

Technical Recommendation

Color Characterization Target and Data File Format for 4-Color Printing

INTRODUCTION.....	1
1 SCOPE.....	5
2 NORMATIVE REFERENCES	5
3 DEFINITIONS.....	5
4 TECHNICAL REQUIREMENTS	5
4.1 DATA SET DEFINITION.....	5
4.2 COLOUR MEASUREMENT.....	18
4.3 DATA REPORTING	18
4.4 DATA FILE FORMAT	19
ANNEX A: DEFAULT VISUAL LAYOUT	21
ANNEX B: DEFAULT RANDOM LAYOUT	24
ANNEX C: SAMPLE DATA FILE	26

Introduction

The content of this technical recommendation is a continuation of ISO 12642:1996 Graphic technology - Prepress digital data exchange - Input data for characterization of 4-colour process printing. The content is a superset of ISO 12642:1996.

Background

The International Standard ISO 12642:1996 defines the ink values to be used for characterizing 4-colour halftone printing processes. The Standard defines a measurement procedure and a data file format for exchange of ink values and color measurement values. The characterization data are used in colour managed workflows as a description of the various input and output processes and as a starting point for the calculation of device profiles. The data can also be used for process calibration and process control.

The International Standard does not define the physical layout of the target. Annex A (informative) of the Standard gives a sample layout for the characterization target. This target is well known in the graphic arts under its former name IT8.7/3 and is often used for controlling and profiling printing and proofing processes.

The data file format defines the minimum requirements for the communication of the characterization data.

Today many companies in the graphic arts have their own proprietary characterization targets and data file formats due to shortcomings in the ink value distribution of the standard target. Also for many applications the number and distribution of ink combinations of cyan, magenta

and yellow is not sufficient. Proofing devices require more ink values in the mid-tones and quarter-tones for a higher accuracy. The gray balance curves of some ink-jet based processes require more values near the gray axis than currently specified. Other processes like flexo and gravure are very sensitive in the highlight and shadow areas.

The number of black combinations with cyan, magenta and yellow is adequate for the calculation of colour profiles with different settings for under color removal and for gray component replacement.

The sample layout of the ISO 12642:1996 target is not adequate for sheetfed, web and gravure printing. There is an uneven distribution of ink coverage with respect to ink zones. The white areas in the target layout are inconvenient for printing stability. The result of a print characterization is highly dependent on page orientation and layout.

CGATS (Committee for Graphic Arts Technologies Standards) is currently developing a new standard to better fit the needs of package printing. Draft 2, December 10, 2001 is a modification of the existing IT8.7/3 data set. This new standard has the same number of ink combinations of cyan, magenta and yellow as well as more combinations with black as the old standard. New to this standard are more ink value sets with ink combinations in the highlight area.

The goal of this technical recommendation is to define a new color characterization target for 4-colour printing that fulfills the needs of all ink-on-substrate halftone printing processes for publishing and packaging. Another goal of this recommendation is to define a new sample layouts with a more even distribution of ink coverage. A further goal is to better define the minimum requirements for the characterization data file format.

It is not the goal of this recommendation to define target layouts for different measurement procedures and devices.

Choice of colour palette

For accurate characterization of printing processes a large number of colours is preferred. With the advance of automatic measurement devices the effort to measure large targets becomes negligible. For that reason the extended data set of ISO 12642:1996 is enlarged from 746 to 1286 patches by adding more cyan, magenta and yellow levels in Group 1 (Table 1) and more black combinations in Group 6 (Table 1).

Table 1: Characterization target ink values for profiling (proposal)

Group	Black (dark colour)	Cyan, Magenta, Yellow (light colors)	# of Patches
1	0 %	0, 10, 20, 30, 40, 55, 70, 85, 100 %	9 x 9 x 9 = 729
2	20 %	0, 10, 20, 40, 70, 100 %	6 x 6 x 6 = 216
3	40 %	0, 20, 40, 70, 100 %	5 x 5 x 5 = 125
4	60 %	0, 20, 40, 70, 100 %	5 x 5 x 5 = 125
5	80 %	0, 40, 70, 100 %	4 x 4 x 4 = 64
6	100 %	0, 40, 100 %	3 x 3 x 3 = 27
		Total # of Patches	1286

Note 1: No redundant combinations of ink values

For accurate process control and characterization additional colour values in the highlight and shadow regions are required as can be seen in Group 7 and Group 11 - 13 (Table 2). The redundancy from the base data set of ISO 12642:1996 is removed (except in Group 7).

Table 2: Characterization target ink values for process control (proposal)

Group	Description and % Dot	# of Patches
7	Single colour step scales for black (dark colour) and cyan, magenta, yellow (light colours) 100, 98, 95, 90, 85, 80, 75, 70, 60, 50, 40, 30, 25, 20, 15, 10, 7, 5, 3, 2	4 x 20 = 80
8	One additional white patch (paper white)	1
9	Gray balance step scales for cyan, magenta, yellow with black overprints (0, 10, 20, 40, 60, 80, 100)	37
10	Base colors with 70 black for compatibility to ISO 12642	9
11	All combinations of 0 and 3 in CMYK without redundancies from group 1 - 7	11
12	All combinations of 0 and 7 in CMYK without redundancies from group 1 - 7	11
13	Combinations of 0 and 3 with 40 in CMYK without redundancies from group 1 - 7, 11 - 12	50
	Total # of Patches	199

Note 2: 26 redundant combinations of ink values in Group 7 with respect to Group 1 to 6

Note 3: 1 redundant combinations of ink value in Group 8 with respect to Group 1 to 6

The total number of patches from Table 1 and 2 (1485) should be adjusted to a number that gives a fully distributed rectangular array with a side ratio proportional to a typical page size. Assuming Letter and A4 and a patch size of 6 mm, we get $33 \times 45 = 1485$ patches.

Every patch has a unique ID. The location of the patch is layout dependent and not part of this specification.

Layout design

There are constraints from printing processes and printing devices (and from measurement devices too) on the layout of the characterization target. In general, the target layout for conventional offset and gravure processes should be orientation and position independent. The distribution of the ink values for each colour should be balanced. This will result in a randomized target.

If possible each single colour step scale and the gray balance scale should be in one inking zone. The step scale values with the highest ink value should be the first value in printing direction.

The target should have a gray border around the patch area with approximatly 50% tonal coverage.

The layouts shown in the annexes are sample layouts. Everyone is free to change the layout as long as the relationship between the patch ID and the ink values is not changed.

Data file format

Todays usage of the data file format specified in ISO 12642:1996 is not consistent with the intended mode of application. Some applications use the patch ID, others the ink values as a reference. In some cases the patch ID is not exactly related to the ink values or the ink values are not the values specified in the standard. The data file format is not exchangable between different applications. Another problem occurs with the usage of different header informations.

CGATS is defining a new exchange format, which is incorporate in this recommendation by reference (CGATS.17-200x Graphic technology - Exchange format for spectral measurement, colorimetric, and densitometric data in electronic form, Draft 1, June 12, 2001).

1 Scope

This Technical Recommendation defines a data set of ink value combinations for a 4-color characterization target for process printing, a data file format for ink and measurement values and a default visual and random target layout. The recommendation may be used with any combination of three chromatic inks and a dark (chromatic) ink.

This recommendation is a superset of the existing ISO 12642 (IT8.7/3) data set.

2 Normative References

ISO 12642:1996 Graphic technology - Prepress digital data exchange - Input data for characterization of 4-colour process printing.

ISO 13655:1996 Graphic technology - Spectral measurement and colorimetric computation for graphic arts images.

3 Definitions

Process color printing: Reproducing colour images using four printing inks. The standard process inks are cyan, magenta, yellow and black. For package printing one or more inks may change. The darkest color should always be associated with the black ink.

Ink values: Digital value which represents the amount of a colorant. For half-tone printing this is equivalent to the dot area on film or plate expressed as a percentage.

Ink value set: Set of four ink values representing the amount of the four colors to be used in a process color area.

Data set: Collection of ink value sets defined by this recommendation.

4 Technical Requirements

4.1 Data set definition

Two sets of ink values are specified. The gamut of the color space is defined by combinations of cyan, magenta, yellow and black dot area percentages. The process characteristic is defined by single colour step scales, gray balance scales and combinations of color critical values. Each ink value combination has a unique ID as specified in Table 3 and Table 4.

Table 3: Characterization target ink values for profiling

ID	% C	% M	% Y	% K
1	0	0	0	0
2	0	10	0	0
3	0	20	0	0
4	0	30	0	0
5	0	40	0	0
6	0	55	0	0
7	0	70	0	0
8	0	85	0	0
9	0	100	0	0
10	10	0	0	0
11	10	10	0	0
12	10	20	0	0
13	10	30	0	0
14	10	40	0	0
15	10	55	0	0
16	10	70	0	0
17	10	85	0	0
18	10	100	0	0
19	20	0	0	0
20	20	10	0	0
21	20	20	0	0
22	20	30	0	0
23	20	40	0	0
24	20	55	0	0
25	20	70	0	0
26	20	85	0	0
27	20	100	0	0
28	30	0	0	0
29	30	10	0	0
30	30	20	0	0
31	30	30	0	0
32	30	40	0	0
33	30	55	0	0
34	30	70	0	0
35	30	85	0	0
36	30	100	0	0
37	40	0	0	0

ID	% C	% M	% Y	% K
38	40	10	0	0
39	40	20	0	0
40	40	30	0	0
41	40	40	0	0
42	40	55	0	0
43	40	70	0	0
44	40	85	0	0
45	40	100	0	0
46	55	0	0	0
47	55	10	0	0
48	55	20	0	0
49	55	30	0	0
50	55	40	0	0
51	55	55	0	0
52	55	70	0	0
53	55	85	0	0
54	55	100	0	0
55	70	0	0	0
56	70	10	0	0
57	70	20	0	0
58	70	30	0	0
59	70	40	0	0
60	70	55	0	0
61	70	70	0	0
62	70	85	0	0
63	70	100	0	0
64	85	0	0	0
65	85	10	0	0
66	85	20	0	0
67	85	30	0	0
68	85	40	0	0
69	85	55	0	0
70	85	70	0	0
71	85	85	0	0
72	85	100	0	0
73	100	0	0	0
74	100	10	0	0

ID	% C	% M	% Y	% K
75	100	20	0	0
76	100	30	0	0
77	100	40	0	0
78	100	55	0	0
79	100	70	0	0
80	100	85	0	0
81	100	100	0	0
82	0	0	10	0
83	0	10	10	0
84	0	20	10	0
85	0	30	10	0
86	0	40	10	0
87	0	55	10	0
88	0	70	10	0
89	0	85	10	0
90	0	100	10	0
91	10	0	10	0
92	10	10	10	0
93	10	20	10	0
94	10	30	10	0
95	10	40	10	0
96	10	55	10	0
97	10	70	10	0
98	10	85	10	0
99	10	100	10	0
100	20	0	10	0
101	20	10	10	0
102	20	20	10	0
103	20	30	10	0
104	20	40	10	0
105	20	55	10	0
106	20	70	10	0
107	20	85	10	0
108	20	100	10	0
109	30	0	10	0
110	30	10	10	0
111	30	20	10	0

ID	% C	% M	% Y	% K
112	30	30	10	0
113	30	40	10	0
114	30	55	10	0
115	30	70	10	0
116	30	85	10	0
117	30	100	10	0
118	40	0	10	0
119	40	10	10	0
120	40	20	10	0
121	40	30	10	0
122	40	40	10	0
123	40	55	10	0
124	40	70	10	0
125	40	85	10	0
126	40	100	10	0
127	55	0	10	0
128	55	10	10	0
129	55	20	10	0
130	55	30	10	0
131	55	40	10	0
132	55	55	10	0
133	55	70	10	0
134	55	85	10	0
135	55	100	10	0
136	70	0	10	0
137	70	10	10	0
138	70	20	10	0
139	70	30	10	0
140	70	40	10	0
141	70	55	10	0
142	70	70	10	0
143	70	85	10	0
144	70	100	10	0
145	85	0	10	0
146	85	10	10	0
147	85	20	10	0
148	85	30	10	0
149	85	40	10	0
150	85	55	10	0
151	85	70	10	0

ID	% C	% M	% Y	% K
152	85	85	10	0
153	85	100	10	0
154	100	0	10	0
155	100	10	10	0
156	100	20	10	0
157	100	30	10	0
158	100	40	10	0
159	100	55	10	0
160	100	70	10	0
161	100	85	10	0
162	100	100	10	0
163	0	0	20	0
164	0	10	20	0
165	0	20	20	0
166	0	30	20	0
167	0	40	20	0
168	0	55	20	0
169	0	70	20	0
170	0	85	20	0
171	0	100	20	0
172	10	0	20	0
173	10	10	20	0
174	10	20	20	0
175	10	30	20	0
176	10	40	20	0
177	10	55	20	0
178	10	70	20	0
179	10	85	20	0
180	10	100	20	0
181	20	0	20	0
182	20	10	20	0
183	20	20	20	0
184	20	30	20	0
185	20	40	20	0
186	20	55	20	0
187	20	70	20	0
188	20	85	20	0
189	20	100	20	0
190	30	0	20	0
191	30	10	20	0

ID	% C	% M	% Y	% K
192	30	20	20	0
193	30	30	20	0
194	30	40	20	0
195	30	55	20	0
196	30	70	20	0
197	30	85	20	0
198	30	100	20	0
199	40	0	20	0
200	40	10	20	0
201	40	20	20	0
202	40	30	20	0
203	40	40	20	0
204	40	55	20	0
205	40	70	20	0
206	40	85	20	0
207	40	100	20	0
208	55	0	20	0
209	55	10	20	0
210	55	20	20	0
211	55	30	20	0
212	55	40	20	0
213	55	55	20	0
214	55	70	20	0
215	55	85	20	0
216	55	100	20	0
217	70	0	20	0
218	70	10	20	0
219	70	20	20	0
220	70	30	20	0
221	70	40	20	0
222	70	55	20	0
223	70	70	20	0
224	70	85	20	0
225	70	100	20	0
226	85	0	20	0
227	85	10	20	0
228	85	20	20	0
229	85	30	20	0
230	85	40	20	0
231	85	55	20	0

ID	% C	% M	% Y	% K
232	85	70	20	0
233	85	85	20	0
234	85	100	20	0
235	100	0	20	0
236	100	10	20	0
237	100	20	20	0
238	100	30	20	0
239	100	40	20	0
240	100	55	20	0
241	100	70	20	0
242	100	85	20	0
243	100	100	20	0
244	0	0	30	0
245	0	10	30	0
246	0	20	30	0
247	0	30	30	0
248	0	40	30	0
249	0	55	30	0
250	0	70	30	0
251	0	85	30	0
252	0	100	30	0
253	10	0	30	0
254	10	10	30	0
255	10	20	30	0
256	10	30	30	0
257	10	40	30	0
258	10	55	30	0
259	10	70	30	0
260	10	85	30	0
261	10	100	30	0
262	20	0	30	0
263	20	10	30	0
264	20	20	30	0
265	20	30	30	0
266	20	40	30	0
267	20	55	30	0
268	20	70	30	0
269	20	85	30	0
270	20	100	30	0
271	30	0	30	0

ID	% C	% M	% Y	% K
272	30	10	30	0
273	30	20	30	0
274	30	30	30	0
275	30	40	30	0
276	30	55	30	0
277	30	70	30	0
278	30	85	30	0
279	30	100	30	0
280	40	0	30	0
281	40	10	30	0
282	40	20	30	0
283	40	30	30	0
284	40	40	30	0
285	40	55	30	0
286	40	70	30	0
287	40	85	30	0
288	40	100	30	0
289	55	0	30	0
290	55	10	30	0
291	55	20	30	0
292	55	30	30	0
293	55	40	30	0
294	55	55	30	0
295	55	70	30	0
296	55	85	30	0
297	55	100	30	0
298	70	0	30	0
299	70	10	30	0
300	70	20	30	0
301	70	30	30	0
302	70	40	30	0
303	70	55	30	0
304	70	70	30	0
305	70	85	30	0
306	70	100	30	0
307	85	0	30	0
308	85	10	30	0
309	85	20	30	0
310	85	30	30	0
311	85	40	30	0

ID	% C	% M	% Y	% K
312	85	55	30	0
313	85	70	30	0
314	85	85	30	0
315	85	100	30	0
316	100	0	30	0
317	100	10	30	0
318	100	20	30	0
319	100	30	30	0
320	100	40	30	0
321	100	55	30	0
322	100	70	30	0
323	100	85	30	0
324	100	100	30	0
325	0	0	40	0
326	0	10	40	0
327	0	20	40	0
328	0	30	40	0
329	0	40	40	0
330	0	55	40	0
331	0	70	40	0
332	0	85	40	0
333	0	100	40	0
334	10	0	40	0
335	10	10	40	0
336	10	20	40	0
337	10	30	40	0
338	10	40	40	0
339	10	55	40	0
340	10	70	40	0
341	10	85	40	0
342	10	100	40	0
343	20	0	40	0
344	20	10	40	0
345	20	20	40	0
346	20	30	40	0
347	20	40	40	0
348	20	55	40	0
349	20	70	40	0
350	20	85	40	0
351	20	100	40	0

ID	% C	% M	% Y	% K
352	30	0	40	0
353	30	10	40	0
354	30	20	40	0
355	30	30	40	0
356	30	40	40	0
357	30	55	40	0
358	30	70	40	0
359	30	85	40	0
360	30	100	40	0
361	40	0	40	0
362	40	10	40	0
363	40	20	40	0
364	40	30	40	0
365	40	40	40	0
366	40	55	40	0
367	40	70	40	0
368	40	85	40	0
369	40	100	40	0
370	55	0	40	0
371	55	10	40	0
372	55	20	40	0
373	55	30	40	0
374	55	40	40	0
375	55	55	40	0
376	55	70	40	0
377	55	85	40	0
378	55	100	40	0
379	70	0	40	0
380	70	10	40	0
381	70	20	40	0
382	70	30	40	0
383	70	40	40	0
384	70	55	40	0
385	70	70	40	0
386	70	85	40	0
387	70	100	40	0
388	85	0	40	0
389	85	10	40	0
390	85	20	40	0
391	85	30	40	0

ID	% C	% M	% Y	% K
392	85	40	40	0
393	85	55	40	0
394	85	70	40	0
395	85	85	40	0
396	85	100	40	0
397	100	0	40	0
398	100	10	40	0
399	100	20	40	0
400	100	30	40	0
401	100	40	40	0
402	100	55	40	0
403	100	70	40	0
404	100	85	40	0
405	100	100	40	0
406	0	0	55	0
407	0	10	55	0
408	0	20	55	0
409	0	30	55	0
410	0	40	55	0
411	0	55	55	0
412	0	70	55	0
413	0	85	55	0
414	0	100	55	0
415	10	0	55	0
416	10	10	55	0
417	10	20	55	0
418	10	30	55	0
419	10	40	55	0
420	10	55	55	0
421	10	70	55	0
422	10	85	55	0
423	10	100	55	0
424	20	0	55	0
425	20	10	55	0
426	20	20	55	0
427	20	30	55	0
428	20	40	55	0
429	20	55	55	0
430	20	70	55	0
431	20	85	55	0

ID	% C	% M	% Y	% K
432	20	100	55	0
433	30	0	55	0
434	30	10	55	0
435	30	20	55	0
436	30	30	55	0
437	30	40	55	0
438	30	55	55	0
439	30	70	55	0
440	30	85	55	0
441	30	100	55	0
442	40	0	55	0
443	40	10	55	0
444	40	20	55	0
445	40	30	55	0
446	40	40	55	0
447	40	55	55	0
448	40	70	55	0
449	40	85	55	0
450	40	100	55	0
451	55	0	55	0
452	55	10	55	0
453	55	20	55	0
454	55	30	55	0
455	55	40	55	0
456	55	55	55	0
457	55	70	55	0
458	55	85	55	0
459	55	100	55	0
460	70	0	55	0
461	70	10	55	0
462	70	20	55	0
463	70	30	55	0
464	70	40	55	0
465	70	55	55	0
466	70	70	55	0
467	70	85	55	0
468	70	100	55	0
469	85	0	55	0
470	85	10	55	0
471	85	20	55	0

ID	% C	% M	% Y	% K
472	85	30	55	0
473	85	40	55	0
474	85	55	55	0
475	85	70	55	0
476	85	85	55	0
477	85	100	55	0
478	100	0	55	0
479	100	10	55	0
480	100	20	55	0
481	100	30	55	0
482	100	40	55	0
483	100	55	55	0
484	100	70	55	0
485	100	85	55	0
486	100	100	55	0
487	0	0	70	0
488	0	10	70	0
489	0	20	70	0
490	0	30	70	0
491	0	40	70	0
492	0	55	70	0
493	0	70	70	0
494	0	85	70	0
495	0	100	70	0
496	10	0	70	0
497	10	10	70	0
498	10	20	70	0
499	10	30	70	0
500	10	40	70	0
501	10	55	70	0
502	10	70	70	0
503	10	85	70	0
504	10	100	70	0
505	20	0	70	0
506	20	10	70	0
507	20	20	70	0
508	20	30	70	0
509	20	40	70	0
510	20	55	70	0
511	20	70	70	0

ID	% C	% M	% Y	% K
512	20	85	70	0
513	20	100	70	0
514	30	0	70	0
515	30	10	70	0
516	30	20	70	0
517	30	30	70	0
518	30	40	70	0
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520	30	70	70	0
521	30	85	70	0
522	30	100	70	0
523	40	0	70	0
524	40	10	70	0
525	40	20	70	0
526	40	30	70	0
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528	40	55	70	0
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530	40	85	70	0
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535	55	30	70	0
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544	70	30	70	0
545	70	40	70	0
546	70	55	70	0
547	70	70	70	0
548	70	85	70	0
549	70	100	70	0
550	85	0	70	0
551	85	10	70	0

ID	% C	% M	% Y	% K
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553	85	30	70	0
554	85	40	70	0
555	85	55	70	0
556	85	70	70	0
557	85	85	70	0
558	85	100	70	0
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560	100	10	70	0
561	100	20	70	0
562	100	30	70	0
563	100	40	70	0
564	100	55	70	0
565	100	70	70	0
566	100	85	70	0
567	100	100	70	0
568	0	0	85	0
569	0	10	85	0
570	0	20	85	0
571	0	30	85	0
572	0	40	85	0
573	0	55	85	0
574	0	70	85	0
575	0	85	85	0
576	0	100	85	0
577	10	0	85	0
578	10	10	85	0
579	10	20	85	0
580	10	30	85	0
581	10	40	85	0
582	10	55	85	0
583	10	70	85	0
584	10	85	85	0
585	10	100	85	0
586	20	0	85	0
587	20	10	85	0
588	20	20	85	0
589	20	30	85	0
590	20	40	85	0
591	20	55	85	0

ID	% C	% M	% Y	% K
592	20	70	85	0
593	20	85	85	0
594	20	100	85	0
595	30	0	85	0
596	30	10	85	0
597	30	20	85	0
598	30	30	85	0
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601	30	70	85	0
602	30	85	85	0
603	30	100	85	0
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608	40	40	85	0
609	40	55	85	0
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611	40	85	85	0
612	40	100	85	0
613	55	0	85	0
614	55	10	85	0
615	55	20	85	0
616	55	30	85	0
617	55	40	85	0
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622	70	0	85	0
623	70	10	85	0
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625	70	30	85	0
626	70	40	85	0
627	70	55	85	0
628	70	70	85	0
629	70	85	85	0
630	70	100	85	0
631	85	0	85	0

ID	% C	% M	% Y	% K
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633	85	20	85	0
634	85	30	85	0
635	85	40	85	0
636	85	55	85	0
637	85	70	85	0
638	85	85	85	0
639	85	100	85	0
640	100	0	85	0
641	100	10	85	0
642	100	20	85	0
643	100	30	85	0
644	100	40	85	0
645	100	55	85	0
646	100	70	85	0
647	100	85	85	0
648	100	100	85	0
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653	0	40	100	0
654	0	55	100	0
655	0	70	100	0
656	0	85	100	0
657	0	100	100	0
658	10	0	100	0
659	10	10	100	0
660	10	20	100	0
661	10	30	100	0
662	10	40	100	0
663	10	55	100	0
664	10	70	100	0
665	10	85	100	0
666	10	100	100	0
667	20	0	100	0
668	20	10	100	0
669	20	20	100	0
670	20	30	100	0
671	20	40	100	0

ID	% C	% M	% Y	% K
672	20	55	100	0
673	20	70	100	0
674	20	85	100	0
675	20	100	100	0
676	30	0	100	0
677	30	10	100	0
678	30	20	100	0
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680	30	40	100	0
681	30	55	100	0
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683	30	85	100	0
684	30	100	100	0
685	40	0	100	0
686	40	10	100	0
687	40	20	100	0
688	40	30	100	0
689	40	40	100	0
690	40	55	100	0
691	40	70	100	0
692	40	85	100	0
693	40	100	100	0
694	55	0	100	0
695	55	10	100	0
696	55	20	100	0
697	55	30	100	0
698	55	40	100	0
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700	55	70	100	0
701	55	85	100	0
702	55	100	100	0
703	70	0	100	0
704	70	10	100	0
705	70	20	100	0
706	70	30	100	0
707	70	40	100	0
708	70	55	100	0
709	70	70	100	0
710	70	85	100	0
711	70	100	100	0

ID	% C	% M	% Y	% K
712	85	0	100	0
713	85	10	100	0
714	85	20	100	0
715	85	30	100	0
716	85	40	100	0
717	85	55	100	0
718	85	70	100	0
719	85	85	100	0
720	85	100	100	0
721	100	0	100	0
722	100	10	100	0
723	100	20	100	0
724	100	30	100	0
725	100	40	100	0
726	100	55	100	0
727	100	70	100	0
728	100	85	100	0
729	100	100	100	0
730	0	0	0	20
731	0	10	0	20
732	0	20	0	20
733	0	40	0	20
734	0	70	0	20
735	0	100	0	20
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737	10	10	0	20
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740	10	70	0	20
741	10	100	0	20
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745	20	40	0	20
746	20	70	0	20
747	20	100	0	20
748	40	0	0	20
749	40	10	0	20
750	40	20	0	20
751	40	40	0	20

ID	% C	% M	% Y	% K
752	40	70	0	20
753	40	100	0	20
754	70	0	0	20
755	70	10	0	20
756	70	20	0	20
757	70	40	0	20
758	70	70	0	20
759	70	100	0	20
760	100	0	0	20
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764	100	70	0	20
765	100	100	0	20
766	0	0	10	20
767	0	10	10	20
768	0	20	10	20
769	0	40	10	20
770	0	70	10	20
771	0	100	10	20
772	10	0	10	20
773	10	10	10	20
774	10	20	10	20
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777	10	100	10	20
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781	20	40	10	20
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786	40	20	10	20
787	40	40	10	20
788	40	70	10	20
789	40	100	10	20
790	70	0	10	20
791	70	10	10	20

ID	% C	% M	% Y	% K
792	70	20	10	20
793	70	40	10	20
794	70	70	10	20
795	70	100	10	20
796	100	0	10	20
797	100	10	10	20
798	100	20	10	20
799	100	40	10	20
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805	0	40	20	20
806	0	70	20	20
807	0	100	20	20
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816	20	20	20	20
817	20	40	20	20
818	20	70	20	20
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826	70	0	20	20
827	70	10	20	20
828	70	20	20	20
829	70	40	20	20
830	70	70	20	20
831	70	100	20	20

ID	% C	% M	% Y	% K
832	100	0	20	20
833	100	10	20	20
834	100	20	20	20
835	100	40	20	20
836	100	70	20	20
837	100	100	20	20
838	0	0	40	20
839	0	10	40	20
840	0	20	40	20
841	0	40	40	20
842	0	70	40	20
843	0	100	40	20
844	10	0	40	20
845	10	10	40	20
846	10	20	40	20
847	10	40	40	20
848	10	70	40	20
849	10	100	40	20
850	20	0	40	20
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853	20	40	40	20
854	20	70	40	20
855	20	100	40	20
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866	70	70	40	20
867	70	100	40	20
868	100	0	40	20
869	100	10	40	20
870	100	20	40	20
871	100	40	40	20

ID	% C	% M	% Y	% K
872	100	70	40	20
873	100	100	40	20
874	0	0	70	20
875	0	10	70	20
876	0	20	70	20
877	0	40	70	20
878	0	70	70	20
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883	10	40	70	20
884	10	70	70	20
885	10	100	70	20
886	20	0	70	20
887	20	10	70	20
888	20	20	70	20
889	20	40	70	20
890	20	70	70	20
891	20	100	70	20
892	40	0	70	20
893	40	10	70	20
894	40	20	70	20
895	40	40	70	20
896	40	70	70	20
897	40	100	70	20
898	70	0	70	20
899	70	10	70	20
900	70	20	70	20
901	70	40	70	20
902	70	70	70	20
903	70	100	70	20
904	100	0	70	20
905	100	10	70	20
906	100	20	70	20
907	100	40	70	20
908	100	70	70	20
909	100	100	70	20
910	0	0	100	20
911	0	10	100	20

ID	% C	% M	% Y	% K
912	0	20	100	20
913	0	40	100	20
914	0	70	100	20
915	0	100	100	20
916	10	0	100	20
917	10	10	100	20
918	10	20	100	20
919	10	40	100	20
920	10	70	100	20
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939	70	100	100	20
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946	0	0	0	40
947	0	20	0	40
948	0	40	0	40
949	0	70	0	40
950	0	100	0	40
951	20	0	0	40

ID	% C	% M	% Y	% K
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953	20	40	0	40
954	20	70	0	40
955	20	100	0	40
956	40	0	0	40
957	40	20	0	40
958	40	40	0	40
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966	100	0	0	40
967	100	20	0	40
968	100	40	0	40
969	100	70	0	40
970	100	100	0	40
971	0	0	20	40
972	0	20	20	40
973	0	40	20	40
974	0	70	20	40
975	0	100	20	40
976	20	0	20	40
977	20	20	20	40
978	20	40	20	40
979	20	70	20	40
980	20	100	20	40
981	40	0	20	40
982	40	20	20	40
983	40	40	20	40
984	40	70	20	40
985	40	100	20	40
986	70	0	20	40
987	70	20	20	40
988	70	40	20	40
989	70	70	20	40
990	70	100	20	40
991	100	0	20	40

ID	% C	% M	% Y	% K
992	100	20	20	40
993	100	40	20	40
994	100	70	20	40
995	100	100	20	40
996	0	0	40	40
997	0	20	40	40
998	0	40	40	40
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1000	0	100	40	40
1001	20	0	40	40
1002	20	20	40	40
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1004	20	70	40	40
1005	20	100	40	40
1006	40	0	40	40
1007	40	20	40	40
1008	40	40	40	40
1009	40	70	40	40
1010	40	100	40	40
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1012	70	20	40	40
1013	70	40	40	40
1014	70	70	40	40
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1016	100	0	40	40
1017	100	20	40	40
1018	100	40	40	40
1019	100	70	40	40
1020	100	100	40	40
1021	0	0	70	40
1022	0	20	70	40
1023	0	40	70	40
1024	0	70	70	40
1025	0	100	70	40
1026	20	0	70	40
1027	20	20	70	40
1028	20	40	70	40
1029	20	70	70	40
1030	20	100	70	40
1031	40	0	70	40

ID	% C	% M	% Y	% K
1032	40	20	70	40
1033	40	40	70	40
1034	40	70	70	40
1035	40	100	70	40
1036	70	0	70	40
1037	70	20	70	40
1038	70	40	70	40
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1043	100	40	70	40
1044	100	70	70	40
1045	100	100	70	40
1046	0	0	100	40
1047	0	20	100	40
1048	0	40	100	40
1049	0	70	100	40
1050	0	100	100	40
1051	20	0	100	40
1052	20	20	100	40
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1063	70	40	100	40
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1066	100	0	100	40
1067	100	20	100	40
1068	100	40	100	40
1069	100	70	100	40
1070	100	100	100	40
1071	0	0	0	60

ID	% C	% M	% Y	% K
1072	0	20	0	60
1073	0	40	0	60
1074	0	70	0	60
1075	0	100	0	60
1076	20	0	0	60
1077	20	20	0	60
1078	20	40	0	60
1079	20	70	0	60
1080	20	100	0	60
1081	40	0	0	60
1082	40	20	0	60
1083	40	40	0	60
1084	40	70	0	60
1085	40	100	0	60
1086	70	0	0	60
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1092	100	20	0	60
1093	100	40	0	60
1094	100	70	0	60
1095	100	100	0	60
1096	0	0	20	60
1097	0	20	20	60
1098	0	40	20	60
1099	0	70	20	60
1100	0	100	20	60
1101	20	0	20	60
1102	20	20	20	60
1103	20	40	20	60
1104	20	70	20	60
1105	20	100	20	60
1106	40	0	20	60
1107	40	20	20	60
1108	40	40	20	60
1109	40	70	20	60
1110	40	100	20	60
1111	70	0	20	60

ID	% C	% M	% Y	% K
1112	70	20	20	60
1113	70	40	20	60
1114	70	70	20	60
1115	70	100	20	60
1116	100	0	20	60
1117	100	20	20	60
1118	100	40	20	60
1119	100	70	20	60
1120	100	100	20	60
1121	0	0	40	60
1122	0	20	40	60
1123	0	40	40	60
1124	0	70	40	60
1125	0	100	40	60
1126	20	0	40	60
1127	20	20	40	60
1128	20	40	40	60
1129	20	70	40	60
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1131	40	0	40	60
1132	40	20	40	60
1133	40	40	40	60
1134	40	70	40	60
1135	40	100	40	60
1136	70	0	40	60
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1138	70	40	40	60
1139	70	70	40	60
1140	70	100	40	60
1141	100	0	40	60
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1143	100	40	40	60
1144	100	70	40	60
1145	100	100	40	60
1146	0	0	70	60
1147	0	20	70	60
1148	0	40	70	60
1149	0	70	70	60
1150	0	100	70	60
1151	20	0	70	60

ID	% C	% M	% Y	% K
1152	20	20	70	60
1153	20	40	70	60
1154	20	70	70	60
1155	20	100	70	60
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1157	40	20	70	60
1158	40	40	70	60
1159	40	70	70	60
1160	40	100	70	60
1161	70	0	70	60
1162	70	20	70	60
1163	70	40	70	60
1164	70	70	70	60
1165	70	100	70	60
1166	100	0	70	60
1167	100	20	70	60
1168	100	40	70	60
1169	100	70	70	60
1170	100	100	70	60
1171	0	0	100	60
1172	0	20	100	60
1173	0	40	100	60
1174	0	70	100	60
1175	0	100	100	60
1176	20	0	100	60
1177	20	20	100	60
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1179	20	70	100	60
1180	20	100	100	60
1181	40	0	100	60
1182	40	20	100	60
1183	40	40	100	60
1184	40	70	100	60
1185	40	100	100	60
1186	70	0	100	60
1187	70	20	100	60
1188	70	40	100	60
1189	70	70	100	60
1190	70	100	100	60
1191	100	0	100	60

ID	% C	% M	% Y	% K
1192	100	20	100	60
1193	100	40	100	60
1194	100	70	100	60
1195	100	100	100	60
1196	0	0	0	80
1197	0	40	0	80
1198	0	70	0	80
1199	0	100	0	80
1200	40	0	0	80
1201	40	40	0	80
1202	40	70	0	80
1203	40	100	0	80
1204	70	0	0	80
1205	70	40	0	80
1206	70	70	0	80
1207	70	100	0	80
1208	100	0	0	80
1209	100	40	0	80
1210	100	70	0	80
1211	100	100	0	80
1212	0	0	40	80
1213	0	40	40	80
1214	0	70	40	80
1215	0	100	40	80
1216	40	0	40	80
1217	40	40	40	80
1218	40	70	40	80
1219	40	100	40	80
1220	70	0	40	80
1221	70	40	40	80
1222	70	70	40	80
1223	70	100	40	80

ID	% C	% M	% Y	% K
1224	100	0	40	80
1225	100	40	40	80
1226	100	70	40	80
1227	100	100	40	80
1228	0	0	70	80
1229	0	40	70	80
1230	0	70	70	80
1231	0	100	70	80
1232	40	0	70	80
1233	40	40	70	80
1234	40	70	70	80
1235	40	100	70	80
1236	70	0	70	80
1237	70	40	70	80
1238	70	70	70	80
1239	70	100	70	80
1240	100	0	70	80
1241	100	40	70	80
1242	100	70	70	80
1243	100	100	70	80
1244	0	0	100	80
1245	0	40	100	80
1246	0	70	100	80
1247	0	100	100	80
1248	40	0	100	80
1249	40	40	100	80
1250	40	70	100	80
1251	40	100	100	80
1252	70	0	100	80
1253	70	40	100	80
1254	70	70	100	80
1255	70	100	100	80

ID	% C	% M	% Y	% K
1256	100	0	100	80
1257	100	40	100	80
1258	100	70	100	80
1259	100	100	100	80
1260	0	0	0	100
1261	0	40	0	100
1262	0	100	0	100
1263	40	0	0	100
1264	40	40	0	100
1265	40	100	0	100
1266	100	0	0	100
1267	100	40	0	100
1268	100	100	0	100
1269	0	0	40	100
1270	0	40	40	100
1271	0	100	40	100
1272	40	0	40	100
1273	40	40	40	100
1274	40	100	40	100
1275	100	0	40	100
1276	100	40	40	100
1277	100	100	40	100
1278	0	0	100	100
1279	0	40	100	100
1280	0	100	100	100
1281	40	0	100	100
1282	40	40	100	100
1283	40	100	100	100
1284	100	0	100	100
1285	100	40	100	100
1286	100	100	100	100

Table 4: Characterization target ink values for process control

ID	% C	% M	% Y	% K
1287	100	0	0	0
1288	98	0	0	0
1289	95	0	0	0
1290	90	0	0	0
1291	85	0	0	0
1292	80	0	0	0
1293	75	0	0	0
1294	75	0	0	0
1295	60	0	0	0
1296	50	0	0	0
1297	40	0	0	0
1298	30	0	0	0
1299	25	0	0	0
1300	20	0	0	0
1301	15	0	0	0
1302	10	0	0	0
1303	7	0	0	0
1304	5	0	0	0
1305	3	0	0	0
1306	2	0	0	0
1307	0	100	0	0
1308	0	98	0	0
1309	0	95	0	0
1310	0	90	0	0
1311	0	85	0	0
1312	0	80	0	0
1313	0	75	0	0
1314	0	70	0	0
1315	0	60	0	0
1316	0	50	0	0
1317	0	40	0	0
1318	0	30	0	0
1319	0	25	0	0
1320	0	20	0	0
1321	0	15	0	0
1322	0	10	0	0
1323	0	7	0	0
1324	0	5	0	0

ID	% C	% M	% Y	% K
1325	0	3	0	0
1326	0	2	0	0
1327	0	0	100	0
1328	0	0	98	0
1329	0	0	95	0
1330	0	0	90	0
1331	0	0	85	0
1332	0	0	80	0
1333	0	0	75	0
1334	0	0	70	0
1335	0	0	60	0
1336	0	0	50	0
1337	0	0	40	0
1338	0	0	30	0
1339	0	0	25	0
1340	0	0	20	0
1341	0	0	15	0
1342	0	0	10	0
1343	0	0	7	0
1344	0	0	5	0
1345	0	0	3	0
1346	0	0	2	0
1347	0	0	0	100
1348	0	0	0	98
1349	0	0	0	95
1350	0	0	0	90
1351	0	0	0	85
1352	0	0	0	80
1353	0	0	0	75
1354	0	0	0	70
1355	0	0	0	60
1356	0	0	0	50
1357	0	0	0	40
1358	0	0	0	30
1359	0	0	0	25
1360	0	0	0	20
1361	0	0	0	15
1362	0	0	0	10

ID	% C	% M	% Y	% K
1363	0	0	0	7
1364	0	0	0	5
1365	0	0	0	3
1366	0	0	0	2
1367	0	0	0	0
1368	100	85	85	0
1369	80	65	65	0
1370	60	45	45	0
1371	40	27	27	0
1372	20	12	12	0
1373	10	6	6	0
1374	5	3	3	0
1375	40	27	27	10
1376	20	12	12	10
1377	10	6	6	10
1378	60	45	45	20
1379	40	27	27	20
1380	20	12	12	20
1381	10	6	6	20
1382	80	65	65	40
1383	60	45	45	40
1384	40	27	27	40
1385	20	12	12	40
1386	10	6	6	40
1387	100	85	85	60
1388	80	65	65	60
1389	60	45	45	60
1390	40	27	27	60
1391	20	12	12	60
1392	10	6	6	60
1393	100	85	85	80
1394	80	65	65	80
1395	60	45	45	80
1396	40	27	27	80
1397	20	12	12	80
1398	10	6	6	80
1399	100	85	85	100
1400	80	65	65	100

ID	% C	% M	% Y	% K
1401	60	45	45	100
1402	40	27	27	100
1403	20	12	12	100
1404	10	6	6	100
1405	100	0	0	70
1406	0	100	0	70
1407	0	0	100	70
1408	100	100	0	70
1409	100	0	100	70
1410	0	100	100	70
1411	40	40	0	70
1412	40	0	40	70
1413	0	40	40	70
1414	3	3	0	0
1415	3	0	3	0
1416	0	3	3	0
1417	3	3	3	0
1418	3	0	0	3
1419	0	3	0	3
1420	3	3	0	3
1421	0	0	3	3
1422	3	0	3	3
1423	0	3	3	3
1424	3	3	3	3
1425	7	7	0	0
1426	7	0	7	0
1427	0	7	7	0
1428	7	7	7	0
1429	7	0	0	7

ID	% C	% M	% Y	% K
1430	0	7	0	7
1431	7	7	0	7
1432	0	0	7	7
1433	7	0	7	7
1434	0	7	7	7
1435	7	7	7	7
1436	40	3	0	0
1437	3	40	0	0
1438	40	0	3	0
1439	40	3	3	0
1440	0	40	3	0
1441	3	40	3	0
1442	40	40	3	0
1443	3	0	40	0
1444	0	3	40	0
1445	3	3	40	0
1446	40	3	40	0
1447	3	40	40	0
1448	40	0	0	3
1449	40	3	0	3
1450	0	40	0	3
1451	3	40	0	3
1452	40	40	0	3
1453	40	0	3	3
1454	40	3	3	3
1455	0	40	3	3
1456	3	40	3	3
1457	40	40	3	3
1458	0	0	40	3

ID	% C	% M	% Y	% K
1459	3	0	40	3
1460	40	0	40	3
1461	0	3	40	3
1462	3	3	40	3
1463	40	3	40	3
1464	0	40	40	3
1465	3	40	40	3
1466	40	40	40	3
1467	3	0	0	40
1468	0	3	0	40
1469	3	3	0	40
1470	40	3	0	40
1471	3	40	0	40
1472	0	0	3	40
1473	3	0	3	40
1474	40	0	3	40
1475	0	3	3	40
1476	3	3	3	40
1477	40	3	3	40
1478	0	40	3	40
1479	3	40	3	40
1480	40	40	3	40
1481	3	0	40	40
1482	0	3	40	40
1483	3	3	40	40
1484	40	3	40	40
1485	3	40	40	40

4.2 Colour measurement

All measurements should be made in accordance with ISO 13655. If white backing is used during measurement, this exception should be noted.

4.3 Data reporting

Colorimetric data shall be reported as CIE based tristimulus values, either in CIELAB or CIEXYZ with sufficient decimal places. CIEXYZ values are in the range from 0.0 to 100.0 for the Y-component.

The following data shall be provided:

- description of originator of the data (organization or individual that created the data file);

- description of the purpose or content of the data;
- date of creation of data;
- description of instrumentation use (manufacturer and model);
- description of measurement conditions (illuminant, geometry);

All other data are optional.

4.4 Data file format

The file format shall be an ASCII format keyword value file.

See ISO 12642:1996 and CGATS.17 for reference.

(Note: Future version should be based on XML.)

The required keywords, and their definitions, are as follows:

ORIGINATOR	Identifies the specific system, organization or individual that created the data file.
DESCRIPTOR	Describes the purpose or contents of the data file.
CREATED	Indicates the creation date of the data file.
INSTRUMENTATION	Used to report the specific instrumentation used (e.g., manufacturer, model number and serial number, etc.) to generate the data reported
MEASUREMENT_SOURCE	Illumination (e.g., A, D50, D65, etc.) and any filters (e.g., uv, polarization, etc.) used during spectral measurement.
MEASUREMENT_GEOMETRY	The type of measurement, either reflection or transmission, should be indicated along with details of the geometry used. Indicates the aperture size and shape.
NUMBER_OF_FIELDS	Number of fields (data format identifiers) that are included in the data format definition that follows. The value associated with this entry is an integer.
BEGIN_DATA_FORMAT	Marks the beginning of a definition of a data set. Data format identifiers indicate the relationship between fields, and their value. Data format may have an arbitrary number of entries, and is closed by END_DATA_FORMAT. The values of the data format must be either data format identifiers or keywords.
END_DATA_FORMAT	Marks the end of a data format definition. END_DATA_FORMAT must be preceded by BEGIN_DATA_FORMAT, and must be followed by white space.
NUMBER_OF_SETS	Number of repetitions or sets of data corresponding to the data format fields that are included in the data to follow. The associated value is an integer.
BEGIN_DATA	Marks the beginning of a stream of data.

END_DATA Marks the end of a stream of data.

The optional keywords, and their definitions, are as follows:

PRINT_CONDITIONS	Used to define the characteristics of the printed sheet being reported.
SAMPLE_BACKING	Identifies the backing material used behind the sample during measurement. Allowed values are "black", "white", or "na".

Keywords for data reporting:

SAMPLE_ID	Identifies sample that data represents
STRING	Identifies the location of sample
CMYK_C	Cyan component of CMYK data expressed as a percentage
CMYK_M	Magenta component of CMYK data expressed as a percentage
CMYK_Y	Yellow component of CMYK data expressed as a percentage
CMYK_K	Black component of CMYK data expressed as a percentage
XYZ_X	X component of tristimulus data
XYZ_Y	Y component of tristimulus data
XYZ_Z	Z component of tristimulus data
and / or	
LAB_L	L* component of CIELAB data
LAB_A	a* component of CIELAB data
LAB_B	b* component of CIELAB data

(Either XYZ or LAB or both can be used for data reporting. Other keywords are allowed.)

What about spectral data ?

Annex A: Default visual layout

This recommendation does not specify any layout of the ink value sets. The layout depends strongly on the printing process as well as on the measurement equipment. A default visual layout is provided in this recommendation as an example.

The visual layout is for use in situations where an easy identification of patches or manual measurement is important and where no or only small interactions occur between adjacent patches.

The minimum patch size should be greater or equal to 6 mm with no borders between the patches. (Some automatic measurement devices require borders between patches to identify the center of the patch. In this case special target layouts are necessary.)

A rectangular array with 1485 patches can be built by 33 rows and 45 columns. (Other combinations are f.e. 11 rows and 135 columns and 15 rows and 99 columns or vice versa.) Rows are identified by characters (A to Z and a to g), columns by numbers (1 to 45). Each patch location is given by a combination of one character and one number (A1 to g45).

The patch id and the target location are not directly related. Information about the relation between them are provided together with the layout files.

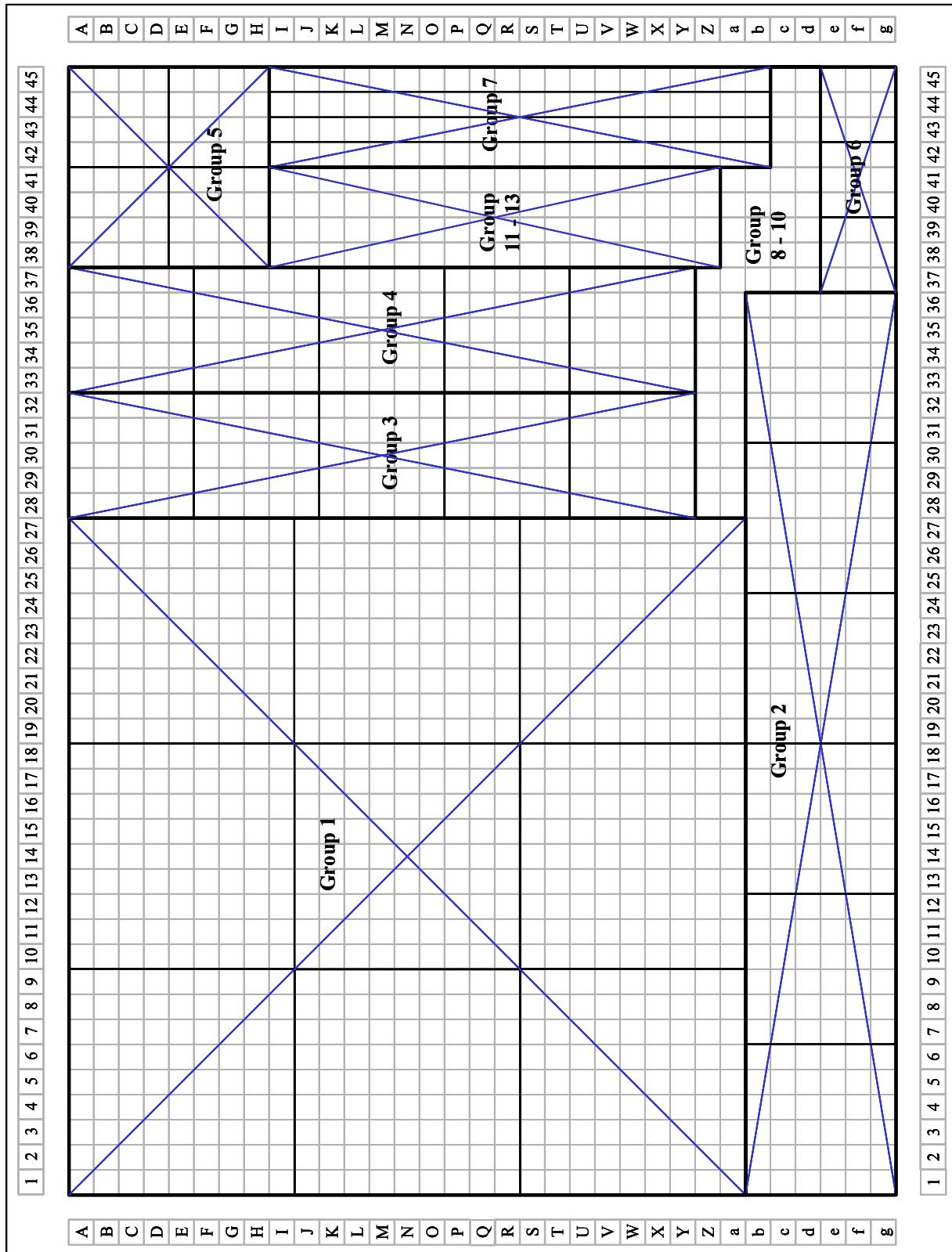


Figure 1: Grouping of ink value sets (visual sample layout)

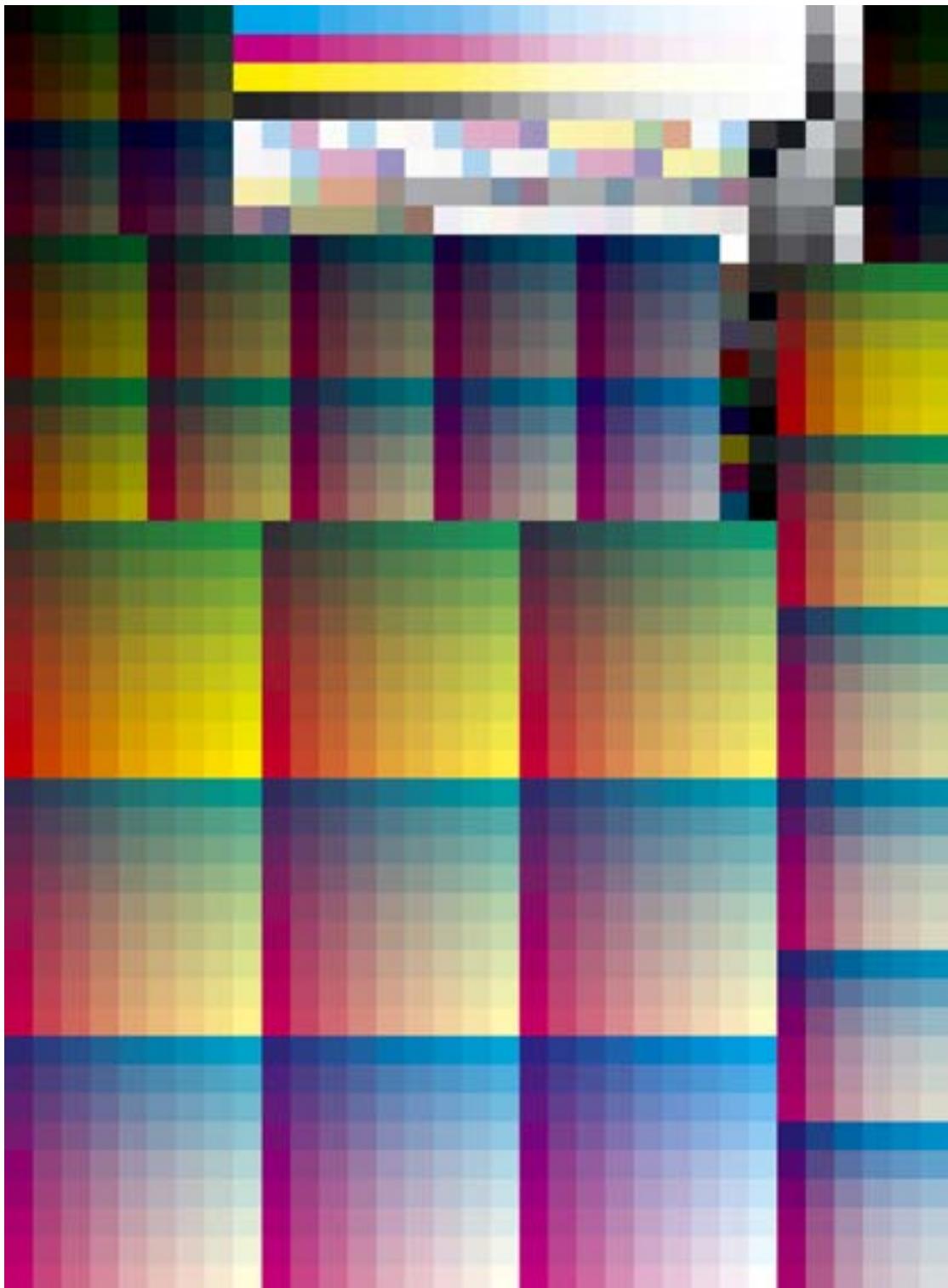


Figure 2: Visual sample layout

Annex B: Default random layout

This recommendation does not specify any layout of the ink value sets. The layout depends strongly on the printing process as well as on the measurement equipment. A default random or scrambled layout is provided in this recommendation as a example.

(The sample is not fully randomized in each row and/or column, but it has equal ink coverage in every 5 rows an/or columns. 5 rows with 6 mm each are approximatly the ink zone width of modern offset printing machines)

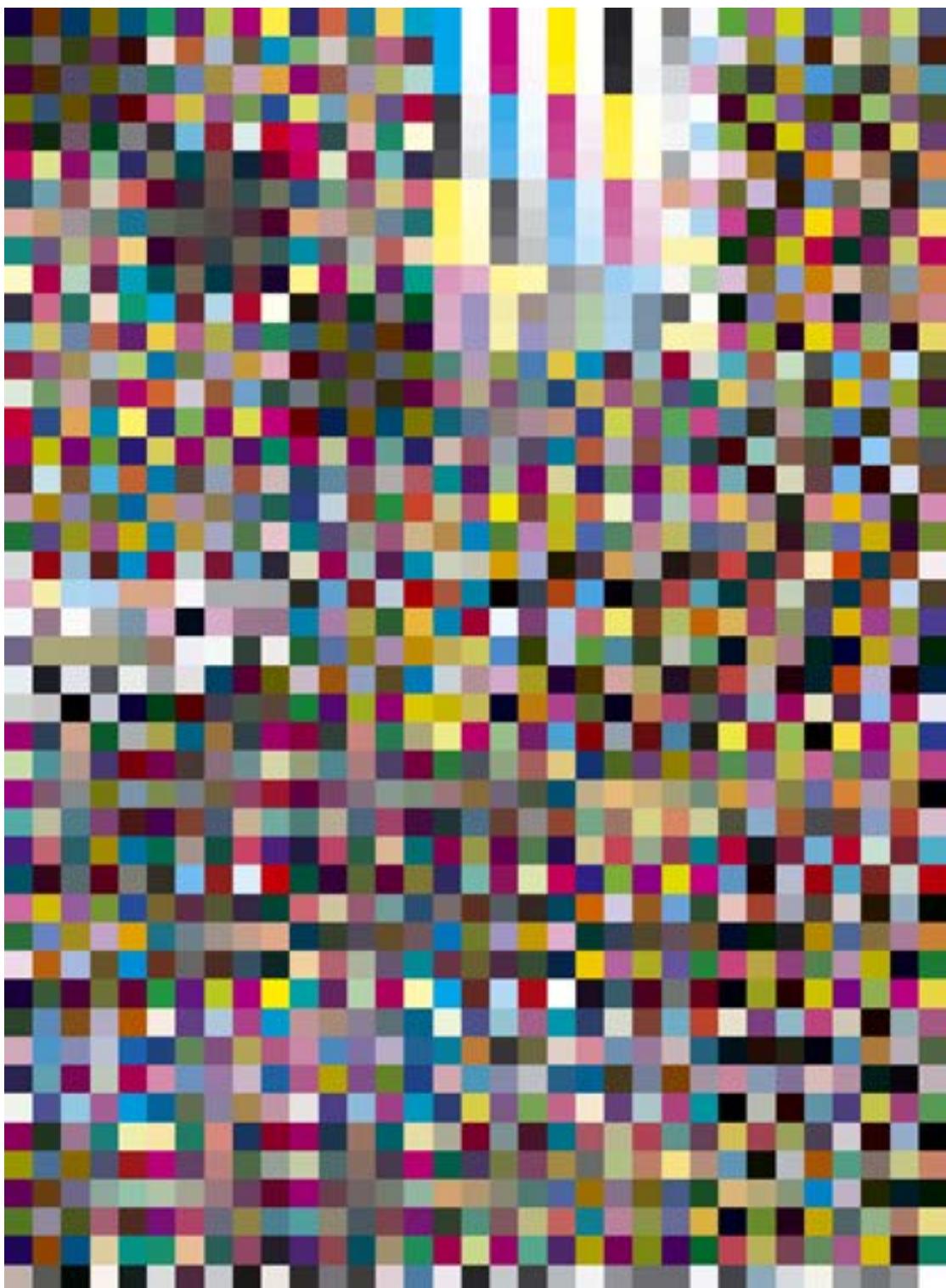


Figure 3: Randomized sample layout

Annex C: Sample data file

ECI2002

ORIGINATOR "descriptiv text"

DESCRIPTOR "descriptiv text"

CREATED "descriptiv text "

INSTRUMENTATION "descriptiv text"

MEASUREMENT_SOURCE "Illumination=D50 Filter=No"

MEASUREMENT_GEOMETRY " ObserverAngle=2- WhiteBase=Abs"

NUMBER_OF_FIELDS 8

BEGIN_DATA_FORMAT

SAMPLE_ID CMYK_C CMYK_M CMYK_Y CMYK_K XYZ_X XYZ_Y XYZ_Z

END_DATA_FORMAT

NUMBER_OF_SETS 1485

BEGIN_DATA

	0	0	0	0	82.6721	85.7712	75.1007
1	0	10	0	0	75.0918	74.9523	66.8712
2	0	20	0	0	68.3989	65.2286	59.3961
3	0	30	0	0	61.5885	55.7294	51.9022
4	0	40	0	0	55.7838	47.5517	45.3927
5	0	55	0	0	47.1948	36.0625	34.8440
6	0	70	0	0	40.4237	27.2339	26.5646
7	0	85	0	0	35.8486	21.0509	20.7293
8	0	100	0	0	32.3485	16.5124	16.0132
9	10	0	0	0	74.0902	
10	0	0	0	0	...		
11	0	0	0	0	...		
12	0	0	0	0	...		
13	0	0	0	0	...		
14	0	0	0	0	...		
15	0	0	0	0	...		
16	0	0	0	0	...		
17	0	0	0	0	...		
18	0	0	0	0	...		
19	0	0	0	0	...		
20	0	0	0	0	...		
21	0	0	0	0	...		
22	0	0	0	0	...		
23	0	0	0	0	...		
24	0	0	0	0	...		
25	0	0	0	0	...		
26	0	0	0	0	...		
27	0	0	0	0	...		
28	0	0	0	0	...		
29	0	0	0	0	...		
30	0	0	0	0	...		
31	0	0	0	0	...		
32	0	0	0	0	...		
33	0	0	0	0	...		
34	0	0	0	0	...		
35	0	0	0	0	...		
36	0	0	0	0	...		
37	0	0	0	0	...		
38	0	0	0	0	...		
39	0	0	0	0	...		
40	0	0	0	0	...		
41	0	0	0	0	...		
42	0	0	0	0	...		
43	0	0	0	0	...		
44	0	0	0	0	...		
45	0	0	0	0	...		
46	0	0	0	0	...		
47	0	0	0	0	...		
48	0	0	0	0	...		
49	0	0	0	0	...		
50	0	0	0	0	...		
51	0	0	0	0	...		
52	0	0	0	0	...		
53	0	0	0	0	...		
54	0	0	0	0	...		
55	0	0	0	0	...		
56	0	0	0	0	...		
57	0	0	0	0	...		
58	0	0	0	0	...		
59	0	0	0	0	...		
60	0	0	0	0	...		
61	0	0	0	0	...		
62	0	0	0	0	...		
63	0	0	0	0	...		
64	0	0	0	0	...		
65	0	0	0	0	...		
66	0	0	0	0	...		
67	0	0	0	0	...		
68	0	0	0	0	...		
69	0	0	0	0	...		
70	0	0	0	0	...		
71	0	0	0	0	...		
72	0	0	0	0	...		
73	0	0	0	0	...		
74	0	0	0	0	...		
75	0	0	0	0	...		
76	0	0	0	0	...		
77	0	0	0	0	...		
78	0	0	0	0	...		
79	0	0	0	0	...		
80	0	0	0	0	...		
81	0	0	0	0	...		
82	0	0	0	0	...		
83	0	0	0	0	...		
84	0	0	0	0	...		
85	0	0	0	0	...		
86	0	0	0	0	...		
87	0	0	0	0	...		
88	0	0	0	0	...		
89	0	0	0	0	...		
90	0	0	0	0	...		
91	0	0	0	0	...		
92	0	0	0	0	...		
93	0	0	0	0	...		
94	0	0	0	0	...		
95	0	0	0	0	...		
96	0	0	0	0	...		
97	0	0	0	0	...		
98	0	0	0	0	...		
99	0	0	0	0	...		
100	0	0	0	0	...		
101	0	0	0	0	...		
102	0	0	0	0	...		
103	0	0	0	0	...		
104	0	0	0	0	...		
105	0	0	0	0	...		
106	0	0	0	0	...		
107	0	0	0	0	...		
108	0	0	0	0	...		
109	0	0	0	0	...		
110	0	0	0	0	...		
111	0	0	0	0	...		
112	0	0	0	0	...		
113	0	0	0	0	...		
114	0	0	0	0	...		
115	0	0	0	0	...		
116	0	0	0	0	...		
117	0	0	0	0	...		
118	0	0	0	0	...		
119	0	0	0	0	...		
120	0	0	0	0	...		
121	0	0	0	0	...		
122	0	0	0	0	...		
123	0	0	0	0	...		
124	0	0	0	0	...		
125	0	0	0	0	...		
126	0	0	0	0	...		
127	0	0	0	0	...		
128	0	0	0	0	...		
129	0	0	0	0	...		
130	0	0	0	0	...		
131	0	0	0	0	...		
132	0	0	0	0	...		
133	0	0	0	0	...		
134	0	0	0	0	...		
135	0	0	0	0	...		
136	0	0	0	0	...		
137	0	0	0	0	...		
138	0	0	0	0	...		
139	0	0	0	0	...		
140	0	0	0	0	...		
141	0	0	0	0	...		
142	0	0	0	0	...		
143	0	0	0	0	...		
144	0	0	0	0	...		
145	0	0	0	0	...		
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156	0	0	0	0	...		
157	0	0	0	0	...		
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159	0	0	0	0	...		
160	0	0	0	0	...		
161	0	0	0	0	...		
162	0	0	0	0	...		
163	0	0	0	0	...		
164	0	0	0	0	...		
165	0	0	0	0	...		
166	0	0	0	0	...		
167	0	0	0	0	...		
168	0	0	0	0	...		
169	0	0	0	0	...		
170	0	0	0	0	...		
171	0	0	0	0	...		
172	0	0	0	0	...		
173	0	0	0	0	...		
174	0	0	0	0	...		
175	0	0	0	0	...		
176	0	0	0	0	...		
177	0	0	0	0	...		
178	0	0	0	0	...		
179	0	0	0	0	...		
180	0	0	0	0	...		
181	0	0	0	0	...		
182	0	0	0	0	...		
183	0	0	0	0	...		
184	0	0	0	0	...		
185	0	0	0	0	...		
186	0	0	0	0	...		
187	0	0	0	0	...		
188	0	0	0	0	...		
189	0	0	0	0	...		
190	0	0	0	0	...		
191	0	0	0	0	...		
192	0	0	0	0	...		
193	0	0	0	0	...		
194	0	0	0	0	...		
195	0	0	0	0	...		
196	0	0	0	0	...		
197	0	0	0	0	...		
198	0	0	0	0	...		
199	0	0	0	0	...		
200	0	0	0	0	...		
201	0	0	0	0	...		
202	0	0	0	0	...		
203	0	0	0	0	...		
204	0	0	0	0	...		
205	0	0	0	0	...		
206	0	0	0	0	...		
207	0	0	0	0	...		
208	0	0	0	0	...		
209	0	0	0	0	...		
210	0	0	0	0	...		
211	0	0	0	0	...		
212	0	0	0	0	...		
213	0	0	0	0	...		
214	0	0	0	0	...		
215	0	0	0	0	...		
216	0	0	0	0	...		
217	0	0	0	0	...		
218	0	0	0</				