmit the command to set the appropriate per channel configuration for Sensitivity, Range, Filter, and Time constant settings.
Reset/Operate	Enable the automatic control (via RS-232C or IEEE-488 interface) of the Operate/Reset commands during a typical acquisition cycle. Amplifier will be automatically set to operate at the start of a cycle, and will return to reset after the acquisition has completed for any given cycle. In some cases, this automatic control of Reset/Operate is not desired and the selection box should remain unchecked.

6.2.1.5.2 RS-232C Setup

(See section 4.8 or 6.2.1.4.2) – This tab will only appear if RS-232C interface is selected.

6.2.1.6 Setup for Charge Amplifier Type 5018

If Type 5018 is chosen (see section 6.2.1.3), the parameters for charge amplifier Type 5018 are applied.

6.2.1.6.1 Charge Amplifier Type 5018

The following parameters must be set if charge amplifier Type 5018 is being used:

Channel	Displays the specific channel number ranging from 1 to 8.
Label	Enter any label for each channel. This label will appear on graphs and reports.
Measuring Range	Enter the Measuring Range (maximum measurable amount) [M.U.] for each channel (M.U. = mechanical unit).
Unit	Enter the mechanical display units of each channel.
Scale	The Scale setting for the amplifier is automatically determined from the Measuring Range and the full scale output capability of the amplifier: Scale [M.U./V] = Measuring Range [M.U.] / 10,0 [V] Output.

Sensitivity	Enter the sensitivity of the sensor (see calibration sheet)
Filter	Select the required low-pass filter (internal filter in the charge amplifier).
Time constant	Select the required Time Constant of the high-pass filter (internal hardware filter in the charge amplifier).
COMx	Enter the COM port of the required Type 5018. Each device must have its own address. On the selected connector the serial (RS-232C or USB) cable must be connected to the charge amplifier.
Measure	Transmit the command to switch the amplifier into the measure (operate) mode.
Reset	Transmit the command to switch the amplifier into the Reset mode.
Send parameters	Transmit the settings for Sensitivity, Range, Filter and Time Constant for each channel to the charge amplifier.
Reset/Operate	Enable automatic control (via RS-232C or USB interface) of the Operate/Reset commands during a measuring cycle. The amplifier will be automatically set to operate at the start of a cycle, and to reset after any given cycle has been acquired. This automatic control option must be disabled in those particular cases in which it is not required.

6.2.1.6.2 RS-232C Setup

See section 4.8 or 6.2.1.4.2

6.2.1.6.3 USB Setup

The charge amplifier Type 5018 can also be controlled via USB instead of RS-232C. The following settings must be made:

- Connect the Type 5018 to the PC with the included USB cable.
- Install the drivers (from the CD included with the Type 5018) if this has not already been done.
- Choose COMx port. The chosen COM port must be the same as that to which the charge amplifier is connected. Please take a look at the Windows device manager (see chapter 6.2.1.4.2) .

6.2.1.7 Configurations Using Other Amplifiers

Selecting Others in the amplifier selection (see section 6.2.1.3) will enable the Other tab.

6.2.1.7.1 Others

The other adapter tab allows for generic amplifier configuration. In this setup no specific equipment is controlled. The data provided allows DynoWare to convert data from measured voltages to real mechanical units. The information configured in this tab is:

Channel	Channel number used for configured devices and connections.
Connector	Unit according to the channel
Label	Enter any label for each channel. Labels will appear on graphs and reports.
Measuring Range	Enter the measuring Range of each channel (if not activated, use double click or F4). You can either enter an overall measuring range, or an individual range and sensitivity. Measuring Range [M.U.] = Sensor Range [pC] divided by Sensitivity [pC/M.U.] (M.U. = Mechanical Unit).
Unit	Enter the unit of each channel. The configured units will appear on graphs and reports
FS	Enter the full scale (FS) of each channel.
Range 1	Enter the range of the adapter for each channel (activate with double click or F4).
Sensitivity	Enter the sensitivity of a sensor (activate with double click or F4).

6.2.1.8 Configurations Using Rotating Cutting Dynamometer Type 9123/9124 with Signal Conditioner Type 5223

Selecting RCD Type 9123/9124 with Signal Conditioner Type 5223 in the amplifier selection (see section 6.2.1.3) will enable the RCD 5223 tab, the RS-232C Setup tab, and the RCD Calculations tab.

6.2.1.8.1 RCD 5223

The rotating cutting dynamometer requires the configuration of the following parameters:

Channel	Channel number. Channels range from 1 to 6.
Label	Assign labels for each channel. These labels appear in graphs and reports.
Measuring Range	The measuring range is automatically assigned based on the Scale and Sensitivity settings. Measuring Range [M.U.] = Full Scale Output [mV] divided by Sensitivity [mV/M.U.]; (M.U. = Mechanical Unit).
Unit	Assign units to each channel. These labels appear in graphs and reports.

Full Scale Output (FSO)	Assign the full scale setting for the amplifier in [mV].
Sensitivity	Enter the sensitivity of a sensor in [mV/M.U]. Two sensitivities (coarse / fine range) for forces F_x, F_y and F_z are specified on the calibration sheet. Even four sensitivities are specified for the torque M_z.
Range Selection	Select the desired measurement range. Range I is a coarse range, Range II is a fine range.
Zoom Channel	Select the channel to appear as the zoom output channel. You can select F_x, F_z or M_z. The output signal of channel 5 (zoomed channel → see manual of rotating Dynamometer) of the signal conditioner amplifies the signal by factor 10. The same sensitivity has to be entered for both original channel and zoomed channel to amplify by factor 10.
Measure	Transmit the command to place the amplifier into the measure (operate) mode.
Reset	Transmit the command to place the amplifier into reset mode.
Send Parameters	Transmit the command to set the appropriate per channel configuration for Sensitivity and Range settings, and the zoom channel selection.
Reset/Operate	Enable the automatic control (via RS-232C interface) of the Operate/Reset commands during a typical acquisition cycle. Amplifier will be automatically set to operate at the start of a cycle, and will return to reset after the acquisition has completed for any given cycle. In some cases, this automatic control of Reset/Operate is not desired and the selection box should remain unchecked.

6.2.1.8.2 RS-232C Setup

(see section 4.8 or 6.2.1.4.2)

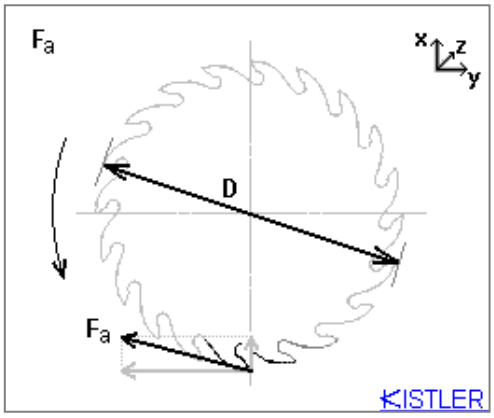
6.2.1.8.3 RCD Calculations

With Type 5223... additional software calculations can be performed. These calculations can provide radial and tangential forces or active force in a variety of applications. If a RCD calculation is enabled, the user can no longer enable/disable channels in the Channels configuration (see section 6.2.2.2).

6.2.1.8.3.1 Off

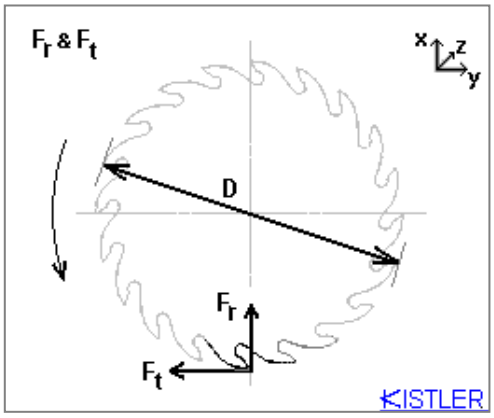
RCD Calculations are disabled

6.2.1.8.3.2 Type 1



The type 1 RCD Calculation computes the active force F_a. The tool diameter D does not have to be entered for this calculation.

6.2.1.8.3.3 Type 2



The type 2 RCD Calculation computes the F_r (Radial Force) and F_t (tangential force) cutting force parameters. The user must configure tool diameter D.

Tool Diameter	Enter the tool diameter for the appropriate tool under test. All distances are entered in millimeters "mm".
Tool View	This window shows a drawing defining the coordinate system, and tool measurement layout for the selected dynamometer.
Output Window	The output window shows channel allocation for acquired and calculated channels. This should be used as a guide when configuring graphs.

6.2.1.9 Configurations Using Rotating Cutting Dynamometer Type 9125 with Signal Conditioner Type 5237

Selecting RCD Type 9125 with Signal Conditioner Type 5237 in the amplifier selection (see section 6.2.1.3) will enable RCD Type 5237 tab, and the RS-232C Setup tab.

6.2.1.9.1 RCD Type 5237

To configure Type 5237 high speed rotating cutting dynamometer, configure the following:

Channel	Channel number. Channels range from 1 to 2.
Label	Assign labels for each channel. These labels appear in graphs and reports.
Measuring Range	The measuring range is automatically assigned based on the Scale and Sensitivity settings. Measuring Range [M.U.] = Full Scale Output [mV] divided by Sensitivity [mV/M.U.]; (M.U. = Mechanical Unit)
Unit	Assign units to each channel. These labels appear in graphs and reports.
Sensitivities	Range I, Range II and Range III – enter the sensitivity of a sensor in [mV/M.U.] for each of the calibrated ranges (see calibration sheet).
Range Selection	Select the desired measurement range from the pull-down choice box. Range I is a coarse range, range III is a fine range.
Measure	Transmit the command to place the amplifier into the measure (operate) mode.
Reset	Transmit the command to place the amplifier into reset mode.
Send Parameters	Transmit the command to set the appropriate per channel configuration for the Range settings.
Operate/Reset	Enable the automatic control (via RS-232C interface) of the Operate/Reset commands during a typical acquisition cycle. Amplifier will be automatically set to operate at the start of a cycle, and will return to reset after the acquisition has completed for any given cycle. In some cases, this automatic control of Reset/Operate is not desired and the selection box should remain unchecked.

6.2.1.9.2 RS-232C Setup

(see section 4.8 or 6.2.1.4.2)

6.2.1.10 Configurations using Multichannel Amplifier Type 5070

Selecting Type 5070 in the amplifier selection (see section 6.2.1.3) will enable the **Multichannel Amplifier Type 5070** tab, the **RS-232C Setup** tab, and the **Force & Moment Calculation** tab.

6.2.1.10.1 Multichannel Amplifier Type 5070

The Multichannel configuration tab allows for customization of Type 5070 Multichannel Amplifier. There are several configurable parameters associated with this amplifier:

5070 version	Selects Type 5070 version, 4-channel, 8-channel or 8-channel summation. The version affects the behavior of the remaining options.
Channel	Channel number displays the specific channel number ranging from 1 to 8 (channels 1 to 4 for 4-channel type).
Label	Enter any label for each channel. This label will appear on graphs and reports.
Sensitivity	Enter the sensitivity of a sensor (see calibration sheet).
Unit (Sensitivity)	Enter the sensitivity units of a sensor (see calibration sheet).
Measuring Range	Enter the Measuring Range (Maximum measurable amount) of each channel.
Unit (Measuring Range)	Enter the Measuring Range Unit/Display Unit of each channel.
Filter	Select the desired low-pass filter (internal filter in the signal conditioner) to be used.
Time Constant	Select the desired Time Constant (internal high-pass filter in the signal conditioner) to be used.
Measure	Transmit the command to switch the amplifier into the measure mode (operate mode).
Reset	Transmit the command to switch the amplifier into reset mode.
Send Parameters	Transmit the command to set the appropriate per channel configuration for Sensitivity, Range, Filter, and Time constant settings.
Measure Mode	Set to **On Start Acquisition** for automatic control (via RS-232C interface) of the measure mode (Operate/Reset) during a typical acquisition cycle. Amplifier will be automatically set to operate at the start of a cycle, and will return to reset after the acquisition has completed for any given cycle. In some cases, this automatic control of Reset/Operate is not desired and the selection box should be set to **Manual (5070)**.
Sensor Distances	(Available for Type 5070 8 Channel Summing only) Enter the dynamometer dimensions 'a' and 'b' in mm. See section 6.2.1.10.3 for more information.

Correction Factors	(Available for Type 5070 8 Channel Summing only) Enter the dynamometer moment correction factors kM_x, kM_y and kM_z from the dynamometer calibration sheet. These correction factors are specified only if the dynamometer was calibrated with a custom calibration.

6.2.1.10.2 RS-232C Setup

The RS-232C configuration must be properly configured using the RS-232C Setup Tab for Type 5070 to function properly.

Serial Port	Selects the COM port used to control the signal conditioner. This is the port on the PC to which the serial cable is connected (see section 4.8).
Baud Rate	Selects the data transmission rate used to communicate with the signal conditioner. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.
Data Bits	Fixed at 8 data bits for Type 5070 amplifier.
Stop Bit	Fixed at 1 stop bit for Type 5070 amplifier.
Parity	Fixed at OFF data bits for Type 5070 amplifier.
Handshaking	Fixed at None for Type 5070 amplifier.

6.2.1.10.3 Force & Moment Calculation

With the Type 5070 version set to **8-channel** and the appropriate equipment, additional software calculations can be performed. These calculations can provide resultant forces and torques for various types of dynamometers, in a variety of applications. If a multichannel calculation is enabled, the user can no longer enable/disable channels in the configuration (Section 6.2.2.2). Select the Multicomponent Mode calculation type from the list presented corresponding to your specific hardware dynamometer.

The 8-channel version of the charge amplifier Type 5070 with hardware summation calculates the resultant forces and torques in real time. However, only the type 4 dynamometer is supported in this case (see section 6.2.1.10.3.6).

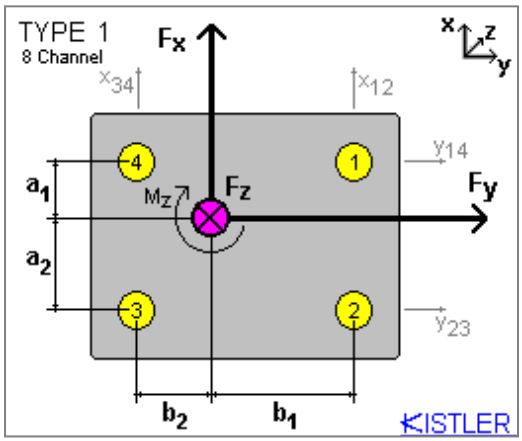
6.2.1.10.3.1 Mode Off

Force and Moment calculation disabled.

6.2.1.10.3.2 Type 1

Option not allowed with Type 5070 amplifier.

6.2.1.10.3.3 Type 1a



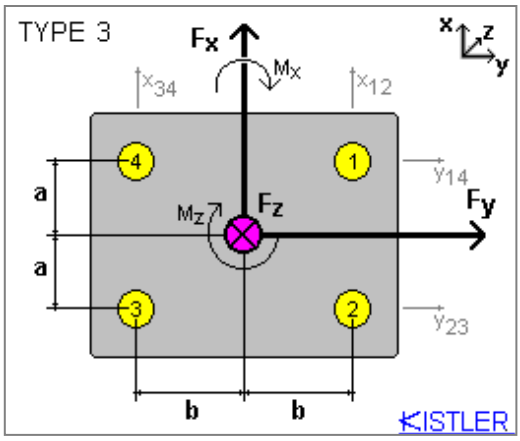
The type 1a dynamometer measures 4 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_z are calculated. The user must configure the distances a_1, a_2, b_1, and b_2.

This is only available for **Type 5070 8-channel**.

6.2.1.10.3.4 Type 2

Option not allowed with Type 5070 amplifier.

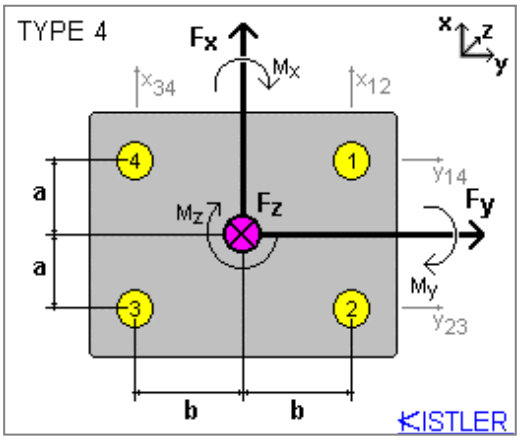
6.2.1.10.3.5 Type 3



The type 3 dynamometer measures 4 shear components and 2 vertical components. From the raw components F_x, F_y, F_z and M_x, M_z are calculated. The user must configure the distances a and b.

The type 3 dynamometer is for the dynamometer 'MiniDyn' Type 9256... only.

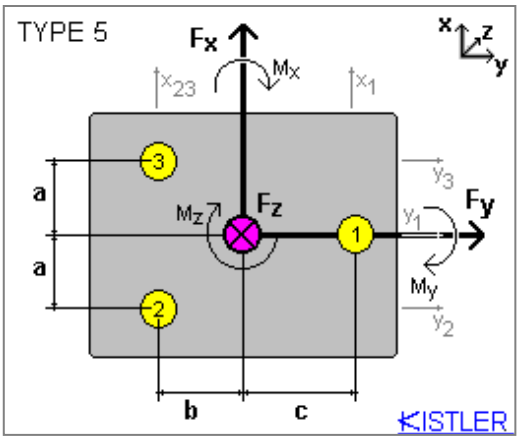
6.2.1.10.3.6 Type 4



The type 4 dynamometer measures 4 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y, M_z are calculated. The user must configure the distances a and b.

This option is available for **8-channel** and **8-channel summing**.

6.2.1.10.3.7 Type 5



The type 5 dynamometer measures 5 shear components and 3 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y, M_z are calculated. The user must configure the distances a, b and c.

This is only available for **8-channel**.

Sensor Distances	Enter the distances between sensors from the drawing or the data sheet of amplifier Type 5070 given for the appropriate dynamometer type. All distances are entered in millimeters [mm].
Dynamometer View	This window shows a drawing defining the coordinate system, and sensor layout for the selected dynamometer. Use this as a guide when entering sensor distances, configuring your system, and interpreting data.
Output Window	The output window shows channel allocation for acquired and calculated channels. This should be used as a guide when configuring graphs.

6.2.1.11 Setup for Multichannel Charge Amplifier Type 5080

If the Type 5080 is chosen (see section 6.2.1.3), the parameters for this multichannel amplifier are applied, with other tabs for the serial interface and multicomponent measurement.

6.2.1.11.1 Multichannel Amplifier Type 5080

The multichannel setup tab allows the user-defined settings for the charge amplifier Type 5080. The following parameters can be set:

5080 Version	Chooses the version or mode of the change amplifier Type 5080, **1-channel**, **2-channel**, … **8-channel** and **8-channel summing** (with hardware summation).
Channel	Channel number displays the specific channel number from 1 to 8.
Label	Enter any label for each channel. This label will appear on graphs and reports
Mode	The software identifies different modules (Type 5067) used in the amplifier Type 5080. The mode can only be changed if a Dual-Mode module (**Charge**, **Voltage**, **Piezotron**) is used.
Sensitivity	Enter the sensitivity of the sensor (see calibration sheet)
Unit (Sensitivity)	Enter the unit for the sensor sensitivity (see calibration sheet).
Measuring Range	Enter the Measuring Range (maximum measurable amount) [M.U.] of each channel (M.U. = mechanical unit).
Unit (Measuring Range)	Enter the unit for the Measuring Range.
Current	If a Dual-Mode module is set to **Piezotron** the output current has to be defined. The current ranges from 1 … 15 mA.
Filter	Choose the required low-pass filter (internal filter in the charge amplifier).
Time Constant	Choose the required Time Constant of the high-pass filter (internal hardware filter in the charge amplifier).
Measure	Transmit the command to switch the amplifier into the Measure (Operate) mode.
Reset	Transmit the command to reset the amplifier into the Measure mode.
Send Parameters	Transmit the settings for Sensitivity, Range, Filter and Time Constant for each channel to the charge amplifier.

Measure Mode	Enable automatic control (via RS-232C interface) of the Measure/Reset commands during a measuring cycle. The amplifier is automatically set to Measure at the start of a cycle, and returned to reset after any given cycle has been acquired. This automatic control option must be disabled in those cases in which it is not required.
Sensor Distances	(Available for Type 5080 8-channel Summing only) Enter the dynamometer dimensions 'a' and 'b' in [mm] in the appropriate fields.
Correction Factors	(Available for Type 5080 8-channel Summing only) Enter the dynamometer torque correction factors 'kM_x', 'kM_y' and 'kM_z' from the dynamometer calibration sheet. These correction factors are specified only if the dynamometer was calibrated with a special calibration.

6.2.1.11.2 RS-232C Setup

The RS-232C interface must be carefully configured using the RS-232C Setup tab for Type 5080 to operate properly.

Serial Port	Selects the COM port. The serial cable to the charge amplifier must be connected to the chosen connector (see section 4.8).
Baud Rate	Set the data transmission rate used to communicate with the charge amplifier. This setting must be identical to that of the charge amplifier. Refer to the charge amplifier manual to determine the correct setting.
Data Bits	Fixed at 8 data bits for Type 5080 amplifier.
Stop Bit	Fixed at 1 data bit for Type 5080 amplifier.
Parity	Fixed at None for Type 5080 amplifier.
Handshaking	Fixed at None for Type 5080 amplifier.

6.2.1.11.3 USB Setup

The charge amplifier Type 5080 can also be controlled via USB instead of RS-232C, but only if the DAQ-System Type 5697 is not being used. The following settings must be made:

- Connect the Type 5080 with the included USB cable to the PC
- Install the drivers (from the CD included with the Type 5080) if this has not already been done
- Choose serial (COM) port. This must be the same as the COM port to which the charge amplifier is connected. Please take a look at the Windows device manager

6.2.1.11.4 Force & Torque Calculation

With at least the 6-channel version of the charge amplifier Type 5080 and suitable dynamometers, resultant forces and torques can be calculated for different types of dynamometer in a variety of applications. If multichannel calculation is enabled, the user can no longer enable/disable individual channels in the configuration (section 6.2.2.2). Choose the required Multicomponent Mode from displayed list corresponding to your dynamometer and the application.

The 8-channel version of the charge amplifier Type 5080 with hardware summation calculates the resultant forces and torques in real time. However, only the type 4 dynamometer is supported in this case (see section 6.2.1.11.4.6).

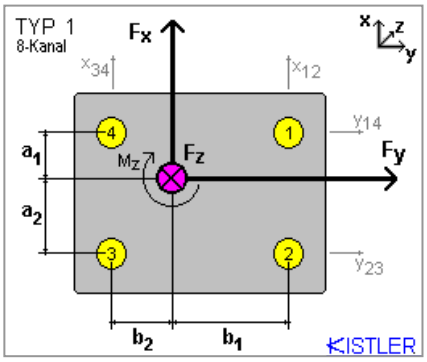
6.2.1.11.4.1 Off Mode

Multicomponent measurements disabled.

6.2.1.11.4.2 Type 1

This type is not supported by the Type 5080 charge amplifier.

6.2.1.11.4.3 Type 1a



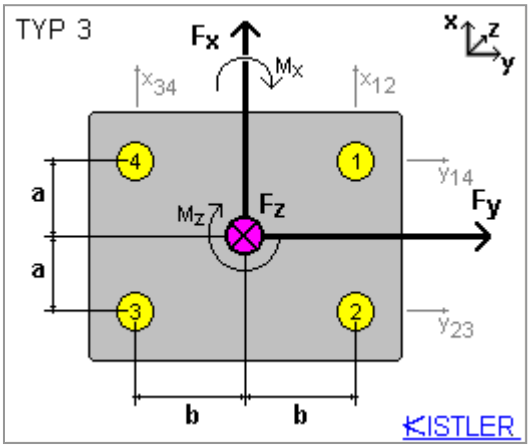
The type 1a dynamometer measures 4 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_z are calculated. The user must configure the distances a_1, a_2, b_1 and b_2.

This is only available in the **8-channel** mode.

6.2.1.11.4.4 Type 2

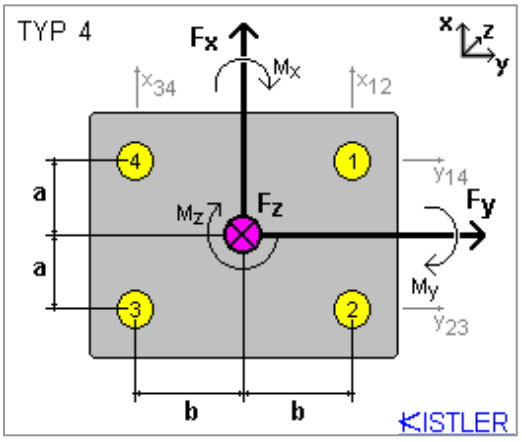
This type is not supported by the Type 5080 charge amplifier.

6.2.1.11.4.5 Type 3



The type 3 dynamometer measures 4 shear components and 2 vertical components. From the raw components F_x, F_y, F_z, M_x and M_z are calculated. The user must configure the a and b distances. This type is only used when the 'MiniDyn' Type 9256… dynamometer is being employed.

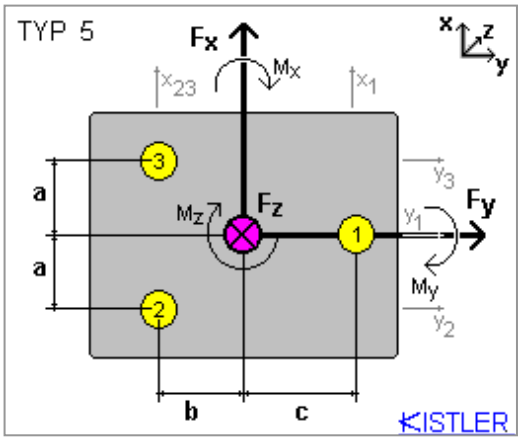
6.2.1.11.4.6 Type 4



The type 4 dynamometer measures 4 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y, M_z are calculated. The user must configure the distances a and b.

This option is available in the **8-channel** and **8-channel summing** mode.

6.2.1.11.4.7 Type 5



The type 5 dynamometer measures 5 shear components and 3 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y, M_z are calculated. The user must configure the distances a, b and c.

This option is only available in the **8-channel** mode.

Sensor Distances	Enter the distances between sensors from the drawings or the amplifier Type 5080 data sheet for the type of dynamometer being used. All distances are in millimeters [mm].
Dynamometer View	This window shows a diagram defining the coordinate system and sensor layout for the chosen dynamometer. Use this as a guide when entering sensor distances, configuring your system and interpreting data.
Output Window	The output window shows channel allocation for acquired and calculated channels. This should be used as a guide when configuring graphs.

6.2.2 Edit...

Shortcut: **Alt+E**

Selecting Acquisition → Edit allows configuration of the data acquisition process for DynoWare. The **Parameters** tab provides configuration of the basic sampling and storage criteria. The **Channels** tab provides selection of the trigger method and the channels available. The **Data Manipulation** tab allows for user customized data calculations to be performed on acquired data.

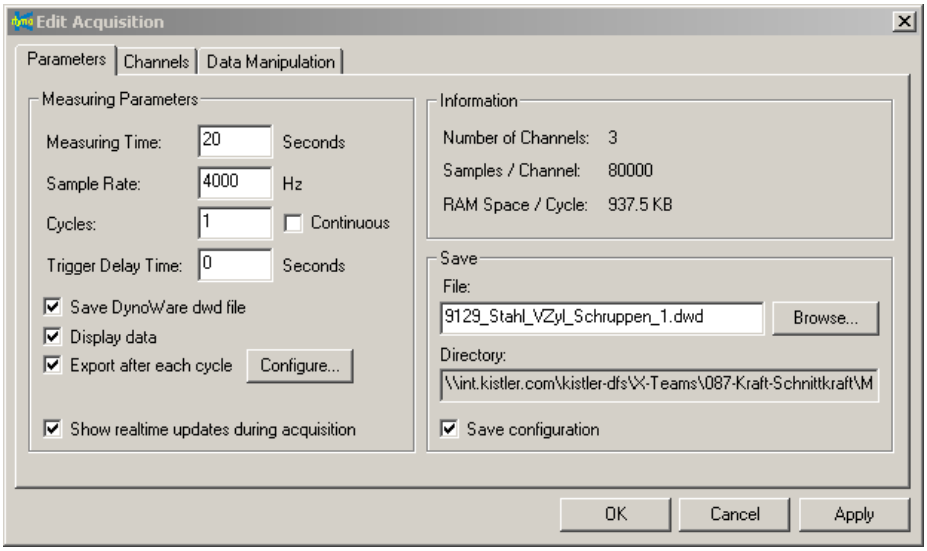


Fig. 20: Edit acquisition parameters

6.2.2.1 Parameter

The **Parameters** tab allows for configuration of the following:

Measuring Time	Definition of the actual duration of acquisition measured in seconds.
Sample Rate	The Sample rate defines the number of measurements per second and per channel.

The higher the sample rate, the better is the resolution of the measuring signal.

Because of the huge amount of data a high sample rate is automatically equivalent to slow data processing and graphics rendering. For detailed analysis, however, 2 000 Hz or higher might be necessary.

High sampling rates and long acquisition duration can create large files. Ensure that there is enough disk space available when using continuous monitoring.

Cycles	This defines the number of measuring cycles (machine cycles) to be acquired.
Continuous	If checked the number of cycles is unknown. The acquisition has to be stopped manually.
Trigger Delay Time	The delay time between the trigger signal and measurement start. This can effect the results of data collection if used with the pretrigger functionality.
Save DynoWare file	Enable saving the acquisition data into a file.
Display data	Enable displaying acquired data on the screen.
Export after each cycle	If enabled, a separate text file can be automatically exported after each data cycle. The **Configure** button allows for configuration of the contents of the exported file.
Show realtime updates	If **Show realtime updates during acquisition** is enabled the graph will be periodically updated during the acquisition process. In some cases (such as very high acquisition rate and high channel counts) enabling realtime updates may result in errors during the data acquisition process and should be disabled.

Information	Displays information about the number of Channels used for measurement, the number of Samples/Channel, and the approximate memory storage size needed for one cycle. This depends on the number of channels, the sampling time, and the sampling rate.
File	The name of the file. The file extension is '*.dwd' .
Browse…	Browse enables visual selection of a directory (folder) and a file name, use the Browse function to find and overwrite an existing file or to browse for a folder.
Directory	Displays the selected directory or folder on a disk where the file will be stored.
Save configuration	Enable the check to save the configuration when starting measurement. DynoWare uses the same file name as for the data file, but with the extension '*.cfg' for configuration files. See Section 6.1.3.2 **Configuration Save…** for more information about configurations.

6.2.2.2 Channels

The **Channels** tab is configured with the following options in the table and trigger sections:

Channel	Displays the number of the channel.
On (Enable)	Activates/Deactivates a channel if **Multicomponent Measurement** mode is not activated.
Trigger	Activate a channel as a 'trigger channel' in case of analog trigger mode.
Label	Enter any label for the channel (e.g. drilling moment).
Trigger: On a key	Measurement is started by pressing the Enter key.
Trigger: Digital	(Types 5070, 5080, 5238 – NPN) Measurement is started by a pulse at the digital input of the charge amplifier Type 5070 or Type 5080 or signal conditioner Type 5238 (e.g. with inductive proximity switch Type 2233B).
Trigger: DAQ	Measurement is started by an external trigger signal into the data acquisition card (e.g. start machine). This signal can be fed into either the relevant input for cable Types 1500A7 or 1500B15 or the connecting box of the DAQ-System Type 5697A.
Trigger: Analog	Measurement is started if the defined channel has reached a certain level.
Rising / Falling	Start of the Trigger at rising or falling edge.
% / Absolute	The analog trigger threshold is defined as a percentage or an absolute value.

Threshold — Specifies in M.U. (mechanical units) or volts the analog trigger threshold.

Pretrigger — When enabled, the resultant trial will contain the specified pretrigger percentage of data prior to the trigger condition. If the trial is 10 seconds long and 50 % pretrigger is specified, the resulting trial will contain 5 seconds of data prior to the trigger and 5 seconds of data after the trigger. This is achieved by filling a pretrigger buffer, then continuously waiting for the trigger signal. Pretrigger can range from 1 … 99 %.

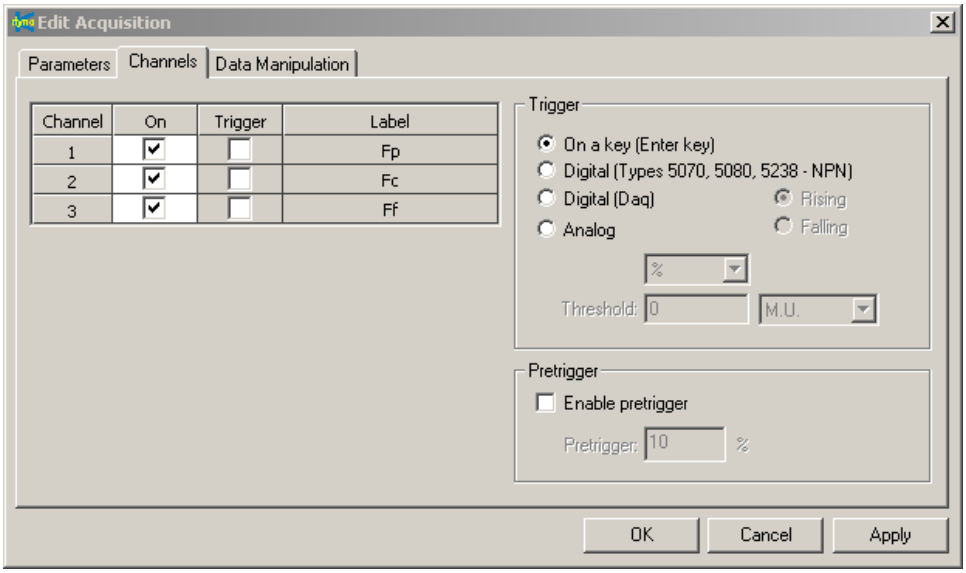


Fig. 21: Edit acquisition channels & trigger

6.2.2.3 Data Manipulation

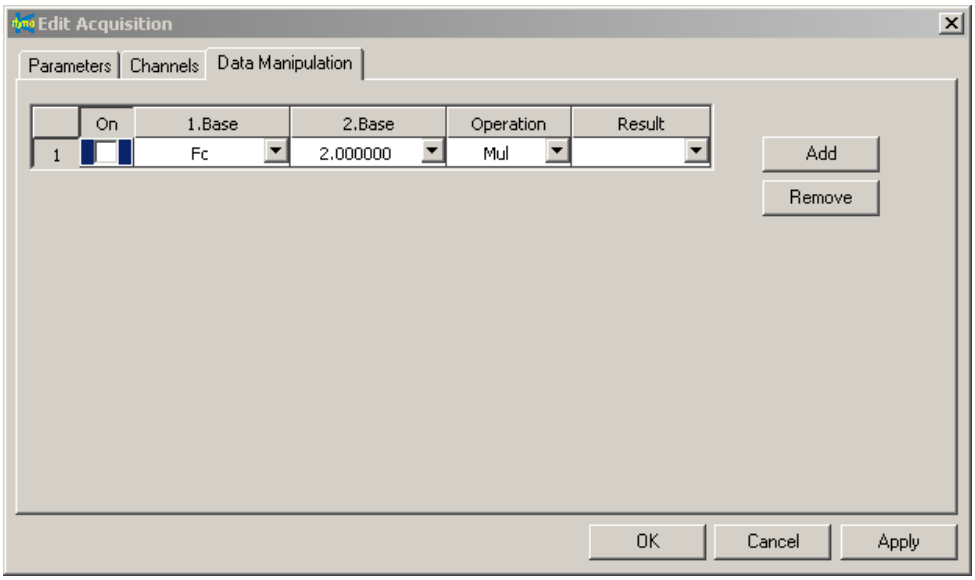


Fig. 22: Edit acquisition, data manipulation online

Data for any specified channel can be modified with standard mathematical functions immediately after the data is acquired. The source channels and operation to be performed must be specified as well as the destination of the calculation.

The destination channel data is permanently destroyed. Use the data manipulation functions with extreme caution.

On (Enable)	Activate the function for the data manipulation.
1. Base	First channel for the data manipulation.
2. Base	Second channel for the data manipulation. Here you may also enter constant values. Note: Confirm numerical entries with RETURN.
Operation	The mathematical operation to be performed. The following functions are available: Addition, Subtraction, Multiplication, Division, log[a], ln[b], exp(e)[c], exp(10)[d], sqr[e], sqrt[f].
Result	Channel to place the result.
Add	Add a new function.
Remove	Remove the selected function.

6.2.3 Start...

Shortcut: **Alt+S**

To begin the data acquisition process, select the **Acquisition → Start** menu choice. If the specified storage file already exists (as specified in section 6.2.2.1 Acquisition Parameter) a prompt will appear to overwrite the existing file.

If you choose to overwrite the file, all existing data in the file will be lost.

[a] base 10 logarithm
[b] natural logarithm
[c] natural exponential
[d] base 10 exponential
[e] square
[f] square root

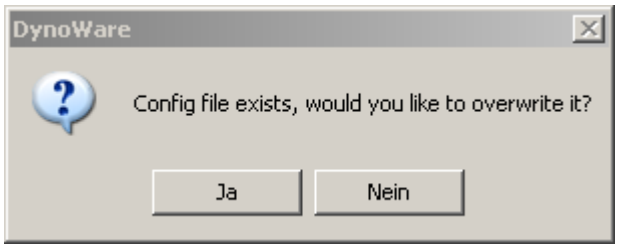


Fig. 23: Overwrite file prompt

First, if enabled, the **Documentation** dialog (see Section 6.3.4.1) will appear. Here notes about the given cycle can be added or changed to document the trial cycle.

Next, if **Show Hardware dialog between Acquisition Cycles** is enabled (see Section 6.2.1.2 Show Hardware Dialog between Acquisition Cycles), the Hardware configuration dialog will appear allowing changes to the amplifier configuration.

Finally, the main data acquisition dialog box will appear showing the current cycle number. If analog or digital triggering is required, the system will go into the wait for trigger state. If Key triggering is enabled pressing the **Go** button or the Enter key will start acquisition. Once a trigger has occurred, or **Go** has been selected, the progress bar will update to indicate acquisition status.

To abort acquisition (or stop a continuous cycle acquisition), press the **Stop** button. Acquired data is saved.

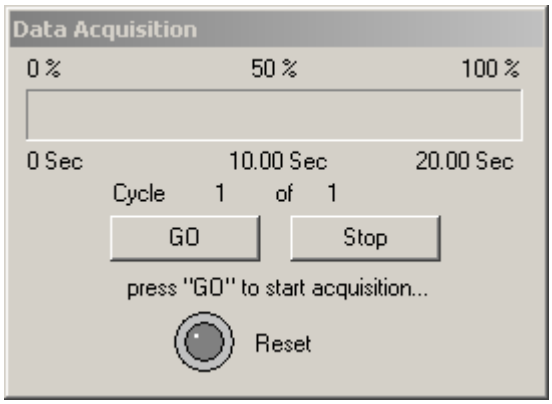


Fig. 24: Begin acquisition prompt

The data acquisition process may take several seconds to abort before the next acquisition interval can begin.

6.3 View...

The **View** menu provides for complete control of the graphical output of DynoWare. Graph types and data content can be selected for individual views and for configuration of a default view set.

6.3.1 New...

With a specific window open, selecting **New...** will create a new duplicate window with the identical configuration as the current active window. This new view can now be configured individually.

6.3.2 Edit...

Shortcut: **Alt+V**

The **View Edit** configuration provides for control of the current windows graph type and contained items. The user can also customize the colors of a specific graph item from this dialog box, and set view dependence (link to other open views of this file).

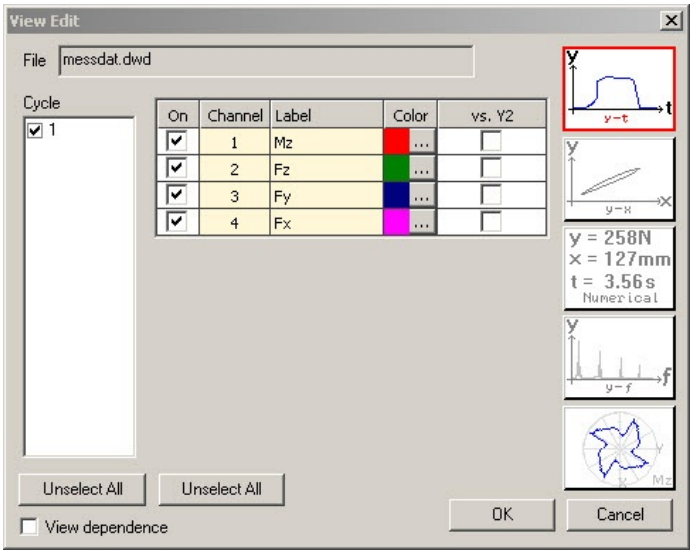


Fig. 25: View Edit

Selected Cycles and Channels are check marked. Click on an item to highlight or select it. Click on a highlighted item to unselect it. There are three types of graphics: y(t), y(x), and numerical. In order to select or change the x-axis in a y(x) graph, click on the y-x icon.

The following describes additional items in the **View Edit** dialog:

File	Displays the name of the file.
On (Enable)	Activate a channel.
Cycle	Selects the cycles to be displayed in the view. If two and more cycles are selected, they will be superimposed (see section 6.3.2.1)
Channel	Select the channels to be displayed.
Color	Shows the color selection for each channel. Color can be changed.
vs. Y2	Selecting **vs. Y2** allows graphing vs. two vertical axis scales. One scaling will appear on the left of the graph, the second scale will appear on the right of the graph. The legend will indicate the corresponding axis that applies to each line. **vs. Y2** applies to time based graphs y(t) only.
Select all/Unselect all	Selects/Unselects all cycles or channels to view.
View dependence	Links two or more windows. Changing in one window from one cycle to the next will update the other windows accordingly.

6.3.2.1 Superimposition of views

It is possible to superimpose signals if two or more cycles are acquired in one file. All cycles that have to be superimposed have to be activated in the **View Edit** dialog.

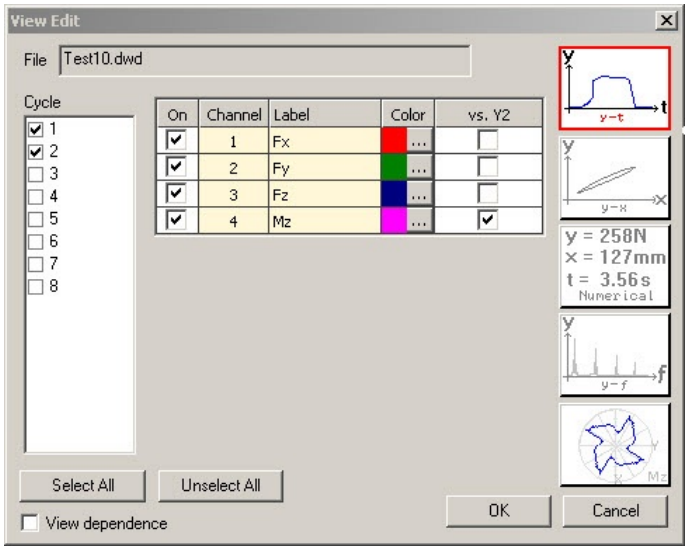


Fig. 26: Superimposition of views

6.3.2.2 Type of View

Several views are available to display the data.

6.3.2.2.1 y-t Graph

Time based graphs display a data vs. the original acquired time base for one specific cycle, or for multiple cycles (superimposed).

6.3.2.2.2 y-x Graph

Y vs. x based graphs display one channel of data vs. another channel of acquired data for one specific cycle, or for multiple cycles (superimposed).

6.3.2.2.3 Numerical Graph

Numerical graphs display a tabular list of time based acquired data for one specific cycle.

6.3.2.2.4 View of FTT Based Graphs

FFT based graphs display data vs. the frequency base for one specific cycle, or for multiple cycles (superimposed).
The FFT analysis is used to find the frequency components of a signal. The scaling of both frequency and amplitude axis are linear.

6.3.2.2.5 Polar Based Graphs

Polar based graphs display a M_z data vs. F_x, F_y data as a scatter graph for one specific cycle, or for multiple cycles (superimposed). The acquired data set must contain an F_x and F_y channel used to determine the polar coordinate angle, and an M_z channel used as the polar coordinate radius. If the data set does not contain the appropriate channels the Polar graph button will be disabled. The view is only informative if a rotating 4-component dynamometer is used.

The polar plot is used to show the relation of the acting forces and the actual cutting edge in operation. Thus, the load distribution on the single cutting edge becomes visible.

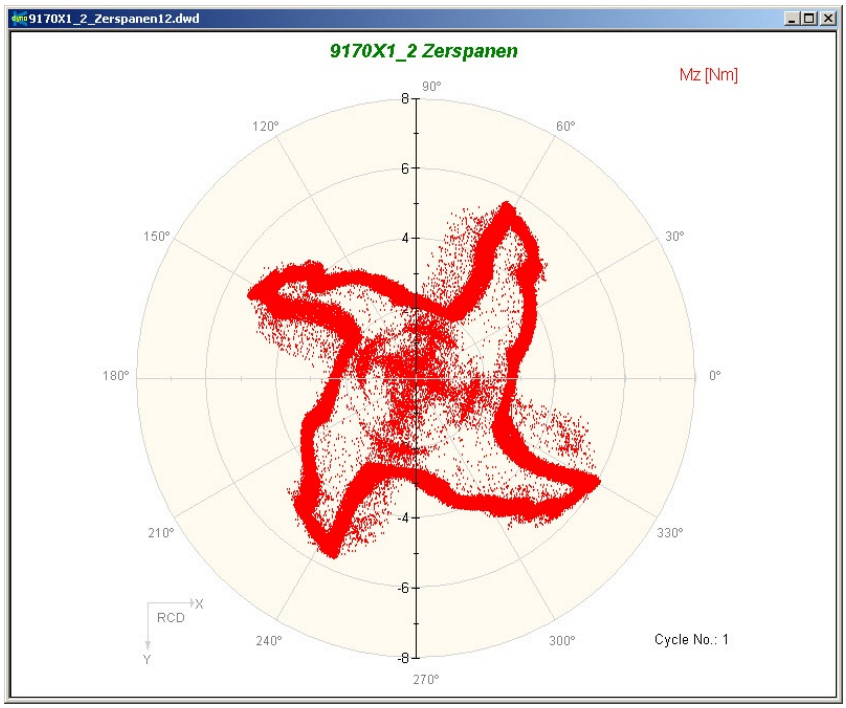


Fig. 27: Shows the polar-graph of a measurement with a 4-tooth milling cutter

The polar coordinates are calculated from the measurement parameters F_x, F_y and M_z.

$$\varphi = \tan^{-1}\frac{F_y}{F_x}$$

$$r = M_z$$

6.3.3 Setup…

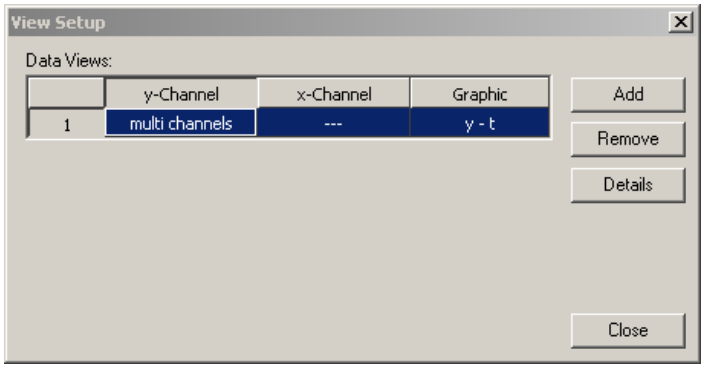


Fig. 28: View Setup

With **View → Setup** you can configure the windows and default graphs that will appear when a file is opened or when data is acquired. A user can configure several default windows by repeatedly pressing the **Add** button and following the onscreen wizard for creating a new view

window. To remove an existing view, highlight the view in the Data Views window and select the **Remove** button.

To find more information about a view, highlight it in the Data Views window and press the **Details** button. A user can change colors and choose a second vertical axis (vs.Y2) in this dialog. Settings chosen in this dialog will be displayed on screen when the option **Show realtime updates during acquisition** is enabled (see section 6.2.2.1).

6.3.4 Documentation

Shortcut: **Alt+D**

Each individual cycle can have additional documentation associated with it. There are two tabs in the documentation dialog, **Comments** and **File, Date, Time**.

6.3.4.1 Comments

The **Comments** (Fig. 27: Documentation) tab allows user entered text data to be associated with each cycle. The changes are updated immediately in the file.

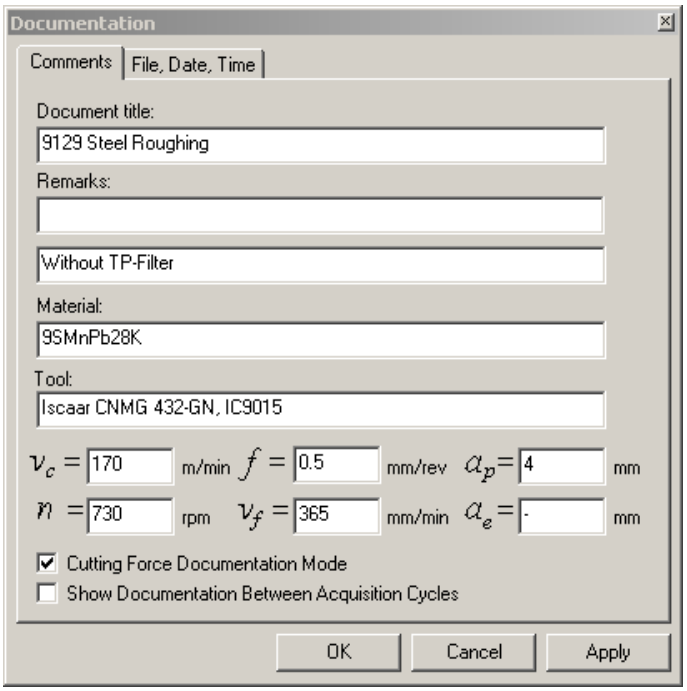


Fig. 29: Documentation

Document title	Allows for customization of the graph titles
Remarks	General text comments can be entered in the remarks section
Material	In **Cutting Force Documentation** mode, the user can supply a material type comment

Tool	In **Cutting Force Documentation** mode, the user can enter specific information about the cutting tool under test.
Cutting Force Parameters	v_c = cutting velocity [m/min] f = feed [mm/rev] a_p = depth of cut [mm] n = speed [rpm] v_f = feed velocity [mm/min] a_e = cutter engagement [mm]
Documentation Mode	Specify to document specific cutting force parameters, or to document the file using general comments.
Show Documentation	Between acquisition cycles enable the automatic display of the documentation dialog box immediately prior to acquiring a cycle.

6.3.4.2 File, Date, Time

The **File, Date, Time** tab documents the temporal and storage data associated with the original acquisition.

Folder	The directory where the file was initially created
File	The initial name of the file
Date	The original date of the acquisition
Time	The original time of the acquisition

6.3.5 Edit Labels

The user can edit the channel labels or unit labels of specific channels at any time using the **View → Edit Labels** selection. The channel label or unit entered for any one specific channel will be applied to all of the stored cycles within the file. The changes are updated immediately in the file.

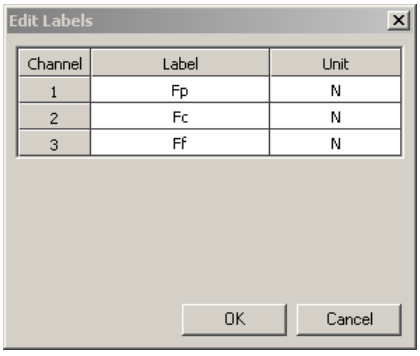


Fig. 30: Edit Labels

6.3.6 Reset Font to Default

The font, color, size and style can be changed by double-clicking the word to be altered in the box. To reset the chosen settings to the defaults, select **Reset Font to Default** from the **View** menu.

6.3.7 Reset Color to Default

The chosen colors of the signals can be reset to the default settings. Choose **Reset Color to Default** from the **View** menu.

6.3.8 Zoom

The **Zoom** function provides for changing the x-axis and y-axis scaling parameters for an active graph. The user can manually zoom by entering the axis minimum and maximum values or graphically zoom using the right mouse button.

6.3.8.1 Manual Zoom

By default all graphs are scaled to best fit the minimum and maximum values of the contained graphs. Selecting **View → Zoom** presents a dialog box which can be used to set the x-axis minimum and maximum values and the y-axis minimum and maximum values. The dialog box will remain active (button **Apply**) so that the user can switch to other open windows and change the zoom settings. New settings will be activated when the **OK** button is selected. The **Zoom Off** button will restore the graph to the original auto scaled values.

A zoomed graph will have the word **Zoom On** in the upper left corner of the window.

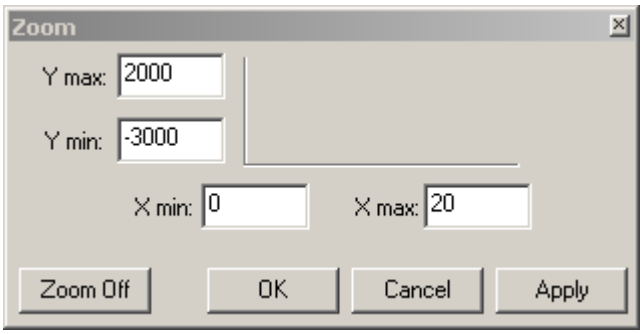


Fig. 31: Manual zoom

6.3.8.2 Graphical Zoom

It is possible to zoom by clicking the right mouse button and dragging to create a Window over the desired zoom area of a graph. When the right mouse button is released, the graph will be redrawn with the new coordinates.

6.3.9 Zoom Out

Zoom Out will restore the graph to the original auto scaled values. Also, by double clicking the right mouse button, the graph will return to the original coordinate scaling. **Zoom Out** is deactivated if the graph is currently not zoomed.

6.3.10 Lock Scaling

The **Lock Scaling** function allows successive measurements to be represented on the force and time axis to the same scale independently of the measured maximum and minimum.

6.3.11 Unlock Scaling

The **Unlock Scaling** allows the **Lock Scaling** function to be disabled again.

6.3.12 Horiz. Grid

Selecting **View** → **Horiz. Grid** from the main menu, or selecting the  icon on the toolbar will redraw the active graph with horizontal grid lines enabled. Selecting the option again will disable the horizontal grid lines.

6.3.13 Vert. Grid

Selecting **View** → **Vert. Grid** from the main menu, or selecting the  icon on the toolbar will redraw the active graph with vertical grid lines enabled. Selecting the option again will disable the vertical grid lines.

6.3.14 Toolbar

Selecting **View** → **Toolbar** will toggle the visible state of the system toolbar. The functional descriptions are:

 File Open

 Hardware

 Edit Acquisition

 Cycle Documentation

 Setup View

 Start Acquisition

 Export Data

 New View

Edit View
Cursor
Mean Value (Stats)
Drift Compensation
Horizontal Grids
Vertical Grids
Lock Scaling
Unlock Scaling
Zoom Out
Voltmeter
Oscilloscope
Cascade Views
Tile Vertical
Tile Horizontal
Help

6.3.15 Status Bar

The status bar can be enabled/disabled from the **View** → **Status Bar** menu selection. The status bar runs along the lower edge of the DynoWare screen. It is separated into two sections. The left side of the status bar offers information on a topic selected when the mouse is moved over a menu bar or tool bar item. The right section of the status bar shows the status of the **Caps Lock** key, the **Num lock** key, and the **Scroll lock** key.

Fig. 32: Status Bar

6.4 Analysis...

6.4.1 Mean Value

By selecting **Analysis** → **Mean value** from the main menu or by clicking the  icon on the toolbar statistical data can be displayed on an active y(t) time based graph.

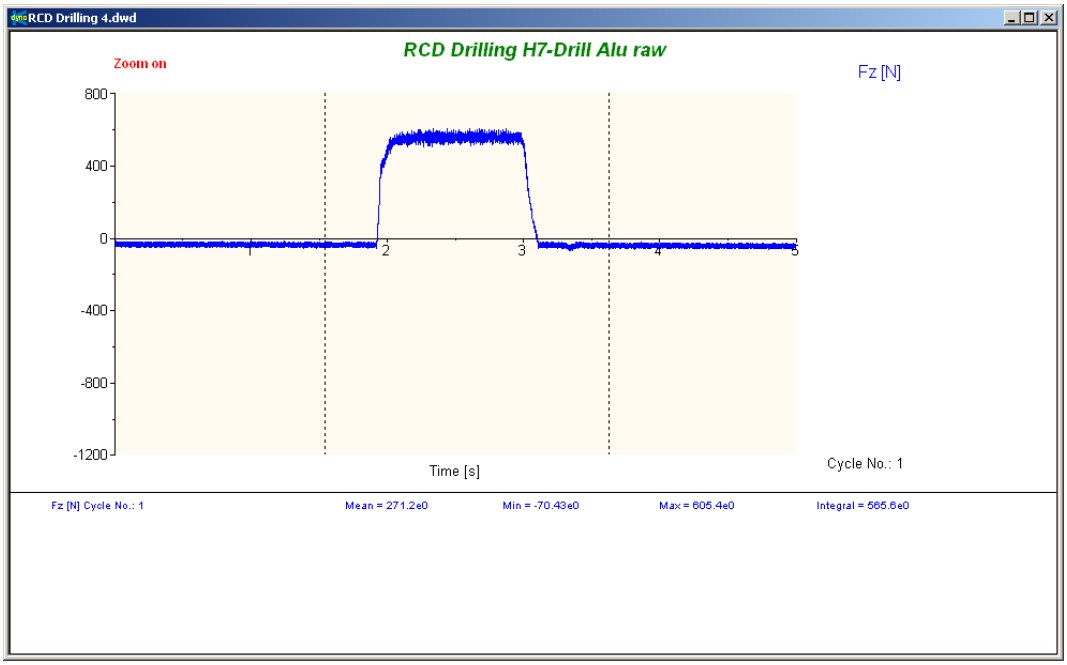


Fig. 33: Mean analysis

The statistical data will appear on the bottom of the graph. Statistical data will include: Mean (average) value, Maximum value, Minimum Value and Integral between two user identified points.

Fig. 34: Sample statistical data

A dashed vertical bar will first appear on the graph along with the  cursor. This vertical line will track the mouse movement to set the starting point for the analysis. Move to the desired starting position then left click the mouse.
Next, a dashed vertical bar will appear on the graph along with the  cursor. This vertical line will track the mouse movement to set the ending point for the analysis. Move to the desired ending position then left click the mouse.

To change either the starting position or ending position and update the statistical data:
1.) Move the mouse over the dashed vertical cursor line. The cursor will change to
2.) Click the left mouse button and drag the line to a new position (cursor will change to ⟷ when dragging)
3.) Release the mouse, the statistical data will be updated.

The Mean value analysis can be disabled and the graph restored to normal by reselecting the menu choice, or the toolbar icon. It is also possible to quit with ESC.

6.4.2 Cursor Tool

For the analysis of data it is helpful to display the x- and y-coordinates. Pressing the toolbar icon  or selecting **Analysis → Cursor tool** from the menu will enable the cursor tool.
A dashed vertical bar will first appear on the graph along with the 1 cursor. Next, a dashed vertical bar will appear on the graph along with the 2 cursor.

To change either the starting position or ending position and update the cursor tool data:
1.) Move the mouse over the dashed vertical cursor line. The cursor will change to
2.) Click the left mouse button and drag the line to a new position (cursor will change to ⟷ when dragging)
3.) Release the mouse, the statistical data will be updated.

The cursor window can be moved anywhere on the desktop by left clicking the mouse on the toolbar, and dragging to a new location. When activated, the cursor tool will apply to all time base graphs y(t).

The cursor tool will display t1 (time at cursor 1), t2 (time at cursor 2), dt (t2 – t1), 1/dt (in s^{-1}), 1/dt (in min^{-1}), Y(t1), Y(t2), and dY.

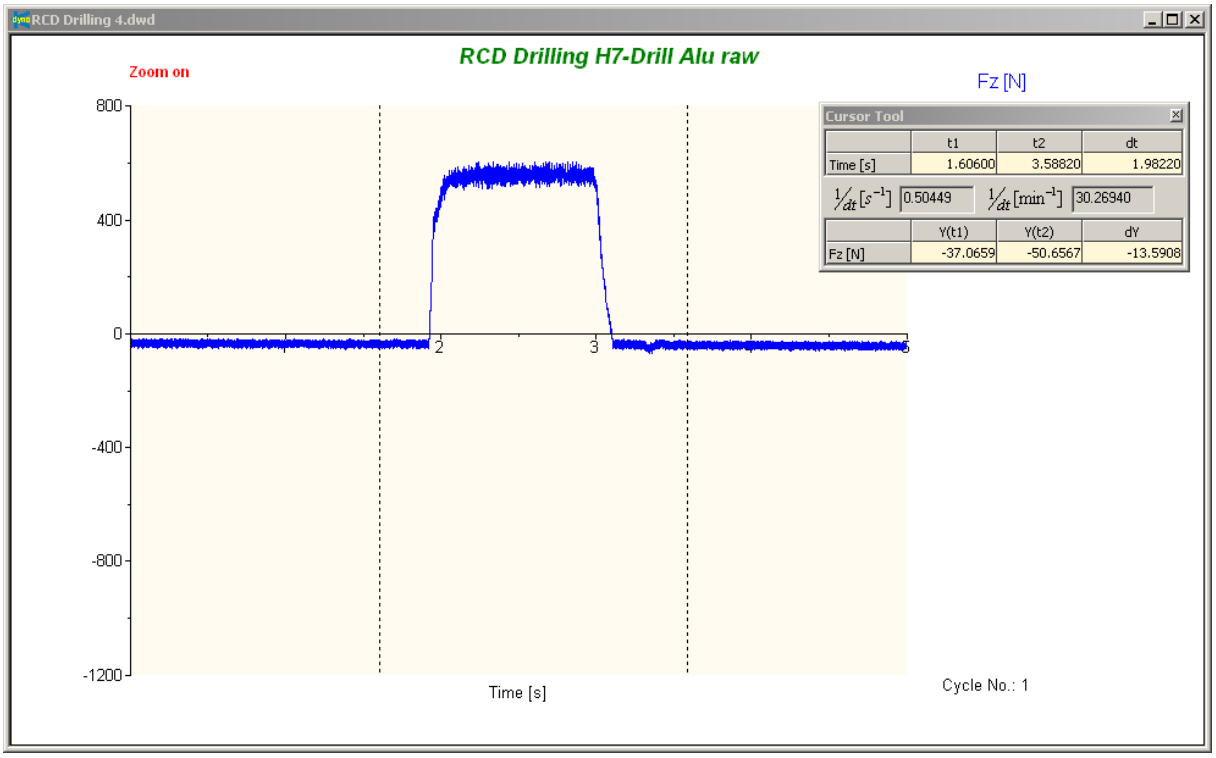


Fig. 35: Cursor tool

6.4.3 Signal Drift Compensation

By selecting **Analysis → Signal Drift Compensation** from the main menu or by clicking the  icon on the toolbar, data can be adjusted to remove the effect of long-term thermal drift and offset. This is accomplished by computing a straight line between a starting and ending point, then subtracting this line from the selected portion of the data set. All data sets on the current time series graph will be compensated.
This function is especially designed for resolving the problems of drift in piezoelectric measurement systems. In the Operate mode, the signal drifts away with a constant slope if the temperature does not change during the measurement. However, the direction (if negative or positive) is unpredictable. In short measurements or in measurements with high forces this drift is usually negligible. After very long measurements however this drift is clearly visible. Measurement is started before applying the force and continues until there is no longer any force applied to the tool, the drift is visible as the signal that does not fall back to the zero line.

NOTE

The selection of the starting and ending points are critical to the accuracy of the compensation.

NOTE

Drift Compensation on will appear in the upper left corner the graph to identify the data set as modified.

When selecting drift compensation:
A dashed vertical bar will first appear on the graph along with the 1 cursor. This vertical line will track the mouse movement to set the starting point for the compensation. Move to the desired starting position then left click the mouse.
Next, a dashed vertical bar will appear on the graph along with the 2 cursor. This vertical line will track the mouse movement to set the ending point for the compensation. Move to the desired ending position then left click the mouse.
The first vertical line should be placed right before the rising edge of the force curve – where the signal still lies on the zero line. The second line has to be placed where there is no longer any force applied, i.e. where the measured signal should lie again on the zero line.

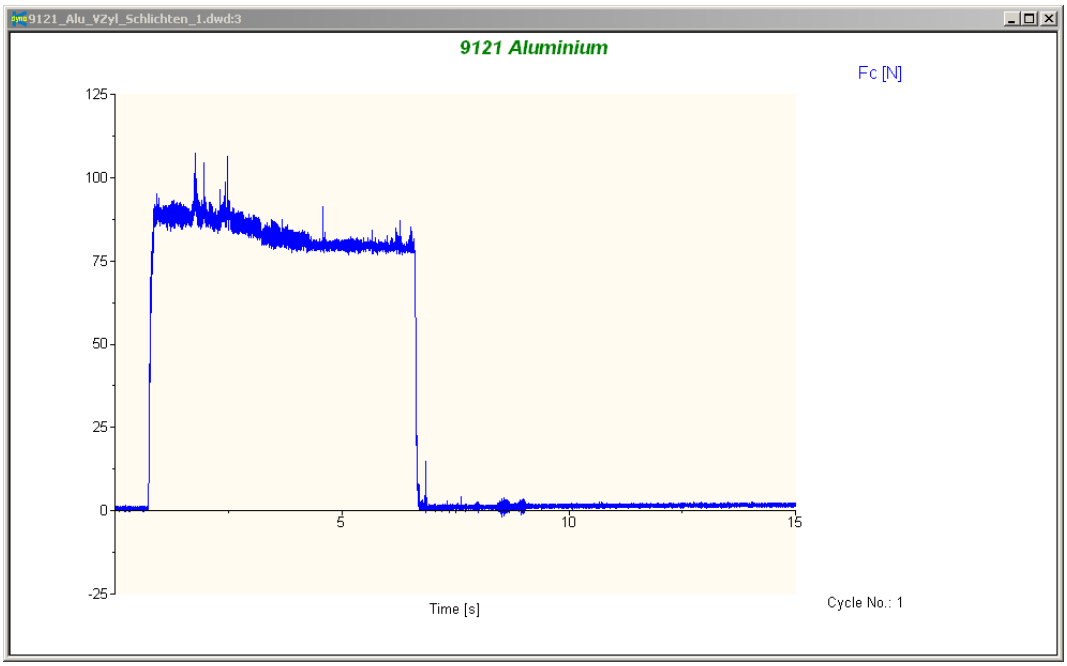


Fig. 36: Original Signal

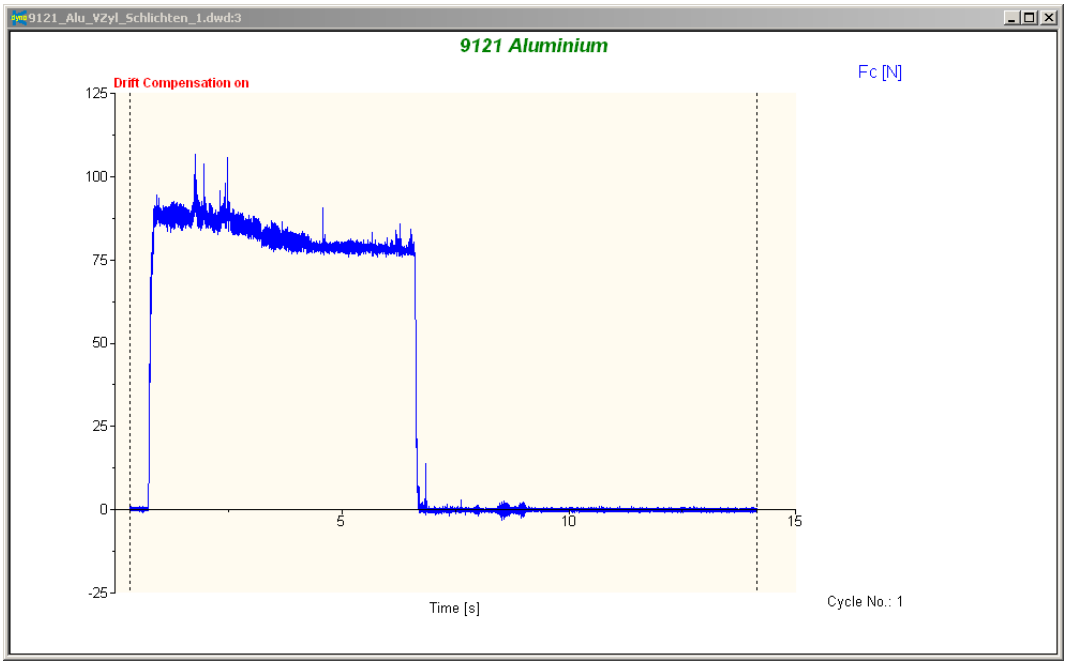


Fig. 37: Drift compensation applied

To change either the starting position or ending position and update the compensation:

1.) Move the mouse over the dashed vertical cursor line. The cursor will change to

2.) Click the left mouse button and drag the line to a new position (cursor will change to ⟷ when dragging)

3.) Release the mouse, the data set will be updated and the graph redrawn.

The change is only temporary and can be disabled by reselecting the menu choice, or the toolbar icon. Select **File→ Save Modified File** (see Section 6.1.2) to permanently apply the changes to the data set.

6.4.4 Smoothing on…

Smoothing is used to 'smooth' a data set. Smoothing is a form of digital filtering. The smoothing options are: 1) Moving Mean, 2) Moving Median. Each is discussed in the following paragraphs. Select the channels to apply the smoothing option from the list presented or press the **All Channels** button to select all available channels.

The words **'Smoothing On'** will appear in the upper left corner of the graph to identify the data set as modified.

6.4.4.1 Moving Mean

A moving mean filter is used to smooth an entire data set when no particular frequencies are to be filtered out. This type of filter generates a moving average data set from the original one, based on a user-specified **Window size**. The window size specifies how many values to the left and right of the current value are averaged. The window size must be an **odd** number, because the current value must fall in the exact center of the window, with an even number of points to the left and right of it (if you enter an even number, the calculation is made with the next higher number). The average of all values in the window is calculated, and this number is used to replace the current value. The larger the window size, the more the resulting data set is smoothed. The Figure below illustrates both the moving mean and the moving median filters.

At the beginning and the end when the window size would exceed the sampled values, the window size is reduced, starting and ending with a window size of CEIL(WindowSize/2).

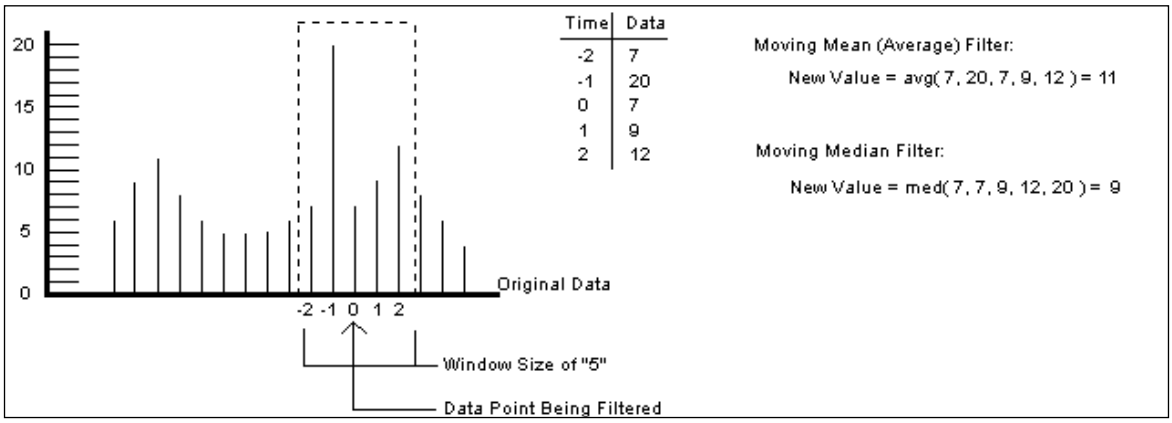


Fig. 38: **Moving Mean** and **Moving Median** filters

6.4.4.2 Moving Median

The **Moving Median** filter is similar to the **Moving Mean** in order that it also uses a moving window. However, this method sorts the values within the window and replaces the current value with the median value (i.e., the middle value in the sorted data window). The moving median type filter is good for removing sharp spikes in the data.

The change is only temporary and can be disabled by reselecting the menu choice, or the toolbar icon. Select **File → Save Modified File** (see Section 6.1.2) to permanently apply the changes to the data set.

Kistler measurement equipment is very sensitive. Sometimes what appears to be noise can be "real" measured phenomena. Care should be exercised in filtering so as not to remove important data.

Below is an example of a "noisy" data set.

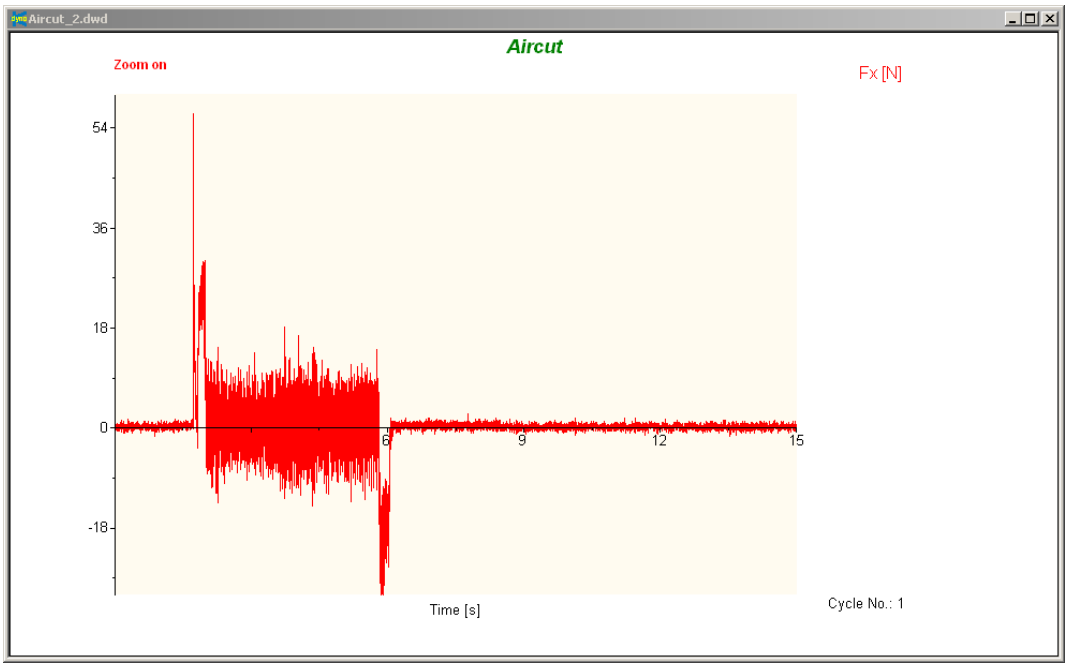


Fig. 39: Original data set (no smoothing)

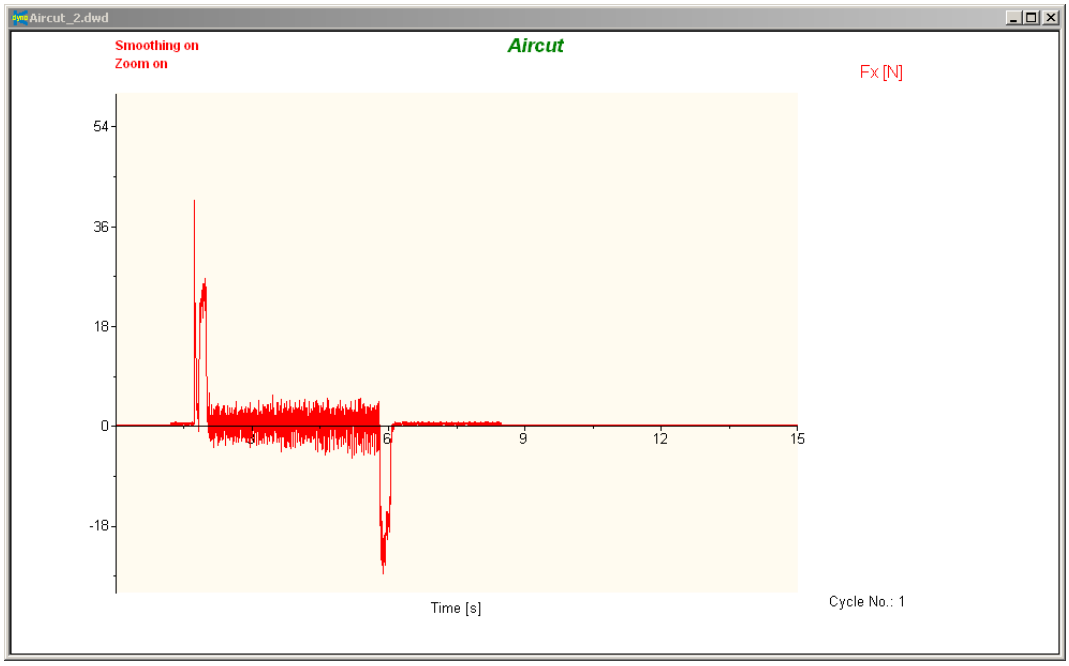


Fig. 40: Smoothing on, moving mean (window size = 20)

6.4.5 Smoothing off

Selecting **Analysis → Smoothing Off** will disable any filters currently applied to the data set. A check mark on the menu will indicate if smoothing is currently on or off.

6.4.6 Filtering on…

Filtering is used to modify a data set using specific frequency content requirements. The type of filter to use depends upon the type of modification required. The Butterworth filtering options are: 1) Low Pass, 2) High Pass, 3) Band Pass, and 4) Band Stop. Each is discussed in the following paragraphs. Select the channels to apply the filter to from the list present or press the **Select All** button to select all available channels.

The words **'Filtering On'** will appear in the upper left corner of the graph to identify the data set as modified.

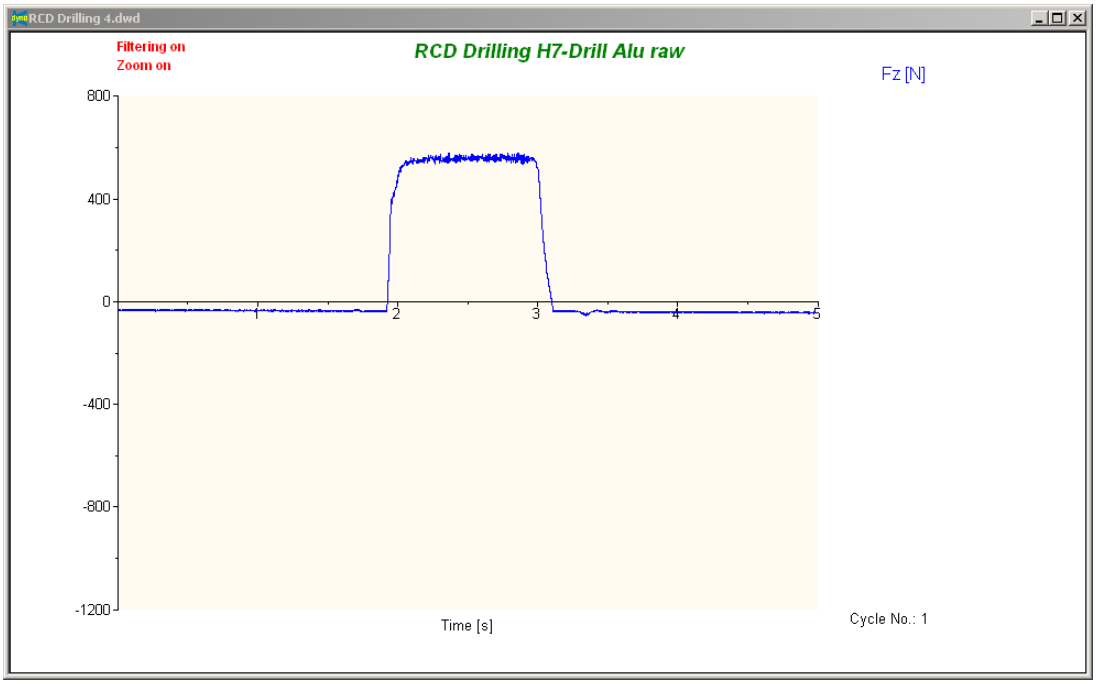


Fig. 41: Filtered signal

6.4.6.1 Low Pass

For a **Low Pass** filter, the edge frequency is the frequency above which all frequencies are attenuated to some degree, and below which all frequencies pass unfiltered. Essentially, all low frequencies are allowed to pass, and all high frequencies are removed. The specified cutoff frequency is the –3 db (half power) attenuation point of an n-th order Butterworth filter.

6.4.6.2 High Pass

For a **High Pass** filter, the edge frequency is the frequency below which all frequencies are attenuated to some degree, and above which all frequencies pass unfiltered. Essentially, all high frequencies are allowed to pass, and all low frequencies are removed. The specified cutoff frequency is the –3 db (half power) attenuation point of an n-th order Butterworth filter.

6.4.6.3 Band Pass

For a **Band Pass** filter, the lower cutoff frequency and upper cutoff frequency define the range in which is frequencies are allowed to pass. Outside the range, the frequencies are attenuated to some degree. The specified cutoff frequencies are the –3 db (half power) attenuation points of an n-th order Butterworth filter.

6.4.6.4 Band Stop

For a **Band Stop** filter, the lower cutoff frequency and upper cutoff frequency define the range in which is frequencies are attenuated to some degreed. Outside the range, the frequencies are allowed to pass. The specified cutoff frequencies are the -3db (half power) attenuation points of an n-th order Butterworth filter.

6.4.6.5 Filter Setup

6.4.6.5.1 Edge Frequencies

The lower and upper edge frequencies define the -3db cutoff frequencies for the various Butterworth filters types.

6.4.6.5.2 Filter Order

The filter order specifies the number of taps on the filter. A higher filter order requires more computation power but provides sharper filtering characteristics.

The change is only temporary and can be disabled by reselecting the menu choice, or the toolbar icon. Select **File → Save Modified File** (see Section 6.1.2) to permanently apply the changes to the data set.

6.4.7 Filtering off

Selecting **Analysis → Filtering Off** will disable any filters currently applied to the data set. A check mark on the menu will indicate if smoothing is currently on or off.

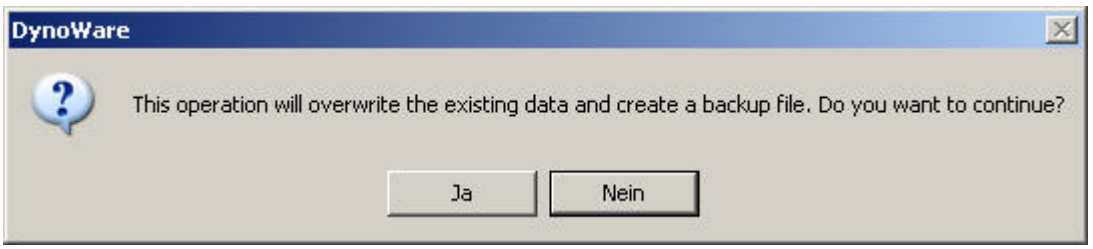
6.4.8 Data Manipulation Offline…

This function allows you to use basic mathematical functions to change data already acquired for each channel. The source channels, operation and destination channel of the calculation must be specified.

The output channel is overwritten with the manipulated data!

On	Activate/deactivate calculation function.
1. Base	First measurand to be processed.
2. Base	Second measurand to be processed. This can also be used to enter constants. It is important to conclude the numerical entry with RETURN.
Operation	Mathematical operation. The following operations are available: addition, subtraction, multiplication, division, log[g], ln[h], exp(e)[i], exp(10)[j], sqr[k] and sqrt[l].
Result	Channel for outputting result
Add	Adds another function.
Remove	Removes the chosen calculation function.

If data is manipulated in this way the following prompt is displayed:



Confirming creates a "*.bak.dwd" file in the folder in which the measurement data is saved. This file contains the unchanged data, whereas the file with the same name but without the ".bak" extension contains the changed data.

[g]Common logarithm
[h]Natural logarithm
[i]Power of e (natural exponential)
[j]Power of 10
[k]Square
[l]Square root

6.4.8.1 Apply to all cycles in file

If several cycles have been acquired beforehand, the data manipulation can be applied to all cycles of this file.

6.5 Tools...

6.5.1 Voltmeter...

The **Voltmeter** is a troubleshooting tool that numerically displays the voltages at the inputs to the A/D card. Selecting **Voltmeter** from the **Tool** menu starts the meter. Any amplifiers configured for Measure Mode **On Start Acquisition** are switched to the Operate mode automatically when the voltmeter is started, and are returned to reset when the tool is exited. To stop the acquisition, press the **Stop** button. To restart an acquisition press **Run**.

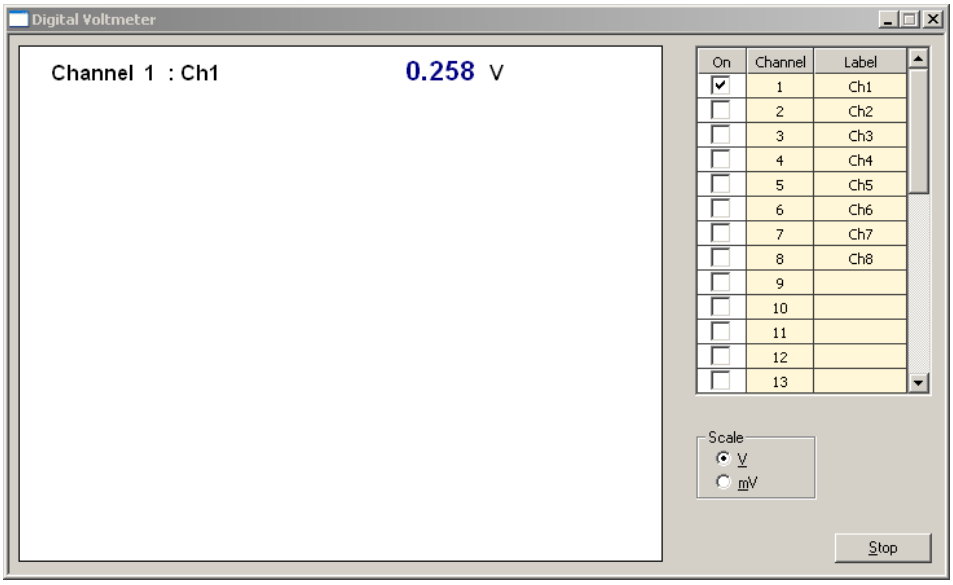


Fig. 42: Voltmeter Tool

The grid shows the channels configured in the system, their active state, and the configured label. To enable/disable a channel use the **On** column check box.

The voltage data can be selected to appear in Volts [V] or Millivolts [mV].

The **Voltmeter** can be run at the same time as the **Oscilloscope** function, but other data acquisition functions are disabled while the **Voltmeter** is active.

6.5.2 Oscilloscope…

The **Oscilloscope** is a troubleshooting tool that graphically displays the voltages at the inputs to the A/D card. Selecting **Oscilloscope** from the **Tool** menu starts the scope. Any amplifiers configured for Measure Mode **On Start Acquisition** are switched to the Operate mode automatically at the start of the oscilloscope, and are returned to reset when the tool is exited. To stop the acquisition, press the **Stop** button. To restart data acquisition press **Run**.

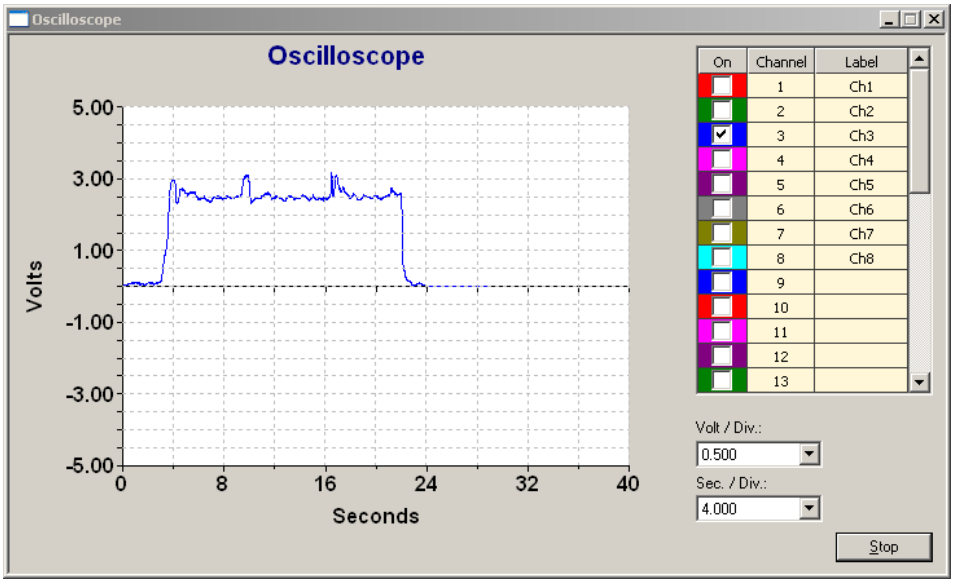


Fig. 43: Oscilloscope tool

The grid shows the channels configured in the system, their active state, and the configured label. To enable/disable a channel use the **On** column check box. The channel color is displayed in the **On** column.

The voltage scale and time scale can be selected from the Volt / Div. and Sec. / Div. Boxes.

The **Oscilloscope** can be run at the same time as the **Voltmeter** function, but other data acquisition functions are disabled while the **Oscilloscope** is active.

6.6 Options...

6.6.1 User Mode

The User Mode allows the software operation to be restricted. The default user mode is **Supervisor**.

6.6.1.1 Supervisor

No operation restrictions are made in the Supervisor mode. To restrict access to software and device configurations, select the **Operator** mode. The default password is "DynoWare" (capital 'D' and 'W', lower case for other letters!).

6.6.1.2 Operator

No functional settings can be made in this mode (Changes to devices configurations, etc. can only be made in the **supervisor** mode). To switch from User mode to **operator** mode a password is required.

6.6.1.3 Change Password

Fig. 44: Changing password

To change the Operator/Supervisor mode password select the **Options → User Mode → Change Password** menu choice. You will need to enter the old password, and enter the new password twice identically for the new password to be accepted. Passwords are case sensitive. The default password is "DynoWare" (capital 'D' and 'W', lower case for other letters!).

6.7 Window...

When a graph is open, the **Window** menu appears in the menu bar. The **Window** menu is for controlling the position of the graphs, and is useful when many different graphs are open on the screen.

6.7.1 Cascade

Arrange all open graphs staggered and overlapping each other.

6.7.2 Tile Horizontal

Arrange all open graphs to be non-overlapping tiled horizontally.

6.7.3 Tile Vertical

Arrange all open graphs to be non-overlapping tiled vertically.

6.7.4 Arrange Icons

Arranges all minimized graphs icons in the lower left corner of the application.

6.7.5 Close All

Closes all open graphs and files.

6.7.6 <open windows list>

Shows a list of all open graphs. Select an item in the list to active a specific graph.

6.8 Help...

6.8.1 Help Topics

The DynoWare help menu is available by selecting **Help** Topics from the **Help** menu, or by pressing F1 at any time. DynoWare uses standard HTML help format through the default-configured browser (see section 1.1 for more information).

6.8.2 Select Language

DynoWare offers two languages (German and English). Any change is made when the program is started for the first time.

6.8.3 About DynoWare

The **About DynoWare** box provides information about the running version of the application, and the product type number. Be prepared to provide this information when requesting technical support.

7. Appendix

7.1 Graphs

Manipulating data using graphs is simple and quick with DynoWare. When a trial is opened one or more graphs appear using the default configuration (see Section 6.3.3 Setup…). The graphs can be edited for content, display, and titles.

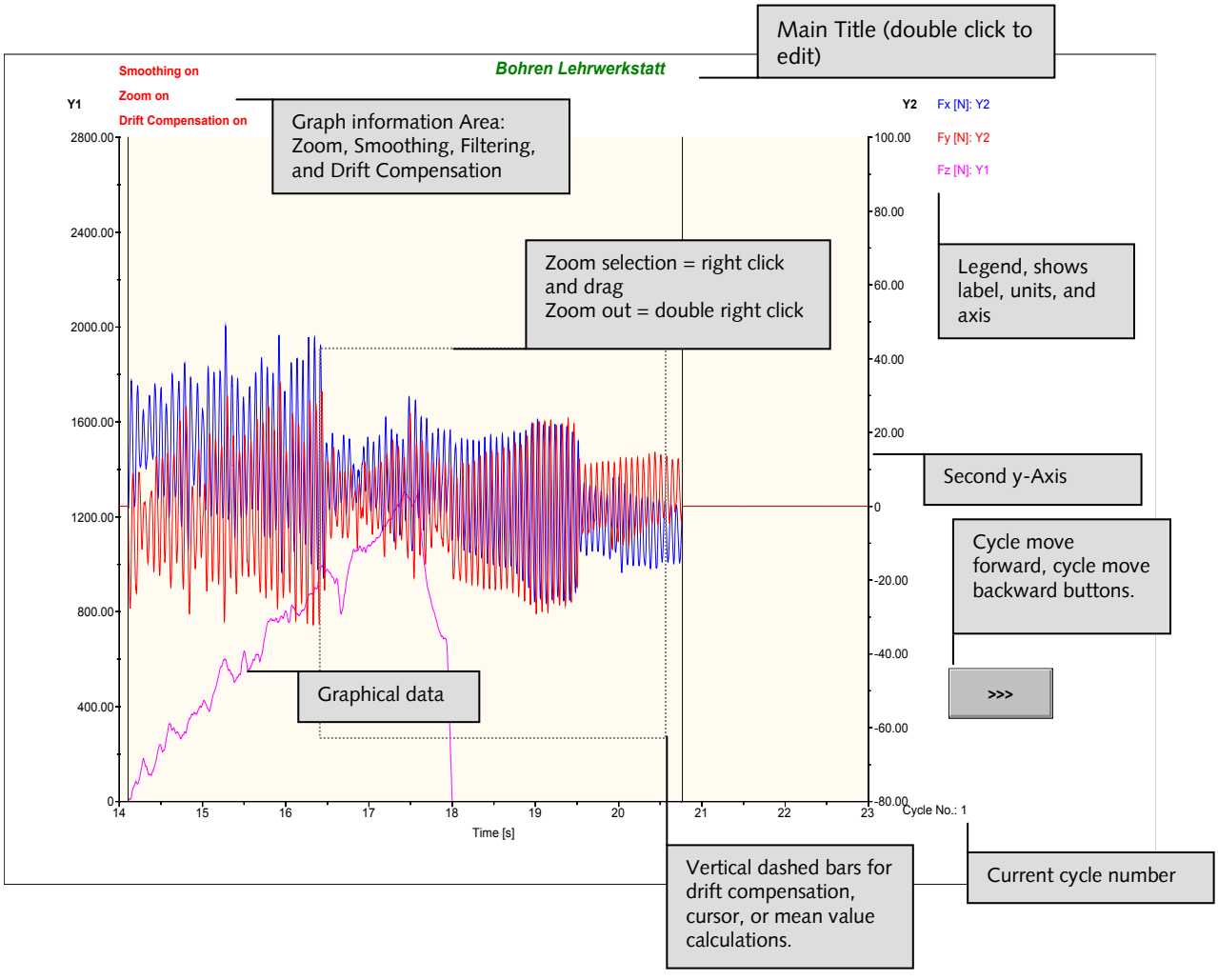


Fig. 45: Typical time based y(t) graph

7.2 Language Selection

All of the supported languages are displayed in a box by pressing Ctrl+Alt+S. You can choose a different language, which will be loaded the next time the program is started.

7.3 Shortcut Key Summary

Key	Command
F1	Help
Alt+D	View → Documentation
Alt+E	Acquisition → Edit
Alt+H	Acquisition → Hardware
Alt+S	Acquisition → Start
Ctrl+Alt+S	Select Language
Ctrl+P	Print Report
Ctrl+L	Report Layout (not documented)
Ctrl+TAB	Cycle through Open Windows (forwards)
Ctrl+SHIFT+TAB	Cycle through Open Windows (backwards)
Right Mouse Drag on graph	Zoom In on graph
Right Mouse Double Click on graph	Zoom Out (if previously zoomed in)

7.4 Modifying the Report Logo

If you want to modify the report print-out to have your company logo, perform the following steps:

Replace the file *prnlogo.bmp*, (by default: C:\Programs\Kistler\DynoWare). Name the file of your logo *prnlogo*.

Notes:

1. The image file extension does not need to be entered. DynoWare will search for "bmp", "wmf", "pcx", "tif" and "jpg" image extensions automatically (and supports these types of images).

2. The recommended image size is 362 (width) by 67 (height) pixels. Images will be scaled to fit and centered in the logo area of the report.

3. Don't delete the original prnlogo.bmp file but rename it.

7.5 Example Files

Filename	Description
messdat.dwd	Drilling steel
messdat1.dwd	
messdat3.dwd	General force application
swept_sine.dwd	1 channel, sine, starting with low and ending with high frequency (swept sine), for filter experiments

This data is saved in the following default folder:
C:\Kistler\DynoWare\Data

8. Technical Data of DAQ-Systems Type 5697A

8.1 General Data

Dimensions	mm	208x70x249
Weight	kg	2,15
Operating temperature range	°C	0 … 50
Min./max. temperature	°C	–10/60

8.2 Power Supply

Electrical isolation (max. 40 V) between input and supply voltage

Input voltage range	VDC	10 … 36
Power consumption	VA	5

8.3 A/D Conversion

Number of channels		28[m]
Resolution (each channel)	bits	16
Input voltage ranges (software-selectable)	V	±0,1 / ±0,2 / ±0,5 ±1 / ±2 / ±5 / ±10
Input voltage	V	±20
Sampling rate (software-selectable)	kS/s	1 000
• Max with 1 channel	kS/s	1 000
• Max with 3 channels	kS/s	333
• Max with 8 channels	kS/s	125
• Max with 14 channels	kS/s	71
Error (conversion)	%	<±0,1
Zero error		
• in range ±1 V / ±2 V	mV	<±1
• in range ±5 V / ±10 V	mV	<±2
Input noise		
• in range <±1 V	mV_{RMS}	<2
• in range >±1 V	mV_{RMS}	<4

[m]DynoWare Type 2825A and DynoWare Update Type 2825E currently only control operation of one multichannel charge amplifier on DAQ-System Type 5697. DAQ-System Type 5697 is capable to acquire 28 channels maximum.

8.4 Connections

USB 2.0 (high-speed) • USB in (uplink, to the PC) • USB out (downlink, unused)	Type	 B, female A, female

8.5 Remote Control

(Digital input and 12 V supply)
Remote Measure and Trigger with 10 kΩ pullup to +5 V

Connector type		D-sub 9f
Input level High (/Trigger Input, /Measure Input) Low	 VDC VDC	 >1,5 <1
Maximum input voltage	VDC	±30
Supply	VDC	+12

9. Measuring Chain Used

Cable Concept for DynoWare Type 2825A... with A/D Cards Type 2855A4 and Type 2855A5

Signal Conditioner	Measuring Signal Connecting Cable	A/D Acquisition Card
Type 5017... 5019... 5070... 5080...[1] 5223... 5237... 5238...	Type 1500B15 D-Sub pos. 15 pole — D-Sub neg. 37 pole Digital L Trigger H Digital L Output H 2 m	Type 2855A4 PCIM-DAS1602/16 (PCI-Bus) D-Sub pos. 37 pole
Type 5011... 5015... 5017... 5018... 5019... 5223... 5237... 5238... other products	Type 1500A67 8x BNC pos. — D-Sub neg. 37 pole 2 m	
Only for signals from the 6-component summing calculator Type 5017Bxxx1 5070Ax2xxx 5080Axx8xxxx[2]	Type 1500A7 D-Sub pos. 15 pole — D-Sub neg. 37 pole Digital L Trigger H Digital L Output H 2 m	

[1] Cable Type 1500B15 is used when output signals F_{x1+2}, F_{x3+4}, F_{y1+4}, F_{y2+3}, F_{z1}, F_{z2}, F_{z3}, F_{z4} have to be acquired.
[2] Cable Type 1500A7 is used when summed signals F_x, F_y, F_z, M_x, M_y, M_z have to be acquired.

Fig. 46: Cable concept for DynoWare Type 2825A... with A/D acquisition card Types 2855A4 and 2855A5

Cable Concept for DynoWare Type 2825A… with DAQ-System Typ 5697A

Signal Conditioner	Measuring Signal Connecting Cable	A/D Acquisition Card
Type 5017… 5019… 5070… 5080…[3] 5223… 5237… 5238…	Type 1700A111A2 D-Sub pos. 15 pole — D-Sub neg. 15 pole 2m	Type 5697A
Type 5011… 5015… 5017… 5018… 5019… 5223… 5237… 5238… other products	Type 1700A113A2 8x BNC pos. — D-Sub neg. 15 pole 2 m	D-Sub pos. 15 pole

[3] Cable Type 1700A111A2 can be used in addition with DAQ-System Type 5697A, regardless of summed or output signals being acquired.

Fig. 47: Cable concept for DynoWare Type 2825A… with DAQ-System Type 5697A

Signal Conditioner	RS-232C Interface Cable (Null Modem)
Type 5011Bx2 5017… 5019… 5223…	Type 1475A3 D-Sub pos. 25 pole — D-Sub neg. 9 pole 3 m
Type 5015… 5018… 5070… 5080… 5237… 5238…	D-Sub pos. 9 pole — Type 1200A27 — D-Sub neg. 9 pole 5 m

Fig. 48: Interface cables

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