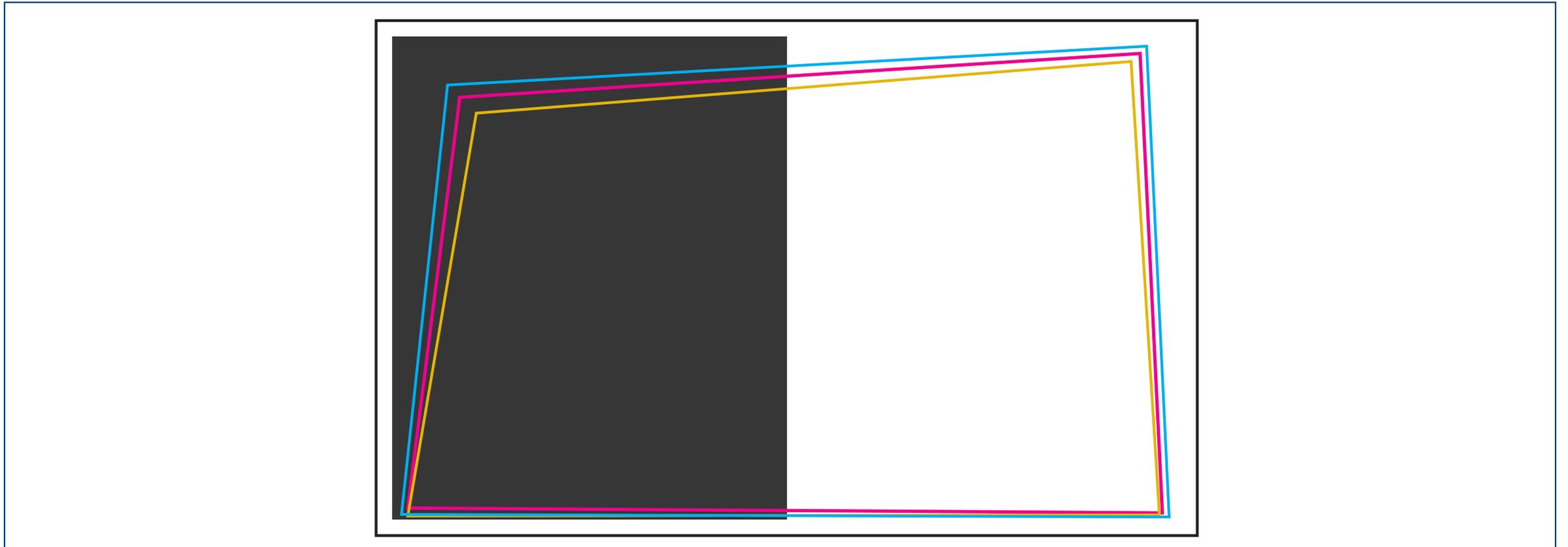


Compensating paper stretch



Prinect User Days

Andreas Gembe | Print Media Center | November 2015





Overview

- The problem
- The impact
- Influencing factors
- Compensation option 1
 - Paper Stretch Compensation
- Compensation option 2
 - Automatic Paper Stretch Compensation - **New Product**
- Comparison

The problem



*“At each production
there is a stretch
of the print substrate”*



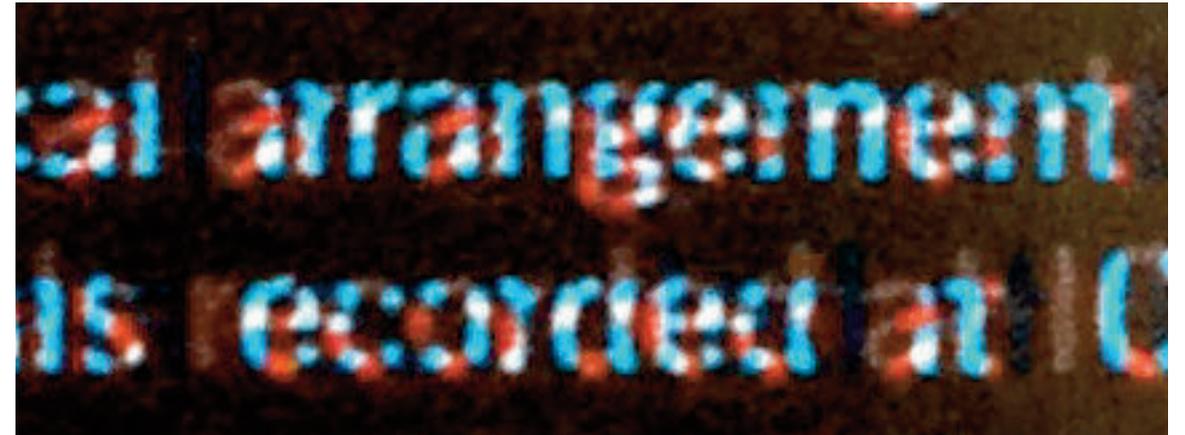
The impact

Loss of Quality

Fonts are unreadable

Details in the image are blurred.

Jobs with multiple ups show a color shift.

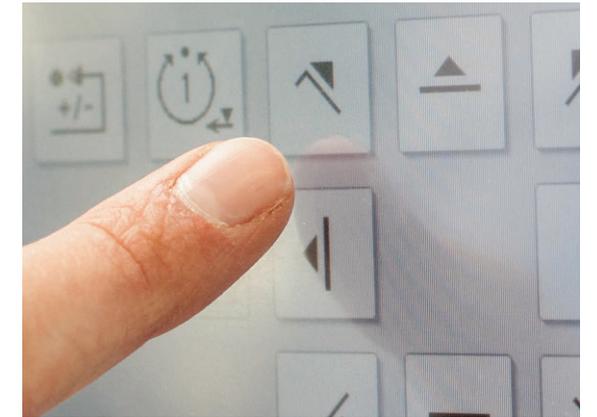




The impact

Increased makeready time and more waste sheets

Adjusting a sellable register requires experience and time - the result is always a compromise



"Mechanical" adjustment by pulling plate - even more time consuming and increased paper consumption



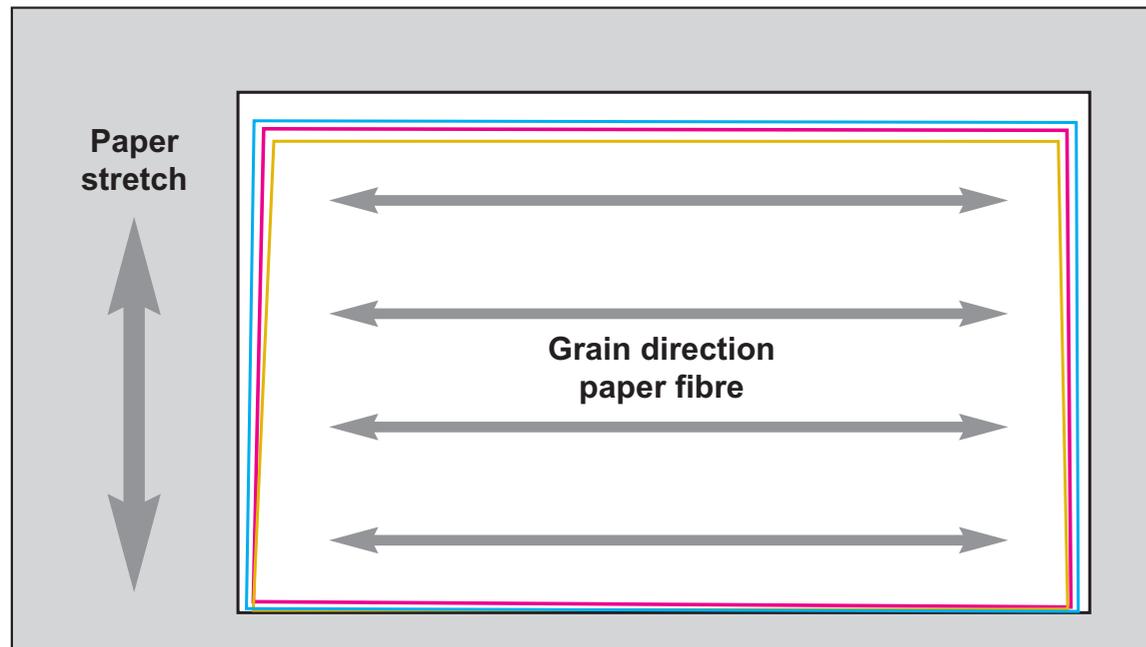


Influencing factors

Grain direction

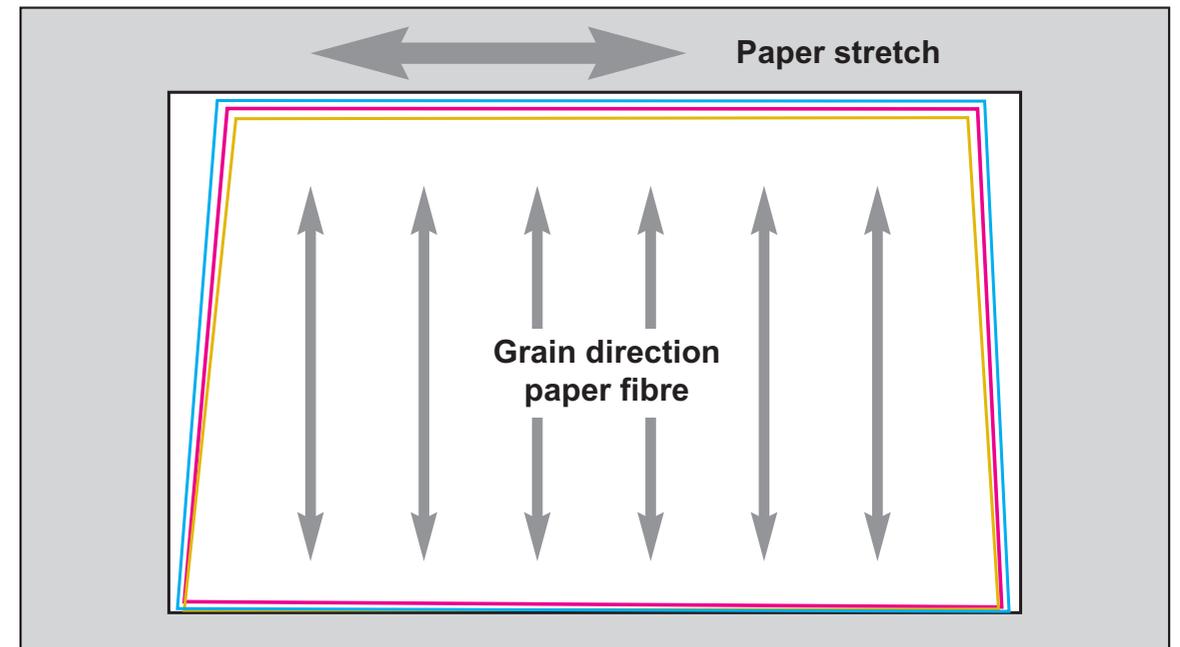
Long grain

Schematic illustration of the paper stretch



Short grain

Schematic illustration of the paper stretch



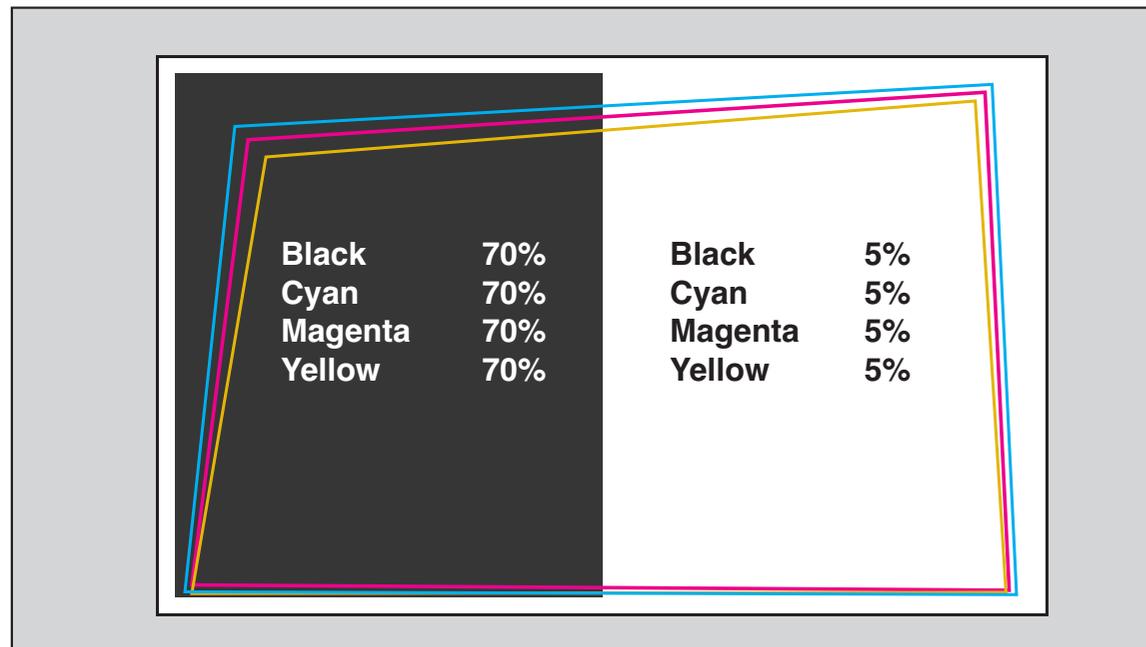


Influencing factors

Ink coverage of the print job

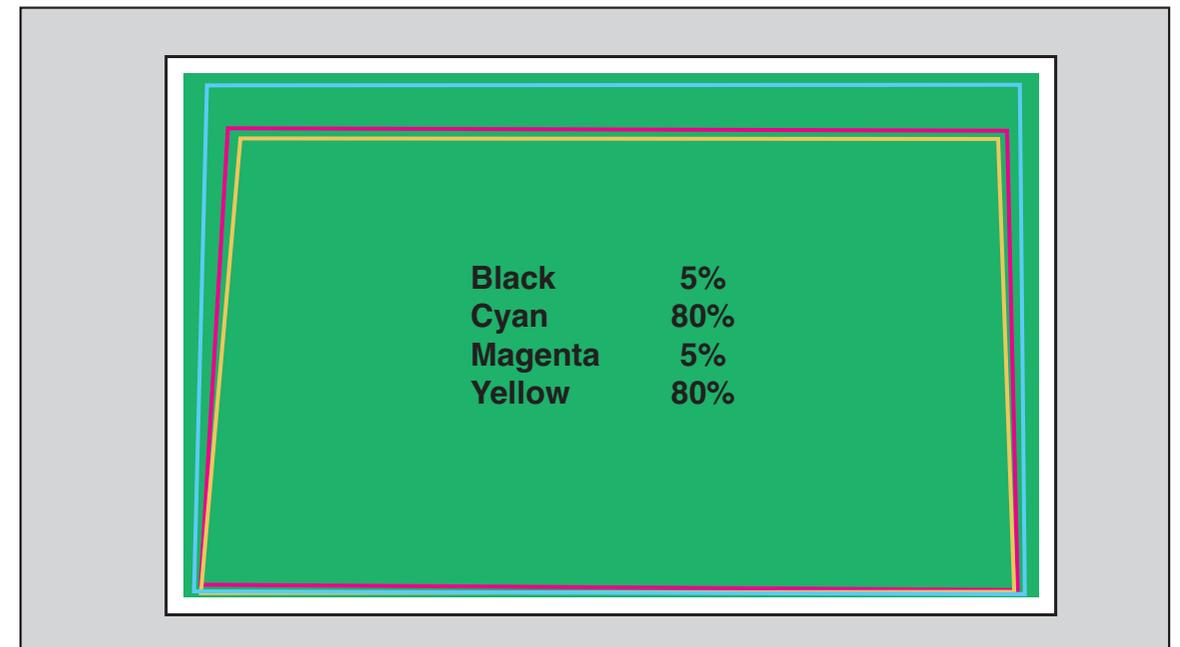
Compare areas with high/low ink coverage

Schematic illustration of the paper stretch



Different ink coverage from unit to unit

Schematic illustration of the paper stretch





Additional influencing factors



Paper type



Used printing units



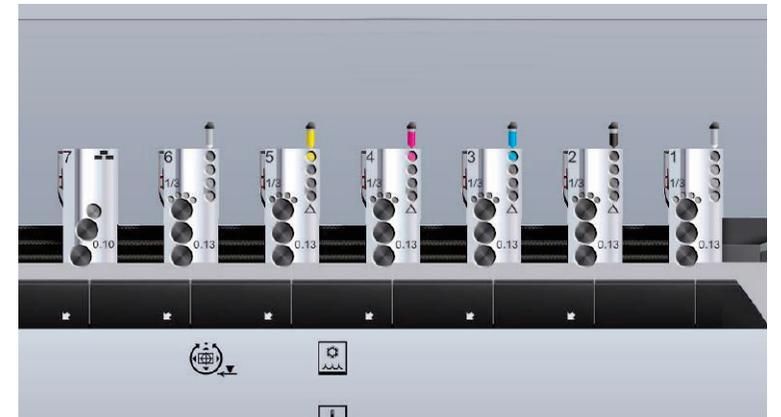
Conditioning paper



Ink / spot colors



Grammage



Color sequence



Compensation Option 1 - "Paper Stretch Compensation"

Compensation of individual print jobs

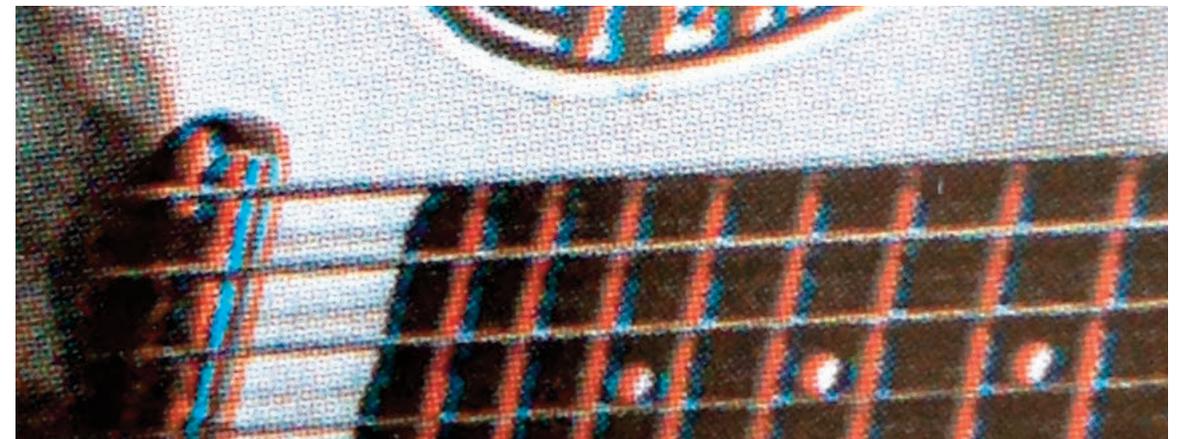
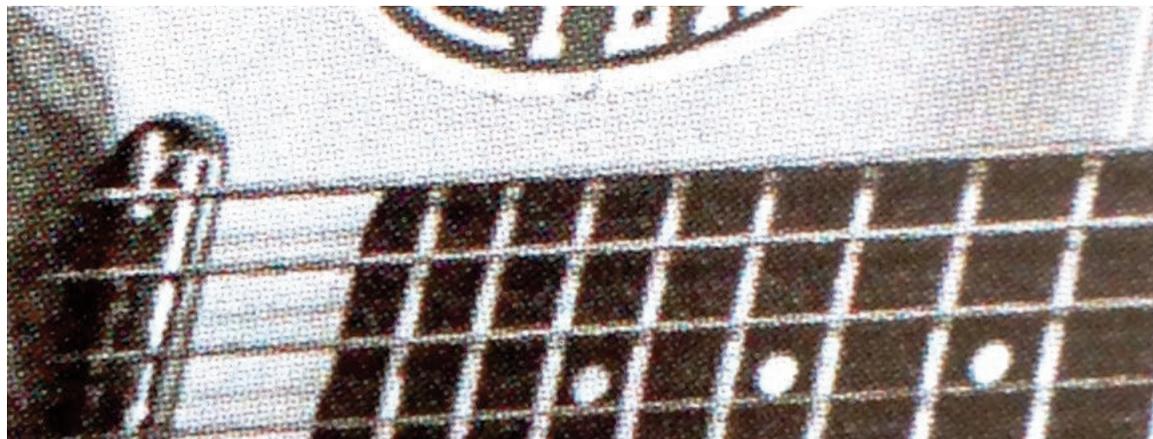
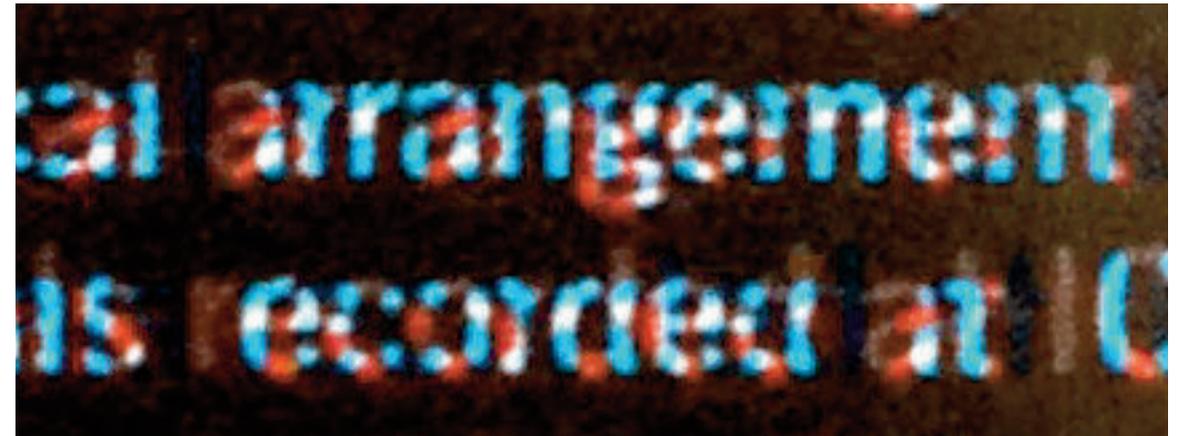
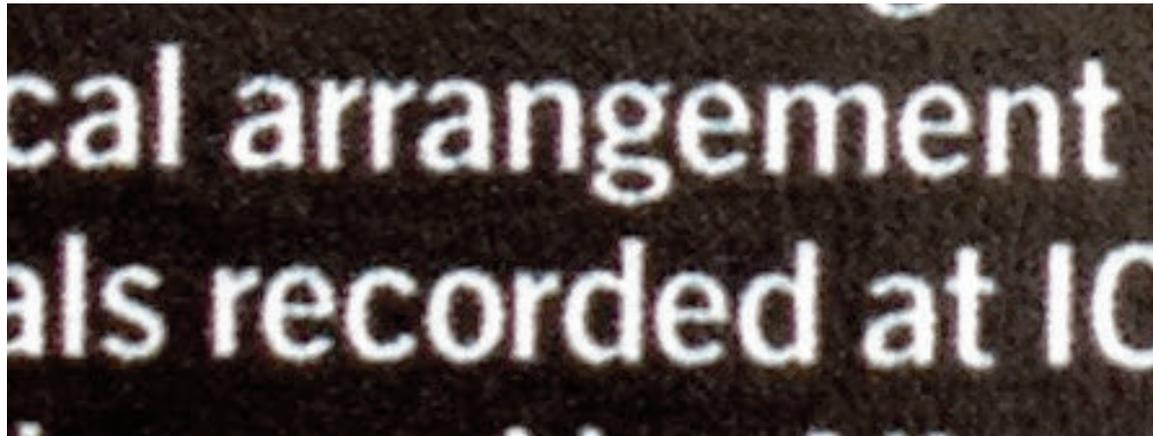
For the compensation of individual print jobs the software "Paper Stretch Compensation" can be used.

This software can compensate individually any type of print job, regardless of any factors.

As a result, a register quality is achieved which shows almost no register differences.

Druckwerk	Farbe	Referenz
1	PANTONE 159 C	
2	Black	Referenz
3	PANTONE 660 C	
4	Cyan	
5	Magenta	
6	Yellow	

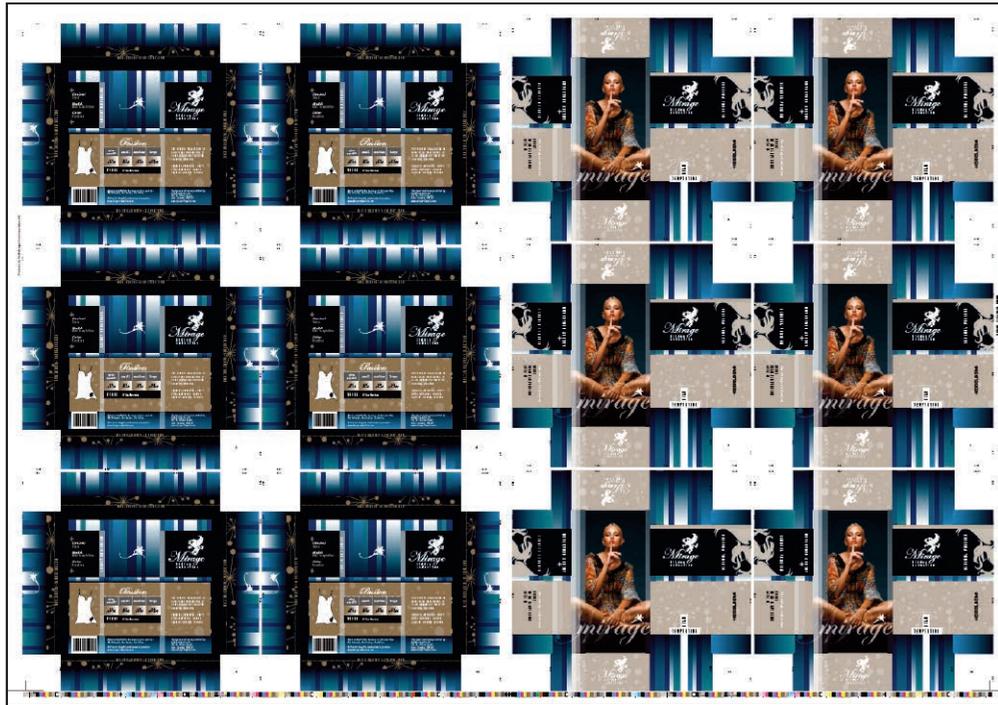
Compensation Option 1 - Comparison with and without compensation



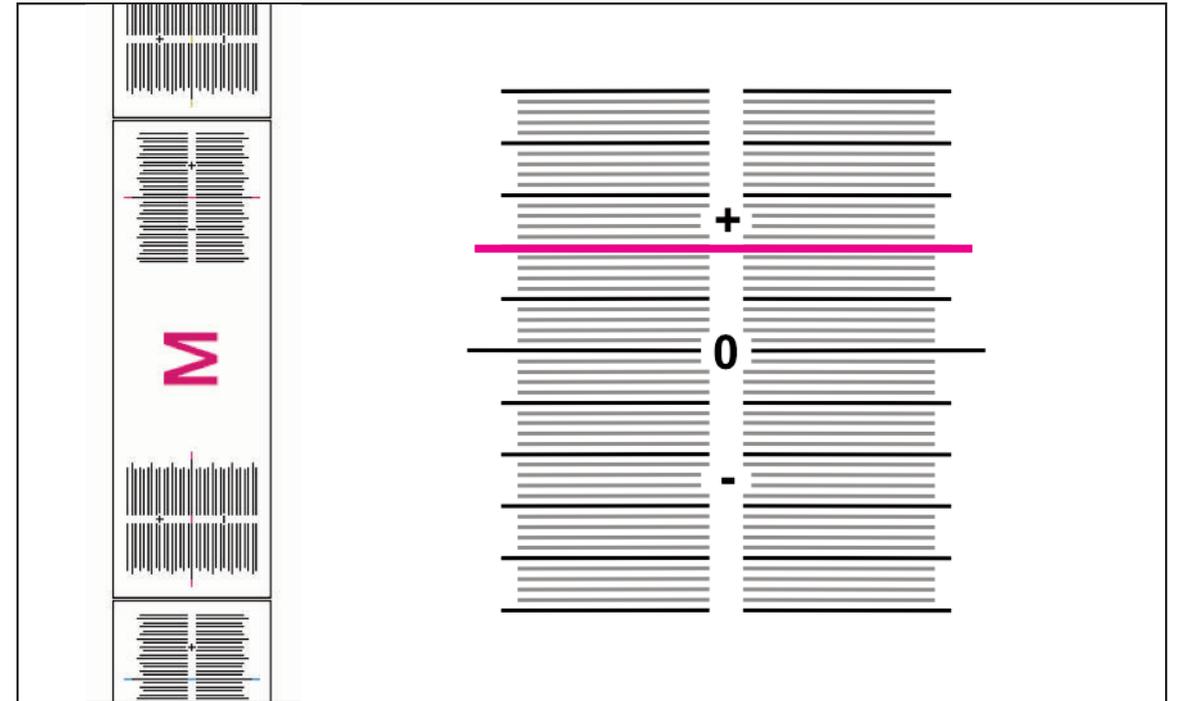


Compensation Option 1 - Workflow

Step 1 - Printing the job



Step 2 - Evaluate register deviation





Compensation Option 1 - Workflow

Step 3 - Transfer values in the Workflow System

Gesamtregisterabweichung:

Druckwerk		±	↔ [mm]	±	↓ [mm]
1		-	0.1	-	0.08
2			Referenz		Referenz
3		+	0.07	+	0.05
4		+	0.09	+	0.07
5		+	0.1	+	0.1
6		+	0.13	+	0.11

Web-Press-Support... Iterative Korrektur...

Positionsfeld

Step 4 - Exposing new printing plates





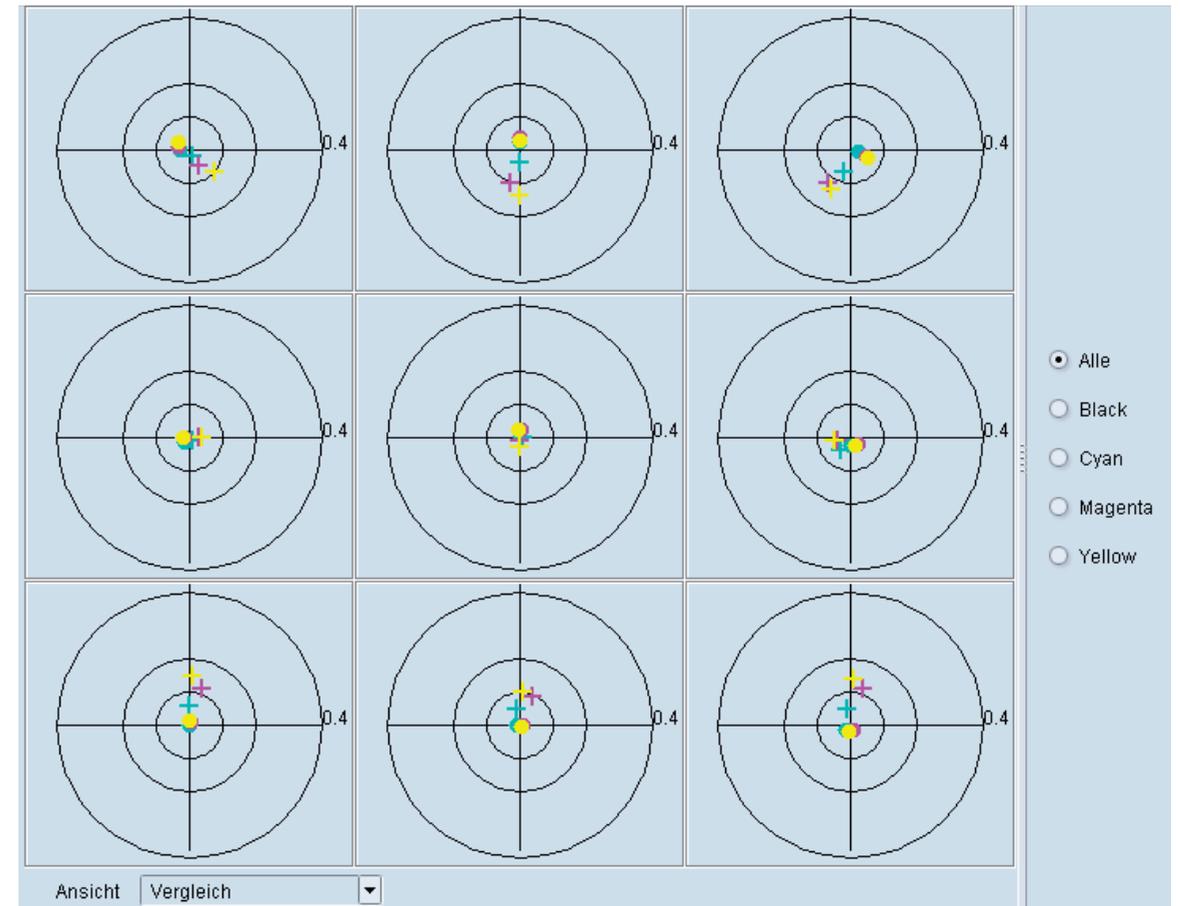
Compensation Option 2 "Automatic Paper Stretch Compensation"

Compensation of print jobs based on a "Paper Stretch Forecast"

For the compensation of print jobs that are produced with the identical materials and constant parameters, the software "Automatic Paper Stretch Compensation" can be used.

With this software it is possible to forecast the paperstretch. The exposure of a second set of plates is eliminated.

The result is a considerable reduction of register deviations.

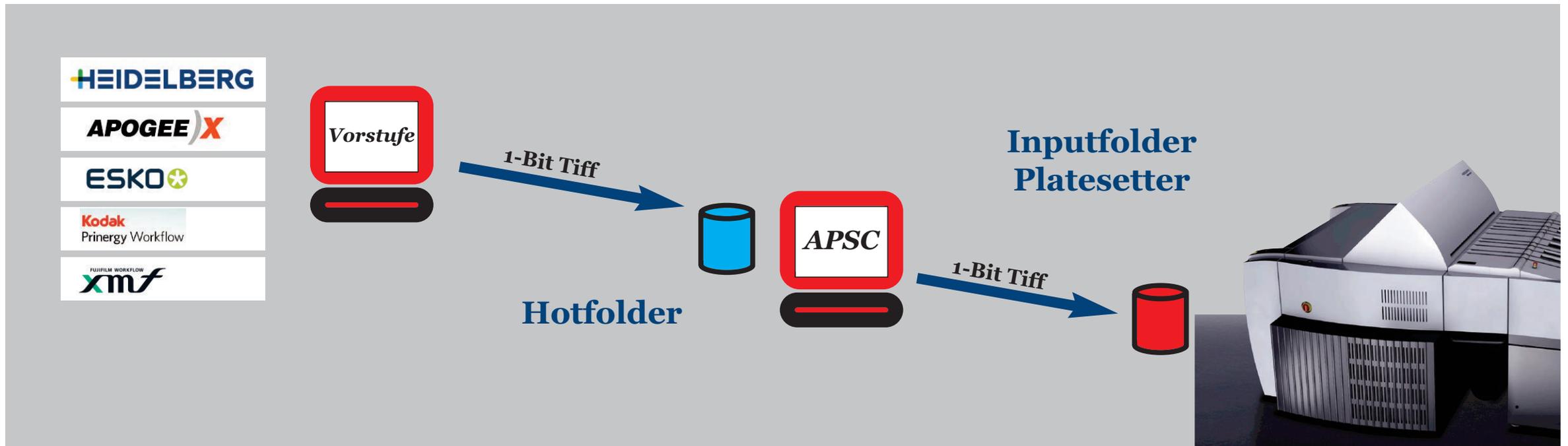




Automatic Paper Stretch Compensation - Workflow

Connecting to the workflow

The actual version of the software works completely workflow independent.
A Prinect-workflow integrated version will follow at a later date





Automatic Paper Stretch Compensation - Workflow

Definition of all process parameters

The basis for the paper stretch forecast is a "Papercalibration".

For each type of paper the job parameters must be defined.

Possible Color sequences

Reference color is always Black and must be printed in the first printing unit.
Subsequent process colors can be printed in any order,
Spot color must be printed after the process colors



Paper type



Used printing units



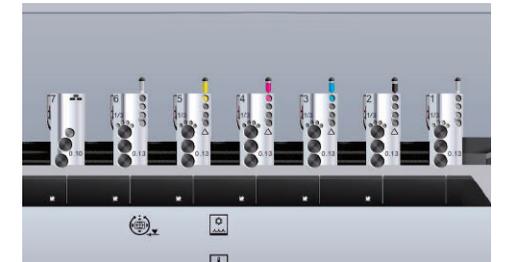
Grain direction



Ink



Grammage



Color sequence



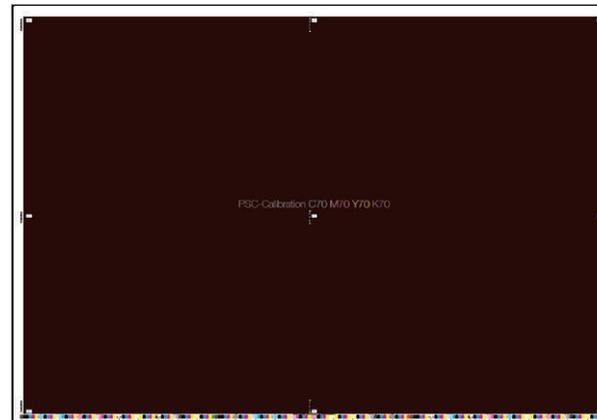
Automatic Paper Stretch Compensation - Workflow

Creation and exposure of the calibration testforms

To determine the paperstretch at least two test forms must be printed with a widely differing inkcoverage.



Kalibrierform 1	
Flächendeckung	
K	10%
C	10%
M	10%
Y	10%



Kalibrierform 1	
Flächendeckung	
K	70%
C	70%
M	70%
Y	70%

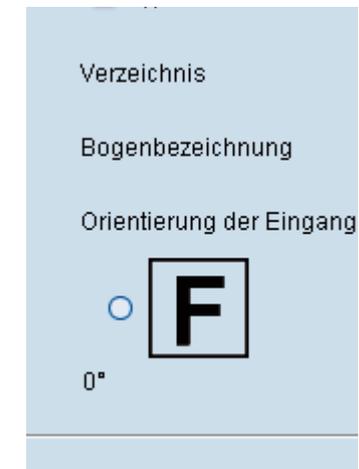
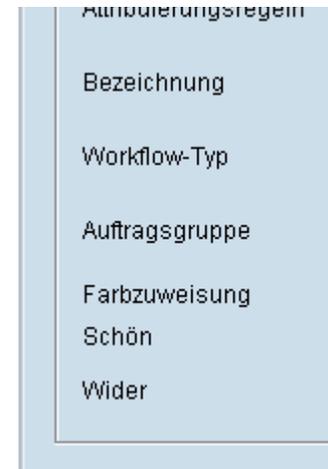
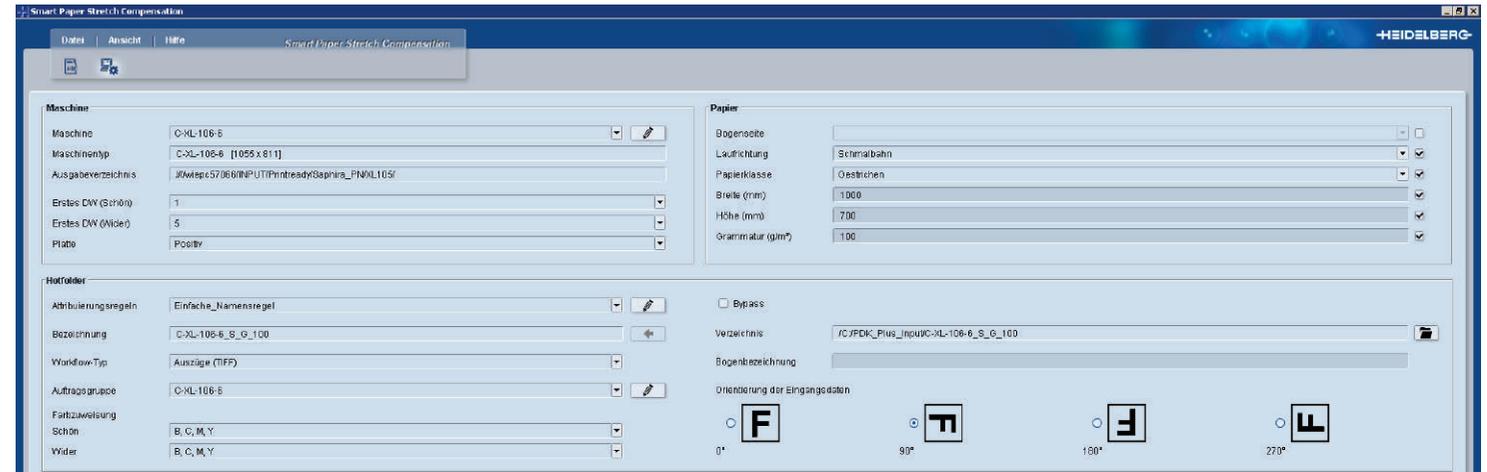


Automatic Paper Stretch Compensation - Workflow

Configuration hotfolder

The configuration for different curves is performed by using individual hot folders.

Variable parameters, such as color separation and sheet side, are read out of the names of the exposure files.



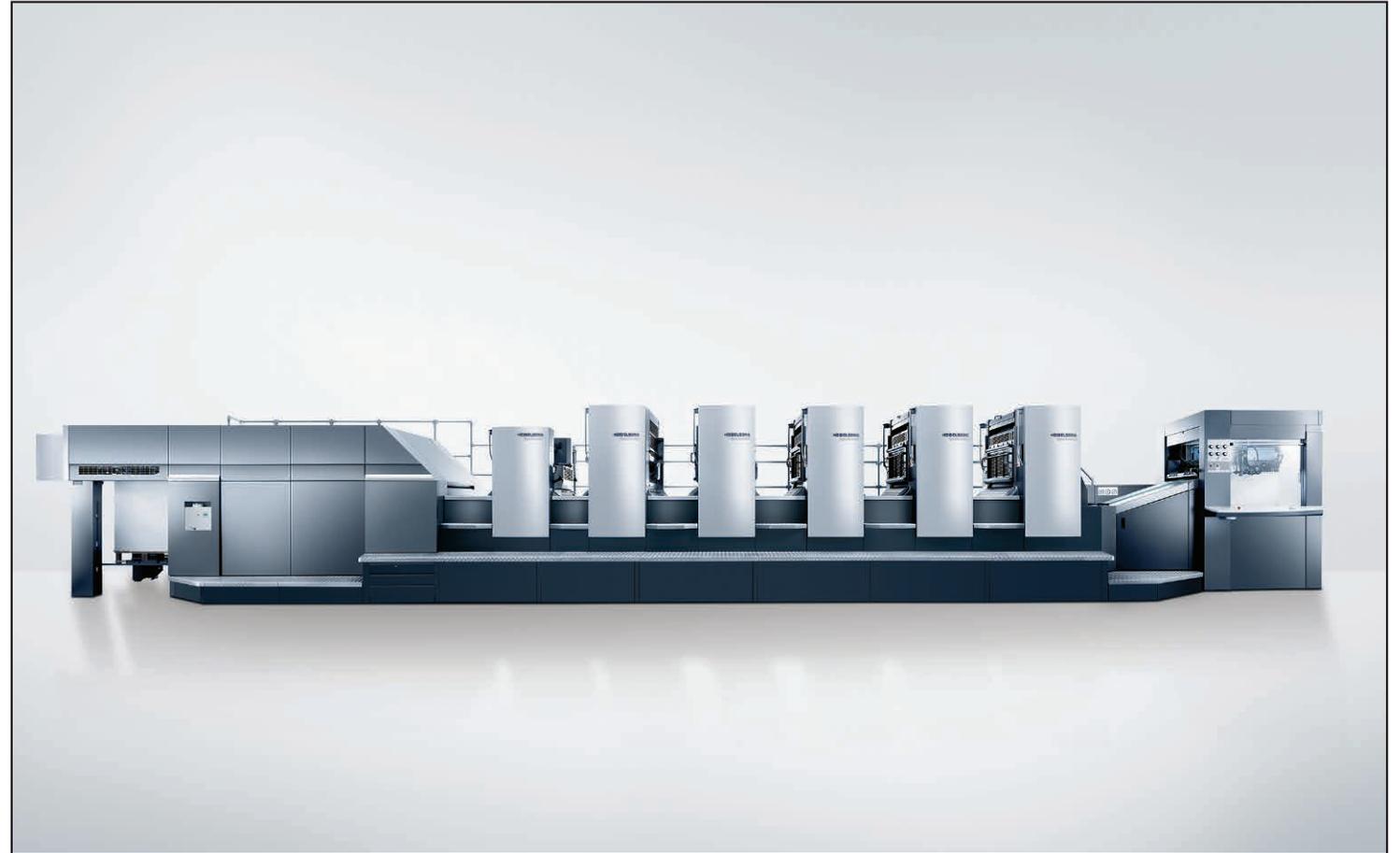


Automatic Paper Stretch Compensation - Workflow

Printig calibration jobs

The printing of the test forms must be performed under production conditions.

Parameters such as color density, dampening settings and the consumables used may not differ from the later production conditions.

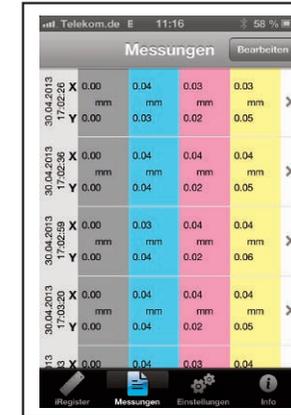
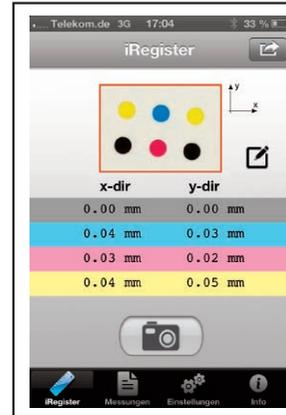




Automatic Paper Stretch Compensation - Workflow

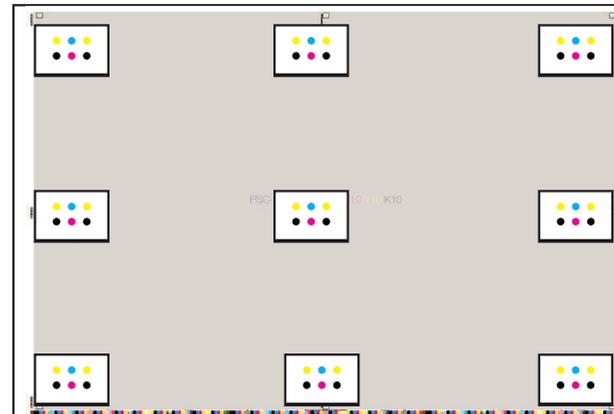
Evaluate register deviation

For the determination of the register deviation, we use the App "iRegister" by **TECHKON** Erfolg ist messbar

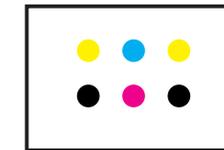


Interface
Techkon-App "iRegister"

For the calibration, the register deviations of CMYK are measured. Spot colors are not measured.



Positioning measuring mark





Automated Paper Stretch Compensation - Workflow

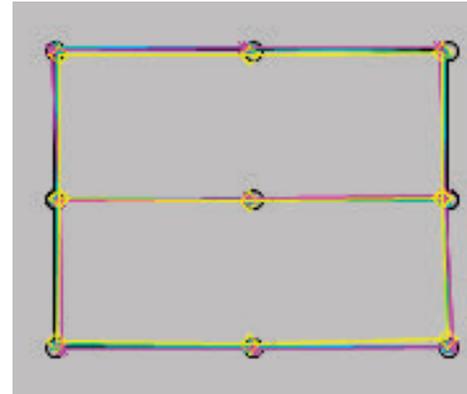
Chart of register deviation

The higher the ink coverage, the higher the paper stretch.

Register deviation rises accordingly to paperstretch.

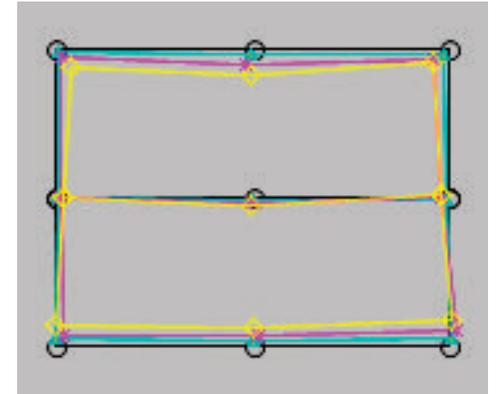
Print job 10%
ink coverage

K 10%
C 10%
M 10%
Y 10%



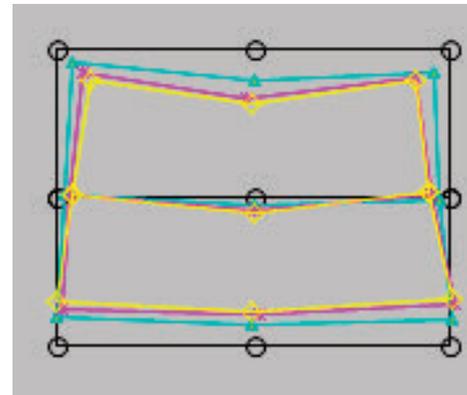
Print job 40%
ink coverage

K 40%
C 40%
M 40%
Y 40%



Print job 70%
ink coverage

K 70%
C 70%
M 70%
Y 70%





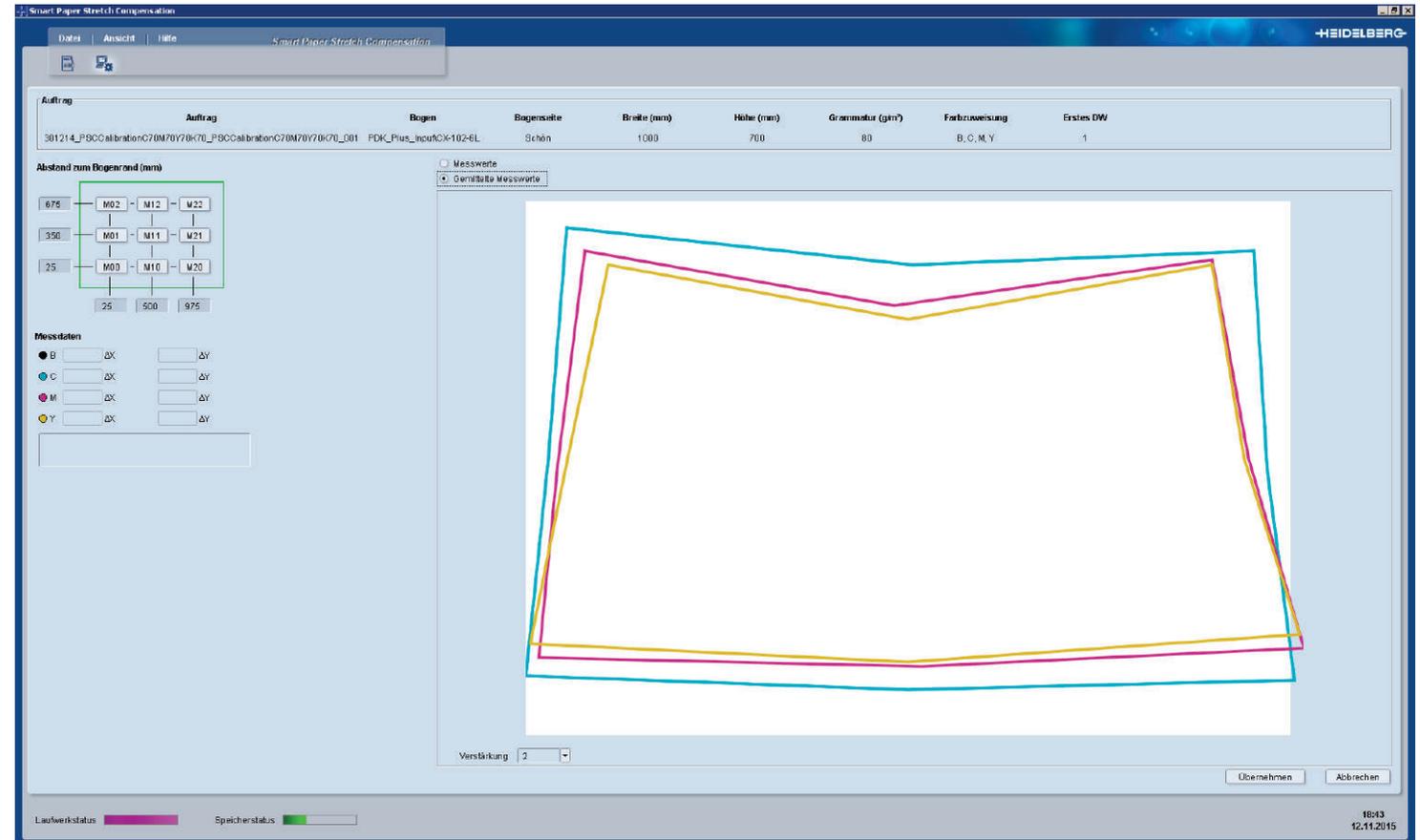
Automatic Paper Stretch Compensation - Workflow

Transfer of measurement data

The readings from the app can directly be transferred to the workflow.

The example shows the transfer of measurement data of the calibration job with an ink-coverage of 70%.

The measured data must be linked to the respective testjob.



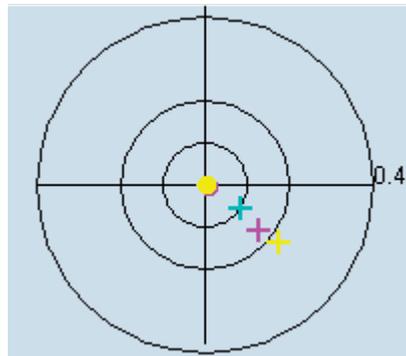


Automatic Paper Stretch Compensation - Workflow

Creating a characteristic curve

A characteristic curve must consist at least of two reference points.

Register deviations are displayed graphically for better evaluation.





Automatic Paper Stretch Compensation - Workflow

Forecast paper stretch

Based on the characteristic curve and the individual ink coverage of the print job, a forecast concerning the paper stretch can be made.

The accuracy of the forecast can be permanently monitored and further optimized in the current production.

Auswählen	Auftrag	Maschine	Bogen	Messungen	Bogensize	Erste dr.	Neu_Δ[%]	Gespeicher...	Gemessen_Δ[%]	Grammatur
B	301214_XL_PSCCalibratorC4M40V4DK40XL_PSCCalibratorC4M40V43...	C-XL106-6		9	Schön	1	98	98	29	100
B	301214_XL_PSCCalibratorC1M10V1DK10XL_ElsterC17	C-XL106-6		9	Schön	1	100	100	74	100
B	301214_XL_PSCCalibratorC7M70V7DK70XL_PSCCalibratorC7M70V70...	C-XL106-6		9	Schön	1	100	100	0	100
D	301214_XL_PSCCalibratorPraxisjktXL_PSCCalibratorPraxisjktL_001	C-XL106-6		9	Schön	1	66	66	22	100



Automatic Paper Stretch Compensation - Workflow

Production - Analysis ink coverage

In the current production, the ink coverage of each color separation is determined. For analysis of the ink coverage the printed sheet is divided into 9 areas.

The screenshot shows the 'Smart Paper Stretch Compensation' software interface. The main window is titled 'Smart Paper Stretch Compensation' and has a menu bar with 'Datei', 'Ansicht', and 'Hilfe'. Below the menu bar are icons for 'ABC' and a gear. The interface is divided into several tabs: 'Vorschau', 'Information', 'Analyse', and 'Flächendeckungswerte'. The 'Flächendeckungswerte' tab is active, displaying four tables of ink coverage data for different colors: Black (B), Cyan (C), Magenta (M), and Yellow (Y). Each table has columns for 'x0', 'x1', and 'x2' and rows for 'y2', 'y1', and 'y0'.

	x0	x1	x2
y2	26.4	31.4	24.4
y1	36.1	43.6	41.2
y0	31.2	37.1	38.9

	x0	x1	x2
y2	30.5	36.8	31.6
y1	45.8	53.3	49.4
y0	38.4	43.9	40.7

	x0	x1	x2
y2	26.6	32.5	26.7
y1	39.4	47.9	43.7
y0	32.6	38.3	36.0

	x0	x1	x2
y2	23.7	28.3	23.3
y1	33.8	41.4	37.1
y0	27.5	32.3	31.8



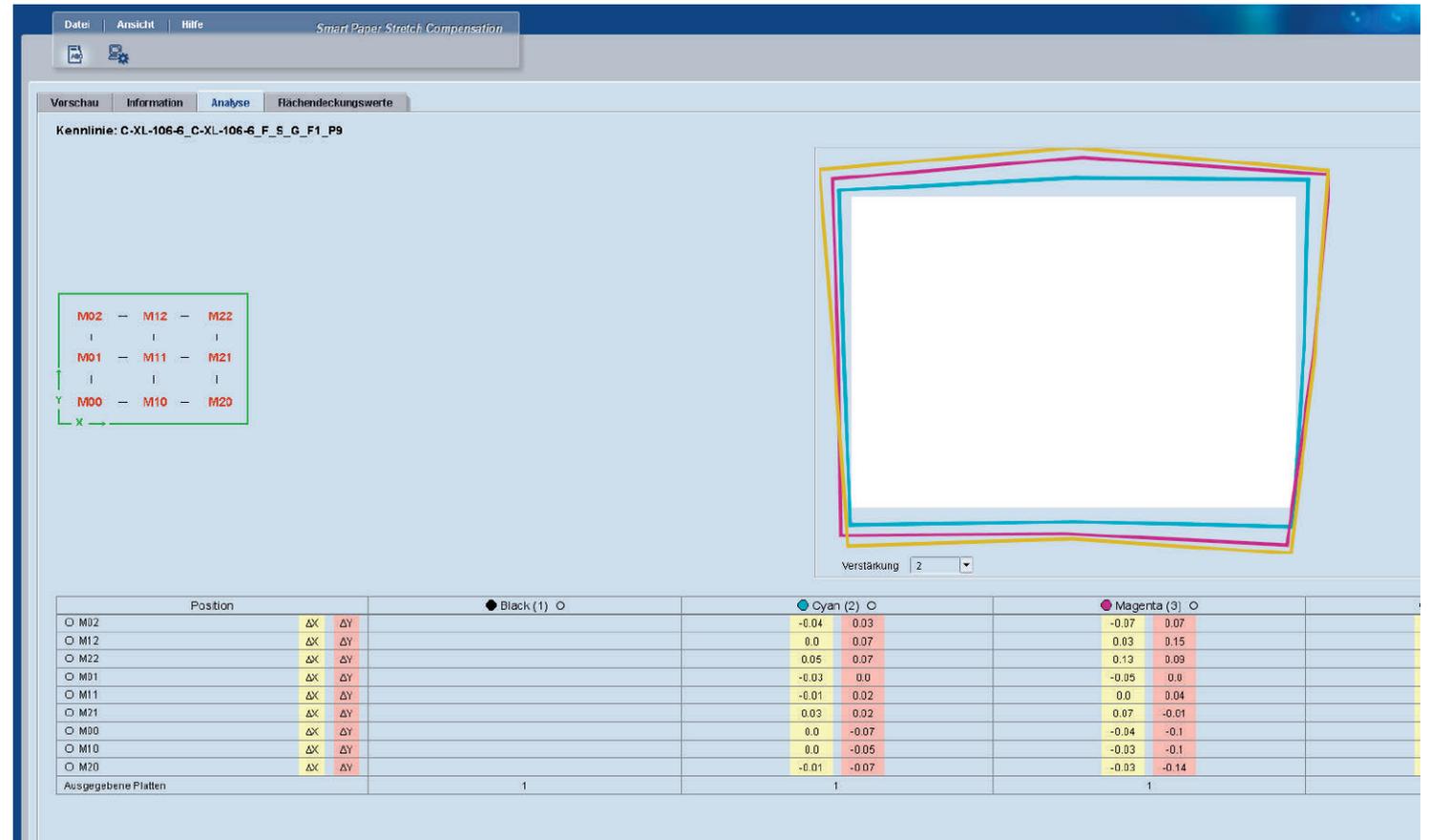
Automatic Paper Stretch Compensation - Workflow

Production - Compensation

In the last process step the calculated distortion is then included in the exposure file.

The graphic illustrates the distortion of the printed image on the printing plate.

● Yellow (4) ○	
-0.12	0.1
0.0	0.18
0.12	0.1
-0.06	0.0
0.0	0.05
0.07	-0.02
-0.01	-0.14
0.0	-0.12
-0.02	-0.17





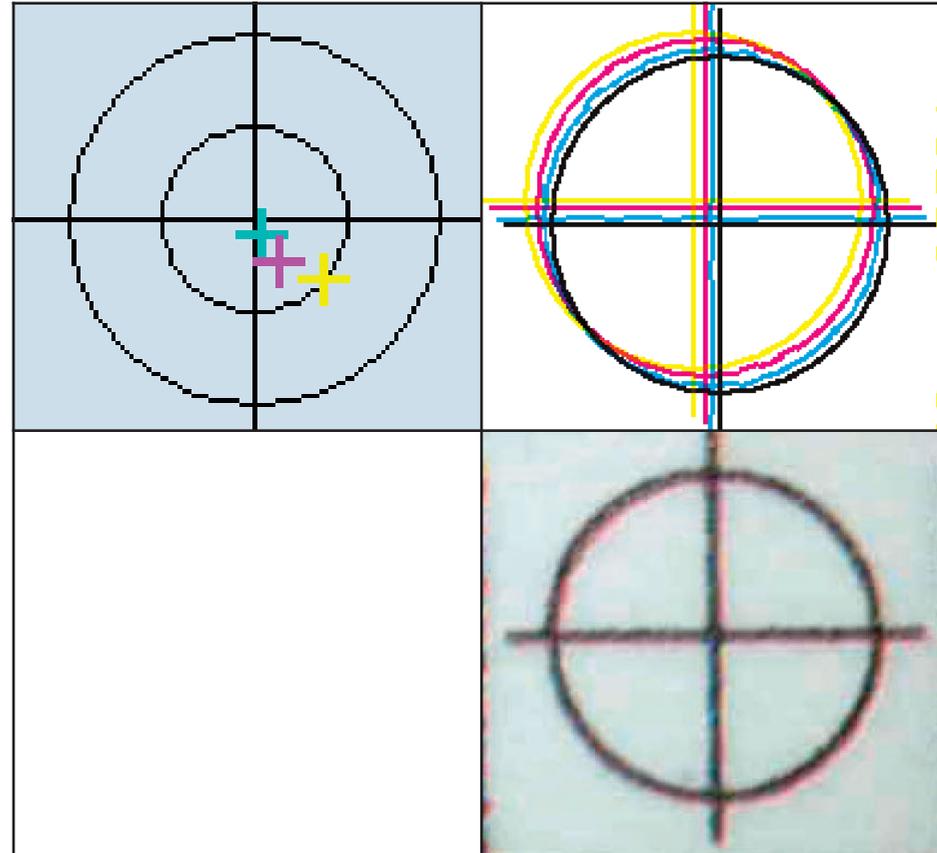
Automatic Paper Stretch Compensation - Results

Result on printing plate

The result on the printing plate shows a reversal of the register from the original print.

In printing this reversal leads to an improved register.

Measuring
printed sheet



Result on
printing plate
middle

Result on
printed sheet



Automatic Paper Stretch Compensation - Production

Production

The further production is fully automatic.

Depending on the respective production parameters the corresponding characteristic curve is applied.

The effective calculating time per job is highly dependent on the content of each file and the format size.

Datum	Auftrag	Bogenseite	Anzüge	Laufrichtung	Grammatur	Papierkla...	Information	Status	Kompens...	Heftfelder	Ausgabehoh...
11.11.2015 18:39	301214-1_PSCCalibrationPraxisjobLini&compensation_PSCCalibrat...	Schön	B C M Y	Schmalbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106...	1 1 1 1 1
11.11.2015 18:33	301214-1_mit_Kompensation_with_compensation_mit_Kompensation_with_co...	Schön	B C M Y	Schmalbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106...	1 1 1 1 1
11.11.2015 18:00	301214-1_ohneKompensation_ohnekompensation_ohneKompensation_ohne...	Schön	B C M Y	Schmalbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106...	1 1 1 1 1
10.11.2015 18:01	301214_XL_PSCCalibrationC40M40Y60K40XL_PSCCalibrationC40M40Y60K40X...	Schön	B C M Y	Schmalbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106...	1 1 1 1 1
10.11.2015 18:00	301214_XL_PSCCalibrationC10M10Y10K10XL_Blaetter07	Schön	B C M Y	Schmalbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106...	1 1 1 1 1
10.11.2015 17:59	301214_XL_PSCCalibrationC70M70Y70K70XL_PSCCalibrationC70M70Y70K70X...	Schön	B C M Y	Schmalbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106...	1 1 1 1 1
10.11.2015 17:57	301214_XL_PSCCalibrationPraxisjobXL_PSCCalibrationPraxisjobXL_001	Schön	B C M Y	Schmalbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106...	1 1 1 1 1
10.11.2015 16:57	301214_PSCCalibrationPraxisjobkompensiert_PSCCalibrationPraxisjobkompe...	Schön	B C M Y	Schmalbahn	80	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-CX102...	1 1 1 1 1
09.11.2015 18:06	Vr0144842-03-R@R	Schön	B C M Y	Breitbahn	82	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_V...	1 1 1 1 1 X
09.11.2015 18:04	Vr0145586-01-R@R	Schön	B C M Y	Breitbahn	82	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_V...	2 2 2 2 2 X
09.11.2015 18:04	Vr0144842-08-R@R	Schön	B C M Y	Breitbahn	82	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_V...	2 2 2 2 2 X
09.11.2015 18:04	Vr0144842-07-R@R	Schön	B C M Y	Breitbahn	82	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_V...	2 2 2 2 2 X
09.11.2015 11:43	301214_PSCCalibrationPraxisjob_PSCCalibrationPraxisjob_001	Schön	B C M Y	Schmalbahn	80	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-CX102...	1 1 1 1 1
09.11.2015 11:41	301214_PSCCalibrationC70M70Y70K70_PSCCalibrationC70M70Y70K70_001	Schön	B C M Y	Schmalbahn	80	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-CX102...	1 1 1 1 1
09.11.2015 11:39	301214_PSCCalibrationC40M40Y40K40_PSCCalibrationC40M40Y40K40_001	Schön	B C M Y	Schmalbahn	80	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-CX102...	1 1 1 1 1
09.11.2015 11:36	301214_PSCCalibrationC10M10Y10K10_Blaetter	Schön	B C M Y	Schmalbahn	80	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-CX102...	1 1 1 1 1
09.11.2015 19:34	800805-1_Testform0_Testform0_001	Schön	B C M Y	Schmalbahn	80	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-CX102...	1 1 1 1 1
09.11.2015 19:00	800805-1_Testform0_Testform0_001	Wider	B C M Y	Schmalbahn	80	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-CX102...	1 1 1 1 1
09.11.2015 19:59	800805-1_Testform0_Testform0_001	Schön	B C M Y	Schmalbahn	80	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-CX102...	1 1 1 1 1
09.11.2015 19:36	800805-1_Testform0_Testform0_001	Schön	B C M Y	Schmalbahn	80	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-CX102...	1 1 1 1 1
21.10.2015 13:52	Vr0144842-05-R@R	Schön	B C M Y	Breitbahn	70	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_V...	1 1 1 1 1 X
21.10.2015 13:50	Vr0144842-04-R@R	Schön	B C M Y	Breitbahn	70	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_V...	1 1 1 1 1 X
21.10.2015 13:49	Vr0144842-02-R@R	Schön	B C M Y	Breitbahn	70	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_V...	1 1 1 1 1 X
20.10.2015 14:07	Vr0144842-05-R@R	Schön	B C M Y	Breitbahn	82	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_V...	1 1 1 1 1 X
20.10.2015 14:06	Vr0144842-01-R@R	Schön	B C M Y	Breitbahn	82	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_V...	1 1 1 1 1 X
18.09.2015 19:11	[4186]14-09-2015_PDK_Plus-Testform.fbi	Schön	B C M Y	Schmalbahn	135	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106-B...	1 1 1 1 1
18.09.2015 18:09	[4185]14-09-2015_PDK_Plus-Testform.fbi	Schön	B C M Y	Schmalbahn	135	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106-B...	1 1 1 1 1
15.09.2015 09:02	[4135]8033489_C-XL106-6LXD-FormJob03.fbi	Schön	B C M Y S 2 S 3	Schmalbahn	135	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106-B...	1 1 1 1 1
14.09.2015 14:17	[4134]8033489_C-XL106-6LXD-FormJob03.fbi	Schön	B C M Y	Schmalbahn	135	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106-B...	1 1 1 1 1
14.09.2015 14:15	[4133]8033489_C-XL106-6LXD-FormJob02.fbi	Schön	B C M Y	Schmalbahn	135	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	C-XL106-B...	1 1 1 1 1
10.09.2015 18:19	802167-PDK-Test_BS_BVS_100_SIG001_PSCCalibrationMikrometerfole	Schön	B C M Y	Breitbahn	115	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL_Format...	1 1 1 1 1 X
09.09.2015 18:26	802167-PDK-Test_BS_BVS_100_SIG001_PSCCalibrationC70M70Y70K70	Schön	B C M Y	Breitbahn	115	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL_Format...	1 1 1 1 1 X
09.09.2015 19:18	802167-PDK-Test_BS_BVS_100_SIG001_PSCCalibrationC70M70Y70K70S2S3	Schön	B C M Y	Breitbahn	115	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL_Format...	1 1 1 1 1 X
09.09.2015 18:04	802167-PDK-Test_BS_BVS_100_SIG001_PSCCalibrationC10M10Y10K10S2S3	Schön	B C M Y	Breitbahn	115	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL_Format...	1 1 1 1 1 X
09.09.2015 18:04	802167-PDK-Test_BS_BVS_100_SIG001_PSCCalibrationC70M70Y70K70S2S3	Schön	B C M Y	Breitbahn	115	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL_Format...	1 1 1 1 1 X
27.08.2015 14:43	[3912]803353_C-XL106-6PSKDFormTestformgestrichen.fbi	Wider	B C M Y	Breitbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_B...	1 1 1 1 1 X
27.08.2015 14:43	[3912]803353_C-XL106-6PSKDFormTestformgestrichen.fbi	Schön	B C M Y	Breitbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_B...	1 1 1 1 1 X
27.08.2015 10:30	[3909]800999_VY-XL106-LSLVanGenevaH4Job2M&M&C&S.fbi	Schön	B C M Y S 2	Breitbahn	100	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	XL106_B...	1 1 1 1 1 X
26.08.2015 15:42	Vr_800700_Lay_Blaetter006	Schön	B C M Y S	Breitbahn	115	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	Funktionst...	1 1 1 1 1 F
26.08.2015 15:25	Vr_802255_Lay_Blaetter	Schön	B C M Y S 2	Breitbahn	115	Gestrichen	Auftrag wurde von Sho...	[OK] [P] [N] [B] [U] [O]	✓	Funktionst...	1 1 1 1 1 F

Comparison



	1 - Paper Stretch Compensation	2 - Automatic Paper Stretch Compensation
Workflow	Heidelberg Prinect	Workflow independent
File format	Output: 1-Bit Tiff	Input/Output: 1-Bit Tiff
Register evaluation	Manually	Techkon iRegister App
Compensation based on file format	1-bit tif file	1-bit tif file
Possible color sequence	In any order	Reference color always Black, first printing unit, subsequent process color in any order, spot color at last
Plate	Any platesetter that can output 1-bit tif files	Any platesetter that can output 1-bit tif files
Evaluate register deviation	Proof print of every job	Forecast based on a "Papercalibration"
additional set of printing plates	Necessary	Not necessary
Process parameters	No restrictions	Papercalibration for every paper type required