Print Control Wizard 24.11

CGATS file requirements for the Verification task

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1. File Format

In Automation Engine, the task **Verify Print Measurements** requires input files that are measurements in CGATS file format, the same format used in Color Pilot and Curve Pilot. Find a wiki page on CGATS files *here*.

A CGATS file contains a list of samples.

A sample represents the measurement of one colored patch.

A colored patch can be composed out of different inks. A sample must describe the percentage used for each of these inks.

The measured value represents the amount of reflected or transmitted light from that patch. The sample must contain the measured value. The measurement metric can be density, color or spectral.

2. Required CGATS Properties for the Verification task

Required Tags

TAG Name	Tag Value	Description
CGATS.17		CGATS version
LGOROWLENGTH	<number>	Chart layout - number of rows
NUMBER_OF_STRIPS	<number>	Chart layout - number of rows
NUMBER_OF_COLS	<number>	Chart layout - number of cols
KEYWORD	“SampleID”	Used in DATA_FORMAT, Order number of each sample in DATA
MEASUREMENT_CONDITION	“M0”,”M1”,...	Measurement mode

Required fields for Data and Data Format

The DATA_FORMAT specifies the format of the data or specifies the values that are needed for each sample.

This format depends on the number of inks that are used to compose the samples and depends on the measurement metrics that are used. Learn more below in *Specifying Inks in CGATS* on page 6.

- **The supported measurement metrics are Lab, XYZ and Spectral Values.**

  Example of a CMYK CGATS file with Lab values:

```
NUMBER_OF_FIELDS 8
BEGIN_DATA_FORMAT
SampleID CMYK_C CMYK_M CMYK_Y CMYK_K LAB_L   LAB_A LAB_B
END_DATA_FORMAT
```

  Example: a CMYK CGATS file with Lab and spectral values (wavelengths expressed in nanometer):

```
NUMBER_OF_FIELDS 44
BEGIN_DATA_FORMAT
SampleID CMYK_C CMYK_M CMYK_Y CMYK_K LAB_L LAB_A LAB_B nm380 nm390 nm400 nm410 nm420
 nm430 nm440 nm450 nm460 nm470 nm480 nm490 nm500 nm510 nm520 nm530 nm540 nm550 m560
 nm570 nm580 nm590 nm600 nm610 nm620 nm630 nm640 nm650 nm660 nm670 nm680 nm690 nm700
 nm710 nm720 nm730nm720 nm730
END_DATA_FORMAT
```

- **The DATA lists the values for each sample as specified in the DATA_FORMAT.**

  Example: a CMYK CGATS file with Lab and spectral values:

```
NUMBER_OF_FIELDS  44
BEGIN_DATA_FORMAT
SampleID CMYK_C CMYK_M CMYK_Y CMYK_K LAB_L LAB_A LAB_B nm380 nm390 nm400 nm410 nm420
 nm430 nm440 nm450 nm460 nm470 nm480 nm490 nm500 nm510 nm520 nm530 nm540 nm550 m560
 nm570 nm580 nm590 nm600 nm610 nm620 nm630 nm640 nm650 nm660 nm670 nm680 nm690 nm700
 nm710 nm720 nm730
```

```
END_DATA_FORMAT
NUMBER_OF_SETS <number of samples>
BEGIN_DATA
1 100 0 0 0 50.6103 -42.092 -45.5219 0.02056 0.0431 0.10884 0.1856 0.31173 0.40309
 0.49517 0.53718 0.56144 0.58454 0.58844 0.58022 0.55589 0.50837 0.43616 0.3482
 0.25866 0.17279 0.10114 0.0572 0.03574 0.02566 0.01936 0.016 0.01522 0.01552 0.01704
 0.02106 0.02684 0.02961 0.02802 0.02424 0.01997 0.01909 0.02511 0.04333
2 0 100 0 0 47.3963 76.223 2.8129 0.04504 0.05623 0.0805 0.11254 0.1574 0.18069
 0.19112 0.18261 0.16216 0.13588 0.10851 0.08461 0.06406 0.0444 0.02928 0.02225
 0.01958 0.01521 0.01058 0.01141 0.0408 0.17612 0.409 0.61128 0.72692 0.78078 0.80732
 0.82203 0.82969 0.83239 0.83281 0.83369 0.83714 0.84015 0.83982 0.84167
END_DATA
… <number of samples>
END_DATA
```

3. Specifying Inks in CGATS

The **Verify Print Measurements** task in Automation Engine must know the inks that were used to compose the different samples. This implies that the CGATS file must contain ink information. This ink information can be specified in two ways: by means of an 'inkset' number or by means of ink descriptions:

- **Inks specified by an inkset number**

  An inkset is an Esko specific predefined set of inks that are part of the 'Process' or ClassicColors ink book and that are indicated by an inkset number. If an inkset number is specified in the CGATS file, no ink definitions or specifications are needed.

  These inkset numbers exist:

```
CMYK = 0,
CMY = 1,
CMYKR = 2,
CMYKO = 3,
CMYKG = 4,
CMYKB = 5,
CMYKV = 6,
CMYKRG = 7,
CMYKRB = 8,
CMYKRV = 9,
CMYKOG = 10,
CMYKOB = 11,
CMYKOV = 12,
CMYKGB = 13,
CMYKGV = 14,
CMYKRGB = 15,
CMYKRGV = 16,
CMYKOGB = 17,
CMYKOGV = 18,
HexaChrome = 19,
IndiChrome = 20,
IndiChromePlus = 21,
UserDefined = 22,
MonoChrome = 23,
DuoTone = 24,
RGB = 25,
NrInkSets = 26
```

  Example:

  If the CGATS file represents measurements from CMYK inks, then the INKSET is 0. In that case, the DATA_FORMAT, part of the CGATS file which describes the format of the data, will contain the keywords CMYK_C, CMYK_M, CMYK_Y, CMYK_K. The DATA part of the CGATS file, which lists the composition and measured values of the samples, will indicate a percentage for each of the CMYK inks.

```
INKSET 0
NUMBER_OF_FIELDS 8
BEGIN_DATA_FORMAT
SampleID   CMYK_C CMYK_M CMYK_Y CMYK_K LAB_L LAB_A LAB_B
END_DATA_FORMAT
NUMBER_OF_SETS 2
BEGIN_DATA
1 100   0 0 0 50.6103  -42.092   -45.5219
2 90    0 0 0 54.9355  -36.6133  -40.532
END_DATA
```

  Example:

When the CGATS file uses ClassicColors, the DATA_FORMAT part of the CGATS file will use the following keyword: <total number of inks used>CLR_<ink nr>.

For example, if the used inks are Cyan, Magenta, Yellow, Black, Orange and Violet, then the INKSET is 12 and the number of inks is 6: The DATA_FORMAT part then looks like this:

```
INKSET 12
NUMBER_OF_FIELDS 11
BEGIN_DATA_FORMAT
SampleID 7CLR_1 7CLR_2 7CLR_3 7CLR_4 7CLR_5 7CLR_6 7CLR_7 LAB_L LAB_A LAB_B
END_DATA_FORMAT
NUMBER_OF_SETS  2
BEGIN_DATA
1 12.5 15.331 12.331 0 0 0 0 75.5295 3.22442 1.9075
2 0 50  0 50  0 0 50  28.5782 16.5747 -10.5426
END_DATA
```

- **Inks specified by ink descriptions**

  The inks must be specified by ink descriptions, if INKSET= 22 (user-defined) or if the INKSET is not given and the CGATS file is not CMYK.

  Each ink must be listed in the following way:

  ```
  PROCESSCOLOR_ID "<inkbook>/<inkname>”
  ```

  For example: (ink 7452 from the coated Pantone book pms1000)

  ```
  PROCESSCOLOR_ID "pms1000c/7452"
  ```

  The DATA_FORMAT part of the CGATS file will then use the following keyword:

  ```
  PC<total number of inks listed>_<ink nr>
  ```

  For example:

  ```
  INKSET 22
  PROCESSCOLOR_ID "pms1000c/7452" PROCESSCOLOR_ID "pms1000c/1002"
  NUMBER_OF_FIELDS 6
  BEGIN_DATA_FORMAT
  SAMPLE_ID PC2_1 PC2_2 LAB_L LAB_A LAB_B
  END_DATA_FORMAT
  NUMBER_OF_SETS 4
  BEGIN_DATA
  1 0 0 95.1 0.0 2.0
  2 100 0 4.19 6.26 13.07
  3 0 100 4.19 6.26 13.07
  4 100 100 4.19 6.26 13.07
  END_DATA
  ```

- **Ink specifications required for the Verify Print Measurements task**

  The **Verify Print Measurements** task in Automation Engine loads the CGATS measurement file(s) and uses them to verify an existing PressSync Curve Set. A PressSync Curve Set is set up for a specific set of inks. This means the inks specified in the CGATS file must match the inks of the PressSync Curve Set.

  For example, if the curve set is set up for C, M, Y, K, O, G, V, the CGATS measurement file should use INKSET=18 (CMYKOGV) .

  It is not required that a CGATS file uses all the inks of the PressSync Curve Set. In that case only the inks that are measured will be verified.

For example, if CGATS INKSET=0(CMYK) and the CGATS file is used on a curve set set up for CMYKOGV, only CMYK ink solids and tone scales will be verified.

4. Required samples in a CGATS file for the Verification task

The Verify Print Measurements task loads one or more CGATS measurement files and uses them to verify an existing PressSync Curve Set. The task verifies the selected printing condition towards the PressSync Curve Set of that printing condition.

To make a proper verification, a minimal set of required samples is needed. This set depends on the PressSync Curve Set type.

- **Minimal required samples for a TVI-based PressSync Curve Set**

  A TVI-based PressSync Curve Set is a curve set that calculates adjustment curves based on individual ink tone scales. The minimal required samples to measure such a PressSync Curve Set are:

  - One or more samples that measured substrate or paper (these are samples with composition for each ink = 0)
  - For each ink, one or more samples that measured the solid ink (these are samples with composition = 100 for the specific ink)
  - For each ink, one or more samples that measured a tint of the ink, e.g. 50% (Samples of composition = 50 for the specific ink)

  Note: It is not required to have samples for each ink in one same CGATS file. You can also use one CGATS file for each ink, and then these multiple CGATS files as input for the verification task.

  Example of minimal required samples in a CMYK CGATS file:

  There is a sample for each ink at 100% (ink solid).

  There is a sample for each ink at 50%.

  There is a sample that measured the substrate/paper (sample with 0% for each ink).

```
KEYWORD "SampleID"
NUMBER_OF_FIELDS 8
BEGIN_DATA_FORMAT
SampleID CMYK_C CMYK_M CMYK_Y CMYK_K LAB_L LAB_A LAB_B
END_DATA_FORMAT
NUMBER_OF_SETS 9
BEGIN_DATA
1 100 0 0 0 50.6103 -42.092  -45.5219
2 50  0 0 0 54.9355 -36.6133 -40.532
3 0 100 0 0 50.6103 -42.092  -45.5219
4 0 50  0 0 54.9355 -36.6133 -40.532
5 0 0 100 0 50.6103 -42.092  -45.5219
6 0 0 50  0 54.9355 -36.6133 -40.532
7 0 0 0 100 50.6103 -42.092  -45.5219
8 0 0 0 50  54.9355 -36.6133 -40.532
9 0 0 0 0 64.1976 -27.2125 -30.5951
END_DATA
```

- **Minimal required samples for a G7-based PressSync Curve Set**

  A G7-based PressSync Curve Set is a curve set that calculates adjustment curves based on gray balance. The adjustment curves will cause gray patches (G7 CMY triplets) to print as achromatically as possible.

  For example, to make a 50% gray patch (G7 CMYtriplet=50,40,40), Magenta and Yellow adjustment will shift so that the patch prints without a color cast.

The minimal required samples to measure such a PressSync Curve Set:

- One or more samples that measure substrate/paper (these are samples with composition for each ink = 0)
- For each ink, one or more samples that measured the solid ink (these are samples with composition = 100 for the specific ink
- For black ink, one or more samples that measured a tint of the ink, e.g. 50% (Samples of composition = 50 for the specific ink)
- G7 CMY triplet composed patches

The verification task supports full G7 verification and reporting. Please consult G7 related documentation for more info on the required samples.

Note: About G7 CMY triplets:

A valid G7 CMY triplet can be calculated in the following way:

- C: Percentage of Cyan, also indicating the gray level
- M,Y: Percentage of Magenta and Yellow, in function of C

The values of M or Y are obtained from a polynomial function containing 4 points: (0,0), (25,19), (50,40), (75,66), (100,100) or by using the function M% = Y% = 0.32*C%3-0.08*C%2+0.76*C%

For example, the G7 CMY triplet for 50% gray:

- C= Gray = 50
- M=Y=100 * (0.32*(50/100)3-0.08*(50/100)2+0.76*(50/100) = 40
- => G7 CMY Triplet for 50% gray is (50,40,40)

- **Recommended samples for a full verification**

  To have a complete verification report, the measurement files should have the following samples:

  - At least one paper sample (one or more samples with composition 0% for each ink)
  - For each ink, a sample with tint 25%, 50%, 75% and 100% of that ink
  - The following G7 CMY triplets:
    - CMY=25,19,19
    - CMY=50,40,40
    - CMY=75,66,66
  - The following overprint values:
    - Red (CMY = 0,100,100)
    - Green(CMY=100,0,100)
    - Blue (CMY=100,100,0)