Rho700/800

4. Printhead Adjustment & Settings

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Version 2.7 – 25/02/2009

4.1 Requirements

4.1.1 <u>Tools</u>

• **Safety guides**	**Use protection goggles!** **Use protective gloves!** **Use protective coat!**

Tools

- Allen key insulated, extra long
- Adjustment key 2.5, code LD2099800
- Adjustment key 3.0, code LD2099801
- Screw driver flat, approximately 200mm long
- Magnifier 25x

4.1.2 <u>Remote Control</u>

For an extensive alignment (more heads,...) it is possible to setup a remote control with e.g. your laptop. The benefit is that you don't need to walk around the printer all the time to push the buttons on the Rho's operator panel.

- Install the VNC viewer on your Laptop (can be found in the web or on the caldera station)
- Enable the remote access on the Rho's workstation: Applications (Start menu) – Preferences – Remote Desktop
- Connect your laptop to the Rho's WS (direct or over customer LAN) and make the necessary network settings (IP, mask,...)
- Enter the Rho's Desktop via VNC to control it from your PC

4.2 Description

4.2.1 <u>Printhead</u>

C ... color from Slot 1 + 2
K ... color from Slot 3 + 4
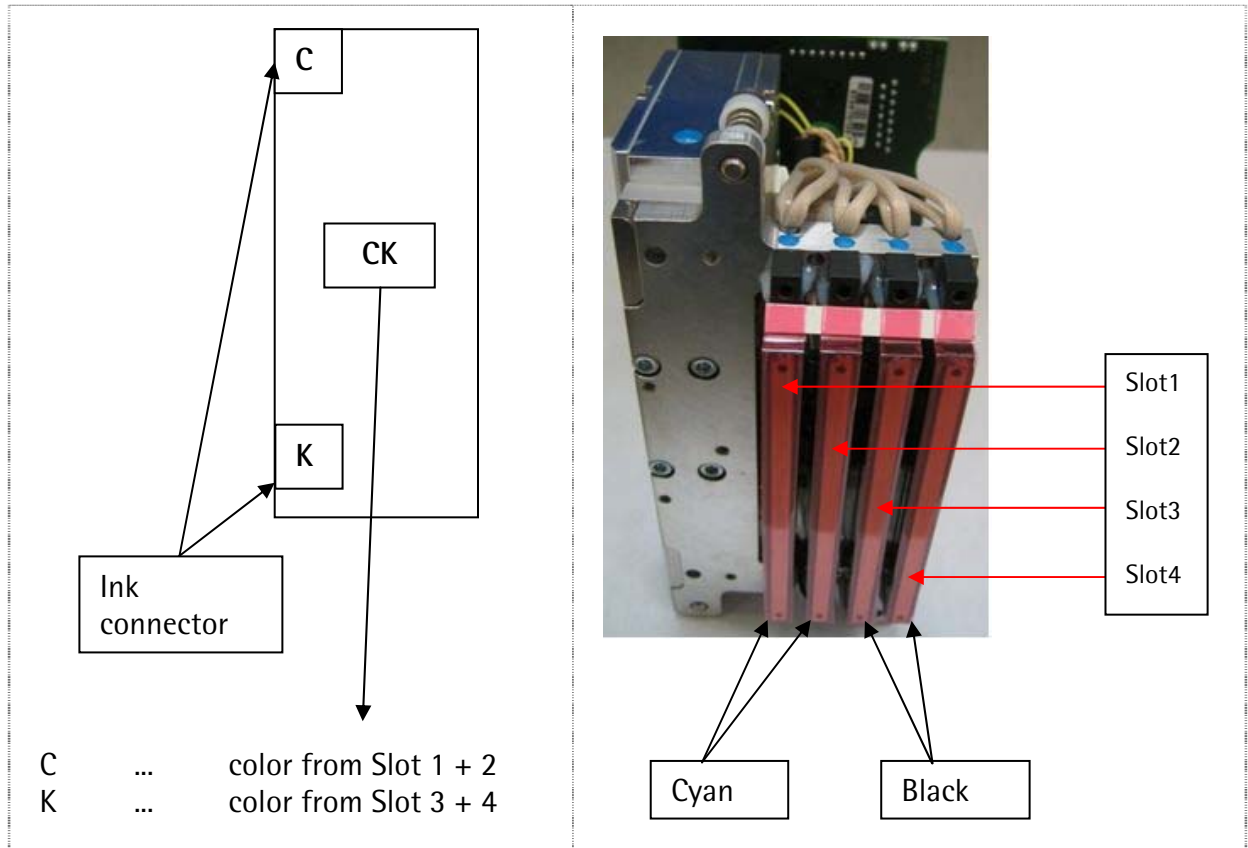
4.2.2 <u>Slot Geometry</u>

Each printhead has 4 slots (slot number 1 is close to the ink tank)
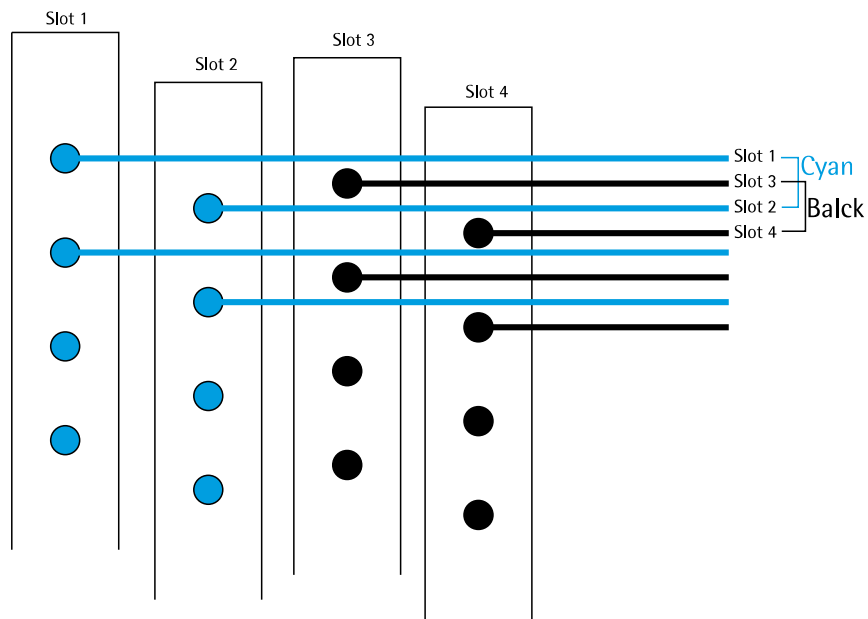
1 Slot 128 nozzles = 1 Head 512 nozzles

4.3 Printhead Arrangement

4.3.1 Printhead Arrangement – Presto
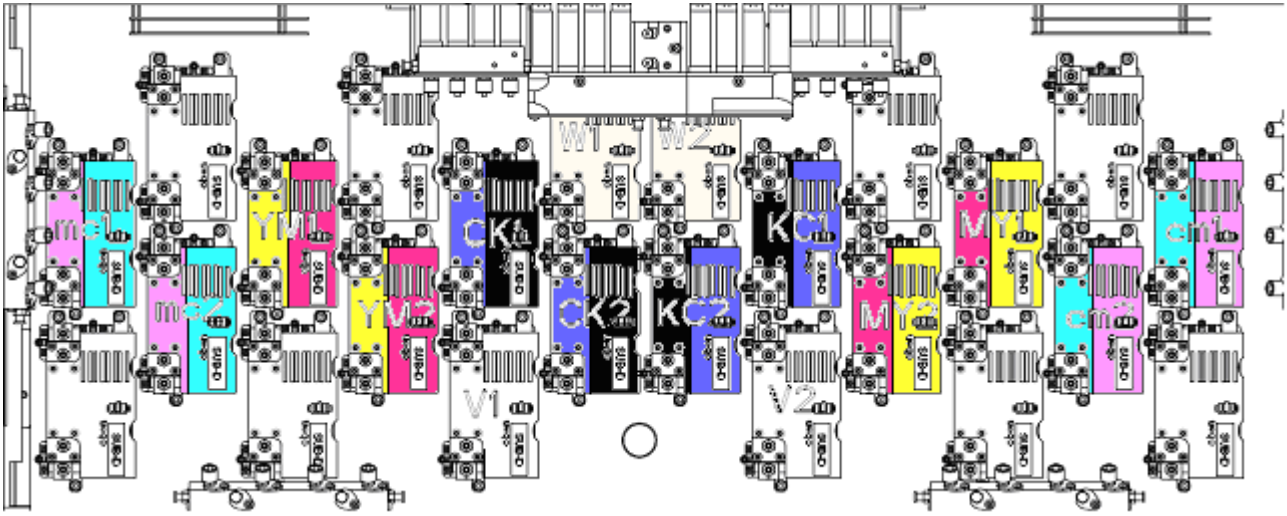
4.3.1.1 Principle Schema Y – Printhead Arrangement

0   ... allocation line
– 1 ... 1 Pixel Offset in Media feeding direction

0	–1	0	0	–1	0

Media advance direction
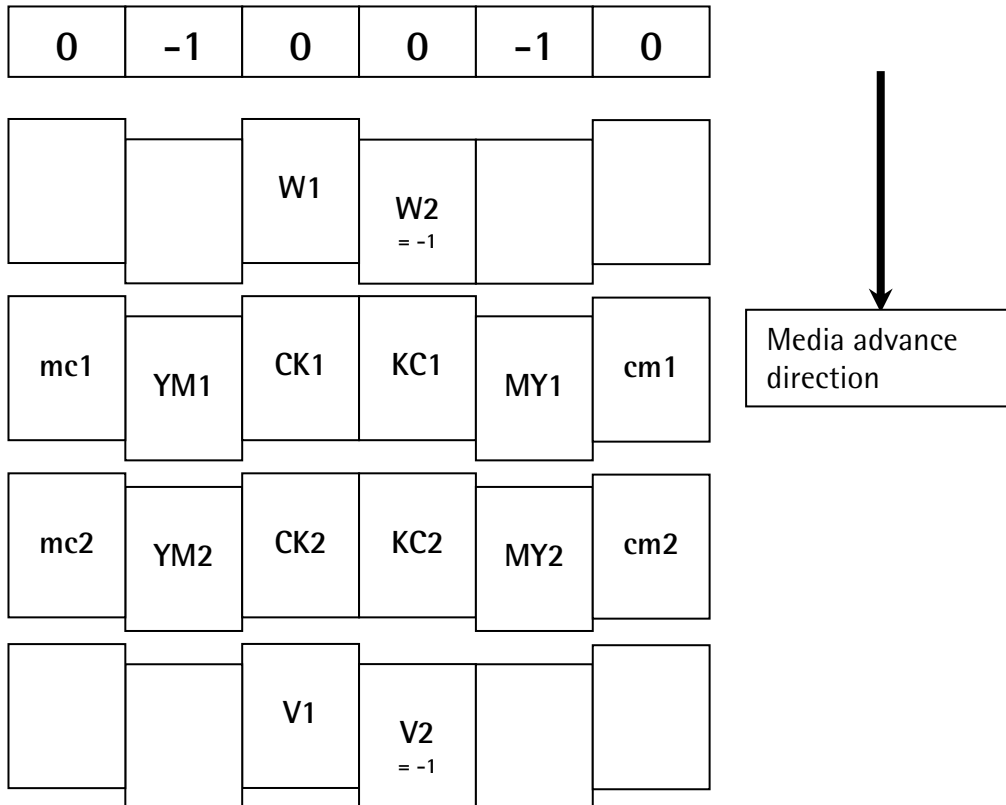
4.3.2 Printhead Arrangement – Basic

4.3.2.1 Principle Schema Y – Printhead Arrangement

0   ... allocation line
- 1   ... 1 Pixel Offset in Media feeding direction

0	–1	0	0	–1	0

Media advance direction

		W1			
mc1	YM1	CK1	KC1	MY1	cm1
		V1			

4.4 Printhead Adjustment

4.4.1 Head Movement
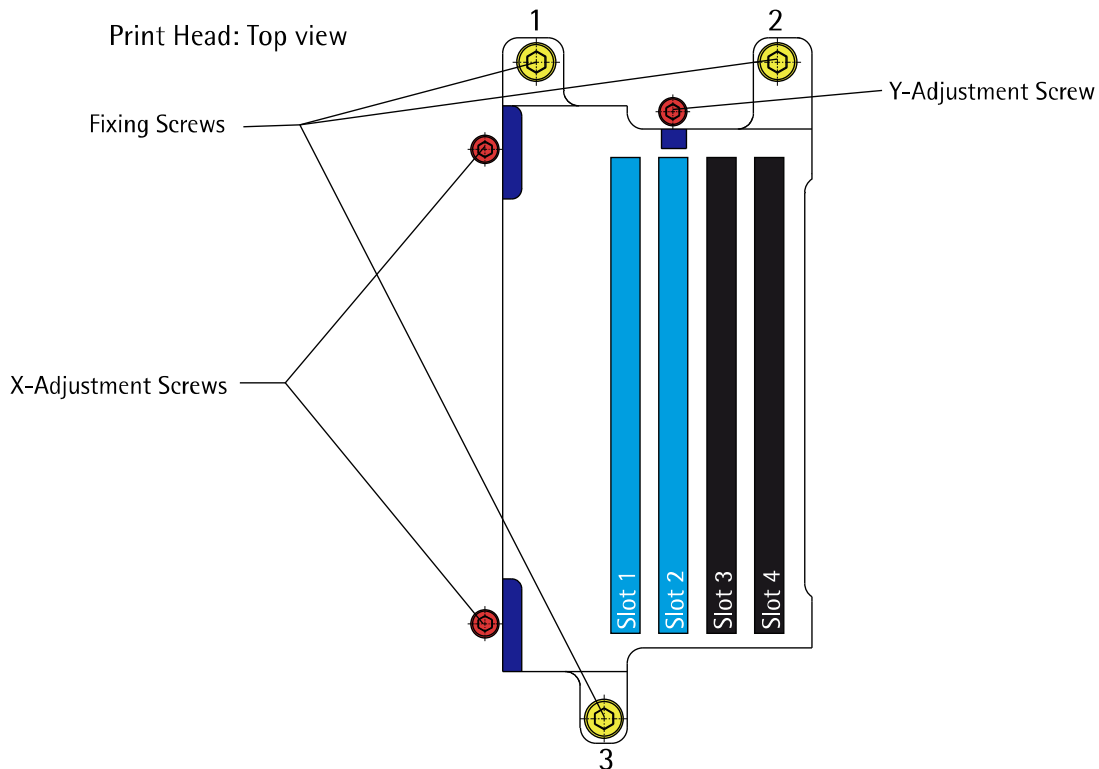
- The *fixing screws* must be loosen for any mechanical head adjustment

- By turning the *adjustment screws* CW the head will move away from the screw
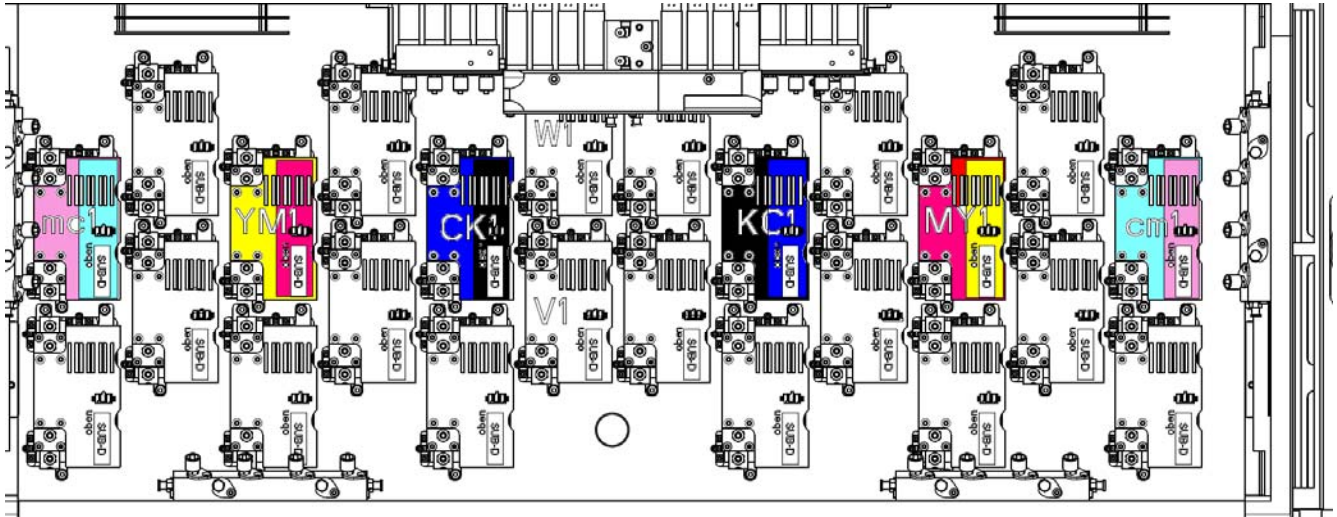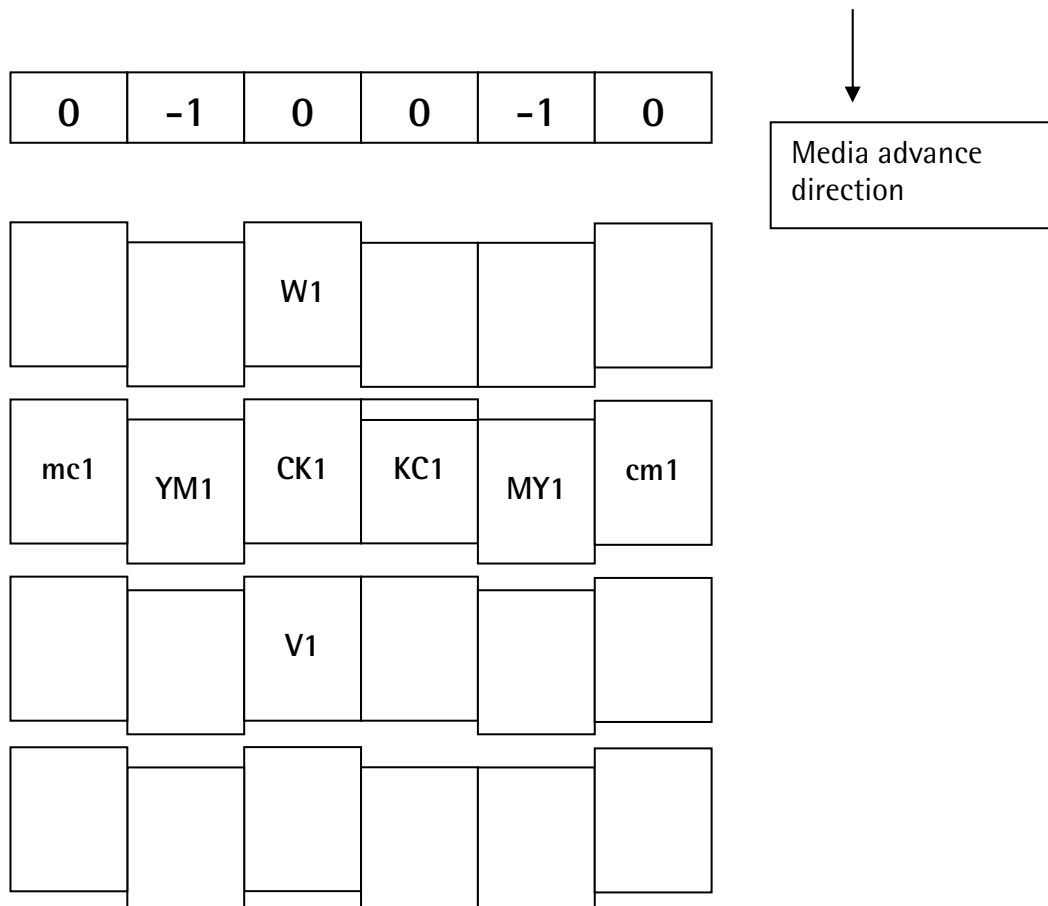
- By turning the adjustment screws CCW only the head will not move to the screws, in this way additional the head has to be pushed with a little force by hand

- At the Y-Adjustment screw 1 rotation means approx. 1 Pixel

- Do not forget to close the fixing screws (order: 3, 2, 1) after the mechanical adjustment!

4.4.2 Y-Adjustment Offset

For a **complete head alignment** procedure (all print heads) it is needed to put all print heads to an offset in y-direction:
- Loosen all *adjustment screws*
- Push all heads to the upper left corner
- Tighten all *fixing screws*
- Turn all *adjustment screws* CW until they are touching the heads frame (resistance is tangible)
- Loosen all *fixing screws* a few rotations
- Turn all *Y-adjustment screws* **1.5 rotations** CW to get the **offset**

4.4.3 Preperation

Load the media (ideally BlueBackPaper) in the *Durst Print Software* to have all the right settings.

Testcom:
- Enter 500 for the Right Margin and for the Left Margin depending on the media 20000 or more
- Table Fan
- UV Lamps

Switch off the UV Lamps and the Ink Heating System and **start** them **manually in Testcom** to kill the autotimer for both systems to avoid an accidental ink temp. breakdown or a UV power off.

4.4.4 X-Rotation Adjustment

4.4.4.1 Raw Adjustment

- Activate Slot 1, 2, 4 of one print head group
- Print a Fullpattern
- Check the symmetry between the lines
- Improve the symmetry by turning the X – adjustment screws

e.g.: CK printheads:

The following slots must be activated:
Name Testcom   = "C S1 ---------- C S2 ----------- K S4"
Actual Slot   = "CK Slot 1   ---- CK Slot 2   --- CK Slot 4"

Slot 2

Slot 4

Slot 1

Media advance direction
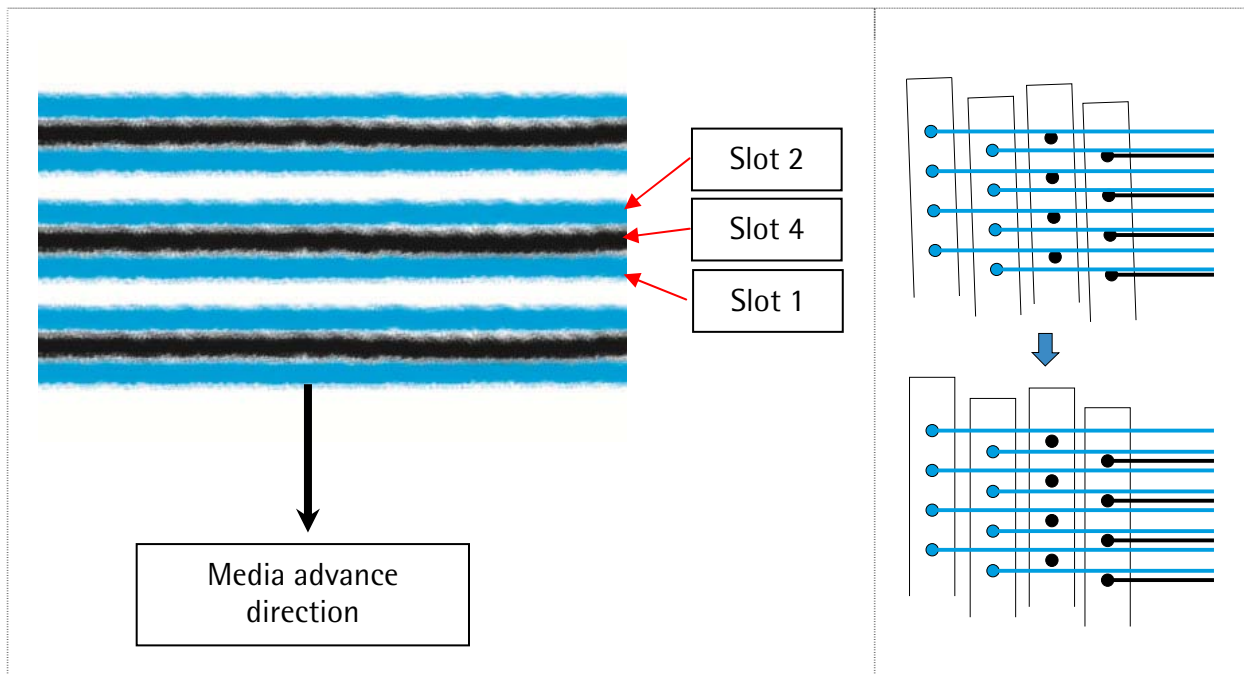
4.4.4.2 Rotation For All Printheads

- Do the same for all print heads. – CMYKcmWV
- CK1 head can be fixed after rotation adjustment

4.4.4.3 Fine Tuning

- Activate all four Slots of one print head group (e.g.: CK head: CS1, CS2, KS3, KS4)
- Recheck the Fullpattern
- The print should be a smooth area
- Improve the print by turning the X-screws very little

4.4.5 CK2 Printhead Y–Adjustment
Not on Basic versions

1. For a new machine setup, the media encoder offset should be adjusted roughly by using the value **200** (or see chapter 4.8 Encoder Calibration)
2. Activate CMYK Slots only
3. Print "**Y_Distance**"
4. Adjust CK2 to CK1 so that the comparison area looks like the same
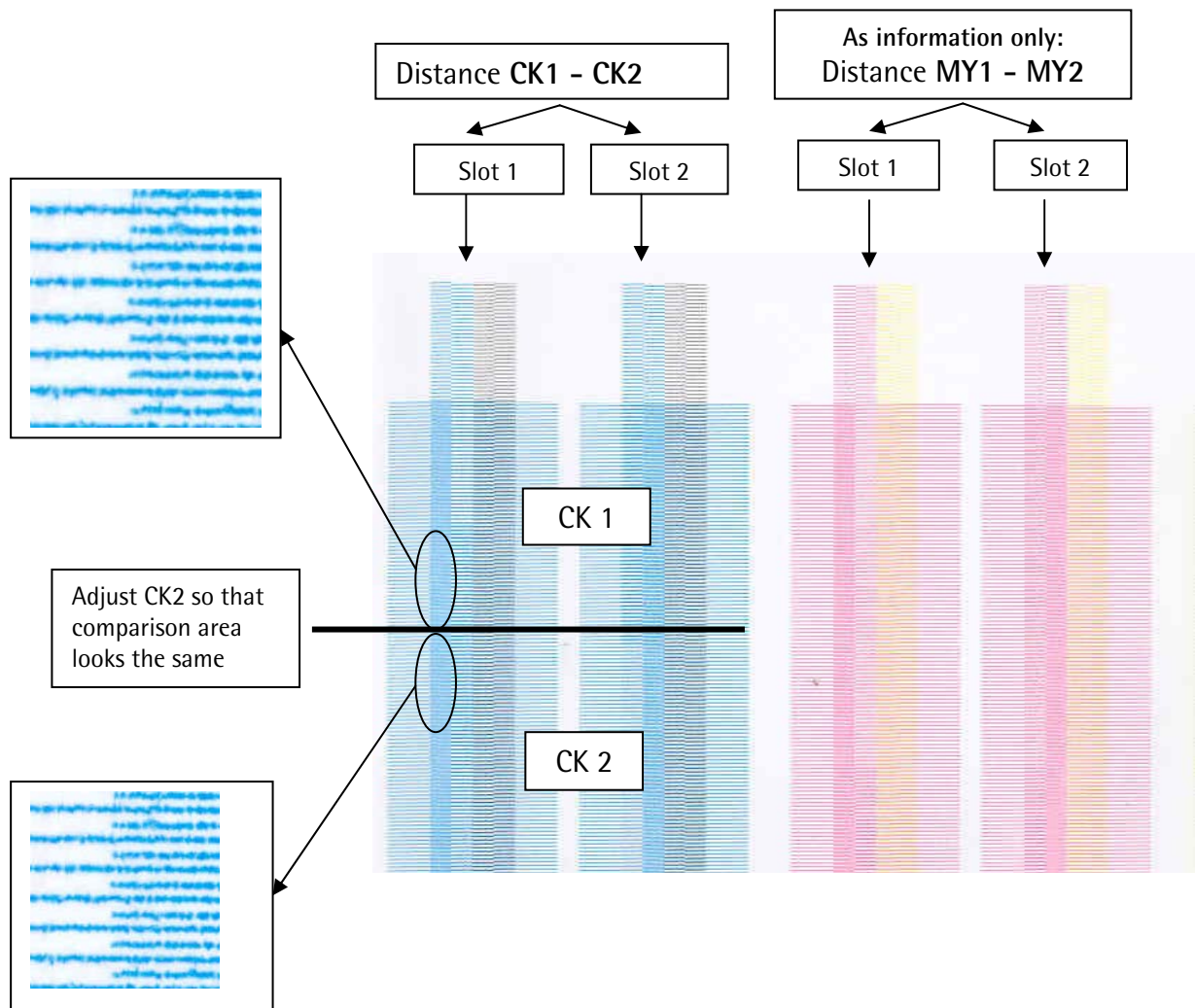
4.4.5.1 Recheck Rotation

Check the rotation from the CK print heads after a movement. If necessary it is needed to do the adjustment from the rotation again.

4.4.6 KC Printhead Y-Adjustment

1. Print "**Y_Align**"
2. Adjust printheads KC as seen in picture below. The last line is a short Cyan line from printhead KC
3. The short lines (KC printheads) are in the middle from the long lines (CK printheads).

long lines = CK Slot 1+2

short lines = KC Slot 3+4

1. short lines in the middle from the long lines

2. start with a short line at bottom

CK1+KC1

CK2+KC2
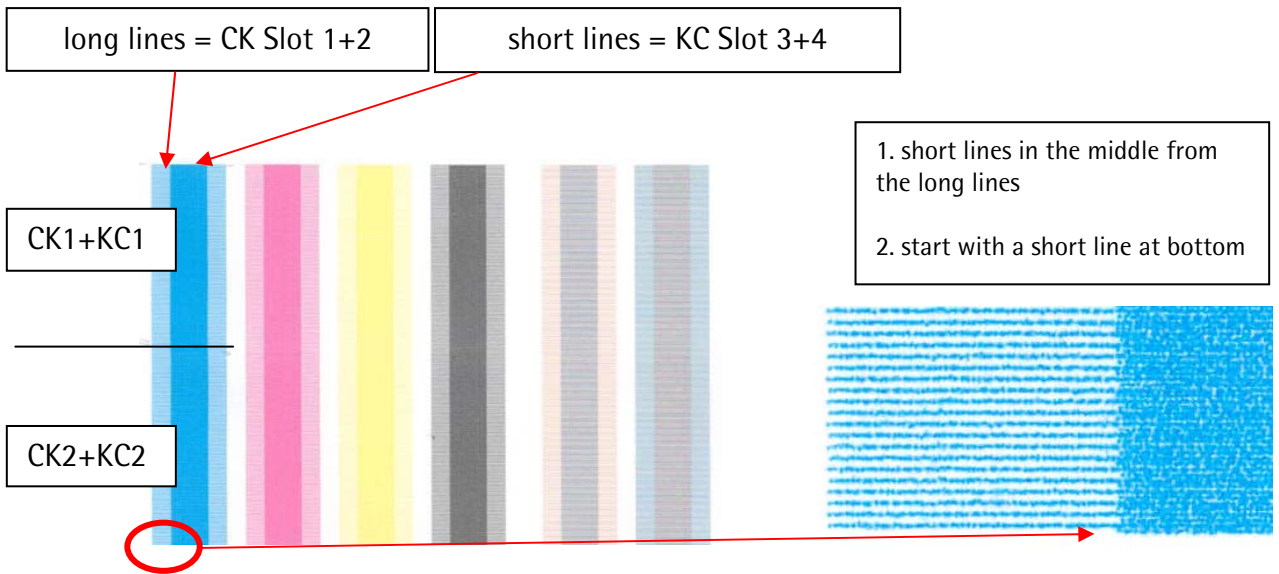
4.4.7 MY Printhead Y-Adjustment

1. Print "**Y_Align**"
2. Adjust printheads MY as seen picture below.

Long lines = CK

short lines = MY

1. short lines (magenta, yellow) in the middle from the long lines (cyan, black)

2. start with a short line (yellow)below

CK1+MY1

CK2+MY2
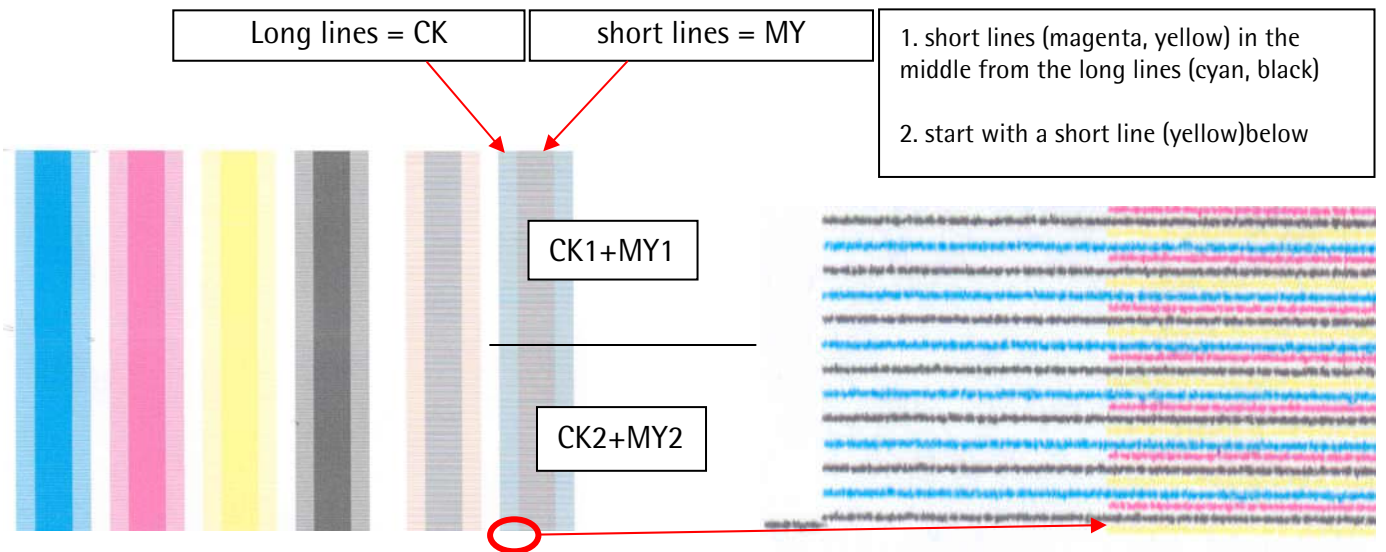
4.4.8 YM Printhead Y-Adjustment

1. Print "**Y_Align**"
2. Adjust printheads YM as seen picture below.

Long lines = YM	short lines = CK

1. long lines (yellow, magenta) in the middle from the short lines (cyan, black)

2. start with a long line (magenta) below

CK1+YM1

CK2+YM2
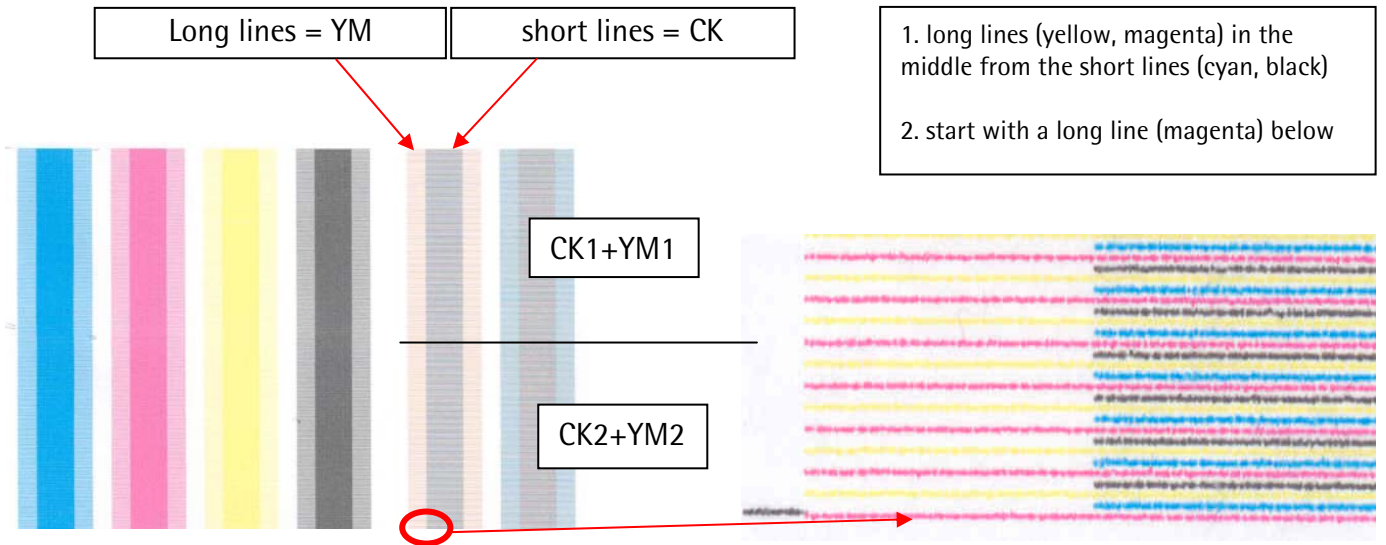
4.4.9 Additional Information

The adjustment is done as written above. These color bars are just for a help information (additional information to check all slots at the same time).

short lines = YM Slot 3+4

long lines = MY Slot 1+2

short lines = CK Slot 3+4

long lines = KC Slot 1+2

short lines = MY Slot 3+4

long lines = YM Slot 1+2
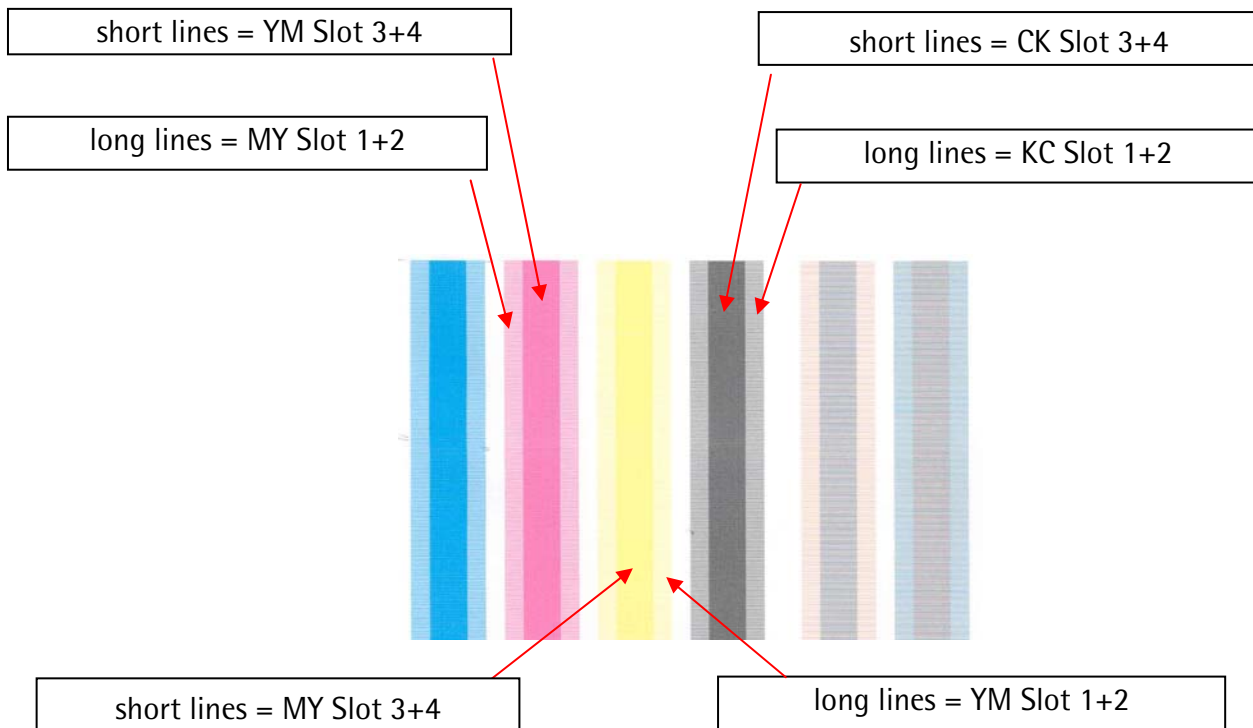
4.4.10 cm Printhead Y-Adjustment

1. Activate slots: **K S1**, **K S2**, **m S3** and **m S4**
2. Print Fullpattern
3. Adjust printheads cm as seen picture below

Light Magenta must be in the middle of black. First line is black (dashed)!

4.4.11 mc Printhead Y-Adjustment

1. Activate slots: **C S1**, **C S2**, **c S3** and **c S4**
2. Print Fullpattern
3. Adjust printheads mc as seen picture below

Light Cyan must be in the middle of Cyan. First line is cyan (dashed)!

4.4.12 Recheck CMYKcm

- Check the rotation of CK, KC, MY, YM, cm and mc print heads
- If necessary readjust the rotation
- **Tighten the Fixing screws of CMYKcm**

4.5 F5 + F6 Adjustment (W + V)

Info: F5 = standard white (underprint color)
F6 = standard varnish (overprint color)
- Adjustment from CMYK color must be finished.
- Check that all jets of the printheads are printing well, especially the **first and the last** nozzle.
- White can be printed on transparent foil (raw surface).
- White and varnish can be printed also on BlueBackPaper. Use a **"Highlighter"** with color pink or orange to highlight the ink. (over paint the printed area)
- Use a lamp from the side to build a shadow of the lines (for white)

4.5.1 F5/1 + F6/1 Y-Adjustment
(Maybe not working with all software versions)

1. For a new machine setup, the media encoder offset should be adjusted roughly by using the value **200** (or see chapter 4.8 Encoder Calibration)
2. Activate the slots **CS1 + 2**, **F5 (W) S1 + 2**, **F6 (V) S1 + 2**
3. Print Y_Distance
4. Move F5 and F6 like shown in the pictures below. The areas should look symmetric and totally identical.
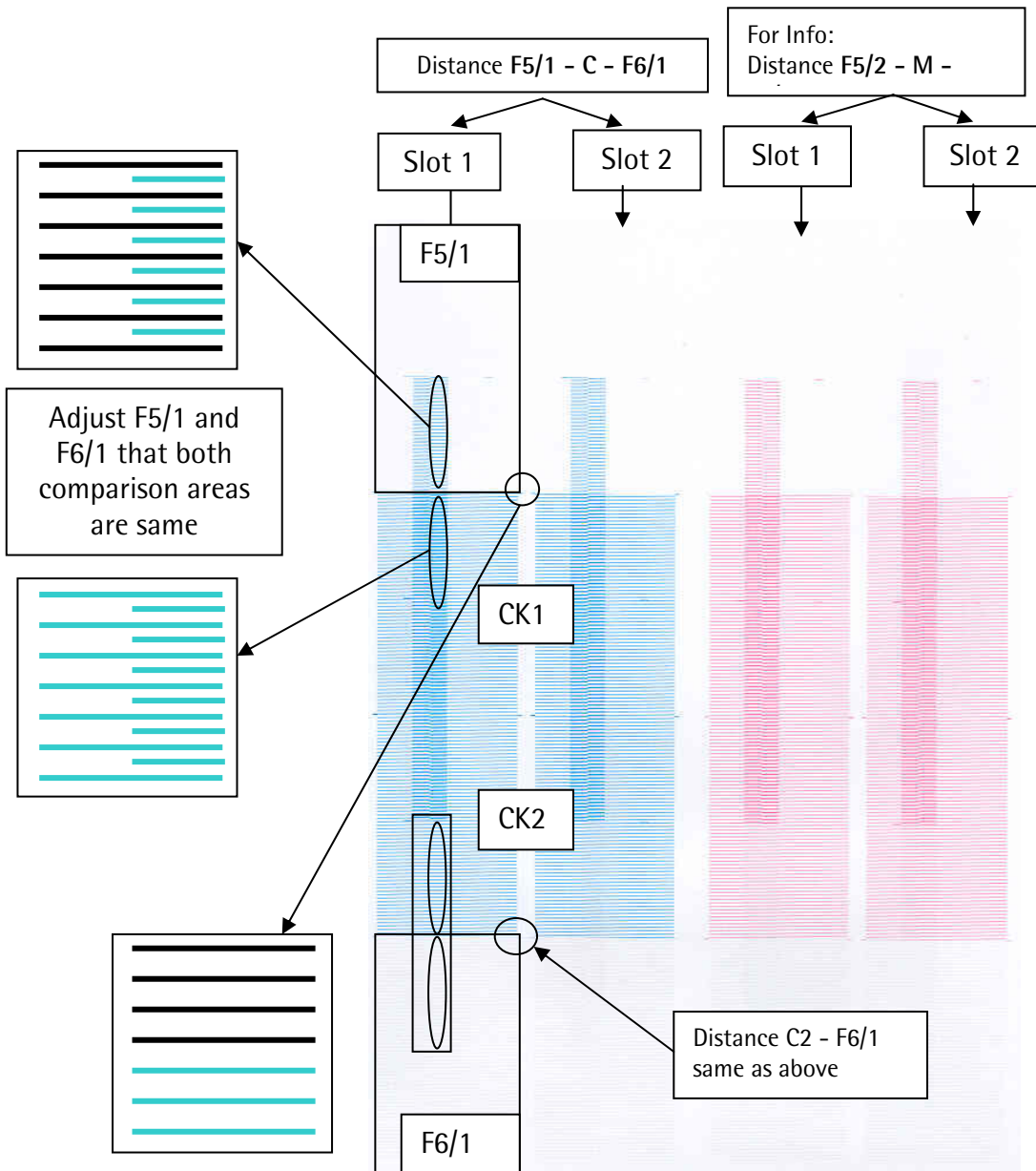
4.5.1.1 Recheck Rotation W, V

Recheck the rotation for F5/1 and F6/1 printheads – if necessary readjust.

4.5.2 F5/2 + F6/2 Printhead Y-Adjustment
Not on Basic versions

1. Activate Slots F5 (W), F6 (V) color (min. 1 slot).
2. Print **"Y_Align"**
3. Adjust F5/2 and F6/2 that the short lines are in the middle from the long lines.

Long lines = F5/1 or F6/1

Short Lines = F5/2 or F6/2

Media Direction

Last long line has to be above the last short line
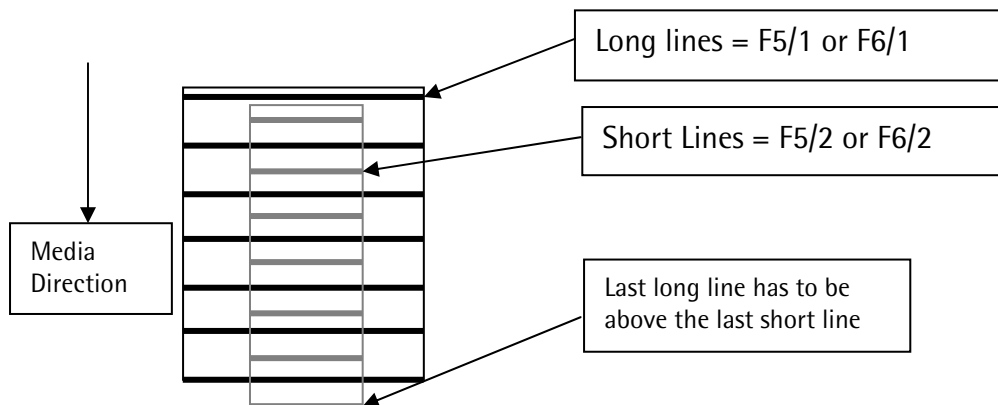
4.5.2.1 Recheck Rotation W, V

Recheck the rotation from F5 and F6 printheads – if necessary do the adjustment again.

4.6 Software Head Adjustment

4.6.1 Basics

4.6.1.1 Parameters

All corrections are done in the file *DurstPrinter.setup* (path: /usr/local/printsw/)

Parameter	Par. Description		Range	Effect/Description	Standard Value	Unit
RhoHeadMountingOffsetaabc *e.g. RhoHeadMountingOffsetCK1C*	aa b c d	Color Group Head Number Head Color Slot Number	-10 /+10 (-4/+4)	Increasing moves to the right (seen from machines output side)	0	Pixel
RhoHeadaabSdVoltage *e.g. RhoHeadCK1S1Voltage*			80-100V or Protocol-10 Protocol+10	Increasing moves the drops together (earlier firing and bigger drops)	CMYKcm: Protocol-5V WV: Protocol Or 90V if not available	Volt
RhoDFTCDataHMD			0.150 – 0.500	Head Media Distance steps for Drop Fly Time Calculation	0.150 0.200 0.350	cm
RhoDFTCDataDistanceE *e.g. RhoDFTCDataDistance400* *RhoDFTCDataDistance600X*	E	Resolution	practical: -0.320 to -0.060	Measured distance according to RhoDFTCDataHMD	*No standard, e.g.* -0.104 -0.124 -0.172	cm

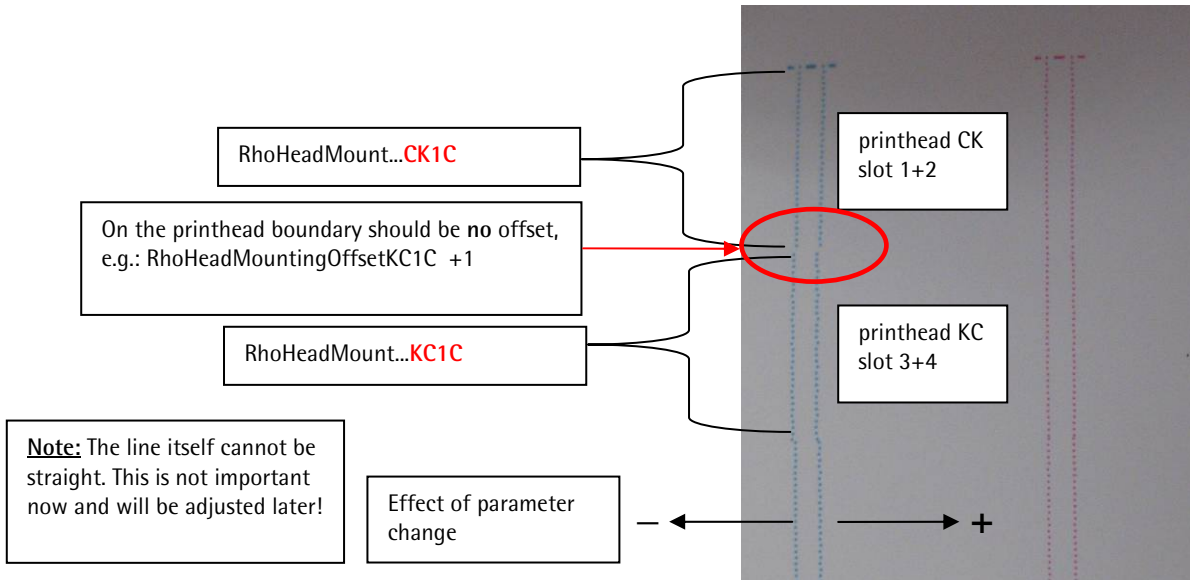### 4.6.1.2 Setting (General Procedure)

1. Open *Testcom*
2. Set *Resolution Control* to **600dpi**
3. Press **Clear DFTC** to set the Drop Fly Time to 0
4. Do the test print and analyze
5. Open **DurstPrinter.setup** file with *emacs* or a different editor (*Testcom* can stay opened)
6. Make corrections for accordant values
7. **Save** and close the file
8. Go to *Testcom* an press **Reread setup file**
9. For Voltage adjustments: Go to *Testcom*'s 2nd page and press **Set Voltage from Setup**
10. Print and analyze again

4.6.2 Adjustment Procedure
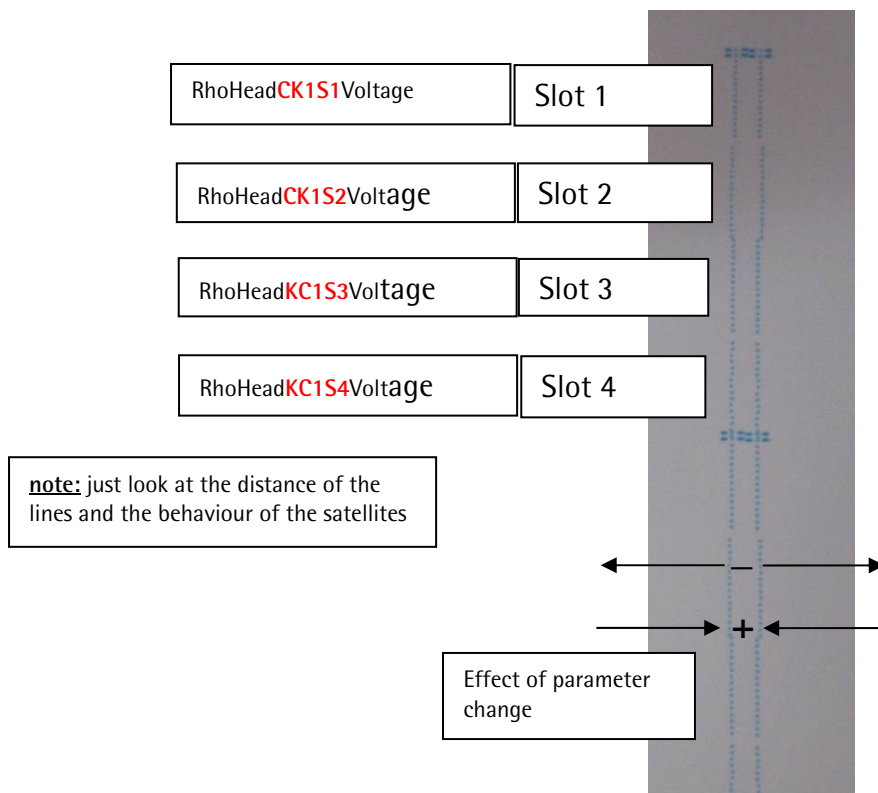Knowledge of chapter 4.6.1 needed, Experience required

4.6.2.1 Head Mounting Offset color intern

1. Use procedure from chapter 4.6.1.2
2. Print testimage "**HeadMountingOffsetAlign**" at 3mm HMD
3. Change the parameters *RhoHeadMountingOffsetaabc* to get the bars aligned to one line
4. Do this with activated **CMYK** slots **first, then** activate **c** and **m** slots instead C and M to align the light colors

	printhead CK slot 1+2
RhoHeadMount…**CK1C**	
On the printhead boundary should be **no** offset, e.g.: RhoHeadMountingOffsetKC1C +1	
RhoHeadMount…**KC1C**	printhead KC slot 3+4

Note: The line itself cannot be straight. This is not important now and will be adjusted later!

Effect of parameter change

— +

4.6.2.2 <u>Voltage – adjustment</u>

1. Use procedure from chapter 4.6.1.2
2. Print testimage "**HeadVoltageAlign**" at 3mm HMD
3. Change the parameters *RhoHeadaabSdVoltage* to get the lines itself straight
4. Do this with activated **CMYK** slots **first, then** activate **c** and **m** slots instead C and M to align the light colors

RhoHead**CK1S1**Voltage	Slot 1
RhoHead**CK1S2**Voltage	Slot 2
RhoHead**KC1S3**Voltage	Slot 3
RhoHead**KC1S4**Voltage	Slot 4

note: just look at the distance of the lines and the behaviour of the satellites
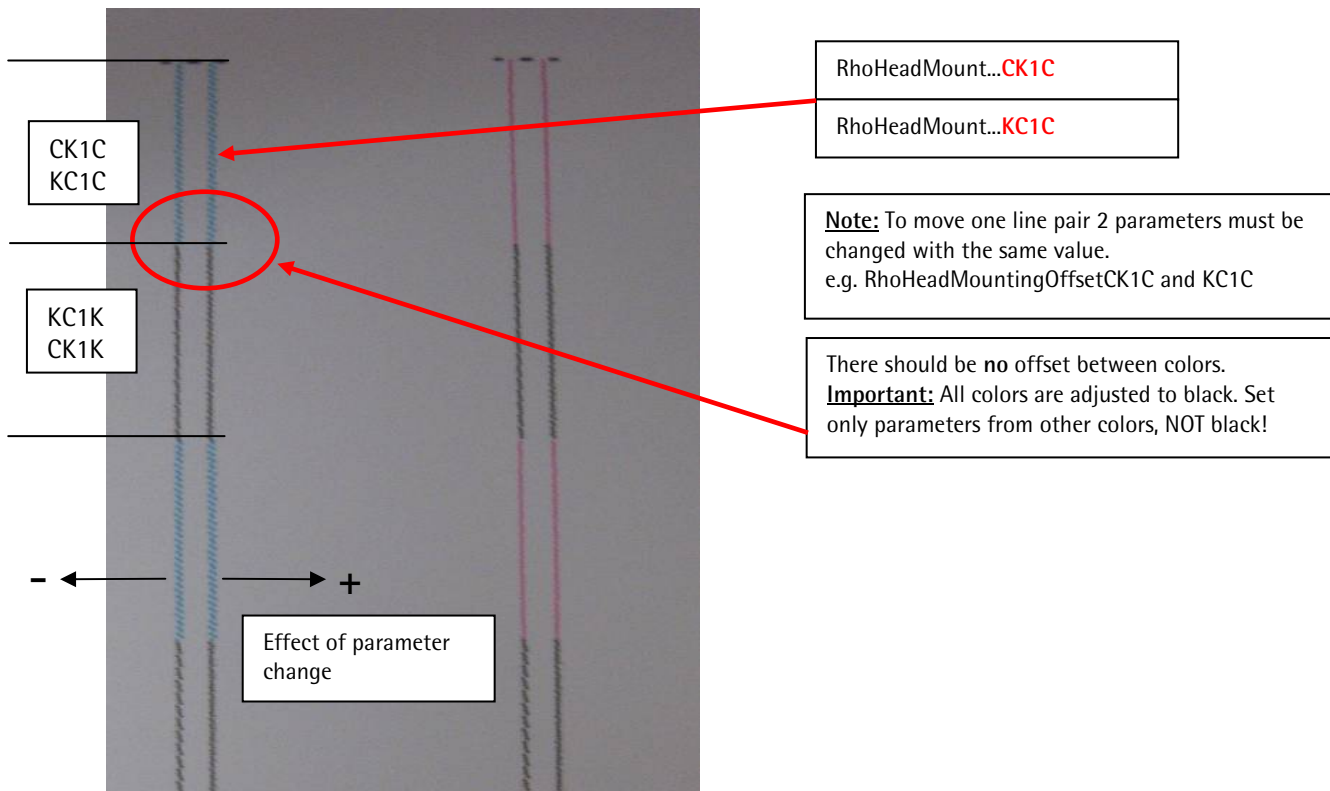
—

+

Effect of parameter change

4.6.2.3 Head Mounting Offset color intern (fine tuning)

Repeat the procedure from chapter 4.6.2 with more accuracy
(Once the voltages are adjusted well it is possible to do this fine tuning)

### 4.6.2.4 Head Mounting Offset color referencing to black

1. Use procedure from chapter 4.6.1.2
2. Print testimage "**HeadMountingOffsetAlign**" at 3mm HMD
3. Change the parameters *RhoHeadMountingOffsetaabc* to get the bars aligned to one line
4. Do this with activated **CMYK** slots **first, then** activate **c** and **m** slots instead C and M to align the light colors

RhoHeadMount...**CK1C**

RhoHeadMount...**KC1C**

Note: To move one line pair 2 parameters must be changed with the same value.
e.g. RhoHeadMountingOffsetCK1C and KC1C

There should be **no** offset between colors.
Important: All colors are adjusted to black. Set only parameters from other colors, NOT black!

CK1C
KC1C

KC1K
CK1K

− +

Effect of parameter change

4.6.2.5 <u>Recheck tuning</u>

1. Enter the current Head Media Distance to field *HMD (excl. medium)*
2. Press „**Set DFTC from Setup**" to activate *Drop Fly Time* values
3. Print testimages „*HeadMountingOffsetAlign*" and „*HeadVoltageAlign*" at 3mm HMD
4. Readjust parameters if necessary
5. Result should be everywhere a thin straight line

e.g. correction of voltage necessary (on Slot 2)
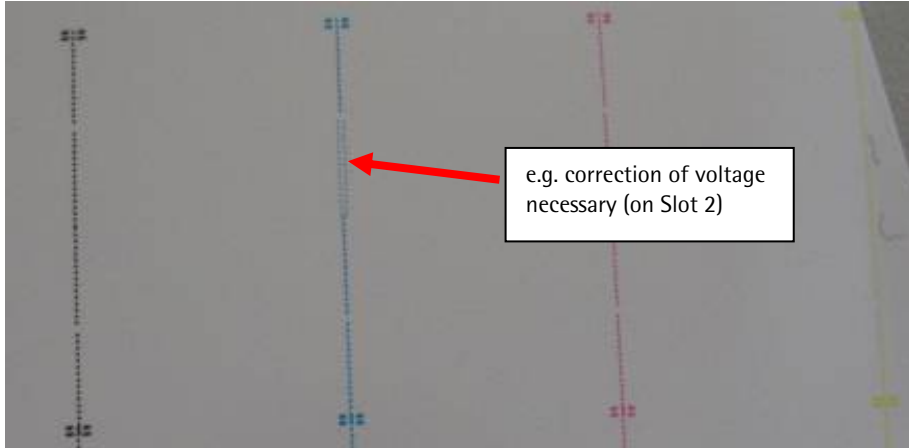
4.6.3 Drop Fly Time

4.6.3.1 Parameters

Parameter	Standard Value	Effect/Description	Range	Unit
RhoDFTCDataHMD	0.150 0.200 0.350	Head Media Distance steps for Drop Fly Time Calculation. 3 measurements – division by space	0.150 – 0.500	cm
RhoDFTCDataDistance400	*No standard, e.g.* -0.151 -0.189 - 0.297	Measured distance according to RhoDFTCDataHMD For 600dpi High Speed/all colors	practical: -0.320 to -0.100	cm
RhoDFTCDataDistance600X	*No standard, e.g.* -0.104 -0.124 - 0.172	Measured distance according to RhoDFTCDataHMD For 600+dpi default/all colors	practical: -0.280 to -0.060	cm
RhoDFTCDataDistance600XCyan	*No standard, e.g.* -0.108 -0.130 - 0.178	Measured distance according to RhoDFTCDataHMD For 600+dpi default, only if C and K differ	practical: -0.280 to -0.060	cm

4.6.3.2 Distance measurement

1. Print Encodertestimage for *HighSpeed* and Standard (*600dpi)* with all the different distances from *RhoDFTCDataHMD* (default: 6 times)
2. Measure the *Distances d* at all print outs
3. Close the DurstPrinter Software
4. Enter the compensations values *d* in the file DurstPrinter.setup
5. Save and close the file and do the prints again
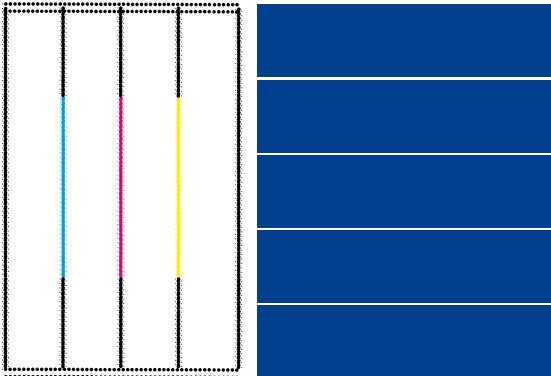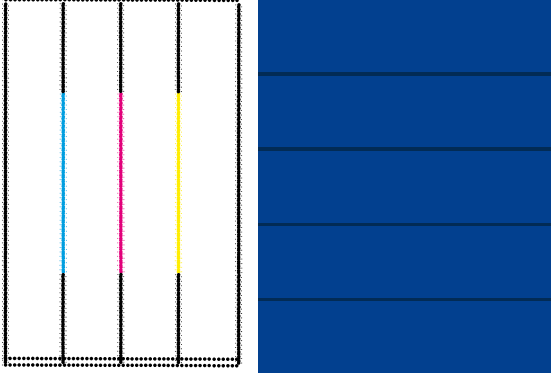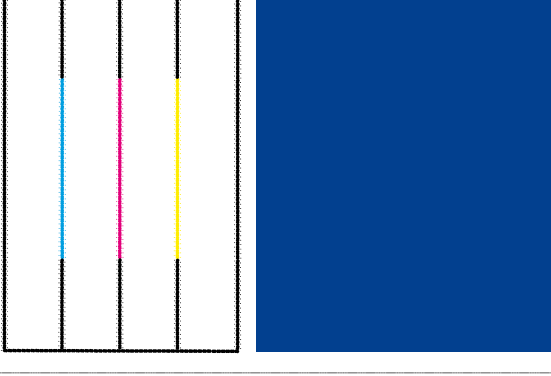6. Make the fine tuning now, to get the lines perfect covered

Distance d
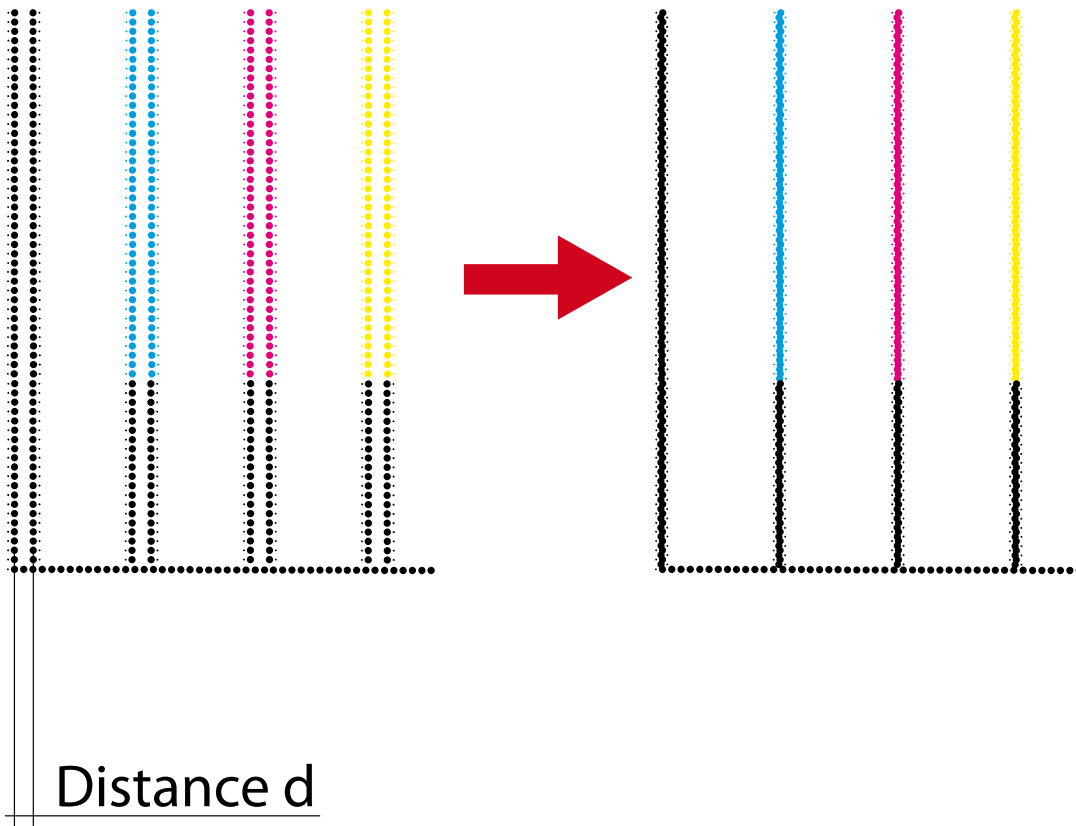
4.7 Encoder Calibration

4.7.1 <u>Procedure</u>

1. Print Encodertestimage for Standard (*600dpi)*
2. Analyze the Encodertestimage according to the illustrations below
3. Change the Encoder Basic Calibration Value
4. Redo this procedure to get a perfect printout

Make changes in steps of tens or more for the rough adjustment to get a visible difference!

4.7.2 <u>Adjustment</u>

Encoder Testimage	Description
	- Double lines in horizontal direction - White gaps in the color field Solution: - Lower the Encoder Offset Value
	- Double lines in horizontal direction - Dark overlaps in the color field Solution: - Enhance the Encoder Offset Value
	Encoder Offset perfect adjusted!

4.8 Slot Border Compensation

Software PRINTSW V1.0 Rev.03 RC3 and higher!

4.8.1 <u>Description</u>

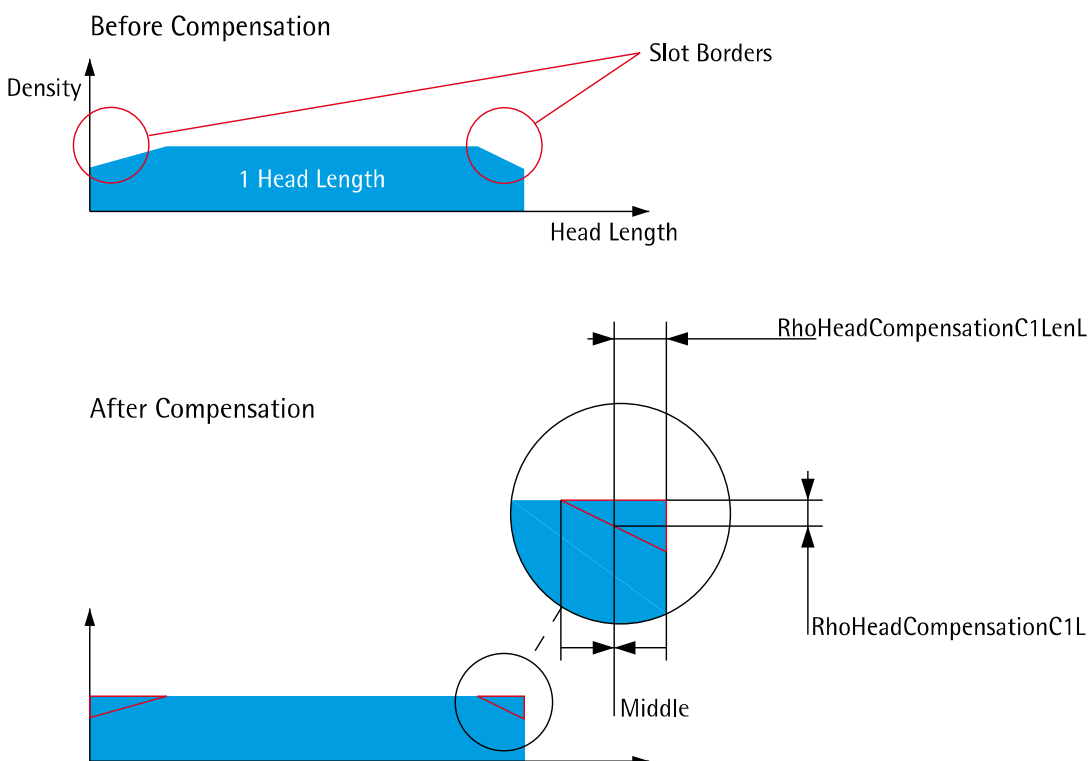**Purpose**
Reduction of the banding effect
Print heads with serial #890 2333 and higher are built with slots of newer generation and may show this effect in a reduced dimension.

Reason
The current slot geometry makes it possible, that the ends of the slots are not printing with the same density as the nozzles in the centre. The Slot Border Compensation can minimize this effect by increasing the density in this areas.
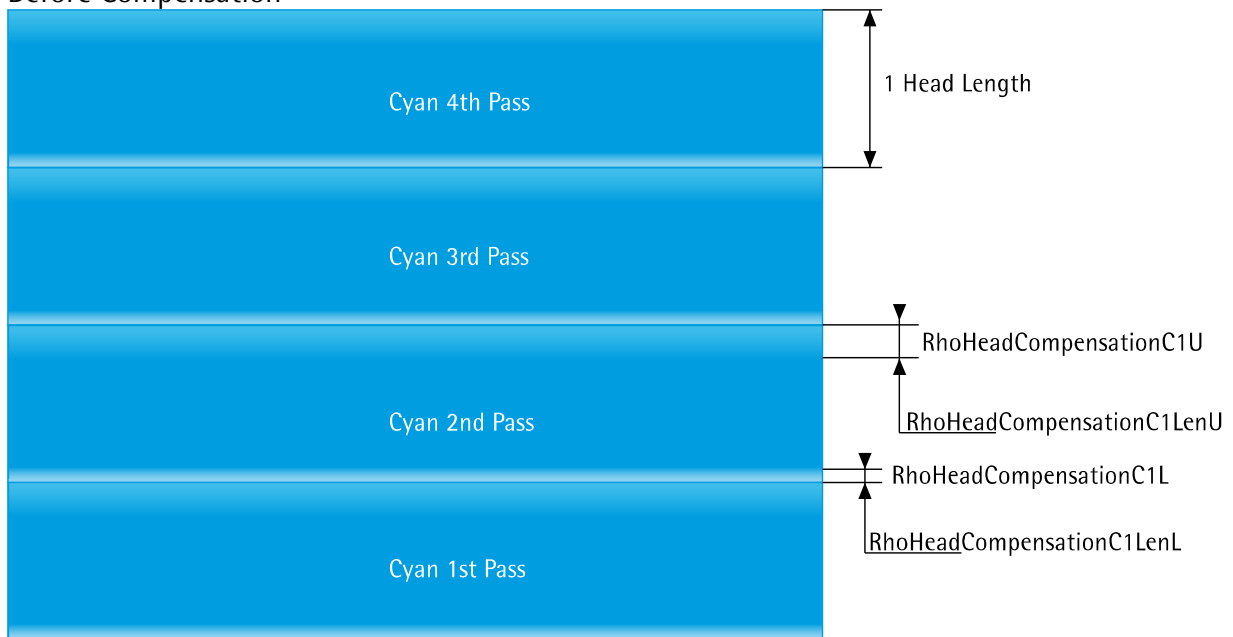
4.8.2 <u>Parameters</u>

Parameter	Par. Description	Range	Effect/Description	Unit
RhoHeadCompensationABP *e.g.* *RhoHeadCompensationC1U* *RhoHeadCompensationC1L* *RhoHeadCompensation5_2U* *RhoHeadCompensation5_2L* *RhoHeadCompensationm1U* *RhoHeadCompensationm1L*	A Color B Head Row(Line) P Position	0 – 10 (practical)	Increasing enhances the density of the for the respective length at the upper or lower end of **all slots of one color in one line**	%
RhoHeadCompensationABLenP *e.g.* *RhoHeadCompensationC1LenU*		0.200 – 0.800 (practical)	Value for effected length of the compensation of all slots of one color in one line. Measured from Slots 1st or last nozzle.	cm

Before Compensation

Density

Slot Borders

1 Head Length

Head Length

After Compensation

RhoHeadCompensationC1LenL

RhoHeadCompensationC1L

Middle

4.8.3 <u>Adjustment</u>

1. Unplug the fire impulse line of all print heads in the second level (all number 2 Print Heads).
2. Load Bluebackpaper (the wider, the better) in Printer Software with a standard HMD (2 mm)
3. Open Testcom and set the Left and Right Margin
4. Activate **all slots of one color** (e.g. C1, C2, C3, C4) and set the Paper Advance to **"1022"**
5. Activate **unidirectional** and **QM 2-Pass**
6. Print **4** or more **Full Pattern**
7. Take out the print of the machine and analyze
8. Take the density and length values in the **middle** (see picture above) of the **weak areas**!
9. Make the corrections in the DurstPrinter.setup and redo until the result is ok – do it for all the other colors (in some cases also the quality of white can be enhanced pretty much)
10. To do for the heads in the 2nd level (row), disconnect the fire impulse for level 1 only.

e.g. Cyan Slots of 1st Level
Before Compensation

After Compensation
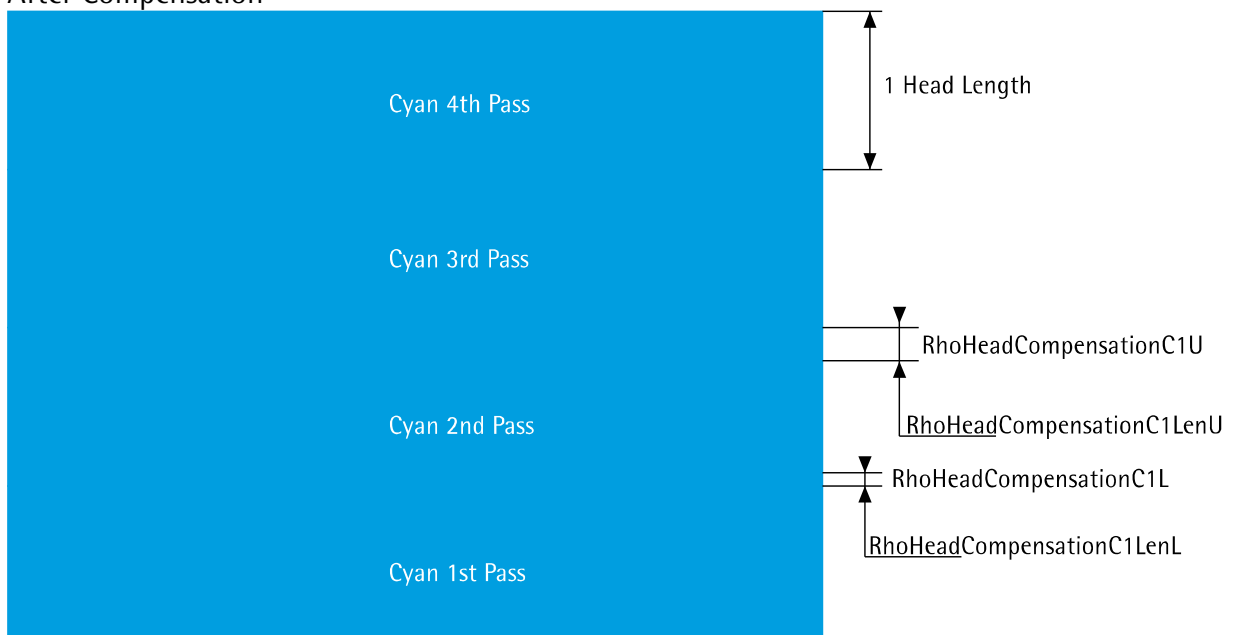
4.9 Print Position Offsets

Parameter	Requirement	Effect/Description	Unit
RhoRefPosCarriage	3 digits *e.g.* *-43* *043*	Increasing moves the print to the guide (purge) side, decreasing moves it in the opposite direction 1mm = 24 Pixel	Pixel
RhoStopSensorOffset		Increasing moves the print to the machines input side (border grows), decreasing moves to in the machines output side (border shrinks)	1/10mm

4.9.1 X – Direction (Carriage Direction)

- Take a well cut (straight edges, right angles) board
- Create a Media Channel according to your board with 0 as default Media Margins on all 4 sides
- Print a cropped image (ideally a plain color field) aligned to the **right** side with a custom border (e.g. 1cm)
- Measure the real border
- The difference between the entered and the real border can be compensated with the parameter RhoRefPosCarriage in the DurstPrinter.setup file
- The PrintSoftware must be closed when changing the parameter
- Reread the Setup file in the Testcom and send the new offset to the Rho
- Reinitialize the print carriage (with the GoInit button)

4.9.2 Y – Direction (Media Transport Direction)

- Take a well cut (straight edges, right angles) board
- Create a Media Channel according to your board with 0 as default Media Margins on all 4 sides
- Print a cropped image (ideally a plain color field) aligned to the **top** side with a custom border (e.g. 1cm)
- Measure the real border
- The difference between the entered and the real border can be compensated with the parameter RhoStopSensorOffset in the DurstPrinter.setup file
- The PrintSoftware must be closed when changing the parameter