

# D-Tect

## Manual



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9000-608-31/30

*hand* made in Germany





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# 1. General

## Symbols used



Warning

## Intended purpose

Capturing and management of X-ray images and their allocation to the project.

## Registration

As a registered user of the Program you are entitled to all the program functions (according to the package ordered). You need to activate the registration within the Program, check the required configuration (i.e. mark with an x), and then print out the registration form or save to drive. Send the completed registration form to the manufacturer or your sales partner by fax, e-mail or mail. You will then be sent a valid release code for your system.

The software is not copy-proof. However, only one copy may be produced for backup purposes. Any duplication or publication of the software or the software documentation is prohibited without the prior approval of the Manufacturer.

## Storage of the data carriers

According to the manufacturer's instructions, protect from

- Direct magnetic radiation (permanent magnet or electromagnet)
- Temperature outside permitted range
- Humidity outside permitted range
- Damage (scratches, breakage, deformation, ...)

## Data backup before installation

We recommend you carry out a complete backup of the software already installed on the computer before installation of the software. If the X-ray module is used (e.g. with CRScan), a regular backup of the database file directory is imperative. Information on how to do this can be found in section "Information on data backup".

## Effect on the computer

We do not assume liability for any effect on any software already installed on the computer.

## Copyright

Copyright 2015 by Software Manufacturer

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– No claims for damages will be accepted except in cases of intent or gross negligence or in the event of an infringement of cardinal contractual obligations by the Licensor. If data is lost in the Licensee's database during the use of the software, the Manufacturer shall be liable for the damage caused only if the Licensee has backed up the data at intervals adequate to the application, but not less than once a day, in a form suitable that the data can be recovered with a reasonable amount of work.

## Operation

### General

The operation of the program follows the Windows conventions. Attention will be drawn to any special operations at the corresponding point in the manual.

### Mouse

Click:	Click left mouse key once and release it
Double click:	Click left mouse key twice
Right click:	Click right mouse key once and release it
Drag&Drop (drag left):	Position mouse pointer on the object, press the left mouse key and keep it pressed while moving the mouse. Release the mouse key when reached the desired position.
Take&Drag&Drop:	Click on object, move object by means of the mouse and release the object by clicking again.

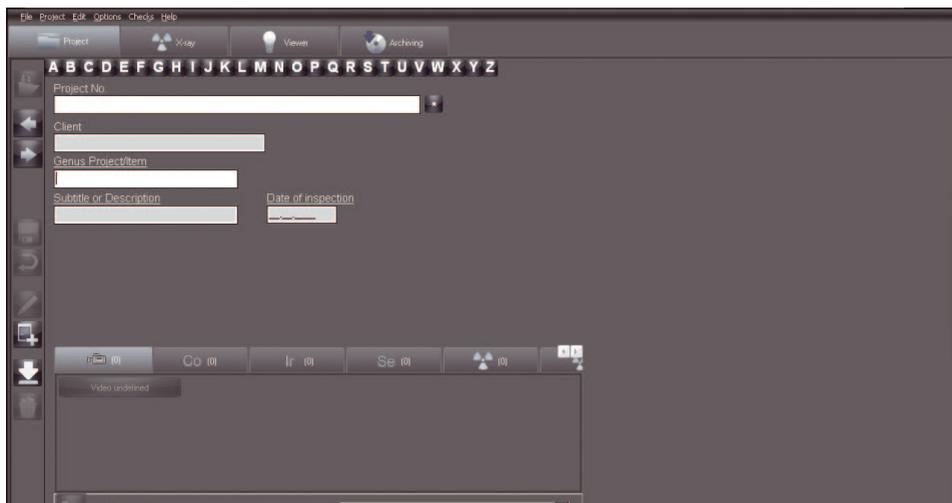
The following description refers to the Windows default settings (right-hand mouse)

Click:	Activate or initiate a function. Select a menu item or function.
Double click on the object:	Activate object or image-related functions (e.g. image processing).
Right click:	Load the context menu.
Drag&Drop:	Move or copy objects between Drag&Drop-capable objects or applications.
Take&Drag&Drop:	Draw graphic objects with start and end points. brightness/contrast settings

### Keyboard

The keyboard can be used to select from menus or to make entries.

## Main window information



The main window is divided into:

1. Header bar (top, not visible in image)  
The company name and the currently selected project are displayed in the header.
2. Menu bar with the menus "File", "Project", etc.
3. Modules (tab sheets) with the tabs "Project", "X-ray", "Light table", etc.
4. Function bar (left-hand column)
5. Status bar (bottom)  
The user logged in and the last logged in project are displayed in the status bar.

### Error log

Errors or messages occurring during the program run are logged by a Logserver that is also started at each program start; the log is automatically written to a file on closing the program. These files (logx.rtf) can be found in the directory "..\<Configured Program Path>\bin" and can be used to provide help in the event of problems. The Logserver symbol can be found below right in the Windows task bar during the running of the program.

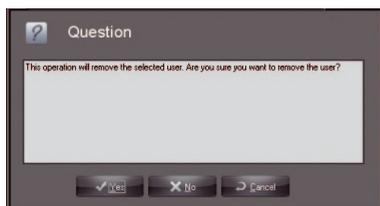
You can view the Logserver by double clicking to show all the messages due to errors or warnings. Right clicking on the Logserver icon in the Windows task bar allows you to quit the Logserver via the menu point "Quit".



Please do not exit the Logserver while the program is running!

### dialog window

#### Question



A question window appears as a safety feature that allows you to confirm, deny or cancel an action.

## Message



Messages give information relevant to an instruction that has been carried out.

## Warning



A warning appears when an instruction could not be carried out or could only partly be carried out.

## General menus/Functions

### Quit (File menu)

Returns to the login status to change user information or to end the program.

### Configuration (Options menu)

Under this menu item you can show and hide the display of the configuration tab, with administrator rights you can create or edit new configurations for a module (e.g. a new user).

### Contents (Help menu)

Contents.

### Help (F1) (Help menu)

Displays help on the current module.

### About (Help menu)

Registration of the program and display of the registered modules and versions.

## System requirements

### Hardware and software

The PC and its components (monitors, printers, etc.) must conform to IEC 60950 (EN 60950). The safety demands on the PC system may differ, depending on the combination with other peripherals (video camera, scanner); further information can be found in the respective user manuals.

### PC

See document "PC System Requirements in Connection with Dürr NDT - CR Systems"

### Data backup



Archiving is not for data backups. It serves only as external storage of image data from the database. The database must be backed up with the daily data backup.

It is strongly recommended that the file system NTFS be used as storage medium for the database DBSDATA! An existing FAT32 file system can be converted to NTFS with the Convert.exe Windows program!

DirectX Version 8.x or higher

### Extension for X-ray recording system, CRScan



The x-ray imaging system CRScan uses important data whose loss may, in some cases, necessitate a new X-ray image. The program was designed to avoid data loss if possible. In order to guarantee this stability, the following minimum system requirements are demanded for operation of the x-ray recording systems: Long-term archiving system using storage media with long-term stability (MOD, WORM, CDR, DVD-RAM).

### Monitor

MPR II, TÜV-GS, CE mark and X-ray Ordinance



Depending on the graphic card monitor combination used and its settings (e. g. resolution, depth of colour, contrast, brightness) the quality of the monitor display can be very different. Particularly the grey levels and the detail precision can differ. If the on-screen display of X-ray images is to be used for analysis purposes, it is necessary to determine during the consistency check whether the monitor has a sufficient display quality.

### Printer

In principle, all printers that can be activated under WINDOWS

## Installation

### General

We recommend you carry out a complete backup of the software already installed on the computer before installation of the software.

In order to install the software on your system, it must satisfy the data stipulated in chapter "System requirements".

Ensure that the driver for the scanner is installed before installing the software. Insert the CD-ROM into a suitable drive. The installation program is started automatically. If this is not the case, start the file Start.exe from the root directory of the CD-ROM.

### Single workstation installation

To carry out a single workstation installation, select "Application and database" at the beginning of the installation. You will now be guided through the routine by the dialogues and can change the default paths suggested by the program. After successful installation you will find the program symbol in the Windows start menu and as an icon on the desktop.

## Network installation



If the program is installed in a network, all workstations need to be linked to the database drive in the same way.

You have to assign a drive letter to the server path (drive) at each workstation. This drive letter must be identical on each station. In order that there are no conflicts with existing drives, you should select a drive letter near the end of the alphabet (e.g. X, Y or Z). Keep in mind that all access rights for the new drives may have to be set.

### First workstation / database

During the installation of the first workstation, select “Application and database” to set up the first workstation and at the same time the database on the server. All inputs up to the page “Database directory” of the installation refer to the local workstation installation. Now assign the database directory to the drive letter which was assigned to the server path before. The next window that appears is “Note for multi-workstation systems”. Please note down the path shown, because you will need it for the installation of other workstations. Select all remaining directories and complete the installation.

### Other workstations

To install a further workstation for operation with the network database, select “Application only”. All inputs up to the page “Find database directory” of the installation refer to the local workstation installation. On this page, select the directory that was displayed during the database installation under “Note for multi-workstation systems”. Select the program symbol from the corresponding group of the start menu.

### Necessity



A backup of the data is absolutely necessary since the failure of the system can lead to a loss of data. A data backup also protects you, however, against data losses caused by operator errors or destruction (fire, water, etc.) of the system. Data backup must not be confused with Archiving, as only images with the corresponding data can be externally stored using the archiving function.

### D-Tect data

The image and project data for a stand-alone standard installation can be found in the directory C:\<*configured program path*>\dbsdata. If you have not used the standard installation, you can check in the configuration menu under tab "Company" where the data for a company have been stored. Details can be found in section "Configuration".

### Methods

If you wish to back up the data on your hard disk to a streamer tape or other backup medium (streamer, external hard disk, etc.), you do not necessarily have to copy all the files at every backup. Once installed, the program files (e.g. Microsoft Windows, Microsoft Excel, etc.) generally remain unchanged. It is not necessary to safeguard them on tape every day. On the other hand, it should be possible to restore all changes and new files of a working day at any time. You should organize your data backup optimally using a combination of the following backup methods.

### Full backup

All files are saved from all sub-directories of a selected drive. Every backup program allows certain files or directories to be excluded even from a full backup – e.g. the backup program proper (because this would have to be installed from the CD-ROM anyway in the event of a system crash) or temporary working directories.

### Incremental backup

An incremental backup - unlike a full backup – saves only those files which have been changed since the last backup. In addition to the file name and the file date, every file has an identifier or archive flag. In a full backup this identifier is deleted, it will be set again by each subsequent write access to the file. You can restore the condition of your PC to an arbitrary day by using a full backup. This is particularly useful if you notice a deficiency in a database or a virus infection some days later. The latest backup could include already deficient files. The incremental backup alone holds a risk however. In order to completely restore your PC, you first have to restore an old full backup. Then you have to read in all created incremental backups in succession. Only in this way is it possible to be sure that all changes are really reconstructed. This can be extremely time consuming. Therefore, it is useful to intelligently combine incremental backups and full backups.

### Backup strategies

With a combination of full backups and incremental backups, you can restore the data at any time up to three months. Should even one backup media system be destroyed, the procedures described here guarantee that you will not be left with a loss of any great consequence – and never a total data loss. Only the changes of a single day may be lost. The procedures described are suitable, of course, for every Storage medium, e.g. also for tape or hard drives. To ensure optimum data security, you will need nine Storage media. Label these as follows:

Tape 1: Monday  
Tape 2: Tuesday  
Tape 3: Wednesday  
Tape 4: Thursday  
Tape 5: Friday 1  
Tape 6: Friday 2  
Tape 7: Friday 3  
Tape 8: Month 1  
Tape 9: Month 2

Start with the backup on a Friday by writing one full write backup onto the Friday 1 storage device. Carry out an incremental backup on the corresponding media on Monday, Tuesday, Wednesday and Thursday of the following week respectively. The following Friday start another full write backup, but this time use the Friday 2 storage device. The following week write an incremental backup each day onto the Monday to Thursday storage devices accordingly without deleting the backups already stored on these media. On the following Friday start a full backup again and use the Friday 3 storage device for it. The schedule remains unchanged for the week after this; instead of the Friday 4 storage device that is not available, use the Month 1 device for the full backup. This backup schedule is repeated for a month, then write a full backup to the Month 2 storage device. The cycle then begins again from the beginning. All media on which full backups have been written (Friday 1, Friday 2, Friday 3, Month 1 and Month 2) must be deleted or overwritten before you can use them again. You should only delete the media with the incremental backups if the size of the incremental backups requires this every four weeks. Simply changing database files each day maximizes the incremental backups enormously. The data compression of the backup software also works more effectively here.

### **Simplified backup**

For smaller amounts of data this backup schedule can be simplified; then only four storage media are necessary. Label these as follows:

Tape 1 : Monday / Wednesday  
 Tape 2 : Tuesday / Thursday  
 Tape 3 : Week 1  
 Tape 4 : Week 2

Start with the backup on a Friday by writing one full write backup onto the week 1 storage device. Carry out an incremental backup on the corresponding media on Monday and Wednesday to storage device 1, on Tuesday and Thursday to storage device 2. The following Friday start another full write backup, but this time use storage device 4. The cycle starts from the beginning again. With this scheme the data of up to three weeks can be restored.

### **Equipment**

In principle any drive can be used for backup. Here are some examples:

- Tape drives (streamers)
- External hard disk drives (Syquest, Iomega, ...)
- Iomega Zip drive
- MO drives (Fujitsu, 3M, HP, ...)
- CD-Writer/-Rewriter
- DVD-RAM
- DVD-R
- DVD+R
- Blue-Ray disc (BD-R)

## 2. Configuration

### Software activation

In order to be able to use the Program with the desired scope of functions, you must carry out the activation process. Without activation, you can only manage 1 project even with the full range of functions of the software. Furthermore, only 50 program starts are possible. To carry out activation, proceed as follows.



Please note that when updating from an older version to the current version a new activation code must be requested before installation is carried out. Further information can be found in the instructions for installation provided with the software.

### Transmission of the registration data



Note that additional costs can accrue during the registration.

Start the software.

The registration window appears.

You can also call up the registration window later in the "Help" menu with the menu item "About ..."

Click on the "Register" button.

The "Activate" dialog window appears.

The buttons in the left area can be used to reach the further dialog window in order to enter the data.



#### Form

With this button you switch to the dialog window in which you enter the necessary order data.

Enter the necessary data in the "Your address" field and in the "Serial numbers" field.

In the lower part of screen in the column "You wish to purchase", activate the check boxes of the modules you wish to activate. In the column "You now have" you will see any modules that have already been activated.

The basic module is selected as standard.

Carry out the registration by fax or per e-mail.

The station number is specified in the "System" field.



Print order form



Export order form



Send the order form per e-mail

## Enter the activation code



### Code

With this button, change to the dialog window in which you enter the "Code" that you have received.

#### **When you have received the code:**

Start the software and call up the registration window.

Click on the "Code" button.

Enter the "Code".

Confirm the input with "OK".

A message appears with the request to restart the program.

Confirm with "OK".

The dialog window for activation of the locally available modules appears.

## Configuration of the modules

### General

During the start of the Program the register "Configuration" is deactivated. The tab "Configuration" is displayed by clicking the menu "Options/Display configuration" in the menu bar. Basic properties of the program can be viewed and set under the "Configuration" tab.



Please notice that incorrect settings may result in malfunction and loss of data!



## Configuration/Operator

File Configuration Edit Options Checks Help

Config Project X-ray Viewer Archiving

Login needed

Status: Logged in as user: Standard

User: Standard Password: [ ] remove

Full name: Standard user

Initials: Std Company: Medisana

Job function: Inspector

Access rights

Administrator  Project: Additional  Video  X-Ray

Access allowed to companies: Medisana

Access denied to companies: [ ]

Standard user CR-System

### General

Other operators can be authorised to use the data via the "User" directory. It is possible to assign different users to each company. Each created user can have individual access right or all access rights to individual company areas.

### Login needed

If you deactivate the check box "Login required", the program start and fundamental alterations to functions and performance features can be made without the input of a password. With the help of the "Login required" check box, you can generally control the use of the device by authorised persons. The input of a password is then demanded during the start and for alterations to functions and performance features.

## Meaning of the displayed dialog fields

"Status":	Name of currently logged in operator
"User":	List field with created users for the current company
"Password":	Password of the operator
"Full name":	Full name of the operator
"Abbreviation":	Short form of the operator name
"Company":	List field with companies entered
"Function":	List with function designations
"Access rights":	List of the access rights to companies

## The Login window

The company of the selected user is displayed. If the user is assigned to various companies, the desired company can be selected from the list.



### Entering passwords

If the names for user and password are identical, the password does not have to be entered at login (e.g. "User" = Brown, "Password" = Brown). If the check box is empty, you can start without the input of a user and password. Please note that this option does not allow any security with regard to unauthorized access.



### Change user

There are two ways of changing the active user.

#### In the program

The active user is displayed in the status bar at bottom left. Clicking the "Name" when a user is logged in allows another user of the current company to be selected.

#### Starting and ending with Login window

End the program up to the login window. Choose the required operator name from the list displayed and enter the correct password. The company of the selected user is displayed. If the user is assigned to various companies, the desired company can be selected from the list. Confirm your selection by pressing the "Login" button. The operator is now logged in. The current operator name is now displayed at the bottom left of the screen.



If a user is not assigned to the current company, the system switches automatically to the company to which the user is assigned.



### Edit user

You require the corresponding administrator rights for editing users and access rights in the program. The edit mode is activated by clicking the "Edit operator data" button. Make the necessary changes in the text fields for full name, abbreviation, company and function.



### Save user

On completion, changes are saved by clicking the "Save" button. The changes will be rejected by clicking the "Reject" button.



## New user

You require the corresponding administrator rights for editing users and access rights. Clicking the button "Edit user data" activates the edit mode and all text fields are emptied. Make the necessary entries in the text fields for full name, abbreviation, company and function.



## Delete user

You require the corresponding administrator rights for deleting users and access rights. Choose the appropriate user name from the list. Click on the "Delete user" button to start the deletion process.



The operator will be definitively deleted by clicking the button "Yes".

## Authorized access

The program allows access rights to be set individually for each user. Care should be taken to allow only a small number of suitable users to have Administrator rights.

"Administrator":	Creating or editing user data Creating or editing company data Configuration
"Project: Extra":	Display the additional information on the current project by clicking the button "Info"
"X-ray":	Access rights to x-ray module



By marking the individual function areas you can assign individual access rights to each user. If the "Administrator" function is assigned, this operator will have full access. If a user is to have access to several companies, click on a company name in the right-hand selection list.

A click on the button  assigns the company to the user.

To delete an entry, click on a company name in the left-hand selection list and then click the button

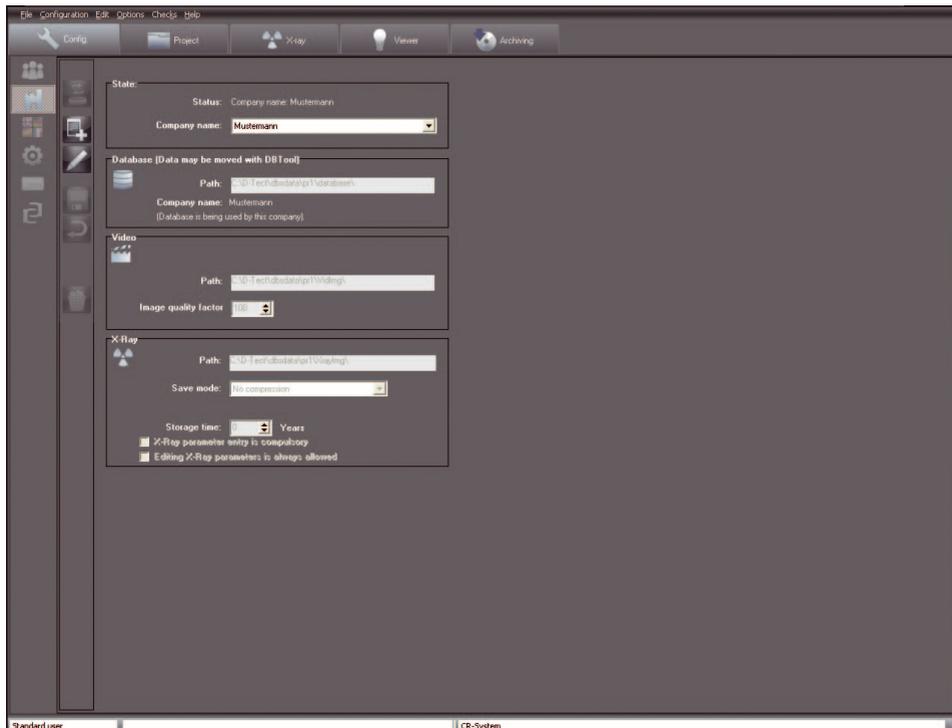


On completion, save the changes by clicking the button .

If you wish to reject the changes, clicking the button .



## Configuration/company



The directories for database, video and X-ray images are entered in the directory "Company". This is necessary if you wish to create and manage further companies. The directory entries are maintained separately for each company.

### Directory structure

A database file directory ".\dbsdata" is created for each company (first company = \pr1\..., second company = \pr2\... etc.). The corresponding database can be found in the subdirectory ".\database" in each company directory. The video images are also stored in subdirectory ".\Vidimg" and the X-ray images in subdirectory ".\Xrayimg" of the company directory. Each company is assigned a company identifier on creation of the company name.

### Moving the database

The complete directory ".\dbsdata" can be shifted to another path (also in the network) using DBTOOL. The directory ".\dbsdata" must then be linked to DBTOOL again at the other stations.



#### Create new company

To create a new company, click the button "Create new company". The data fields are deleted and you can now enter a name for the company or database to be created. The program paths will be automatically suggested. However, it is possible, to enter your own program paths. Repeat these steps for the X-ray path.



#### Save

Save any change by clicking the button "Save new or edited/changed user data". The changes will be rejected by clicking the "Reject" button.



## Edit company data

To edit the current company data, click the button "Edit company data". You can now change the company name and assign the paths again. This is necessary if the position of the files has changed (directories were moved, backed up). On completion, changes are saved by clicking the "Save" button. The changes will be rejected by clicking the "Reject" button.



## Delete current company

If you have administrator rights, you can delete individual companies. Select the company to be deleted and click the button "Delete current company". The appropriate entry will be deleted.



Only the path instruction will be deleted and not the paths themselves. This must be carried out manually, in this case via Explorer.



## Change company

To change to another company, click on the pull-down field next to the currently displayed company. A selection list is displayed with all available companies. If available, select an item from the list and confirm with left click. To change to the selected company, click the button "Change company". The active company is displayed at the top of the program window.

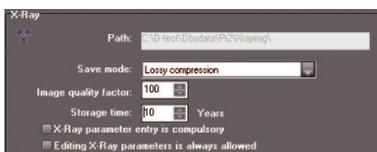
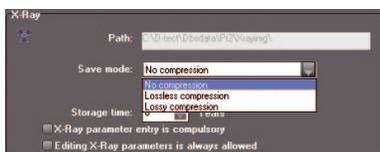


## X-rays

In the field "Storage time" you can set how long X-ray images are to be stored in the database. X-rays produced within this period cannot be deleted. You can select whether the entry of X-ray parameters is necessary for an X-ray image or not with the "X-ray parameters are mandatory entries" check box. If you want to change these parameters later, the "X-ray parameters always changeable" check box must be set.

There are three methods of storage for X-ray images (the file size and image quality values are not fixed, they are dependent on a number of factors):

- No compression (100% file size)
- Loss-free compression (50–60% file size)
- Lossy compression (100 = 40–50% file size; 90 = 20–30% file size)



The compression ratio chosen will depend on national regulations concerning storage of dental images!  
We recommend that "No compression" is set.

In general, the image loading time will increase the lower the compression ratio. With the lossy compression, an image quality factor of 100 means that the image information will be theoretically 100% restored.



The images must be saved loss-free to ensure a lasting evaluation capability of the X-ray images.

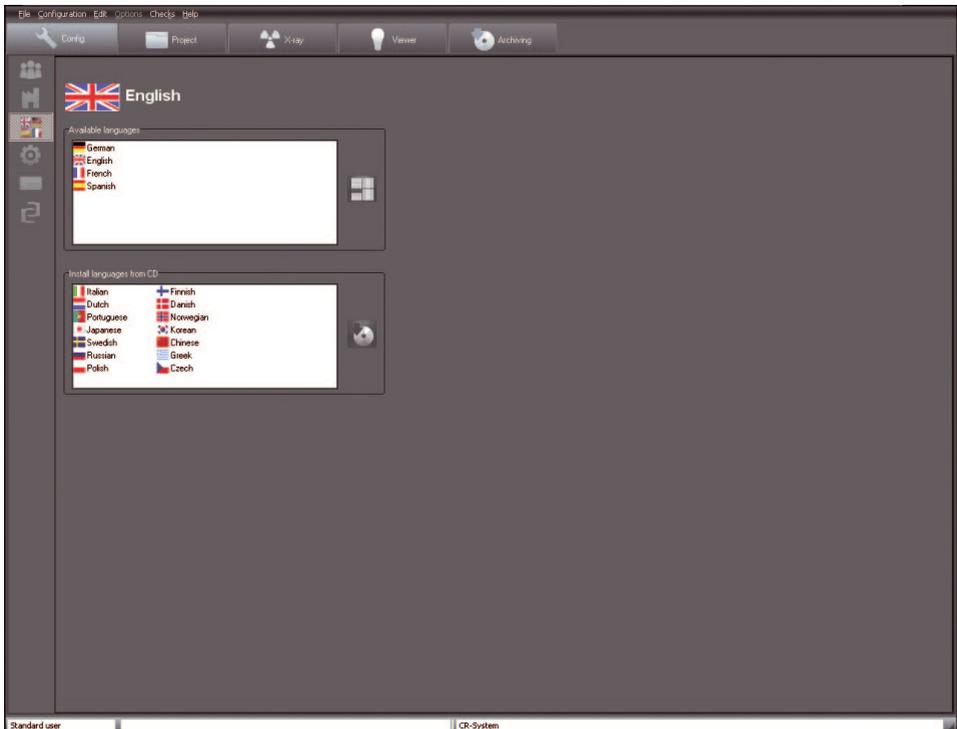


## Database

Here the path of the currently used database and the identifier of the company linked to this database are displayed.



## Configuration/Language



The Program supports a number of languages. During the initial installation, the two languages German and English are installed. To switch to the required language, left click (left-hand mouse button) on the appropriate language in the upper table. Confirm the selection by pressing the "Change language" button (on the right-hand side, next to the "available languages" selection list). The changeover to the new language takes effect the next time the program is started! National languages not yet installed can be selected from the lower selection list with the left mouse key and then installed from the CD by clicking the button "Install selected languages from CD" (on the right alongside the selection list "Install languages from CD").



## System Info

Information such as memory occupancy and system utilisation is displayed on this page. The following fields can be edited by the Administrator. Press the "Edit systeminfo" button. The name of the computer can be edited. Each station computer should be assigned an individual and unique name for identification purposes when working in a network.

### Warning/Error limits

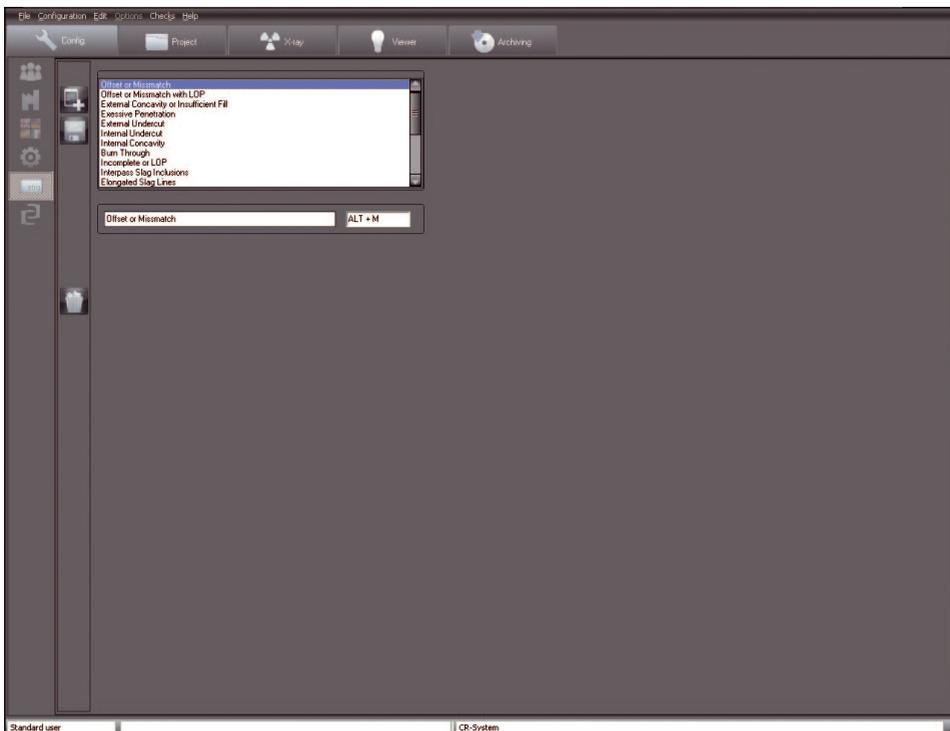
Warning or error limits can be set in the "Database" field or in the "image files" field. In the case of available memory not being sufficient and falling below a pre-set value, the system then sends a Warning message. In the case of the Error Limit being reached, no more new data or images can be entered.



Set the warning limit to a value that gives you sufficient time to react, for example, to rearrange data storage or provide a new data carrier.



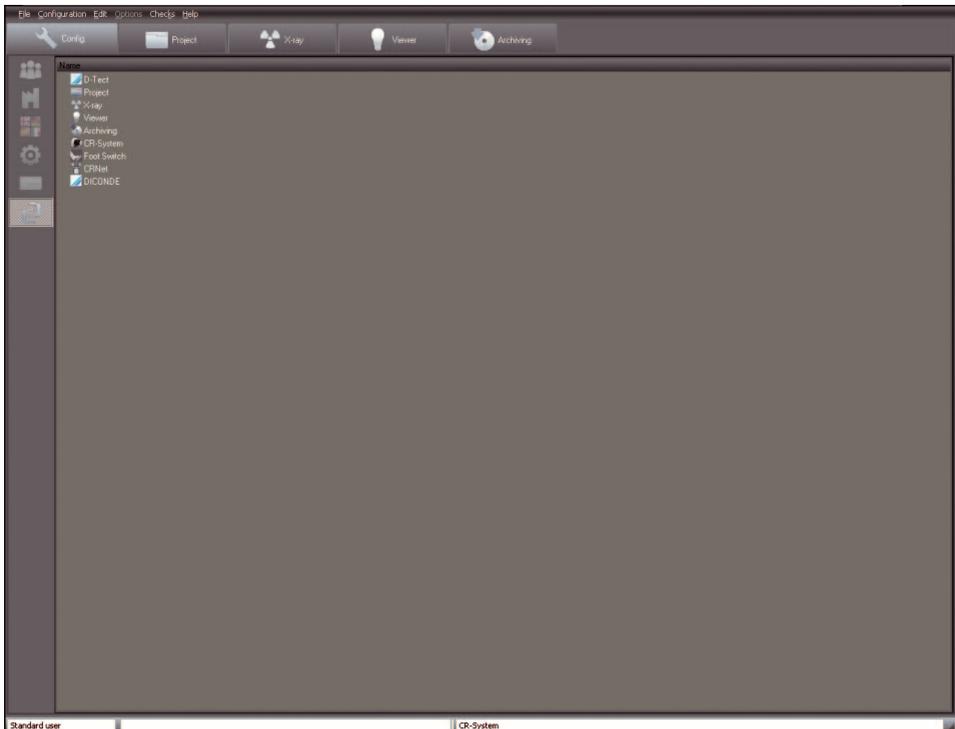
## Short cuts



The short cuts allow you to enter comments or evaluations in the image information box more quickly. The assignment of short cuts can be amended here. You can edit existing terms in the edit field under the selection box and add new terms by clicking the button "Create new short cut". The right field displays the key combinations entered. Save your inputs by clicking the button "Save short cuts". To delete an entry, select it from the list and click the "Delete short cut" button (recycle bin).



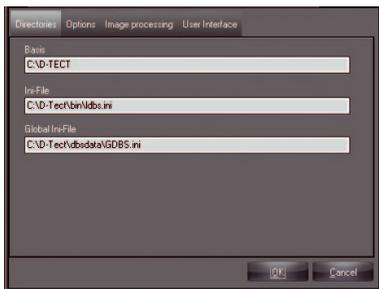
## Configuration/Modules



Settings for the individual program modules are made under the tab "Modules".

### D-Tect module

#### Directories tab



Displays the program directories and position of the initializing files LIDS.INI and GDBS.INI.

## Options tab



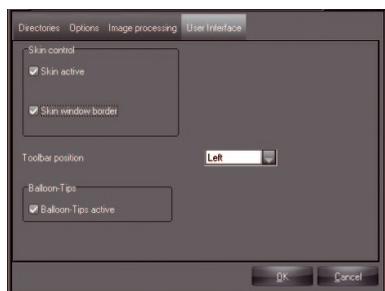
If the check box "Confirm program termination" is activated, the system asks again on closing whether the program is really to be terminated. The module control allows you to activate or deactivate modules. Select the desired module and click the button "Activate module" (double-arrow to the right) or "Deactivate module" (double-arrow to the left). A restart is necessary after a change has been made!

## Image processing tab



The settings of the image processing filters are reset to the factory settings. Current settings can be replaced.

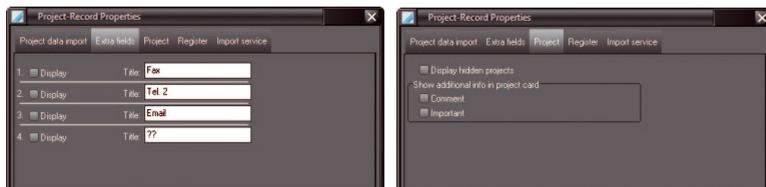
## User interface tab



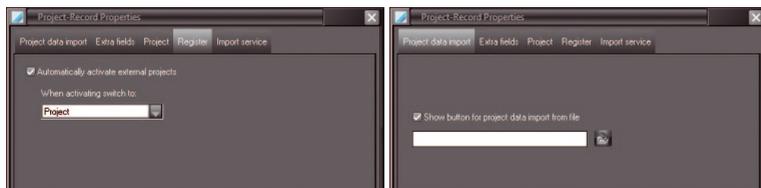
The two check marks under "Skin control" must not be removed. Under "Position of the function bar" you can set where the function bar is to be positioned.

If the check box "Balloon tips active" is activated, tips are displayed at the mouse pointer when the mouse is pointed at a button.

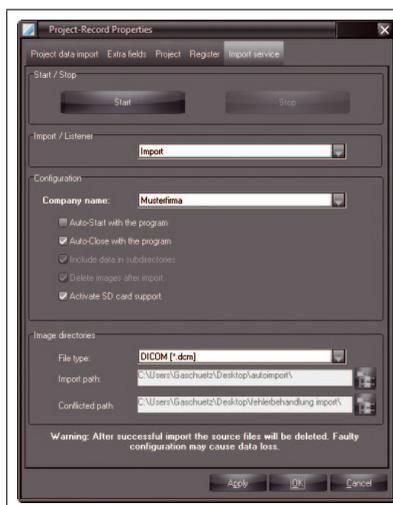
## Module "Project" (project tab)



Under the tab "Extra fields" (Fig. left) you can select which or how many additional fields are to be displayed in the project tab and can edit their designations. Under the tab "Project" you can select whether projects marked as hidden in the database are to be displayed again in the project search list.



The automatic program change on activation of a project can be set in a selectable module under the tab "Login". If you wish, for example, to jump immediately to the module "X-ray" when logging in a project via an external program, then select "X-ray" and activate the check box "Automatically activate external projects". A login selection list is generated when several projects are handed over by an external program and the check box "Automatically activate external projects" is not activated. The list is then displayed under the project tab during the project import. Under the tab "Project data import" you can activate the display of the button "Project data import" under the project tab. You can specify a file that is to be automatically loaded when the button is clicked.



The import process can be configured on the "Import process" tab by activating/deactivating functions. The work directories for the import service are determined in the "Image directory" field. An import directory and conflict directory must be defined. Their role as "import or listener" must then be defined. When the import process should begin/end can still be determined in the "Configuration" field. The treatment of the files can also be defined in the "Configuration" field with the "Import" role. The settings for both windows are accepted by clicking on the "Execute" button. Click on the "Start" button to start the import process.



An additional icon is shown after the import process starts. Click on the new D-Tect icon in the task bar to display a statistic of the import process.

## X-ray module

### X-ray station

- "Name": Designation of the X-ray stations, list  
 "Manufacturer": Name of the manufacturer of the X-ray appliance  
 "Type": Name, type, serial number of the X-ray appliance or the source  
 "Category": Category of the X-ray appliance  
 "Owner"/  
 "Address": Name and address of the owner

All mandatory fields must be completed. The parameters for different X-ray sources can be set under the tab "X-ray stations". By clicking on the button "Edit name or default parameter" you can set the name and the parameters of the current X-ray system. Click on the button "Create new X-ray station" to create a new X-ray system. The contents of the "Manufacturer", "Type", "Owner" and "Address" fields are automatically adopted in the forms of the checks.



For measurement purposes (length and angle measurement) in X-ray images, the image must be calibrated using a reference image object! The accuracy will depend greatly on the distortion of the projection onto the particular image viewer surface.

The parameter input is the same for both procedures described above. Select the category and then click on the button "Input parameters" to start the parameter input.

### Standard values

In the section "Input values", enter the input values for current, voltage and exposure time and then click the button "Save value(s)" so that the values are saved. If you have installed several X-ray systems, you can take over the input values of other X-ray systems. Click with the left mouse key on the button in section "Copy default values". If available, select an item from the list and confirm with left click.



### "Automatically open image processing" check box

If the check box "Automatically open image processing" is checked, the image processing box will be opened with the corresponding X-ray image standard functions immediately after an X-ray exposure.

### Check box "Display X-ray data in the mask New image"

If this check box is selected, the X-ray parameters are displayed in the X-ray module and can be changed there.

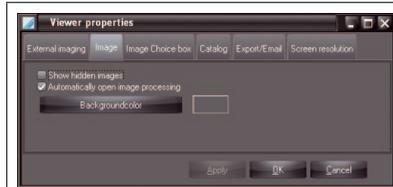
### "Automatically export images" check box

If this check box has been selected, any saved images will automatically be exported additionally to the X-ray module. The export format for X-ray images and the export path is defined by the mode "Autoexport" that can be configured in the module Light table/Export e-mail/Export options.

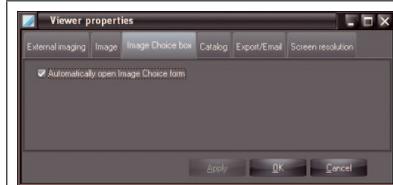
## Viewer module (light table)



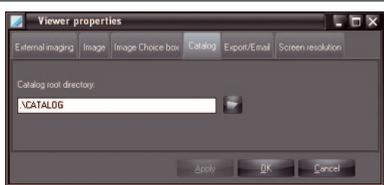
You can enter your preferred processing software for your images under the tab "External image processing".



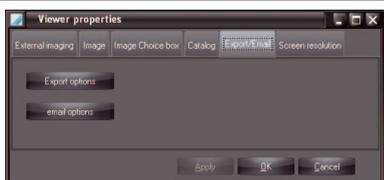
Under the tab "Image" you can select whether images marked in the database as hidden are to be displayed. The background colour of the light table can be selected.



Under the tab "Image selection box" you can set whether the image selection box is to be opened automatically on activation of the light table.



You can set the path for the image catalogue under the tab "Catalog". The catalogue is available for the storage and subsequent calling up of a selection of example images which may be stored in a variety of addresses. The images can be loaded to the light table with the menu item "Light table/Load/Catalogue". Images on the light table can be saved to the catalogue with the Export function.



The export or sending of an image by e-mail can be configured under the tab "Export/e-mail".

## Export options

The settings for Export and Email will be assigned the appropriate mode name. The mode name should therefore reflect the function as closely as possible, for example:

"AutoExport" Settings are used for the autoexport of X-ray and video images. This mode name is predefined and cannot be changed!



Create new mode



Edit mode



Further functions can be displayed using this symbol or can be hidden. This is possible only for users with administrator status!



Selection of the export path to which the images are to be saved. Not available with e-mail.

"Image status": Status of the image to be exported



Display/hide extended options

Use "File name" to set up rules for file naming on export. For example, it is possible to regulate whether a file name should include a free entry and/or an image attribute.

"To subdirectory ...": Images are saved to the export path subdirectory = Project number.



Set format, depth of colour and quality of the compressed image formats

"Save image info file": The image info file is saved to the image with the image file name+ -info.txt in the export path (Xnnnn-nnnnnn.JPG-info.txt).

"With comment text": Image comment texts are written to the image info file.

"Export reports with image": Existing reports are exported with the image.

For video and X-ray images it is possible to select an image format from a list. Depending on the format it is possible to select the colour intensity and the quality of compressed images.

A "rule-of-thumb" for the quality of image which is available after compression of the image file:

- 100 – Original data
- 90 – Practically negligible losses
- 80 – Minor visible losses
- 70 – Visible losses

**E-mail options (e-mail configuration mask)**

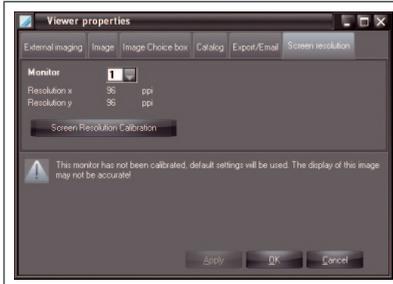


The Export path field is no longer available under Email configuration.

Should the image be too large to send by e-mail, cut out the relevant image detail with the Crop function and then send this detail. Check your IT directives for the largest image size that can be sent by e-mail.



Do not send large image files by e-mail! If any problems are encountered, select a larger compression ratio. Incomplete X-ray images (i.e. those subject to loss of quality) must not be used for evaluation in Germany!

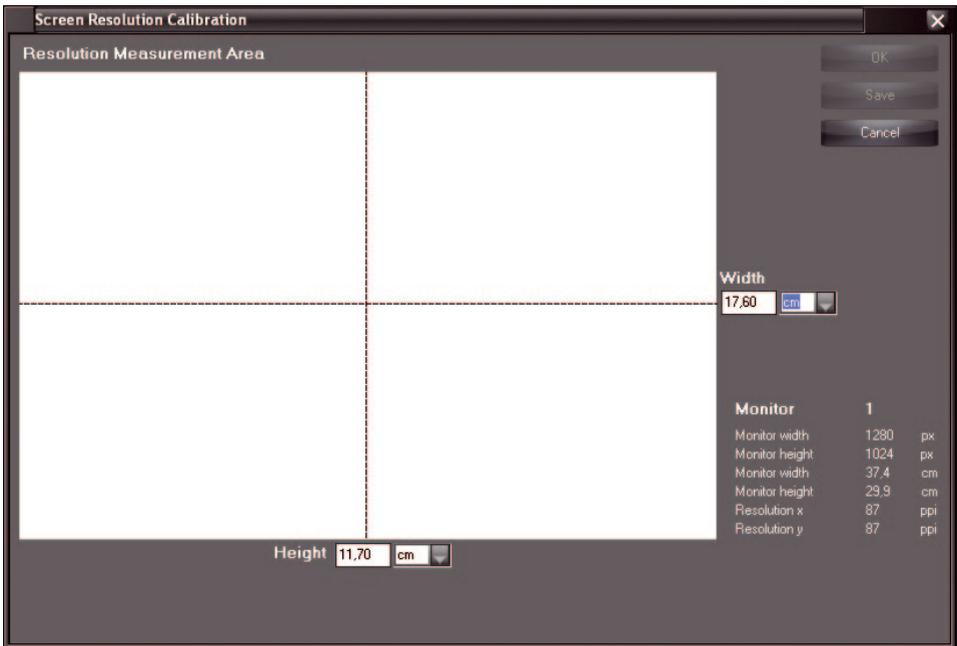


Use the register "Screen resolution" to calibrate the screen so that the original size representation can be used.

The number of the current monitor appears in the left top corner.



## Calibration of screen resolution



Select button "Calibration of screen resolution" with mouse click to open calibration window. Enter width and height of the white balance area in cm or inch and click "OK" to return.

## Archiving module



A double click on the archive symbol opens the configuration dialog of the archiving module. It consists essentially of two tabs: The tab "Data" for setting the archiving parameters, and the tab "Drives" with the parameters of the archiving drives. These settings are default values used by the Archiving module.

### Archiving parameters

#### Check box "Archiving at this station"

You can define whether archiving is permitted at this workstation. For security reasons it is recommended that archiving is enabled at only one station! Transfer back is possible at all stations.

#### Check box "Archive video images"

Determine here whether you want to take video images into the long term archive.

#### Check box "Archive X-ray images"

Determine here whether you want to take X-ray images into the long term archive.



The images to be taken in consideration for archiving are defined as follows:

- All images within the blue time period are always selected for archiving.
- Images within the red time period are not selected for archiving.
- Images falling within the green time zone and fulfilling the criterion "Project with at least n images" are selected for archiving.

### Examples

Quarterly long-term archiving of all images:

Grey zone: 90 days  
Green zone: 1 image  
Red zone: 0 days

If you wish to save only patients with at least 10 images and more than 20 days' old on one medium:

Grey zone: 90 days  
Green zone: 10 image  
Red zone: 20 days

## Archiving drives



The archive module can manage 3 drives at most. These drives must be addressable by assigning drive letters. Before you can make any setting, you must register the drive in the archiving module by clicking on the "Drive active" check box.



The drives must be filled in ascending order (Drive-1, -2, -3)!

### Procedure

- Choose the drive letter for the drive that you want to use for archiving or backing up (e.g. CD-ROM, CD-R). In a network, the drive that is to be used for archiving must be on the server computer.
- Choose the corresponding drive type for your drive in the selection box. Regarding data security a MO-drive type should be used for archiving.
- By filling out field "max. utilisation" you control the maximum percentage of drive capacity that may be used by the archiving module (see also section "8. Image archive").

### Example for drive configuration

"Archiving drive 1": If the write/read drive for archiving and reading back is the medium that has not yet been closed. In a network this drive must be installed on a server that can be accessed by all systems.

"Archiving drive 2" and "3": These can be a global CD-ROM drive on the server, a global CD-ROM jukebox or a local CD-ROM drive for reading copies of closed archive media. Using a local CD-ROM drive but does not allow fast access to long-term archived image data (without an expensive jukebox system)!

## CR Scanner module

In this module the scanner controller can be configured and tested using the program CRScanConfig. The advanced functions available in this program may only be used by trained and certified technicians. The program CRScanConfig offers the following functions:

### Standard functions

- Check and set existing interface (connection)
- Read in and display (test) an exposed image plate
- Check ambient light conditions (Oscilloscope mode)

### Further functions

- Adapt or expand existing parameter sets
- Carry out test functions of the scanner (System check/Manipulation)
- Create and save available and current test reports (System check/Reports)

### Standard functions



With the scanner connected, register "DeviceIDs" shows the respective electronic ID of the scanner.



The USB interface used is shown in register "Configuration".

### Program CRScanConfig

The CRScanConfig program is started by clicking button "Configure".

### CRNet module

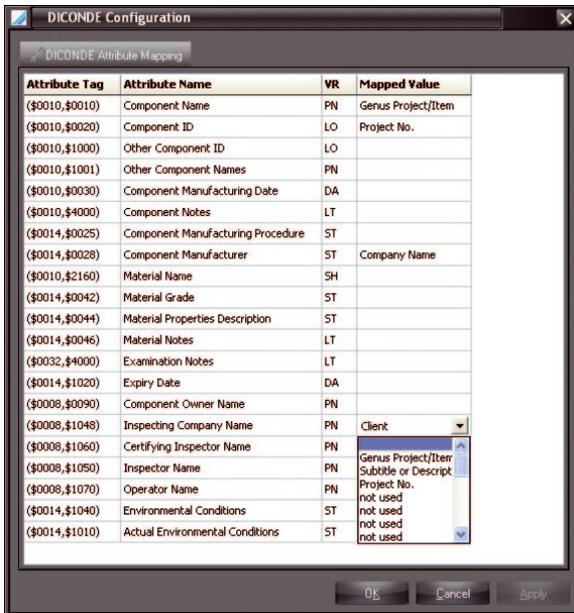
The CRNetConfig is started by clicking module "CRNet".

This module can be used to select, configure or test any scanner and panel which are connected to the network.

For the operation of a panel, this option must first be activated via the licensing.

## DICONDE module

Clicking the button "DICONDE" calls up the configuration dialog to the DICONDE-interface. The DICONDE configuration dialog is used to assign the various attributes to a pre-defined project or to image information. The assignment can also be carried out without further activation of DICONDE.



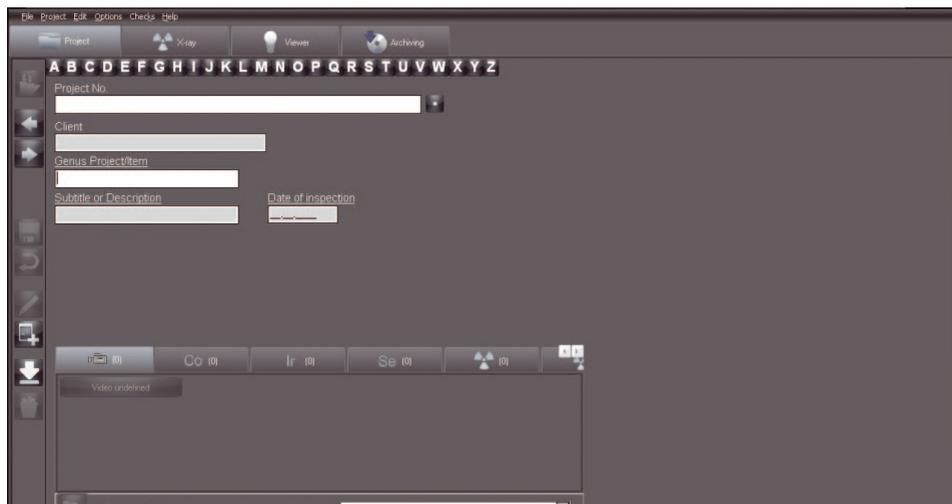
To assign information to a field in the column "Assign" click and confirm with Enter key. From the list box select the desired entry and save with "Select" or "OK" and close the window. Further information concerning activated DICONDE-interfaces and their functions and configurations can be found in the handbook supplied with the DICONDE-interface option.

## 3. Project tabs

### General

In the project index, project data can be created, changed, deleted and selected. All project-related data and an overview of the existing recordings are shown on the register sheet.

### Project view



### Functions



#### Login/open project (Project menu)

Clicking the button "Login/logout project" logs in the currently selected project and its data is displayed in the status line.

All functions can not be executed for the selected project (Carry out image recording, View images on the light table). You can then select the previously registered project again by clicking on the project entry in the status line without having to search for the project again. The "Open/Close Project" button then switches to "Log out project" again. If a new project is selected and registered, this new project is shown in the status line. Externally imported projects are always registered!

#### Logout/close project (Project menu)

The currently registered project and all data fields are cleared.



#### Switch to previous project



#### Switch to next project



#### Save project (Project menu)

Saves the current changes to patient record.



#### Create new project (Project menu)

Click on button "Create new project", to create a new project. Fill in the data form. You can save the project by actuating button "Save project or changes" . The 'Test date' field is preset with the cur-

rent date when created. The fields 'Generic term test object' and 'Detail designation test object' must be completed. If mandatory fields are not filled in or are partially or incorrectly filled in, an information window opens. You can also abort or reject the data recording by clicking the button "Reject input".



### Edit project data (Project menu)

By clicking on the button "Edit project data", you can change the project data. Save your changes by clicking on the button "Save project or changes".



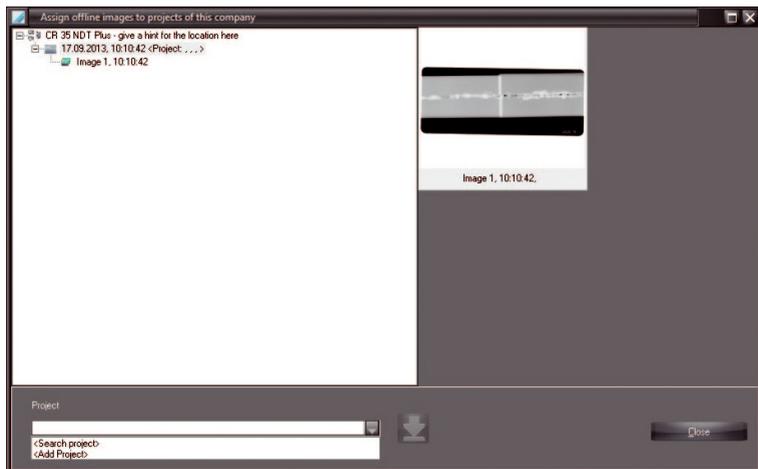
### Discard changes (Project menu)

Quit edit mode without saving the inputs.



### Assign images from offline operation to particular projects (Project menu)

This function allows images provided from a scanner which can be used in offline mode to be assigned to particular projects.

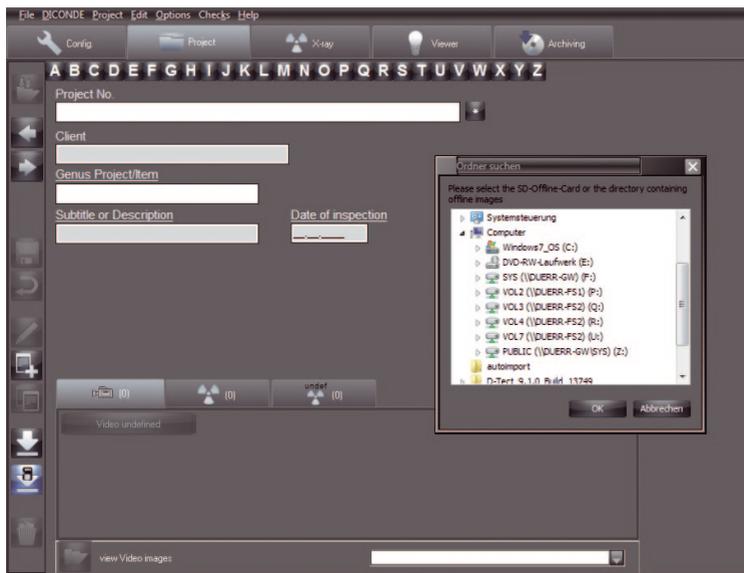


After clicking the icon a window appears for the transmission of images which are currently located in an available scanner. Select both a scanner and a project from the scanner. From the options list "Project" either <Find Project> or <New Project>. If when scanning, data from an existing project has been entered then this will also appear in the current options list. Subsequently the icon to the data will be active and the data can then be transmitted by clicking.



### Import offline SD card (menu project)

This function can be used to read images in the background using the scanner SD card. The project is automatically created when the project data is entered in the scanner.



After clicking on the icon, a window for selection of the memory path appears. After reading in the images, they are deleted from the SD card.



### Delete project (Project menu)

To delete a project, select it from the database and click on the button "Delete project". The selected project is then deleted from the active database. If images belong to this project in the database, you are notified during the deletion process that you cannot delete the project if there are any X-ray images that must be stored or if archived images exist. In this case, the project is hidden, which means that the project is no longer displayed. The "Display hidden projects" check box must be activated in "Configuration/Module/Project" so that you can select a hidden project again. Hidden projects can then be shown in the search list again (and in the "Hidden" column). The attribute "Hidden" is reset as soon as a hidden project is selected. The project can then be seen as normal.



### Show and record information (Menu Project/Info...)

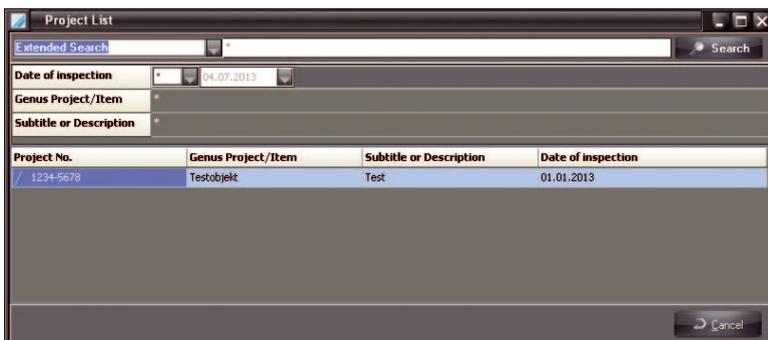
You can record or change additional information in the fields "Important" and "Comment" in editing mode for every project.

### Find project

To search for a project in the database, click on the card tab with the start letter for the project.



All projects with this start letter are shown in the search window "Project list". You can move through the list to select the desired project. If the list contains several entries, enter more of the name in the "Search text" field. Start the search by clicking the "Search" button. In the search field you can select the "Project number", the "Generic term test object" or the "Test date" as search criterion in order to allow the project selection via this number indicated by you or via the location. You are also able to call up the extended search. Here you can enter the "Test date", "Generic term test object" and the "Detail designation test object" in order to limit the search results. The last sort setting is saved when the search window is left and this sorting setting is applied again when operating next time.



Start the search by pressing the enter key or clicking on the "Search" button.

If you click on button "Project search using the job number" (Star icon next to the job number), all projects are shown.

Note: The job number is a maximum 15 place character sequence that is evaluated from left to right! For example: The search character string "001T-A0" produces a results list "001T-A0\*", whereby \* can be any character.



### Import project data

Clicking the tab enables you to import project data from an external program.

## Call up recordings via radiation source



If recordings are stored for a project, these can be selected and called up directly via the radiation source (X-ray, cobalt, iridium, selenium).

After selection of a tab on a radiation source and marking of an object type, the light table appears with the image selection box with the selected recording.



### View created recordings

After selection of a radiation source and clicking the button, the light table appears with the image selection box. The images recorded in the project and for a radiation source are displayed.

## 4. Light table

### General

The light table allows free arrangement of images selected. You have the possibility to choose between a pre-set order, to arrange images as required, to move, to enlarge and to process them.

### Global image search

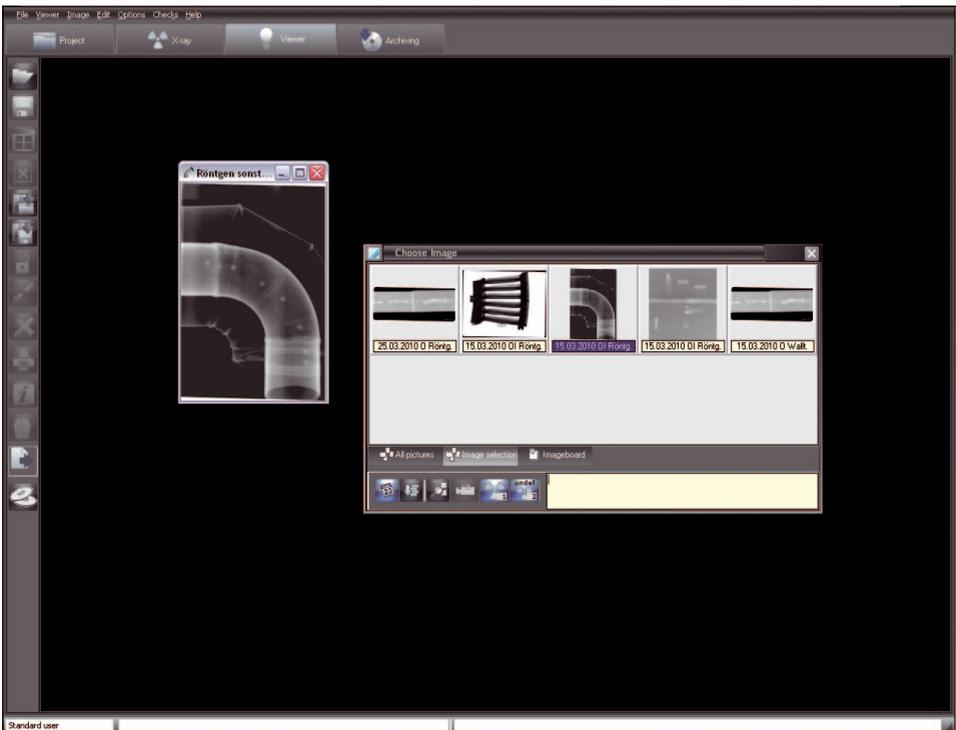
If no project is selected when switching from the project module to the light table, then you can also work with all image data. For example, for a search for specific images.



The process can take longer if all the images for the company are displayed in the image selection box.



### View





### Load an image (Light table menu)

To load an image from the database onto the light table, click the "Open image selection box" button. The image selection box appears.

If you double click with the left mouse key on an image in the image selection box, it is opened in full size on the light table. You now have the possibility of loading several images side-by-side onto the light table. Click on the desired image in the image selection box and Drag&Drop the image onto the light table. The image selection box disappears and you can drop the image in any position on the light table in "Free mode". In "fixed mode" you can drop the image only in an existing image frame. If no empty image frames are open on the light table, load a mask first. After putting the image in place, the image selection box appears again and you can open more images. Images can only be opened once. This is shown by the image information line which has a coloured background.



### Store image (Image menu)

Stores the active image, or its changes, to the archive.



### Gather images on the light table (Light table menu)

Several partial captures of an object can be combined as a complete image.

By pressing the button, all of the open images with no borders on the light table are opened on a separate light table with a white background. The recorded images can be moved and rotated so that the respective edges overlap to match with one another. This makes it possible to create a large image of a single object from several partial recordings. The newly created layout can then be saved as a new image or as a group.

In this display mode, more buttons appear in the left-hand toolbar:



Optimise image size



Save layout as group



End display mode (the view changes to light table again)



Rotate clockwise/counter-clockwise



Zoom in view



Zoom out view



### Clear light table (Light table menu)

Clear the light table (all images and frames are removed).



### Fixed mode (Light table menu)

Activate "Fixed mode" by clicking on the option "Fixed mode" in the "Light table" menu. The image frames cannot be moved in "Fixed mode".

Using Drag&Drop, images can be moved from one image frame to the other. Move an image from its frame to a new frame that is occupied and release, the two images will switch places.



### Freehand mode (Light Table menu)

Activate free mode by clicking on the option "Fixed mode" again in the "Light Table" menu, which unlocks it. Images can be moved around on the light table in free mode.



### Full screen

Shows current image without additional elements as Full Frame Groups.

### Groups

Individual images of a project can be put into groups to e. g. combine the important image captures for a sitting or sitting sequence.



### Save a group (Light table menu)

When the current sequence of images on the light table is to be saved, select from the light table menu the option "Save as Group". You will now be asked to assign a name to the new group. Information concerning the group can be entered in the window below. Then click "Save". A group thus saved, can be loaded or changed and then saved under the same or under a different name.

The "Save layout as group" button is only visible if the images are moved together on the light table.



### Load group (Light table menu)

To load a group, select from the light table menu the option "Load mask/group". The load menu with the available groups will be opened and the required group can be selected from the list. Place the mouse cursor over the group name in the list and click the left mouse key, then click "Load mask/group".

### Delete a group (Light table menu)

To delete a group, select the "Light table/Delete/Group" option in the menu. A selection box with the available groups is opened and the required group can be selected from the list. Position the mouse cursor over the group name in the list and press the left mouse button, then click "Delete".

### Masks

A number of different masks (empty frames) can be organized on the light table simultaneously. Standard image arrangements, for example, can be quickly created in this way without having to sort the images on the light table.



Images which are within the image frames will not be saved! Masks can be used for every project.



### Save a mask (Light table menu)

To produce a new Mask, arrange the images in the desired sequence on the light table. Select from the light table menu the option "Save as Mask". You will now be asked to assign a name to the new mask. Then click "Save mask".

When saving, only the image frames without images are saved. If you want to load defined object image recordings automatically when loading the mask in the respective image frame, these image frames must be allocated with object type numbers before saving. You can achieve this by copying a corresponding available X-ray image (object type number) and inserting it again. The imported image must now be assigned the required object type by using the Image info function. This procedure must take place for all desired objects. After saving under an appropriate name this layout will be available for the automatic loading of all the newest, matching images.



### Load mask (Light table menu)

For loading a mask, select from the light table menu the option "Load Mask". The load menu with the available masks will be opened and the required mask can be selected from the list. Place the mouse cursor over the name of the mask to be opened and click the left mouse key, then click "Load".



If you want the mask to automatically select the latest matching images, mark the appropriate option field "Load latest images".

### Delete a mask (Light table menu)

To delete a mask, select the "Light table/Delete/Mask" option in the menu. A list with the available masks will be opened and the required mask can be selected from the list. Place the mouse cursor over the mask name in the list and push the left mouse button. Then click the delete field.

### Load catalogue (Light table menu)

With command "Light table/Load/Catalogue", you can load an external image catalogue from a directory. In a catalogue, you can combine and call up several images in a project..



### Image processing (Image menu)

You can edit an activated image by clicking on the "Edit active image" button or by double clicking on the image. Read more on the functions in "Image processing".



### Print (Light table, Image menu)

Under the menu item in the light table you can print out the activated image or all the images of the light table and reports on the images. For more information, read the manual in chapter "Printing" or in Help.



### Report (Light table menu, Report; Image menu, Report)

Under this menu item you can call up the dialog for the creation of reports and reports already stored. For more information, read the manual in chapter "Printing" or in Help.



### Image information (Image menu)

To enter, edit or display information on the active image, press the "Image information on active image" button. The image information box appears for the respective image.

You can enter text information on the image in the "Comments" tab. The texts of the hot-keys can be copied to the text area with the right mouse key. The first comment can only be entered once and cannot be changed after saving.

The image type, image size, object type and object range are displayed on tab "Image info". By clicking on button "Selection" in the middle window area "Type", you can select where the image should be allocated and confirm your selection with "OK". In defining the object range, the previously selected main object is displayed with a blue background. All marked objects are displayed in text in the "Range" field.

You are provided with a view of the creation data for the image in the "Creation" tab. In addition, the operator responsible for the image is also listed.

The previously entered values are shown in the "X-ray" tab and can be changed if necessary.

You can find information on the creation, the last change, the file name and the resolution in the "Image status" tab.

The "DICONDE" register can be used to read DICONDE-Metadata to the image.

Using the register "Image properties" a descriptive text commenting on the image can be entered, which is then displayed in the image selection box below the image. This enter option can be adapted to be customer specific or can be expanded.



### Delete an image (Image menu)

An image can only be deleted when it has not yet been archived in the long-term archive and is not subject to any statutory storage period (e.g. X-rays)! The program asks whether the image should only be hidden for each image. That means that the image is no longer shown in the image selection box until the field "Display hidden images" is set in "Configuration/Module/Light table". As soon as the image is loaded on the light table, the hidden status is eliminated and it will always be displayed in the image selection box.



### Drop surface

If individual images or several images are moved out of the image selection box by means of Drag&Drop, then the following functions are displayed in a list for selection for the image or images.

- "Export...": Export image(s)
- "E-mail...": Send image(s) by e-mail
- "Image clipboard": Copy image selection box in the image clipboard



In order to send e-mails an SMAPI Client (e. g. Outlook Express) must be installed!



### Export to CD/DVD (File menu)

This function enables images to be burnt to a CD/DVD. The following alternatives for exporting are available:

All images of the project  
 Images from ... until ...  
 Selected image on viewer

Export and burn processes run automatically.

## Scan an image (Light table menu)

This menu item enables you to accept images from a TWAIN source (e. g. scanner). After the selection of this menu item, the scan window opens in which you can select the TWAIN source and activate the image acquisition. The number of images taken is shown. After closing the scan window, these images are displayed in turn on the light table.

To put the image in the database, click on "Save active image" (Diskette). You must now assign an image type to the imported file, otherwise the image cannot be saved.



## Activate an Image

Simply clicking the left mouse activates the appropriate image (the scroll bar colour changes - the actual colour will depend on the Windows design).

## Marking images



Mark image with a red tick

How to mark an image:

- Individual images: Ctrl. button and mouse click in the image range
  - All images: Right mouse click in image range, call context menu "Mark/Mark all"
- Eliminate the marking for individual images or all images in the same way.

The image to be marked in this way can be in the Image selection box or on the light table. If an image is marked from the light table, then the thumb image in the Image selection box will also be marked and vice versa. Several images can be marked at once.

An image or all images marked in the image selection box or on the light table can then be saved, saved as a group, deleted, exported, sent as e-mail or copied to the image store in the image selection box.

The functions for marked images ("Save", "Save as group", "Delete", "Export", "Send mail" and "Image store") are available via the following menus:

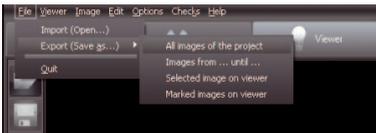
- Ctrl button + Drag&Drop
- Context menu/"All marked"
- Main menu/"Light table/All marked"

## Import (File menu)

This menu function allows images to be imported. After the selection of this menu point, a load window opens, in which the respective image file can be selected. Then click the "Open" menu. The image is now depicted on the light table and can be processed. To put the image in the database, click on the "Save active image" button. You must now assign an image type to the imported file, otherwise the image cannot be saved.

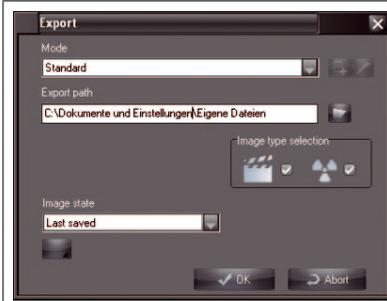
## Export (File menu)

This function allows images in various formats to be exported, e.g. to process these further or to make them available to others.



You can either confirm an available export mode (setting under "Configuration/Modules/Light Table") from the list and select or confirm the directory where it is to be sent. If you want to use a different mode than that proposed in the predefined Image status for export, this can be selected from the list of options under Image status. Detailed information concerning the image formats can be found under "Configuration/Modules/Light table/Export-Email". Further selection criteria are partly explained in the following section.

## Export functions



### All images of the project

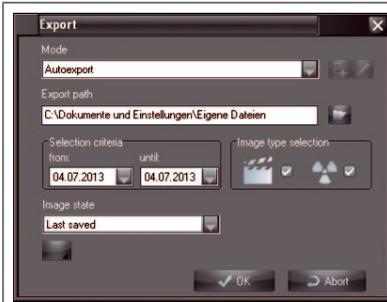
"Image type selection": Selection for video-/X-ray images

"Image status": Image status of the exported image



: Activate extended function view!

Only visible for users with administrator rights



### Images from ... to ...

"Selection criteria": Selection of the period of the images to be exported



### Selected image on viewer

– Only the active image (blue image bar) is exported.

### Marked images on the light table

– All images marked with a red check mark are exported (Ctrl + left click).

The system administrator has the possibility of amending all the parameters for current image export using the further options menu point.

Any changes made to the current mode will not be stored. This can only be done under "Configuration/Modules/Light table/Export-Email"!

## Image status

The five different image states "Original", "First save", "Diagnosis", "Last saved" and "Current status" can be exported.

All visible coloured graphic elements presented in the image on the light table will be added to the exported image (burned-in)!

The image processing box supports the following four levels of drawing, whose graphic elements can either be visibly presented singly (control box On) or all together (control box All) or be set as non-visible:



Angle measurements



Length measurements of lines and polygons



Text, line and closed line elements

### Examples of images exported under varying image status

Not visible = drawing level is not visible or no graphic element is present

Not possible = image status does not support drawing level

Display	Original status	Initial storage	Evaluation	Last stored image	Current status
	Not possible	Not visible	Not visible	Not visible	Not visible
	Not possible	Not visible	Not visible	Not visible	Visible
	Not possible	Not visible	Visible	Not visible	Visible
Light table image					
export. Image"					

### Duplicate an Image (Image menu)

Creates a duplicate of the active image on the light table.

### Assign an image (Image menu)

Open the project list to allocate an image to another project located in the project base. Archived images can no longer be reassigned!

## Sort images (Light table menu)

Automatic sorting of all images which are on the light table at the moment.

## Imaging (Light table menu)

The active image is transferred to an external image editing program as a call-up parameter. The external image editing program available must be entered in "Configuration/Modules /Light Table/Imaging". After ending the imaging program, the changed image is displayed on the light table and can be stored as a duplicate!



## Image selection box

You can vary the size of the image selection box by dragging the box at the borders, edges or separation line of the image section. The size of the comment area can be adjusted by dragging the upper border of the comment field with the mouse (mouse pointer changes from arrow to double arrow). These settings are stored until the next change.

The image selection box can be brought up to date under Context menu/Update (right click). This means that those images which may have been taken at other stations in the meantime are also displayed. The image selection box is displayed by pressing the "Open image selection box" button. The Image selection box enables you to choose the required image from those saved for displaying on the light table.

## Example



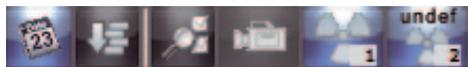
## Display Bar

Here, you can switch between the display of all images, a selection of images and the images on the image clipboard.



The image clipboard serves to store selected images temporarily. If images are sent to the light table (e. g. from project-, video- or X-ray module), then they are stored in the image clipboard as copies. This allows immediate access to the images. It is also possible to copy a particular image from the image selection box or from the light table onto the image clipboard. The current content is deleted as soon as new images are copied into the image clipboard.

The button "Image clipboard" is inactive when it contains no images.



Clicking the buttons "All images", "Image selection" and "Image storage" displays the buttons of the image group "X-Ray", "Video images", etc., and the number of images present in each group. Clicking the button displays the images of the group in the image selection box.



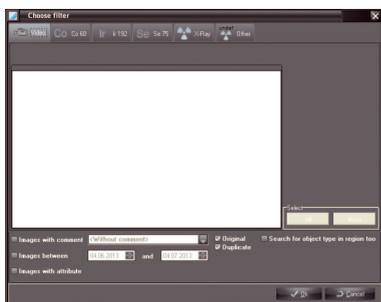
## Sorting of images by date/object type

The images can be sorted in the image selection box according to date of creation or to object type. Within the sorting according to object type images are also sorted according to date of creation. You can display particular images only by using a filter on the stored images. This is especially useful if many images are created for a project.



## Advanced image selection filter

After clicking the button "Filter selection (detailed image search)", the expanded filter selection box is shown for all image types.



The available recordings are displayed in the list plan. You can select these with a click. You can make separate selections so that only the desired images from the existing recordings are shown in the image selection box.

Additional selection criteria for filtering the display of images can be entered and activated for all types of image, e.g. special image designation contained in file name.



## 5. X-rays

### General

In conjunction with the X-ray imaging system CRScan, X-ray images can be digitised and saved. Every X-ray image is allocated to the currently selected project. All X-ray images are stored as original data and are no longer changed. If X-ray images are edited with the image processing functions, this does not affect the original image. Information is simply added and can be undone any time as desired. If you have allocated an X-ray image to the wrong project, it is possible to assign it to the correct project. This can be carried out at the following two places:

In the X-ray module, before saving with menu option "2nd image/Save under another project".

In the light table under the "Reassign image" menu item. In the original image, this action is documented with the entry of the data for the operating project and the initial project.

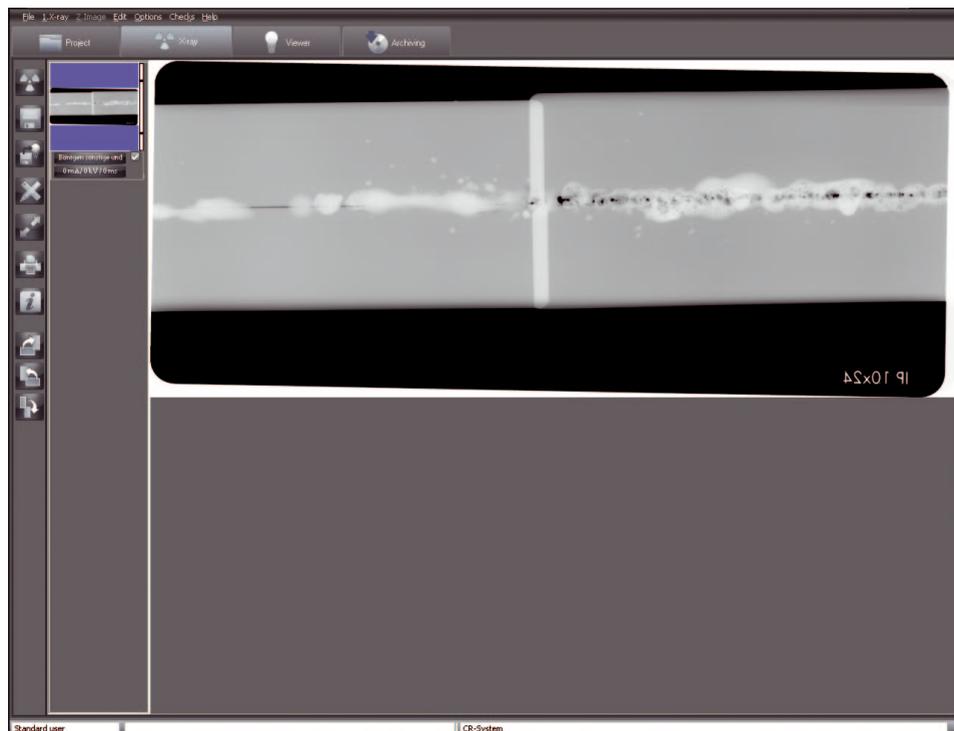
### Measurement of X-ray images

Using the editing module it is possible to measure X-ray images taken with a recorder (image plate, CRScan, transmitted-light scanner) only after calibration using a defined object (e.g. metal ball, metal pin). The measurement precision in this case, depends heavily on the positioning of the image plate (relative to the object and source of radiation). Please go to chapter "Image processing" and read the warning information on length and angle measurements.

### Data backup

As a general rule, you should back up your data regularly. If the X-ray module is used (e.g. CRScan), a regular backup of the database file directory "..\dbsdata" is imperative! Please read the section "Information on data backup" in chapter "General" for further information.

### View





## Take X-ray image (X-ray menu)

Taking an X-ray image is initialised by clicking the "Take a new X-ray image" button.

### X-ray image configuration

Before an X-ray exposure can be performed, the "Record image" dialog window appears, in which the recording parameters can be entered or selected.

The standard recording mode for the selected X-ray imaging is displayed and can be changed (standard mode can be defined in "Configuration/Module/CR scanner").

An image object can be selected before or after the recording. In the left-hand lower corner of the window, the recording system is shown .

### Compulsory entry of X-ray recording parameters

If the check box "X-ray parameters are mandatory" is checked in section "X-rays" under "Configuration/Company", at least the X-ray metering parameters (mA, kV, ms) have to be indicated. At the latest when saving the entry you will be prompted to enter these once more (figure below on left) if these parameter fields contain no data (figure below on right). X-ray parameters can only be subsequently changed after saving the image if the check box "X-ray parameters are always modifiable" is checked in section "X-rays" under "Configuration/Company"!



### Input of the X-ray parameters

The program proposes the exposure parameters if a saved recording exists for the selected object with the currently selected X-ray appliance. If this is the case, the existing values are used as the parameters. Otherwise the standard settings of the selected X-ray appliance for the object that are defined under "Configuration/Modules/X-rays" will be used. If you use different recording values for the X-ray device, these are to be entered manually.

The standard setting of established X-ray parameters can be set for each X-ray device and every object type under "Configuration/Module/X-ray". Please note that these standard settings can only be modified by users with the required access authorisation (administrator)!

### Read an image

After entering the X-ray parameters, click on the "Read" button and a recording window appears.

### CRScan recording window

CRScan goes to recording readiness (LEDs lit green), if the button "Start scan" is activated. As soon as image plates are read in the CRScan, this window shows the current line information and the image flow through CRScan in the recording window. Providing this window is not closed, further image plates can be fed into the system.





If problems (e.g. image plate not transported all the way out) occur during or after scanning, the recording process can be ended and called up with the button "Error recovery" (Open-end spinner icon) for dialog "Problem solving". Here you can control the film transport.



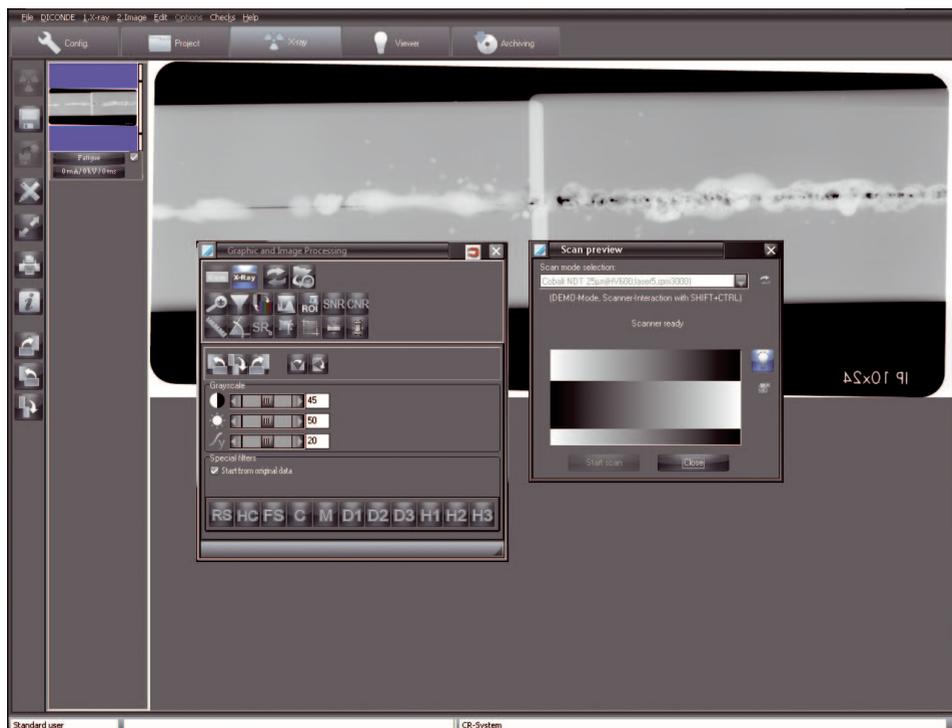
Using button "Switch delete function on or off", you can switch the delete function on the scanner on/off.

### Message "Light exposure too high"

Avoid direct exposure to halogen lights and sunlight.

Check lighting conditions ( $\leq 1000$  Lux) at the input area of the scanner and reduce light if necessary. In general the scanner should be operated in subdued light conditions.

While the recording window is displayed, all X-ray images that are recorded are shown in the image strip on the left.



The last image taken (blue background in the image strip) is shown large in the right-hand window and can be analysed with the image processing functions. By clicking on another image in the image strip, the active image can be changed. All images stored in the image strip also show a colour bar to the right: this displays the Dose Equivalent Value of the image. This value serves only as a guideline

for the optimal setting of the dose parameters (only possible if there is no extreme overexposure or underexposure). A good setting is displayed with a green bar, a critical setting with a red bar. There is a lower and an upper critical limit (slash in the bar), as of which the bar colour is red.

### Procedure in the event of a red bar:

Bar red and low: Increase X-ray dosage or amplification in recording system

Bar red and high: Reduce X-ray dosage or amplification in recording system



### Save images (X-ray menu)

If you click on this button, all images that are selected and assigned to an object type are stored in the database. Before you save images for the currently selected project, you should make sure that the object type is allocated correctly. If you discard an image, you must first remove the marking and answer the question on the following displayed dialog with "NO".



### Save and open on the light table (X-ray menu)

If you click on this button, all images that are selected and assigned to an object type are stored and transferred to the light table for further processing. There they appear in the image clipboard of the image selection box and can be put on the light table using drag&drop. Before you save images for the currently selected project, you should make sure that the object type is allocated correctly.



### Image processing (Image menu)

You can process the active image by activating the processing box. To do this, press the "Image processing" button, double click in the image area or click with the right mouse button within the image to open the context menu and select "Image Processing". The exact descriptions of the functions are available in the manual or in the online Help in chapter "Image processing".



### Full screen

You can also display the image in the main window in full screen mode by clicking on the "Full screen display" button. Switching to normal view is done with a right click with the Full frame context selection or with the ESC button.



### Print (Print menu)

Click on the "Print" button to prepare the image for printing. Read more on the subject in the manual or in the online help in chapter "Printing".



### Image information (Image menu)

To enter, edit or display information on the active image, press the "Image information on current image" button. This displays the image information box for the current image.

You can enter text information on the image in the "Comments" tab. The texts of the hot-keys can be copied to the text area with the right mouse key. The first comment can only be entered once and cannot be changed after saving.

The image type, image size, object type and object range are displayed on tab "Image info". By clicking on button "Selection" in the middle window area "Type", you can select where the image

should be allocated and confirm your selection with "OK". In defining the object range, the previously selected main object is displayed with a blue background. All marked objects are shown in text in the field "Range", whereby combined objects are displayed within a rectangle between the start and end object for the range.

You are provided with a view of the creation data for the image in the "Creation" tab. In addition, the operator responsible for the image is also listed.

The previously entered values are shown in the "X-ray" tab and can be changed if necessary.

The "DICONDE" register can be used to read DICONDE-Metadata to the image.

Using the register "Image properties" a descriptive text commenting on the image can be entered, which is then displayed in the image selection box below the image. This enter option can be adapted to be customer specific or can be expanded.



### Rotate 90° clockwise

The active image is rotated by 90° to the right (clockwise).



### Rotate 90° counter-clockwise

The active image is rotated by 90° to the left (counter-clockwise).



### Rotate 180°

The active image is rotated by 180° to the left (counter-clockwise).

## Image activation (X-ray menu)

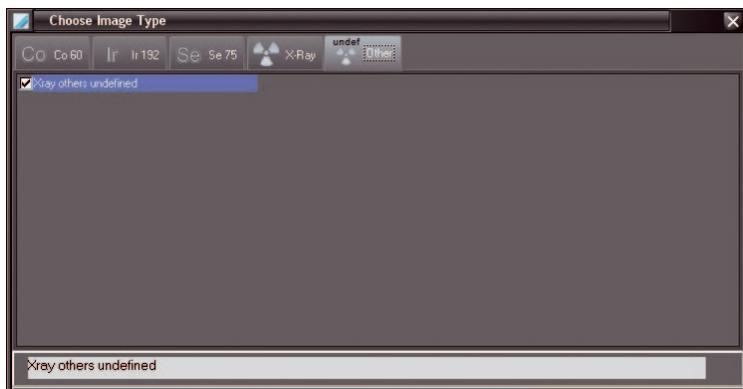
Click on an image in the image strip to display it in the main window. You can activate the previous image if you activate menu sub-point "Previous image" in menu "X-ray".

## Mark image to be stored

There is a check box below the bottom border of the images which are displayed in the image strip. Clicking on this box allows the image to be selected or deselected for storing purposes. Only images that are checked are saved or transferred to the light table.

## Assigning images

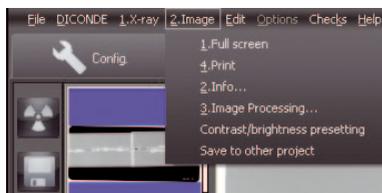
The images in the image bar can be assigned the X-ray image type, an area selection, the X-ray parameters and other image information. You should be assign X-ray-UNDEF for undefined object types! To define the area selection, click on the button in the lower border of the desired image in the image strip and select the desired type in the dialog window "Area selection".



You can also click on button "Info" and define the image type via button "Selection" in the dialog window "Image information". The X-ray parameters and other image information can either be entered by clicking on the button in the lower border of the desired image in the image strip or with the "Info" button.

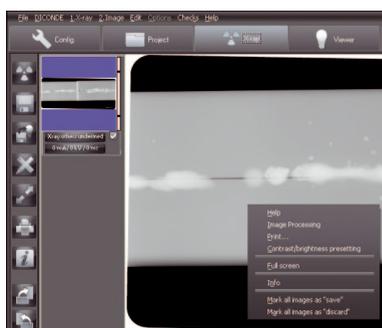
## Assigning an image to another project (Image menu)

If an image is not to be assigned to an active project, you can assign the active image to a project that can be selected from the project list via the menu bar under "Save 2nd image/under another project".

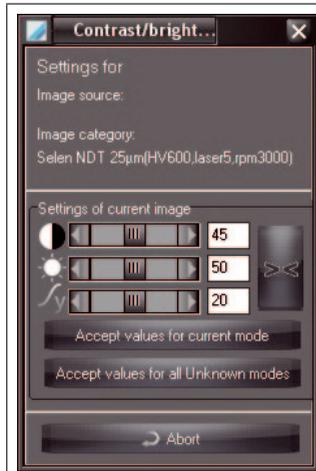


## Defining brightness and contrast values for new image captures using CRScan

The image processing box must be closed! After right clicking in the image area, you can activate the respective window in the context menu with menu point "Brightness/Contrast default definitions".



The changes to brightness, contrast and gamma values are shown directly in the current image and can be saved for newly captured images of the same CRScan mode or for all modes of the same type.



"Settings of current image": Set desired brightness, contrast and gamma values.



: Reset brightness, contrast and gamma values.

"Accept values for current mode": Save current setting values for the currently selected CRScan mode.

"Accept values for all unknown modes": Save current setting values for all modes.



The display presents the current settings for object type "Corrosion". The parameters presented for the HKG grey value improvement, scanning mode and the image edit filter can be saved and automatically used for other images of the same object type.

---

## What to do after a PC crash

If the computer crashes while you are in the X-ray program module during or after an X-ray recording, the images recorded are not lost!

During the restart of the program, a message appears that generally indicates that there are still image data in the X-ray recording system or temporarily on the hard disk that have not been finally saved to the database.

In order that the program can access the images, the appropriate project must first be selected. After selecting the program part "X-ray", a dialog is displayed that informs you that there are still one or more images of a project that have not been stored in the database. This dialog is only displayed if the image found also belongs to the currently selected company. The images are presented as preview images in the image strip. The selected images can then be saved.

## 6. Image processing

### General

The Image Processing function allows the operator to control and amend the image parameters. There is also the possibility to add elements to the original image. These are then stored with the image, but can later be removed if necessary.

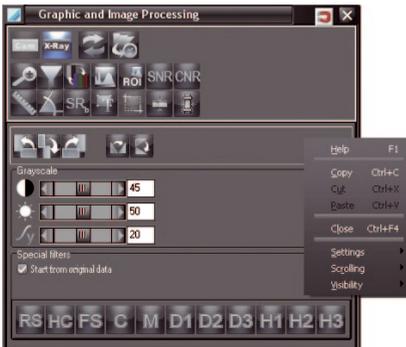
### Graphic and image processing

The image processing is performed with dialog window "Graphic and Image Processing". Many important functions can also be accessed directly via button in the right-hand function bar. The dialog window for image processing can be adapted in the start-up image.

Click on the "Process active image" button or on the "Image processing" entry in the "Image" menu. The dialog window appears.

### Context menu

Right-click on the dialog window to open a context menu.



### Unfold

The dialog window can be folded up partially or completely if not being used.

Right click on the dialog window.

Select "Unfold".

Three options can be selected here:

"Always open": The toolbox is not folded up.

"Half open": The additional functions are folded up.

"Fully closed": All functions are folded up.

### Visibility

The dialog window can be made transparent over the background with option "Transparency". To have the function active, the option "Half open" must be selected in menu "Unfold".

Right click on the dialog window.

Select "Visibility".

Four levels can be selected here:

100%, 75%, 50%, 25%

Depending on the selected level, the dialog window is shown with transparency.

Note: The "Transparency" function only works in conjunction with the "Unfold" function. If the "Always open" option is selected in "Unfold", the "Transparency" function is automatically deactivated.

## Overview of functions



### Function area with image processing functions

In the upper area of the image editing box, clicking on the appropriate symbol allows you to select either one of the global functions or one of the function groups.

In the lower area of the image editing box are shown the individual editing functions according to the function or function group selected.



#### Return to previous image edit function

Click the button "Undo/repeat last image operation" to revoke the last image processing function or to restore it by clicking again.



#### Load image status

Clicking button "Load image status" ("Main menu/Image" or "Image context menu") and select entry "Load image status". One of the currently available image statuses can be selected from the list and can be displayed on the screen.

An image can have one of the following four statuses:

- Last save: Image at last save process
- Evaluation status: Image when saving the initial comment (Diagnosis etc.) in the image info box
- First save: Image at initial save after the image creation in the X-ray module. If no image processing function (Rotate, brightness, contrast stretching etc.) was used on the original image, this image status corresponds with the original image.
- Original image: Image after the image capture



#### X-ray image – main functions

All the principal functions for image editing of X-ray images are displayed in the functional area. Further functions can be selected where necessary.



### Section "Grey value"

The settings for individual images can be altered using the sliding bars (brightness, contrast, gamma) as required.



Alternatively, you can change the brightness (horizontal mouse movement) and contrast (vertical mouse movement) intuitively in the active image (mouse icon in the image area: ) with the left mouse key pressed.



### Image rotating & mirroring



Depending on which of the symbols has been selected, starting with the current image, the image will be rotated 90°, 180° or 270°.

The last rotation or mirroring can be revoked/repeated when clicking the push-button "Undo/repeat last image operation" (main functions).

The image can be flipped horizontally and vertically by clicking on the invert function.

### Evaluation support

The evaluation support is performed with the original data if the marking field "From original data" is set. In all other cases the filter is selected matching the current type.

Structures or objects in the image that are significant to the respective evaluation can be highlighted (contrast amplified) without decreasing the image sharpness. These interesting structures are seen at a glance within the image displayed.

The use of the following filters is limited to images up to a maximum size of 50 MBytes. To filter areas of larger images, the respective area can first be cut out using the crop function and then the cut-out area can be filtered.

By using the following filters, an optical change of the displayed edges is possible.



Regular structure: Contrast of medium-sized structures is increased.



High contrast: Contrast of medium-sized structures is greatly increased.



Fine structures: Contrast of fine structures is greatly increased.



Castings: Contrast of fine structures is increased.



Unsharp mask: Fine structures (<2 mm) are enhanced.



High Detail 1: Contrast between smaller and medium-sized structures enhanced.



EQ2: Equalising filter over small cells and medium gradient.

H3

EQ3: Equalising filter over medium-sized cells and smaller gradient.

D1

Details 1: Medium-sized structures enhanced while contrast reduced.

D2

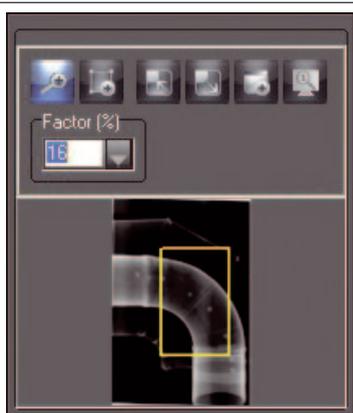
Details 2: Medium-sized structures enhanced while contrast balanced.

D3

EQ3: Equalising filter over medium-sized cells and medium gradient.



## Zoom tools



The zoom tools allow you to view the complete image or, alternatively, a section of the image either enlarged or reduced in size.



To display the image with a magnification factor, please press on the magnifying glass. Clicking the left mouse key within the image enlarges it, clicking the right mouse key reduces it.

"Factor": Alternatively, you can enter or select percentages in the list field.



Using function "Draw rectangle", you can draw a rectangle, displayed in the preview window as a yellow frame. You can move the yellow frame in the preview image with the mouse. In the image frame, this selected part can be displayed larger.



With the function "Set image window size to image size", the frame is adapted for the magnified image.



With the function "Adapt image to window size", the image is adapted to the frame size.



With the function "Magnifying glass (local zoom window)" you are provided with a magnifying window on your image, which you can magnify and move as you wish. The zoom factor is selected using the sliding scale at the side of the screen.



The function "Original Image" allows the image to be seen at original size on the monitor where the system has been calibrated. The monitor is calibrated during the configuration of the light table module.



## Filter functions



The filter functions can be selected by clicking the relevant active filter function symbol. Filter operations can be revoked/repeated by clicking the push-button "Undo/repeat last image operation" (main functions). To get back to the original image, please press the "Load image status" button in the upper selection bar. The original image can be restored after saving by clicking the "Load image status" button.

## Drawing levels

The image processing box supports the following six levels of drawing, whose graphic elements can either be visibly presented singly (control box On) or all together (control box All) or be set as non-visible:



Angle measurements



Length measurements of lines and polygons



Text, line and closed line elements



CROP tool (cut-out of image parts)



Line profile representation



Penetrated material thickness (optional)



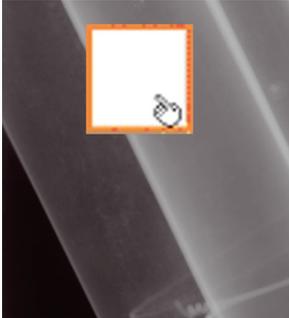
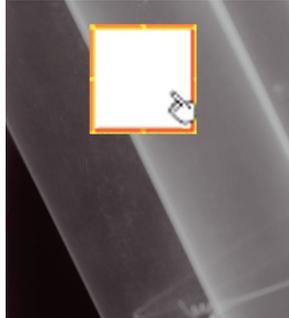
Wall thickness (optional)

## Create graphic elements

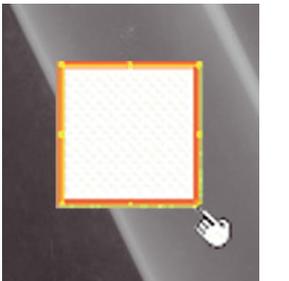
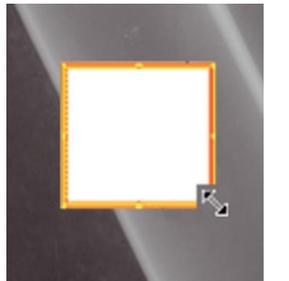
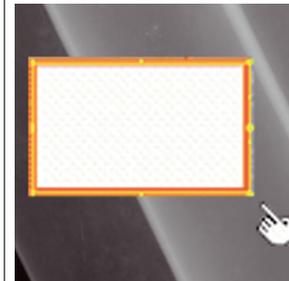
In order to create a new graphic element, select the elements required and click the appropriate symbol. Define the start position of the element by clicking with the left mouse key on the desired image area. Now, you can change the size and alignment of your element by moving the mouse. It is locked with a single click of the left mouse key.

After any creation the last used graphic element is always the active one. This is displayed by a dotted line surrounding the element and a hand as cursor. You can now change the parameters of the elements, for example colour, size, layout and background colour.

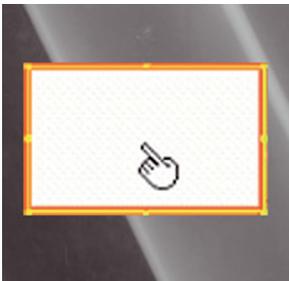
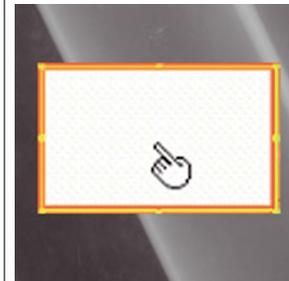
## Activate graphic elements

<p>1. Left click on element with pointer finger mouse cursor. Holding down the Ctrl key allows other graphic elements to be activated.</p>	<p>2. Marking frame with drawing points of active element is visible</p>
	

## Alter graphic element size

<p>1. Set pointer finger tip of the mouse cursor on a drawing point of the active element + Left click</p>	<p>2. Double arrow mouse pointer appears. Determine element size with mouse movement + Left click to end.</p>	<p>3. Link select mouse pointer (finger symbol) appears again.</p>
		

## Move graphic element

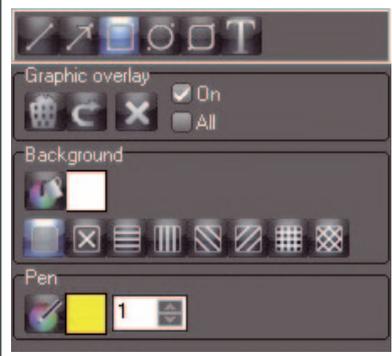
<p>1. Left click on element with pointer finger mouse cursor</p>	<p>2. Hand mouse pointer appears. Move element with mouse movement + Left click to end.</p>	<p>3. Link select mouse pointer (finger symbol) appears again.</p>
		

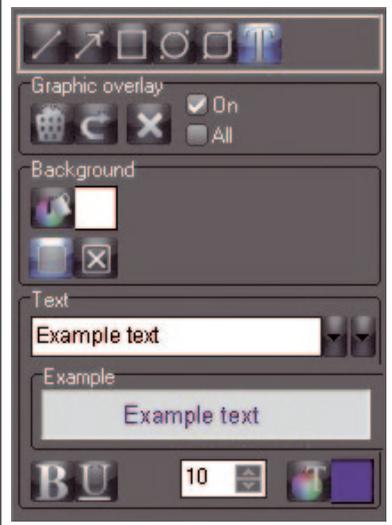
## Common functions at drawing level

 <p>Graphic overlay</p> <p><input checked="" type="checkbox"/> On <input type="checkbox"/> All</p>	<p>"Delete...": Deletes active graphic elements</p> <p>"Undo delete": Undoes the delete of active graphic elements</p> <p>"Delete graphic": Deletes all graphic elements</p> <p>"On" check box: Make current drawing level visible or invisible</p> <p>"All" check box: Make all drawing levels visible or invisible</p>
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## Text, line and closed line elements

 <p>Graphic overlay</p> <p><input checked="" type="checkbox"/> On <input type="checkbox"/> All</p> <p>Background</p> <p>Pen</p>	<p>: Create closed line element</p> <p>"Pen": Pen colour can be set; Pen thickness can be set via list field</p> <p>"Background": Colour of background pattern can be set; Background pattern can be set</p>
---	---

 <p>Graphic overlay</p> <p><input checked="" type="checkbox"/> On <input type="checkbox"/> All</p> <p>Background</p> <p>Text</p> <p>Example text</p> <p>Example</p> <p>Example text</p> <p><b>B</b> <u>U</u> 10</p>	<p>: Create text element</p> <p>"Text"</p> <p>: Arrow-button to select text block Left arrow: List of "Moniker" Right arrow: List of text blocks</p> <p>"Background":</p> <p>: Text background pattern filled</p> <p>: Colour of filled text background</p> <p>: Text background pattern transparent</p> <p>"Text": Text can be input or changed Text attributes: bold, underlined, colour, size</p>
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Create line elements



### Length measurements of lines and polygons

<p>The 'Line' tool settings panel includes:</p> <ul style="list-style-type: none"> <li><b>Line:</b> Icons for simple and polygonal lines.</li> <li><b>Graphic overlay:</b> Copy, paste, and checkboxes for "On" and "All".</li> <li><b>Pen:</b> Color selection and line thickness selector.</li> <li><b>Length:</b> Input field with "0" and a unit dropdown set to "mm".</li> <li><b>Calibration length:</b> Input field with "0" and a unit dropdown set to "mm", with a checkmark icon.</li> <li><b>13.2 Pixel / mm:</b> A field showing the current calibration value.</li> </ul>	<p>"Line":</p> <ul style="list-style-type: none"> <li> : Create simple line</li> <li> : Create polygonal line</li> </ul> <p>"Length": Define actual length of path and unit: pixels, cm, mm, inches Attention: A calibration must always be carried out for cm, mm or inch!</p> <p>"Calibration length": Select or enter calibration length in the field.</p> <ul style="list-style-type: none"> <li> : Accept calibration length Attention: For unit = Pixels not possible!</li> </ul>
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In order to estimate lengths and angle in X-ray images, the image must be calibrated using a reference object. Despite calibration, this estimation does not indicate the accuracy of a measurement and must not be used as the measured result. The accuracy will depend greatly on the distortion of the object projection onto the particular image viewer surface. In video images, no estimation of lengths and angles can be done to scale!

**Calibration with an object of known size as reference object**

	<p>Length 62.7 mm</p> <p>Calibration length 62.7 mm</p> <p>13.2 Pixel / mm</p> <p>Zoom Factor (%) 12</p>	<p>Measure the defined reference object distance e.g. Unit = select mm and enter path.</p>
	<p>Length 62.7 mm</p> <p>Calibration length 70.0 mm</p> <p>11.8 Pixel / mm</p> <p>Zoom Factor (%) 12</p>	<p>The calibration length must be selected! Set calibration length = 70.0 mm. Accept calibration length by clicking the button "Use selected line for length calibration".</p>
	<p>Length 70.0 mm</p> <p>Calibration length 70.0 mm</p> <p>11.8 Pixel / mm</p> <p>Zoom Factor (%) 12</p>	<p>All future measurements will be based on this calibration. This calibration can be repeated at any time!</p>



**Angle measurements**

	<p>"Line": Create an angle "Angle": Enclosed angle is displayed (in example: "85°")</p> <p><b>Create side 1</b> Left click. Drag route from A to B in the direction of the apex with the mouse. End side 1 in point B with left click.</p> <p><b>Create side 2</b> Left click at point C. Drag the mouse from point C to point D. End side 2 in point D with left click.</p>
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**CROP function**

The CROP function allows you to mark a section in an image and to save it as a new image.



Create rectangle (image section)



Cut out section and save as a new image

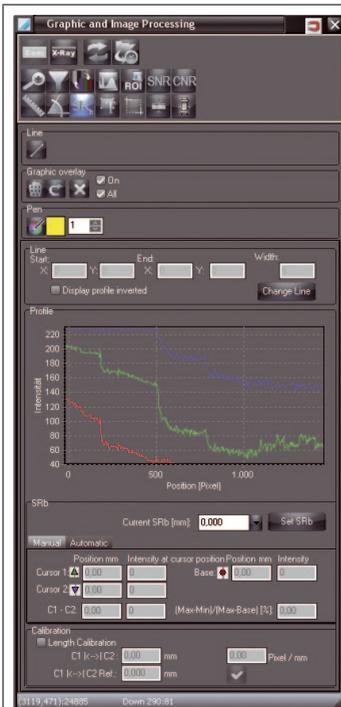


## Line profile representation

The colour density values all along a line are shown. The desired line is drawn in the image window using the button "Create new line for profile analysis". The line colour can be defined in the dialog "Drawing tools" by clicking the button "Select pen colour" in section "Pen".

Clicking in the line profile window displays a cross cursor in the image window and in the line profile window. Moving the cross cursor in the line profile window displays the density values along the line. Both cross pointers are synchronised so the position in the image can be determined precisely. The current value of the intensity (density) and the position are shown.

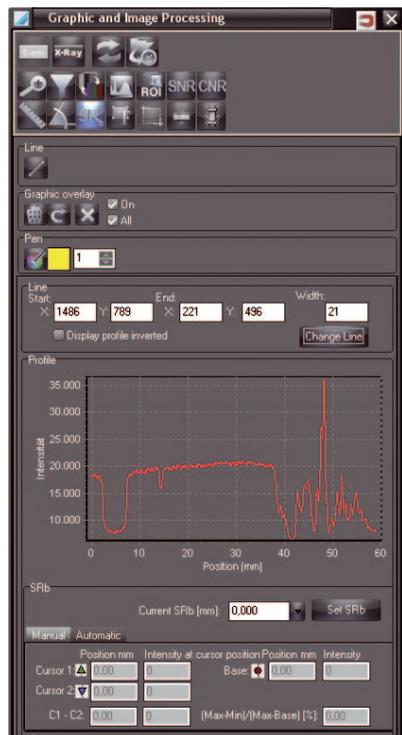
### Profile line for colour images



The current intensity value and the set scale values are displayed again in two fields in section "Intensity" under the profile.

## Profile line for grey scale images

More precise settings and evaluations of the line profile are possible for grey scale images. The intensity profile is always taken from the unfiltered image status. If the image has previously been filtered, the grey values of the original image is created in the background for the display of the intensity profile.



Section "Line": Display of the position values for the current line; manual input of the position values and copying with the button "Change line". The values correspond to the pixel values in the image. Manually entered values that exceed the image size are automatically set to "0" on copying with "Change line" and a corresponding message is displayed.

If several profile lines are drawn, the active profile line is marked with yellow boxes. Unselected profile lines appear in black.

"Display profile inverted": The values for the profile line are displayed with inverted values.

Section "Profile": Display of the line profile

"Change SRb": Value for the basic local resolution (in mm).

"Manual" tab

Area "Calibration":

If the check symbol "Length Calibration" is activated, then calibration of all length measurements (except for penetrated material thickness) can be carried out. For this, a reference object with known measurements (e.g. steel ball) must be within the measuring plane.

- Use tool "Line"  to draw a line over the central point of the reference object in the x-ray image.
- Click in the diagram under "Profile" to set up cursors C1 and C2.
- Within the diagram draw the two cursors C1 and C2 to the edges of the reference object. Under C1 |<->| C2 the non-calibrated length will be displayed.
- Enter at C1 |<->| C2 Ref. the known length of the reference object (e.g. diameter of the steel ball).
- Close calibration with  . The calibration values will now be taken up. The tool "Length measurement"  enables lengths within the same plane to be measured (see **Length measurements for lines and for polygons**).

## Example – profile line in grey scale image

Graphic and Image Processing

Line

Graphic overlay

Pen

Line Start: X: 4047 Y: 1899 End: X: 4308 Y: 3438 Width: 21

Display profile inverted

Profile

Intensity

Position [Pixel]

SRb

Current SRb [mm]: 0.000

Manual Automatic

Cursor	Position [Pixel]	Intensity at cursor position	Position [Pixel]	Intensity
Cursor 1	1068	39343		
Cursor 2	903	39280		
C1 - C2	165	63	(Max-Min)/(Max-Base) [%]	0.00

Calibration

Length Calibration

C1 [←→] C2: 0 Pixel 6 Pixel / Pixel

C1 [←→] C2 Ref.: 0 Pixel

(4879,3277):43467 Down 347:277

## Enter cursor in line profile

Profile

Intensity

Position [Pixel]

SRb

Current SRb [mm]: 0.000

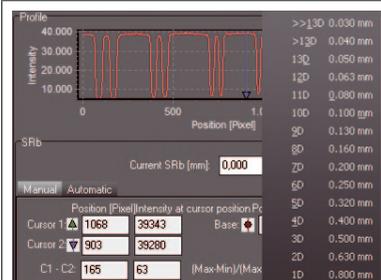
Manual Automatic

Cursor	Position [Pixel]	Intensity at cursor position	Position [Pixel]	Intensity
Cursor 1	1068	39343		
Cursor 2	903	39280		
C1 - C2	165	63	(Max-Min)/(Max-Base) [%]	0.00

Two cursors can be entered in the line profile for evaluation.

Click in the line profile. At each mouse click "Cursor 1", "Cursor 2" and "Basis" appear in turn. The current values for the "Position" and "Intensity" appear in the fields. The position values are displayed in pixel, cm, mm or inch, depending on the setting in dialog "Length measurement".

## Define SRb value



Value for the basic local resolution (in mm):

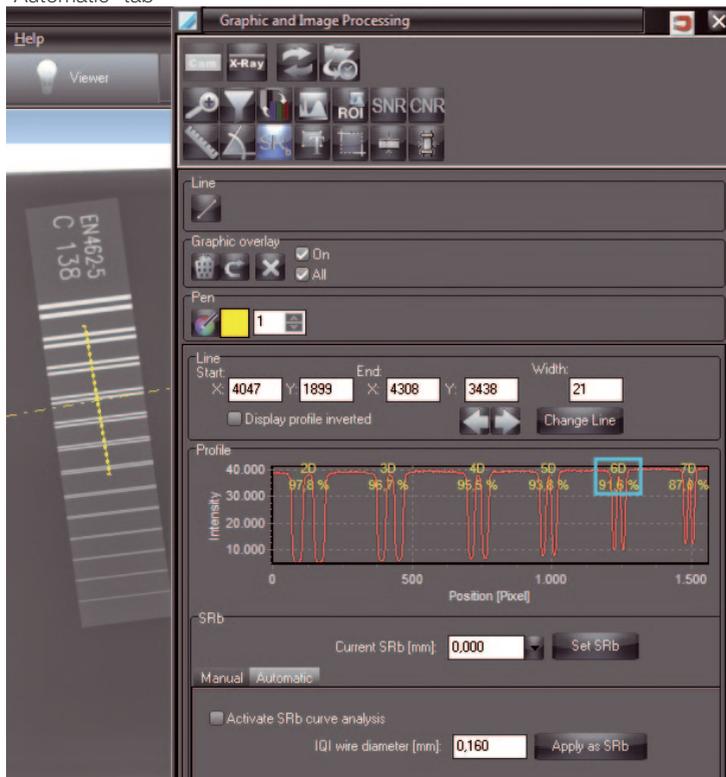
Enter the SRb value manually.

– OR –

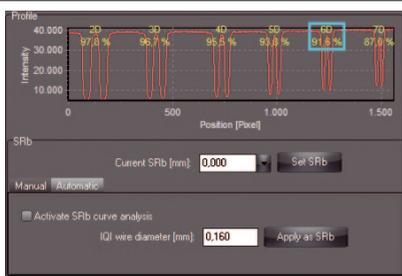
Select the SRb value according to the element number of the test specimen from the list.

## Example – profile line in grey scale image

"Automatic" tab

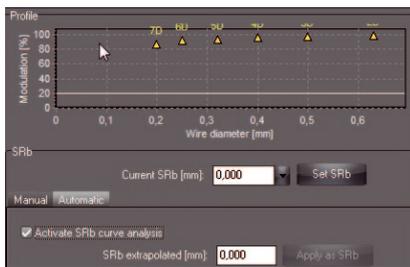


## Determining the local resolution



Click on the "Automatic" button to determine the local resolution **Automatic**.

## Determining the maximum basic local resolution

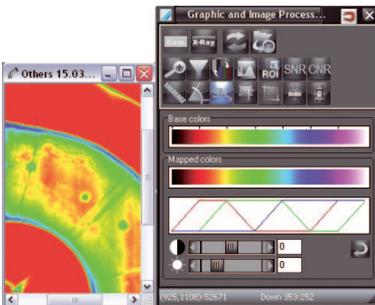


Activate the tick for "Activate SRb curve analysis" to determine the basic resolution. The calculated value for the basic local resolution is determined with the activated curve resolution. This value can be adopted as the basis for SRb.



## Pseudo coloured image

You can set the pseudo colour using the sliders. The pseudo coloured image will not be stored! The basic colours can be selected individually to get your optimum of colour transitions by clicking on the stripe base colours within the colour you want to be replaced by another colour. The Windows colour selection box appears where you can select the new colour. The available colours are shown in the stripe mapped colours which can be extended using the sliders.



With button "Set standard", the base colours and the slide controller are reset to the standard values.

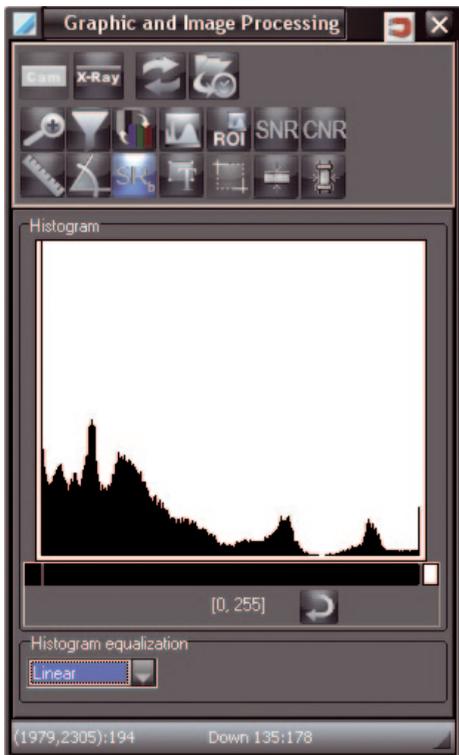


## ROI histogram /

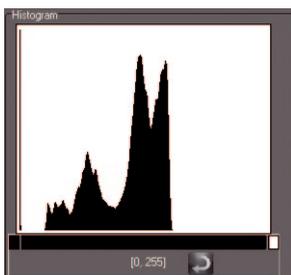


## Histogram functions

Both functions display the grey value distribution of the image. They allow, for example, the existing intensity values to be spread over the whole range. This way, differences in intensity that are too small to perceive with the human eye are intensified so that they can be detected.



## 16-bit grey scale images



16-bit grey scale images from CrScan: Low dosage = 0; High dosage = 65535

## Histogram stretching

The histogram is shown in the upper area. Here you can perform a histogram stretch. The display is changed to grey scale during the process.



Optimally extended original images cannot be extended any further!

### Procedure with histogram function:

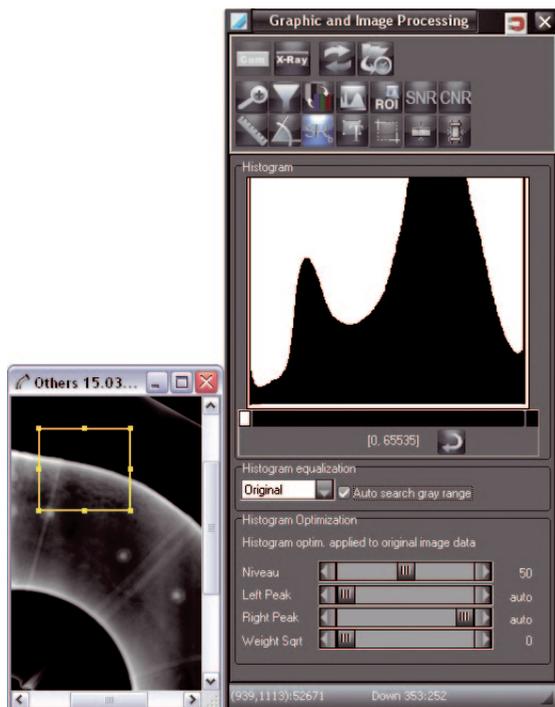
Click on the black bar under the histogram and define the length with the left mouse key pressed.

### Procedure with ROI histogram function:

If you only want to view a certain image area (ROI = "region of interest"):

Draw a frame in the image.

The contrast stretching area is then set with a minimum and maximum grey value within the drawn frame.



If you move the frame, the contrast stretching range is adapted automatically.

The levels of grey in the area of the black bar are always displayed at 256 grey levels for display on the monitor.

By pressing the "Set Standard" button  the entire grey scale range is shown (bar extends across the entire area).

## Histogram optimisation

In the lower area, you can perform a histogram optimisation. During the optimisation, the histogram of the image is changed ("Histogram equalisation"). The optimisation is defined using the slider control.

- "Level": This slider control defines the height at which the peaks are cut off in the histogram.
- "Left Peak" / "Right Peak": The setting of the slider control ideally corresponds with the grey value of the inner edge of the two peaks at the edge of the histogram. If both controls are not moved, the area is calculated automatically. The display on the right, next to the controller then shows "auto". If you move one of the two slider controls, this value is used instead of the calculated grey value.
- "Weight Sqrt.": This slider control setting defines the weight (from 0 % to 100 %) of consideration of the root curve in the information of the histogram.

### Procedure

Step 1: (with slider control "Level")

Reduce the contrast of the grey value range that corresponds with the peaks of the histogram curve, compared with a standard histogram equalisation.

Step 2: (with slider control "Left Peak" and "Right Peak")

Suppress peaks on the left and right edges of the histogram. These peaks correspond with the image border or the object background. In addition, the contrast area in the grey value range is decreased outside the value defined by the slider control.

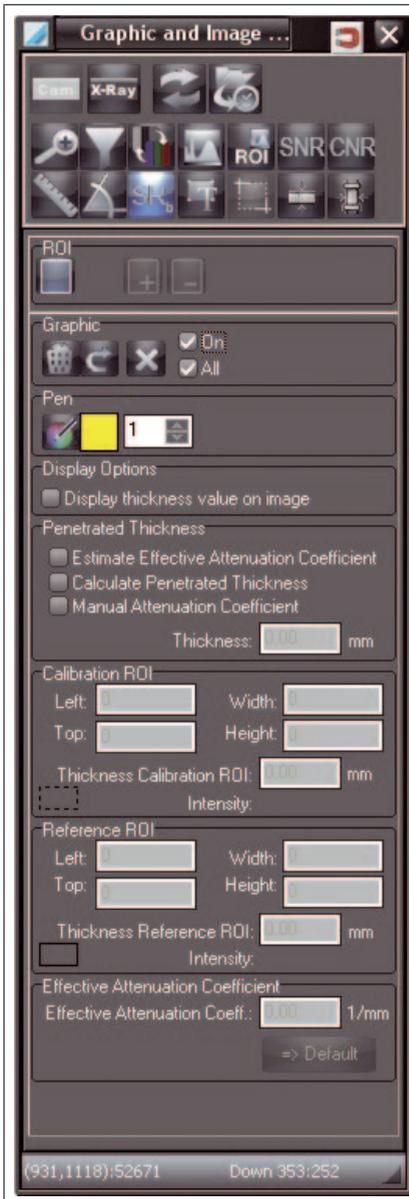
Step 3: (with slider control "Weight Sqrt.")

Average histogram.



## Penetrated material thickness

The program uses the x-ray and the known material thickness together with the (effective) absorption coefficient to calculate material thicknesses at various points of the penetrated material. This function is optional and is only activated with the licensing.



### Area "ROI"

-  Create ROI (ROI = Region Of Interest).
-  Create additional ROI.
-  Delete ROI.

### Area "Graph"

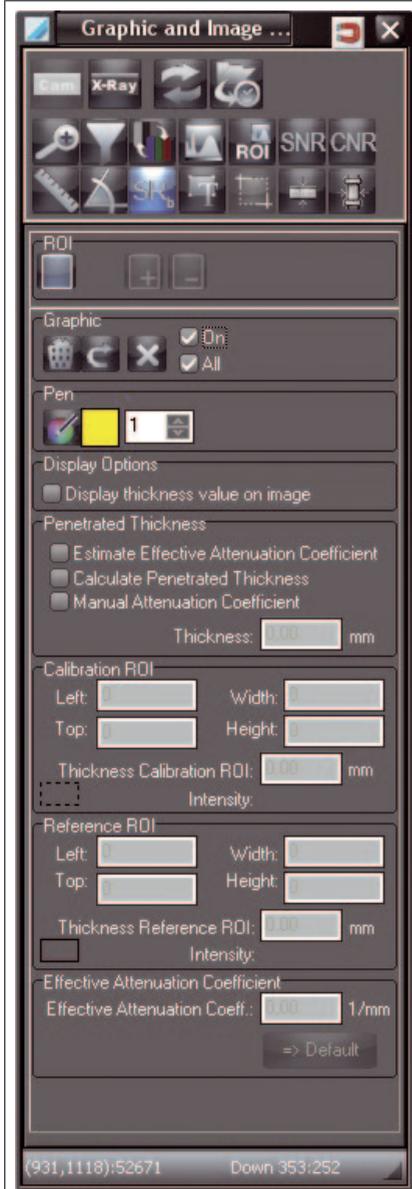
-  Delete selected object.
  -  Cancel last step.
  -  Delete graph.
- On    Make current drawing levels visible or invisible  
All    Make all drawing levels visible or invisible

### Area "Pen"

-  Pen colour can be set.  
Pen thickness can be set via list field

### Area "Display options"

The material thicknesses measured can be opened and closed within the x-ray image.



## Area "Penetrated material thickness"

### Calculate effective absorption coefficient

Using the ROI calibration, the ROI reference and the relevant material thickness at this point, the effective absorption coefficient can be calculated.

### Calculate penetrated material thickness

The calculated material thickness is shown at the ROI measurement. To measure the material thickness at the points, move the ROI measurement or create a new ROI at the point of interest.

### Enter the absorption coefficient manually

After the ROI calibration has been carried out, the effective absorption coefficient (e.g. taken from a text book) must be entered manually. Subsequently an additional ROI for measuring at the appropriate point can be established.

### Material thickness

The calculated material thickness is shown.

## Area "ROI Calibration"

Where an ROI calibration has been used, then the actual measured material thickness at this point must be entered.

## Area "ROI Reference"

Where an ROI calibration has been used, then the actual measured material thickness at this point must be entered.

## Area "Effective absorption coefficient "

Where an ROI calibration and reference have been used, the actual measured effective absorption coefficient at this point must be entered.

---

When establishing the penetrated material thickness, two methods are differentiated:

- The effective absorption coefficient is established
- The effective absorption coefficient is entered manually

### **Determine absorption coefficient and calculate thickness of material penetrated**

- Measure the material thickness at two points where the material was penetrated.
- Under "Penetrated material thickness" select "Determine effective absorption coefficient" from list.
- Use the x-ray image to place the ROIs at the appropriate points. The first ROI is the ROI calibration, the second is the ROI reference.
- Enter the measured values under "ROI Calibration" and "ROI Reference". The effective absorption coefficient is established and displayed.
- Under "Penetrated material thickness" select point "Determine penetrated material thickness".
- Using button "New ROI" a measurement ROI can be set and the calculated value read off at "Material thickness".

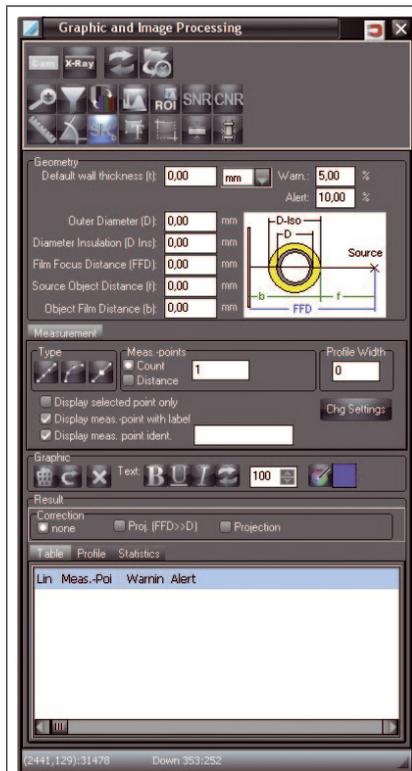
### **Enter the absorption coefficient manually and establish the penetrated material thickness**

- Measure the material thickness at one point (ROI Calibration) of the material penetrated.
- Under "Penetrated material thickness" select "Enter effective absorption coefficient" from list.
- Use the x-ray image to place the ROI at the appropriate points.
- Enter the measured value under "ROI Calibration".
- Under "Effective absorption coefficient" enter the absorption coefficient ( e.g. taken from a text book).
- Under "Penetrated material thickness" read off the measured material thickness at ROI measurement point.
- Using button "New ROI" a further measurement ROI can be set and the calculated value read off at "Material thickness".



## Wall thickness

The program determines in an X-ray the wall thickness of a tube or tube elbow from the intensity profile. The wall thickness is determined either at a point on the tube wall (one measurement point) or in a section along the tube wall (several measurement points). This function is optional and is only activated by the licensing.



### Section "Geometry"

Enter data on the plotted curve (geometric data). The selected unit of length (mm, cm, inch) is used in the tab "Table". Input of the data is necessary if an option "Projection" is selected in section "Correction".

"Warn."/"Alarm": Enter limit values (in percent) for the automatic determination of the wall thickness. If the values drop below these limit values, the corresponding measurement points are marked in the image (yellow: Warning; red: Alarm).

### Tab "Measurement"

Settings for determining curve/line type and definition of reference and measurement points.

"Type": Set curve type:



: Line, 2 reference points



: Curve, 2 to 15 reference points



: Create new reference point

"Measurement points": Enter number of equidistant measurement points or fixed distance between the measurement points (in pixel) (only possible with curve type line and curve)

"Profile width": Enter value for averaging of the pixel array. The value indicates over how many adjacent pixel values the profile line for determination of the wall thickness is averaged.

"Display only selected point": Display only the selected measurement point in the image

"Measurement point with text": Display text for the measurement points (wall thickness, line/measurement point No.)

"Display measurement point ID": Enter and assign dedicated designation for the selected measurement points. The designation can be used in the report for sorting and unambiguous identification.

### Area "Graph"

Delete curve, undo last change, delete all curves

"Text": Set style of the text. Format text for the measurement points

### Section "Result"

"Correction": Set correction mode.

### Correction with existing calibration

If the X-ray image was calibrated using a reference calibration object, "none" must be selected as correction value. With this setting the pixel value for the wall thickness is converted into selected unit of length using the calibration without the geometry of the recording configuration being taken into consideration. The image resolution must have been calibrated with a reference object.

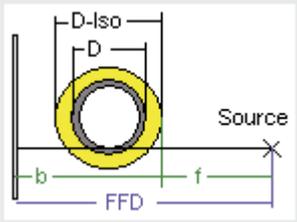
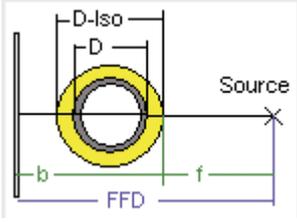
### Correction without calibration

If no calibration was performed, the resolution stored in the image is used for the calculation of the wall thickness. Depending on the tube wall thickness, tube diameter and recording geometry, the distortion caused by the projection of the tube wall onto the image plate plane has to be taken into consideration.

Note: The combination of calibration and projection does not normally lead to an expedient correction. Use only one of the correction methods at a time.

The correction method presupposes that the necessary geometric data were entered in the section "Geometry".

All settings have to be confirmed by clicking "Accept".

"Proj. (FFD >>D)"	"Projection"
<p>The geometric arrangement of beamer, object and film is taken into consideration during the calculation of the corrected wall thickness. An approximation equation is hereby used that is valid when the film focus distance (FFD) is significantly larger than the value entered for the outside diameter (D) in section "Geometry".</p>	<p>The geometric arrangement of beamer, object and film and the value entered in section "Geometry" for the outside diameter (D), object-film distance (b) and film focus distance (FFD) are taken into consideration during the calculation of the corrected wall thickness.</p>
<p>Designation in tangential radiography: Offset method</p> 	<p>Designation in tangential radiography: Centerline method</p> 

### Tab "Table"

Display of the calculated wall thicknesses along the plotted curve(s). If a cell is marked, the assigned auxiliary line appears pale green in the X-ray image.

### Tab "Profiles"

Graphic representation of the wall thickness profiles. The vertical lines in the profile indicate the position of the inner and outer tube radius. Clicking in the profile allows a zoom window to be opened.

"Manual inside"/"Manual outside": Position of the tube radii can be defined manually via the input fields or by shifting the cursor.

"Auto zoom": Limit X axis to the range of the tube radii.

## Example – Tab "Profiles"

The screenshot displays the 'Graphic and Image Processing' software interface. On the left, a grayscale image of a pipe bend is shown with several measurement points labeled: 2/1 : 6,54 mm (MP2), 2/2 : 6,38 mm (MP2), 1/1 : 3,62 mm (MP1), 1/2 : 3,94 mm (MP1), 1/3 : 3,70 mm (MP1), 1/4 : 3,98 mm (MP1), 3/1 : 3,56 mm (MP3), and MP3. The main window contains various control panels:

- Geometry:** Default wall thickness (t): 0,00 mm; Warn.: 5,00 %; Alert: 10,00 %.
- Measurement:** Type: Count; Meas. points: 4; Profile Width: 21.
- Graphic:** Text: BUT; 100.
- Result:** Correction: none; Proj. (FFD>>D); Projection.
- Table:**

Lin	Meas.-Poi	rem.
1/1	MP1	3,62
1/2	MP1	3,94
1/3	MP1	3,70
1/4	MP1	3,98
2/1	MP2	6,54
2/2	MP2	6,38
- Figure:** A line graph showing a peak at approximately 25 on the x-axis, with a y-axis ranging from 0 to 40,000.

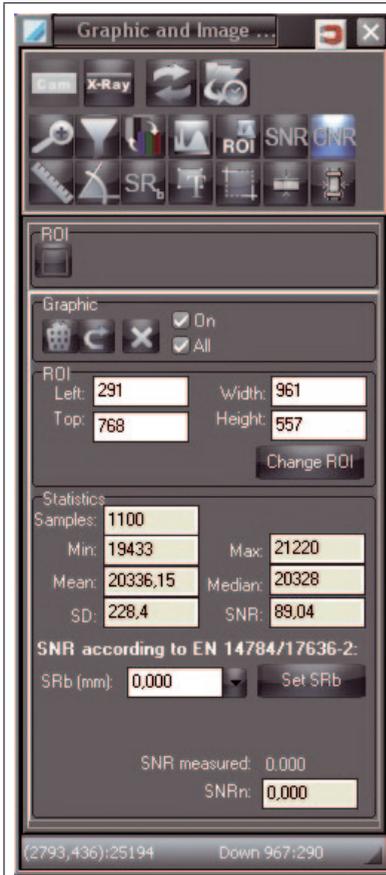
## Tab "Statistics"

Statistical evaluation of the measured wall thicknesses along a line or curve (with curve types line or curve, with more than one measurement point). With several curves in the image, the curve selected in the table is displayed.



## SNR

The function SNR allows you to view the statistical values for an ROI and to set the SRb-value. The statistical values and the normalised SNR value are recalculated during plotting of an ROI when changing the position or size of an ROI. The normalised SNR value is also recalculated if an SRb-value is selected and "Set SRb" is clicked.



### Area "ROI"

Plot ROI in the image.

– or –

Enter ROI values manually and apply with "Change ROI".

The ROI is displayed in the image.

The minimum width of an ROI is 10 pixels. If there are several ROIs, the selected ROI is displayed in yellow.

### Section "Graph"

Delete ROI / Restore previous deleted ROI / Delete all ROIs.

### Section "Statistics"

Values in the ROI

"Values": Number of pixels

"Min": Smallest pixel value

"Max": Largest pixel value

"Mean": Arithmetic mean value

"Median": Median of all pixel values

"SD": Standard deviation of all pixel values

"SNR": Signal/noise ration of all pixel values

"Median of average line values": Median of all line averages of the ROI. For even numbers of lines the higher value is taken as median.

"Median of the SDs of all lines": Mean value of all line standard deviations. With an even number of lines, the larger value is used as the median.

### Section "SNR according to EN 14784"

In the lower section, the normalised SNR value to EN is displayed. The statistical values for the ROI and the basic local resolution (SRb) of the image are used for the calculation.

## "SRb"/"Set SRb"

Enter the SRb value manually.

– or –

Select the SRb value according to the element number of the test specimen from the list.

### Example – SNR values for X-ray image

The screenshot displays a software interface for X-ray image analysis. On the left, an X-ray image is shown with a yellow rectangular Region of Interest (ROI) box. The main window title is "Others 15.03.2010 14:32:03 Orig...". On the right, a control panel titled "Graphic and Image ..." is visible. It includes a toolbar with icons for X-Ray, ROI, SNR, SNR, SRb, and other functions. Below the toolbar, there are sections for ROI settings, Graphic options, and Statistics. The Statistics section shows the following data:

Statistics	
Samples	1100
Min	19433
Max	21220
Mean	20336.15
Median	20328
SD	228.4
SNR	89.04

Below the statistics, there is a section for "SNR according to EN 14784/17636-2:" with a dropdown menu for "SRb (mm)" set to "0.050" and a "Set SRb" button. At the bottom of the panel, it shows "SNR measured: 93.1" and "SNRn: 163".





## Printer / **Create new printer profile**

Click button "Create new printer profile".  
Click the text field and enter a name for the newly created profile.  
Make all settings as described from "Select printer profile".

### **"Printer" list field: Select printer profile**

Click on the pull-down button and select the desired profile.



## Printer / **Select printer**

Click on the printer button and select the desired printer.

### **Print type: Select print type**

#### **Single image:**

The marked image is printed.

#### **Light table:**

All images on the light table are printed.

#### **Images per line:**

When activating the button "Images per line", the images for printing are sorted in lines and columns.

#### **Print with drawing:**

If a checkmark is set with "Print with drawings", drawings that were inserted with the toolbox are also printed.

#### **Frame / Background colour:**

Choose any colour for the image background.

#### **Scale: Select output range and scale**

#### **X-ray images in original size:**

If a checkmark is set with "X-ray images in original size", the images are printed in original size.

#### **Light table:**

The button "Light table" scales the printout of the entire light table to a full page.

#### **Image only:**

In activating the marking field "Image area", the smallest possible frame is determined to surround all images and the printout is scaled to a page.

#### **Border (%):**

The setting "Border (%)" determines the border width (relative to the image size) with which an image is surrounded. This has an effect the print of several images, as it also defines the margin between the individual images.

#### **Format": Select format**

Select portrait or landscape format.

#### **Annotation: Select information**

In this selection field, the images for printing can be automatically supplemented with information, e.g. patient name, job number, etc.

Click button "New annotation".

Under "Position", select where the information is to appear.

Select font, typeface and point size under "Character set".

- In the pull-down menu of the "Content" field, select the information that is to be supplemented. Multiple definitions are possible.
- Confirm with "OK".

## "Preview" tab

Select the "Preview" tab to check the pre-settings.



Depending on the used printer model, printer setting (e.g. fast-print mode at reduced quality) and paper grade, the quality of the printout can vary widely. These factors also influence the reproduction of details and number of grey levels. Where printouts of x-rays are to be used for the purpose of diagnosis, it is important that the quality of the printing is sufficient by printing out a grey value test sheet (..\<Configured Program Path>\GREYTEST).

## Creating and printing reports

The dialogues or menu items described below can be activated if there is at least one image on the light table. You can create reports for images, view these in the preview and export and print them in different formats.

Images for which reports already exist are marked in the image loading box.



### Calling up the dialog window Print report

You have the following options for calling up the dialog window Print report:

Select in the menu bar the menu item "Image/Report" or "Light table/Report".

– or –

Click the "Print" button.

The context menu with the items "Report/Image" or "Report/Whole light table" appears.



Select a menu point.

The "Print report" dialog window appears.



### Profile / **Create new report profile**

A new report profile is created as described in chapter "Setting up a printer".



### Profile / **Select and configure printer for report profile**

Click the button and select the desired printer in the list field.



### Profile / **Delete report profile**

Select a report profile in the list field and click the button.  
The report profile is deleted from the list.

### Report type

Mark an option to select the report type.  
"Single image": A report on the active image on the light table is created.  
"Light table": A serial report on all images on the light table is created.

### Annotation

The reports belonging to the report profile are put together in this section. Administrator rights are necessary for this.

### Select report layout

The available report layouts are listed in the combination field and can be selected there.



### **Create new annotation**

Click the button to add the report selected in the combination field to the report profile. The annotation is added to the list field in the selected report layout.



### **Delete annotation**

Select an annotation in the list field and click the button.  
The annotation is deleted.





Show tree view



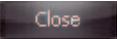
Display miniature view of the report



Call up dialog "Page settings"



Page display: First page / Previous page / Select page / Next page / Last page



Preview: Close

## 8. Image archive

### General

Unlike the backup function, which is designed to help you to restore the last backup level (working status) in the event of a total system failure, the purpose of the archive module is to build a long-term archive of the video and X-ray images and to permit direct access (random access) to the images archived. On the one hand, such a long-term archive reduces the storage requirements on the working partition while, on the other hand, it fulfils the legal requirements regarding the obligation to preserve X-ray images for a specified period.

Long-term archiving is based on a two-phase procedure. In the first step the images are copied to the archive medium and remain in the normal image archive (these images are referred to below as archive buffer) from where they can be uploaded again to the program at any time.



A long-term archive should be created on a separate data storage medium (e.g. MO drive, CD burner). If you set up a long-term archive on a work partition, on which the operating system and other user programs are installed, there is a danger of there not being sufficient storage area for the operating system and any other possible programs. This may result in problems during program execution.

Immediately before or after an archiving process, a backup of the database directory ".\dbsdata" must be performed so that all data can be restored consistently after an irreversible drive crash!

### Data security with DBTool



On installation of the software the program "DBTool" was also installed. This program can be used to back-up the database, to restore or to repair it. Additionally the database can be moved, e.g. from a local drive to a network drive on a server.

The program symbol for DBTool is located in the same start menu directory as the main program.

### Suitable archiving drives and storage media

Based on the present state-of-the-art engineering, a magneto-optical drive, abbreviated MO drive, is to be recommended for long-term archiving. The manufacturer should guarantee data readability for up to 30 years. The access times to files are also reasonable.

CD recorders are less suitable since the manufacturers can only guarantee a max. medium readability period of 10 years. Moreover, the life of a CD greatly depends on ambient conditions. Note that only CD burners that can be accessed with special driver software (e.g. Adaptec Direkt-CD > V2.0) can be used as a file system. The storage medium must be formatted before using.



While hard disk drives are a possible storage medium, they should only be used in cases of emergency or for testing since they are not suitable for long-term archiving! Tape drives are unsuitable for long-term archiving since they do not support direct access to data.



When archiving security-relevant X-ray images (e. g. in nuclear power plants), the X-ray images must be recopied after the shelf-life of the media specified by the manufacturer has elapsed.

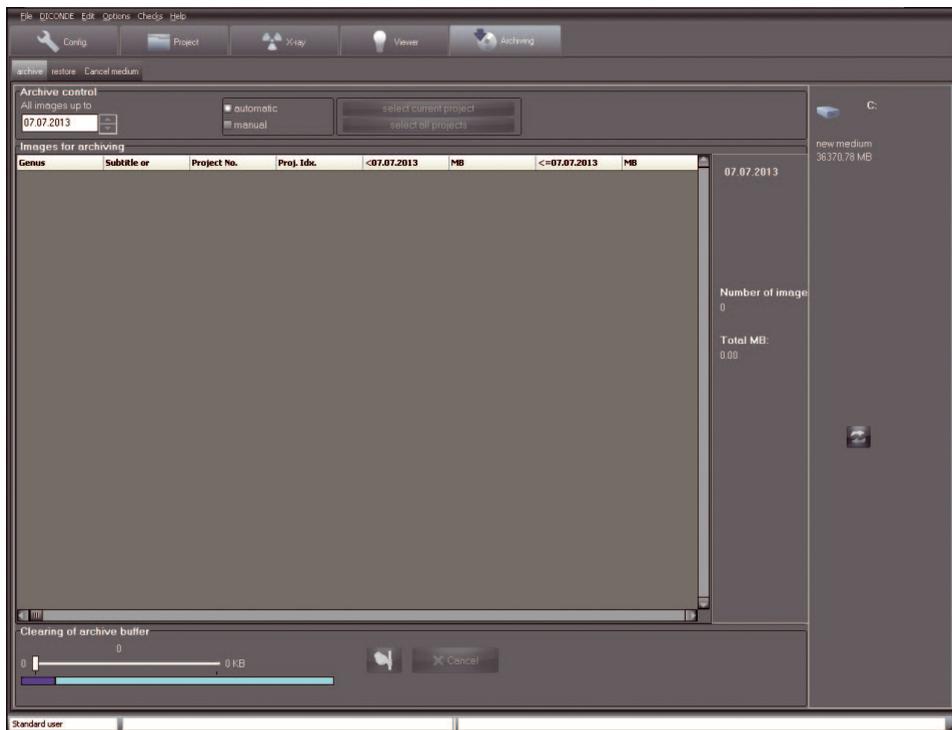
### Archive management

The archive module tab contains the tabs "archiving", "restoring" and "delete medium". The field "Archive control" is located underneath. It contains the entry field "All images up to", archiving mode "automatic" and "manual" and the button "Select current project" and "Select all projects".



Before starting an archive procedure, the archiving system must be configured properly ("Menu/Configuration/Module/Archiving").

### Archiving



"Images for archiving": Image list with project numbers and other information



Archive packet with date information, number of images and size



Archive drive (example) with available size

### Creation of the archive image list

As long as you are in automatic mode, the buttons "Select current project" and "Select all projects" are blocked and in the date field "All images to", the date limit is displayed as the set value between the green and red area of the configuration setting. This is the mode of operation that should generally be used.



In the automatic mode described above, the program determines the images to be archived using the configuration setting. You can however change the time period in the area "Archiving control" with date field "All images to" for this archiving process.



Every date change must be confirmed with the button "Date OK?" so that the image list is updated.

Under this field is the image list "Images for archiving". This image list shows all the images that match the selection criteria. If at least one image to be archived is displayed, the archive module creates a package in the first field on the right. Click on this packet and Drag&Drop it to the desired archiving drive shown in the right-hand field. If no archive disk drive is present, then this must be configured under "Configuration/Module/Archive/Drive".

### Manual creation of the archive image list

The manual and automatic archiving procedures in the procedures only differ in that you define the project images to be archived yourself, from the list. Only select this operating mode if you want to do project-oriented archive!

Here, you are provided with the two buttons "Select current project" and "Select all projects". If the button "Select current project" is deselected, you have either not selected a project (Project module) or there are no images that can be archived for the current time period.

### Procedure

- You can select the projects as usual in the Explorer, also using the mouse, the Shift or Ctrl buttons or with the buttons already indicated.
- If you have selected at least one project, the respective images are bundled into an archive packet which, as already indicated, you can move using Drag&Drop to the desired archive drive.
- Other procedures are the same as automatic archiving.

### Closing of archive media

The program automatically closes each medium if the medium becomes full after or during an archival storage. If you want to close the medium in advance (e.g. a copy should be made), select the respective medium closing from the context menu. Display the context menu by clicking on the medium symbol in the drive display area with the right mouse button.



This medium can not be used for further archiving!

## Labelling of archive media

Always label a new medium immediately after the first successful archival storage with the archiving number displayed below the medium in the field to the right. The first 6 numbers (from the left) are unique and should be recorded.

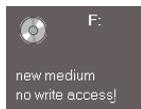
### Copying of archive media

The archive medium to be copied must be closed to guarantee data consistency! Copies should be made for protection against data loss (due to mechanical destruction or disappearance of the original medium).

### Archive drives

The second field contains the drive icons for the existing archive drives and information on their current status:

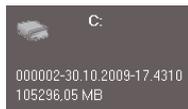
- Closed:** Each medium on which at least one archive has been stored can be closed. If this is the case, click on it with the right mouse button to open a context menu which enables you to obtain additional information on the drive or to close the drive. Closed means that you cannot perform any further archiving procedures on this medium.
- Other company:** An archive data medium has been inserted whose archive does not belong to the current company.



No write access

The currently inserted storage medium does not permit write access. Any data already present on one of the archive medium can be read!

In the case of an MO disk or similar storage medium, this means that the write protection function has been activated. A recordable CD has been closed using the file system, or a CD-ROM drive has been configured.



Indication of media ID and free storage capacity on this medium

This medium may be used as the first one for the next archival storage. Should the capacity remaining be insufficient to hold all the data to be archived, you will need additional media to continue the archival storage. The number of media required is estimated before the archiving operation starts. The number of media indicated is the maximum number of media needed; this number will never be exceeded.



No medium

If an archiving drive does not contain a medium (e.g. no CD in CD-ROM drive), this is indicated by a thick diagonal line.



### Refresh drives

Double clicking this field updates the drive display (e.g. after changing medium).

## Archive buffer

Long-term archiving is based on a two-phase procedure. In the first step the images are copied to the archive medium and remain in the normal image archive (these images are referred to below as archive buffer) from where they can be uploaded again to the program at any time.

To do this, move the slide control to the right to determine the size of the storage space to be cleared. Then click on the "Delete" button to close the process.

The coloured bar shows the current memory allocation of the drive on which the company data are stored.

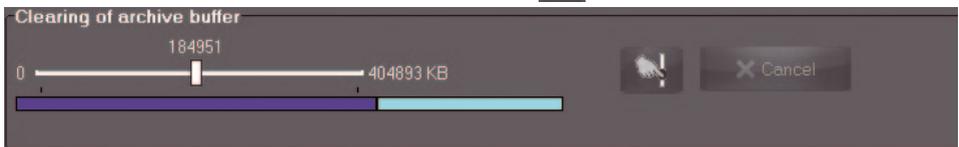
This bar consists of three sections identified by different colours:

- blue = unusable hard disk space
- olive = storage space occupied by archive buffer
- green = usable hard disk space

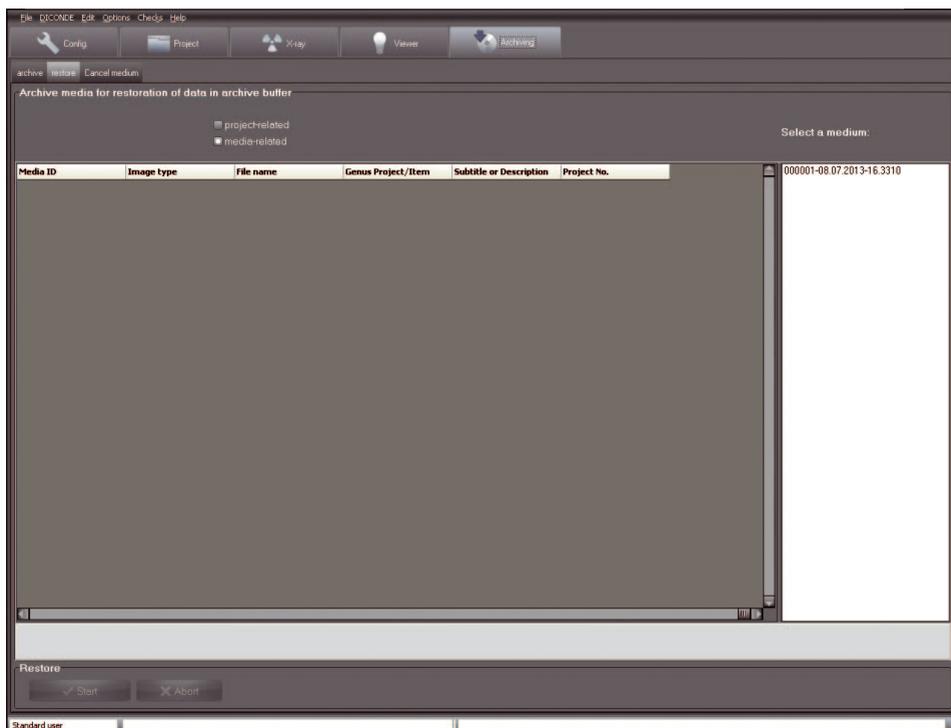


You should only delete these images in the archive buffer if you absolutely require memory on the drive (e.g. for new image captures).

In the following example, the slide control was moved to the right to clear 184951 Kbytes of the 404893 Kbyte archive buffer. After clicking on the button  the memory will be made free.



## Restore archived images



You are able to restore medium-based or project-based. . If a medium restore is to be performed, the archive module searches all drives configured for archive media. When restoring by project, all archive media that belong to the currently selected project are shown in the field "Select a medium" next to the list field and can be selected there. As a limitation, up to which day the images are to be restored can be entered via the date field. Once a medium has been selected, all matching images are displayed. The recording date, medium ID, image type and file name are shown for each image. After you have selected a medium, you can then restore all of the images shown in the list back into the archive buffer with the "Start" button.

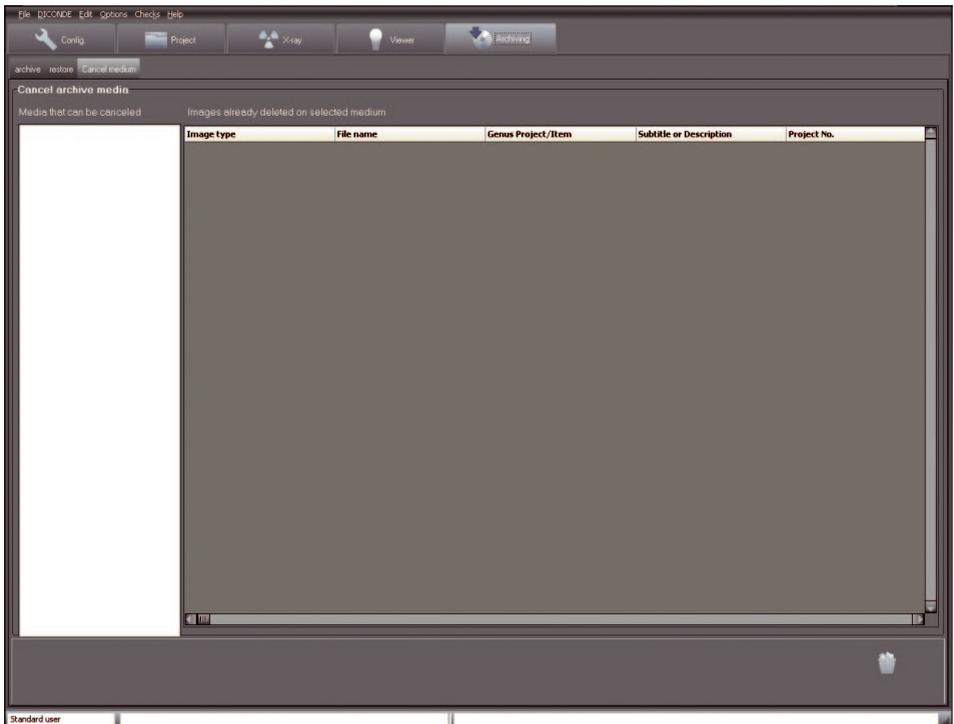


The project-specific restore is always expedient when preparing the next company day(s). This always guarantees that all required images are always available on the drive and do not have to be tediously read during a sitting from archives on one or more media!

## Cancellation of archive medium



Use this function only in case of loss of or damage to an archive medium or for a migration to larger storage media!



Only the image data of the archive medium still found in the archive buffer can be archived again after the cancellation. A cancelled archive medium must always be deleted before it can be used for archiving again. All registered archive media are displayed for selection. After selection the images on the medium are displayed that have been deleted and are therefore no longer in the archive buffer. These images will be lost if the archive medium is totally damaged or lost. If the archive medium is only partially defective, you must restore as much data as possible (function: Restore archive) before you cancel it.

All data must be restored for a migration to new archive media. (There must be sufficient drive space for images.) You must check that all the images are available before cancelling the medium. After that all the data can be archived on the new archive medium.





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