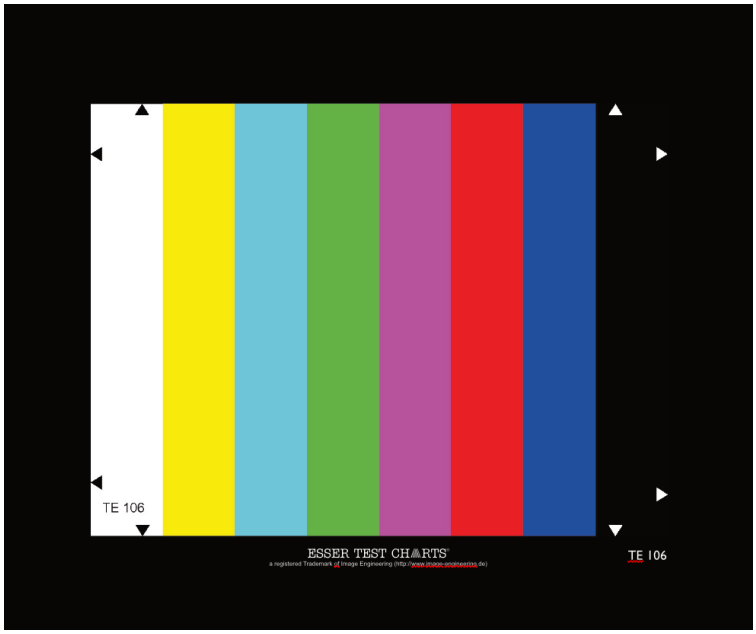
TE106 A/D data sheet



Overview

Product name	TE106 A (reflective) / TE106 D (transmissive)
Principle	A test chart to determine the color reproduction of a digital camera. Test chart mainly designed to check the image quality of TV cameras where the colors are close to the electronic 100/75 color bars.

Features

Color patches

Type/s of pattern	6 color bars, 2 neutrals • RGBCMY • Clear/white film • Black film
Color values	Reflective charts (A) with Munsell paper Transmissive charts (D) with color foils and BW film All default values are given at the end of this data sheet Individual measurement on request
Size of color patch [mm]	

	4:3	16:9
A460	57.5 x 345	57.5 x 258.75
A360	45 x 270	45 x 202.5
A280	35 x 210	35 x 157.5
K360*	-	45 x 202.5
K280*	35 x 210	35 x 157.5
K160*	-	20 x 90
D280	35 x 210	35 x 157.5
D240	30 x 180	30 x 135

Colorimetric information	Due to the manufacturing process, the color values of the test chart deviate slightly from the standard values, particularly in the green and blue areas. Reflective media cannot achieve the same color saturation as transmissive media; therefore, the colors of transmissive test charts are generally much closer to the standard values. Colorimetric results may vary significantly depending on the measuring device and measurement method.

General description hardware

Type	Reflective (A) Transmissive (D)
Aspect ratio	4:3 16:9

Chart size [mm]

	W	H	D
A460	600	500	3.2
A360	500	400	3.2
A280	365	305	3.2
K360*	390	271	2.1
K280*	334	271	2.1
K160*	204	164	2.1
D280	360	280	4.6
D240	320	290	4.6

Picture size [mm]

	4:3		16:9	
	W	H	W	H
A460	460	345	460	303.75
A360	360	270	360	202.5
A280	280	210	280	157.5
K360*	-	-	360	202.5
K280*	280	210	180	101
K160*	-	-	160	90
D280	280	210	280	157.5
D240	240	180	240	135

Material	Munsell Paper (A) Color foils (D)
Mounting	Aluminum (A) Glass plates (D)
Edge protection	Fabric tape, might have influence to chart thickness tolerance
Chart size tolerances	Up to +/- 2 mm as they are handmade in-house and fabric tape is used
Service life	Munsell Paper 2 years (A) Color foils 1 year (D) Color film or some filter foils used for transmissive charts may fade over time, especially when exposed to sunlight (ultraviolet light) or strong light sources. We therefore recommend storing the chart in its folder or case when not in use and minimizing unnecessary exposure to light. We also recommend and offer a re-measurement of the chart after 2 years of regular use.
Storage	Dark, dry, and free from harmful gas (e.g., formaldehyde or ozone). 20 °C and 25 °C with a humidity of 35% – 65% and no direct sunlight at any time.

Surface finish	The color foils of transmissive charts (and, in rare cases, Munsell charts) may show scratches or streaks. This issue does not affect the test chart's function, as the scratches/streaks are not visible under standard illumination geometry. We also recommend recording the color chart slightly out of focus to obtain a stable average value in the result.
Scope of delivery	Test chart

Miscellaneous

Evaluation / Assessment	Supported by iQ-Analyzer V6 – Vektorskope only Visual appraisal
Reference data iQ-Analyzer-X	Individual reference file provided, if ordered Not applicable
Measurement device	X-Rite eXact (A) X-Rite 361T (D) https://www.image-engineering.de/content/products/charts/IE_reference_data_accuracy.pdf
Standards	EBU
Accessories	Chart case
Related products	LG3, LG4, LE7
Terms & Conditions	image-engineering.de/terms-and-conditions

* Only available in combination with a folder

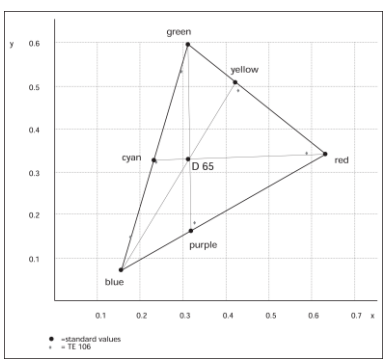
Colorimetric data A charts

The test chart is adjusted to standard light D65. With all kinds of light it is important to effect a white balance to the white bar of the transparency first, before starting the measuring procedure.

When using standard light D65 the color of the test chart have the following color coordinates in the CIE-xy-diagram as are shown in the table below and compared with the standard values.

Color	EBU standard		TE106 with D65	
	x	y	x	y
white	0.31	0.33	0.31	0.33
yellow	0.41	0.50	0.42	0.49
cyan	0.22	0.33	0.24	0.32
green	0.29	0.60	0.30	0.53
purple	0.32	0.15	0.33	0.18
red	0.64	0.33	0.59	0.34
blue	0.15	0.06	0.18	0.15

The following diagram shows the standard color coordinates and those of TE106 entered in the CIE-xy-coordinate-system.

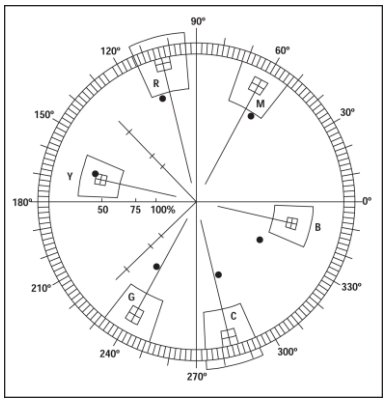


The brightness of the colors is matched with the electronic 100/75 color bar. To compare the luminance of the reflecting color with standard value, the following table shows the L*-value in the CIE-L*a*b*-diagram.

Color	EBU standard	TE106 with D65
	L*	L*
white	100	100
yellow	77.3	79.9
cyan	71.9	73.0
green	69.1	70.7
purple	47.5	37.6
red	41.9	45.4
blue	23.6	29.4

Different types of cameras have different spectral sensitives and therefore different matrix circuits. Therefore no general binding statement can be made for the test chart in respect of measurements by vectorscope or oscilloscope.

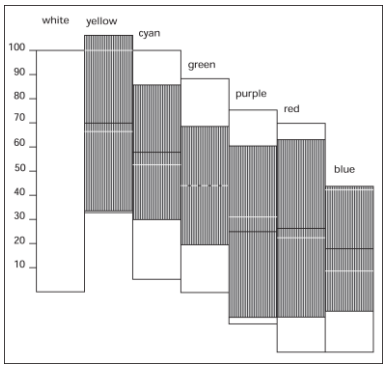
The calculated vectoscope image is shown below. The black spots show the calculated color coordinates in the vectorscope.



The following diagram compares the standard values of the luminance signal Y of the 100/75 color bar with the computed value of the test chart colors.

Color	EBU standard	TE106 with D65
	Y	Y
white	100	100
yellow	66.4	69.9
cyan	52.6	57.8
green	44.0	44.0
purple	31.0	24.9
red	22.4	26.3
blue	8.6	17.8

In the diagram below shows if the 100/75 standard color bar is compared with the calculated value of the test chart colors. The striped areas show the FA-signal for the test chart color values. The underlying white fields marked in black outline show the standard FA-signals. White lines within the striped areas mark standard values of the Y-signal resp. the upper limit of the standard FA-signal for yellow and blue.



Colorimetric data D charts

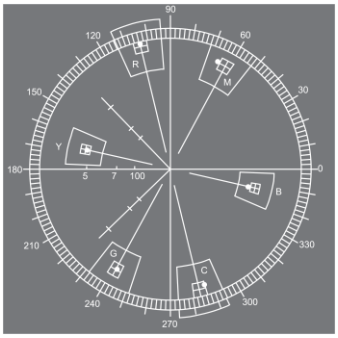
The test chart is adjusted to standard light D65. With all kinds of light it is important to effect a white balance to the white bar of the transparency first, before starting the measuring procedure.

The colors of the transparency are close to the standard colors of the electronic color bar as far as chroma, saturation and luminance are concerned. Slight deviations from the standard values can, however, not be avoided due to the color pigments of the filters available.

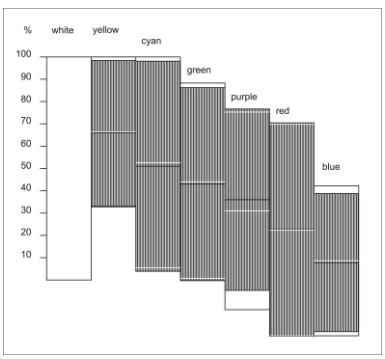
The spectral transmission values of the colors were measured by a spectrometer under standard conditions. Then the CIE-XYZ values were calculated for standard illumination D65. The resulting XYZ-values were mathematically transformed by the EBU-matrix and give the results shown in figure and the ttable on the following page.

Deviations of the test transparency color coordinates from the standard values are usually under 5%. The largest deviations are with blue, which has a to small color saturation. It has to be noted that different measuring devices and methods may lead to significant deviations, i.e. Measuring errors of 5% are considered acceptable.

The figure shows the calculated values of the colors as they should appear on a vectorscope.



Colorimetric results compared with the EBU 100/75 Color Bar.

Color	RGB values						Light density		Color difference		Color difference		chromin.signal (peak to peak)		Phase angle	
	R%		G%		B%											
	EBU	106	EBU	106	EBU	106	EBU	106	EBU	106	EBU	106	EBU	106	EBU	106
White	100	100	100	100	100	100	100	100	0	0	0	0	0	0		
Yellow	75	74	75	75	0	0	66,4	66	-32,8	32.5	7,5	7,2	67,2	65,9	167,1	167,5
Cyan	0	0	75	71	75	81	52,6	51,0	11,1	14,7	-46,1	-44,7	94,8	94,2	283,5	288,2
Green	0	0	75	73	0	0	44,0	43,0	-21,7	-21,2	-38,6	-37,7	88,6	86,5	240,7	240,7
Purple	75	79	0	8	75	67	31,0	36,0	21,7	15,4	38,6	37,6	88,6	81,3	60,7	67,7
Red	75	76	0	0	0	0	22,4	22,6	-11,1	-11,1	46,1	46,5	94,8	95,7	103,5	103,5
Blue	0	0	0	0	75	69	8,6	7,8	32,8	30,2	-7,5	-6,9	67,2	61,9	347,1	347,1

In the diagram below the oscilloscope image of the 100/75 standard color bar is compared with the calculated values of the test chart colors. The striped areas show the chrominance-signal for the test color values. The underlying white fields marked in black outline show the EBU chrominance-signal. White lines within the striped areas mark standard values for the Y-signal resp. the upper and lower limits of the standard chrominance-signal.