Rho P10 200/250

Service Manual – Print head 10D

Edition 05.03.2015
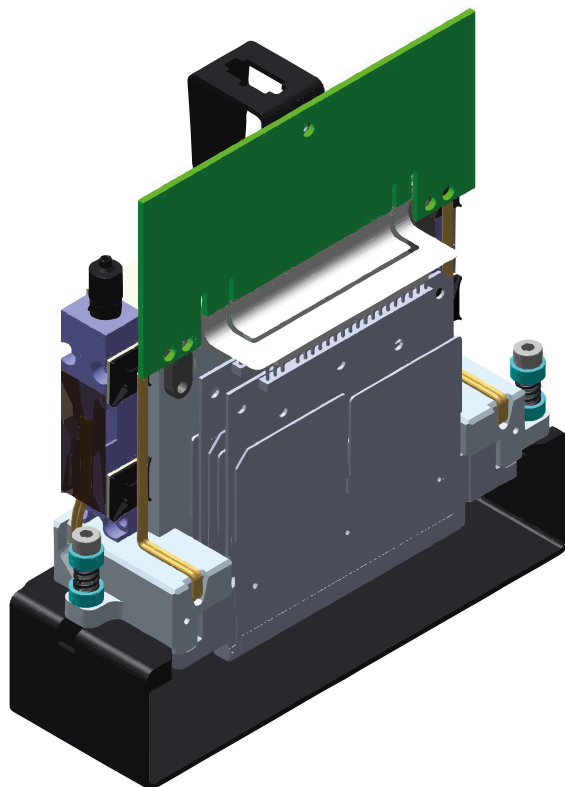
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1   About this document

▶ Make sure that this document is accessible at all times.
▶ Insert all supplements received from Durst Phototechnik AG into this document.
▶ Read and comply with this document and all other documents in the service documentation.

1.1   Purpose and target group

This document is part of the service documentation and contains information about how to replace the print head modules.
This information applies to printers of the Rho P10 200/250 range of Durst Phototechnik AG and should be referred to by the following personnel:

■ Durst service engineers (service engineer Durst group)
■ General service technicians (service technician distributor)
■ Trained customer's technicians (in-house technician)

1.2   Revisions

Edition of the document	What is new?
20.02.2014	First edition
03.03.2014	Preparing the old print head for the dispatch modified
17.03.2014	New illustration for slot arrangement, encoder offset adjustment and drop fly time compensation
21.08.2014	Camera unit Nikon (LH2099450) added
28.10.2014	Detailed description about Nikon camera system added
04.11.2014	Requirement of LAN to USB dongle device driver for Nikon camera system added.
26.11.2014	Nikon camera system: connection and settings modified, troubleshooting added
05.03.2015	Preparing the print head for dispatch modified

Tab. 1:   Revision index

1.3   Symbols and markers

Symbol	Meaning
✓	Pre-requirement for an action
▶	Request for a single-step action
1.	Step within a request for a multi-step action
↪	Result of an action sequence
ℹ	Note for easier or safer work

Symbol		Meaning
→		Cross-reference
⚠	DANGER!	Immediately dangerous situation, where disregard of safety measures will lead to death or serious injury.
⚠	WARNING!	Potentially dangerous situation, where disregard of safety measures may lead to death or serious injury.
⚠	CAUTION!	Potentially dangerous situation, where disregard of safety measures may lead to minor injury.
NOTE!		Potentially dangerous situation, where disregard of safety measures may lead to damage to property.

Tab. 2:   Symbols and markers

1.3.1 Structure of warnings

Warnings are structured as follows (shown here as an example: the warning level "WARNING"):

⚠ **WARNING! Type and source of the hazard**
   Consequences of the hazard.
   ▷   Measures for avoiding the hazard.

▶   Read the warning and comply with it.

2   Materials and tools required

Designation	Specification	Order number
Plug for ink tubes (print head side)	FTLLP-6 black	1472683
Cap for valve block	MTLLP-6 black	1472676
Head locking wrench for print head module	Hexagon key L-wrench, 3.0 mm	LD2099801
Head adjustment wrench for print head module	Ball point, Tx10	LH2099800
Camera unit V1 (Canon)		LH2099300
Camera unit V2 (Nikon)		LH2099450

Tab. 3:   Materials and tools required

The camera units Canon and Nikon can both be used for the automatic slot offset alignment.

3   Description of the print head module

3.1   Position of the fixing screws and adjustment screws
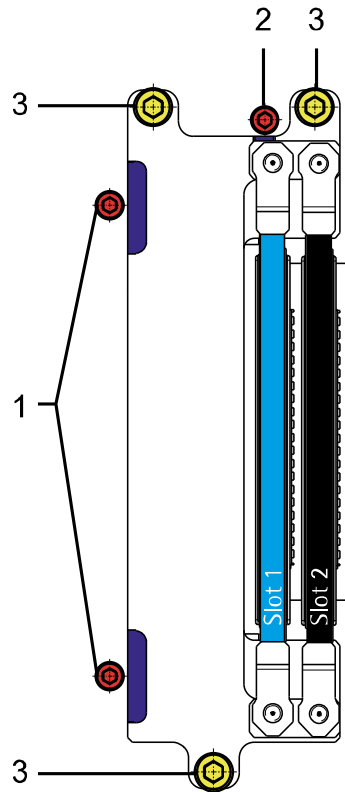
Fig. 1:   Position of the fixing screws and adjustment screws

1   Adjustment screw (X rotation)
2   Adjustment screw (Y direction)
3   Fixing screw

3.2   Slot arrangement
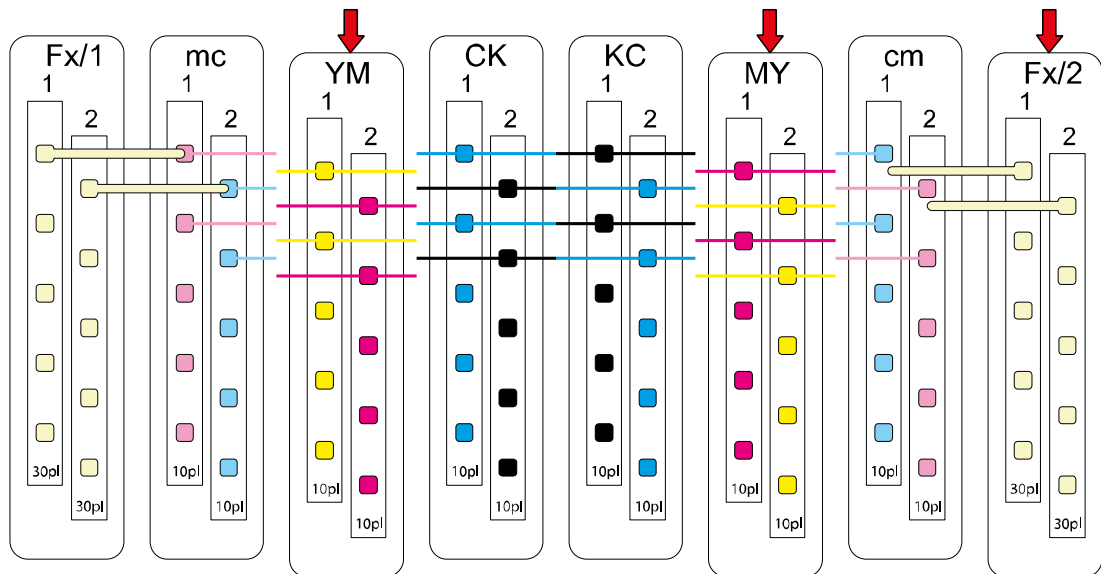
Fig. 2:   Slot geometry

3.3   Arrangement of the print heads

Depending on the exact configuration of the printer, the arrangement of the print heads can be seen on the circuit diagram (→ circuit diagram).
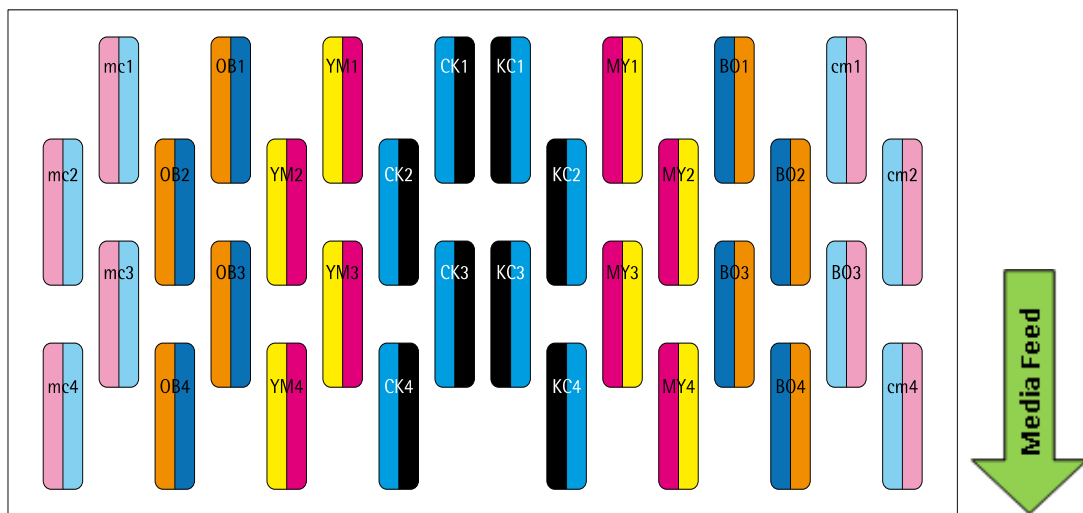
Fig. 3:   Arrangement the print heads for CMYKcmBO (example)

4   Replacing the print head module

⚠️ **WARNING! Contact with inks!**
Risk to health if inks are allowed to come into contact with skin or eyes or if inks are
breathed in.
▷   Wear safety gloves.
▷   Wear safety glasses.
▷   Avoid allowing the ink to come into contact with skin or eyes.

NOTE! Improper installation and deinstallation!
Damage to the print head modules.
▷   Do not touch the circuit board contacts.
▷   Do not touch the nozzle plate.
▷   Do not kink the ink tubes.

4.1   Before replacing a print head module

The droplet size generated by print head modules for standard colors (CMYKcmBO) differs
from the size generated by print head modules for spot colors:
■ CMYKcmBO: 10 pl
■ Spot colors: 30 pl
For this reason, the order numbers for print head modules for standard colors differ from the
order numbers for print head modules for spot colors.
▷   When ordering a print head module, check that the order number is correct.
▷   Before replacing a print head module, check that the correct print head module has
been supplied:
–   Serial number 913xxxx: Print head module with 10 pl
–   Serial number 916xxxx or 910xxxx: Print head module with 30 pl

Before replacing a print head module, print a test pattern. This provides documentation of
the condition of the nozzles.
▷   Printing a density compensation test pattern (→ Chapter 6.2, p. 31).

4.2 Disassembling the old print head module

✓ Have the necessary tools to hand:
  – Covers:
    Plugs for ink tubes
    Caps for valve block
  – Head locking wrench for print head module

4.2.1 Preparing for disassembly of the print head module

✓ Ink heating must be switched on.
✓ The print heads must be up to working temperature.
✓ The print heads must be filled with ink.

1. Select the **Ink Heating** tab.
2. Check the temperature of the print heads.
   The print heads must have reached working temperature.

LOIS Voltage >>>						
Printer						
	Head 1/1	Head 1/2	Head 2/1	Head 2/2	Head 3/1	Hea
Cyan	300	300	300	300	300	300
Magenta	300	300	300	300	300	300
Yellow	300	300	300	300	300	300
Black	300	300	300	300	300	300
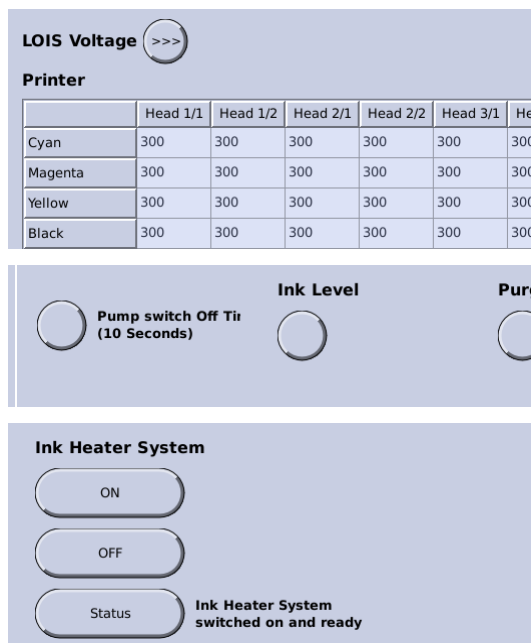
3. Select the **LOIS** tab.
4. Check the ink level in the print heads.

The print heads must be filled with ink.

Pump switch Off Tin (10 Seconds)   Ink Level   Purg

5. Select the **Pumps / Valves** tab.
6. Switch off the Ink Level Control.

Ink Heater System
ON
OFF
Status   Ink Heater System switched on and ready

7. Select the **Printer** tab.
8. Switch off the Ink Heating.

4.2.2 Disassembling the print head module

ℹ As soon as there is no vacuum in the meniscus tube, ink will flow out of the print heads.
  ▷ Finally, pull off the meniscus tube.

1. At the parking position, line the purge tray with paper.
2. Detach all cables from the print head module.
3. Undo the fixing screws
4. Carefully pull the ink tubes off the printer valve block.
5. Fit plugs or caps to seal off the ink tubes at the print head end and printer end.

ℹ When pulling off the meniscus tube, make sure that the vacuum is maintained until the seal has been made, for instance by pressing the meniscus tube.

6. Pull the meniscus tube off the printer and seal the print head end.

7. Seal the meniscus tube at the printer end.
8. Carefully lift the print head module off the print carriage.
9. Carefully pull the legible stickers off the ink tubes and off the print head module, and affix them to the new print head module.
10. Use the old print head module as reference to cut the ink lines of the new print head.

4.3   Preparing the old print head for the dispatch

ℹ Print head modules must be empty when sent to Durst Service.

4.3.1   Draining the old print head

✓ Have the necessary materials to hand:
   – One way syringe
   – Filter PTFE 50mm 0,45µm
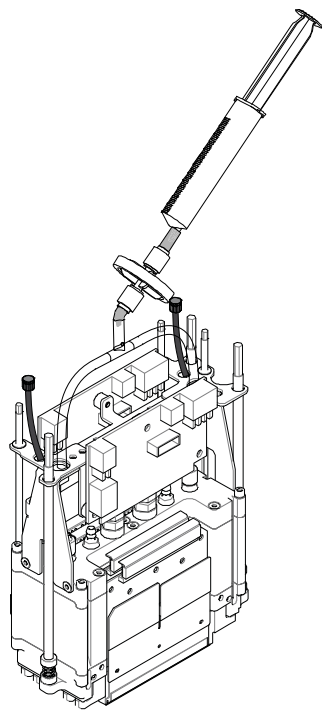
1. Take a new clean syringe.
2. Connect the syringe with the meniscus filter.
3. Open one side of the meniscus tube.
4. Connect the meniscus filter with the meniscus tube.
5. Push with the syringe air through the meniscus line until the print head is empty.
6. Remove the meniscus filter form the meniscus line.
7. Seal the meniscus tube.

4.3.2   Capping the old print head for dispatch

✓   Have the necessary materials to hand:
–   Capping plate (included in the scope of supply of a new or refurbished print head module)
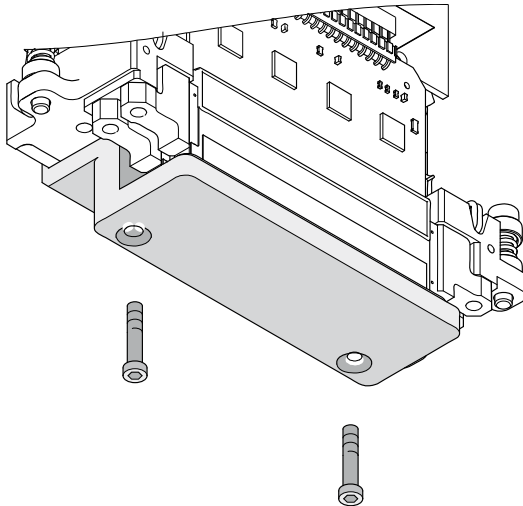
1.   Attach the capping plate to the print head module.
2.   Make sure that the capping plate is fitted squarely and cleanly.
3.   Make sure that the ventilation screws on the underside of the capping plate is closed.
4.   Separate the meniscus line of the ink tanks and seal them with the delivered fittings.

5.   Fill in the Print Head Change Form.
6.   Send the old print head to Durst Service, enclosing the following data in a package protected against ink:
–   Test pattern printed using the old print head module
–   Test pattern printed using the new print head module
–   Print Head Change Form

The Print Head Change Form is supplied with the new print head module.

4.4   Fitting the new print head

4.4.1   Preparing the new print head

1. Remove the transport protection from the new print head module.
2. Cut the ink tubes to an appropriate length.
3. Identify the ink tubes and print head module with stickers taken from the old print head module.
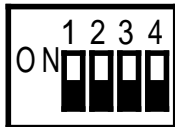
4. Refer to the circuit diagram or the old print head module for the DIP switch settings.
5. Set the DIP switch on the new print head module to those settings.

4.4.2   Fitting the print head module
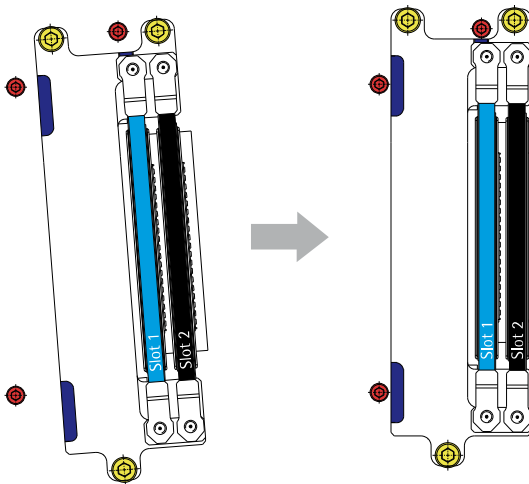
1. Carefully insert the print head module into the printing plate and push it into the installation position.
    The print head module will perceptibly click into place.
2. Move the print head module to the extreme top left corner.
3. Tighten the fixing screws
4. Slacken all the fixing screws a few turns.
5. Connect all cables to the print head.
6. Connect the ink tubes.
7. Connect the meniscus tube.

4.5   Commissioning the print head module

4.5.1   Empty the print head module

1. Select the **Pumps / Valves** tab.
2. Switch off the Ink Level Control.
3. Select the **Printer** tab.
4. Switch on the ink heating.
5. Select the **Ink Heating** tab.
6. Check the temperature of the print heads.
    Wait until the print heads are up to working temperature and until the working temperature is stable.
7. Select the **Motors** tab.
8. Set the HMD to 10 mm.
9. Pull out the light trap.
10. Move the print carriage until the new print head module is above the purge tray.

> The meniscus tubes for several print head modules are suspended from one meniscus valve. Except where print head modules are to be drained, all meniscus tubes suspended from the same meniscus valve must be sealed or clamped.

11. Select the **Pumps / Valves** tab.
12. Open the relevant meniscus valve.
13. Open the purge valve (**Purge Ambient Valve**).
    Ink is driven out of the print head module under pressure, and flows via the purge tray into the collection container.
14. Wait at least 5 min until the print head module is completely drained.
15. Close the purge valve.
16. Close the meniscus valve.
17. Connect the sealed or clamped meniscus tubes again.

4.5.2 Calculating the LOIS offset (Low On Ink Sensor)

✓ The print head module must be drained
✓ The DurstPrinter.setup file must be closed
✓ The Ink Level Control is switched off
✓ The print heads must be up to working temperature (±0,1 °C)

1. Select the **LOIS** > **LOIS Offsets** tab.
2. Press the **Edit** button.

   As a rule, the LOIS offset is set individually for each print head module.
   If the LOIS offset is to be calculated for all print head modules (for instance when commissioning a new printer), the values can be calculated in a single operation by pressing the **Initialize Values** button.

Abb. 4:   Overview LOIS offset calculation

1   Save changes to the DurstPrinter.setup file
2   Cancel
3   Load values from the DurstPrinter.setup file
4   Calculate LOIS offset for all ink tanks
5   LOIS offset will be calculated as soon as the working temperature is reached
6   Calculate LOIS offset of a single ink tank

3. In the **Setup** matrix for the print head module (ink tank), identify the
   – Head**#**/...: Row in which the print head module is fitted
   – Head#/**1**: Tank 1 in the print head module (left hand color)
   – Head#/**2**: Tank 2 in the print head module (right hand color)

Example

Print head required: CK1

Cyan in CK1: Row "Cyan", column "Head1/1"

Black in CK1: Row "Black", column "Head1/2"

Setup	Head 1/1	Head 1/2	Head 2/1	Head 2/2	Head 3/1	He
Cyan	-30	-30	-30	-30	-30	-30
Magenta	-30	Initialize Value	0	-30	-30	-30
Yellow	-30	-30	-30	-30	-30	-30
Black	-30	-30	-30	-30	-30	-30
W.Under	-30	-30	-30	-30		
W.Over	-30	-30	-30	-30		
Light Cyan	-30	-30	-30	-30	-30	-30
Light Magenta	-30	-30	-30	-30	-30	-30

4. Right click in the respective field.

    The **Initialize Value** button appears.

5. Press the **Initialize Value** button.

    The LOIS offset for the ink tank will be calculated.

6. Press the **Save** button.

    The LOIS offset is saved in the file **DurstPrinter.Setup**.

7. Repeat the procedure for the second ink tank in the print head module.
8. Press the **Send to Rho** button.
9. Press the **Read From Rho** button.
10. Check that the values in the **Printer** and **Setup** areas match.
11. Select the **Pumps / Valves** tab.
12. Switch on the Ink Level Control.

    The print heads are filled with ink.

4.5.3 Close the print head module commissioning

✓ Medium is loaded

✓ All print heads are operational

1. Select the **Purge** tab.
2. Perform 2 long purges with the exchanged print head module (without cleaning the nozzle plate).
3. Perform a long purge with all colors (with cleaning the nozzle plate).
4. Print a few images to check that all the nozzles are operational.

5   Mechanically aligning the print heads

5.1   Instructions for working with test patterns

▶   Before printing test patterns, print for some time in normal mode.
▶   Make sure that the printer is warmed up properly.
▶   Make sure that all the nozzles are printing.
▶   Select a HMD of 2 mm.

In order to ensure good quality, the HMD for the test patterns must be 2 mm.

▶   Print all the test patterns on paper.

Recommended paper:
Blueback paper, white, 115–150 g/m²

1024 pixels are equivalent to the length of a slot (65 mm).

The dimensions and proportions of the test patterns shown in this service document differ from the test patterns used in practice. The illustrations serve only to give an idea of the test patterns and their evaluation.

5.2   Adjusting the rotation of the print head modules

All the print head modules can be aligned in a single operation.
Alignment of the print head modules to each another is not necessary in this operation.

Printing the test pattern

1. Select the **Test pattern** tab.
2. Check and if necessary adjust the following settings:

Area	Settings
Colors and slots	C, M, Y, K, c, m, B, O
Print Quality Mode	Test pattern
Test pattern	X-Rotation
Heads	Select all print head modules
Options	High Resolution
	Encoder comp.
	Encoder Control
	Check PH Temp.
	Check UV Lamps

Tab. 4:   Test pattern X rotation settings

3. Press the **Expose** button.

Evaluating the test pattern
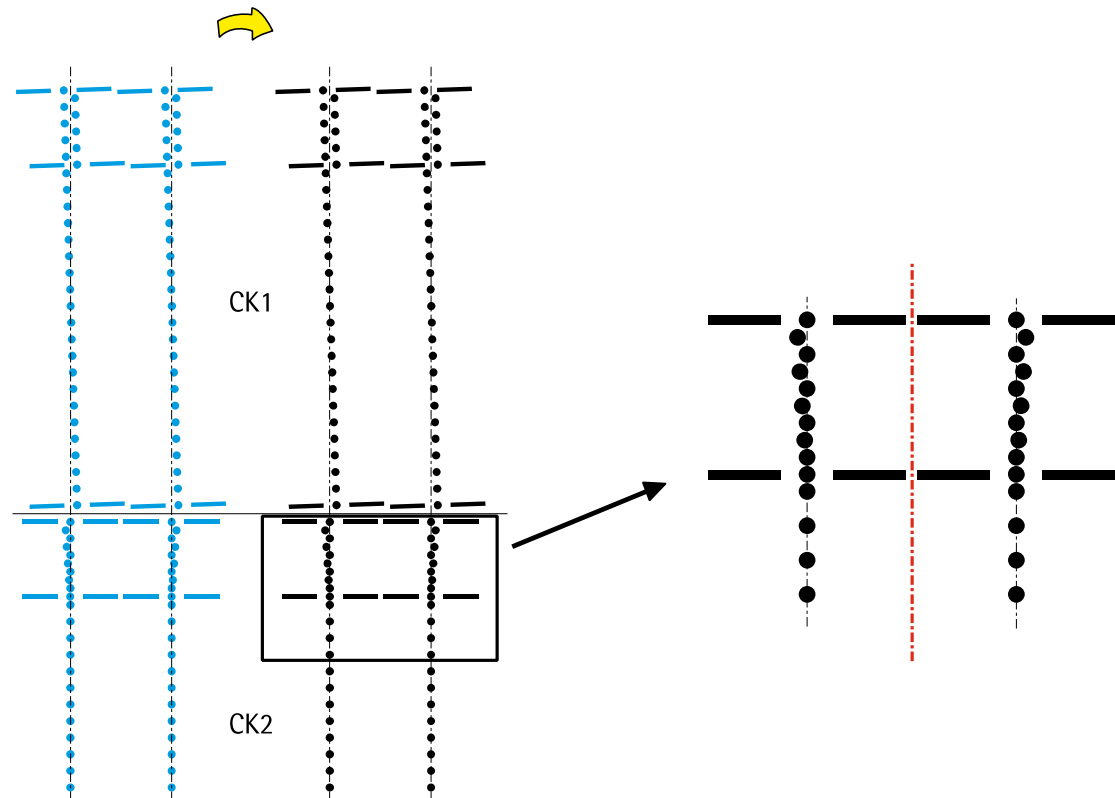
Fig. 5:   *Evaluating the test pattern X rotation (example)*

Example

In the CK1 area the test pattern shows a slight counterclockwise twist. The print head module must be twisted in the opposite direction.

Optimum setting

The area where the upper and lower parts of the print head print above each other must display a symmetrical pattern.

Aligning the print head module

✓   Have the necessary tools to hand:
  –   Head locking wrench for print head module
  –   Head adjustment wrench for print head module

> **Method of operation of the adjustment screw (X rotation)**
> **Clockwise** rotation moves the print head module away from the adjustment screw.
> **Counterclockwise** rotation moves the print head module towards the adjustment screw, but not automatically. The print head module must be pushed carefully by hand in this direction.

1. Align the print head module with the adjustment screws for X rotation (do steps of ¼ to ½ of a turn).
2. Print the test pattern and evaluate it.
3. Repeat the procedure if necessary until the print head module is correctly aligned.

5.3   Aligning the CK print head modules in the Y direction

> The CK print head modules are the reference for all the other colors. Therefore the first step is to align these to each other row by row.
> ▷   Perform these operations with the utmost care.
> ▷   First align print head module CK2 to CK1.
> ▷   Repeat the procedure for all other CK print head modules (CK3 to CK2, CK4 to CK3,...).

✓   The rotation of all print heads is adjusted.

Printing the test pattern

1.   Select the **Test pattern** tab.
2.   Check and if necessary adjust the following settings:

Area	Settings
Colors and slots	C, M, Y, K
Print Quality Mode	Test pattern
Test pattern	Y Distance
Heads	All
Options	High Resolution
	Unidirectional
	Encoder comp.
	Advance before Print
	Encoder Control
	Check PH Temp.
	Check UV Lamps
Paper Advance	512
Number of advance	1

Tab. 5:   Y Distance test pattern settings

3.   Press the **Expose** button.

Evaluating the test pattern
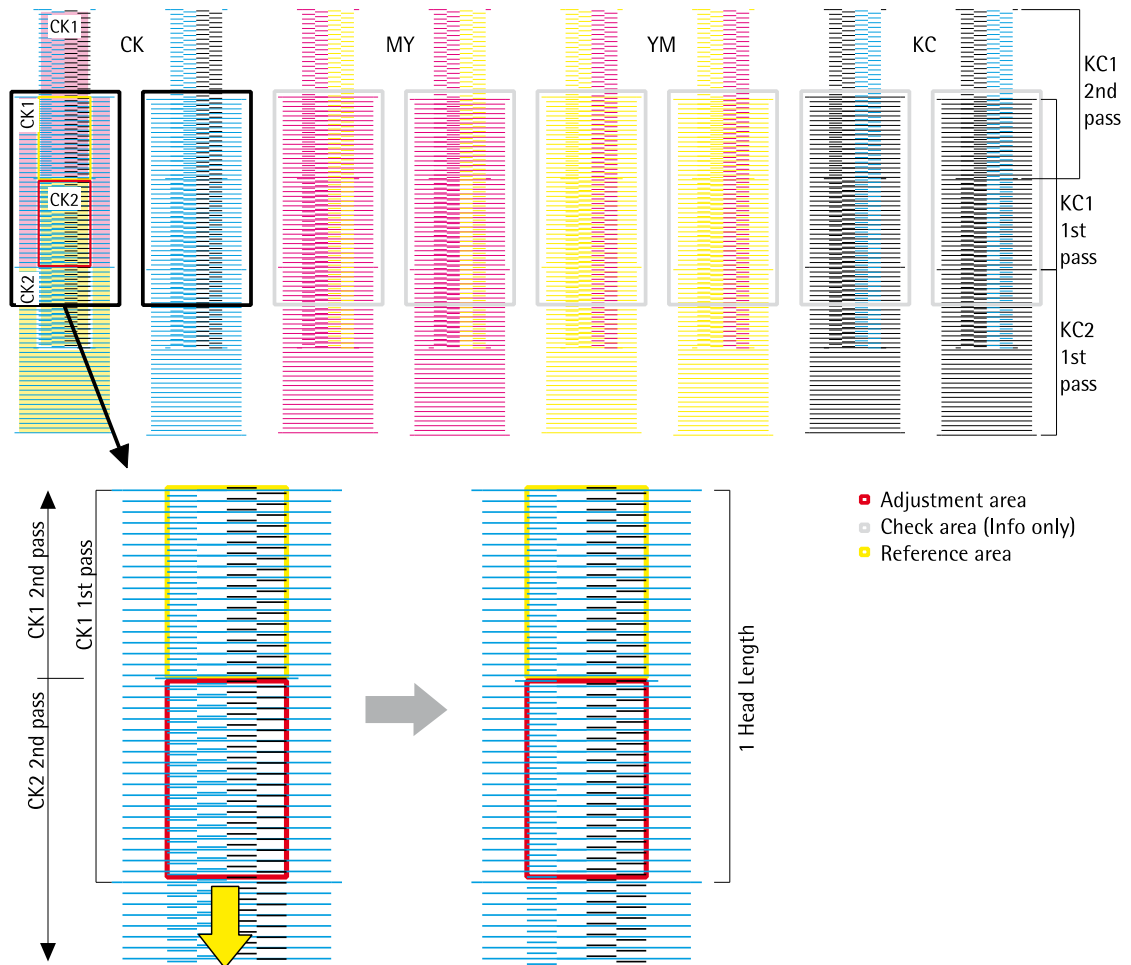
Fig. 6:   Evaluating the Y distance test pattern (example)

Example

The black lines in the adjustment range are slightly high compared to the reference area. The print head module CK2 must be moved down.

Optimum setting

The arrangement of the lines in the adjustment range match the arrangement of the lines in the reference area.
A check with the naked eye indicates that both areas display a uniform appearance (color, brightness, ...).

Aligning the print head module

Method of operation of the adjustment screw (Y direction)
Clockwise rotation moves the print head module away from the adjustment screw.
Counterclockwise rotation moves the print head module towards the adjustment screw, but not automatically. The print head module must be pushed carefully by hand in this direction.

1. Align the print head module with the adjustment screw for the Y direction (do steps of ⅛ to ¼ of a turn).
2. Print the test pattern and evaluate it.
3. Repeat the procedure if necessary until the print head is correctly aligned.

5.4   Aligning KC to CK print head modules

All KC print head modules can be aligned in a single operation.

✓   The CK print head modules are adjusted in the Y direction.

Printing the test pattern

1.   Select the **Test pattern** tab.
2.   Check and if necessary adjust the following settings:

Area	Settings
Colors and slots	C, M, Y, K
Print Quality Mode	Test pattern
Test pattern	Y Align
Heads	All
Options	High Resolution
	Unidirectional
	Encoder comp.
	Encoder Control
	Check PH Temp.
	Check UV Lamps

Tab. 6:   Y Align test pattern settings

3.   Press the **Expose** button.

Evaluating the test pattern
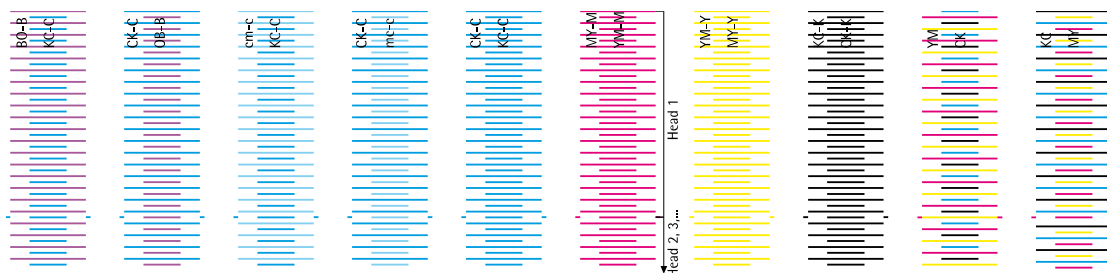
Fig. 7:   Evaluating the Y Align test pattern
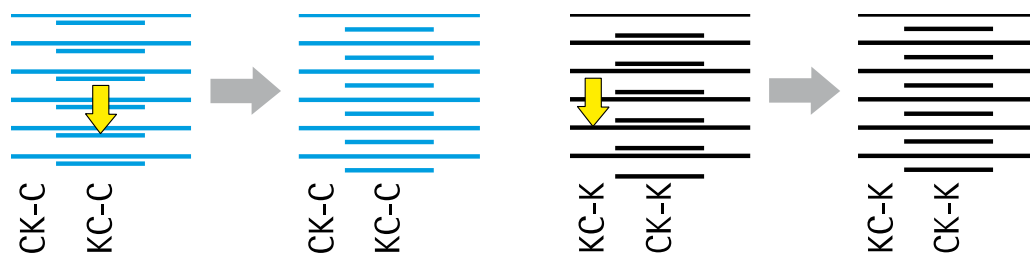
Fig. 8:   Evaluating the Y Align test pattern (example)

Example

The short cyan-colored lines (KC-C) and the long black lines (KC-K) are slightly high compared to the reference CK-C and CK-K.
The print head module KC must be moved down.

Optimum setting

The short lines are centred exactly between the long lines.
The CK/KC pattern and the KC/CK pattern both begin with a long line and end with a short line.

Aligning the print head module

(→ Chapter 5.3, p. 20)

5.5 Aligning MY, YM, cm, mc, OB, BO to CK/KC print head modules

Printing the test pattern

1. Select the **Test pattern** tab.
2. Check and if necessary adjust the following settings:

Area	Settings
Colors and slots	C, M, Y, K, c, m, B, O
Print Quality Mode	Test pattern
Test pattern	Y Align
Heads	All
Options	High Resolution
	Unidirectional
	Encoder comp.
	Encoder Control
	Check PH Temp.
	Check UV Lamps

Tab. 7: Y Align test pattern settings

3. Press the **Expose** button.

Evaluating the test pattern
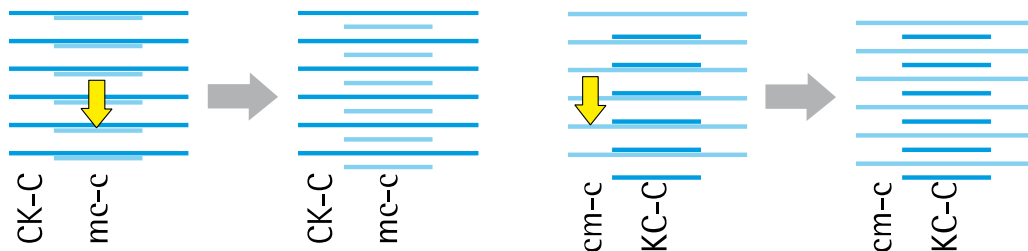
Fig. 9:   Evaluating the Y Align, mc/cm test pattern (example)
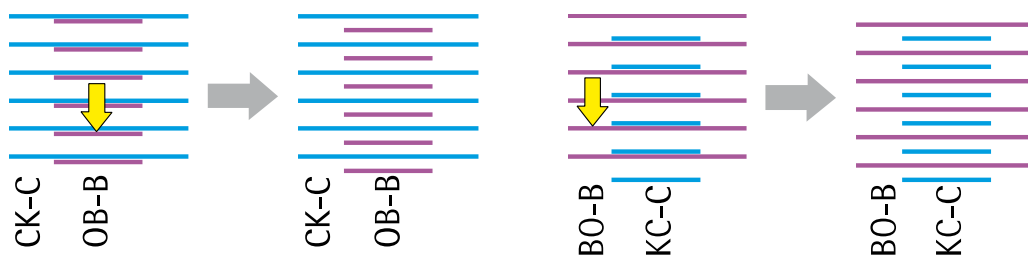
Fig. 10:   Evaluating the Y Align, OB/BO test pattern (example)
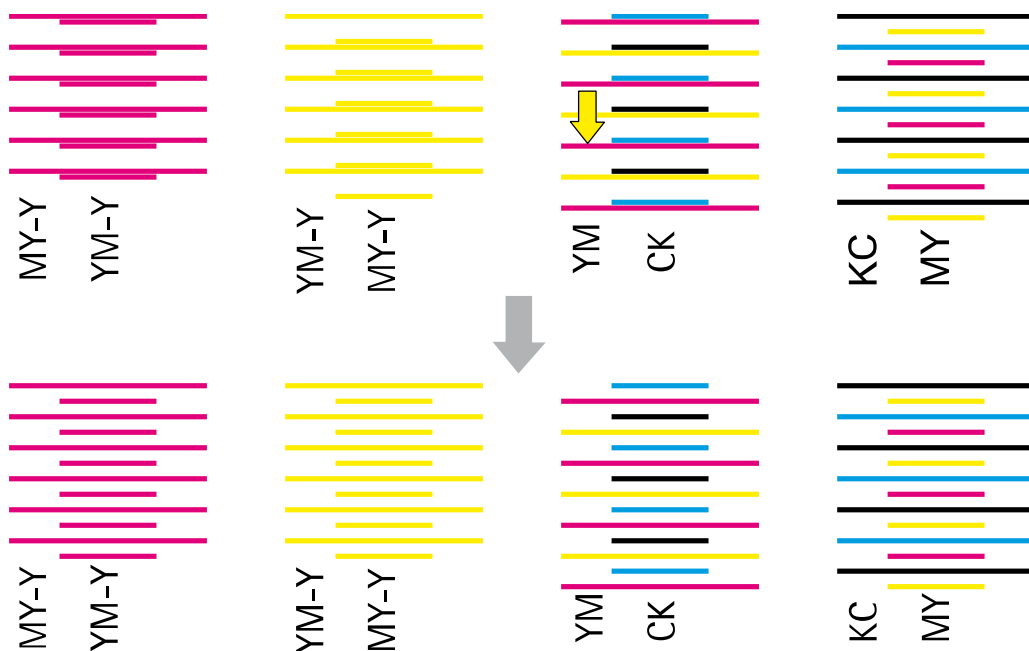
Fig. 11:   Evaluating the Y Align, YM/MY test pattern (example)

Example YM/MY

In the left 2 pattern the reference of MY and YM is visible. The right 2 pattern show the reference of YM/CK and KC/MY.

It is visible in the 2 left pattern that the height of MY and YM does not fit, but it is not visible, if MY must be moved up or YM down. For this reason the pattern YM/CK and KC/MY need to be checked.

In the 2 right pattern it is visible that MY is correct and YM is too high.

Optimum setting

The short lines are exactly centered between the long lines (see the second row of the YM/MY test pattern).

The YM-CK pattern begins with a short line and ends with a long line.
The patterns for all the other print head modules begin with a long line and end with a short line.

Aligning the print head module

(→ Chapter 5.3, p. 20)

5.6   Checking Y distance of MY, YM and KC print head modules

After all print heads have been aligned to the reference (CK and KC print head modules; → Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**, p. **Fehler! Textmarke nicht definiert.**), the distance of the print head modules KC, YM and MY in Y direction has to be checked.

1. Select the **Test pattern** tab.
2. Check and if necessary adjust the following settings:

Area	Settings
Colors and slots	C, M, Y, K
Print Quality Mode	Test pattern
Test pattern	Y Distance
Heads	All
Options	High Resolution
	Unidirectional
	Encoder comp.
	Advance before Print
	Encoder Control
	Check PH Temp.
	Check UV Lamps
Paper Advance	512
Number of advance	1

Tab. 8:   Y Distance test pattern settings

3. Press the **Expose** button.
4. Check the test pattern.
5. Repeat the procedure if necessary until the print heads are correctly aligned.

5.7   Adjusting the rotation of the white print head modules

Printing the test pattern

ℹ️ Test patterns in white or varnish cannot be seen on white paper.
- ▷   Print white test patterns on transparent material.
- ▷   When printing on white paper: Mark the test patterns in white or varnish with orange or pink text markers.

1. Purge the white print head modules and print at least 1 m² before printing the test pattern.
2. Select the **Test pattern** tab.
3. Check and if necessary adjust the following settings:

Area	Settings
Colors and slots	C, U, O
Print Quality Mode	Test pattern
Test pattern	X Rotation Spot
Heads	All
Options	High Resolution
	Encoder comp.
	Encoder Control
	Check PH Temp.
	Check UV Lamps

Tab. 9:   Test pattern X rotation spot settings

4. Press the **Expose** button.

Evaluating the test pattern
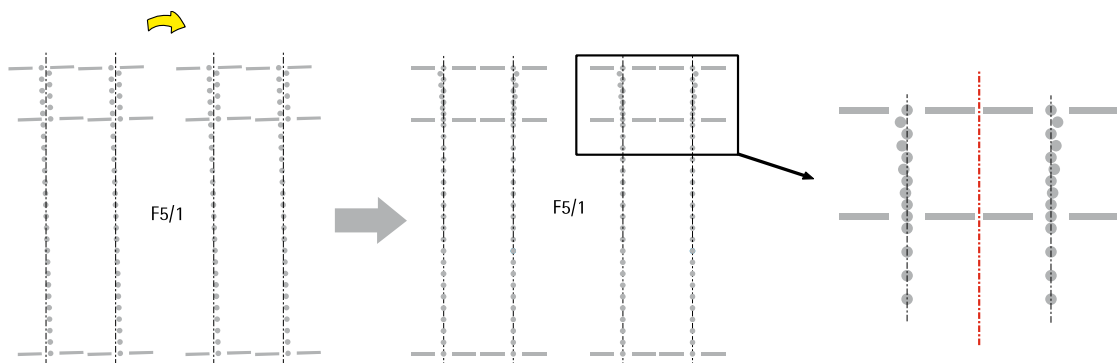
Fig. 12:   Evaluating the X rotation spot test pattern (example)

ℹ️ ▷   For the further procedure see "Evaluating the test pattern" and "Aligning the print head module" (→ Chapter 5.2, p. 18).

5.8   Aligning the white print head modules (F5/F6) in the Y direction

ℹ The CK print head modules are the reference for all the other colors.
 ▷ First align the print head module F5/1 to CK-C.
 ▷ Align the print head module F5/2 to F5/1.
 ▷ Perform the procedure for all further spot print head modules.

Printing the test pattern

ℹ Test patterns in white or varnish cannot be seen on white paper.
 ▷ Print white test patterns on transparent material.
 ▷ When printing on white paper: Mark the test patterns in white or varnish with orange or pink text markers.

1. Purge the white print head modules and print at least 1 m² before printing the test pattern.
2. Select the **Test pattern** tab.
3. Check and if necessary adjust the following settings:

Area	Settings
Colors and slots	C, U, O
Print Quality Mode	Test pattern
Test pattern	Y Align Spot
Heads	All
Options	High Resolution
	Unidirectional
	Encoder comp.
	Encoder Control
	Check PH Temp.
	Check UV Lamps

Tab. 10: Y Align spot test pattern settings

4. Press the **Expose** button.

Evaluating the test pattern
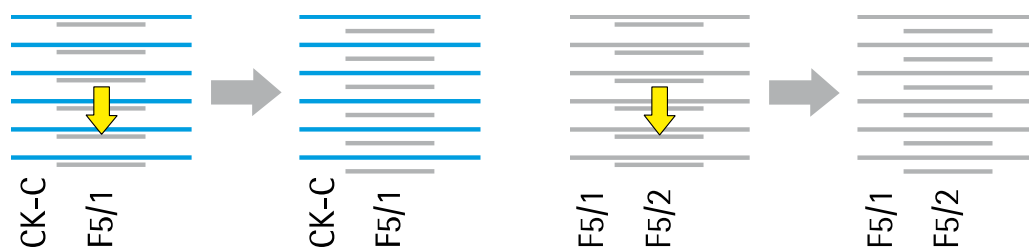
Fig. 13:   Evaluating the Y Align spot test pattern (example)

ℹ ▷ For the further procedure see "Evaluating the test pattern" and "Aligning the print head module" (→ Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**, p. **Fehler! Textmarke nicht definiert.**).

5.9   Fixing the print head modules in place

✓   The print heads must have been mechanically aligned (→ Chapter 5, p. 17)

1.   Tighten the fixing screws on all print head modules.
2.   Check the Y Distance and the Y Align test pattern again to make sure that the print head modules did not get out of place.
3.   Readjust a print head module if necessary.

6   Software adjustment

6.1   Encoder-Offset

✓   The print heads must have been mechanically aligned (→ Chapter 5, p. 17)

Printing the test pattern

1.   Select the **Media** area.
2.   Select appropriate type of media.
3.   In the **Default Job Options for Media – Print Options** tab select the following settings:

Area	Settings
Print Direction	Bi-directional
Print Finishing	Matt
Print Quality enhancement	Deactivate all
Special Effects	Deactivate all
Print Quality Mode	4 Pass

Tab. 11: Encoder offset test pattern settings

4.   Select the **Printer** area.
5.   Select the **Printer** tab.
6.   In the **Encoder Test** area, press the **Print High Resolution** button.
7.   Print the test pattern

Evaluating the test pattern
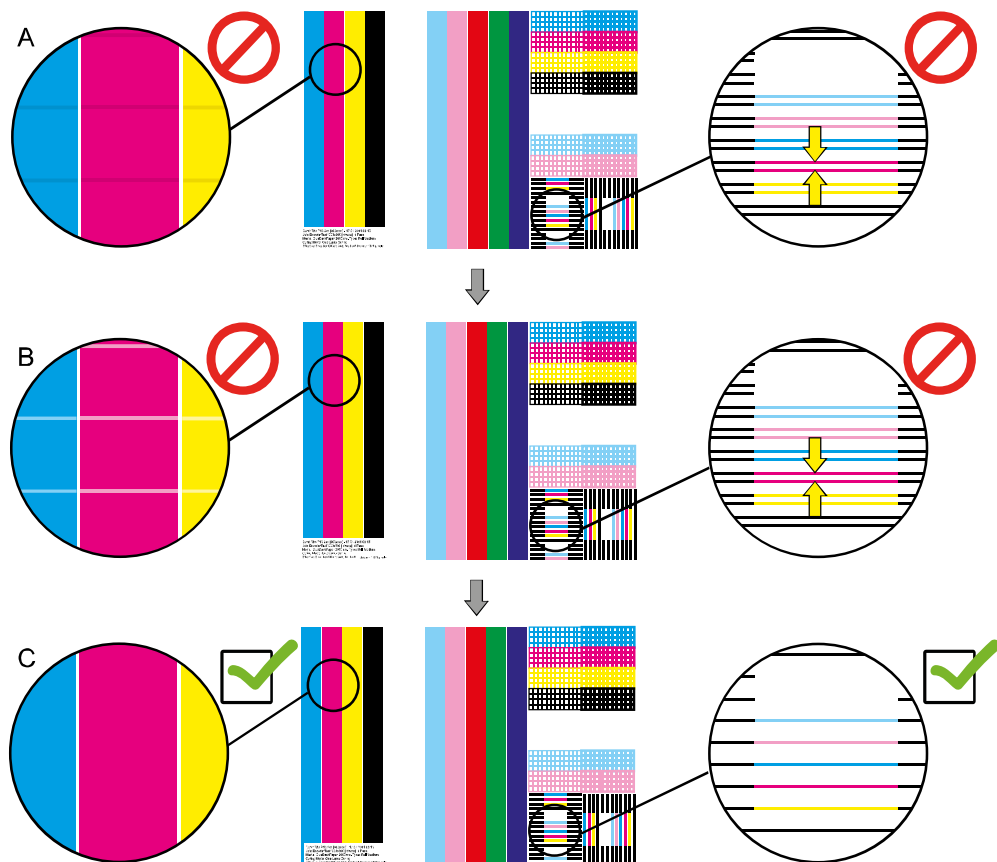
Fig. 14:   Evaluating the encoder test image

Example A

The print shows double lines in a horizontal direction and overlapping between the color fields.

The value for the encoder offset must be increased.

Example B

The print shows double lines in a horizontal direction and spaces between the color fields.

The value for the encoder offset must be reduced.

Optimum setting (example C)

No transition can be seen between the fields. The lines lie more or less on top of each other.

Entering the encoder offset

To achieve visible changes to the test pattern, the value for the encoder offset must be changed in steps >10.

1. Select the **Setup** area.
2. Select the **General** tab.
3. Change the value in the **Encoder Offset** field.
4. Print the test pattern and evaluate it.
5. If necessary change the value for the encoder offset again.

6.2   Density compensation

Printing the test pattern

✓   The encoder offset has been adjusted

1.   Select the **Printer** area.
2.   Select the **Test pattern** tab.
3.   Via **From Image File** > **Select File** select the test pattern "VoltageMatch1000.tif".
4.   Select the following settings:

Area	Settings
Colors and slots	C, M, Y, K, c, m, B, O
Print Quality Mode	2 Pass
Heads	All
Options	High Resolution
	Unidirectional
	Encoder comp.
	Encoder Control
	DFT Compensation
	Check PH Temp.
	Check UV Lamps
Paper Advance	1
Number of advance	8

Tab. 12: Density compensation test pattern settings

5.   Press the **Expose** button.

Evaluating the test pattern
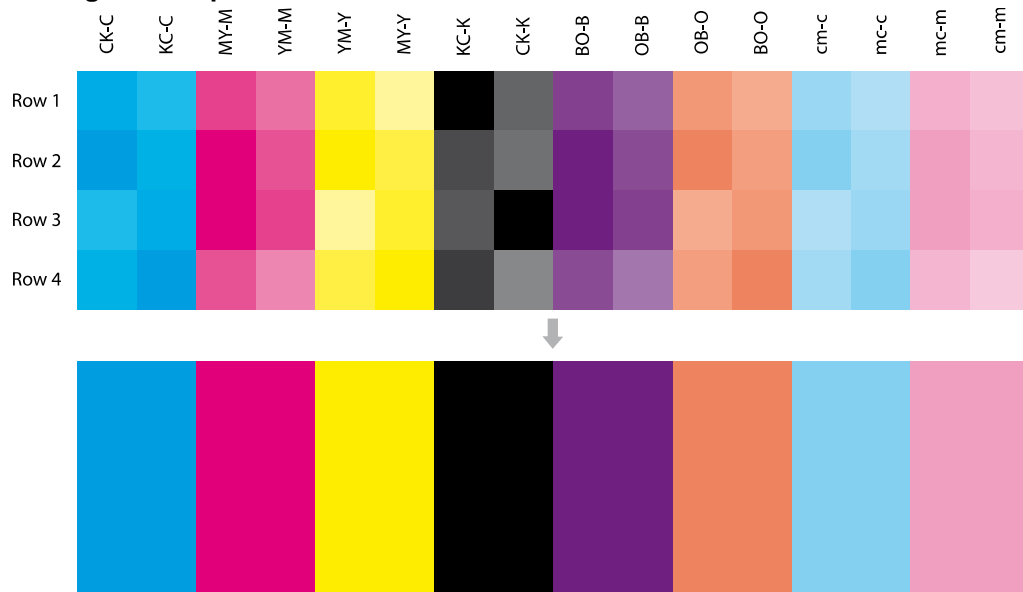
Fig. 15:   Evaluating the density compensation test pattern (example)

> The density within a slot length is not always constant and cannot be influenced by the density compensation. This effect is normal.

Example

Before the density compensation, the test pattern density shows differences between the individual slots of a color. After the density compensation, all differences have been balanced out.

Correct setting

The density in the fields for each color (e.g. cyan) is uniform throughout.

Inputting the values for density compensation

Parameter	Parameter variables	Description
RhoHead**AAB**S**C**Voltage	AA = color group, e. g. CK B = number of the print head module C = slot number Example: RhoHead**CK1**S**1**Voltage	Unit: Volt Recommended adjustment range: 70 to 82 Higher values lead to an earlier firing impulse and lead to larger droplets.

Tab. 13: Density compensation parameters

1. Change the values for RhoHeadAABSCVoltage in the **DurstPrinter.setup** file as indicated by the test result.
2. Save the **DurstPrinter.setup** file.
3. Select the **Other** tab.
4. Press the **Reload and Set** button.
5. Print the test pattern and evaluate it.
6. If necessary change the values in the **DurstPrinter.setup** file once again.

6.3   Setting the slot offsets using a camera

Automatic setting of the slot offset using a camera can be performed only for the colors C, M, Y, K, c, m, B and O

For spot colors the slot offset must be set manually (→ Chapter 6.4, p. 41).

For further information see also the video (**Help** > **Service Instructions**).

NOTE! An incorrect power supply can damage the camera!
  ▷   Operate the camera only on 24 V DC.

The camera unit is optimally configured for automatic setting of the slot offset. If changes are made to the camera unit this will lead to incorrect settings.
  ▷   Never manually change the setting of the optics (e. g. the lenses).
  ▷   Never switch to auto-focus (AF).
  ▷   Never disassemble and reassemble the camera unit.

The Canon as well as the Nikon camera system is working with the print heads used in the P10 200 and P10 250.

✓ Have the necessary tools to hand:
  –   Canon or Nikon camera system.
✓ Have the necessary materials to hand:
  –   Digital printing film (3M™ Scotchcal™ Graphic Film Series ij40-10)
✓ The print heads must have been mechanically aligned (→ Chapter 5, p. 17)
✓ The density compensation must have been performed (→ Chapter 6.1, p. 29)
✓ The drop fly time compensation must have been performed (necessary only when commissioning a new printer, → Chapter 6.7, p. 52)
✓ Printer software version 1.1 Rev 20 or higher

Preparing for setting

Before setting the slot offset, allow the printer to run at least 30 minutes in normal mode.
  ▷   For "warming up" the printer, select an image which contains all the colors apart from white

1.   Select the **Input Queue** > **Job Options** area.
2.   Select the following settings:

Area	Settings
Print Quality HQ	4 Pass
Print Direction	Bidirectional
Print Finishing	Matt
Special Effect	Backlit CMYKcmBO
Width	Full width

Tab. 14: Settings for warm-up mode

3.   Print for at least 30 minutes

Printing a calibration image

1. Select the **Media** > **Media Definition** area.
2. Select or create the appropriate type of media (3M™ Scotchcal™ Graphic Film Series ij4010).
3. Select the following settings:

Field	Settings
Head Media Distance	2.0 mm
UV Power	+4
Vacuum	5

Tab. 15: Settings for the calibration image

4. Select the **Printer** area.
5. Select the **Printer** tab.
6. Print several encoder test patterns with the "High Resolution" print setting.
    –   In the **Encoder-Test** area, press the **Print High Resolution** button.
7. Select the **Test pattern > Printer Calibration** tab. Do not change the pre-settings.
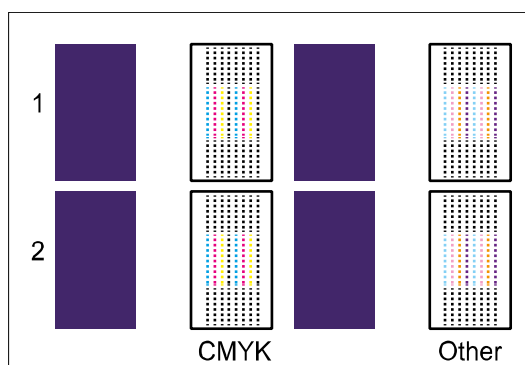8. Press the **Expose** button.

Fig. 16:   Printer calibration test patter for calibration software version 3.x.

6.3.1   Nikon camera system

Preparing the camera system for software version 3.x
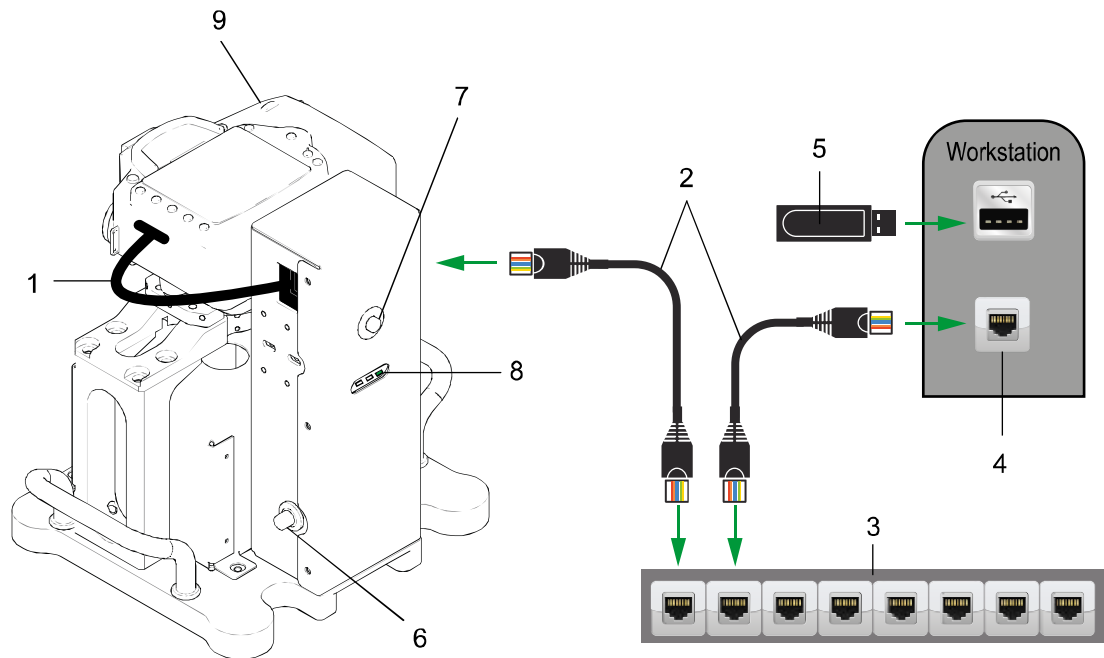
Fig. 17:   Connection of Nikon camera to the Workstation

1	Connection cable (camera – transmitter)	6	Switch for main power supply
2	Network cable	7	Start button for transmitter
3	Ethernet switch	8	Status LED's of transmitter
4	Network port ETH1 on workstation	9	Main switch of camera
5	USB dongle		

1. Place the camera on a flat, non-slip surface.
2. Make sure that the **DurstPrinter.setup** file is closed.
3. Connect the camera with the transmitter.
4. Use a network cable and connect the camera directly to network port **ETH1** on the workstation or use the ethernet switch.
5. Connect the USB dongle to the workstation.
6. Connect the power supply to the camera.
7. Switch on the main power supply of the system.
8. Push the button start transmitter (7) until the status LED (8) turns green.
9. Turn on the camera.

Camera settings for software version 3.x

1. Press the **Menu** button on the camera

2. Select **Setup Menu** – **Network**.

3. Select **Network settings**.
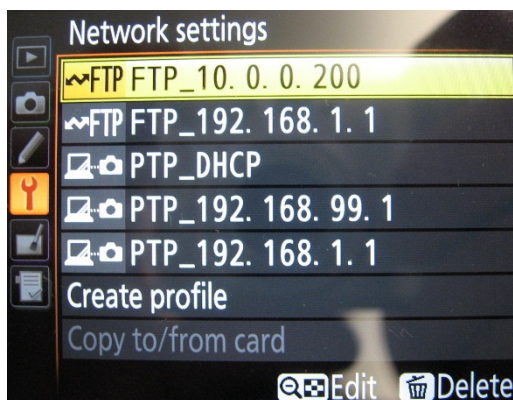
4. Select **FTP_10.0.0.200**
5. Edit the profile with the button "loupe –".
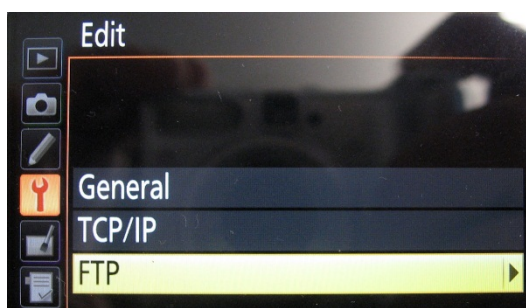
6. Select **FTP**.

7. Check the port settings:
    Port: 54321

8. Go back to the **Network** menu and select **Options**.
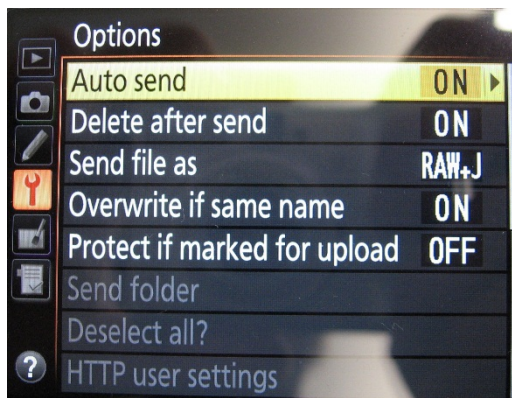
9. Make sure that **Auto send** is **ON**.

The required network setting depends on the version of the camera calibration software.
  ▷ FTP_10.0.0.200 - for calibration software version 3.x.
  ▷ PTP_DHCP - for calibration software version 4.x.

6.3.2 Canon camera system
Preparing the camera
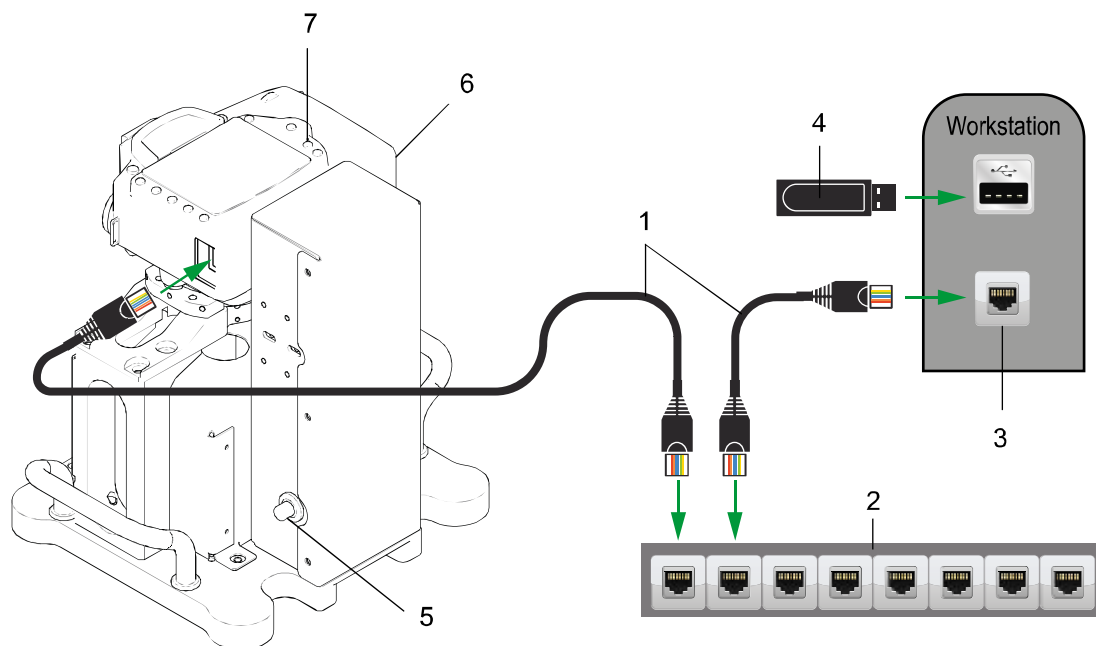
Fig. 18:   Connection of Canon camera to the Workstation

1	Network cable	5	Main switch of system
2	Ethernet switch	6	Main switch of transmitter
3	Network port ETH1 on workstation	7	Main switch of camera
4	USB dongle		

1. Place the camera on a flat, non-slip surface.
2. Make sure that the **DurstPrinter.setup** file is closed.
3. Use a network cable and connect the camera directly to network port **ETH1** on the workstation or use the ethernet switch.
4. Connect the USB dongle to the workstation.
5. Connect the power supply to the camera.
6. Switch on the main switch of the system.
7. Turn on the transmitter.
8. Turn on the camera.

6.3.3   Creating photos with software version 3.x

1. Select the **Printer Calibration** tab.
2. Press the **X-Align** button.
    The camera software must be started.
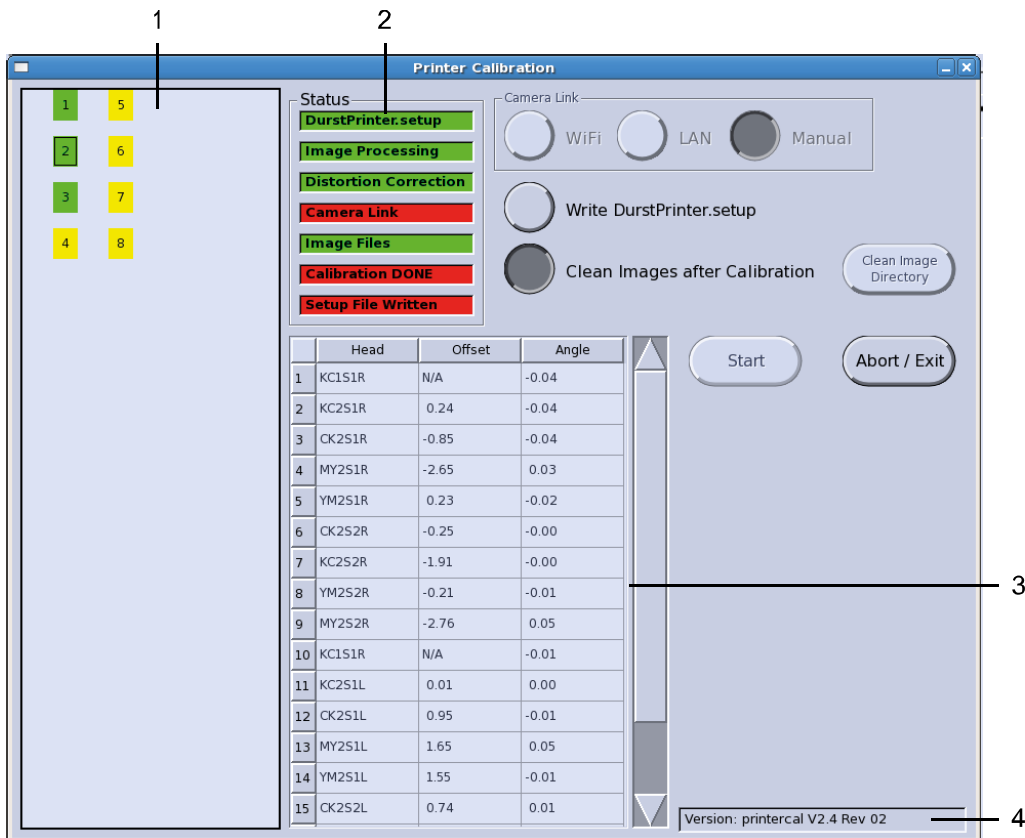
Abb. 19: Overview camera software

1   Progress of the calculation of the pictures
     Yellow: not calculated
     Green: Calculation OK
     Red: Calculation failed
2   Status
3   Detailed view of the results of the calculation (Offset and angle of the slots)
4   Version of the Printer Calibration Software

3. In the **Camera Link** area, press the **LAN** button.
4. Select **Write DurstPrinter.setup** and **Clean Images after Calibration**.
5. Press the **Start** button.
6. Switch on the camera.
7. Select the camera program C1.

> A camera is shown on the Printer Calibration image; this indicates the direction in which the camera must point when taking pictures.
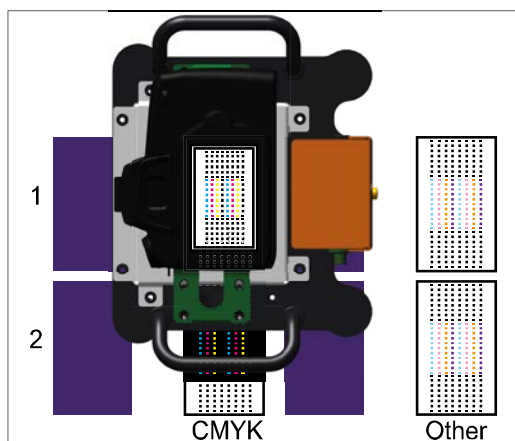
8. Take the photos in the following
    sequence:
    CMYK: 1, 2, 3, …
    Other: 1, 2, 3, …
9. Wait until the photos have been loaded
    to the workstation and all the displays of
    photos in the printer software are green.

ℹ️ If the photos are not loaded correctly, check that the camera is connected by LAN to ETH1.

10. If the display of a photo turns red, take the photo again. Make sure you perform the
    actions in the specified sequence.
11. The calibration was successful if **Calibration DONE** and **Setup File Written** turn green.
12. To exit the printer calibration software, press the **Abort / Exit** button.

ℹ️ The photos can be loaded to the workstation by LAN or manually. For loading manually,
    proceed as follows:
    ▷ In the **Camera Link** area, press the **Manual** button.
    ▷ Copy the photos (file format *.CR2) from the camera into the directory
       /mnt/images/calibration on the workstation.

6.3.4   Repeat the setting

ℹ️ For fine adjustment of the slot offset, perform the setting a second time.

1. Before performing the setting the again, allow the printer to run at least 15 minutes in
    normal mode.
2. Print the calibration image.
3. Create the photos.

6.3.5   Troubleshooting

The calibration software will create a backup of the DurstPrinter.setup file with a time stamp in
the folder **/usr/local/printsw.**

Every time when a calibration is started the software will create a folder with the current time
stamp in **/mnt/images/calibration/debug**.
In case of problems it's necessary to upload the respective folder with the time stamp to our
FTP server and to contact Durst Service.

6.4   Setting the slot offsets manually

6.4.1   Setting the slot offset within a color

> **i** The slot offset can be set for all print head modules in a single operation.
> Alignment of the print head modules to each another is not necessary in this operation.

Printing the test pattern

1.   Select the **Test pattern** tab.
2.   Select the following settings:

Area	Settings
Colors and slots	C, M, Y, K, c, m, B, O
Print Quality Mode	Test pattern
Test pattern	Slot Offset
Heads	All
Options	High Resolution
	Encoder comp.
	Encoder Control
	Check PH Temp.
	Check UV Lamps
Paper Advance	0
Number of advance	1

Tab. 16: (Manually) setting the slot offset test pattern

3.   Press the **Expose** button.

Evaluating the test pattern
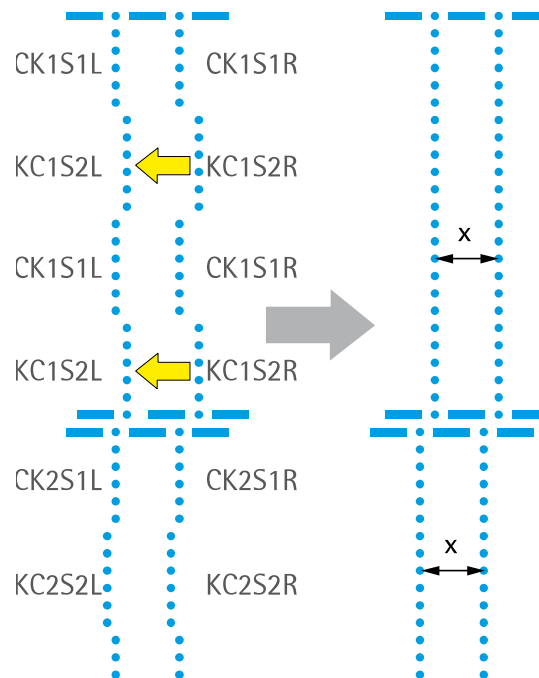
Fig. 20:   Evaluating the slot offset test pattern

Example

The part lines of the KC1 print head module lie too far to the right, compared to the part lines of the CK1 print head module. The slot offset values for KC1S2L and KC1S2R must be reduced; note that the values for KC1S2R must be reduced more than the value for KC1S2L.

Optimum setting

The two lines lie about 1.2 mm to 1.4 mm apart.
Note: The distance x between the two lines must be the same for all head rows!
The part lines created by the CK and KC print head modules generate a continuous line over the length of the print head.

Setting the values for the slot offset

Parameter	Parameter variables	Description
RhoSlotOffset**AAB**S**CD**	AA = color group, e. g. CK B = number of the print head module C = slot number D = direction (L/R) Example: RhoSlotOffset**CK1**S**1L**	Unit: Pixel Default setting: 0 Increasing the value moves the line to the right (as seen from the material output side). Reducing the value moves the line to the left.

Tab. 17: Parameter Slot-Offset

1. Change the values for `RhoSlotOffsetAABSCD` in the **DurstPrinter.setup** file as indicated by the test result.
2. Save the **DurstPrinter.setup** file.
3. Press the **Reload setup entries** button.
4. Print the test pattern and evaluate it.
5. If necessary change the values in the **DurstPrinter.setup** file once again.

6.4.2 Setting the slot offset between all other colors and black

> The slot offset can be set for all print head modules in a single operation.
> Alignment of the print head modules to each another is not relevant to this operation.

Printing the test pattern

($\rightarrow$ Chapter 6.4.1, p. 41)

Evaluating the test pattern
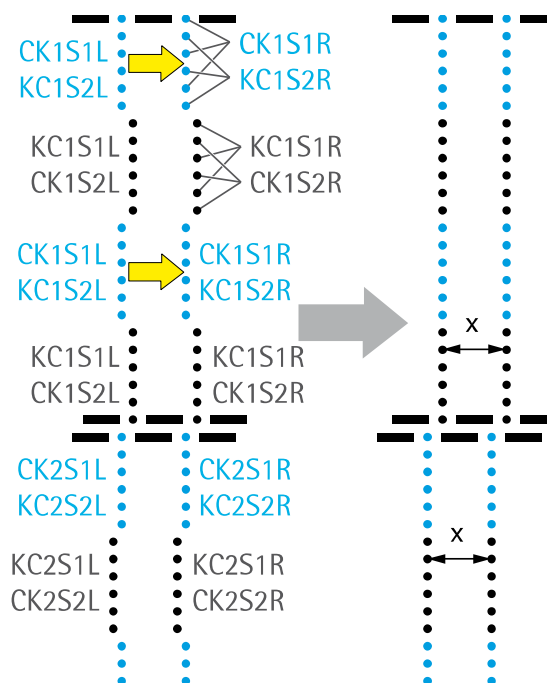
Fig. 21:   Evaluating the slot offset test pattern

Example

The cyan part lines lie too far to the left, compared to the black part lines. The slot offset values for CK1S1L, KC1S2L CK1S1R and KC1S2R must be increased.

Optimum setting

The two lines lie about 1.2 mm to 1.4 mm apart.
The part lines created by the black slots and the color slots generate a continuous line over the length of the print head.

Setting the values for the slot offset

($\rightarrow$ Chapter 6.4.1, p. 41)

6.4.3   Setting the slot offset between the rows

> ℹ The slot offset can be set for all print head modules in a single operation.

Printing the test pattern

1.   Select the **Test pattern** tab.
2.   Select the following settings:

Area	Settings
Colors and slots	C, M, Y, K, c, m, B, O
Print Quality Mode	Test pattern
Test pattern	X Head Row Offset
Heads	All
Options	High Resolution
	Unidirectional
	Encoder comp.
	Encoder Control
	Check PH Temp.
	Check UV Lamps

Tab. 18: X Head Row Offset test pattern settings

3.   Press the **Expose** button.

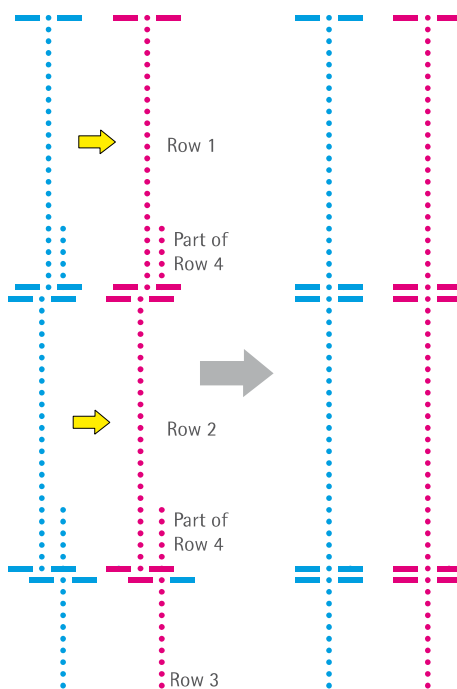**Evaluating the test pattern**

Fig. 22:   Evaluating the X Head Row Offset test pattern

Example

The lines for the print head rows 1 and 2 lie too far to the left, compared to the lines for the print head row 4. The slot offset values for print head rows 1 and 2 must be increased; note that the value for print head row 2 must be increased more than the value for print head row 1.

Optimum setting

The lines for the print head rows must generate a continuous line.

Setting the values for the slot offset

Parameter	Parameter variables	Description
RhoSlotOffsetRow**F**	F = print head row	Unit: Pixel
		Default setting: 0
		Increasing the value moves the line to the right (as seen from the material output side).
		Reducing the value moves the line to the left.

Tab. 19: Parameter X Head Row Offset

1. Change the values for RhoSlotOffsetF in the **DurstPrinter.setup** file as indicated by the test result.
2. Save the **DurstPrinter.setup** file.
3. Press the **Reload setup entries** button.
4. Print the test pattern and evaluate it.
5. If necessary change the values in the **DurstPrinter.setup** file once again.

6.5 Setting the slot offset for white print head modules (for printers with 4 CMYK print head rows)

> ℹ For printers with 4 CMYK print head rows the slot offset can be set for all white print head modules (F5/1, F5/2 and F6/1, F6/2) in a single operation, since the spot colors can be set to the black reference.
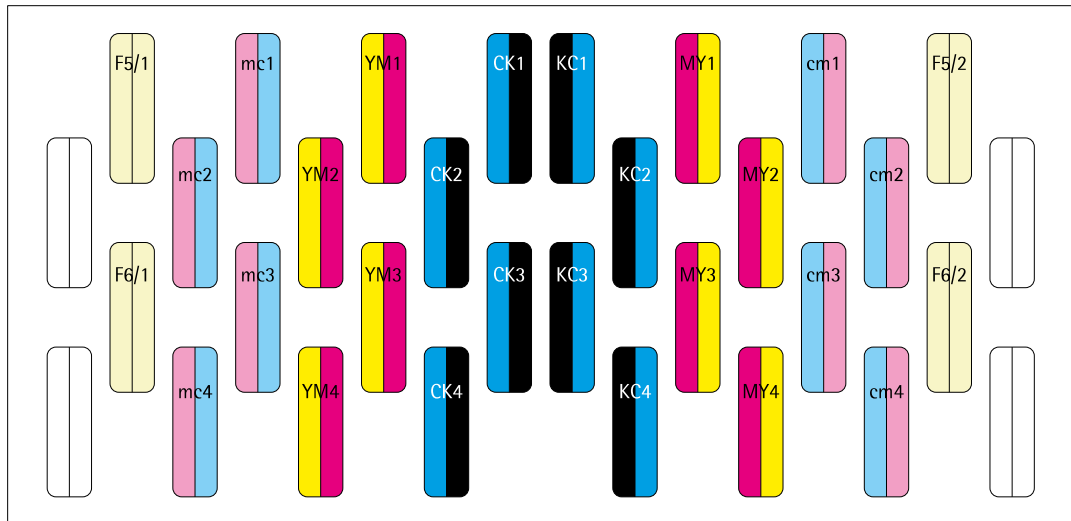

Fig. 23:   Printer with 4 CMYK print head rows (example)

Printing the test pattern

> ℹ Test patterns in white or varnish are difficult to be seen on white paper.
> ▷ Print white test patterns on transparent material.
> ▷ When printing on white paper: Mark the test patterns in white or varnish with orange or pink text markers.

1. Purge the white print head modules and print a least 1m² before printing the test pattern.
2. Select the **Test pattern** tab.
3. Via **From Image File** > **Select File** select the test pattern "Slot Offset (Spot)".
4. Select the following settings:

Area	Settings
Colors and slots	K, U, O
Print Quality Mode	Test pattern
Heads	All
Options	High Resolution
	Encoder comp.
	Encoder Control
	Check PH Temp.
	Check UV Lamps

Tab. 20: Slot Offset (Spot) test pattern settings

5. Press the **Expose** button.

Evaluating the test pattern
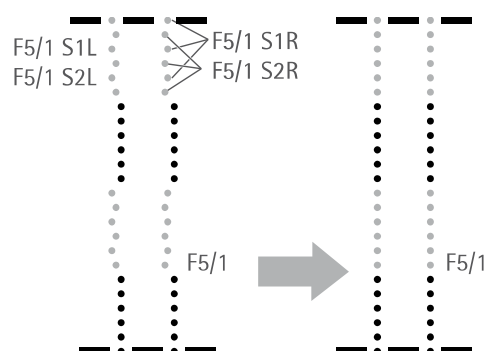
Fig. 24:   Evaluating the slot offset (spot) test pattern

Example

The part lines for the F5/1 print head module lie too far to the left, compared to the black part lines. The slot offset values for F5/1S1L, F5/1S2L, F5/1S1R and F5/1S2R must be increased accordingly.

Optimum setting

The part lines created by the black slots and the spot color slots generate a continuous line over the length of the print head.

Setting the values for the slot offset

6.6   Setting the slot offsets for white print head modules (for printers with 2 CMYK print head rows)

> **i** For printers with 2 CMYK print head rows the slot offset must be set for all print head modules in 3 steps, since there is no reference print head module in the same row.
> The procedure below is described for print head module F5/1, but it can be adapted for the other white print head modules (F5/2, F6/1, F6/2).
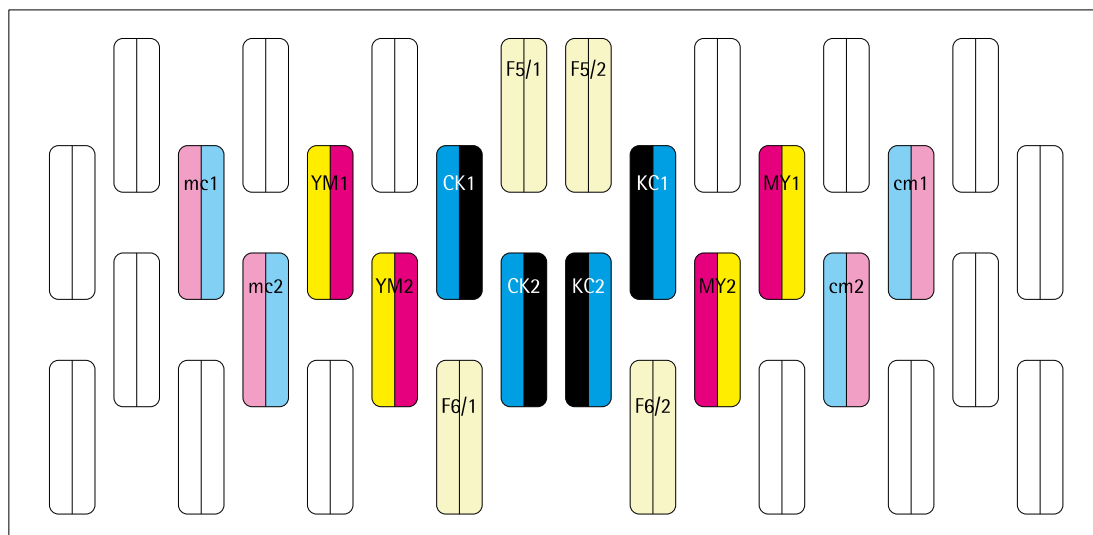
Fig. 25:   Printer with 2 CMYK print head rows (example)

6.6.1   Setting the slot offsets to line up the pattern for the left and the right printing direction

Printing the test pattern

($\rightarrow$ Chapter 6.5, p. 46)

Evaluating the test pattern

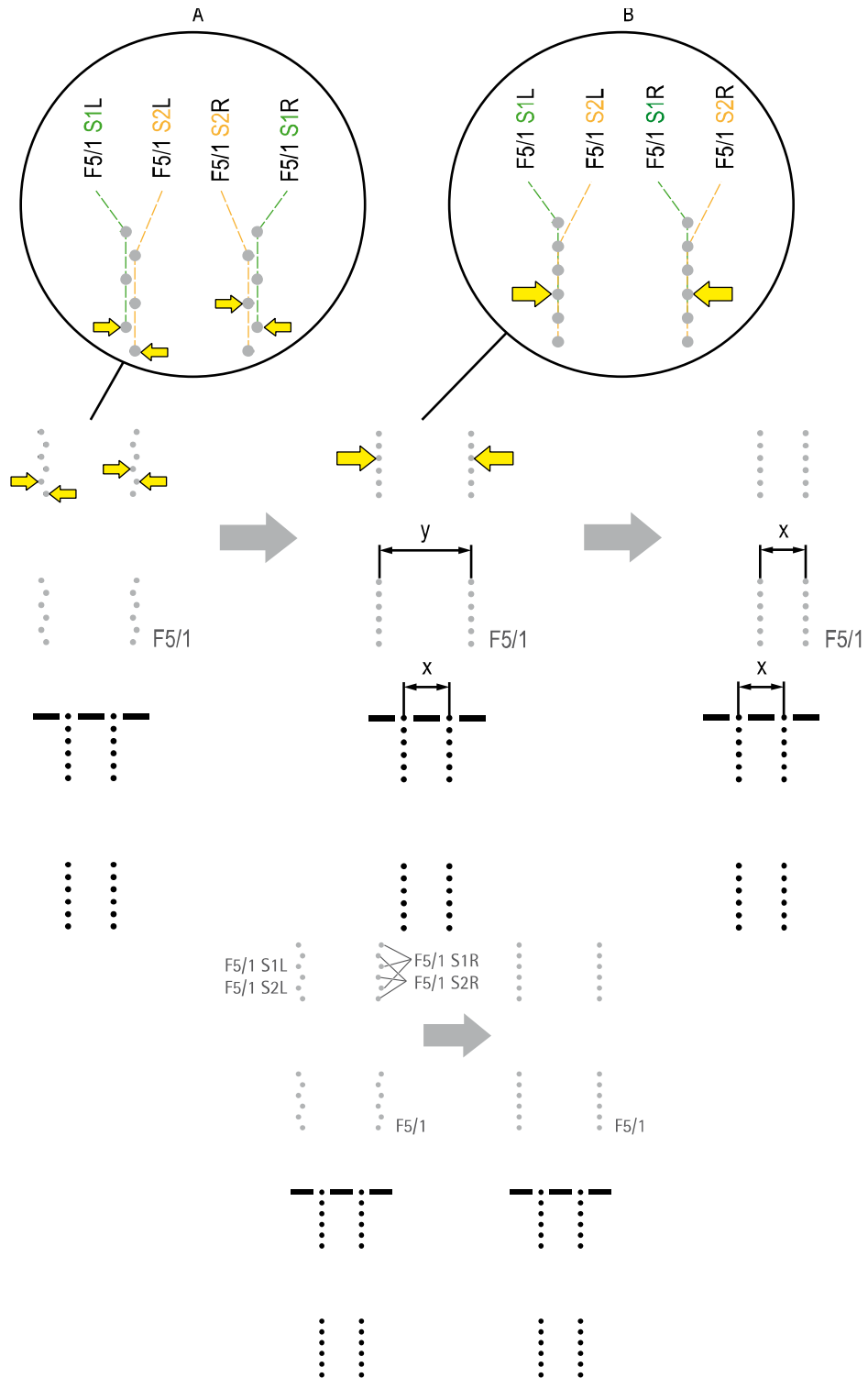*Fig. 26:   Evaluating the slot offset (spot) test pattern*

A   Setting the slot offsets to line up the pattern for the left and the right printing direction
B   Adjusting the slot offsets to adapt the drop fly time of black

The test pattern is printed bidirectional. Therefore the slot offset of each slot must be adjusted for the left and the right side.

Example A

The part lines of slot 1 and slot 2 of the print head module do not generate a continuous line for the left and the right printing direction.
The slot offset values for F5/1 S1L, F5/1 S2L and F5/1 S1R, F5/1 S2R must be changed.

Optimum setting

The part lines of slot 1 and slot 2 of the print head module generate a continuous line for the left and the right printing direction.

Setting the values for the slot offset

(→ Chapter 6.4.1, p. 41)

6.6.2 Setting the slot offsets to adjust the distance between the left and the right line.

Printing the test pattern

(→ Chapter 6.5, p. 46)
Evaluating the test pattern

(→ Chapter 6.6.1, p. 48)

▶   Measure the distance x (drop fly time) between the left and the right black line.

Setting the values for the slot offset

▶   Set the values for the slot offsets of the white print head modules so that the distance y between the left and the right white line is equal to the distance x (→ Chapter 6.4.1, p. 41).

To move a line, two parameters must be set, e. g.:
■   `RhoSlotOffsetF5_1S1L = +5`
■   `RhoSlotOffsetF5_1S2L = +5`

6.6.3 Setting the slot offset between white and black

1. Disconnect the connection for the firing impulse of the print head module F5/2.

The line for white under will be printed only with F5/1.

2. Select the **Media** area.
3. Select appropriate type of media.
4. In the **Default Job Options for Media – Print Options** tab select the following settings:

Area	Settings
Print Direction	Bi-directional
Print Finishing	Matt
Print Quality enhancement	Deactivate all
Special Effects	Deactivate all
Print Quality Mode	4 Pass

Tab. 21: Slot Offset (white to black) test pattern settings

5. Select the **Printer** area.
6. Select the **Printer** tab.
7. In the **Encoder-Test** area, press the **Spot Inks** button.
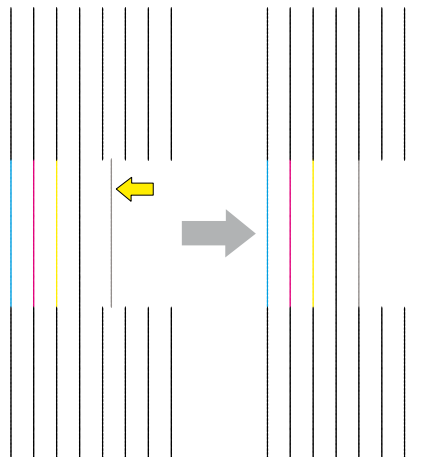
Fig. 27:   Evaluating the Encoder Test test pattern

8. Determine the offset between the line printed by F5/1 and the reference black.
9. Set the value for the slot offsets of the print head module F5/1 so that the white and reference black are in line (→ Chapter 6.4.1, p. 41).

To move a line, four parameters must be set, e. g.:
- ■ `RhoSlotOffsetF5_1S1L` = -6
- ■ `RhoSlotOffsetF5_1S1R` = -6
- ■ `RhoSlotOffsetF5_1S2L` = -6
- ■ `RhoSlotOffsetF5_1S2R` = -6

10. Reconnect the connection for the firing impulse of the print head module F5/2.
11. Disconnect the connection for the firing impulse of the print head module F5/1.
12. Perform steps 2 to 5 for print head modules F5/2, F6/1 and F6/2.

6.7   Drop fly time compensation

✓   The head media distance must be correctly set (→ service manual settings)

Printing the test pattern

ℹ️   Each HMD value and each resolution saved in the **DurstPrinter.setup** file needs to have its own offset.

1.   Make an archive copy of the **DurstPrinter.setup** file.
2.   Set the values for `RhoDFTCDataDistancex` for each head media distance in the file **DurstPrinter.setup** to 0.
3.   Select the **Media** tab.
4.   Set the HMD to the desired value (e. g. 2 mm) and load the medium.
5.   Select the **Printer** tab.
6.   In the **Encoder-Test** area, select the **High Resolution** or **Vario Drop** resp. **High Speed** button:
      –   High Resolution (printing at 1000x800 dpi)
      –   High Speed (printing at 800x600 dpi)
      –   Vario Drop (printing at 600x600 dpi)

ℹ️   Depending on the printer configuration either the resolution High Speed or the resolution Vario Drop (default) is available.
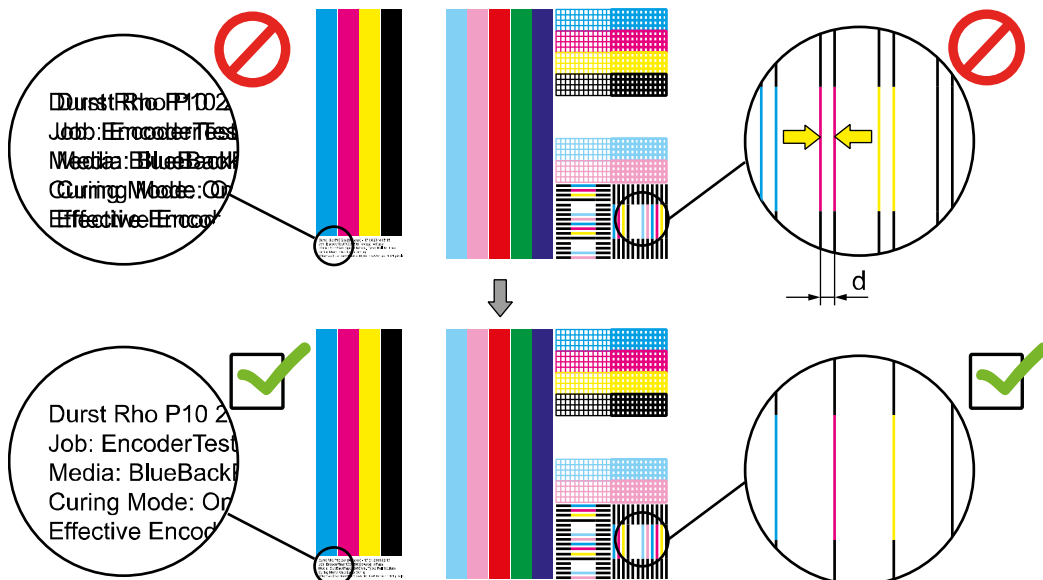
Evaluating the test pattern

Fig. 28:   Evaluating the test pattern

▶   Measure the distance d on all test patterns.

Optimum setting

The vertical lines generate a single line. The text is sharp.

ℹ️ Depending on resolution and head media distance the text and the vertical lines will not always show the same result!
    ▷   Use the text for fine tuning.

Inputting the values for drop fly time compensation

Parameter	Parameter variables	Description
RhoDFTCDataHMD	0.150 0.200 0.300 0,400	Unit: cm Adjustment range: 0.150 to 0.500 HMD values for the drop fly time calculation Each value is delimited by a space.
RhoDFTCDataDistance**x**	x = resolution x=1000 → High Resolution x=800 → High Speed x=600 → Vario Drop	Unit: cm Measured distance between the lines as a function of the head media distance, e.g. -0.140 -0.160 -0.220 -0.250 Each value is delimited by a space.

Tab. 22: Drop fly time compensation parameters

1. Change the values for RhoDFTCDataDistancex in the **DurstPrinter.setup** file according to the results of the evaluation.
2. Save the **DurstPrinter.setup** file.
3. Press the **Reload setup entries** button.
4. Print the test pattern and evaluate it.
5. If necessary change the values in the **DurstPrinter.setup** file once again.

6.8   Slot border compensation

ℹ️ The density at the edges of the slot is adjusted via the slot border compensation.

✓ The encoder offset has been adjusted

Printing the test pattern

1. Select the **Input Queue** area.
2. Select an image that satisfies the following requirements (example: → Fig. *29*, p. 54):
    –   Solid surface
    –   Progress over the surface
    –   High ink application
3. Select the following settings:

Area	Settings
Print Direction	Bi-directional
Print Finishing	Matt
Print Quality enhancement	Deactivate all
Special Effects	Deactivate all
Print Quality Mode	2 Pass

Tab. 23: Slot border compensation test pattern settings

Evaluating the test pattern

Fig. 29:   Example of a slot border compensation test pattern

Example

The printing exhibits darker areas at the transitions from one pass to the next. The density at the slot borders must be reduced.

Optimum setting

The printing exhibits saturated colors at the transitions from one pass to the next.

Inputting the slot border compensation

The settings apply to all colors and all slots.

Parameter	Parameter variables	Description
`RhoHeadCompensationU` `RhoHeadCompensationL`	U = upper part of the pass L = lower part of the pass	Unit: % Recommended adjustment range: 0 to -10 A reduction of the value reduces the density on the selected length in the upper/lower parts of the pass
`RhoHeadCompensationLenU` `RhoHeadCompensationLenL`		Unit: cm Length over which the density is to be adjusted Recommended adjustment range: 0.00 to 0.20

1. Change the values in the **DurstPrinter.setup** file as indicated by the test result.
2. Save the **DurstPrinter.setup** file.
3. Select the **Reload setup entries** button.
4. Print the test pattern and evaluate it.
5. If necessary change the values in the **DurstPrinter.setup** file once again.