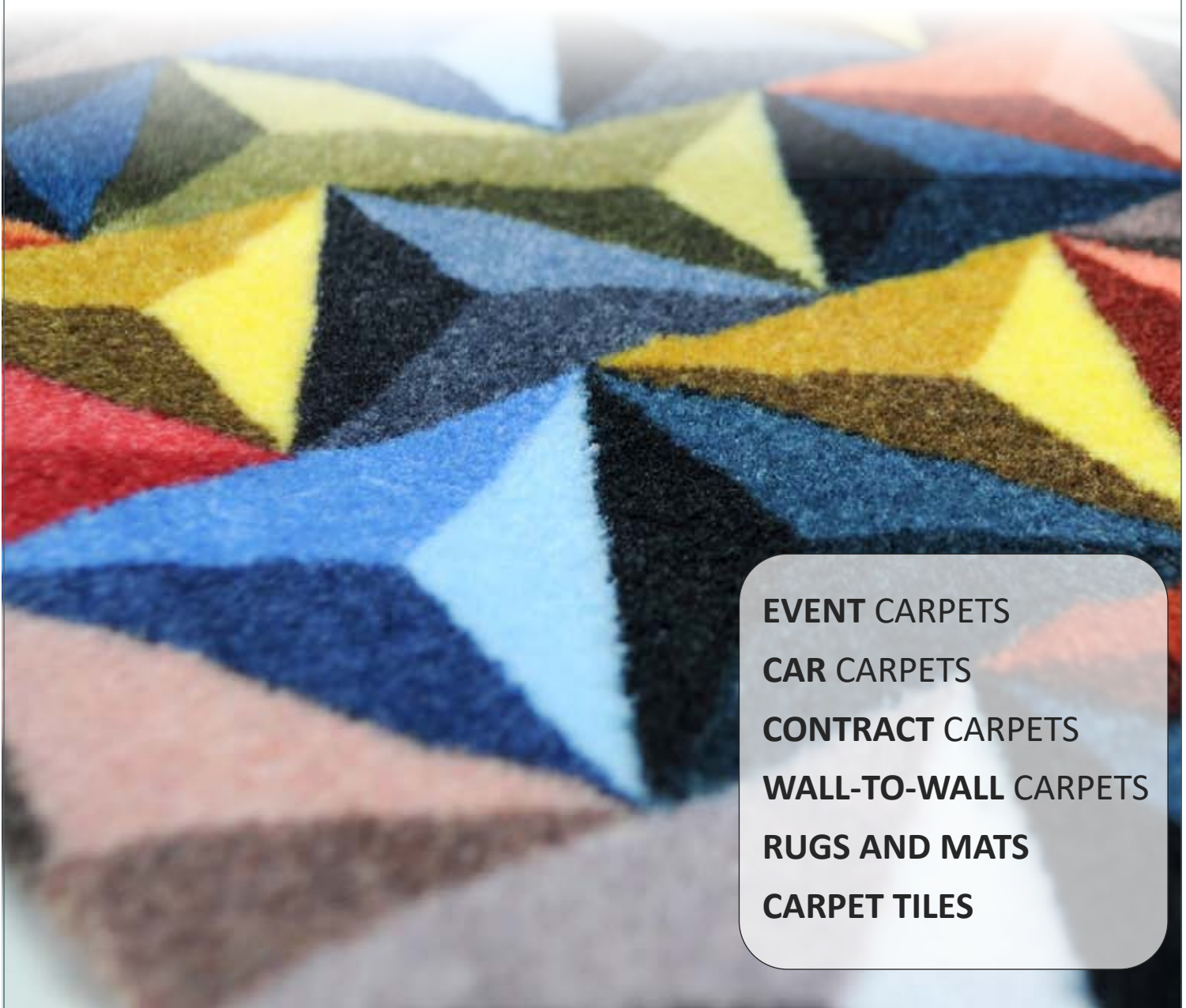




# COLARIS.CARPET

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THE BEST DIGITAL INKJET  
PRINTER FOR CARPETS



**EVENT CARPETS**  
**CAR CARPETS**  
**CONTRACT CARPETS**  
**WALL-TO-WALL CARPETS**  
**RUGS AND MATS**  
**CARPET TILES**

## COLARIS.CARPET PRINTER

**COLARIS.CARPET** represents the next generation of digital carpet printing technology using industrial piezo print heads.

Inkjet printing is a very complex technology involving precision mechanics, high speed electronics, software, chemistry and fluid dynamics, ...

In addition, a lot of process know-how is needed to build an efficient and reliable carpet print line.

**ZIMMER AUSTRIA** has a long history in carpet printing (starting with the first **FLATSCREEN** printer in 1962, **ROTARY-SCREEN** printer in the 70s, digital **CHROMOJET.PRINTER** since 1980) and all this know-how is a good base to lead the industry into the new age of digital printing.

**INNOVATION, QUALITY AND SERVICE** - this is our motto - and we act accordingly.



## COLARIS.PRINTING

Industrial INKJET technology with high resolution up to 800 x 1,600 dpi is used to print any shade out of a number of base colors.

The required penetration can be achieved by using several processes and technologies. Pre-washing, pre-coating, **SUPRAPRESS**, Penetration Booster Ink, ... These are the elements to get best penetration - also on heavy carpets.

## StarFire™

# HIGH PERFORMANCE industrial inkjet print heads



### TECHNICAL FEATURES



- Robust and reliable construction
- Coated metal nozzle plate - to withstand abrasion and resist damage
- High firing frequency - for high productivity
- High drop velocity - distance between nozzles and carpet can be up to 8 mm
- **RediJet™** - Continuous ink circulation system to avoid nozzle blockage and to reduce ink waste
- Repairable by customer - reduces costs



The **StarFire™ SG1024** is a compact industrial print head built to withstand demanding industrial textile and carpet printing applications. It uses field proven materials to deliver consistent output over a long service life with continuous ink circulation at 400 dpi native resolution. Each head is equipped with a replaceable metal nozzle plate that is designed to withstand abrasion and to resist damage.

## PENETRATION

- Carpet needs ink penetration!  
The weak point of standard inkjet system is the tiny amount of ink applied and laid onto the carpet.
- Dark shades normally have a much better penetration in comparison to light shades. The reason is that light shades have less penetration because there is no liquid to distribute and flush down into the pile.



**ZIMMER AUSTRIA's "Penetration Booster Technology"** overcomes this problem by adding a special penetration fluid which acts as a wetting agent on the carpet and flushes down the inkjet droplets into the pile.



**1,000 g/m<sup>2</sup> (8 mm)**





## COLARIS.PRINTER AND CARPET TRANSPORT SYSTEM

- Heavy duty machine frame - for precise print results
- Rollers with 500 mm diameter - for extremely precise conveyor transport movement
- Stable beam without deflection to keep precise distance between print heads and carpet
- Servo drive for print head with linear gear rack and high load bearings with automatic lubrication - for a trouble free operation over long time



### PRINT HEAD CONFIGURATION

- Heavy duty carriage beam to avoid any bending and deflection
- Stable carriage with integrated height adjustment system (0-50 mm)
- Anti-collision system to avoid head crashes
- Integrated suction and filtration system to keep ink dust out of the print carriage
- Carriage for up to 96 print heads grouped in different options and configurations (6c \* 16ph 2 \* 6c \* 8ph; 4c+8c \* 8ph; 12c \* 8ph; ...)



### INK SUPPLY SYSTEM

- Ink supply from 10 or 20 liter canisters or from 120 liter barrels
- Ink canister or barrel can be changed without stopping the printer
- High volume multi filtration system - to keep any particles out of the system
- Ink heating and cooling system to keep a constant temperature



Stability, precision and robustness of the printer are most important for any digital print!

**COLARIS** is based on the know-how **ZIMMER AUSTRIA** has gained from its **CHROMOJET** machinery which is the benchmark in the industry.

## CONTROL SYSTEM

- Electric cabinets with integrated air condition
- Control system with industrial components (Lenze drives, Soft-PLC, ...)
- High power industrial PC
  - Windows 10 Professional operating system
  - 64 Gigabyte memory
  - 512 Gigabyte SSD Disk
  - Gigabyte Ethernet
  - 2 channel optical fibers for print data transfer
- Remote diagnostics, updates and parameter settings



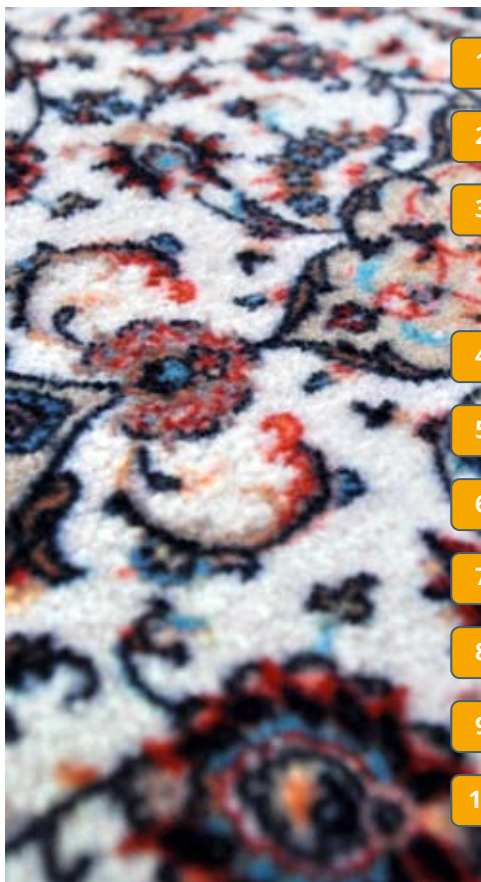
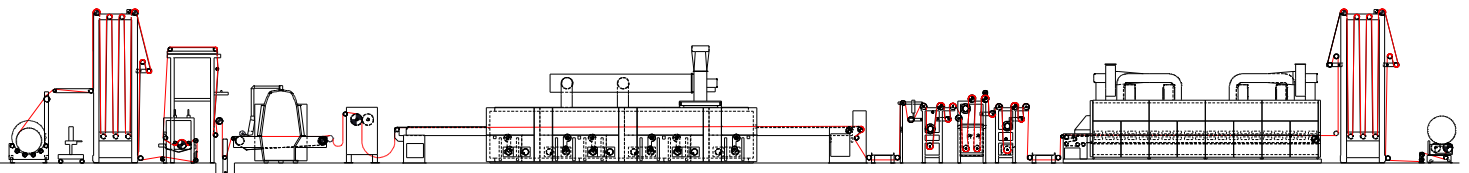
## SOFTWARE - WITH CARPET SPECIFIC FUNCTIONS



- Endless repeats (limited by hard disk space only)
- Print length set in repeats or meters
- Print width can be set on the printer (small repeats can be repeated across the width)
- Print resolution (in X and Y direction) can be set and changed on the printer - to get the required ink amount for best penetration
- Left - Center - Right alignment of designs
- Design change on the fly - with variable gaps between designs
- Multiple resolutions and print modes to optimize print head utilization at maximum speed
- Carpet seam detection and reprint function (the last stroke is re-printed after a seam to minimize loss)
- Cutting and status lines can be printed at the side of the carpet to control automatic cutting devices
- Log files for settings and operating data



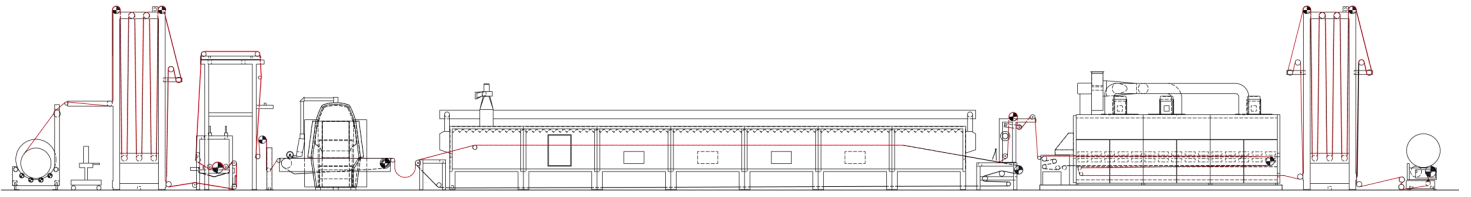
## COLARIS.PRINT LINE FOR POLYESTER



- 1 UNWINDER | SEWING MACHINE
- 2 ACCUMULATOR
- 3 PIVOT GUIDING  
- PRE-WASHING AND VACCUM EXTRACTION (OPTIONAL)  
- **CHROMOJET-DTP** PRE-COATING (OPTIONAL)
- 4 **COLARIS**.PRINTING MACHINE
- 5 SUPRAPRESS (OPTIONAL)
- 6 DRYER AND HOT AIR FIXATION
- 7 WASHING UNIT
- 8 STENTER DRYER OR BELT DRYER
- 9 ROLLER ACCUMULATOR
- 10 REWINDER UNIT



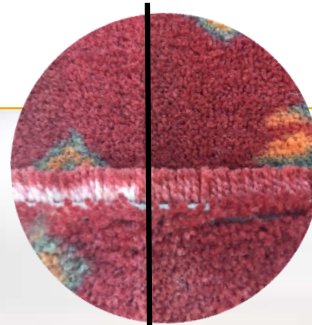
# COLARIS.PRINT LINE FOR POLYAMIDE / WOOL OR EASY DYEABLE POLYESTER



- 1 UNWINDER | SEWING MACHINE
- 2 ACCUMULATOR
- 3 CENTER GUIDING  
- PRE-WASHING AND VACCUM EXTRACTION (OPTIONAL)  
- **CHROMOJET-DTP** PRE-COATING (OPTIONAL)
- 4 **COLARIS.PRINTING** MACHINE
- 5 STEAMER
- 6 WASHING UNIT
- 7 STENTER DRYER OR BELT DRYER
- 8 ROLLER ACCUMULATOR
- 9 REWINDER UNIT



**WITHOUT**  
Pre-coating  
and SUPRAPRESS



**WITH**  
Pre-coating  
and SUPRAPRESS

## TECHNICAL FEATURE AND OPTIONS

- Easy to operate
- Complete print line from one supplier
- Modular system with a number of different configurations
- Full penetration with '**Penetration Booster Technology**'
- Several ink suppliers, no color kitchen
- Ink circulation system - to avoid sedimentation and blockage
- Pile weight from 200 up to 1,600 g/m<sup>2</sup>
- High resolution, high brilliancy, finest details
- Millions of shades and colors
- Remote diagnostics and service through internet
- Set-ups for constructions out of:
  - polyamide and wool
  - polyester and modified polyester
  - cotton and cellulose
- Optional positioning device for individual carpet tiles on 2.2 m printer



A high resolution on a carpet is not giving a better quality of the design, but is enhancing penetration due to more ink pick-up.

**For a high print speed at moderate costs these factors are essential:**

- Big droplets - to apply as much ink as possible
- High head speed - to utilize the max. frequency of the print head and system
- Low number of passes (each additional pass reduces the print speed)
- Ink concentration, pre-coating and penetration booster

## COLARIS.CARPET LINES | CONFIGURATIONS

LINE LAYOUT	A	C	D	E	F	G
<b>Application</b>	PES needlefelt	PA carpet, low to medium pile	PA carpet, low to high pile	PA carpet, low to high pile	PES carpet, low to high pile	Modified PES, low to high pile
<b>Ink system</b>	Direct Sublimation	Acid	Acid	Acid	Disperse	Disperse
<b>Entry</b>	Unwinder, J-Box or accumulator, optional pre-steaming or pre-washing, center guiding, pull-roller and synchronization					
<b>Pre-wash</b>	No	No	Yes	Yes	No	No
<b>Pre-coating</b>	No	No	optional		No	No
<b>COLARIS</b>	4 colors x 8 print heads	6 colors x 8 print heads	6 colors x 8 print heads	6 colors x 16 print heads	6 colors x 8 print heads	6 colors x 8 print heads
<b>SUPRAPRESS</b>	No	No	No	optional	optional	optional
<b>Steaming</b>	No	4-6 minutes			No	5-8 minutes
<b>Hot air fixation</b>	Stenter dryer and fixation unit at 150 - 200°C	No	No	No	Stenter dryer and fixation unit at 150 - 200°C	No
<b>Washing</b>	optional	1 stage washing	1 stage washing	2 stage washing	3 stage washing	2 stage washing
<b>Drying</b>	optional	Stenter dryer	Stenter dryer	Stenter dryer	Stenter dryer	Stenter dryer



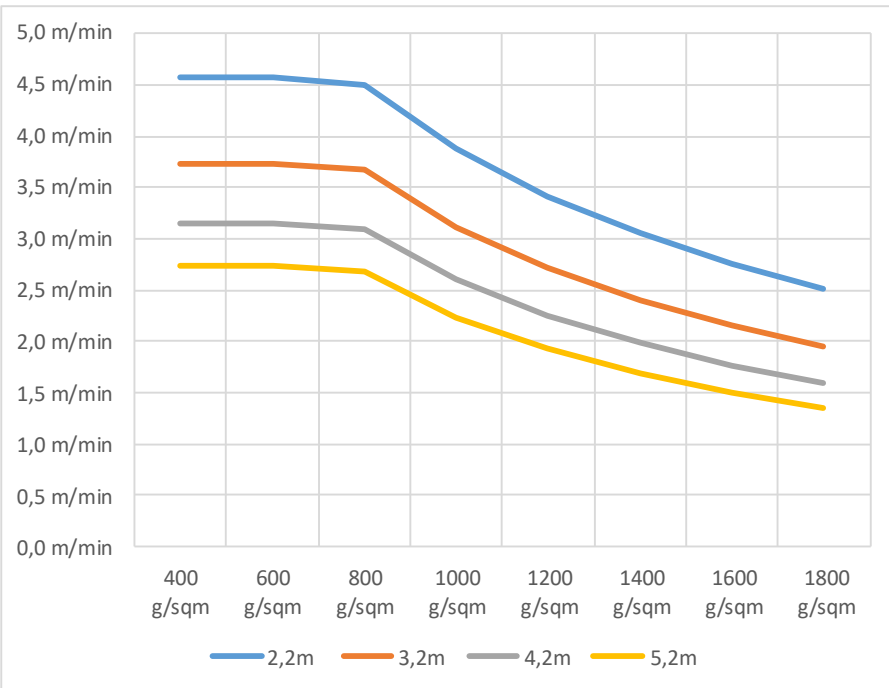


## PRINT SPEED, INK LAYDOWN

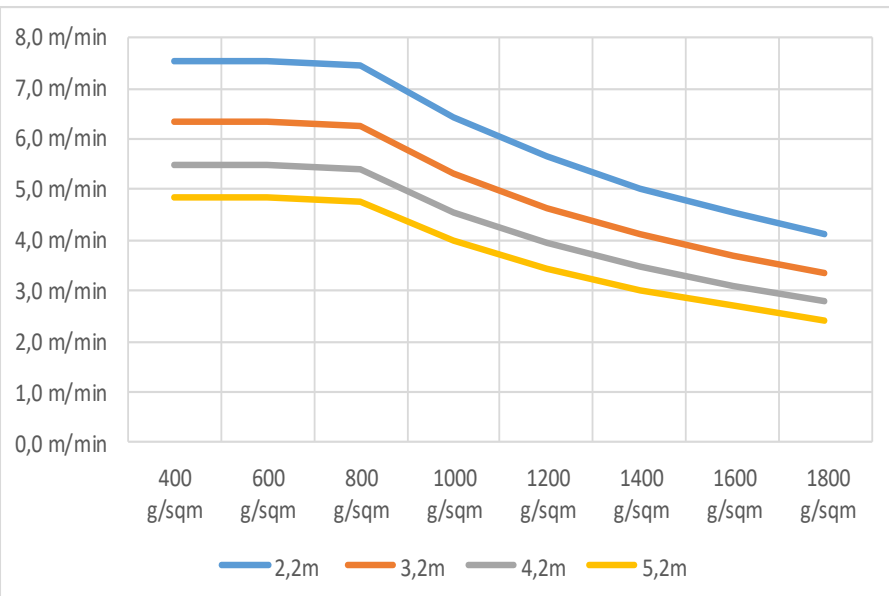
The print speed depends on many factors.

In general, the required ink amount is the dominating factor for resolution and its resulting print speed.

**COLARIS** functions are optimized for speed and efficiency.



This graph shows the range of **COLARIS.PRINT SPEED** depending on print width (printer width), **8 StarFire™ L-type print heads** per color, and carpet pile weight (based on 5% ink pick-up for full penetration).



This graph shows the range of **COLARIS.PRINT SPEED** depending on print width (printer width), **16 StarFire™ L-type print heads** per color, and carpet pile weight (based on 5% ink pick-up for full penetration).

## PRINT LINE MODULES - ENTRY, STEAMER, WASHER



### ENTRY UNIT

- Unrolling with center guiding
- Accumulator with tension control
- Lint removal
- Pre-washing (optional)
- Pre-steaming (optional)
- Center guiding
- Pull-roller with synchronization



### HORIZONTAL STEAMER

- Rollers or conveyor belt (optional)
- Sump and cloud steam generation
- 100 mm insulation



### WASHING UNIT

- Spraying pipes
- Cold/hot basins
- Squeezing rollers/wipers
- Chemicals application (optional)
- Water ring vacuum pump for backed carpet
- Blower type vacuum pump for unbacked carpet



## PRINT LINE MODULES - DRYER, ACCUMULATOR AND ROLL-UP



- Double impingement dryer with horizontal stenter chain
- Humidity control of exhaust air
- Speed controlled fans
- Automatic chain lubrication
- Support conveyor belt (optional)
- Pile beater at entry of the dryer



50 m Accumulator



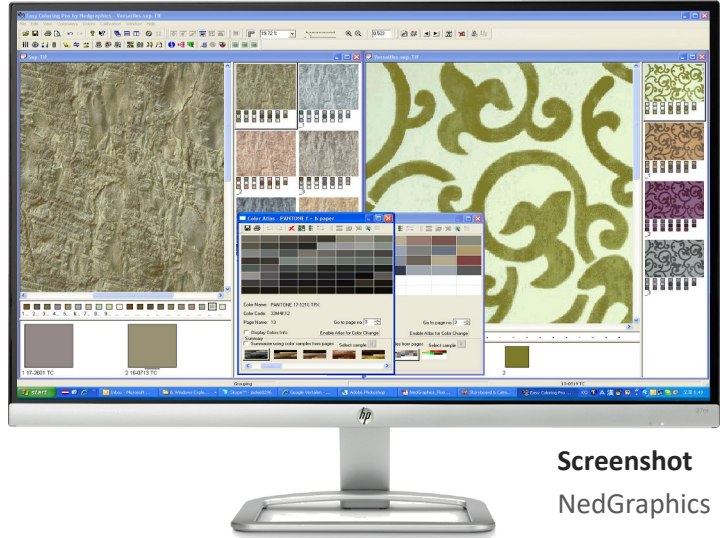
Roll-up unit with cross cutter and foil dispenser



## DESIGN PREPARATION

The design system has these basic functions:

- Create, match and combine patterns and designs
- Bring patterns into repeat
- Reduce number of colors
- Coloration - to show a design in several colorways



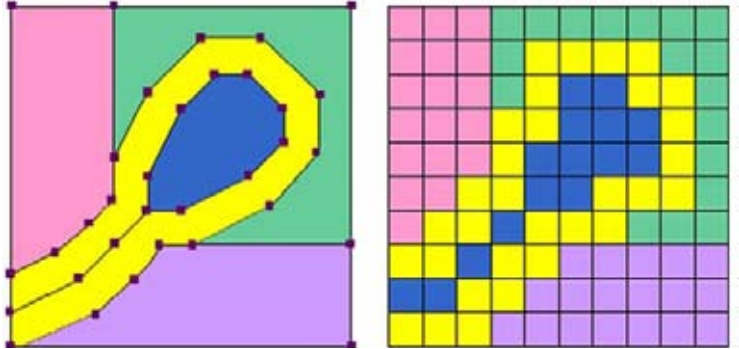
Screenshot  
NedGraphics

## RASTER- OR VECTOR- FORMAT?

Each file format has its pros and cons:

**RASTER or Pixel Format** can show more details and is the most common format in the carpet industry. The disadvantage is its high memory demand and its limited scalability.

Common platforms: **Adobe Photoshop, NedGraphics, ...**



**VECTOR Format** has the advantage that the memory demand is much lower and the designs can be zoomed and scaled without losing details.

Common platforms: **Adobe Illustrator; Corel Draw, ...**

COMBINED **RASTER AND VECTOR FORMATS**

There are also programs available which combine raster and vector files.

Typical software platform: **Adobe InDesign, ...**



## DESIGN AND PATTERN RESOLUTION

Design resolution is independent from the print resolution and ranges from 16 to 200 dpi - depending on the required details.

Especially large repeats like 4 m x 30 m are very demanding for the designer and design system. In most cases a compromise between resolution, number of individual colors and memory demand must be found.



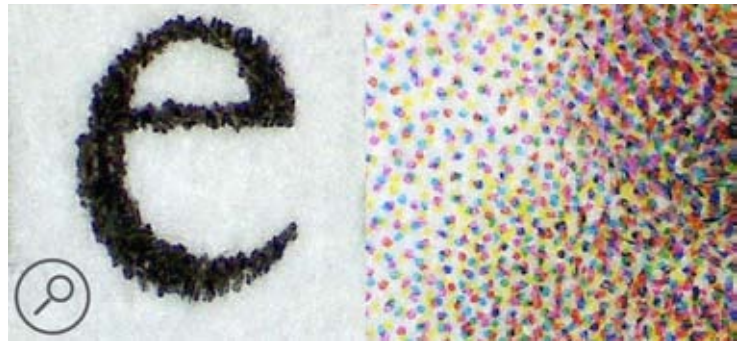


## RIP (Raster Image Processor)

The input files from the design system are converted into a number of TIFF files which correspond to the number of ink channels used in the printer.

The RIP output resolution is important for the distribution of the ink droplets. If the output resolution is too low - the print will show dithering.

Therefore the RIP resolution should be at least 200x200 dpi to 400x400 dpi



## RIP - Color Management Module

The color management tool is a part of the RIP software which splits the design and color information of the design into TIFF files which actually control the inkjet nozzles .

The RIP is based on ICC profiles which contain all the information about inks used, linearization, saturation, base material (carpet), ...

RIP's are taking over more functions like

- Cost calculation
- Interaction with web shops and order systems
- Adding contours and cutting marks ...

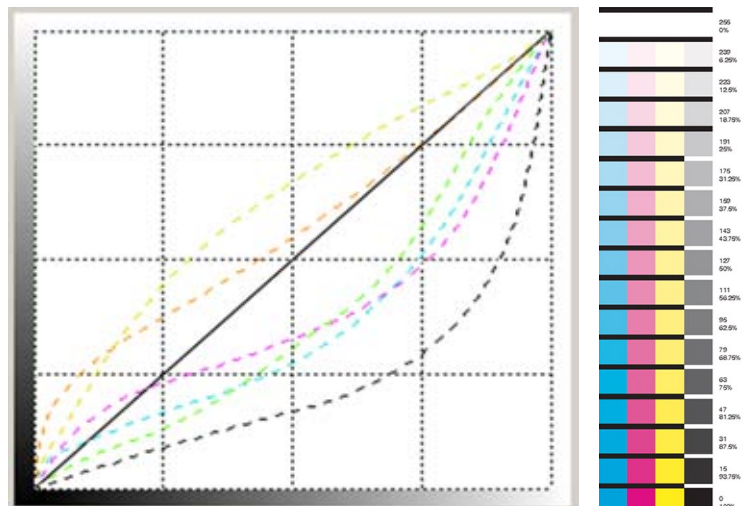
COLARIS is open for all professional RIP's like *Caldera*, *Inedit*, *AVA*,...



## ICC Profiling Module

ICC profiling is done in 2 steps for all instruments and equipment involved (camera, scanner, monitor, paper, printer, sample printer, production printer, ... )

1. **Linearization** – evaluate fiber saturation
2. **Color measurement** – a test chart is printed, measured and compared with a target file.





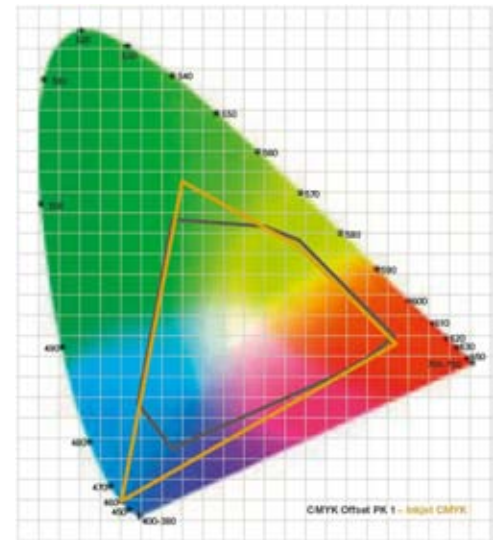
## INK SELECTION

An inkjet system is a combination between print head, print head driver, waveform, ink system and software.

Ink selection is one of the most important decisions.

We are working with a number of ink manufacturers around the world to make sure that the right ink is provided, based on the following criteria:

- **Fastness requirements**  
Depending on the fiber and the final application of the carpet, we select the right ink set to get the best fastness (light-, crock-, wash-, chlorine fastness)
- **Color gamut**  
Depending on the inks, a certain color gamut can be achieved. For Polyamide we normally use red, blue, yellow and black. For Polyester we use magenta, cyan, yellow and black. Additional colors (i.e. violet or orange) can enhance the color gamut.
- **Brilliance and color depth**  
Brilliance depends on the fiber and the inks selected
- **Runnability, shelf life, concentration, fixation rate, ...**  
All these parameters are important for a stable production system
- **Costs and availability** (direct costs, shipping costs, import duties, ...)
- **COLARIS can be operated with any ink tested and certified by ZIMMER**

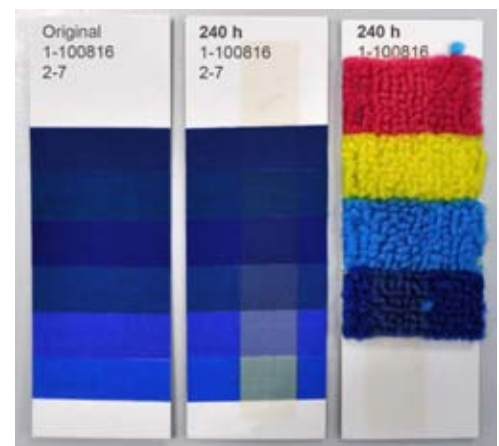


## WAVE-FORM

The wave-form determines how the piezo is energized to eject a tiny droplet of ink. The wave-form is influenced by ink viscosity, surface tension, droplet size, velocity, ...



Drop-Watcher System to observe, measure and optimize drop-formation of different inks.



Lightfastness test on polyamide carpet



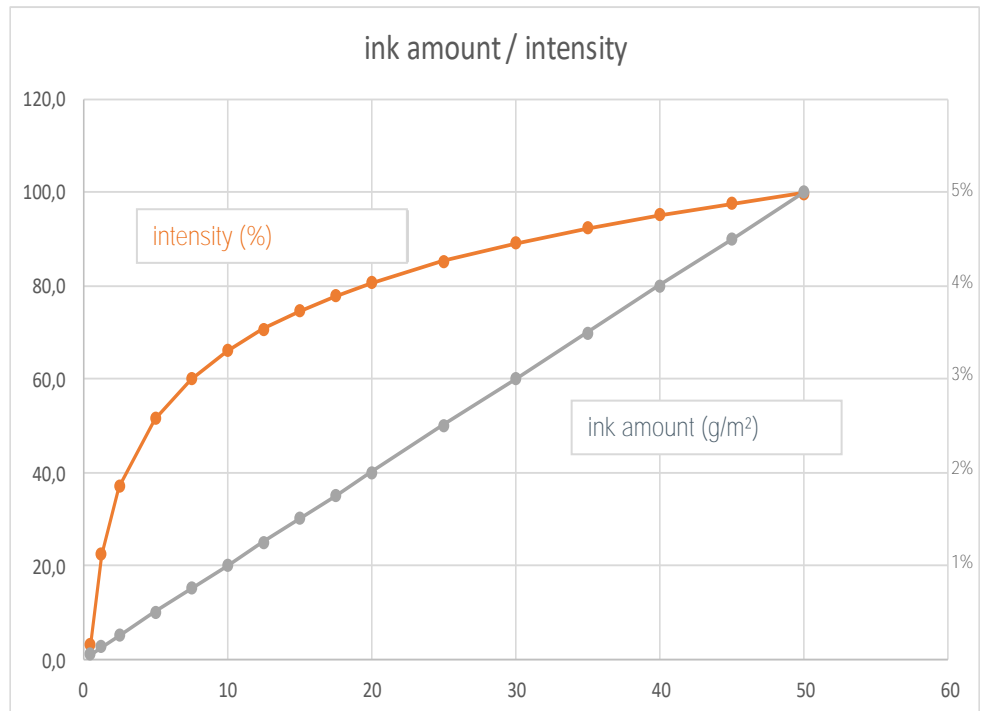
## INK PICK-UP

For Polyamide we need about 5% of ink (based on pile weight) for a full coverage (i.e. black) at maximum penetration.

For a carpet with 1000 g/m<sup>2</sup> we need a calculated amount of 50 g/m<sup>2</sup> of ink. Typical designs need about 1-2% of ink (based on the pile weight), because light shades need much less ink in comparison to dark shades. This is about 10-20% of the 5% calculated for full penetration.

The ink lay down or ink pick-up is determined by 2 factors:

- Drop-size (for carpet we normally use L-type heads with 80 picoliter drop-size)
- Print resolution (this is normally determined by the carpet pile-weight and quality)



The grey graph shows the ink amount laid onto a carpet - between 0 and 50 g/m<sup>2</sup>.

The orange graph shows the hue (0-100%) of the measured color on a carpet.

This is also the reason why light shades have minimum penetration without additional measures.



The maximum ink lay down of a single base-color can be calculated as follows

$$\text{Ink-laydown (g/m}^2\text{)} = \text{X-res. (dpi)} * \text{Y-res. (dpi)} * \text{dropsize (pl)} / 645.000$$

## PRINT RESOLUTION

The print resolution determines the ink amount applied to the carpet and can vary from 200 x 400 dpi up to 800 x 800 dpi. This covers a pile weight range of about 200 - 1600 g/m<sup>2</sup>.

## RESOLUTION, CARRIAGE SPEED, PASSES...

All these parameters influence the production speed. **COLARIS** operates within a safe range of all these parameters to get highest production at best quality.





Applied to a large variety of textiles



## COLARIS.SAMPLEPRINTER

- The **COLARIS.SAMPLEPRINTER** is the perfect tool for product development, process and parameter optimization and to make quick samples for your customer.
- Two models:
  - Table type printer for contract and carpet tile sampling
  - Conveyor belt printer for rugs , mats and contract sampling
- Ink tanks of 2 liters allow to print a lot of samples before a refill is needed.
- Temperature controlled ink supply - for constant conditions.
- Software and parameters are identical to the production printer.

## TECHNICAL DATA

Model	COLARIS.12-1200	COLARIS.12-2200
Print size	120 x 120 cm (4 x 4 ft)	Up to 215 cm in width
Number of colors	Up to 12 (typically 6 colors for carpet)	
Print heads per color	1 x Starfire 1024 L	
Resolution	Up to 800 x 1600 dpi	
Ink tank	2 liters	
Space required	4 x 4 m	5 x 5 m
Electrical connection	380/400/480V; 3 phase + N; 5kW connected load	
Operating condition	25°C +/- 5°C ; 30-80% humidity	

## LAB POST-TREATMENT STEAMING-WASHING-DRYING UNIT

### for carpet out of polyamide, wool and modified polyester

This is a compact carpet finishing unit which can handle individual samples printed on **COLARIS** or **CHROMOJET**. The sample is put onto the conveyor belt which runs through the complete line. Steaming, washing and drying the sample is completed within a mere 20 minutes.



#### STEAMER

Sump type steamer with condensate burn-off pipes at entry and exit; inspection window; exhaust at entry and exit

#### WASHING UNIT

Sandwich type washing unit which can also process individual samples. 2 spray and 2 vacuum units

Water-ring vacuum pump with 30 kW



#### DRYER

Dryer with steam/air heat exchanger (gas burners optional)

Temperature control

#### DRIVE SYSTEM

Glass/Kevlar type conveyor belt, drive with speed control  
0.1 - 2.0 m/min



### TECHNICAL DATA

Conveyor width	130 cm
Electrical connection	35 kW
Steam consumption	Up to 100 kg/h





## TECHNOLOGY APPLICATION CENTER

Our new R&D Center is the heart of our activities. Here we define the process, select the right ink system and define the RIP and print parameters.

Equipped with all kinds of **COLARIS** and **CHROMOJET**.PRINTERS, steamers, dryers, digital coating equipment - we work out the perfect solution and print process for the customers' products.

The work in our R&D center is the base of a custom made print line.



### SHS (Super Heated Steam) STEAMER


can be operated in the following modes

- **DRYER** up to a temperature of 200°C
- **STEAMER** with saturated steam
- **STEAMER** with overheated steam - up to 180°C



In our R&D technology center we have specific conventions, symposiums, workshops and trainings - all related to digital printing and digital functionalization (coating) technology and processes.

# CARPET FIBRES & DYE CLASSES FOR CHROMOJET OR COLARIS PRINTING PROCESS

		Polyamide/Nylon (PA)	Wool (WO)	Cationic modified Polyester (EDP)	Sorona, Triexta (PTT)	Polyester (PET, PES)	Acrylic (PAC)	Cotton (CO)	Olefin, Polypropylen (PP)
		high price good resilience easy process	very high price moderate resilience dull color	moderate price moderate resilience easy process	slightly cheaper than polyamide very good resilience easy process	low price good fastness low resilience difficult process brilliant and shiny	high price excellent light fastness very soft (like wool) bad resilience	high price very good wash fastness difficult process	low price can not be dyed or printed
Resilience	+++	++	+	--	--	--	--	--	
Flame resistance	++	+++	+	++	+/-	+/-	+	+/-	
Stain resistance	-	+	+	+++	+++	+	--	++	
Light fastness	++	++	+	++	+++	+++	+	++	
Wash fastness	++	++	++	++	+++	++	+++	++	
Chlorine fastness	+	+	++	++	+	++	+	++	
Property and Fastness	contract carpet, carpet tiles, laundry mats		rugs, mats, contract carpet	rugs, mats, semi-contract carpet	contract carpet, carpet tiles, rugs	rugs, mats	rugs, mats, bath mats	rugs, mats, bath mats	rugs, mats
	<ul style="list-style-type: none"> <li>▶ steaming 3-5 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>		<ul style="list-style-type: none"> <li>▶ steaming 8-10 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 5-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ washing</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ drying</li> <li>▶ hot air fix. 1 min. from 170 - 190 °C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ reductive washing</li> <li>▶ vacuuming</li> <li>▶ cold washing</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 5-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 6-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 6-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	
Dye Class and after Process Printing	Acid								
	Disperse								can not be printed or dyed; only solution/spin dying possible
Cationic	Reactive	<ul style="list-style-type: none"> <li>▶ steaming 6-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 6-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 5-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ washing</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 6-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 6-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 6-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 6-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>	<ul style="list-style-type: none"> <li>▶ steaming 6-8 min. at 100°C</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ spraying</li> <li>▶ vacuuming</li> <li>▶ drying</li> </ul>
	<p>(Cationic dyes are only used with CHROMOJET)</p>								



## COLARIS CONFIGURATIONS

	COLARIS 12-1200	COLARIS 12-2200	COLARIS 48-2200	COLARIS 48-2600	COLARIS 96-4200	COLARIS 96-5200
Max. print width (mm)	1200 x 1200	2200	2200	2600	4200	5200
Typical applications	Table Sampleprinter	Small Production Mat-Printer	2 m Production Tile-Printer		High Production Printer Wall-to-Wall and Rugs	
Number of colors	12	12 or 6	12 or 6	12 or 6	12 or 6	12 or 6
Print heads/color	1	1 or 2	4 or 8	4 or 8	8 or 16	8 or 16
Max. linear print speed		1.0 m/min.	7.1 m/min.	6.6 m/min.	5.2 m/min.	4.4 m/min.



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**INNOVATION**

**QUALITY**

**SERVICE**

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