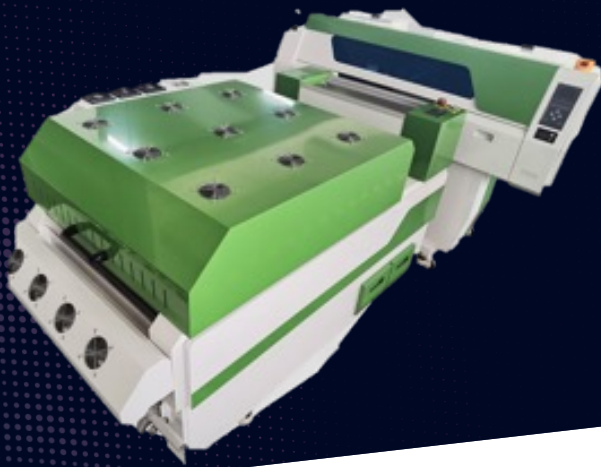# Direct-to-Film Report

A Comprehensive Keypoint Intelligence Evaluation

Enjoy Print E-620 DTF Max

With Enjoy Print film and adhesive powder
Driven by Fiery (CADlink) Digital Factory 11 RIP

Background Specifications	
Printhead	On demand Piezo head
Print Resolution	720dpi
Print Speed (4 head model)	Up to 19m²/hr in 6 pass mode
Maximum Printable Area	600mm
Maximum Media Width	620mm
Ink Type	Enjoy Print Heat transfer pigment (CMYKW)

OUR TAKE

The E-620 is a high volume 24" DTF printing solution from Nanjing, Chinese headquartered Enjoy Print. The device can be purchased in a 2 or 4 Epson i3200 printhead configuration, offering advertised speeds up to 19m2/hr at the six-pass 720 x 1800dpi mode in the four head configuration.

Some of the technology Enjoy Print promotes on the device includes tension bar-controlled media feeding and electric pinch roller control for improved media feeding plus automatic printhead moistening and ink-heating to reduce the risk of clogging. Automated nozzle blockage detection and clean function with user definable blockage tolerance control and blocked nozzle mask compensation are also included for when the occasional blockage does occur. The device comes with Enjoy Print's own powder shaker which has an advanced powder control system and smoke filter to clean the exhaust air of particulates.

Image quality was vibrant with rich vector graphics and solids on both white and black t-shirts. Small fonts when printed with white ink on black t-shirts were among the best we have seen with clear character definition down to 4 point in 8-pass HW mode, while black characters

on white t-shirts were clearly defined down to 5 point with a little definition being lost at the smallest font sizes due to ink spray.

Pantone spot colour matching was good overall delivering an average DeltaE of 7.37 on white t-shirts in production mode with only one colour (PANTONE 2685 Purple) in low double digits. Colour matching on black t-shirts was not quite as good with some of the lighter colour spots (yellows and orange) having higher values due to the black background. Skin tone and memory colour halftones were very good, greyscales suffered from some loss of detail in darkest contrast areas. Ink consumption was lower than most devices we have tested to date on both white and black t-shirts.

Washability results were very good across both white and black t-shirt tests. Colour gamut dropped by no more than 6% which is the lowest gamut drop we have seen to date with not surprisingly no discernible colour changes. No visual defects were observed until 15 washes and then only a minor quality drop in text on white t-shirts and all t-shirts were deemed to be wearable quality after 20 washes.

MAY
2024

PRINT SPEED

Print speed was assessed using the vector graphic shown to the right with 540mm (W) x 450mm (L) dimensions. The image was submitted to the device in various quality modes.

Timings were taken from the moment the printhead started printing the film to the moment the printhead has finished printing and commenced returning to the docking station.

Where multiple film widths are provided for testing, speed analysis shall be conducted on each film with the print speed expressed in m2/hr based on the film width provided.

Note: Film widths tested below the maximum supported width of the device will show slightly reduced maximum print speeds due to the higher impact of each carriage step versus the carriage width covered.

	Maximum Print Speed
	60cm film
Production (720 x 1800dpi) 6 pass	14.68
Highest Quality (720 x 2400dpi) 8 pass	9.40

INK CONSUMPTION

Ink consumption was assessed using the graphic shown to the right with 320mm x 350mm dimensions. The image was submitted to the device in production and high-quality modes.

If the vendor recommends different quality settings for transfer onto white versus black t-shirts then testing shall be conducted accordingly

Provide courtesy of Great Dane Graphics

	Production	**High Quality**
Total CMYK Ink Consumption	1.369 ml	1.637 ml
Total White Ink Consumption	4.252 ml	5.923 ml

INK CONSUMPTION DURING A CLEANING CYCLE

	Soft	Normal	Hard
Ink Consumed on a Full Head Clean Cycle	2.4 ml	6.0 ml	13.1 ml

Vendor Ink Cleaning Cycles

Enjoy Print's recommendation is to run a head check and weak head clean before a large print job. In addition to the manual nozzle check process, the device has an automatic head blockage detection system designed to pick up on head blockages. The user can set the level of blockage acceptability before counter measures are instigated. When an issue is detected, the weak clean will be automatically run, then an automatic nozzle check done again, if the results still exceed the set threshold level then another weak flush and nozzle check will be automatically run. If this still fails, the device will stop the print run until the operator manually approves printing to continue. The device also has nozzle block compensation technology to reduce the impact of individual nozzle blockages. There is also the ability to compensate for nozzle blockages through masking.

IMAGE QUALITY

All image quality analysis conducted by Keypoint Intelligence is carried out using white and black Next Level 3600 premium 100% combed ring-spun cotton T-shirts manufactured in a single batch shipment. Jobs are submitted using the vendors recommended settings. Information on settings provided in the Supporting Test Data section at the back of the report.

COLOUR ACCURACY

The KPI test target containing 9 PANTONE spot colours was released to the device with the RIP set to Spot Colour Matching ON. The printed patches were compared to the Pantone reference library, with the Delta E00 variance measured using a calibrated XRite Exact spectro-photometer.
Note: a DeltaE00 value of less than 4.0 is typically regarded as a near perfect visual match.

White T-shirt Colour Matching Measured in **ΔE°°**

PANTONE Colour	Home Depot 165C	Cadbury 2685C	Walmart 285C	McDonalds 123C	Coca Cola 485C	IKEA 109C	Fedex 363C	UPS 476C	Ford 294C
Production Mode	8.28	14.79	5.39	4.73	6.76	5.49	6.87	5.98	8.00
High Quality Mode	9.1	14.81	5.87	4.76	5.89	5.6	7.87	7.03	8.84

Black T-shirt Colour Matching Measured in **ΔE°°**

PANTONE Colour	Home Depot 165C	Cadbury 2685C	Walmart 285C	McDonalds 123C	Coca Cola 485C	IKEA 109C	Fedex 363C	UPS 476C	Ford 294C
Production Mode	12.94	15.95	6.51	10.78	10.42	11.38	9.59	6.81	9.98
High Quality Mode	13.53	14.38	7.27	10.74	9.76	11.29	10.56	6.23	7.9

COLOUR GAMUT

Colour Gamut Analysis

A 400 colour patch profiling target was printed with colour matching disabled. The patches were read using an Xrite i1iO table/ES 2000 spectrophotometer with XRite's Color Profiler software to create an icc profile. The icc profile was assessed using Chromix ColorThink software to determine the CIE colour gamut volume measurements. The graphical representations of colour gamut presented below were created using Chromix ColorThink Pro software)

	White T-Shirt		Black T-Shirt	
	Production	High Quality	Production	High Quality
Colour Gamut (CIE)	209,776	238,304	142,890	170,606

TEXT AND FINE LINES

	White T-Shirt		Black T-Shirt	
	Production	High Quality	Production	High Quality
Text (Minimum Legible Size)	5 pt	5 pt	5 pt	4 pt
Fine lines	Good	Good	Very Good	Very Good

Text and Fine Line Analysis

Visual assessment of the output was conducted with and without magnification. Fonts were assessed using the sans serif Arial font recording the smallest font size with clear definition. Fine lines and circles are evaluated using a selection of standard laundry symbols with a rating scale from Excellent to Poor.

HALFTONE AND VECTOR GRAPHIC REPRODUCTION

Image quality files were submitted using the vendor recommended settings. The output was visually appraised in a professional D50 light viewing booth by two technicians assessing the output independently across a range of quality attributes with scores assessed over a five-scale rating (Excellent, very Good, Good, Fair, Poor).
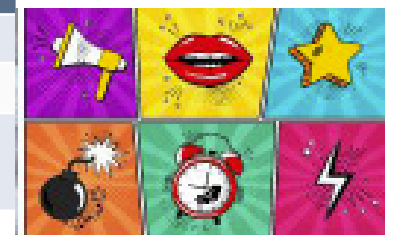
Halftone Image targets

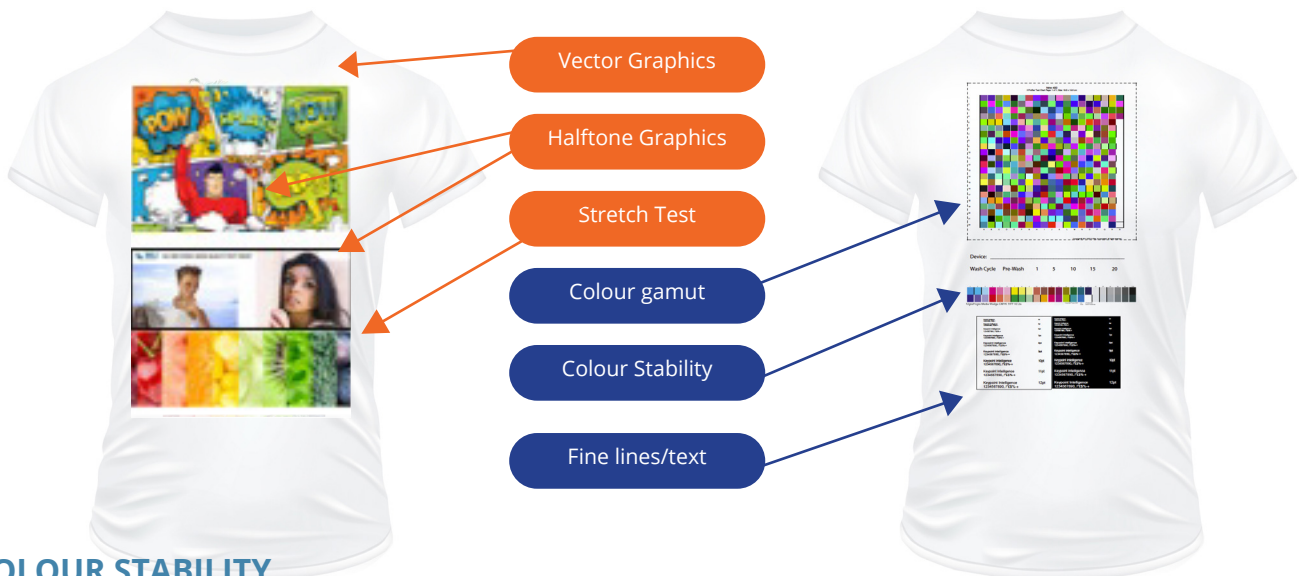| White T-shirt		
Halftone Reproduction		
	Production	**High Quality**
Skin Tones	Very Good	Very Good
Memory Colours	Very Good	Very Good
Greyscales	Good	Good
General Comments	Vibrant metallics, realistic memory colours with high depth of field detailing, some loss of detail in greyscales in darkest shade	
Vector Reproduction		
Solids	Excellent	Excellent
Fine Details	Very Good	Very Good
General Comments	Rich solids with no banding and even colour throughput, smooth gradations from light to dark and from colour to colour.	

Vector Image targets

Black T-shirts		
Halftone Reproduction		
	Production	**High Quality**
Skin tones	Very Good	Very Good
Memory Colours	Very Good	Very Good
Greyscales	Good	Good
General Comments	Vibrant metallics, realistic memory colours with high depth of field detailing, some loss of detail in greyscales in darkest shade	
Vector Reproduction		
Solids	Very Good	Very Good
Fine Details	Very Good	Very Good
General Comments	Rich solids with no banding and even colour throughput, smooth gradations from light to dark and from colour to colour.	

WASHABILITY PERFORMANCE

Washability testing was conducted using two apparel types; Next Level 3600 100% cotton white and black t-shirts. Tests were conducted with the device printing in production mode with two presses. Garments were washed inside out using a Hoover H-Wash 300 H3W 410TAE 10Kg washing machine, at 30ºC with a Proctor & Gamble's Fairy non bio detergent and dried between each wash using a Candy CSE H8A2LE 8Kg heat pump tumble dryer set to hang dry setting. The impact of washing on garment quality over 5/10/15 and 20 wash/dry cycles was assessed across a range of quality attributes comparing back to the garment prior to the first wash/dry cycle.

Note:: Keypoint Intelligence washability test performance should NOT be compared against results quoted by vendors based of AATCC or other standards which maybe limited to assessing one parameter (color fastness alone) or use different test parameters for washing and drying and can greatly influence results. Comparisons should ONLY be conducted with-in the same test protocol.

Vector Graphics

Halftone Graphics

Stretch Test

Colour gamut

Colour Stability

Fine lines/text

COLOUR STABILITY

	Colour Stabilty Results	
	White T-shirt (results expressed as DeltaE00)	**Black T-shirt** (results expressed as DeltaE00)
# of washes		
5	0.91	0.67
10	1.05	0.68
15	1.13	0.74
20	1.29	0.86

Colour stability was assessed using a 84 patch IDEAlliance ISO12647-7 media wedge. The media wedge was measured using an X-Rite spectrophotometer and colour stability versus the original pre-washed output using EFI Verifier software, recording the mean and max colour shift in DeltaEOO. Note: DeltaE00 is a measure of colour difference. A DeltaE00 of 4 is commonly regarded as being undetectable by the human eye.

TEXT DEGRADATION

Font legibility was assessed throughout the washability test routine. On white T-shirts the black fonts were assessed, and on the black T-shirts the white fonts were assessed.

Assessments are judged by two analysts from a 1m viewing distance based on a three-star system (see table to right).
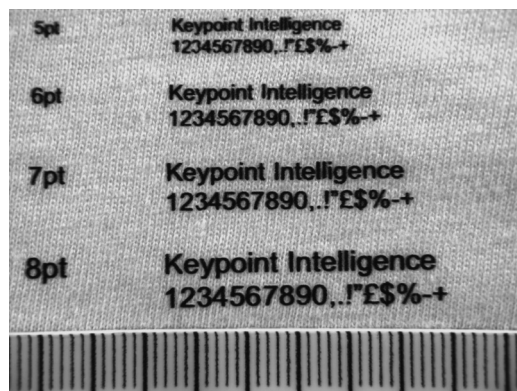
Assessments are carried out before washing, and after 5,10, 15 and 20 washes

Text Degradation Scoring System	
8pt or less	***
9-11pt	**
12pt or more	*

	Text Degradation Results	
	White T-shirt (results expressed as DeltaE00)	**Black T-shirt** (results expressed as DeltaE00)
# of washes		
5	***	***
10	***	***
15	**	***
20	**	***

8 Point Font in HQ mode with T-seal 2ⁿᵈ Press (images enlarged)
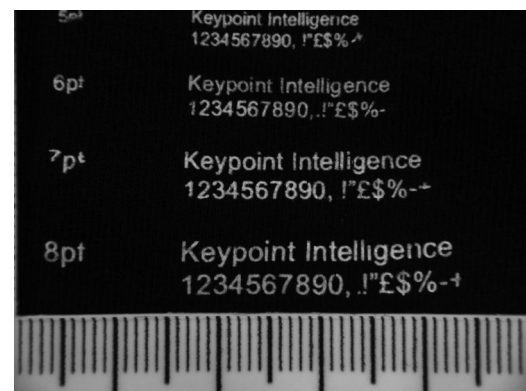
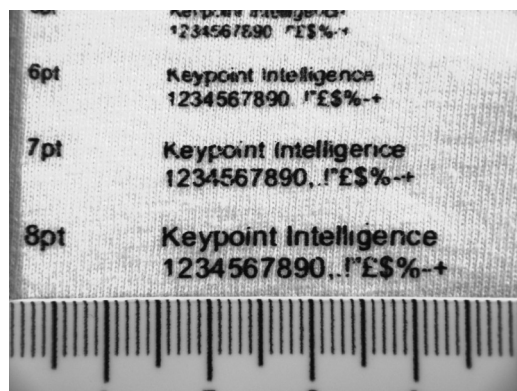| White T-shirt		Black T-shirt

Pre-Wash
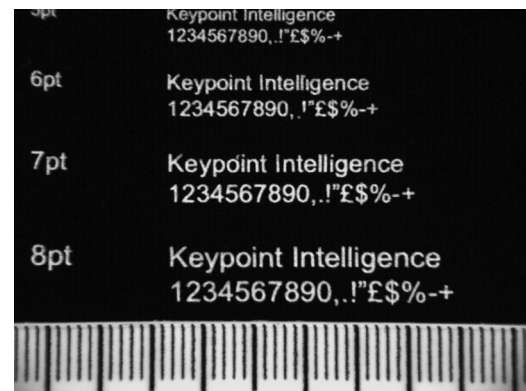
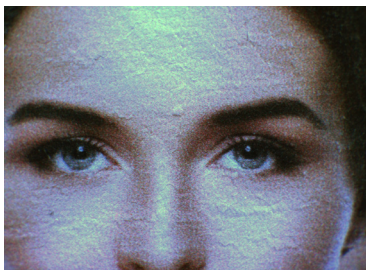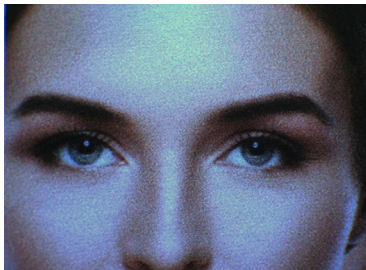20 Washes

HALFTONE AND VECTOR IMAGE DEGRADATION

Halftone and vector graphic quality retention was assessed throughout the washability test routine. Assessments are judged by two analysts from a 1m viewing distance based on a three-star system (see table to right). Assessments are carried out before washing, and after 5,10, 15 and 20 washes

| Graphics Degradation Scoring System	
No degradation	***
Minor Degradation (still suitable for wearing in public)	**
Major Degradation (unsuitable for wearing in public)	*

	Graphic Degradation Results	
	White T-shirt (results expressed as DeltaE00)	Black T-shirt (results expressed as DeltaE00)
# of washes		
5	***	***
10	***	***
15	***	***
20	***	***

Images in Production mode with 2nd Press (images enlarged)

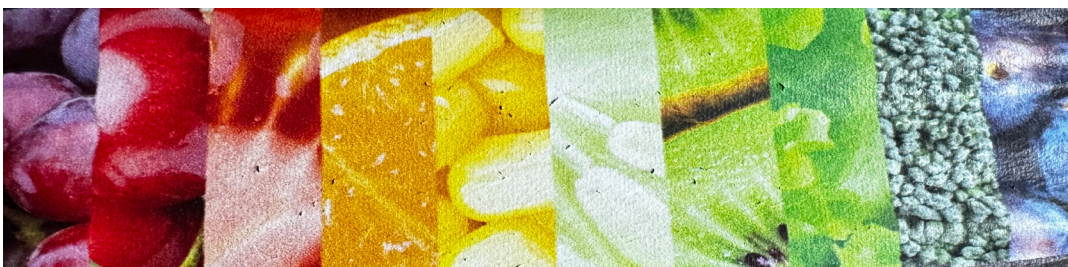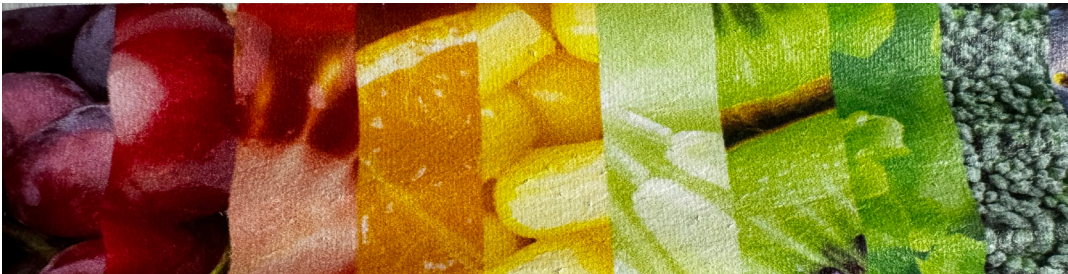| White T-shirt		Black T-shirt
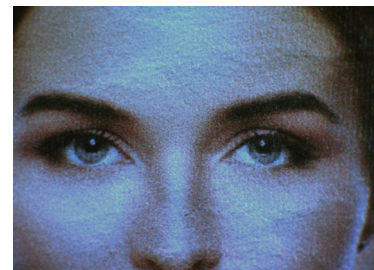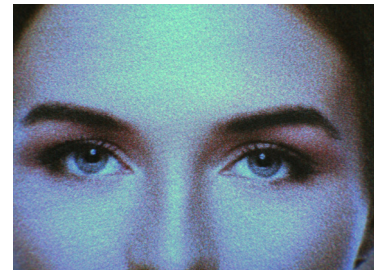
Pre-Wash

20 Washes

STRETCH RESISTANCE

Ink elasticity was assessed throughout the washability test routine using both halftone and solid graphics. Stretch testing was conducted on black t-shirts with a 150% stretch applied using clamps and a set weight over 10 seconds in a horizontal orientation (parallel to shoulders). Images were then taken with a 115% stretch applied simulating modest stretch during wearing. Stretch tests were conducted after 10 and 20 washes.

Stretch Degradation Scoring System	
No degradation	***
Minor Degradation (still suitable for wearing in public)	**
Major Degradation (unsuitable for wearing in public)	*

	Dstretch Resistance Results
	Black T-shirt **(results expressed as DeltaE00)**
# of washes	
10	***
20	**

Images in Production Mode with 2-Press (images enlarged)

COLOUR GAMUT SHRINKAGE

	Colour Gamut Shrinkage Results	
	White T-shirt	Black T-shirt
# of washes		
10	3%	2%
20	6%	4%

Colour gamut shrinkage was assessed using a 400 colour patch IT8 profile target. The target was measured with an X-Rite spectrophotometer using XRite Profilemaker to create an icc profile. The resulting icc profile was then assessed using Chromix ColorThink Pro software to determine the colour gamut size expressed as a CIE volume. The CIE volume after each set number of wash cycles was compared versus the original pre-washed output to determine gamut shrinkage.

SUPPORTING TEST DATA

Device Speed Modes Used For Test	
Production Mode – White	720 x 1800dpi 6 pass
High Quality Mode – White	720 x 2400dpi 8 pass
Production Mode – Black	720 x 1800dpi 6 pass
High Quality Mode - Black	720 x 2400dpi 8 pass

Recommended Cleaning Procedure	
Cleaning Frequency	Recommendation is to run a head check and weak head clean before a large print job. Device has automatic head blockage detection system to pick up on head blockages, the user can set the level of blockage accept-ability before counter measures are instigated
Clean Cycle Used	Weak

Powder / Cure and Image Transfer Settings	
Feed Speed	1.2m feed rate per min
Pre-Heat Temp	INA
Heat Temp	110ºC
First Film Transfer Settings	150ºC press on med pressure for 10 seconds
Second Press Settings	150ºC press on med pressure for 10 seconds

About Keypoint Intelligence

For 60 years, clients in the digital imaging industry have relied on Keypoint Intelligence for independent hands-on testing, lab data, and extensive market research to drive their product and sales success. Keypoint Intelligence has been recognized as the industry's most trusted resource for unbiased information, analysis, and awards due to decades of analyst experience. Customers have harnessed this mission-critical knowledge for strategic decision-making, daily sales enablement, and operational excellence to improve business goals and increase bottom lines. With a central focus on clients, Keypoint Intelligence continues to evolve as the industry changes by expanding offerings and updating methods, while intimately understanding and serving manufacturers', channels', and their customers' transformation in the digital printing and imaging sector.