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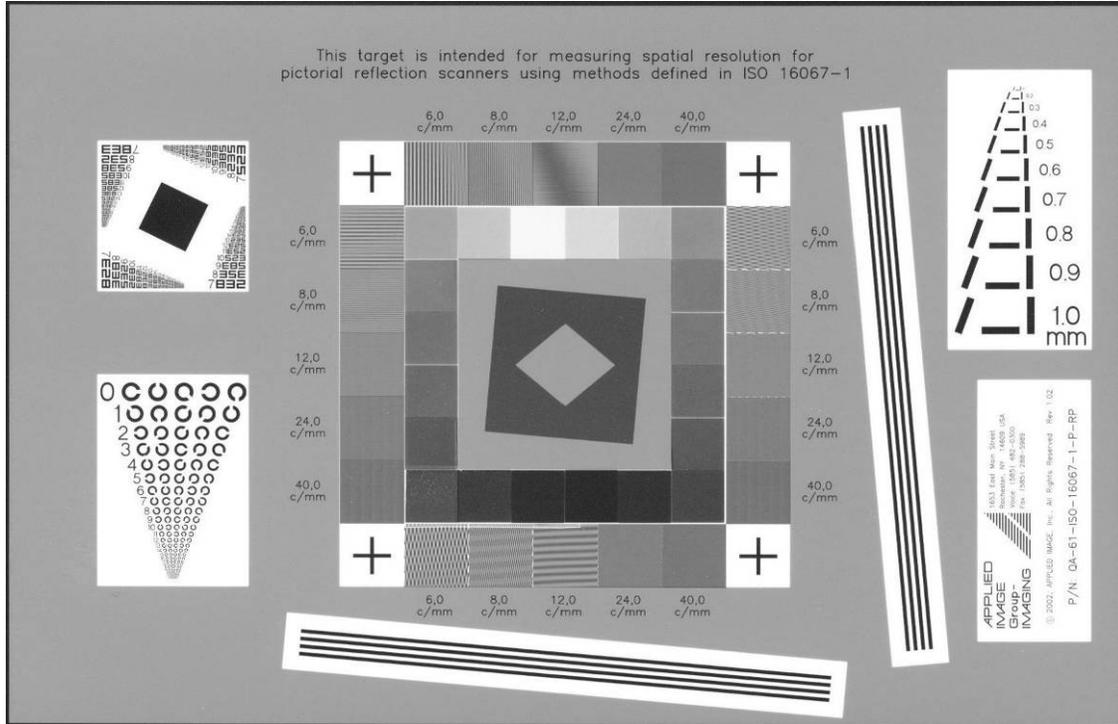
QA-61-RM
ISO-16067-1
Scanner Test Chart
Product Specifications



Catalog Part No: QA-61-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: The QA-61 target is a test array that meets the specified requirements of ISO-16067-1. It is made on a spectrally neutral black & white silver halide reflective media. It conforms to the target specifications outlined in ISO 16067-1, *Electronic Scanners for Photographic Images – Spatial Resolution Measurements – Part1: Scanners for Reflective Media*.

Substrate Size: 100mm x 152mm

Substrate Type: “Black & White” photographic 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

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Electronic Pixel Target that has 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: Typical computer programs are available that use a specific target format (ISO 16067-1) so that the user can 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.

Slant-edge features can be analyzed using SFR software available through:

Windows and Mac SFR program (sfr.zip) is available at no charge from:
Image Quality from an Edge Target (SFR)

<http://www.mitre.org/tech/mtf/index.html>

ImageJ is a handy image analysis tool, with many plugins, including one for mtf analysis;

<https://imagej.net/Welcome>

<https://imagej.net/plugins/se-mtf/index.html>

Sourceforge offers a “pre-alpha” version of SFR analysis at:

<http://sourceforge.net/projects/slantededge/>

Sourceforge also has;

<http://sourceforge.net/projects/mtfmapper/>

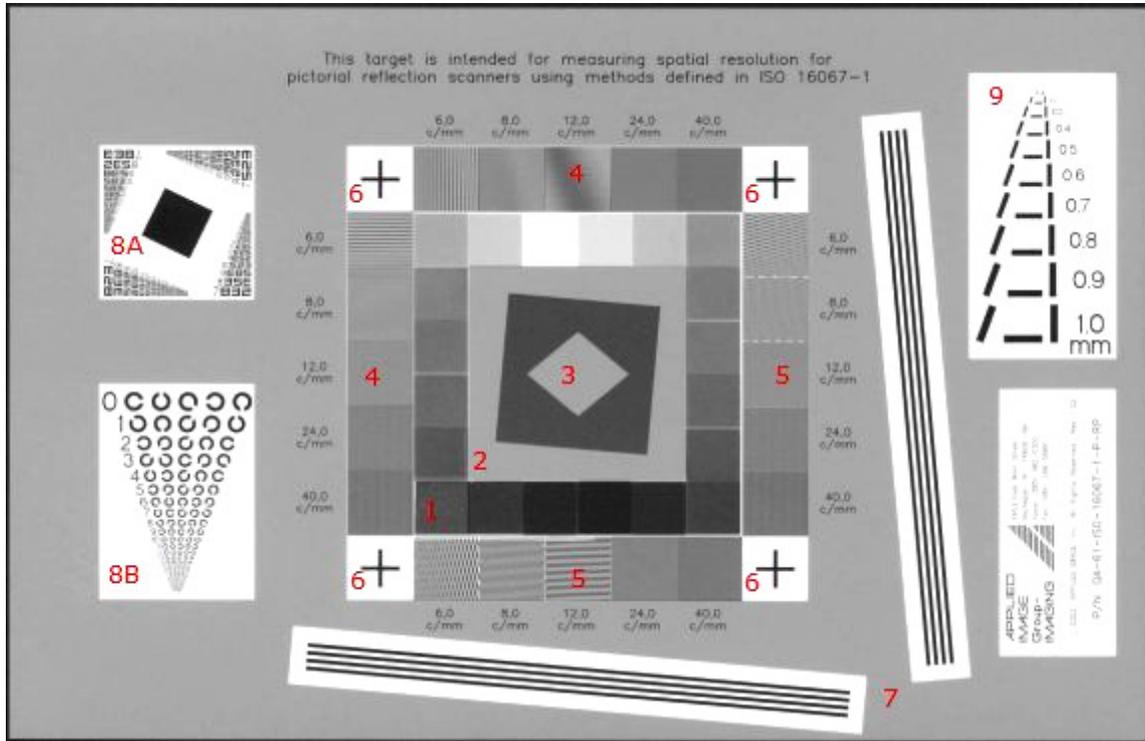
Not free, but decent analysis program:

<http://www.quickmtf.com/>

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

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Key to features:

1. Neutral tone scale patches

These patches are used to measure a device's Opto-Electronic Conversion Function (OECF); the relationship between measured optical density and the values output by an electronic output device. The nominal reflection densities for each patch are provided below. The user is encouraged to verify or supersede these values with their own densitometry.

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

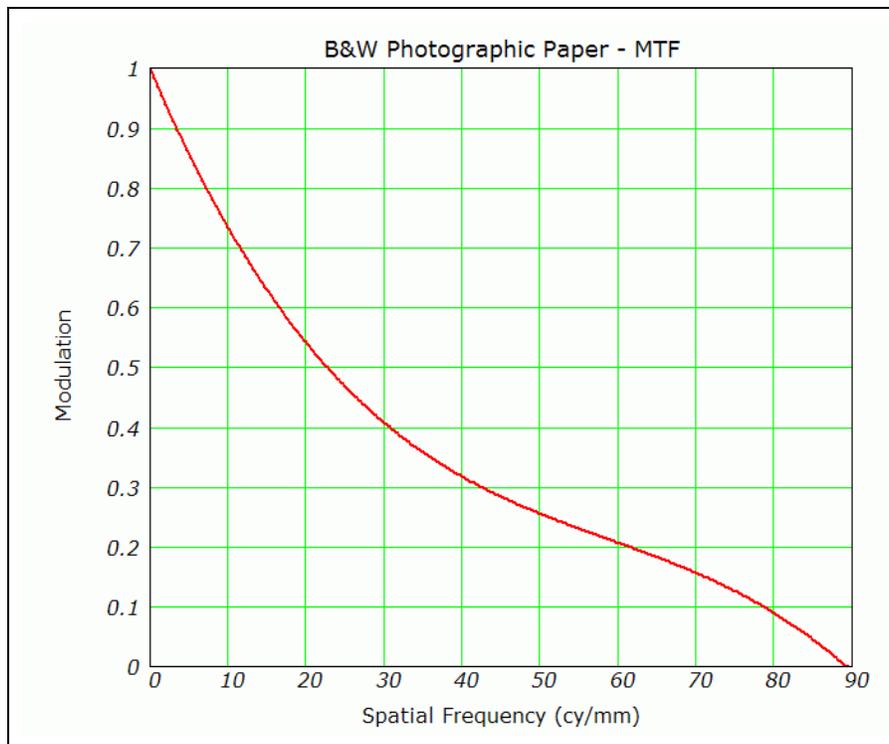
1) 0.60	5) 1.00	9) 1.50	13) 0.90	17) 0.30
2) 0.70	6) 1.20	10) 1.30	14) 0.80	18) 0.10
3) 0.80	7) 1.40	11) 1.10	15) 0.70	19) 0.20
4) 0.90	8) 1.60	12) 1.00	16) 0.50	20) 0.40

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 an electro-optical device. They are rotated approximately 5 degrees from horizontal and vertical directions and have approximately a 60% contrast modulation. This relatively 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).

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

where v 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.

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4. Vertical and horizontal square wave features.

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

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

Similar to the previous features, except due to their angle, these test features will reduce the visual impression of phase-induced aliasing.

6. Registration fiducials

As indicators of position and distance, these marks may be useful in using a scanner to perform automated analysis and sampling verification by a scanner. The vertical and horizontal distance between each mark is nominally 50.8 mm.

7. Slightly slanted extended lines – High Contrast

These features are helpful for verification of scan linearity, “stair stepping”, cyclical scan artifacts, or color miss-registration.

8. Bi-tonal spatial resolution elements

These elements are intended to correlate traditional limiting visual resolution with MTF results. An R.I.T. Alphanumeric Target is located in the upper left. A “Landolt-C” test pattern is located in the lower left. Patterns are shown in numbered groups by spatial frequency. Spatial frequencies are listed below along with size, resolution and orientation by Group Number.

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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				
6	102	0.250	2.00	315	90	270	90	225	Upper left	Upper right	Lower left	Lower right
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
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

9. T-100 Digital Electronic Pixel Target

This area contains horizontal, vertical and slanted bars, each having a dimensional ratio of 1:5, in widths from 0.1 mm to 1.0 mm.