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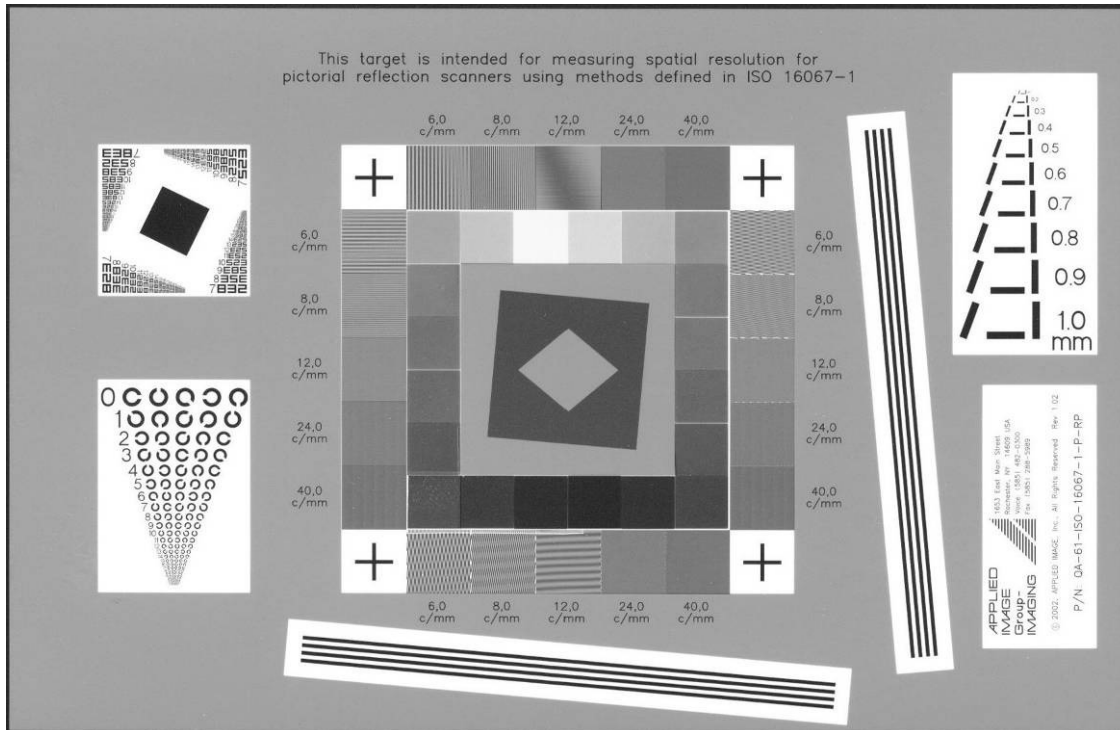
QA-61-ISO-16067-1
ISO-16067-1
Scanner Test Chart
Product Specifications



Catalog Part No: QA-61-ISO-16067-1-P-RM

Product Name: ISO-16067-1 Scanner Test Chart

Drawing / Photo of Part:



The above image is an approximate representation of the actual product.
Specifications are subject to change without notice.


Description: Test array meeting the specified requirements of ISO-16067-1.

Substrate Size: 100mm x 152mm

Substrate Type: White reflective photo paper

Image Forming Material: Photographic emulsion

Image Description: Includes slant edge, alphanumeric resolution chart, Landolt Ring chart, gray step patches. Horizontal, vertical and slanted Ronchi patterns are provided at 6 to 40c/mm. Applied Image has also provided (as permitted in section 4.1.2 of the standard) a T-100 Digital Electronic Pixel Target that has

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horizontal, vertical and slanted bars in widths from 0.1 to 1.0mm (width to length ratio is 1:5).

Polarity: Positive and primarily gray.

Reading Direction: Right Read Emulsion Up (RREU).

Image Placement Accuracy: Not applicable

Feature Size Accuracy: Typical line width is 2 to 5 percent of aim.

Image Contrast / Density: As specified in ISO-16067-1.

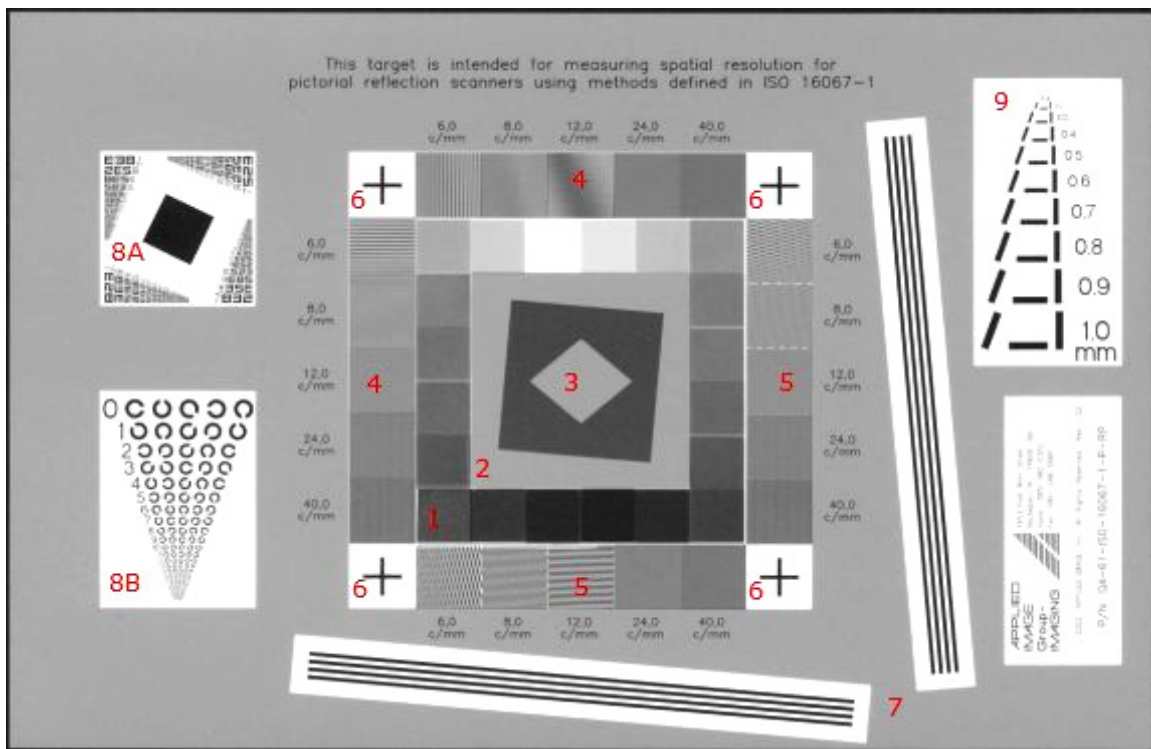
History / typical use: To determine reflective light resolution and imaging characteristics of recording devices.

Other: A Windows executable program (2.5 MB zip file) is available for download from www.i3a.org. That executable is a target format (ISO 16067-1) specific version of *sfrwin* that allows the user to easily select fiducial mark locations through a GUI. Four SFR estimates (two horizontal and two vertical) are generated based on pre-defined edge locations as well as Opto-Electronic Conversion Function (OECF) and noise data for target gray patches. TIFF and BMP files are the acceptable input formats.

Related Parts: QA-62, QA-76, QA-72, QA-77

Target Information:

The ISO-16067-1 target is made on a black & white silver halide reflective media. It is spectrally neutral, of high spatial frequency content and conforms to the target specifications outline in ISO 16067-1, Electronic scanners for photographic images – Spatial resolution Measurements – Part1: scanners for reflective media.



1. Neutral tone scale patches

Used to measure a device's Opto-Electronic Conversion Function (OECF). The OECF is the relationship between physical optical density and scanner count value. The nominal reflection densities for each patch are indicated on the reverse side. The user is encouraged to verify or supersede these with their own densitometry.

2. Near-vertical and near-horizontal slanted edges

With the aid of appropriate software, these features are used to measure the vertical and horizontal spatial frequency response (SFR) or Modulation Transfer Function (MTF) of a device. They are rotated approximately 5 degrees from horizontal and vertical directions and have approximately a 60% contrast modulation. This relatively

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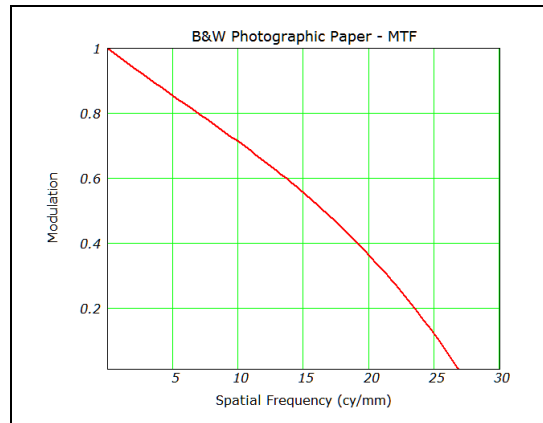
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low contrast ratio is designed to minimize MTF estimation errors. The following equation indicates a typical MTF response (ISO-16067-1 Section 4.2.5).

$$MTF = - 2.497 \times 10^{-6} (\nu^3) + 4.418 \times 10^{-4} (\nu^2) - 3.074 \times 10^{-2} (\nu) + 1.0$$

where ν equals spatial frequency in cycles/mm and is less than or equal to 80 cycles per mm. For rigorous MTF estimates this target response needs to be considered, especially at resolutions greater than 1200 dpi.



3. Near 45° edges

These features are used to aid in measuring the MTF at 45° diagonal.

4. Vertical and horizontal square wave features.

These test features are intended to aid in the visual detection of aliasing. These features have a spatial frequency of 6, 8, 12, 24, and 40 cycles/mm and roughly correspond to sampling frequencies of 300, 400, 600, 1200, and 2000 dpi respectively.

5. Near-vertical and near-horizontal square wave features

These test features are similar to #4 but because of their slant will tend to reduce the visual impression of phase-induced aliasing.

6. Fiducial or Registration marks

As indicators of position and distance, these marks may be useful in automated analysis and sampling verification of a scanner. Nominally, the vertical and horizontal distances between each mark is 50.8 mm.

7. Slightly Slanted Extended Lines – high contrast

Helpful in verifying scan linearity, “stair stepping”, cyclical scan artifacts, and color miss-registration.

8. Bitonal spatial resolution elements

Intended to correlate traditional limiting visual resolution with MTF results. A R.I.T. Alphanumeric target is located in the upper left. A Landolt "C" test pattern is located in the lower left. The numbered groups correspond to patterns of known spatial frequencies. The group number for both targets and corresponding spatial frequencies are listed below along with size, resolution and orientation.

9. T-100 Digital Electronic Pixel Target

This area contains horizontal, vertical and slanted bars (1:5 Ratio) in widths from 0.1 mm to 1.0 mm.

Nominal Patch Reflection Densities (starting at upper right and proceeding clockwise)

1) 0.60	5) 1.00	9) 1.50	13) 0.90	17) 0.30
2) 0.70	6) 1.20	10) 1.30	14) 0.80	18) 0.10
3) 0.80	7) 1.40	11) 1.10	15) 0.70	19) 0.20
4) 0.90	8) 1.60	12) 1.00	16) 0.50	20) 0.40

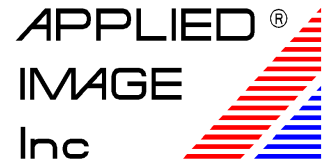
R.I.T. Alpha-Numeric
Target
Answer Key (8A)

Landolt "C" Answer Key (8B)

Group #	Effective sampling frequency (dpi)	Line width (opening size - mm)	Effective frequency (cycles / mm)	Left Feature Opening Position (degrees CCW)	2 nd Feature Opening Position (degrees CCW)	Middle Feature Opening Position (degrees CCW)	4 th Feature Opening Position (degrees CCW)	Right Feature Opening Position (degrees CCW)				
0	50.8	0.500	1.00	0	90	315	180	270				
1	55.8	0.455	1.10	135	270	45	225	90				
2	66.0	0.385	1.30	180	225	45	270	0				
3	71.1	0.357	1.40	45	135	0	225	315				
4	81.2	0.313	1.60	90	180	45	270	0				
5	91.4	0.278	1.80	180	225	45	225	270	Upper left	Upper right	Lower left	Lower right
6	102	0.250	2.00	315	90	270	90	225				
7	112	0.227	2.20	90	0	45	225	135	8E3	523	E28	832
8	127	0.200	2.50	135	225	45	270	315	532	235	83E	532
9	142	0.179	2.79	180	270	0	225	45	538	385	2E5	E85

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10	163	0.156	3.21	90	180	315	135	90	E85	538	832	523
11	183	0.139	3.60	270	45	180	270	180	E85	285	283	E52
12	203	0.125	4.00	315	135	90	315	225	583	E52	2E8	E25
13	229	0.111	4.50	45	90	0	180	270	83E	823	83E	235
14	254	0.100	5.00	225	270	135	90	315	2E5	532	583	E25
15	300	0.086	5.8	135	225	90	315	45	32E	253	8E5	582
16	320	0.079	6.3	180	135	45	315	270	3E8	3E2	E85	E28
17	360	0.070	7.1	0	90	315	180	45	35E	8E5	3E8	8E5
18	400	0.063	7.9	45	135	0	225	315	2E8	E38	E52	E23
19	450	0.056	8.9	315	180	270	135	270	582	235	235	253
20	510	0.050	10	270	0	90	135	270	832	8E5	8E5	5E2
21	580	0.044	11	0	90	315	180	270	3E8	83E	83E	8E5
22	650	0.039	13	315	45	135	0	135	5E2	832	832	523
23	730	0.035	14	90	270	225	45	180	832	523	52E	523
24	820	0.031	16	135	315	180	90	90	532	35E	35E	E25
25	910	0.028	18	0	90	225	180	270	583	32E	32E	3E8