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scanner value pack

PlugIn for DpuScan

OMR

Optical Mark Recognition

Supplement to the DpuScan Reference Manual

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It may happen that a more recent version of this manual for DpuScan is available for download from the Internet. Therefore, it is recommended that you should compare the version by means of the date printed on this page with the version on the Internet. You should use the most up-to-date version of the manual.

The Internet version of this annex to the DpuScan Reference Manual is found on the Web at the following address:

<http://www.jkimaging.com/pdf/PlugIns/OMR-English.pdf>

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Table of Contents

1	Overview	4
2	The PlugIn in the Task Definition	4
3	The PlugIn in the Class Definition	6
3.1	Configuration of the PlugIn	7
3.1.1	Property Page General	9
3.1.2	Property Page Percent Code	10
3.1.3	Property Page Information	13
4	Configuration of the OMR	14
4.1	Property Page: Marks	15
4.1.1	Frames	15
4.1.2	Recognition	16
4.1.3	Result	17
4.1.4	Options	17
4.2	Property Page: Alignment	18
4.2.1	Frames	19
4.2.2	Search for Pattern	19
4.2.3	Result	19
4.2.4	Optionen	19
4.3	Property Page: Simulation	20
4.3.1	Results for Alignment	21
4.3.2	Results from Marks Recognition	21
5	How to Use the OMR	22
5.1	Usage of the OMR-Results	23

PlugIns for DpuScan are expansions for its functional scope and must be licensed separately.

This documentation describes one such additional module for already existing licenses of DpuScan. The use of this PlugIn is possible only in combination with DpuScan. Therefore, this documentation can also be used only together with the documentation for DpuScan.

1 Overview

OMR (Optical Mark Recognition) means the method to recognize marks on scanned documents, like questionnaires, for example. Often, mark areas are printed boxes that are manually marked by crosses, hooks, or any other mark. Also, there are cases where the marks can be set directly beside the text, without a defined box.

For better determining the position of such marks fields in a scanned image, the alignment (rotation and movement) of the entire image can be found out. This alignment recognition orientates itself to specific alignment marks which must exist in the image.

If suitable alignment marks exist, the alignment recognition should always be activated.

The OMR PlugIn serves for evaluation of such marking fields on scanned documents. For using it, the PlugIn must be loaded in the Class, must be configured there and be inserted into the Task as a new action.

2 The PlugIn in the Task Definition

The search for marks can be added in the Task definition, after getting the images by the action "Load from scanner" or "Load from directory".

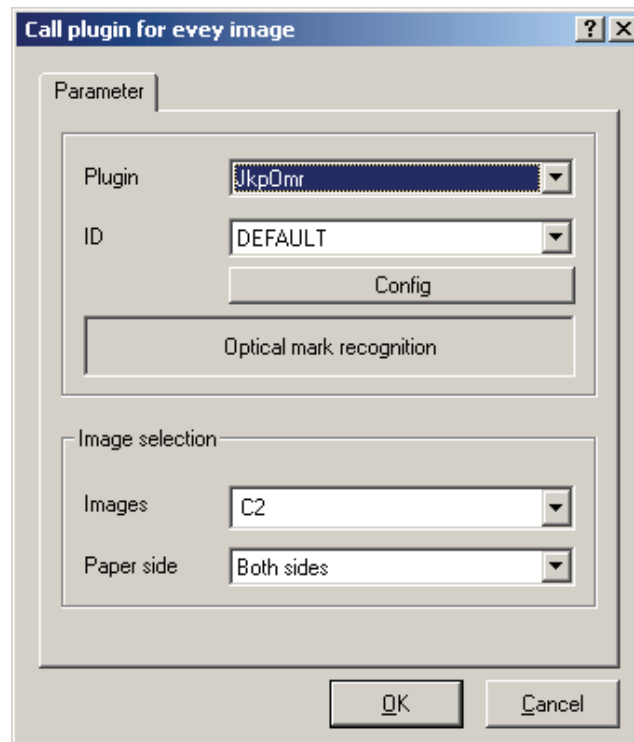


Illustration 1 – Calling the Plugin in the Task

This Task action is available only if the OMR Plugin was loaded in the actual Class.

You can configure the Task action via selection lists: Select the **OMR** Plugin, the prior established configuration and the color format / image, and also determine the paper side to be processed (Front side / Rear side / Both sides).

A bitonal image is required as base for the evaluation. If a color image or a grayscale image is selected, it will be transformed into a bitonal image by internal settings.

If the quality of the questionnaires to be evaluated is good enough, the originals can directly be scanned as bitonal images.

If a color image is available, the specific image enhancement methods of DpuScan can be utilized, like color noise reduction, color filtering, or enhanced modification, in order to achieve an optimum image for the OMR.

3 The Plugin in the Class Definition

The Plugin must be loaded and be configured within the Class. Open the **Class Configuration**, select the property sheet for **Process** and click the **Plugins** button.

The **Add** button guides you to the selection of available Plugins.

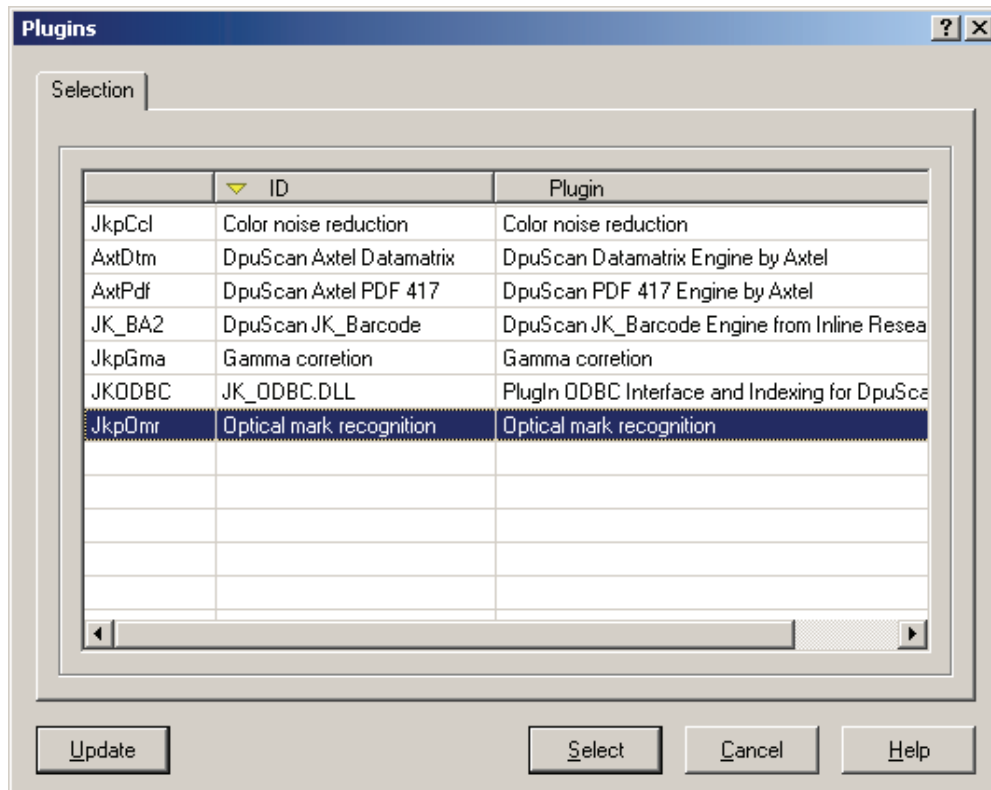


Illustration 2 – Selection of Available Plugins

You must select the Plugin called **JkpOmr**. Highlight its line by clicking into it and click the **Select** button.

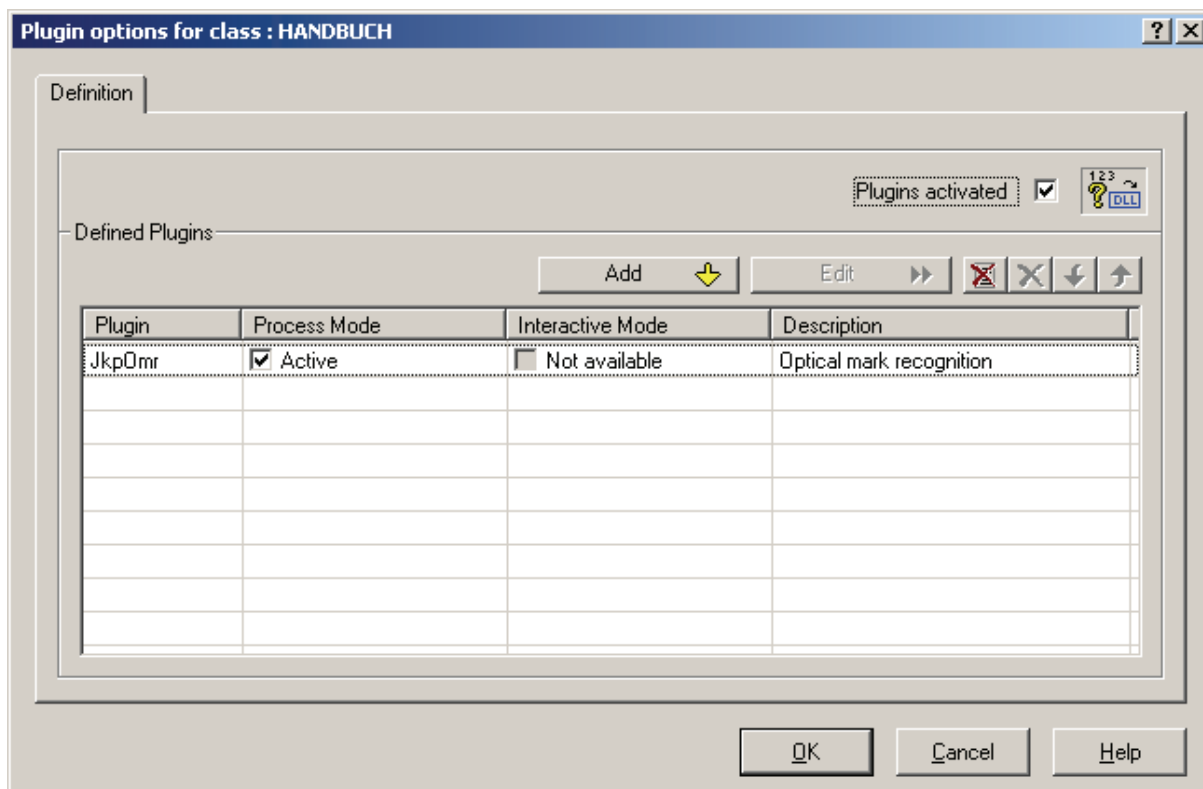


Illustration 3 – PlugIn Configuration for The Class

The OMR PlugIn is now loaded for usage in this certain Class.

Don't forget to enter the hook in the "Plugins activated" checkbox, as otherwise no Plugins will be used.

The entry in the list as per the above illustration shows, in the **Process Mode** column, an activated check box, while the check box in the **Interactive Mode** column is not activated. This means that this PlugIn can be used exclusively in the Process Mode, during the scan process, but not in a scan pause or in the Edit Window.

3.1 Configuration of the PlugIn

A double-click to the list entry opens the PlugIn configuration – refer [Illustration 7 – PlugIn Configuration](#) on page 9. It shows, at the top, the control elements for administering the different PlugIn configurations.

ID

Selects an existing configuration and assigns it to this Class.



Sets up a new configuration. This copies the settings of the actual configuration.

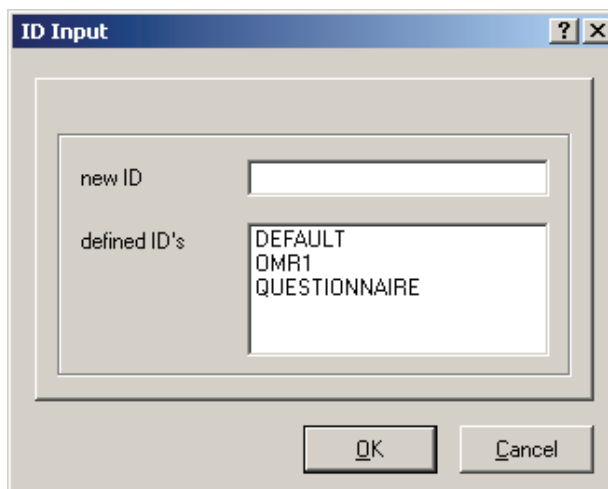


Illustration 4 – Setting Up a New ID



Deletes the actual configuration. Eventually, the following warning message will display:

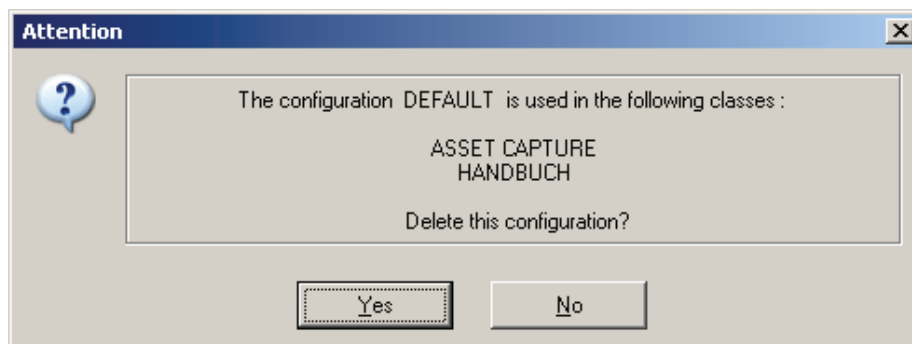


Illustration 5 – Warning before Deletion



Applies the modifications for the actual configuration.



Opens a dialog that states in which Classes the actual configuration is also used.

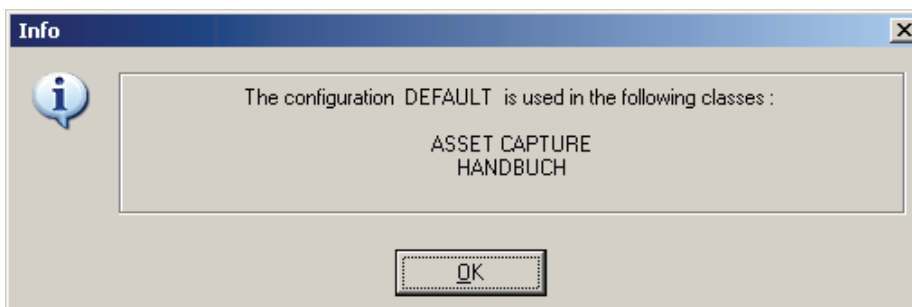


Illustration 6 – Information about Use of the ID

The remaining area below displays the three Property Pages **General**, **Percent Code** and **Information**.

3.1.1 Property Page: General

The **General** page shows detailed information about the PlugIn, in this case to its version and its manufacturer.

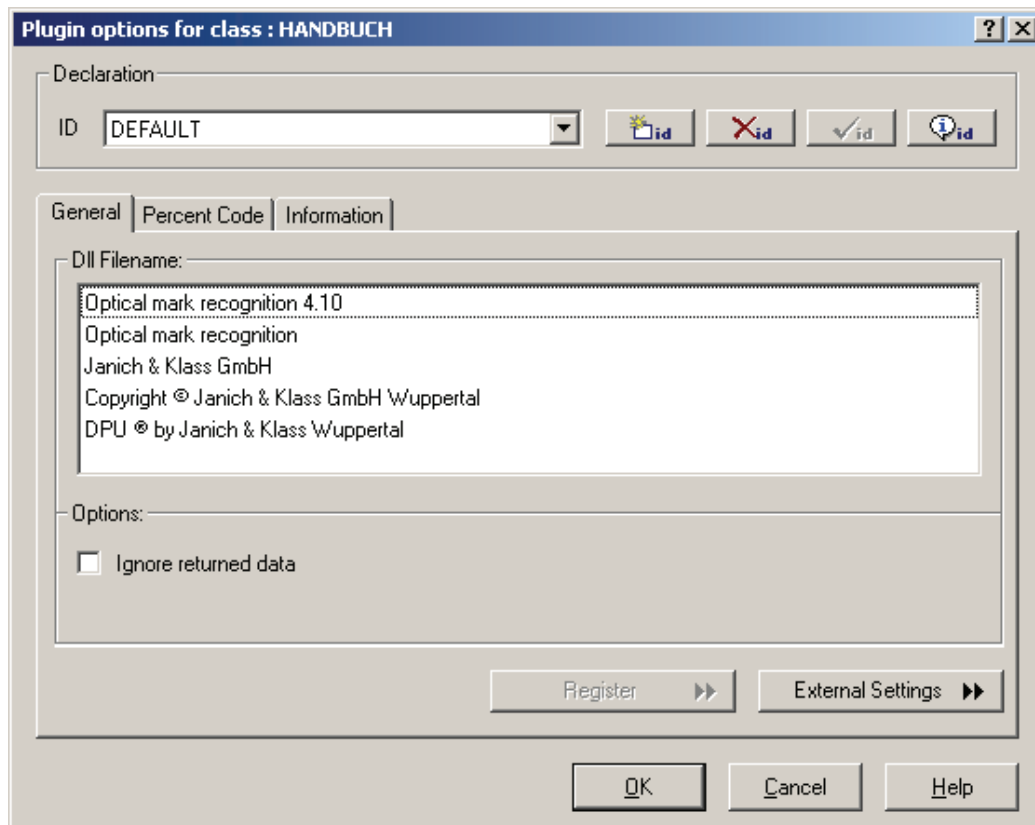


Illustration 7 – PlugIn Configuration, General

- Ignore returned data** The variables will not be returned to DpuScan if this check box is activated.
- Register** Opens the dialog for entering the registration key.
- External Settings** Opens the dialog for PlugIn configuration, refer Chapter [4 Configuration of the OMR](#) on Page [14](#).

Prior to its first usage, the Plugin must once be registered. Please click the tool button *Registration* and enter the registration key in the next dialog, in order to unlock the OMR-Plugin.

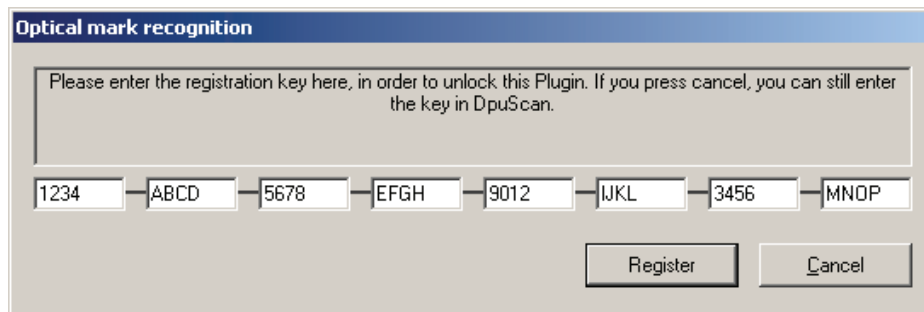


Illustration 8 – Registration Dialog

3.1.2 Property Page: Percent Code

The **Percent Code** page lists the variables that can be used by the Plugin or within the configuration.

But the Plugin returns some more variables which allow to draw conclusions from the run of the process.

JKPOMR_ALIGN_ FOUND_COUNT	Delivers the absolute number of retrieved alignment marks.
JKPOMR_ALIGN_ FOUND_PERCENT	Delivers the relative number of recognized alignment marks, in relation to the number of defined alignment marks. The indications are made in percent.
JKPOMR_ PROCESSTIME	Delivers the duration of the entire process run. The indication is made in tenth milliseconds. This value is mainly used for analytical purposes during the OMR setup.
JKPOMR_THD_ MIN_VALUE	<p>Delivers the smallest distance of the calculated black value from one of the defined thresholds. The minimum of all defined marks is returned. The indication is made in hundredth percent.</p> <p>If, for example, the bottom threshold for a mark is set to 10% and a black value of 10.5% is found out, this variable will receive the value "50". Using this result, you might for example set a blue mark with an Event Rule so that the reading result can be verified manually in such a case.</p>
JKPOMR_THD_ COUNT	Indicates the absolute number of marks whose determined black value deviates less than 2% from one of the defined thresholds.

If, for example, the determined black value for a frame is 58.1%, and the threshold for "demarking" (making a mark void by blackening its field) is set to 60%, this frame will also be counted for determining the value for JKPOMR_THD_COUNT.

JKPOMR_THD_PERCENT

As JKPOMR_THD_COUNT, but the number is delivered in percent, relative to the number of all defined frames.

These variables allow a better control of the optical mark recognition. Evaluation of these returned values inside the Event Rules makes it possible to recognize pages with insecure marks and to react to them, and also to create the base for statistical evaluations.

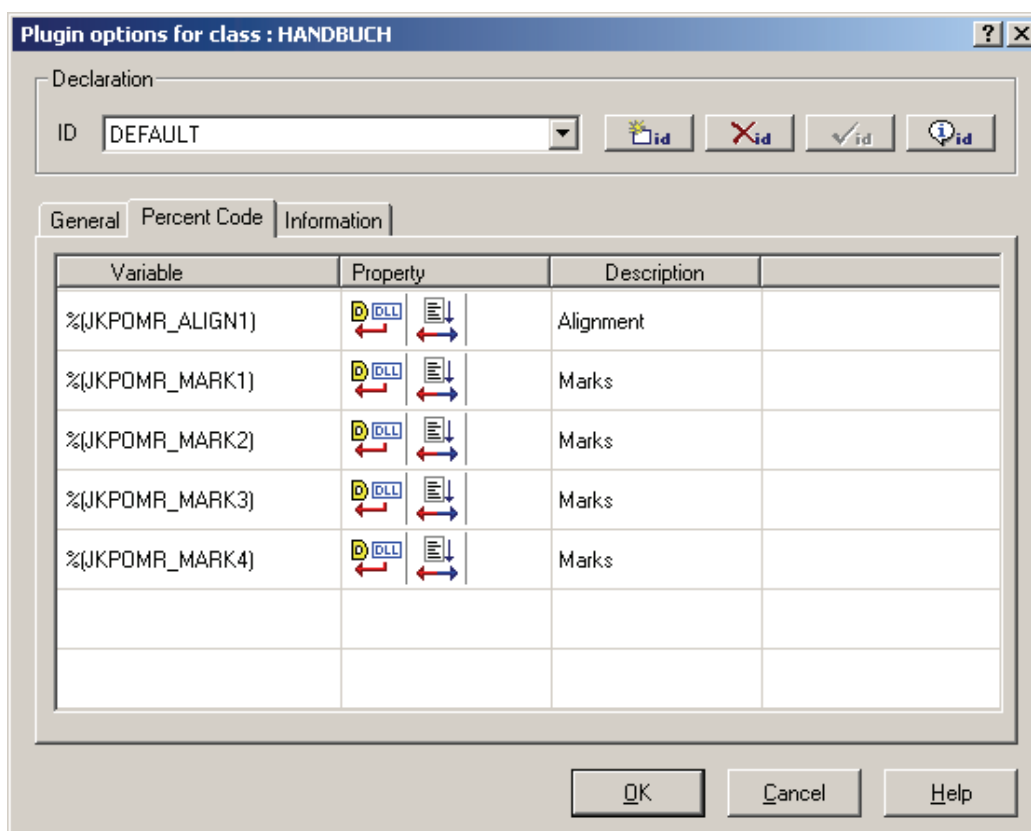


Illustration 9 – List of Variables

The table lists, next to the name of the variable, the **Property** that marks with symbols how the variables shall be processed by the system.

For OMR, the following symbols are displayed:



The variable is set by the PlugIn and is passed over to DpuScan.



The variable is set while the according Task step is being processed.

The **Description** column gives info about the origin of the variable. For the OMR PlugIn, there are two kinds of variables:

Variables that are used to align the image, and variables that contain the search results.

Marks

Contains the results from the OMR for a defined area/frame.

The variables may have the following values:

- 0 frame not found
 - 1 frame found, not marked or blackened
 - 2 frame found, marked
 - 3 frame blackened
- (depending on further settings for the OMR)

Alignment

These variables state whether the under-lying search pattern was found and whether thus a position correction for the image could be executed.

- 0 search pattern not found
- 2 search pattern found

We recommend, mainly if you use your own names for the variables, that you check them, after configuration is completed, at this instance.

3.1.3 Property Page: Information

This page offers, in form of a tree view, information about the name of the PlugIn, its manufacturer and the version.

The ID lists the windows, images and variables that are used by the PlugIns. The OMR-PlugIn uses only variables.

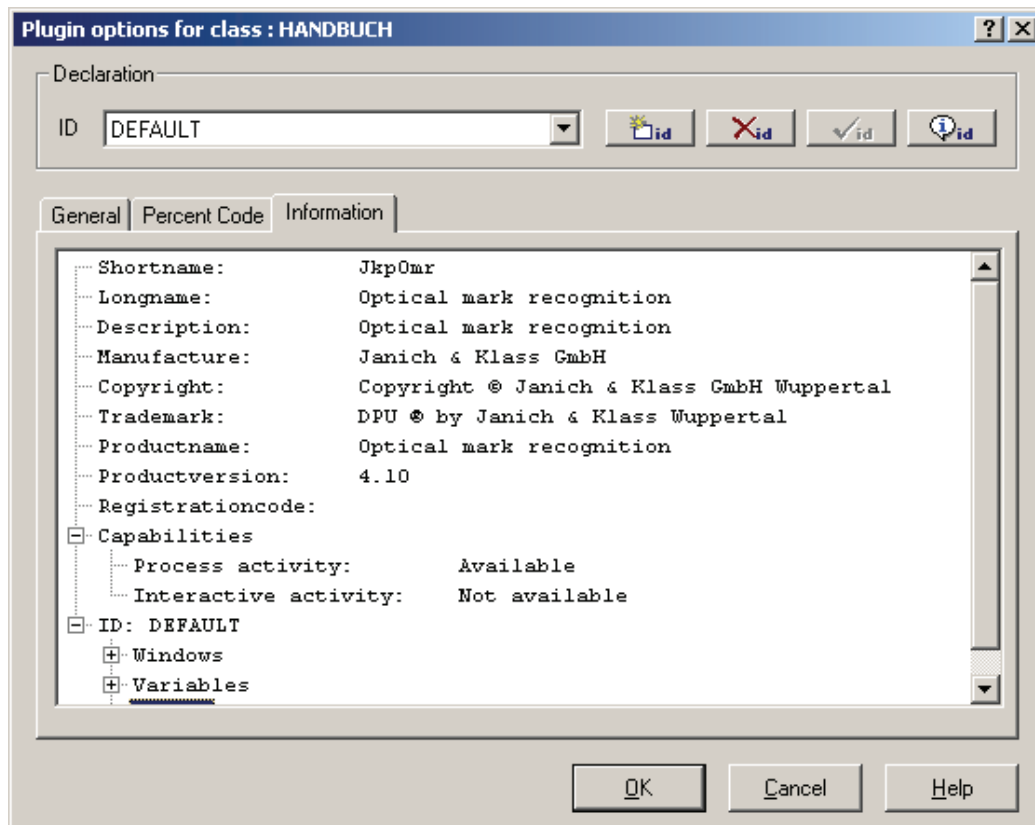


Illustration 10 – Property Page: Information

4 Configuration of the OMR

When you click, on the **General** page, on the button for **External Settings**, the following dialog displays, for the configuration of the OMR.

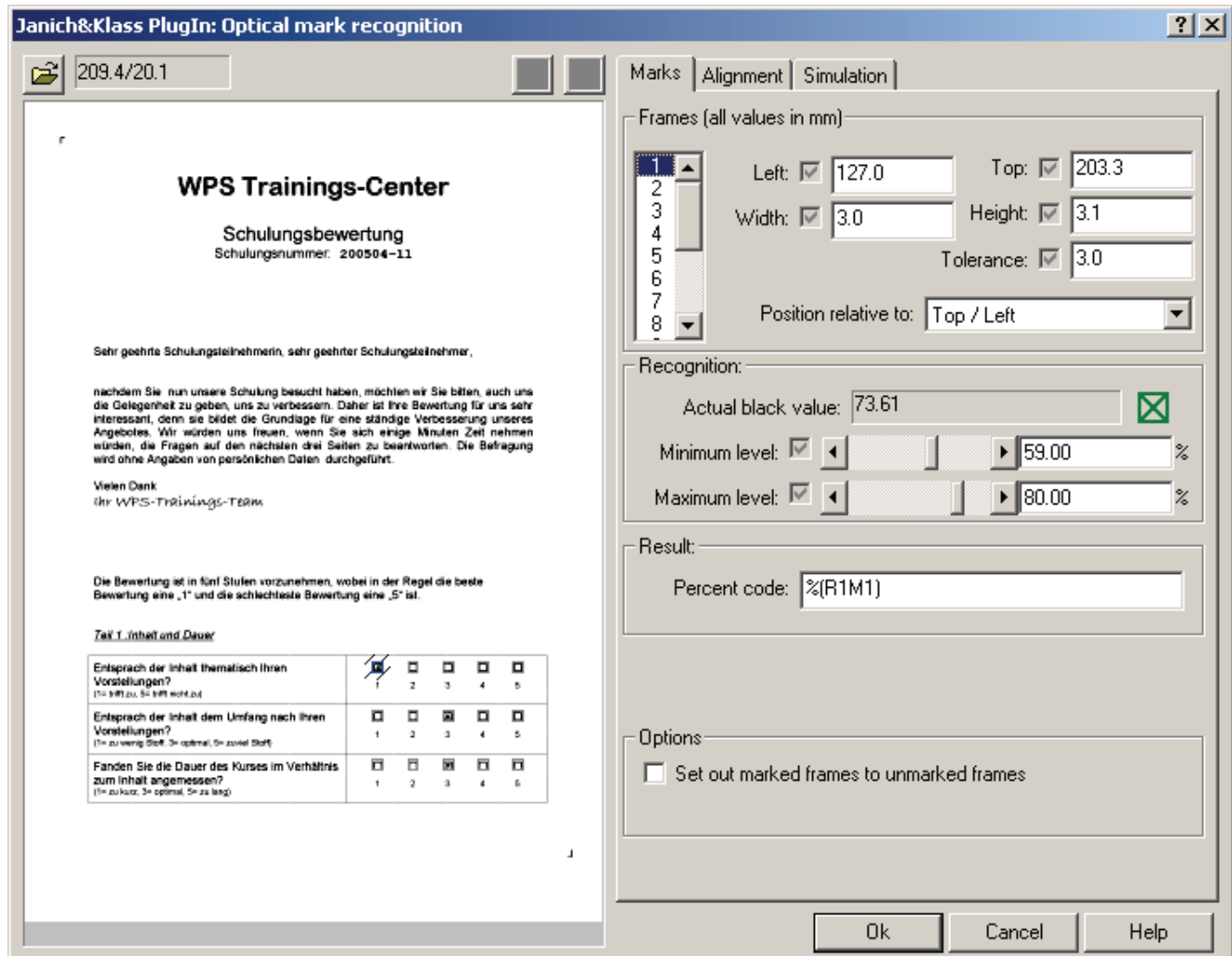
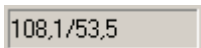


Illustration 11 – Setting Dialog for the OMR (Optical Mark Recognition)

The left-hand pane shows a preview window and control elements for loading an image and for setting frames. The other pane offers the property pages for **Marks** and **Alignment**.



Opens the dialog for loading an image.



Shows the actual position of the mouse pointer in the preview window.



Adds a frame.

If no marks can be added on the **Marks** tab because the button is inactive, you must initially define the alignments.



Only then, the marks can be edited. This serves to prevent making any modification based on a sheet that was loaded by mistake.

Removes a frame.

If no marks can be removed on the **Marks** tab because the button is inactive, you must initially define the alignments. Only then, the marks can be edited. This serves to prevent making any modification based on a sheet that was loaded by mistake.

Preview window

In the preview window, some functions are assigned to the mouse buttons:

Click on left button zoom into the image

Click on right button zoom out of the image

Frames can be spanned with the left mouse button pressed down

Selection of all elements inside the spanned frame

Move the mouse with right button pressed down:

Move the actually visible image section

Shift key pressed down:

Keep your left mouse button pressed down to directly span up a new frame.

Keep control key pressed down and click on individual frames:

Multi-selection of several frames.

When an image is loaded for editing the OMR definitions, it is checked whether the alignment was made on base of the loaded image.

If the alignment was not defined for that image, a warning message will appear in red characters in the preview window, saying: "Attention! The alignments have not been defined on this image".

4.1 Property Page: Marks

Here, you define the areas where the OMR will search for marks. A frame must be defined for every single mark to be evaluated. The automatically pre-assigned features can be modified and adapted for each of these frames.

4.1.1 Frames



Allows to directly select the already defined search areas. It is possible to select individually, or to make a multi-selection. Such multi-selection is done, Windows-conform, with pressed Shift or Control key.

Left:

Indicates the position of the left-hand edge of the frame. The value bases on the actual selection in the dropdown list **Position relative to:**.

Top:

Indicates the position of the top edge of the frame. The value bases on the actual selection in the dropdown list **Position relative to:**.

Width:

Defines the width of the frame.

Height: Defines the height of the frame.

Tolerance: Defines an area around the frame position, where the PlugIn will later try to find a mark. Depending on the quality of the feeder, the position of the frame to be evaluated will be more or less strongly shifted on subsequent images. The defined tolerance zone is graphically shown as hatch.

Position relative to: Indicates the reference point for defining the frame position.

In case of a multi-selection, the topics **Left**, **Top**, **Width**, **Height** and **Tolerance** can be set in the same way, for all selected element, for example for all marks in one line. For values that already are equal at the moment of selection, the edit box is active, so that the value can be altered.

The edit boxes of those values can not be altered; they are different for the selected element.

Only if the check box beside the edit box is enabled, you are allowed to enter values here; those will be taken over for all selected elements in the same way. This serves to prevent from unintended alterations.

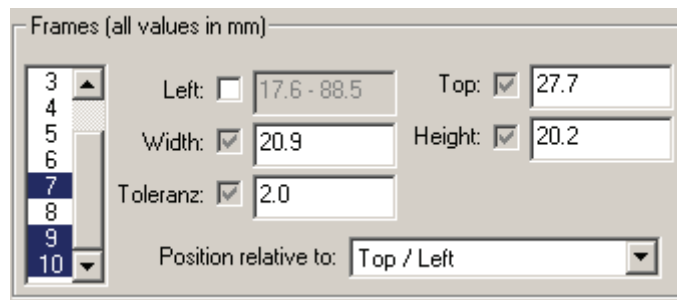


Illustration 12 – Modifying Features for a Multi-Selection

In the above illustration, the search frames 7, 9 and 10 are selected. They all are within one line and therefore have the same value for the **Top** field. Because our example is for a group of check fields, also the values for **Width**, **Height** and **Tolerance** are the same. If you enter new values in these fields, they will be taken over for all selected elements.

The locked edit box for **Left** is occupied by the minimal and the maximal value for the actually selected frame.

4.1.2 Recognition

Actual level Indicates a value for the actual mark.

Depending on the set minimum and maximum values, and the setting in Search for box, a green symbol will display next to the percentage value that represents the status of recognition.



An empty square means that no mark was recognized in the defined field; then the value of the according variable would be 1.

A square with a cross-mark denominated a recognized mark, the value of the according variable would be 2.

A filled-up square stands for a field whose mark was cancelled (that was unmarked), for example by complete blackening. In this case, the value 1 will be returned to the variable.

- Minimum level:**
- Indicates the value, below which a field is said to be not marked.
- Maximum level:**
- Indicates the value an, above which a field is said to be unmarked, i.e. fully blackened.

4.1.3 Result

The result of the search is reported to DpuScan via a variable, also known as Percent Code. The names of the variables are proposed by the PlugIn when the search field is defined. The format is %(JKPOMR_MARKxx), where JKPOMR_MARK is the prefix and xx an incrementing number. The nomination can be over-written in order to, for example, get a "talking" name.

4.1.4 Options

The checkbox named **Set out marked frames to unmarked frames** rules the return value in case of a blackened marks field.
If the black value exceeds the defined maximum level, the variable normally will contain a 3.
However if this checkbox is active, 1 is returned .

Mark	Value of the variable with deactivated option	Value of the variable with activated option
<input type="checkbox"/>	1	1
<input checked="" type="checkbox"/>	2	2
<input type="checkbox"/>	3	1

This option serves for compatibility to older versions of the OMR PlugIn.

4.2 Property Page: Alignment

This property page is used to define fields that serve the PlugIn for alignment of the image. Many originals have positioning marks. The search fields for aligning the image are defined analog to the fields for Marks recognition.

Janich&Klass PlugIn: Optical mark recognition

208.8/7.5

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Schulungsbewertung
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Sehr geehrte Schulungsteilnehmerin, sehr geehrter Schulungsteilnehmer,

nachdem Sie nun unsere Schulung besucht haben, möchten wir Sie bitten, auch uns die Gelegenheit zu geben, uns zu verbessern. Daher ist Ihre Bewertung für uns sehr interessant, denn sie bildet die Grundlage für eine ständige Verbesserung unseres Angebotes. Wir würden uns freuen, wenn Sie sich einige Minuten Zeit nehmen würden, die Fragen auf den nächsten drei Seiten zu beantworten. Die Befragung wird ohne Angaben von persönlichen Daten durchgeführt.

Vielen Dank
Ihr WPS-Trainings-Team

Die Bewertung ist in fünf Stufen vorzunehmen, wobei in der Regel die beste Bewertung eine „1“ und die schlechteste Bewertung eine „5“ ist.

Teil 1: Inhalt und Dauer

Entsprach der Inhalt thematisch Ihren Vorstellungen? <small>(1= zu wenig Stoff, 5= optimal, 3= zurecht Stoff)</small>	<input checked="" type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
Entsprach der Inhalt dem Umfang nach Ihren Vorstellungen? <small>(1= zu wenig Stoff, 3= optimal, 5= zuviel Stoff)</small>	<input type="radio"/> 1	<input type="radio"/> 2	<input checked="" type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
Fanden Sie die Dauer des Kurses im Verhältnis zum Inhalt angemessen? <small>(1= zu kurz, 3= optimal, 5= zu lang)</small>	<input type="radio"/> 1	<input type="radio"/> 2	<input checked="" type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5

Frames (all values in mm)

1
2

Left: ☒ 12.8 Top: ☒ 12.5
Width: ☒ 2.3 Height: ☒ 3.3
Tolerance: ☒ 20.0
Position relative to: Top / Left

Search for pattern:

Suitability:

Recognizing:

Apply pattern

Result:

Percent code:

Options:

☐ Don't use Alignment
☐ If no Alignment is found, search on rotated image.
☐ Rotate image.

Ok Cancel Help

Illustration 13 – Property Page: Alignment

4.2.1 Frames

Left:	Indicates the position of the left-hand edge of the frame. The value bases on the actual selection in the dropdown list Position relative to:
Top:	Indicates the position of the top edge of the frame. The value bases on the actual selection in the dropdown list Position relative to:
Width:	Defines the width of the frame.
Height:	Defines the height of the frame.
Tolerance:	Defines an area around the frame position, where the Plugin will later try to find a mark. Depending on the quality of the feeder, the position of the frame to be evaluated will be more or less strongly shifted on subsequent images. The defined tolerance zone is graphically shown as hatch.
Position relative to:	Indicates the reference point for defining the frame position.

4.2.2 Search for Pattern

Here, you find the two color beams **Suitability** und **Recognizing**. The **Suitability** color beam informs about how well the mark can be recognized inside the actually selected frame. The mark should consist of either horizontal or vertical streaks, and the frame must completely cover this mark. The mark inside the beam should be in the green area, so that the mark is suited for alignment. The **Recognizing** color beam indicates how good the mark can be recognized within the tolerance range. Also here, the mark must be in the green area of the beam. After appropriate setting, the search pattern must be applied for every frame. This is done by clicking the **Apply pattern** button.

4.2.3 Result

Analog to the definitions on the **Marks** property page, a variable is defined also here for every frame; it can later be used in the process.

4.2.4 Options

Don't use Alignment	Here you can set that the automatic alignment shall not be used, however without the need to have to delete all entered values.
If no Alignment is found, search on rotated image	If this option is selected, the search for alignment marks is repeated on the image after rotating it by 180 degrees. It is not possible to search on an image rotated by 90 degrees or 270 degrees.
Rotate image	If the search was successful on the rotated image, you can use this option to constantly keep the image rotation. The image will then appear rotated also on the DpuScan surface.

4.3 Property Page: Simulation

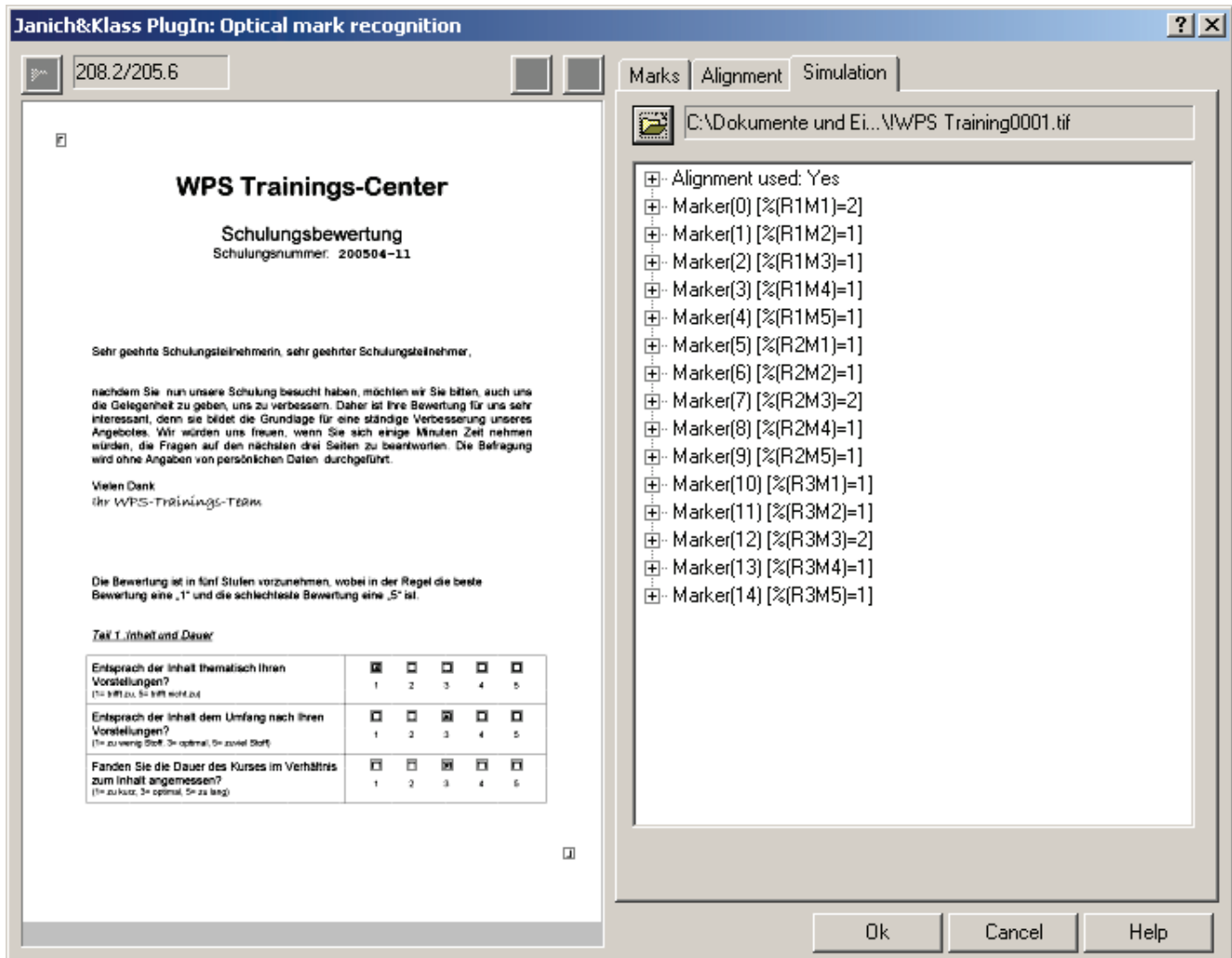


Illustration 14 – Property Page: Simulation

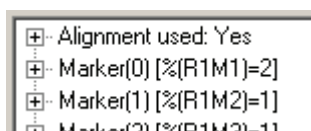
In order to be able to check how the settings made will work with other images, you can load an image for simulation. The tab contains the following elements:



Click this button to reach a dialog for loading an image. After it is opened, the OMR will automatically be started, and the result is displayed in the preview field.

C:\Dokumente und Einstell...\OMRTEST_1.tif

The display field next to the button for opening the image file shows the path and file name of the actually opened file.



The display field below the button for opening the image file shows the result from the simulation in a tree view.

4.3.1 Results for Alignment

The branch "Alignment used: ..." allows to check which alignment marks were found and which image corrections were made. This includes Movement, Rotation, Distortion and Characteristic middle deviation.

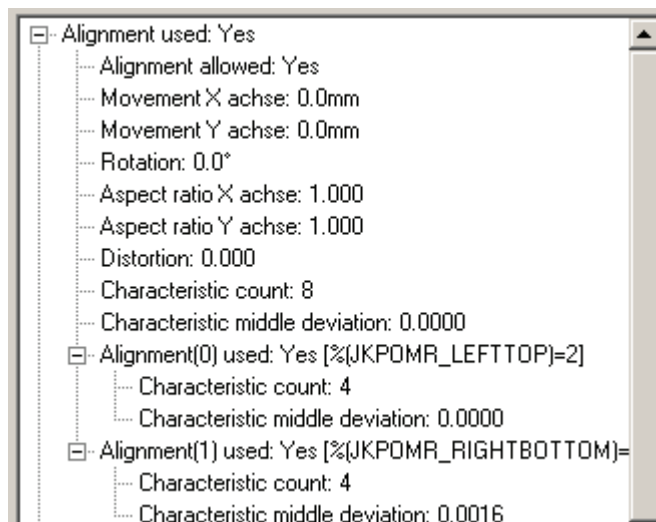


Illustration 15 – Results from Simulation, for Alignment

4.3.2 Results from Marks Recognition

A branch is added for every marker, the name of the relatively used variable and the reading result are displayed. Furthermore, the actually calculated black value is put out, and the threshold as defined for this frame.

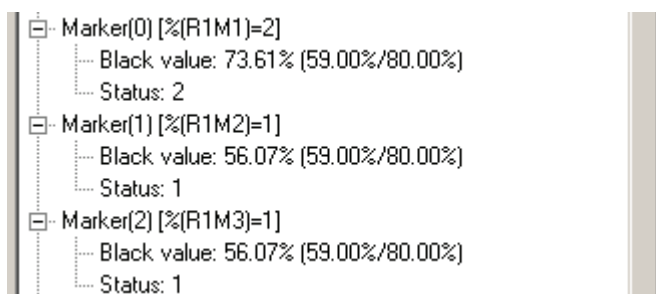


Illustration 16 – Results from Simulation, for Marks Recognition

5 How to Use the OMR

Below, we describe the subsequent steps of a configuration.

First, you must scan some example documents and process them (deskew, alignment) in the way that they are suited for being used in the configuration.

Open the configuration of the Class where you want to work with the OMR. Select the **Process** property page and click on the **PlugIns** tool button.


Activate the **PlugIns activated** check box. Click the **Add** tool button and then select the **JkpOmr** PlugIn.

Use the **Edit** tool button, or double-click the newly added line to enter the configuration dialog of the PlugIn. You must eventually execute your registration.


Click the ID button  to create a new OMR configuration. First, you must define its name.

Use the **External Settings** tool button to start the definition for the search areas.

Now, the **Marks** property page is active, and you can define the marks to be evaluated.

First, you load a suitable image as the base for positioning the frame/s. Click on: 

Switch to the **Alignment** tab. Add a frame for every alignment marker. Move the frame to the alignment marker and change its size until the entire marker is inside the frame. The two color beams now will indicate how well the marker is suited and how well it can be recognized in its immediate environment. When both color beams are in their green area, the setting is saved by a click to the **Apply pattern** button.

Next, switch to the **Marks** tab. In order to add a new frame, click the  button. The automatically generated frame can be positioned and altered with the mouse. A new frame can also be spanned directly at the desired position, with the mouse and the Shift key held down. In the **Result** area, the PlugIn now proposes, in the **Percent code** box, a name for the selected field. You can keep this name, or enter a name of your own choice that will make more sense. Please obey the rules for names of variables or Percent codes.

For defining further frames, please repeat the above process.

Finally, you can check your setup – switch to the **Simulation** tab and load another image. The results from the optical marks recognition (OMR) will then be displayed in a tree view. Should it be necessary to correct the settings, you can again switch to the tabs for **Marks** and **Alignment**. There, you can alter and correct your settings and can immediately switch back to the **Simulation** tab. The OMR will be executed automatically with the new parameters, and the new result is displayed in the tree view.

This completes the definition phase.

5.1 Usage of the OMR-Results

The OMR results can be used in the process by using the contents of the defined variables. So, for example, the results can be written into a Batchfile.

Example: The original sheet has three rows with five boxes each. The variables are defined accordingly as %(RxMy), where *R* is the row, the *x* stands for the number of the row, *M* means the mark, and the following *y* stands for the position of the mark in the relative row.

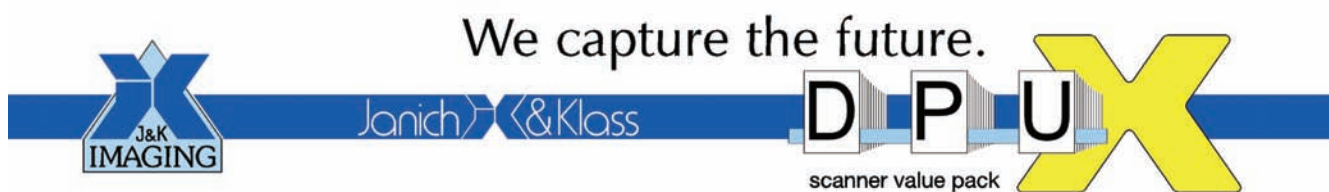
The Batchfile is defined in the Class definition as follows:

```
[03]%F
[03]Zeile1: %(R1M1)/%(R1M2)/%(R1M3)/%(R1M4)/%(R1M5)
[03]Zeile2: %(R2M1)/%(R2M2)/%(R2M3)/%(R2M4)/%(R2M5)
[03]Zeile3: %(R3M1)/%(R3M2)/%(R3M3)/%(R3M4)/%(R3M5)
```

Then, the Batchfile of our examples contains:

```
C:\SCAN\154054.124\00000000.TIF
Zeile1: 2/1/1/1/1
Zeile2: 1/1/2/1/1
Zeile3: 1/1/2/1/1
```

The result makes clear that - in the first line - the first group element and - in lines #2 and #3 – the third group element each is marked. As no 0 exists in the Batchfile, all check boxes were found.



Janich & Klass Computertechnik GmbH
Zum Alten Zollhaus 24
D-42281 Wuppertal
Germany
Phone: +49 (0)202 2708-0
Fax: +49 (0)202 700 625
<http://www.janichklass.com>

J&K Imaging, L.P.
1633 Sands Place
Marietta, GA 30067
USA
Phone: (770) 984-1212
Fax: (770) 953-8399
<http://www.JKImaging.com>

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