

# Malvern Link User Manual

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Head office:

Malvern Instruments Ltd.  
Enigma Business Park,  
Groveswood Road,  
Malvern,  
Worcestershire WR14 1XZ  
United Kingdom.

Tel + [44] (0)1684-892456

Fax + [44] (0)1684-892789

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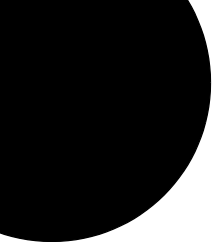
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# Introduction to Malvern Link®

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## Introduction

**Malvern Link** is used in conjunction with the **RTSizer**® software to control the Insittec installation and provide a simplified user interface for both automated and manual systems. **This software application is described within this manual.**

The Insittec® installation is controlled by application software supplied with the Insittec system. Depending upon the installation requirement, including **Malvern Link**, three distinct software applications may be delivered. The additional applications are **OPC server for RTSizer** and **RTSizer**.

These applications are described in their respective manuals.

- **OPC Server for RTSizer**

This provides an interface between the **Malvern Link/RTSizer** software and the plant control (SCADA) software where data reporting can be gathered. The accompanying **OPC Server** manual describes the procedures and parameters required for configuring the application and server connection.

- **RTSizer and hardware operating manual**

RTSizer is the analysis application used to measure the particle size of the process sample being delivered through the Insittec analyser. The information in the accompanying **RTSizer and Insittec analyser user manual** describes and identifies the main features of the Insittec instrument, and describe how to use the Insittec to measure particle size, view the results, perform basic maintenance procedures and diagnose simple problems.

The RTSizer and hardware operating manual also details the systems covered by the manual, operator access to the instrument and software, and **health and safety** precautions.

The information given in **this** manual complements the information given in the above mentioned manuals. All manuals should be read in conjunction, where appropriate, for an understanding of the process system, and application software.

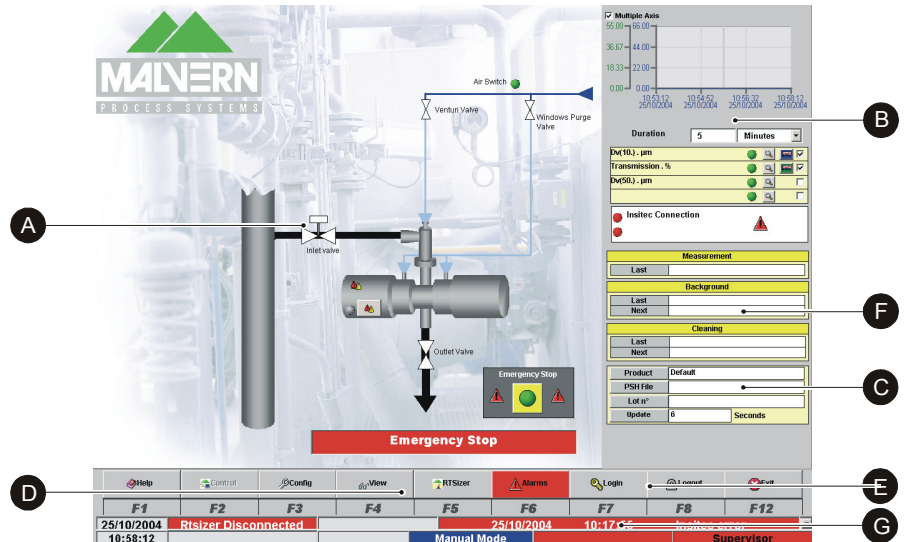
Malvern Link can also be used in conjunction with **RTSizerX** to control **RTSizer** and to automate sample and gas valves using remote input and output connection modules. **Malvern Link** can also be used to report particle size data measured with the Insitex via communication with the plant DCS (Distributed Control System), or configured to a remote mode where it acts as a slave (sensor) controlled by the DCS.

**Malvern Link** has three security levels:

- **Operator** level allows operators to perform basic procedures such as entering sample information, and stopping and starting the measurement process. The operator can only use the **Malvern Link** software display.
- In **Supervisor** level it is possible to configure the software to be able to measure new samples, setup measurement schedules, define measurement files and more.
- A “**configurable**” level allows the user to only perform operations that have been allowed by the Supervisor; this may range from merely starting and stopping the measurement process to full maintenance operations.

# The Malvern Link control screen

On starting **Malvern Link**, the main interface window is displayed, as shown below. A brief description is given for each feature of the window. If more information is required, refer to the on-line help.



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## ① Instrument Mimic

The instrument schematic (the Mimic) is a representation of the installation configuration, and shows the status of the key system components. All valves, pressure switches, sensors are shown, as well as the optical unit. The Mimic shown will have been configured by the installation engineer to represent the actual system configuration.

**Open** valves, switches and sensors are shown in **green**. **Closed** valves, **pressure** switches and sensors are shown in **white**. Any device that is in movement, will be shown 'flashing' while it changes state.


The actual state of each valve is setup by the configuration **Action** buttons.


For full details of the Instrument Mimic see **Chapter 2**.

## ② Mini trend chart

The particle history display shows the measurement parameters (e.g. Dv(50), transmission levels etc) over time. The **Duration** section under the display determines the time period that is displayed.

The section beneath the display lists all parameters that can be monitored.

To add a parameter, press the  button. Select from the scroll down list and press the tick (✓) button to confirm.


To display a parameter in the chart, select the check box . A colour coded X-axis will be added to the chart.

## © Setup information

**Malvern Link** controls the measurement and its setup by a “Product” setup file. It is possible to have more than one product specified for the setup, e.g. different grades of material may be used, and a product file is setup for each. To change between products, select a product from the drop-down list next to the product label.

The information section not only allows changing between products, but also displays other information, such as:

- **Particle Size History (.psh)** file – the file the measurement information is saved to.
- **Lot** – an optional identifier field for the batch of sample being measured. Again, this is set using the **Config.** button
- **Update** – how often the measurements are made can be changing by altering the update period.

The information and setup displayed will initially be the same as when the configuration was setup using the configuration button (**Config-Parameters -Products--Insitec filename**).

Full details of setting up configurations are described in **Chapter 3**.

## ① Action buttons

The action buttons are the main controls for **Malvern Link**. Selecting a button will immediately perform a designated function, or display a sub-menu.



If a menu is displayed, each button will have function key number alongside. The function key number can be pressed instead to activate the respective action button. Each button will be available to a user if a key is shown; if unavailable, the button will be greyed out and a lock will be shown instead.



If the installation incorporates a touch-screen monitor, the buttons will align underneath the touch-screen buttons. Use of the action buttons will then be via the monitor and not the mouse.

## Control

Clicking this button displays the **Control** sub-menu. **Background**, **Cleaning** and **Measurement** are only visible at the **Supervisor** or **User configurable** access levels. When any control button is pressed, a sequence of events is initialised.

On an automated system the various valves within the system are opened/closed as applicable. For a manual system, instructions are given to the operator to manually open /close the various valves. The actual sequence of events performed depends on the configuration running, the operations being defined when a configuration is prepared. Each of the control buttons is outlined below.

### Idle

Pressing the **Idle** button sends the system into a standby state, i.e the inlet and outlet valves will be closed but the purge air will still be in operation to protect the windows from dust contamination.

### Start/Stop

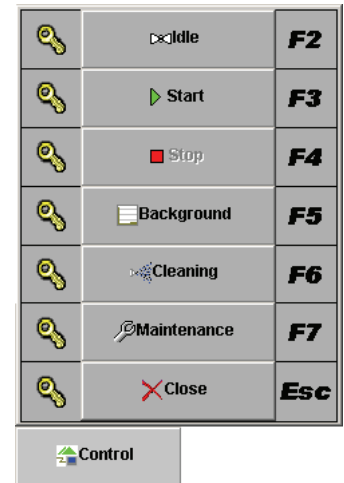
Pressing the **Start** button starts the measurement process. When the button is pressed, the button will display the word **Stop**, allowing the measurement process to be stopped. Typically, when in the stop state, the system will still have sample passing through the instrument, but the measurement will be halted (the exact state of the valves will be dependent on how the system was commissioned).

### Background

Pressing the background button initiates a background measurement. Note that, if an auto-schedule Ⓢ has been set up, then a background measurement will be started automatically at pre-defined time intervals. With the process flow switched off, background measurements are taken to ascertain what electronic and optical noise (how clean the windows are) is present in the system. When the process flow is switched on, the noise is then subtracted from the measured signal to leave only the scattering pattern that is caused by the presence of sample in the beam.

### Cleaning

Pressing the cleaning button initiates a backflush sequence. This is where air is directed back along the inlet pipe to clear blockages or accumulation of powder. Note that if an auto-schedule Ⓢ has been set up, then the cleaning sequence will be started automatically at pre-defined time intervals.



## Maintenance

Pressing the maintenance button sends the system into a safe state to dismantle for maintenance; i.e. the inlet valve will be closed to prevent sample passing through the system (the outlet valve will remain open to dissipate the pressure that would be caused by the purge air).

## Close

Closes the sub-menu.

## Config.

Clicking this button displays the configuration sub-menu. The configuration button is only visible at **Supervisor** or **User configurable** access levels. Pressing this button allows the following functions to be performed

## Load

Loads an existing configuration.

## Save

Saves the current configuration.

## Security

Changes the security configuration (the access to the features of **Malvern Link** are user dependent).

## Tags

Displays the tag configuration windows.

## Parameters

Displays the parameter configuration windows to configure the valves sequences, the product library, the auto background, the auto back flush.

## Hardware

Sets **Malvern Link** in configuration mode to be able to modify the **Malvern Link** options (Auger, At-Line, ...) the valves, the switches and the sensors. This function works in conjunction with the **Instrument Mimic**.

## Close

Closes the sub-menu.

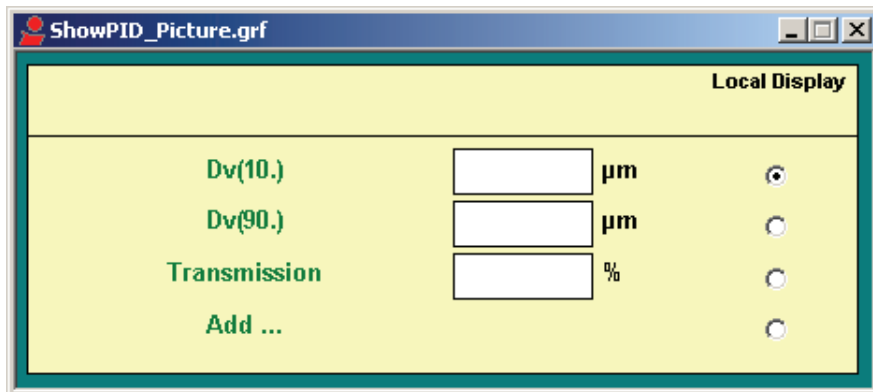
Full details on setting up configurations are given in **Chapter 3**.





### PCVs (Process Control Variables)

Displays a window for selecting the PCVs to view. In these windows a PCV can be assigned to a local display (select the appropriate radio button) or have control of the PIDs.



Depending upon the configuration opened, a facility exists where the auger speed and transmission can be adjusted.

### Mimic

Returns to the main mimic. Clears the PCV and results views and returns to the Instrument Mimic view.

### Close

Closes the sub-menu.

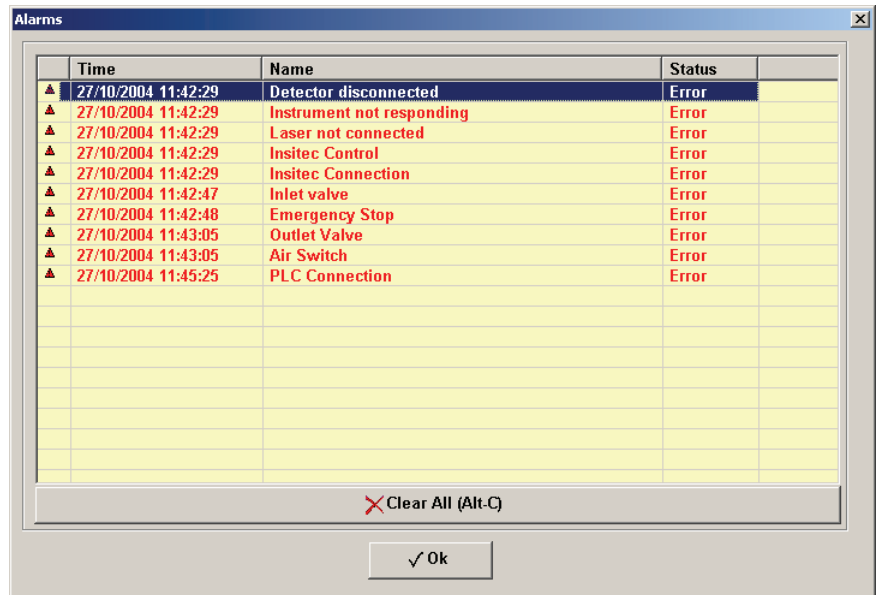
### RTSizer

Displays the **RTSizer** software. The software will be displayed over the **Instrument Mimic**. Clicking on the **Malvern Link** again will hide **RTSizer**. Access within **RTSizer** will be dependent upon the users security permissions.

For full details on using **RTSizer** refer to the **RTSizer and Insittec analyser user manual**.

## Alarms

Pressing the **Alarms** action button displays all alarms that have been triggered. The operator has the option of acknowledging the alarm using the **Clear** button.



	Time	Name	Status
▲	27/10/2004 11:42:29	Detector disconnected	Error
▲	27/10/2004 11:42:29	Instrument not responding	Error
▲	27/10/2004 11:42:29	Laser not connected	Error
▲	27/10/2004 11:42:29	Insitac Control	Error
▲	27/10/2004 11:42:29	Insitac Connection	Error
▲	27/10/2004 11:42:47	Inlet valve	Error
▲	27/10/2004 11:42:48	Emergency Stop	Error
▲	27/10/2004 11:43:05	Outlet Valve	Error
▲	27/10/2004 11:43:05	Air Switch	Error
▲	27/10/2004 11:45:25	PLC Connection	Error

✗ Clear All (Alt-C)

✓ Ok

## Exit

Pressing this button will immediately shut down the complete system and the controlling Insitac software. A shutdown dialogue window appears and an **Emergency Stop** warning message is displayed in the centre of the screen. This button is only available at **Supervisor** or **User configurable** access levels.

## Help

Opens the Help file.

## ⑤ Login/logout and Security

**Malvern Link** has configurable security for levelled access to the software. The **Supervisor** access level is responsible for allocating access rights for individuals. To logon to the system, press the **Login** button. The software will ask for the user name and password. Once finished with the software, a user should always log out of the system by pressing the **Logout** button to prevent unauthorised access.

Users can log on to **Malvern Link** using three access levels:

- **Operator** level.
- “**User configurable**” level.

### ■ Supervisor level.

Both **Malvern Link** and **RTSizer** have security features.

For an automated system, only **Malvern Link** security is required. The security permissions inputted using **Malvern Link** will also give the relevant security for the **RTSizer** software.

For a non-automated system, only the **RTSizer** security functions are used.

Full details on setting up security and access levels are given later in this chapter.

### Ⓕ Auto measure/background/cleaning

The **Supervisor** can set up a schedule to automatically perform background measurements, cleaning sequences or timed measurements at specific times of the day.

If a schedule has been specified, this area will display the time of the previous and next measurement.

### Ⓖ Status area

This bar displays the current status of the Insitec system. It will display each valve opening and closing operation and any sequences that have been setup. Use the scroll arrow to view the operations.

The status area also displays the data and time, the security access level, and the **RTSizer** connection.

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# Security

The systems may be used by users of varying skill levels. With the Insitec it is possible to limit user access so that certain functions (such as changing the product, configuring the Insitec or allowing the auger startup) can be reserved for specific users only. Within the Malvern Security system, one or more persons are set up as the supervisor. The supervisor then controls access to the instrument by defining **Users** and their **Permissions**.

Each user is assigned to a **Group**. A group is one or more persons that have the same access rights or Permissions. Permissions are the access rights that are allowed for each user group, and may range from product selection to changing the configuration. **Malvern Link** can be used on three group security levels:

- An **Operator** level allows operators to perform basic procedures such as entering sample information, and stopping and starting the measurement process. The operator can only use the **Malvern Link** software display.
- In **Supervisor** level it is possible to configure the software to be able to measure new samples, setup measurement schedules, define measurement files, etc.
- A “**configurable**” level allows the user to only perform operations that have been allowed by the Supervisor; this may range from just starting and stopping the measurement process to full maintenance operations.

The supervisor adds operators to a group, assigning each operator a password. Each operator's identification and password are entered to enable access to the software.

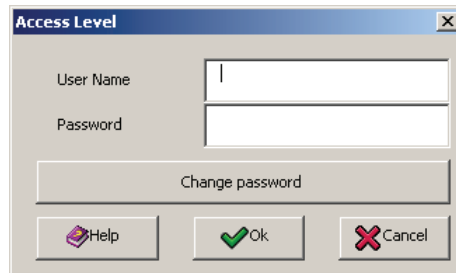
The first time the software is run, the security system will be disabled and a supervisor user and supervisors group will be created by the system. This is so at least one user will have permission to configure the security system.

**The first task at first software startup is to set up the supervisor account.**

## Initial start-up - set up the Supervisor

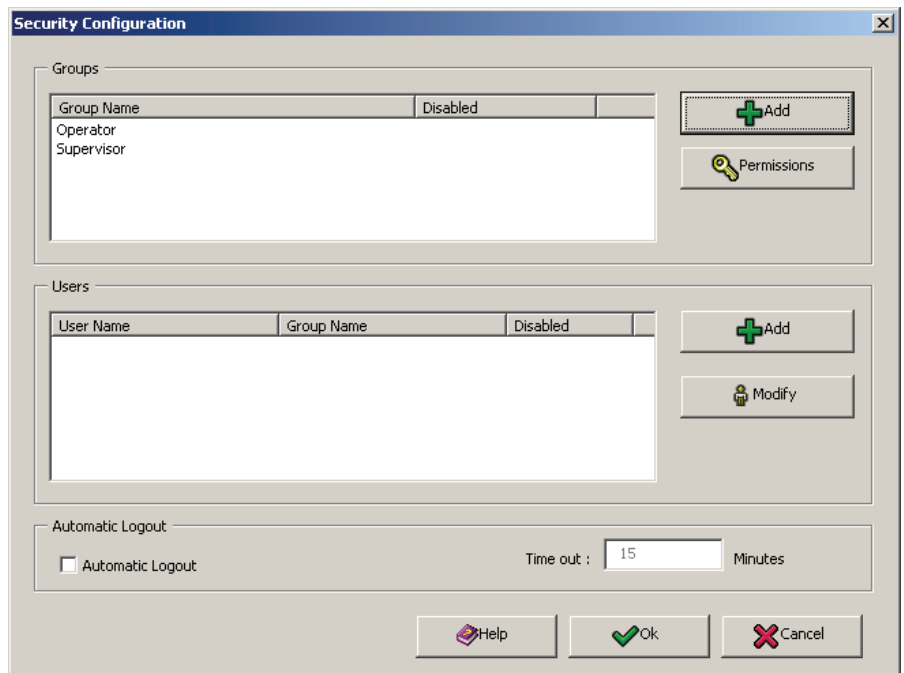
The Supervisor must first configure their own security access before any group permissions or users are assigned. It is vital that at least one user has access to the configuration of the security system.

At first start up of the software, the security system allows access to the security settings by pressing the **Login** button, and pressing **OK** on the **Access level** dialogue.



The 'Access Level' dialog box contains two input fields: 'User Name' and 'Password'. Below these fields is a 'Change password' button. At the bottom of the dialog are three buttons: 'Help' (with a question mark icon), 'Ok' (with a green checkmark icon), and 'Cancel' (with a red X icon).

Press the **Config** button and select **Security**. The first time the system is run, there will be one **Group** (supervisor), but no users allocated.



The 'Security Configuration' dialog box is divided into three main sections. The top section, 'Groups', contains a table with columns 'Group Name', 'Disabled', and an empty column. The table lists 'Operator' and 'Supervisor'. To the right of the table are 'Add' (with a green plus icon) and 'Permissions' (with a key icon) buttons. The middle section, 'Users', contains a table with columns 'User Name', 'Group Name', 'Disabled', and an empty column. To the right of the table are 'Add' (with a green plus icon) and 'Modify' (with a wrench icon) buttons. The bottom section, 'Automatic Logout', has a checkbox labeled 'Automatic Logout' and a 'Time out' field set to '15' minutes. At the bottom of the dialog are three buttons: 'Help' (with a question mark icon), 'Ok' (with a green checkmark icon), and 'Cancel' (with a red X icon).

To secure the system, a user must first be specified for the **Supervisor** group - see **Adding a user** below.



### Note

It is preferable to have at least two users assigned to the **Supervisors** group. The users user name and password should be stored in a secure location. This is to safeguard against accidental lockout or deletion of permissions that may prevent the security settings being available.




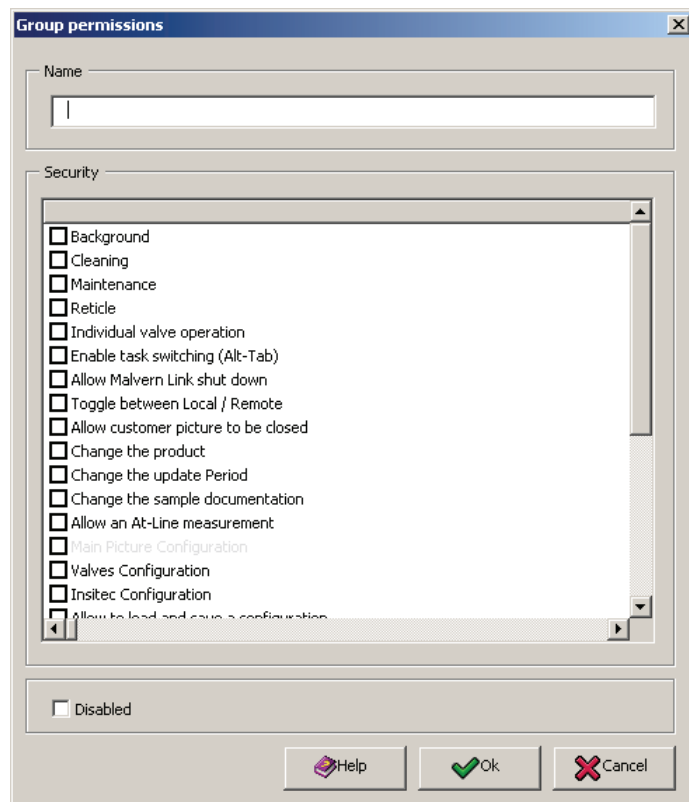
Remember that after any changes to the security system – adding users, changing of permissions, etc, – the **OK** button must be pressed.

### Automatic logout

Select the Automatic logout checkbox and specify the timeout period. After the timeout period has elapsed, the security system will then logout any users currently using the allowed permissions (i.e. Configuration settings).

## Adding a Group

Select **Config-Security** to enter the **Security configuration** dialogue. Alongside the **Group** area, select the  **Add** button to display the **Group permissions** dialogue:



Enter a **Name** for the group, possibly identifying the group's purpose. Example names might be:

- **Operators** - general users of the system.


- **Supervisors** - skilled operators responsible for configuration and maintenance procedures.
- **Administrators** - users authorised to configure the security system.

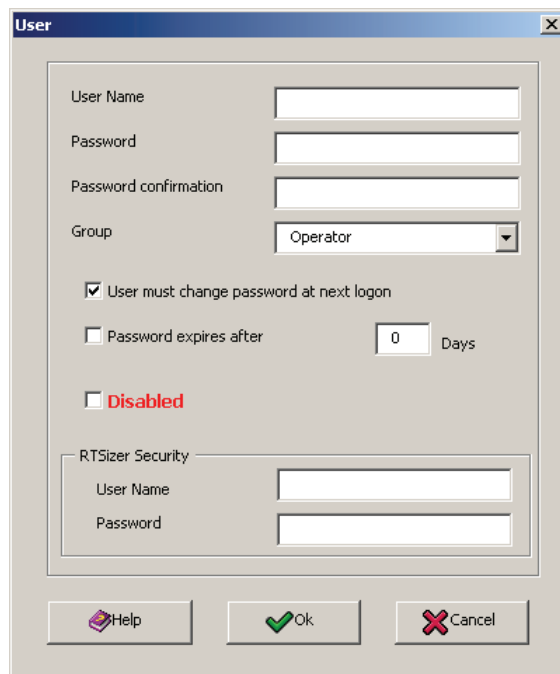
The **Security** section of the dialogue allows functions (or permissions) of the software to be enabled or disabled for the group. To set the access permissions for the group, simply scroll down the list of permissions and check the boxes for the permissions required. This can also be done with a mouse or by highlighting a permission and pressing the space bar. The permissions list can be navigated using the up and down keys once selected.

Note that the **Permissions** button in the **Security configuration** dialogue only displays the permissions assigned for that group.

To stop a group operating, select the **Disabled** check box. It is not possible to remove a group once created.

## Adding a User

Select **Config-Security** to enter the **Security configuration** dialogue. Alongside the **Users** area, select the  **Add** button to display the **User** dialogue:



The **User** dialogue box is a standard Windows-style window with a title bar. It contains several input fields and checkboxes. The main section has fields for 'User Name', 'Password', and 'Password confirmation', followed by a 'Group' dropdown menu currently set to 'Operator'. Below these are three checkboxes: 'User must change password at next logon' (checked), 'Password expires after' (unchecked) with a '0' in a box and 'Days' label, and 'Disabled' (unchecked) in red text. At the bottom is a section titled 'RTSizer Security' containing 'User Name' and 'Password' fields. The window has 'Help', 'Ok', and 'Cancel' buttons at the bottom.

Each user must have a unique **User Name**. This, along with the user **Password**, forms the unique key required to identify each individual using the system.

- The **User Name** is commonly an abbreviated form of the individual's name or a unique identifier such as an employee code.
- **Passwords** must be alpha-numeric (e.g. operator4).

Press the **Group** button to allocate the user to the required group.

Generally it will be the supervisor entering these details. The supervisor can enter the password but this would require the administrator to know a users password beforehand. A more secure approach is for the administrator to specify a previously arranged password, such as the users name, and force the user to change their password the next time they log on using the password check boxes - User must change password at next logon.

To disable a user's security access, select the **Disabled** check box. It is not possible to remove a user once created.

User details can be changed by selecting the user and pressing the **Modify** button.

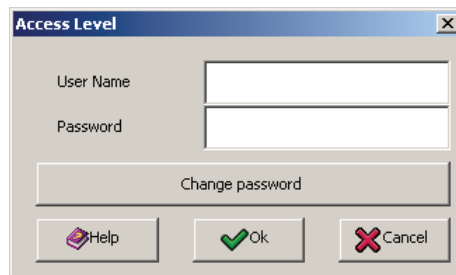
## Password options

### User must change password at next logon

The change password dialogue will be shown when the user next logs in, allowing the user to change their password. This allows the supervisor and a user to set up a user account without the supervisor knowing the users final password.

Users can change their own passwords once logged in by using the **Security-Change password** menu.

To change the user password; enter the current password and specify a new password with confirmation. Pressing **OK** makes the change to the security settings.

A screenshot of a Windows-style dialog box titled "Access Level". It contains two text input fields: "User Name" and "Password". Below these fields is a button labeled "Change password". At the bottom of the dialog are three buttons: "Help" (with a question mark icon), "Ok" (with a green checkmark icon), and "Cancel" (with a red X icon).

### Password expires after

To force a user to change their password, select the **Password expires after** checkbox and the number of days before the change must be done.

**RTSizer security**

To allow access to **RTSizer** software security, input a **User Name** and **Password**. This will allow access to the security features at the same access level as setup in **Malvern Link**.

# The Instrument Mimic

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## Introduction

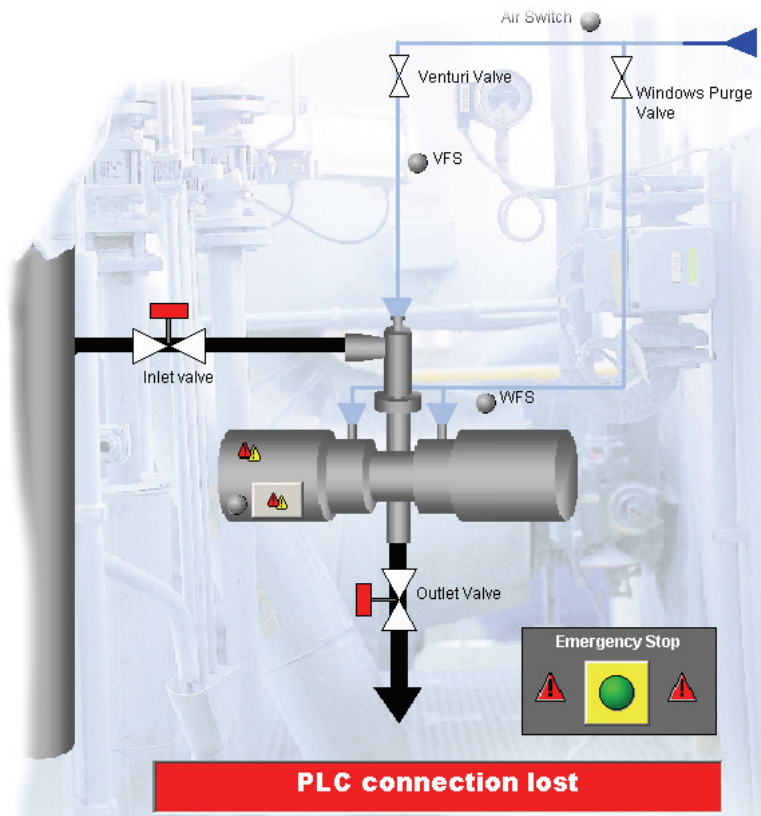
The **Instrument Mimic** is a representation of the installation configuration, It is configured by the installation engineer when the process system is originally installed.

In **normal view** the schematic will show the status of the key components of the system. The optical unit (the Insitec) plus all feed lines, air supply lines and valves will be shown. The valves are shown in **green** when open, and **white** when closed.

The actual state of each valve is setup by using the configuration menu (**Config-Hardware**) - this will change the mimic to the **design view**. In design view all components that make up the installation will be shown; this will include all valves, sensors and switches.

## Instrument Mimic - Normal view

This is the standard mimic view when the installation is running. When the start button is pressed (**Control-Start**) the process will begin. The mimic simulates what the real installation is doing - valves will open (shown in green) and shut (shown in white) depending upon the operation currently being performed. Any device that is in movement, will be shown 'flashing' while they change state.



With all relevant valves open the sample flow will begin. This is shown by a moving sample line travelling from the main process line and then through the Insitec.

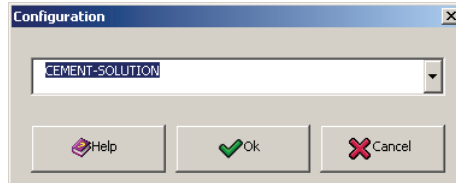
If other options such as an auger or stirrer are fitted to the installation, their operation will also be shown via a moving graphic.

## Control of the Mimic

While the mimic is in the normal view, the following actions can be performed.

### Loading an installation configuration

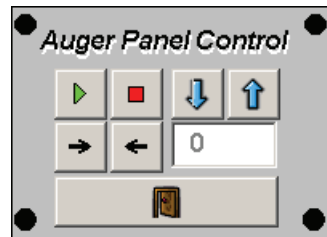
Installation configurations can be loaded by selecting **Config-load**.



A list of available “default” installation configurations is shown. Select the required configuration and press **OK**. The mimic will change to match the selected configuration. This action can only be performed at a supervisor access level.

### Auger control

If an auger is fitted to the installation it is possible to adjust its performance using the Auger control panel.



The buttons are:



Starts and stops the auger.



Increases or decreases the auger speed.



Current auger speed (%).



Normal (forward) or reverse rotation of the auger.



Closes the Auger control panel.

This action can only be performed at a supervisor access level. Not all functions are available for all applications.

### Other control options

Depending upon the installation configuration, other process control components may have been added:

Diluter



Ultrasonic



Liquid Insitac



Stirrer



AT-line feeder



It is possible to alter the configuration settings for each of these components - see below.



## Emergency Stop



Pressing this button will initialise an “emergency stop”. The current measurement sequence will cease and **all** control valves will be **immediately** closed, without going through the specified valve closing sequence. An emergency stop warning message will be displayed in the centre of the screen and the **STOP** button will change into a green circle. Pressing the green circle will clear the emergency stop and allow the measurement to be started again.

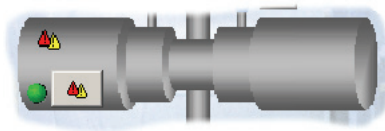


### Note

This is a software emergency stop and **does not** have the same reliability as a **hardware** emergency stop. Consult the site’s health and safety policy on the implementation of this stop.

## Insitec status

The Insitec in the middle of the mimic, allows the user to review the current status of the Insitec.




The icons are:

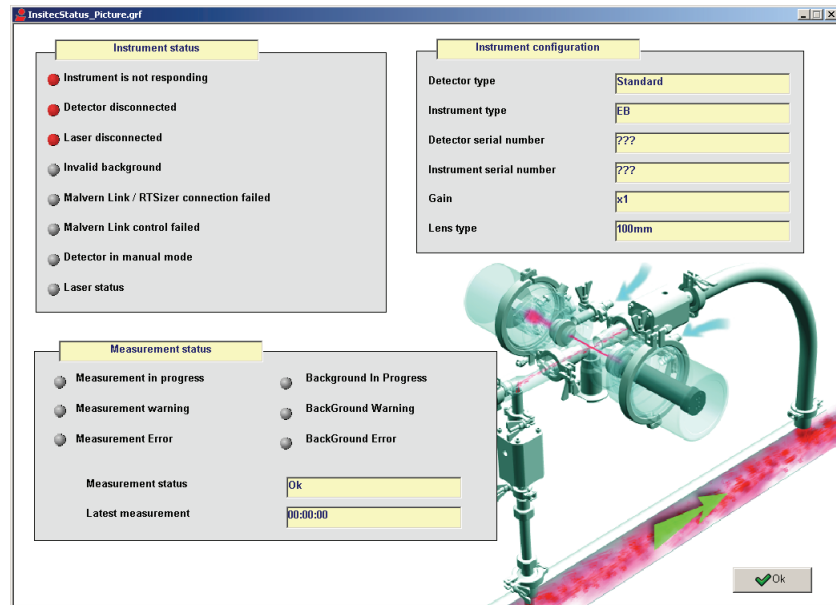


Flashes if there is an Insitec failure



Shows green when the **RTSizer** software is connected and controlled by **Malvern Link**

Further details of the Insitec status can be checked by left-clicking the mouse on the  button positioned on the Insitec. This shows the **Insitec Status** dialogue. This can be inspected by all users.



This dialogue shows the current status and settings of the Insitec configuration. The status dialogue is divided into three areas:

### Instrument status

Details the control and communication status of the instrument with respect to the hardware and software - laser disconnected, instrument is not responding.

If there is an error, each operation indicator will display red.

### Instrument configuration

Details the hardware used in the instrument - detector type and serial number, lens type fitted.

### Measurement status

How the measurement is proceeding - whether there is an error, time of current measurement, background measurement. The indicators alongside each operation describe the status.

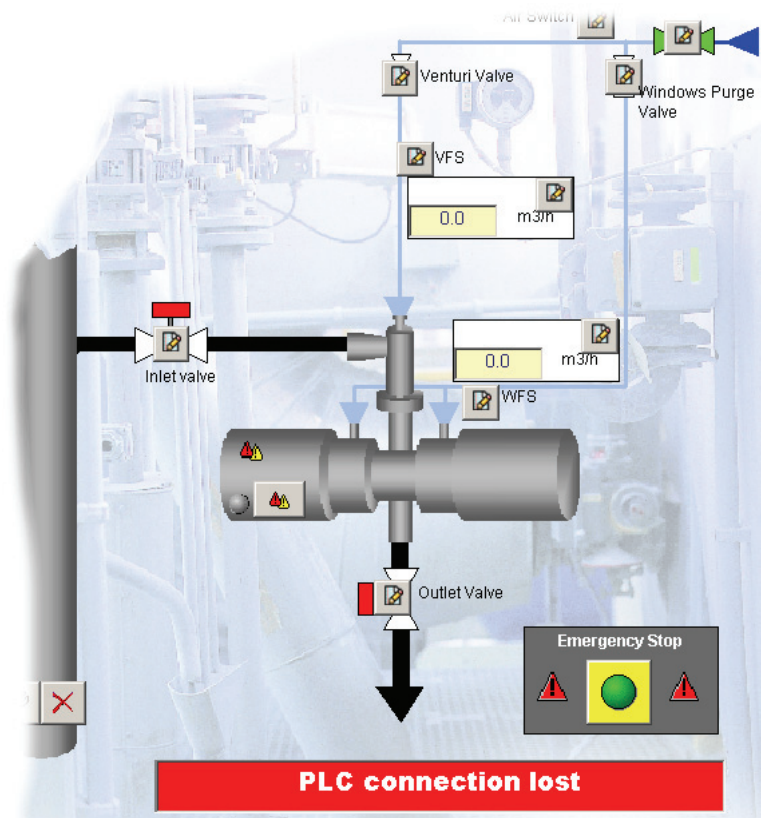
- **Red** if there is an error.
- **Yellow** if there is an warning.
- **Green** if the operation is working.

Press **OK** to exit the dialogue.

## Instrument Mimic - Design view

To set up and configure the mimic, enter the design view. This is done via the Configuration menu - select **Config-Hardware**. Only a supervisor can enter the design view and alter the mimic.

With the **Instrument Mimic** in design view, the control menu is greyed out and measurements cannot be started.



When in the design view all components of the installation will be displayed.

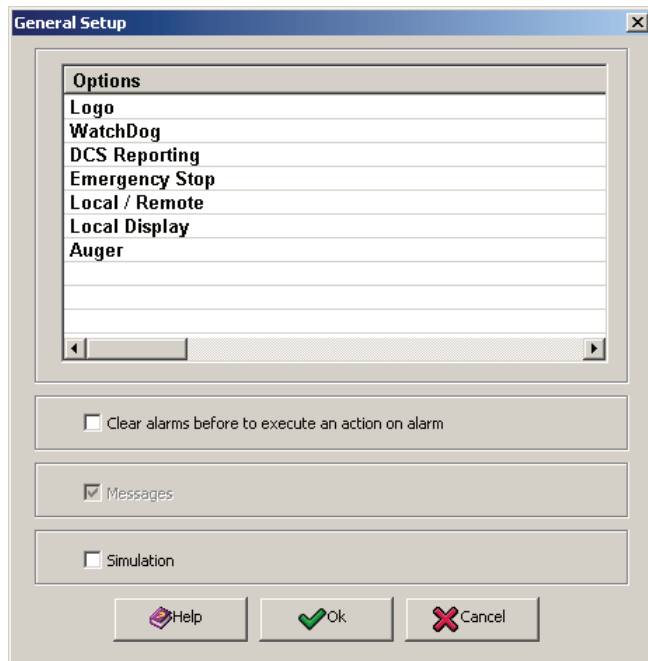
The dialogues use **“tags”** for connecting the various input or output parameters for each component. **Tags** is the name given to the remote input and output connections the parameter will be connected too - i.e. Analogue input 01.

## General setup

When in design view, the process pipe will display the following two buttons:



Opens the **General Setup** dialogue. This dialogue enables the setting up of various options that have been assigned to the configuration. The sections below cover the most common options.

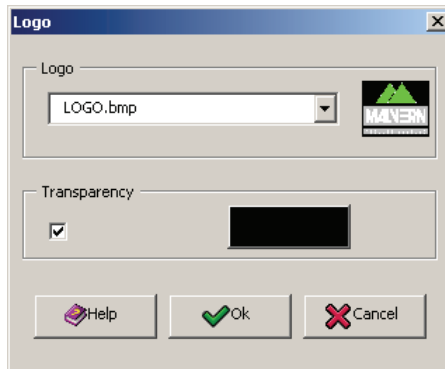


Closes the hardware configuration session. Select this button and save the configuration when all changes have been completed.

The example above shows the options used for a typical application. To access each option's configuration dialogue, double-click on that option.

## Logo

This dialogue allows a customer logo to be added to the **Instrument Mimic**. The logo used must be in **.bmp** format and in the **C:\Dynamics\MalvernLink....\Pic** directory.

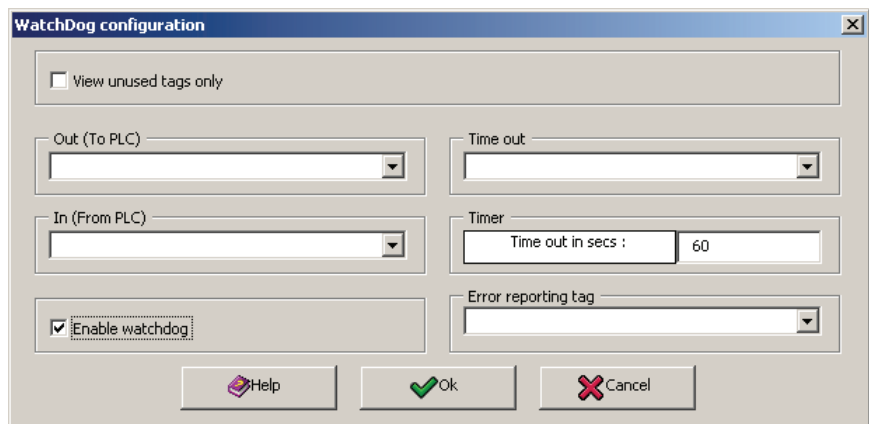


Select the logo required from the scroll down list. A preview of the logo will be shown alongside.

If the mimic background is required to show through the logo, select the **Transparency** check box. Select the transparency colour by pressing the colour button alongside.

## Watchdog

The watchdog checks the communication between the **Malvern Link** software and the remote input and output connections.



Communication to and from the remote input and output connections is provided by the **Out** and **In** tags selection.

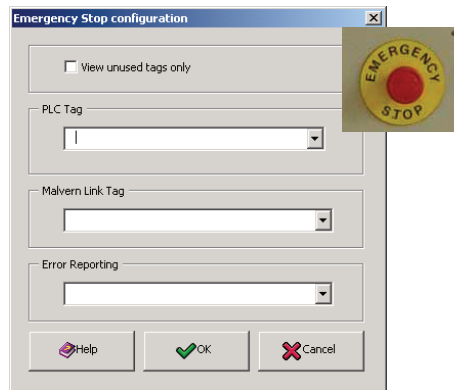
**Timer** determines the period the software will check for communication before an error is reported. Any communication error is reported on the **Error reporting** tag.

### DCS reporting

The **DCS reporting configuration** dialogue enables reporting control between **Malvern Link** and the DCS (Data control system) used - i.e. a SCADA package. The dialogue allows tags to be configured for the monitoring and reporting of the data, plus error tag indication.

### Emergency stop

If an external emergency stop button has been fitted to the system, this can be controlled using the **Emergency Stop configuration** dialogue.



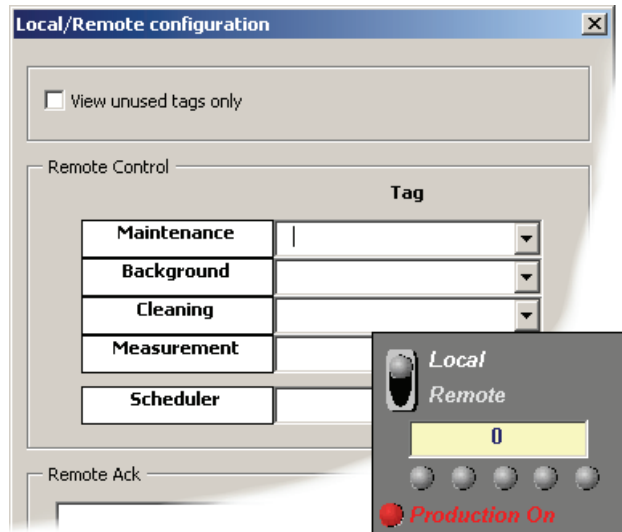
The **PLC Tag** shows the status of the Emergency stop.

If the emergency stop has been pressed, this will be reported on the **Malvern Link** tag. If an error occurs, this is reported on the **Error Reporting** tag.

### Local/remote

The local/remote option is used when the installation is controlled via a remote computer. The remote option will enable the basic Maintenance, background, cleaning and measurement operations to be carried out. These operations will be done as configured, with the **Malvern Link** software, on the Local computer.

Appropriate tags will be assigned in all areas.



When used, the Local/remote display on the **Instrument Mimic** can be used to switch the control between the local and remote computers.

The display will show the following:

- The central display shows the product code sent by the remote computer.
- Indicators on the display identify particular actions. They show green when the action is on. In order from the left, they are: **Measurement, Background, Cleaning, Maintenance** and **Alarm**.
- **Production on** – green when production is running, otherwise red.

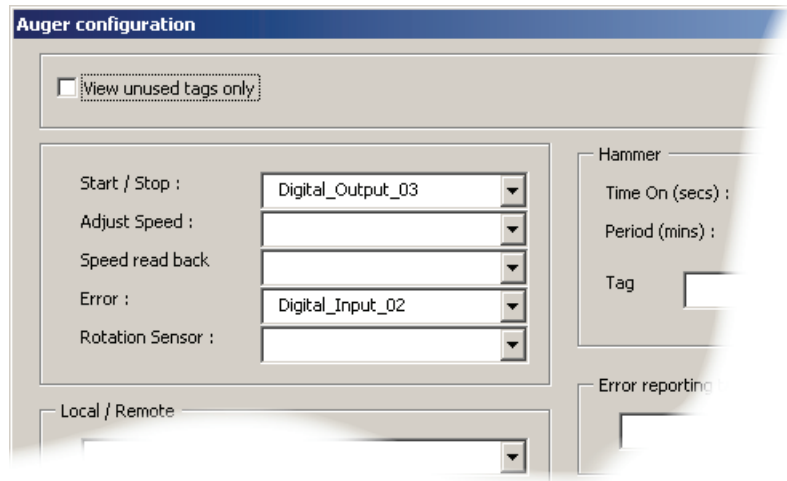
### Local display

Available if a display module has been added to the automation compartment.

The display module will display the measurement result specified in the **View-PCVs (ShowPID)** control dialogue.

## Auger

The **Auger configuration** dialogue enables the setting up of the various tags used for control and reporting of the Auger.



Appropriate tags can be assigned in all areas for local/remote operation, setting of the hammer action, speed and direction, etc.

If an error occurs, this is reported on the **Error reporting** tag.

## Configuration dialogue

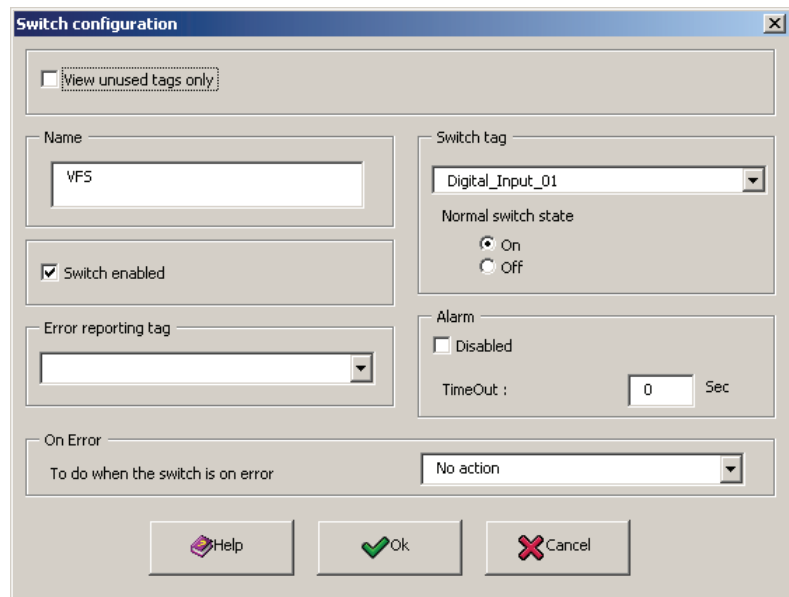
Left-clicking the mouse on any of the components opens the **Configuration** dialogue where the components parameters can be set. This dialogue allows the following parameters to be set:

- Operational state
- Name of valve
- Relationship to valve sensor
- Timeout settings
- Tag setup
- Error reporting
- Status indicator

The configuration dialogue includes pull down menus that allow measurement parameters to be stored to memory addresses located in the automation architecture, to be retrieved and analysed later using SCADA packages.



Different dialogues exist for each type of component, though most parameters are similar in each dialogue. This example shows a **Switch configuration** dialogue:



The image shows a 'Switch configuration' dialogue box with the following fields and controls:

- ☐ View unused tags only
- Name: Text field containing 'VFS'
- Switch tag: Drop-down menu showing 'Digital\_Input\_01'
- Normal switch state: Radio buttons for 'On' (selected) and 'Off'
- ☒ Switch enabled
- Error reporting tag: Drop-down menu (empty)
- Alarm: ☐ Disabled; TimeOut: 0 Sec
- On Error: To do when the switch is on error; No action (selected)
- Buttons: Help, Ok, Cancel

### Creating a switch configuration

Login at the appropriate security level, select **Config-Hardware** to display the **Instrument Mimic** in design view, then left-click on a switch to display the dialogue. Configure the **Switch** dialogue as follows:

#### Name

Input a name to identify the switch (e.g. Pressure switch indicator low).

#### Switch Tag

This is the "Malvern memory address". Each Malvern memory address references both a remote input and output connection memory address and a wiring scheme. These are both unique to each system installation and will have been configured by the installation engineer. A list detailing the relationship between the Malvern tag to the remote input and output connections and wiring will be supplied with the system.

Click on the drop-down arrow to view and select the appropriate tag for the switch.

#### View unused tag only

With this option selected only the available tags will be displayed when selecting a tag address; all assigned tags will be hidden.

**Switch enabled**

Selecting this will allow the switch information to be displayed on the instrument schematic. Deselecting the option will hide the information.

**Normal switch used**

Select the radio button that corresponds to the switch's normal operating state (e.g. if the switch contact is made when pressure is on, then select **On**).

**Alarm**

If a fault occurs with the switch, an alarm will be raised after the set **Timeout period**, unless the **Disabled** check box has been selected.

**Error reporting tag**

If an error signal has to be sent to the remote input and output connection module (PLC), select the appropriate Malvern tag from the drop-down list.

When the switch configuration is set up, save the configuration by pressing **OK** to exit the dialogue, then **Config-Exit hardware** to exit design mode. A dialogue will appear requesting the filename to save the new configuration as.

# Configuring the installation

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## Introduction

The procedures in this chapter are for use only by the **Supervisor** or an operator given authorisation

This chapter deals with the **Configuration** menu, where all the system parameters are set. It enables the supervisor to set up parameters and sequences for each product measured; whether that is sequences for opening and closing valves, or product measurement specifications.

## The Configuration menu

The **Configuration** menu is accessed by logging in and selecting the **Config** action button. This button is only visible at **Supervisor** or **User configurable** access levels, otherwise it is greyed out.

The menu allows the following functions to be performed:

Command	Function
<b>Load</b>	Loads an existing configuration.
<b>Save</b>	Saves the current configuration.
<b>Security</b>	Changes the security configuration. Security is explained at the end of <b>Chapter 1</b> .
<b>Tags</b>	Displays the tag configuration windows.
<b>Parameters</b>	Displays the parameter configuration windows to configure the valves sequences, the product library, the auto background, the auto back flush.
<b>Hardware</b>	Sets <b>Malvern Link</b> in configuration mode to be able to modify the <b>Malvern Link</b> options (Auger, At-Line, ...) the valves, the switches and the sensors. This function works in conjunction with the <b>Instrument Mimic</b> . The mimic is explained in <b>Chapter 2</b> .
<b>Close</b>	Closes the sub-menu.

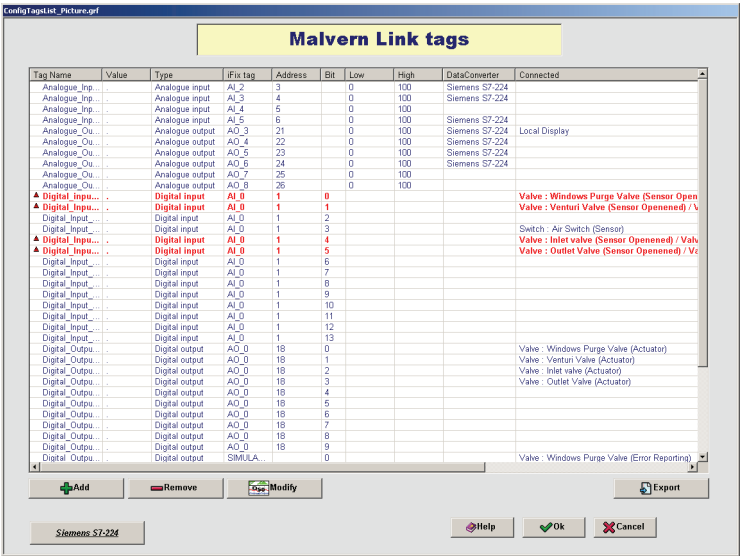
## Tags settings

What are tags? Tags is the name given to the remote input and output connection modules used to provide the input and output signals between the **Malvern Link** software and the process interface - the SCADA package.

During the configuration of the process installation specific functions are assigned to one of the connections, or tags.

To review which tag has been assigned to each function, log in at an appropriate security level (i.e. **Supervisor**), open the **Configuration** menu and select the tag option (**Config-Tags**).

The **Malvern Link tags** dialogue will appear:



**Note**  
The dialogue will display the tags assigned to the currently loaded configuration.

The dialogue shows every tag (remote input and output connection) that is available, and displays its name, the type of connection, the data conversion used and the Malvern functions that has been assigned to it. Additionally the SCADA name that is applicable to the package used (**iFix** tag).

Any line displayed in **red** has been used twice.



Enables a new tag to be added to the list (see below).



Deletes a tag from the list.



Enables an existing tag to be altered (see below).



Displays a picture of the remote input and output connection modules, showing the connections used and the current loop connection.



Exports the tag list as a text-file (.txt).

## Adding/Modifying a tag

When the **add** or **modify** button is pressed the **Malvern Link tag configuration** dialogue is displayed. This is slightly different for digital or analogue tags.

### Name

Input the name of the new tag.

### Type

Select the type of connection the tag will be - Digital input/output or Analogue input/output. If the tag type is analogue, the **limit areas** will appear. This is needed to construct the high and low limits necessary when a current loop is used, otherwise damage may occur to the device being controlled. If the limit values are too great, the previous value is kept.

### Value

Enter the value of the tag. The value can also be changed by double left-clicking the tag line in the tag listing.

### Mode

Select the check box to connect to an **iFix** driver (i.e. modbus).

### iFix configuration

If the mode check box is selected the iFix configuration becomes active. The configuration area will be different if a digital or analogue tag type is chosen.

### iFix tag

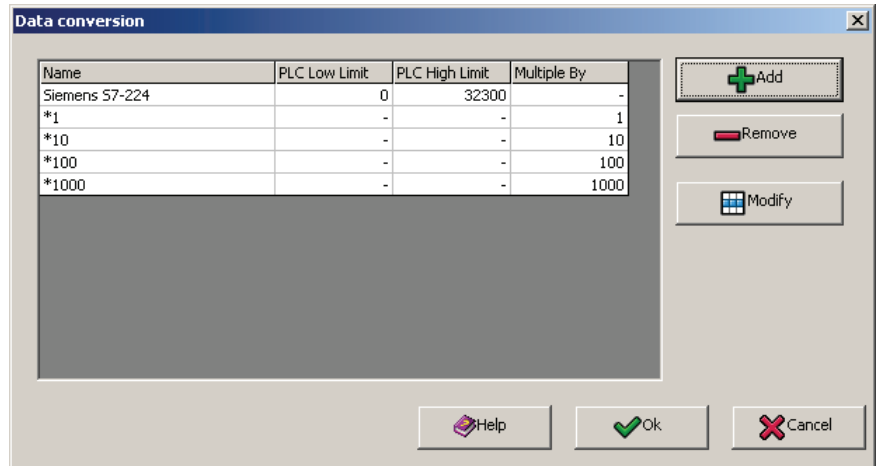
Enter the **iFix** tag name that is to be checked.

### Digital tags only

Select the bit number of the **iFix** tag that is to be checked. If the bit is a negative value, select the **Invert** check box to invert the value expected - i.e. from normally open to normally closed.

### Analogue tags only

From the scroll down list select the **Data convertor** to be used then press the **PLC** button alongside to configure. This displays the **Data conversion** dialogue:



The 'Data conversion' dialog box contains a table with the following data:

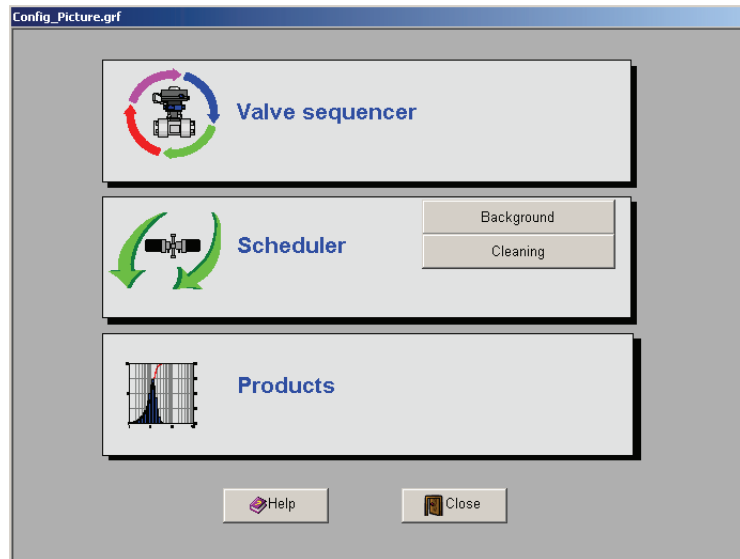
Name	PLC Low Limit	PLC High Limit	Multiple By
Siemens 57-224	0	32300	-
*1	-	-	1
*10	-	-	10
*100	-	-	100
*1000	-	-	1000

Below the table is a large empty rectangular area. To the right of the table are three buttons: '+ Add', '- Remove', and a grid icon labeled 'Modify'. At the bottom of the dialog are three buttons: 'Help' (with a question mark icon), 'Ok' (with a green checkmark icon), and 'Cancel' (with a red X icon).

This dialogue enables a user to configure the scaling of the 4-20mA current loop value. This should be done in conjunction with the remote input and output connection module (PLC) documentation.

# The Configuration Parameters

This screen appears when the **Parameters** button is pressed on the **Configuration** menu. It has three buttons - **Valve sequencer**, **Scheduler** and **Products**.



## Note

If any option has been changed the configuration must be saved when exiting.

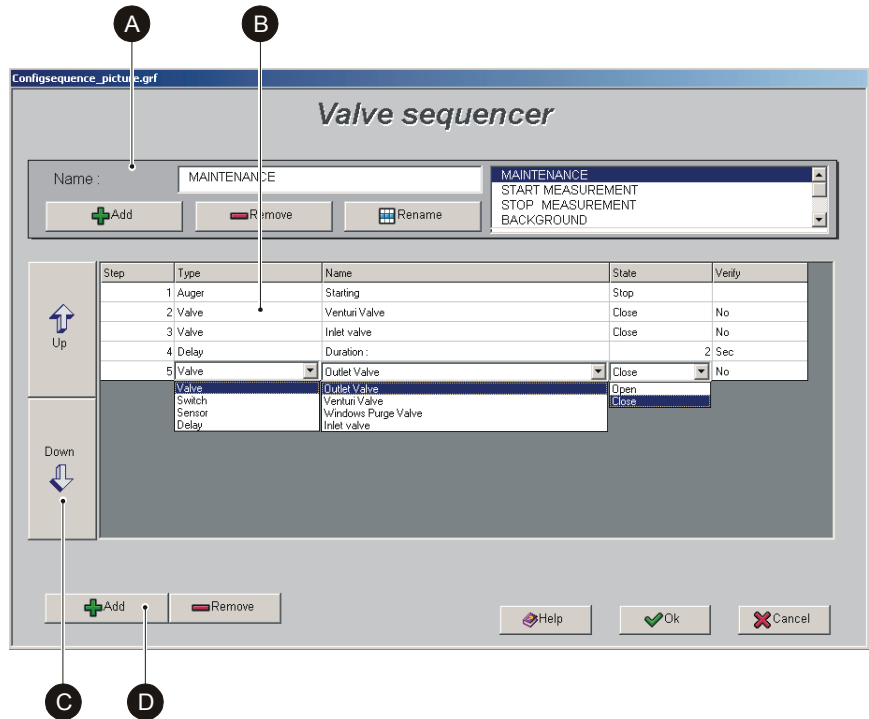
## Valve sequencer button

Pressing the **Valve sequencer** allows "sequences" to be configured. A "sequence" is a pre-determined group of actions performed when any **Control menu** button is pressed. For example, if the **Background action** button is pressed the following sequence of actions could take place (dependent upon the system configuration).

1. Venturi Valve - Close
2. Inlet Valve - Close
3. Windows purge Valve - Open
4. Outlet Valve - Open
5. Extended Valve - Close



The valves are automatically opened or closed in a pre-defined sequence. This sequence is defined in the **Valve sequencer** dialogue.



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This dialogue enables sequences to be created, removed or renamed. Sequences available are shown in the pull down list in the top right of the dialogue. When a sequence is selected the table shows each action within that sequence as a step. Using pull-down lists within the table, sequence action 'steps' can be created, modified and removed, and the actual order of steps within a sequence can be changed.

Each sequence defined here will be assigned to a **Control** menu button by using the **Valve sequences** dialogue found under the **Products** button (**Config-Parameters-Products-Add-Valve sequences**); this is explained later in this chapter).

### Ⓐ Action Buttons selection

The right-hand list shows the action buttons that are available. The currently selected action button (double click to select) will be displayed in the **Name** box. Its particular sequence will also be shown in the **Sequence operation list** Ⓑ.

Actions can be Added, Removed or Renamed using the relevant buttons.

### Ⓑ Sequence operation list

This area shows the “sequence” of operations necessary for each **Action** button task to be completed. Drop down lists for each sequence operation allow specific sequences to be created. Double-click on each column to display the option list available:

- **Type** column – choose the component required from the pull-down list: Valve, sensor, switch or delay. The delay component is used to input a delay time between the operation of one valve and the operation of the next. This will be done so the components do not all activate at the same time.
- **Name** column – select the name of the component type (i.e. for a switch this may be air supply or air switch, though this will depend upon the installation configuration).
- **State** column – select the operating state of the component (i.e. on or off).
- **Verify** column – selecting this will ask the software to check that a step has been performed before proceeding to the next one. The verifying action will be displayed in the status line of the **Malvern Link** control screen.

### Ⓒ Up/Down selection

The sequence order can be changed by selecting a step and using the **Up** or **Down** button as appropriate.

### Ⓓ Add/Remove selection

These buttons allow a new sequence step to be added or removed.

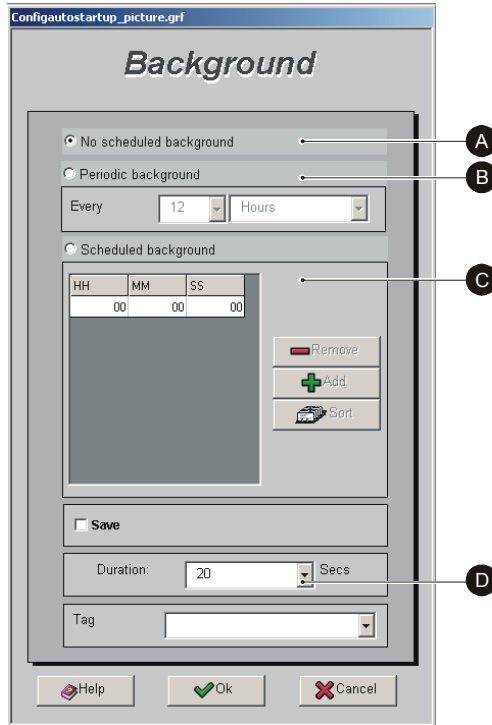
## Scheduler

If automatic background or cleaning operations are required then the scheduler is used. Pressing either the **Background** or **Cleaning** buttons on the scheduler will open a dialogue screen that can configure these operations to be performed at specific or periodic time intervals.

The status of the chosen sequence can then be viewed in the scheduler section of the **Malvern Link** control screen, where both the last and next occurrences of the sequence will be displayed.

Pressing the **Background** or **Cleaning** button displays a dialogue similar to the one shown below. The example below shows the **Background** dialogue.

Each dialogue has a tag entry box where the input tag can be defined.



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### Ⓐ No Scheduled Background

Selecting this option disables the scheduler.

### Ⓑ Periodic Background

Each sequence can be set to perform at a regular specific time frequency. For example, the scheduler can be set to perform a Background measurement every 10 hours. The pull-down menus allows a background to be set to perform at any time interval from 1 minute up.

### Ⓒ Scheduled Background

Each sequence can be set to perform at set times. For example, the scheduler can be set to perform a Background measurement at 10.00am, 2.00pm and 7.00pm.

The **Add**, **Remove** and **Sort** buttons allow each time setting to be added, deleted or placed in order. For each time period line double-click the mouse on the appropriate box and use the drop-down list to select the time. When all times have been entered press the **Sort** button to place the time periods in order.

### Ⓓ Duration

How long each sequence will take. This is product dependent.

## Product

For every material that is measured a Product configuration file must be selected, or created if the material is new. Pressing the **Products** button opens the **Products** selection dialogue. This dialogue identifies all the Products that can be used with the installation. Products can be added, deleted or modified using the respective buttons.



The arrow buttons on the left side of the dialogue dictate the order of the product list. Products can be either moved to the top or bottom of the list, or stepped up or down, so they can be viewed in a particular order.

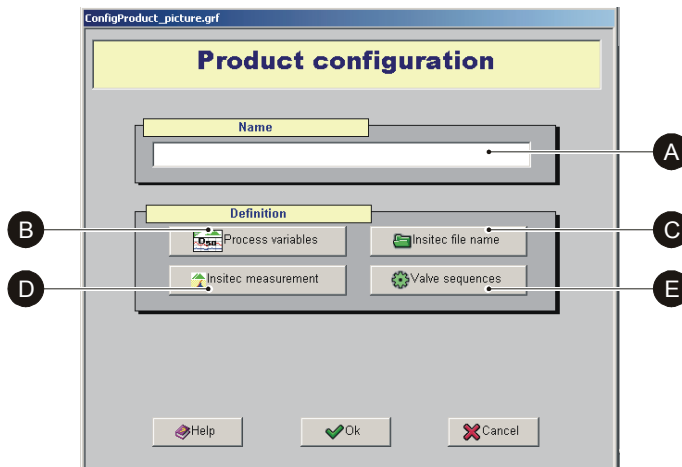
To create a new product, select the **Add** button; this displays the **Products configuration** dialogue (see below). The **Modify** button opens the same dialogue, but shows the currently configured parameters.

An existing product file can be deleted by first selecting the product file and then pressing the **Remove** button.

Once the new Product configuration is defined, the product can be selected using the information area in the **Malvern Link** control screen.

## Defining a Product

When the **Add** or **Modify** button is pressed the **Product configuration** dialogue is displayed.



This is where all aspects of the measurement configuration for a particular product can be defined. The Product to be measured can be input or selected and all its associated parameters then defined. Parameters that can be defined are Process variables, Particle Size History and configuration filenames, measurement parameters and assigning sequences. ill 6973

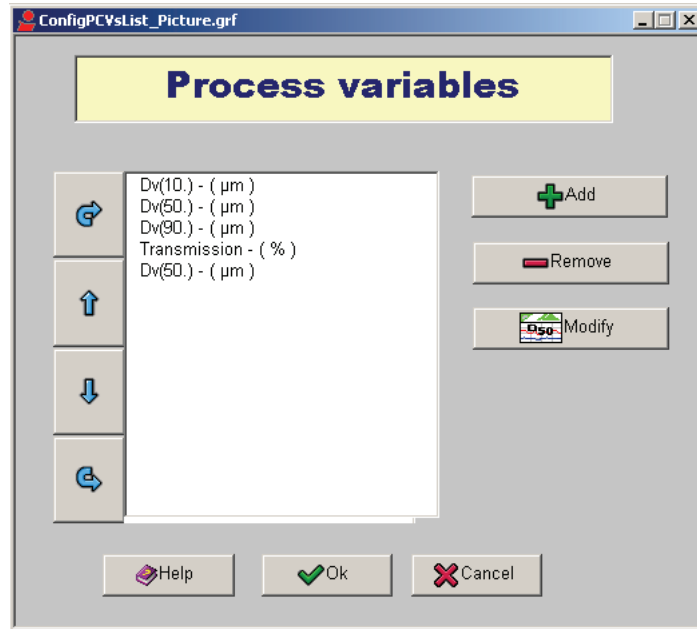
The **Name** entry box (A) at the top of the screen allows a product configuration file to be named and identified. If modifying a product, the entry box will already show the product name

Once a product is identified, the measurement parameters are assigned to it with the use of the four definition buttons - **Process variables**, **Insittec filename**, **Insittec measurement** and **Valve sequences** - described below.

### (B) Process variables

Process variables (PCVs) are the measurement parameters that are reported in the Particle History Display and the results area within the main **Malvern Link** control screen. The Supervisor has the ability to amend existing variables and also to define new ones.

For every Product used, select the Process variables to be displayed. Pressing the **Process variables** button opens the **Process variables** selection dialogue. This dialogue identifies all the process variables that will be displayed with this product. Process variables can be added, deleted or modified using the respective buttons.



The arrow buttons on the left side of the dialogue dictate the order of the product list. Products can be either moved to the top or bottom of the list, or step up or down, so they will can be viewed in a particular order.

To create a new product, select the **Add** button; this will display the **Products configuration** dialogue (see below). The **Modify** button opens the same dialogue, but showing the currently configured parameters.

To delete an existing product file, selectit and press the **Remove** button.

## Defining a Product

When the **Add** or **Modify** button is pressed the **Process control variable definition** (PCVs) dialogue is displayed.

The areas in the dialogue are:

### Name

The name of the Process control variable. Use an easily understood name, not one that is too scientific.

### Variable definition

The type of variable that is to be displayed; choose from the pull down list.

The measurement parameter that the chosen variable will display. Depending on the variable type chosen, the measurement parameter will be either one or both of the values specified in the **X1** and **X2** columns.

Refer to the **Process variables** section at the end of this **Chapter** for a list and definition of the different process variables available.

### Warning - Low and High

The values entered here define the point at which a warning message will appear. If the value measured goes beyond either the low or high limits then a warning message will appear on the **Malvern Link** control screen.

The low and high limits defined here indicate the maximum and minimum values that can be displayed for each variable. For example, suppose the **High** limit value was set to 75microns; now as long as the measured value was below this it would be displayed (i.e. 74, 73, 72microns and below would be displayed). If the measured value was now to increase above the **High** limit value then the displayed value would always be 75microns (i.e. if 77 and 78microns was measured the displayed value would still be 75).

#### Error - Low and High

The values entered here define the point at which an alarm will appear. If the value measured goes beyond either the low or high limits then an alarm will trigger on the **Malvern Link** control screen. For low and high limits definition, see above.

#### Variable Correlation

Selecting the checkbox displays the **Correlation definition** dialogue. This dialogue defines the relationship of the requested measurement variable to a certain desired result (i.e. a sieves result). For example, to see a result that displays a value as if it was generated by a sieve measurement, then the conversion or correlation values will be inputted here. Consult the on-line help for more information.

#### PID Definition

Selecting the checkbox displays the **PID definition** dialogue. This dialogue enables the control of one parameter of the process directly from an **RTSizer** process variable. Consult the on-line help for more information.

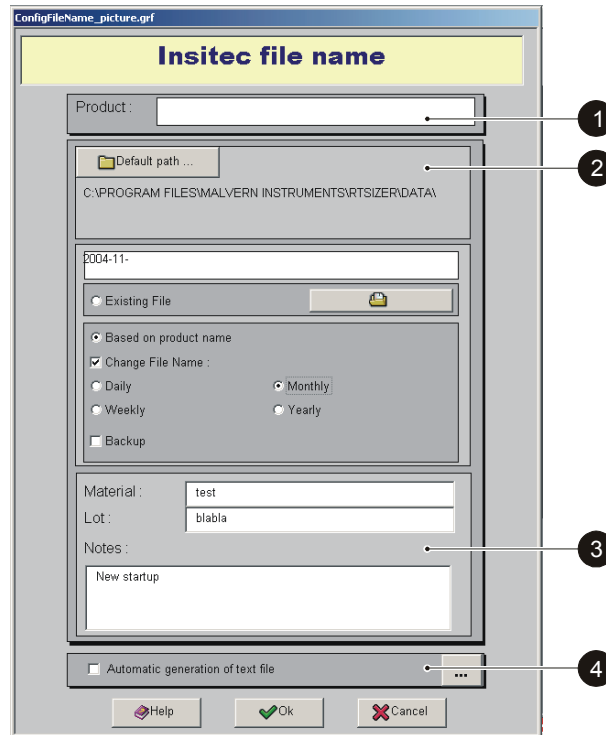
#### Batch Reporting

This area enables measurement parameters, and any errors that occur, to be stored to memory addresses located in the remote input and output connection module architecture; and be retrieved and analysed later using SCADA packages.



### © Insitec file name

When a measurement is performed the results are saved into a **.psh** file; the file is located in the **Data** directory of **RTSizer**. For each product a file can be created in different formats using the options within is generated using the Insitec Filename dialogue. The particular naming format of the **.psh** file depends on the Product measured and the naming format specified in the **Insitec filename** dialogue:



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The filename format can be chosen so the measurement results can be written to an existing file, to a file using the product name, or to a file that updates automatically at defined time periods (the date is included as part of the filename).

A description of the product (**Material**, **Lot** and **Notes**) can be input for reference.

If the results are required to be reported and viewed in a spreadsheet package, such as Excel, a text-file (**.txt**) can be created. One text line showing the chosen Process variables will be written every time a measurement is done. The frequency of the measurement and subsequent text lines are dependent upon the Update period. The text file will be stored with the same filename as the **.psh** file into the Data directory.

### ① Product

This displays the name of the product selected in the **Product Configuration** screen (i.e. Calcium). The product name is only displayed when the new product is saved and then subsequently modified, otherwise it will remain blank.

### ② Insitec filename selection

#### Default path

Determines the **.psh** file path where the measurements will be saved too. The name depends upon which of the three options below are selected.

#### Existing File

With this selected an existing **.psh** file can be chosen and newer measurements can be added to it, or a new filename can be created. Select the radio button then press the **Open file** button, the measurement files dialogue box will appear. Within this dialogue a filename can either be selected or created. Press **Open** and the selected filename will be shown in the Insitec filename window.

#### Based on product name

The filename will be derived from the Product name (i.e. Calcium.psh). With the radio button selected a filename with the same name as current product will be shown in the Insitec filename window. If the Product name **.psh** file already exists newer measurements will be added to it.

#### File Name Change

Select **File Name Change** and the filename will automatically change after the selected time period has expired – either Daily, Weekly, Monthly or Yearly. For each time period the filename format is (as shown in the Insitec filename window).

Daily	2002-02-11-Calcium
Weekly	2002-W07-Calcium
Monthly	2002-02-Calcium
Yearly	2002-Calcium

For example, with a monthly filename change the filename will change at the end of each month. It will change from 2002-01-Calcium.psh to 2002-02-Calcium.psh.

#### Backup

Select this check box to make a backup of the current file according to date. If not selected, the system will close the current file and create a new one at the requested date.

### ③ Material, Lot & Notes

Details about the product measured can be entered here. These descriptions will be displayed in the **.psh** file. The **Lot** description is also shown in the **Information** box on the **Malvern Link** control screen.

#### ④ Automatic generation of text-file

Ticking this option will allow a **.txt** file to be created that can be used in spreadsheet applications such as Microsoft Excel. One text line showing the chosen process variables will be written every time a measurement is done. The frequency of the text line depends on that specified in the **Text File** dialogue (below).

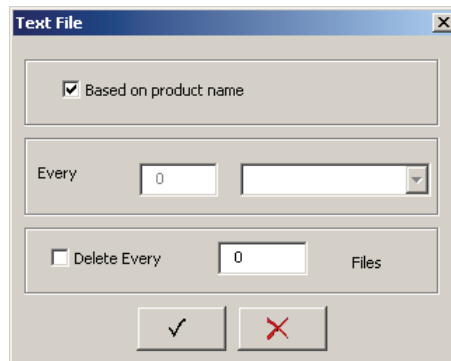
Unless specified in the **Text file** dialogue, the text file will be stored with the same filename as the **.psh** file in the Data directory within the **RTSizer** software.

For example, the following extract shows five measurements at a 2-second update period:

Date and time	DV(50)	DV(10)	DV(90)	Transmission
11/02/2002 12:30:21	11.14	4.06	19.06	68.51
11/02/2002 12:30:23	11.00	3.99	18.84	70.01
11/02/2002 12:30:25	11.15	4.05	19.13	68.87
11/02/2002 12:30:27	11.07	4.04	18.93	67.08
11/02/2002 12:30:29	11.22	4.08	19.23	68.99

#### Text file dialogue

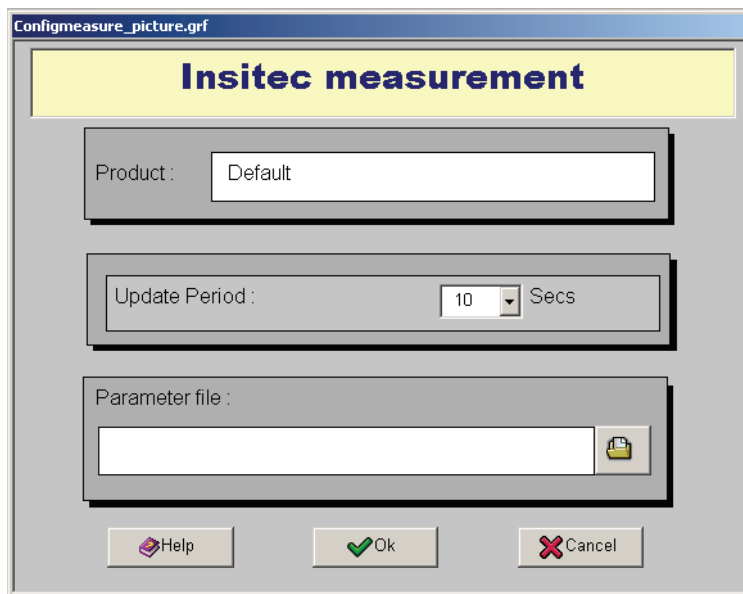
Selecting the button to the right of the **Text file** check box displays the dialogue:



- **Based on product name...** check box – select this check box and the text file will be created with the same name as the measurement file. If this check box is not selected the text file will named according to the creation period specified.
- **Every...** – a new text file will be created after the time period selected.
- **Delete every...** check box – select the number of text files to keep. The software will delete the oldest files, keeping the latest.

### ④ Insitec measurement

This enables the measurement update period to be set and specifies where the parameters file will be found.



#### Update period

Change how often the measurements are made by altering the update period. Corresponds to the update panel in the information section of the **Malvern Link** control screen.

This will be the default setting for the product whenever the product configuration file is opened.

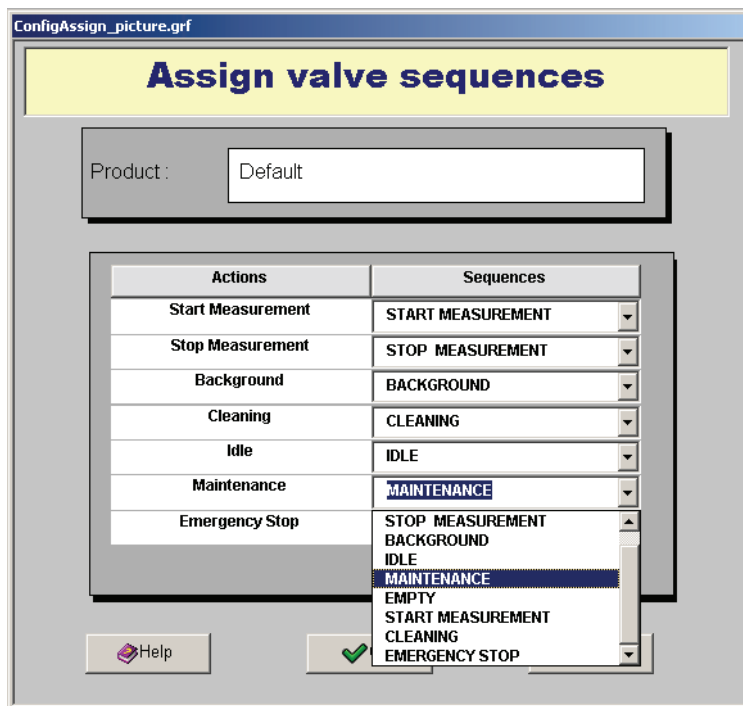
Altering the **Update** value in the information box of the **Malvern Link** control screen will decrease or increase the frequency of the measurements. It will alter the default setting specified in 1 above.

#### Parameters file

Each product used requires a parameter file to be setup. All the parameters necessary for a measurement with **RTSizer** - refractive index, data analysis and calculation information, et. - are stored here. The Parameters files are set up within the **RTSizer** software and stored as **.psa** files

### ⑤ Valve Sequences

Each of the **Control** menu buttons must have a valve sequence assigned with it. A sequence is a pre-determined group of actions that are performed when any of the control buttons are pressed. Valve sequences can be defined using the **Valve sequencer** button as described earlier in this chapter.



In the dialogue **Product** displays the selected product to be configured. The table displays the **Control** menu buttons in the left-hand column. Its assigned sequence is displayed in the right hand column.

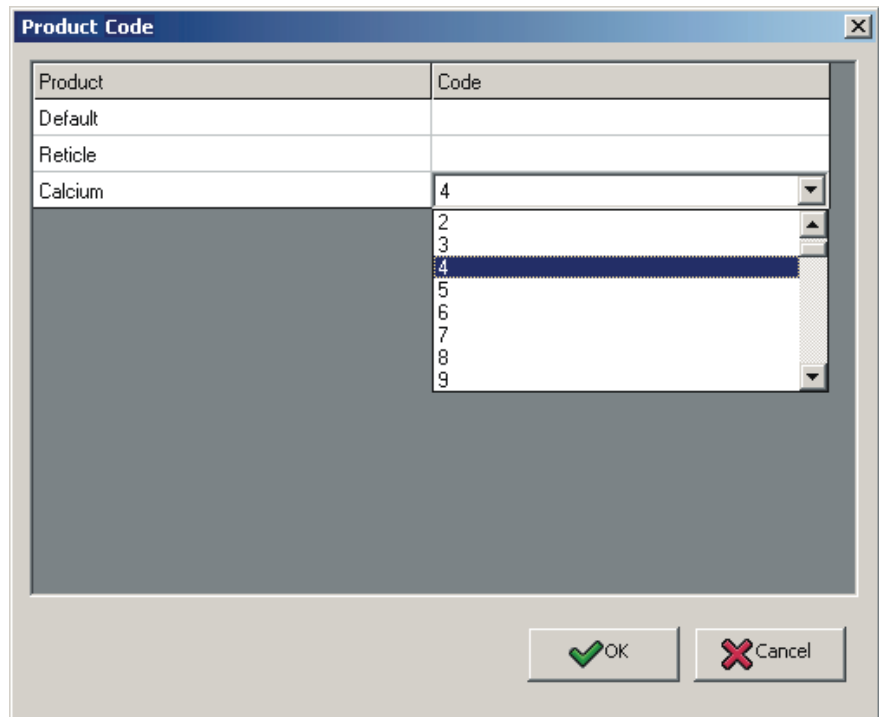
To assign a value sequence to a control menu button, double-click the mouse next to that button, and from the pull-down menu select the sequence to assign to the button.

### ⑥ Product Code

When the system is being controlled via a plant DCS (Distributed Control System) each product measured can be assigned a number that will only select that product. This is because the DCS cannot handle product names so a number needs to be assigned to each product instead.

Whenever the DCS talks to the **Malvern Link** software it sends a number to select a predefined product configuration.

Using the **Product Code** dialogue, select a product and assign a number from the pull-down menu.



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## Process variable types and definition

Process variables are the measurement parameters reported in the Particle History Display and the results area within the main **Malvern Link** control screen.

The Process variables are selected within the **Process variables** dialogue of the Product configuration setup area.

For each Process variable named, the variable type and definition has to be inputted. The variable type is first selected from the pull down list, and then dependent upon the variable type chosen the measurement parameters will be entered - either one or both of the values specified in the **X1** and **X2** columns.

The variable types are detailed below, together with the standard for the variable normally used.

### Variable types

#### Dv(x1)

This variable type allows the setting up of process control variables of the form Dv(10), Dv(50) and Dv(90). When choosing the variable type, it is necessary to also complete the parameter x1. For example, to define Dv(45), enter 45 in the **X1** box.

The statistics of the distribution are calculated from the results using the derived diameters  $D[m,n]$  - an internationally agreed method of defining the mean and other moments of particle size. For more details, see British standard BS2955:1993 or ISO/DIS 9276-2 (Representation of results of particle size analysis, Part 2: Calculation of average particle sizes/diameters and moments from particle size distributions).

**Dv(10)**, **Dv(50)** and **Dv(90)** are standard “percentile” readings from the analysis. The Dv(10) is sensitive to changes in the volume of the small particles in a sample and the Dv(90) is sensitive to the changes in the volume of the large particles. The Dv(50) gives an idea of the mid range.

#### Dv(10)

This is the size of particle below which 10% of the volume of material lies. See the particle size distribution graph below for the typical position of the Dv(v, 10).

#### Dv(50)

This is the size in microns at which 50% of the volume of material is smaller and 50% is larger. This value is also known as the Mass Median Diameter (MMD). See the particle size distribution graph below for the typical position of the Dv(50).

#### Dv(90)

This gives a size of particle below which 90% of the volume of material lies. See the particle size distribution graph below for the typical position of the Dv(90).

### D[x1][x2]

This variable type allows the setting up of process control variables of the form D[4,3] and D[3,2]. When choosing the variable type, it is necessary to also complete the parameter x1 and x2. For example, to define the number mean, D[1,0], enter 1 in the x1 box and 2 in the x2 box.

### D[3,2]

This is the surface area mean diameter. It is also known as the Sauter mean. It is used to monitor the fine material in a powder.

Examples of where the D[3,2] is useful are the cement and fuel industries. In the cement making industry, the hydration rate of cement is related to the surface area of the particles, and in the fuel industry, particles with larger surface areas burn more quickly.

### D[4,3]

This is the volume mean diameter. It is also known as the De Broucker mean. It is used to monitor the coarser material in a powder.

## Transmission

This variable type allows the transmission value to be included in the time history pane. There are no parameters to specify.

The transmission is a measure of the amount of laser light that reaches the beam power detector. A certain amount of light is blocked out when particles are introduced into the Insittec flow cell. An ideal transmission for particle size measurement is between 90% and 50%.

For the Insittec: The transmission value allows monitoring of the concentration of particles that are passing through the Insittec flow cell. If there are any sudden changes in transmission, there is likely to be a physical reason that is needed to attend to. The main reasons for a sudden change in transmission are:

- **A blockage** – the transmission increases as no powder is reaching the flow cell.
- **A dump of material** – the transmission decreases as the large amount of powder in the flow cell blocks out more laser light.
- **The material feed has stopped** – the transmission increases as there is no powder in the flow cell.

## Obs

This variable type allows the obscuration value to be included in the time history pane. The obscuration is a measure of the amount of laser light lost when particles are introduced into the flow cell (Insittec). There are no parameters to specify.



### Cv

This variable type allows the volume concentration to be included in the time history pane and provides feedback of product throughput. When choosing the variable type, it is necessary to also select the units in which the volume concentration will be shown. The options are parts per million (PPM) or liquid water content (LWC).

The volume concentration is calculated from the Beer-Lambert law.

The information that is given by this value is similar to that of the transmission. The difference is that the volume concentration is not affected by particle size.

### SSA

This variable type allows the specific surface area to be included in the time history pane. There are no parameters to specify.

The optical specific surface area, is defined as the total area of the particles divided by the total weight. If using this value, then it is important that the density of the sample is defined in the **System controller** window-**Analysis** tab-**Material** tab.



#### Note

This figure is a mathematical calculation based on the assumption that the particles are both spherical and non-porous. It can, therefore, be misleading if measuring particles such as cement, which are porous (to aid hydration). In these cases, it may be useful to monitor the D[3,2] as well as the SSA.

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### %<x1

This variable type will display a graph of the volume percent of the sample that is smaller than a specific particle size (x1), in the time history pane. When choosing the variable type, it is necessary to specify the parameter x1 and the units in which the particle size is displayed. For example, to see the percent volume of the sample that is less than 5 microns, enter 5 in the x1 box and choose microns in the Units field. The units can also be specified in mesh sizes.

### %>x1

This variable type will display a graph of the volume percent of the sample that is larger than a specific particle size (x1), in the time history pane. When choosing the variable type, it is necessary to specify the parameter x1 and the units in which the particle size is specified. For example, to see the percent volume of the sample that is larger than 2 microns, enter 2 in the x1 box and choose microns in the Units field. The units can also be specified in mesh sizes.

**x1<%<x2**

This variable type will display a graph of the volume percent of the sample that is between two specific particle sizes (x1 and x2), in the time history pane. When choosing the variable type, it is necessary to specify the parameters x1 and x2, and the units in which the particle size is specified. For example, to see the percent volume of the sample that is between 2 and 3 microns, enter 2 in the x1 box, 3 in the x2 box, and choose microns in the **Units** field. The units can also be specified in mesh sizes.

**[Dv(x1) - Dv(x2)] / Dv(50.0)**

This variable type is used to calculate the span of the particle size distribution. When choosing the variable type, it is necessary to specify the parameters x1 and x2. The x1 and x2 values should be equidistant from the Dv(50) to measure the span correctly. A common span measurement uses Dv(10) as the x1 value (enter 10 in the x1 box), and Dv(90) as the x2 value (enter 90 in the x2 box).

**Span**

This is the measurement of the width of the distribution. The narrower the distribution, the smaller the span becomes. The span is calculated as:

$$Dv(90)-Dv(10) / Dv(50)$$

**Dv(x1)/Dv(x2)**

This variable type allows the calculation of a ratio between two Dv values. When choosing the variable type, it is also necessary to complete the parameters x1 and x2. For example, to define the ratio Dv(10)/Dv(90), enter 10 in the x1 box and 90 in the x2 box.

**ASD**

This variable type allows the arithmetic standard deviation to be included in the time history pane. There are no parameters to specify.

**GSD**

This variable type allows the geometric standard deviation to be included in the time history pane. There are no parameters to specify.

**Blaine**

This variable type allows the Blaine value to be included in the time history pane. There are no parameters to specify.



