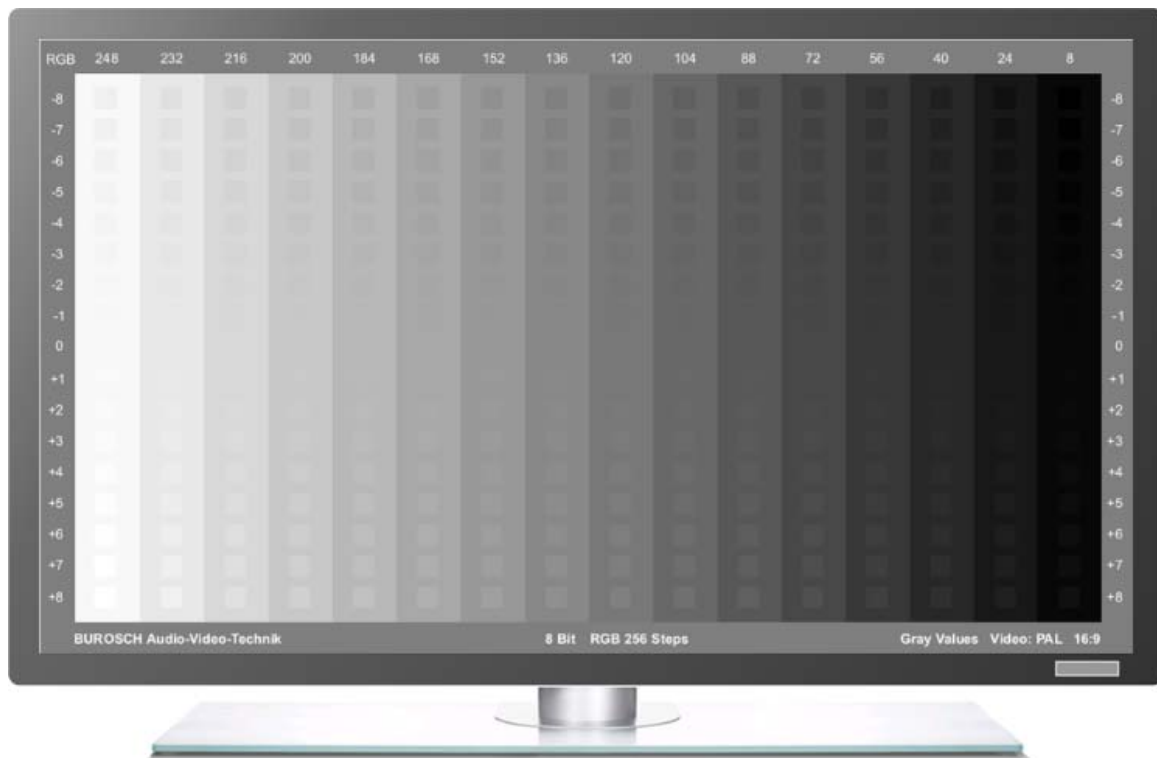


BUROSCH

Audio-Video-Technik



Gray Values

Reference Test Pattern

Technical documentation and application

Reference Test Pattern: Gray Values

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Reference Test Pattern: Gray Values

1 Company Profile

Competence and innovation are the characteristics of the company BUROSCH Audio-Video-Technik. Already in 1948 we produced radios.

Because of this long experience in the topic electronic we are the European leader in reference test signals for quality evaluation and optimizing of displays respectively nowadays.

Already in year 1994 we developed the source code for these test signals which guarantees the specification of our declaration of conformity.

A lot of static and dynamic test sequences for every application, image format and for FullHD displays are stored at our internal server to satisfy the individual requests of our customers.

Of course we also offer you various audio test sounds in different sound formats.

So we offer a lot of audio and video test sequences to a technician for evaluating all components of the playback string professionally and to optimize by the help of these signals if needed.

These sequences developed by us act in many national and international laboratories as reference for comparative product tests. These test signals are also used by leading manufacturers worldwide in development, quality controls and in services, too.

Of course we cultivate the collaboration with various research institutes and technical universities.

Mr. Prof. Dr. Ing. M. Plantholt (domain: display measurement at university of Wiesbaden, Germany) also confirms the quality of our test signals.

Reference Test Pattern: Gray Values

Profit by our know-how: Because of our long-time advising activity, also for famous industrial companies we are willingly at your command for competent assistances and advices e.g. for configurations of look-up-tables over color temperature up to dynamic contrast measurements.

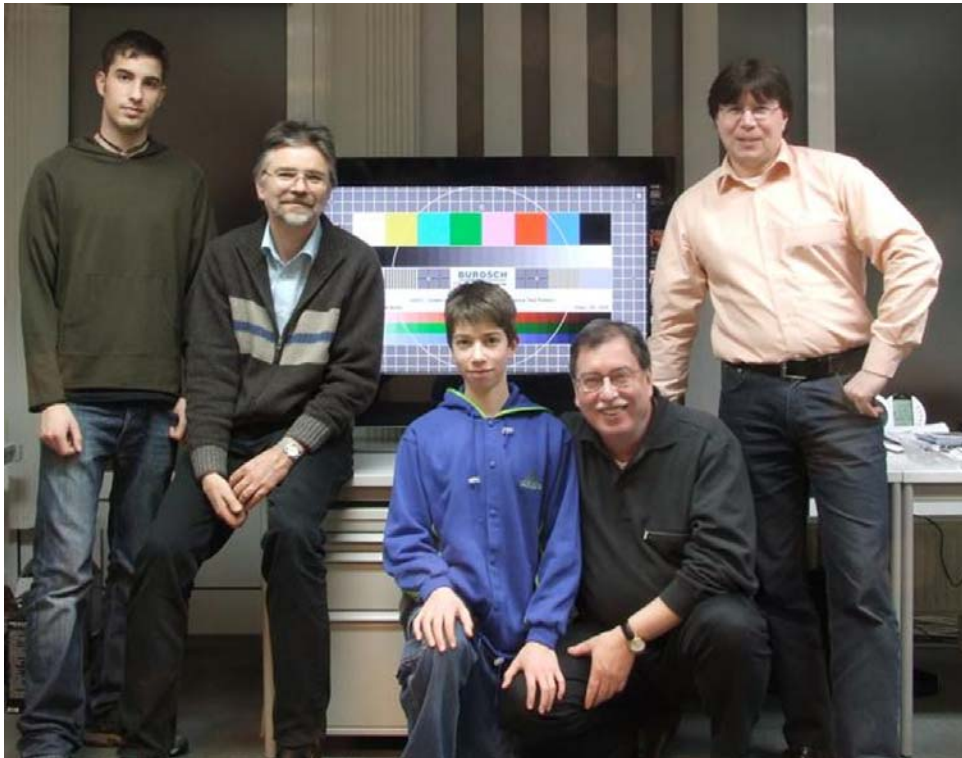


Image 1: from left:
Steffen Burosch, Eberhard Graf, Andreas Burosch, Klaus Burosch, Paul Gaukler
(Year 2007)

Reference Test Pattern: Gray Values

1.1 Video Labor

By the long experience the company BUROSCH Audio-Video-Technik grown up to the Europe's leader in the area image evaluation and image optimization respectively.

Modern audio and video analyzers are used in our video labor.

The Burosch Company works only with first-class devices made by the most popular manufacturers like Sony, Hewlett Packard, Rohde & Schwarz, Tektronix, Quantum Data, Konica Minolta and many more.

Of course we work with the spectroradiometer CS-2000 from Konica Minolta already to make exact measurements, analyzes and calibrations.

Premium Broadcast Class A monitors from Sony are used in our video labor for a standard of comparison.

But in spite of grave improvements of the LCD and Plasma technique these Broadcast Class A monitors are optimal adapted for evaluation and documentation of the naturalness of colors and motion blurs.

We also arrange our knowledge to labors of famous journals for comparative product tests like Chip, c't Magazin, AVF-Bild and to professional testing laboratories like ASIG or OBL.

Stored at different mediums like CD, Video-DVD and Blu-ray Disc (BD) all test signals are available for you.

Development departments of leading manufacturers of consumer electronics like Panasonic are also advised competently by us.

We also advise you willingly!
Please profit by our competence!

Reference Test Pattern: Gray Values

1.1.1 Reference Measuring Devices

On the following pages we present our measuring devices for professional image analysis.

Professional spectroradiometers like Minolta's CS-2000 are used in the Burosch Video labor. This enables high-precision display measurements and perfect analysis. The following image shows the first-class measuring device from Minolta.



Image 2: Spectroradiometer CS-2000 from Konica Minolta



Image 3: Premium measuring- and indication systems from Rohde & Schwarz (VSA, UPL, CCVS), Tektronix (VM-700) and Hewlett Packard and many video display units from Sony (Broadcast Class A) are used in the labor of the Burosch company.

Reference Test Pattern: Gray Values



Image 4: Andreas and Klaus Burosch: Image- and Video Analysis with Video Analyzers from Rohde & Schwarz.



Image 5: Klaus Burosch: Image- and Video Analysis with high-precision measuring devices from Rohde & Schwarz and many more.

Reference Test Pattern: Gray Values

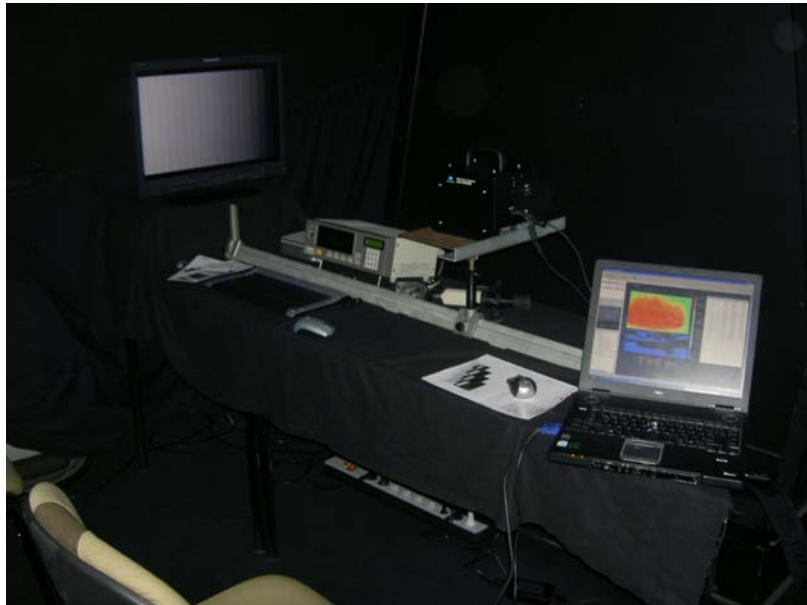


Image 6: Display measurements with spectroradiometers and color analyzers from Minolta (CA-2000 und CS-2000)



Image 7: Prototype Analysis of the newest Panasonic displays (year 2007); from left: Mr. Wild (Department Manager HDTV Panasonic), Raphael Vogt, Klaus Burosch, Eberhard Graf, Philipp Smoldas

Reference Test Pattern: Gray Values

1.1.2 Source Code

For being able to make a professional quality evaluation the quality of the reference signal must be known. Only if the reference and source signal respectively is known a correct image evaluation can be done.

Therefore we developed already in 1994 this source code to ensure the reconvertibility of our reference test signals and so we guarantee the specifications of the declaration of conformity.

All of our test signals are created based on this source code and so it's an absolute reference for the technical engineer.

This source code is the basis for all further test patterns.

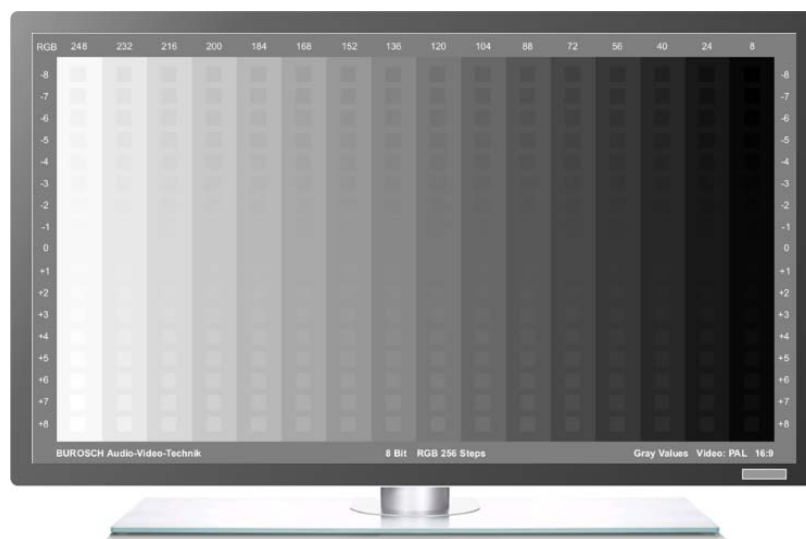
```
1116 for ($frame = 0; $frame < $anzframe; $frame++) {
1117     # $shift = 1.5707963267948966192313216916398*4/$anzframe*$frame;
1118     $shift = 1.5707963267948966192313216916398*4/$anzframe*$frame;
1119     $faktor = 1.5707963267948966192313216916398/$bildbreite*2*$endfreq/37.137330754352030947775628626692*((($frame/$anzframe*2)+0.5);
1120     #BUROSCH Reference Test Pattern
1121     print "Frame $faktor shif $shift \n";
1122     for ($y = $topmargin; $y < $bildhoehe+$topmargin; $y++) {
1123         #print "Line $y shif $shift \n";
1124         for ($x = $leftmargin; $x < $bildbreite+$leftmargin; $x++) {
1125             $counter = 0;
1126             #my $color = Imager::Color->new(gray => ((sin($x*log($y/10+1)/50+512)+1)*128));
1127             #my $color = Imager::Color->new(gray => ((sin($Kx*$x + $Ky*$y + $Kx2*$x*$x + $Ky2*$y*$y + $K1*$t + $K12*$t*$t)*256));
1128             my $skala = $y % 50;
1129
1130
1131             #if(($x == 50) or (($skala == 0) and ($x > 9) and ($x < 91))){
1132                 # $color_wert = 0;
1133             #}else{
1134                 my $distanz = sqrt(($x-$breite/2)*($x-$breite/2) + ($y-$hoehe/2)*($y-$hoehe/2));
1135                 # $color_wert = (sin(1.7044230976507124774645417661022*0.000001*$distanz*$distanz+1)*128;
1136                 $color_wert = (sin($faktor*$distanz*$distanz+$shift)+1)*128;
1137             #}
1138             #print "Wert = $color_wert\n";
1139
1140             $color = Imager::Color->new(gray => $color_wert);
1141
1142             if($color_wert == 0){
1143                 $counter++;
1144             }
1145             $gray -> setpixel( x => $x, y => $y, color => $color); #=
1146         }
1147         # $color_new = $gray->getpixel(x=>$x, y=>$y);
1148         #print "Zeile \"$y.\", $counter*2, "\n";
1149     }
1150     $outfilename = $bildpath."/". "ZP"." $breite $hoehe"."H $endfreq $frame.bmp";
```

BUROSCH Reference Test Pattern source code

Reference Test Pattern: Gray Values

2 Description

Here you see the test pattern in optimal display.



The Gray Values test pattern is structured in 3 individual test zones. The test pattern is optimal adapted for fine brightness measurements of the display and its signal string. This test pattern allows the reading of very fine brightness differences.

Therefore are 16 columns (bars) with equally falling brightness values from left (bright) to right (dark). In the bars are small squares with minimal different brightness and luminance respectively in relation to each bar. The values on the left and right border give information about the brightness differences of the squares which range from “-8” to “+8”. The columns and rows are laid out for a simple interpretability. So they are optimal adapted for an exactly reading and quantification of the brightness- and contrast difference. The scales and grading of the fields accord to the usual brightness allocation of the computer world in 8 bit, so in equal steps from “0” up to “255”.

Optimal Display:

- The columns from “+248” to “+8” are displayed in same-sized grading
- All squares from “-8” over “-1” and “+1” up to “+8” inside of the columns are clearly visible

Reference Test Pattern:

Gray Values

Note: Please note that static test patterns like this one mustn't be displayed more than one hour without changing pictures of the TV-display because of possible phosphor burn-ins which causes so-called "ghosts", especially on flat screens.

The same effect of "ghosts" can also be caused by broadcasting station icons or black bars which appear when a film is reproduced in another mode than its production mode. These things also cause diverse burn-ins on a display.

Therefore we suggest a not so long display of the test signal on the display unit.

Reference Test Pattern: Gray Values

2.1 Panasonic On-Screen Display

2.1.1 Brightness



You find more detailed information about the function of the individual test zones Bright, Middle, Dark in chapter 2.2.

Reference Test Pattern: Gray Values

2.1.2 Contrast



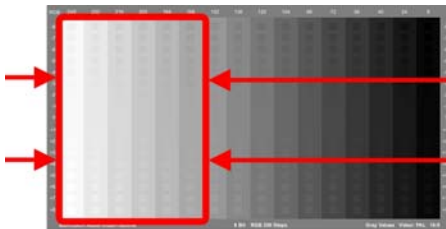
You find more detailed information about the function of the individual test zones Bright, Middle, Dark in chapter 2.2.

Reference Test Pattern: Gray Values

2.2 Overview of the test zones

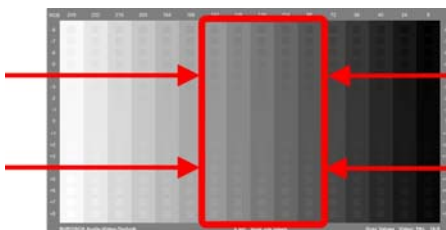
Here you see an overview of the various test zones. Detailed information you find in chapter "Individual Test Zones".

2.2.1 Test Zone 1: Bright



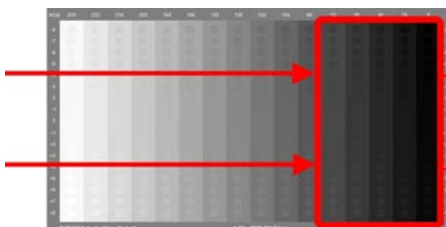
The first test zone shows the six brightest gray bars inclusive the squares with different brightness. More detailed information for this test zone you find in chapter "Individual Test Zones" in the sub point "Light Gray Test Zone".

2.2.2 Test Zone 2: Middle



This second test zone shows 5 gray bars colored middle gray to dark gray inclusive the squares with different brightness. More detailed information for this test zone you find in chapter "Individual Test Zones" in the sub point "Middle Gray Test Zone".

2.2.3 Test Zone 3: Dark



The third and last test zone shows 5 dark gray bars inclusive the squares with different brightness. More detailed information for this test zone you find in chapter "Individual Test Zones" in the sub point "Dark Gray Test Zone".

Reference Test Pattern: Gray Values

3 Preface

This description applies to all products and technologies of displays like PDP (Plasma), LCD, projection or DLP.

The universal test pattern, described in the following is excellent adapted for visual and measurement evaluation and analysis respectively.

Before using the test patterns please check that all conditions come up with the later appliance, especially check the signal path and the light conditions.

Please pay attention to a normal comfortable brightness of the room and do not arrange the display so that a light source does impact the image on the display negatively caused by possible reflections if procurable. At daylight it could distort the color and brightness sensation because of reflections or the ambient light. The best and the most enjoyable conditions for the human eye are given when the TV display is arranged in a preferably dark room with less light like in a cinema. As a result good colors and brightness differences will come into one's own.

If you modify parameters for improvement of the image quality don't forget to save the modifications so that the changes become permanent.

Please note the options of your image sender (e.g. DVD Player). Also try to get by with as few as possible of so-called image-improving features which distort the original image more than improve it.

Of course the setup in the image sender and image replication device (e.g. TV-display) must be adjusted optimally to make a perfect display possible.

Tip: Please let you and your eye a few minutes time to better detect potentially color differences or display problems. For it this test pattern is optimal applicable because you often don't have enough time for a cognition at quick motions.

Reference Test Pattern: Gray Values

3.1 Gamma (γ)

You need a gamma correction in displayed systems to compensate the non-linear brightness sensation of the human eye. At a double brightness increase the human eye don't react it necessarily as a doubling of the brightness perception. The felt brightness sensation increases steeply in darker areas and not so steep in bright areas. The human eye has a gamma of ca. 0.3 to 0.5.

The sensation of the human vision is not linear. Electronic displays should simulate the human viewing habits. Therefore a correction is necessary because an electronic sensor like a CCD-chip or an electron ray tube work almost linearly.

To solve this problem as good as possible the gamma correction was launched:

$O = I^\gamma$ (O: Output signal; I: Input signal).

At the calculation of the output signal O there will be only changed the gray values, the black- and white point don't change if the input signal is in range [0,1] and set on 1 respectively. The correction function is called like the exponent gamma (γ).

At a gamma value of 1 the output signal is all in all a bit darker – brighter steps of gray bars are graded stronger than the darker ones. At a gamma of less than 1 you have a brighter output image overall – darker steps of gray bars are graded stronger than the brighter ones whereat the brightness of the brightest and darkest point (white- and black-point) won't be changed. The white point is unchanged 100% white and the black point is also still 100% black.

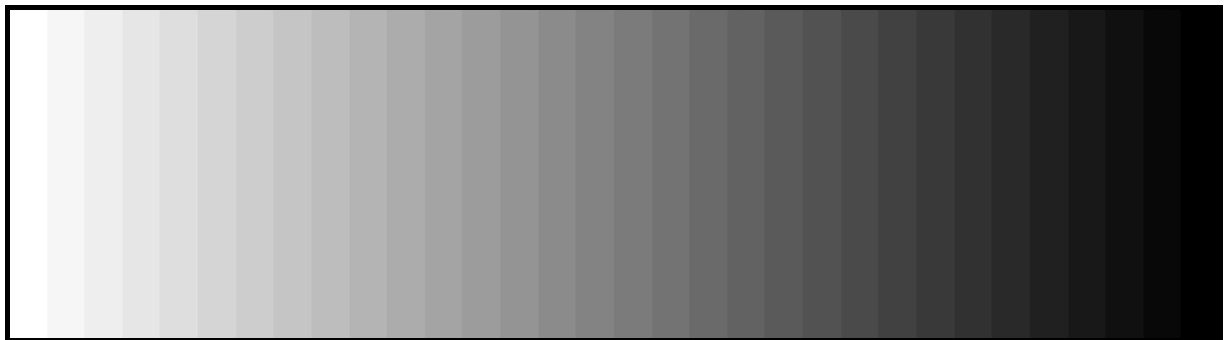
Manufacturer of modern displays use always a gamma value of ca. 2,2 to ensure a real brightness sensation of the human eye.

Reference Test Pattern:

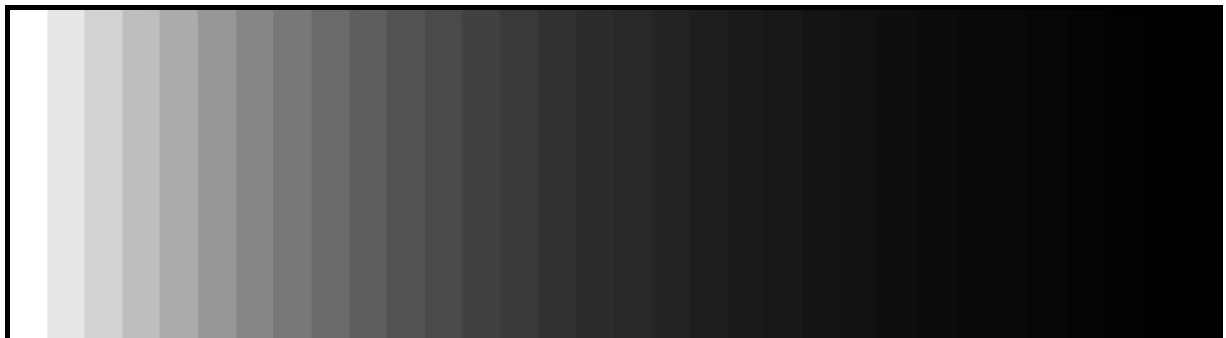
Gray Values

Subsequent you find a few marked and adapted examples which show you the meaning of the gamma function practically.

The original image (following image) shows gray bars with linear increasing brightness from left to right – the left field is completely white (100%), the right field is maximum black.



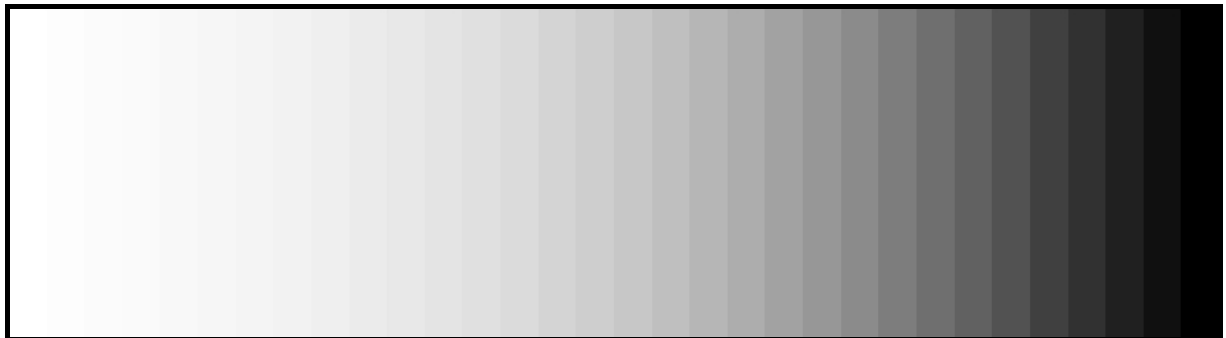
- In case of a too high adjusted gamma the brightest fields are graded stronger than the darker ones. This means you aren't able to distinguish the darker areas in the image (see following image)



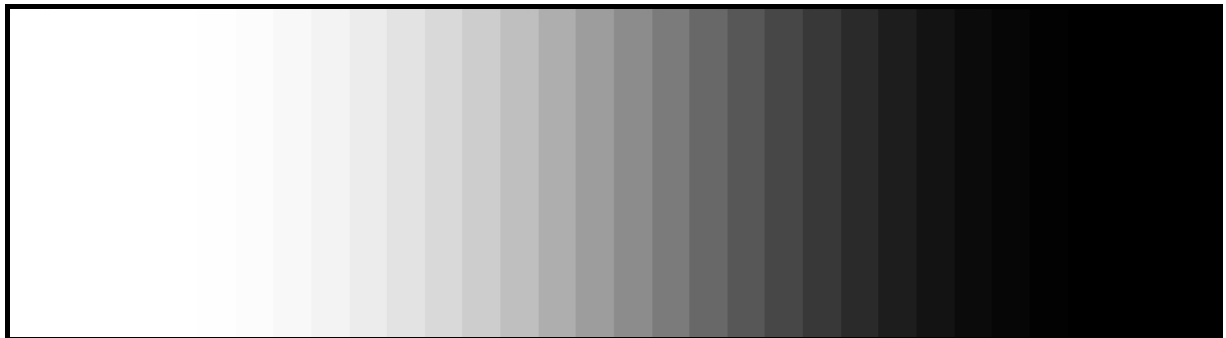
Reference Test Pattern:

Gray Values

- In case of a too low adjusted gamma the darkest fields are graded stronger than the brighter ones. This means you aren't able to distinguish the bright areas in a image (see following image)



- In case of a "S"-deformed gamma the middle gray fields are stronger graded than the outer fields. This means you aren't able to distinguish the brightest and darkest areas in a image (see following image)



Reference Test Pattern: Gray Values

3.2 Suitable Resolutions

The AVEC Reference test pattern is optimal adapted for different resolutions. Many displays can be checked, evaluated and optimized if necessary, doesn't matter which label, image format or application the display has.

For example you can display this test pattern on small mobile phone displays, digital picture frames, navigation systems to the point of very large TV-Displays over 1.70 meter screen-size smoothly.

The following table gives an overview of the applicable resolutions:

Screen resolutions		
Name	Pixel	Aspect ratio
VGA	640 x 480	1.33 : 1 = 4 : 3
SVGA	800 x 600	1.33 : 1 = 4 : 3
WVGA	853 x 480	1.77 : 1 = 16 : 9
XGA	1,024 x 768	1.33 : 1 = 4 : 3
SXGA	1,280 x 1,024	1.25 : 1
WXGA	1,280 x 768	1.66 : 1 = 15 : 9
WXGA	1,280 x 800	16 : 10
WXGA	1,366 x 768	1.77 : 1 = 16 : 9
SXGA+	1,400 x 1,050	1.33 : 1 = 4 : 3
UXGA	1,600 x 1,200	1.33 : 1 = 4 : 3
Full HD	1,920 x 1,080	16 : 9

Note: The test pattern is optimal adapted for an aspect ratio of 16:9. For other aspect ratios (16:10, 4:3, ...) please use the source signal from your corresponding transducer.

Reference Test Pattern: Gray Values

3.3 Equation image „Jasmin und Sabrina“

Subsequent you find the description of the individual image elements and parallel the effect of possible image failures on a real image. Exemplary we use a real image portrait with different skin types for comparing.

Afterimage shows the real image in optimal, original exposition.



In addition to many abstract technical test images this real image shows the typical problems and its effect on real, complex images. To clarify possibly problems there are heightened cut-outs of this image.

Following aspects have to be attended of the real image:

- The whole surface of the background is neutral white
- Real skin types of the light and dark-skinned woman with clearly visible differences to each other.
- Hairs of the women show perfect and clear differences in bright and also dark parts of the image
- Real image is shown completely without any deformations or cuts

Reference Test Pattern: Gray Values

3.4 Evaluation System

All images are evaluated based to the screen evaluation standard ITU-R BT500-11 and shown as stars. This should give you an intuition for the heaviness of the shown difference to the original image:

Excellent ★★★★★ Image is equivalent to the original	Good ★★★★ No visible differences to original image	Fair ★★★ Visible, uncritical differences to original image
	Poor ★★ Highly visible differences to original image	Bad ★ Image is not equal to original, indicates a loss of information

A very good playback string with applicable connections like HDMI or DVI should reach a quality of five or four stars.

Good analogue sources like SCART-RGB or S-Video (Y/C) shouldn't reach less than 3 stars on a good display, doesn't matter which technology – CRT, LCD, Plasma, DLP or projection.

Correct wired, labeled devices should never fall to two or one star niveau at right adjustment. This is typically an unmistakable sign that there is a problem in the signal-string. It could be the configuration, calibration or other wrong adjustment or simply a defect. This needs to be checked once more.

Please keep in mind that not all TV-manufacturers allow complex calibrations on parameters like “gamma” or “color processing”. The typical parameters for calibration which should be possible at all displays are brightness, contrast, color, focus and partly the image geometry settings.

Reference Test Pattern: Gray Values

3.5 Testbed

The optimal image reproduction on the TV-device depends on the individual settings (brightness, contrast, ...) and from the correct testbed. The testbed is a really important factor which is often underestimated by many users. In this chapter the factor testbed is described.

Special attention should be paid to the following criteria:

- cabling / wiring
- ambient light
- viewing distance
- viewing angle (90° as possible)

For perfect film enjoyments please keep a preferably vertical (90°) viewing angle on the display. In case of too large difference of the viewing angle for example when you look from far right or far left it could be that brightness, contrast or color becomes falsified. Further you must pay attention to a correct presetting of the signal source (e.g. DVD Player, Playstation 3,...) and your reproduction device (e.g. TV).

Reference Test Pattern: Gray Values

3.5.1 Wiring

For a perfect image and audio signal there have to be a qualitative wiring. Because only with applicable wirings an optimal reproduction and so a perfect home cinema feeling is warranted. In this paragraph the different possibilities for wiring are presented and shortly described. At wirings you distinguish analogue from digital transfer systems.

- Analogue:

Wirings over SCART, S-Video or Component Video over Cinch plugs rank among analogue connections which reproduce a pretty poor image and audio signal respectively. Due to the high annoyances caused by bad shielded cables and/or too long cables such analogue wirings are inadvisable. The following image shows a SCART, Cinch (Component Video) and an S-Video plug successively. From these analogue connections the SCART-RGB possibility is the most reasonable and best one.



- Digital:

Modern connections via digital interfaces like HDMI, DVI or LVDS make a good playback quality possible and eliminate the out-dated analogue transfer systems in the consumer electronics. The following image shows the usual digital plugs HDMI and DVI which make the best image and audio reproduction possible.



Reference Test Pattern: Gray Values

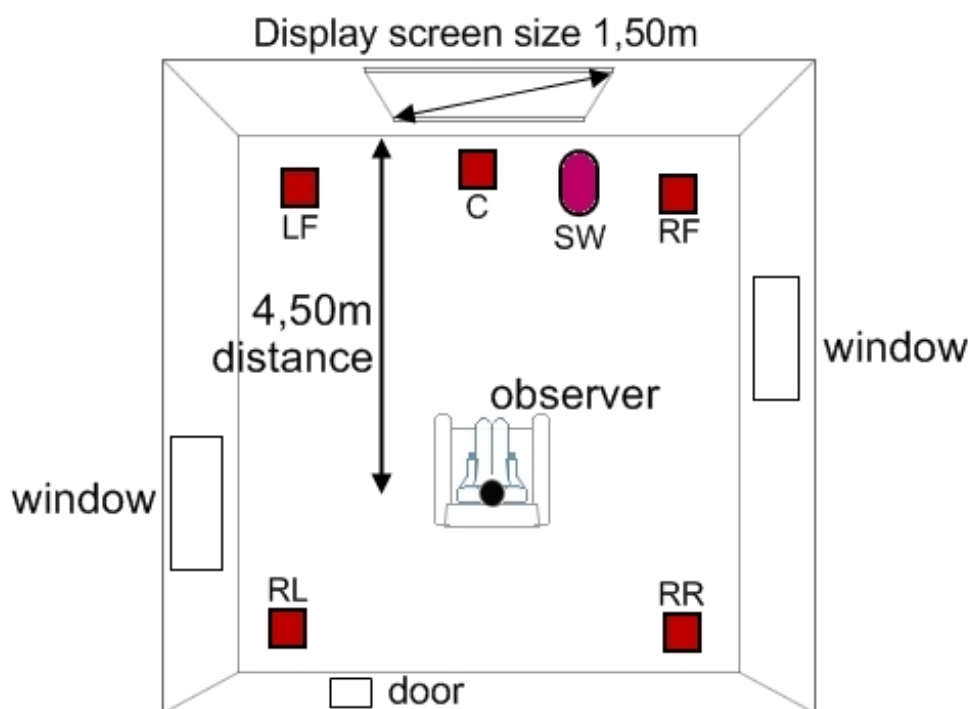
3.5.2 Ambient Light and Viewing Distance

Beside correct wirings you must also pay special attention to the positioning of the TV-display. Please place your TV-device so that various light sources like direct sunlight or the light from a bulb don't have a negative impact on the display itself by reflections if possible.

Further we advise a approximately viewing distance which depends on the size of the display. The viewing distance advised by us you can detect easily: 3 x diagonal screen size of the TV-device. This means if your TV display has a diagonal screen size of 1 meter you have to keep a distance of approximately 3 meter to ensure a sharp and high-contrast image.

The following schematically drawing shows a perfect home cinema system. Please also note the placement of the stereo or Dolby Digital 5.1 speakers.

- | | |
|------------------|-----------------|
| LF (Left Front) | RL (Rear Left) |
| C (Center) | RR (Rear Right) |
| RF (Right Front) | SW: Subwoofer |



Schematically drawing of an ideal home cinema system

Reference Test Pattern: Gray Values

4 Individual Test Zones

In this chapter the various test zones of the reference test pattern will be shown and described. Also you find a detailed description of possible maladjustments of the test zones in this chapter.

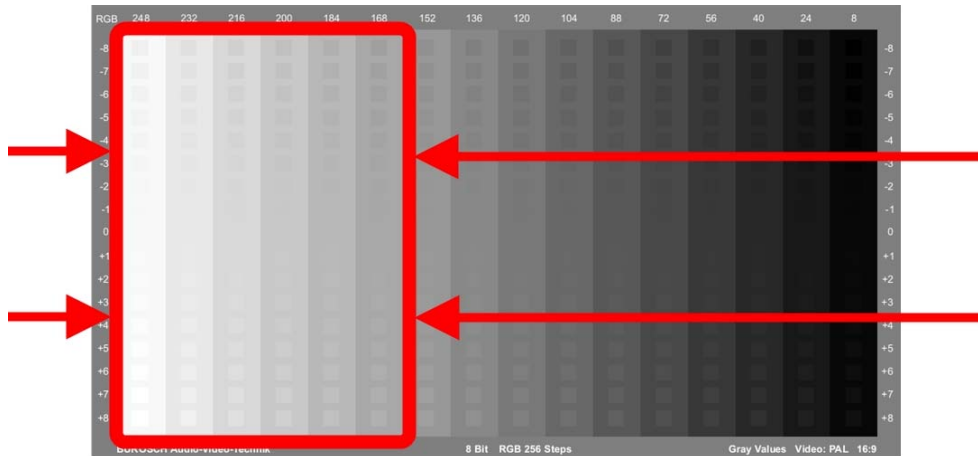
The reference test pattern Gray Values is made up of 3 different test zones (see content on second page in this document for particular page numbers):

- Light Gray Test Zone
- Middle Gray Test Zone
- Dark Gray Test Zone

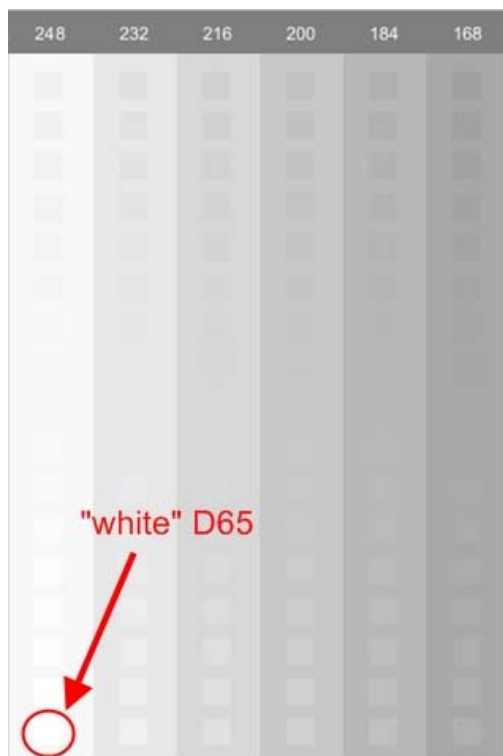
The particular test zone is red marked for definitely clarification.

Reference Test Pattern: Gray Values

4.1 Light Gray Test Zone



Detail View:



The first test zone shows 6 vertical separated bars. The RGB values above convey the brightness of these bars. In every bar are 16 small squares arranged vertically, from top to bottom with increasing luminance and brightness respectively from “-8” to “+8” in relation to each bar. The brightness of the square with value “0” complies exactly with the particular bar itself. The lowest square (“+8”) on the left bar (RGB 248) is equivalent to full white (RGB 255) and maximum brightness. The white of this square is equal to the standardized white D65 which accords with a cloudy sky.

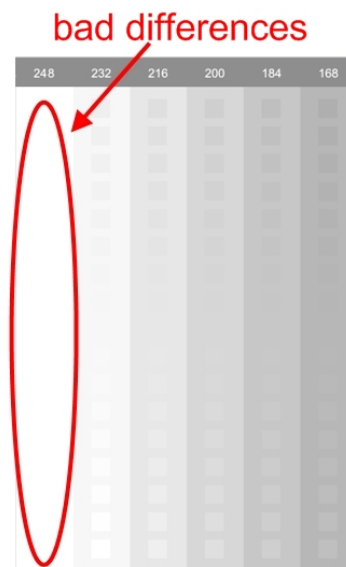
This test zone is adapted for the fine adjustment of the brightest areas in the image.

In best case there are all squares well visible. Maybe only the squares “+2” to “-2” are not clearly visible. But that’s normal.

Reference Test Pattern: Gray Values

4.1.1 Typical Faults

- The squares in the left bar “RGB 248” are not clearly visible – brightness of the display is adjusted fractionally too high.



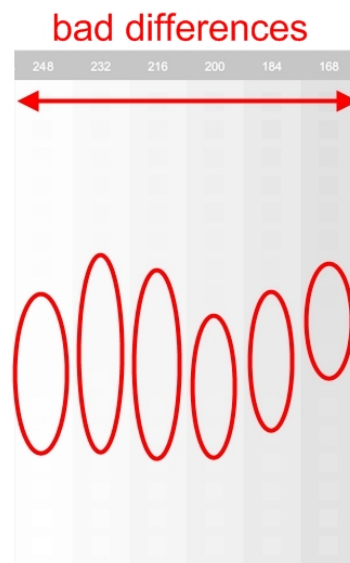
The quality of this image is “good” ★★★★★

The brightness is adjusted fractionally too high in this example. You can easily detect such minimal brightness differences by the help of this test zone. See the effect of this on the following real image. In the real image are practically no differences to the original visible.



Reference Test Pattern: Gray Values

- The squares in the brightness area “-4“ up to “+4” are badly detectable and the differences of the vertical bars is also deficient – gamma of the display is adjusted too low



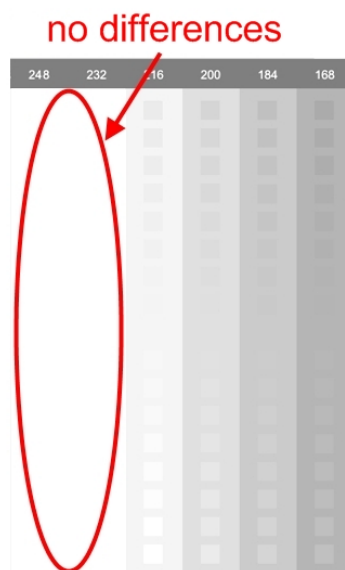
The quality of this image is “poor” ★★

In case of a too low adjusted gamma the brightest parts in the image don't show any differences. You see the effects on the following real image. The shoulder and face area of the left woman are differentiated badly.



Reference Test Pattern: Gray Values

- The two bars on the left side inclusive those squares are bad differentiated – contrast of the display is adjusted too high.



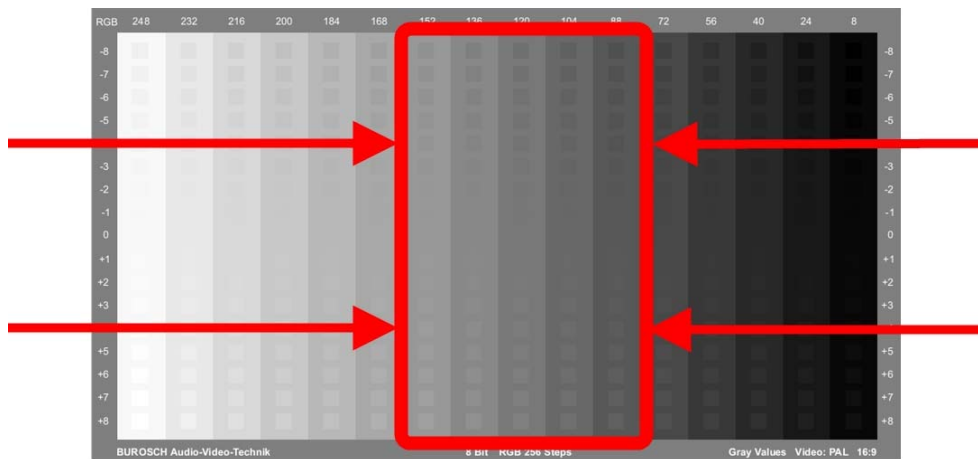
The quality of this image is “poor” ★★

A too high adjusted contrast control causes bad differences of bright areas in the image. You see the effect clearly in the following real image “Jasmin und Sabrina” (red marked). The shoulder and face area of the blond woman on the left side and the hairs of the darker woman right appear as one bright and dark area respectively.

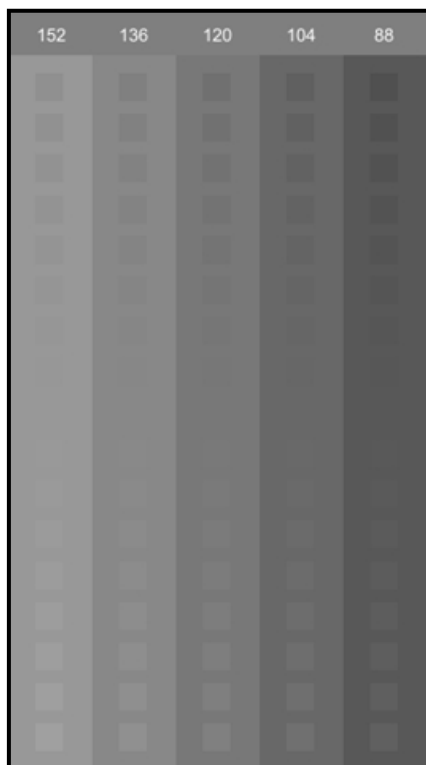


Reference Test Pattern: Gray Values

4.2 Middle Gray Test Zone



Detail View:



The second test zone shows 5 vertical middle gray bars with decreasing brightness from left to right from RGB “152” to “88”. In these bars you see small squares again with increasing brightness values from top to bottom.

On the left border of the full image the brightness difference of the squares is shown.

This test zone is adapted for fine adjustments of the middle brightness steps and is also optimal adapted for possible drifts of the color temperature. Because with this test zone you can best detect color drifts.

The most displays have problems with color drifts in middle gray areas.

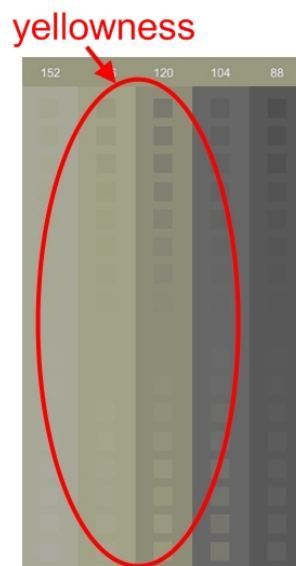
In best case

In best case there are all squares well visible. Maybe only the squares “+2” to “-2” are not clearly visible. But that’s normal.

Reference Test Pattern: Gray Values

4.2.1 Typical Faults

- One or more steps show color faults of one or more colors – there is a drift in the color temperature. Maybe bad work from the color processing of the display is here the reason. In this example there is a surplus of yellow in the middle gray area detectable



The quality of this image is “poor” ★★

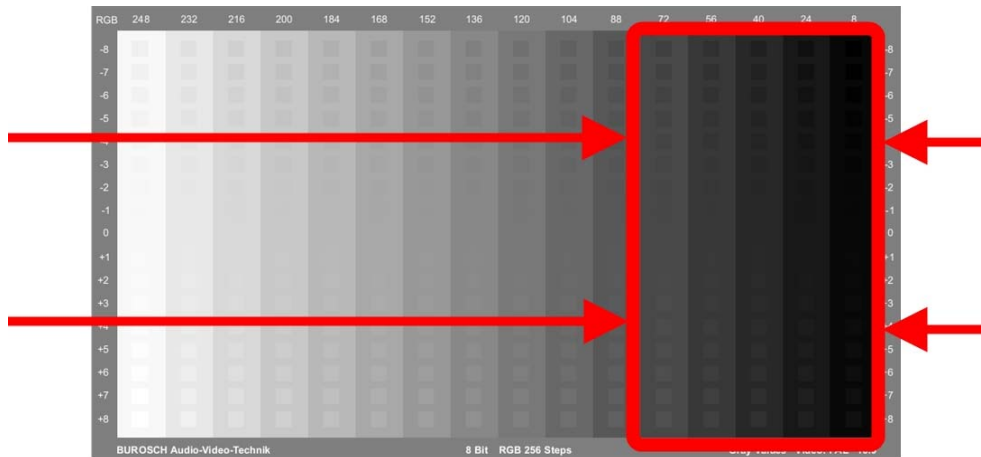
The following detail view of the real image shows the effect of a drifting color balance. You see false colors clearly at the hair line or in the face area of the right woman.

unnaturally discoloring

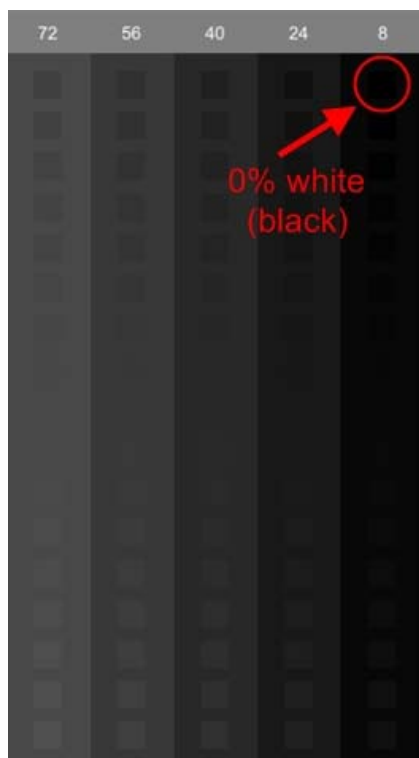


Reference Test Pattern: Gray Values

4.3 Dark Gray Test Zone



Detail View:



This third test zone consists of 5 vertical dark gray bars with different brightness from RGB “72” to “8”. In the bars are again 16 squares respectively in fine grading. Ideally the square at top left should be differentiated clearly as a complete black square from the background (RGB 8).

The dark gray test zone is optimal adapted for detecting minimal differences of contrast, brightness and gamma adjustments. So you can say the test zone is adapted for the fine adjustment of dark gray reproduction of the display.

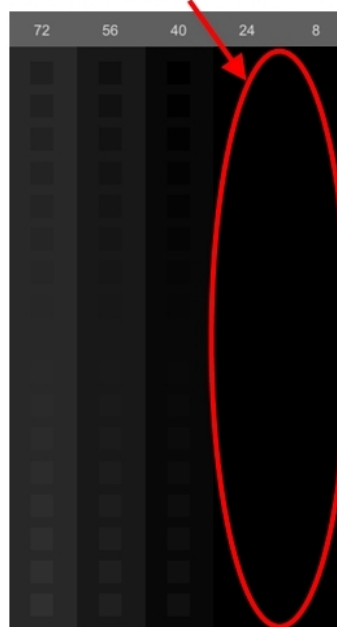
In best case there are all squares well visible. Maybe only the squares “+2” to “-2” are not clearly visible. But that’s normal.

Reference Test Pattern: Gray Values

4.3.1 Typical Faults

- One or more dark fields inclusive those squares are bad differentiated – there could be many reasons for this problem: gamma adjusted too high, brightness too low and/or maybe too high adjusted contrast of the display.

no differences



The quality of this image is “poor” ★★

There could be more than one reason for such a problem. The images on the following pages show the effects of the different wrong adjusted parameter of the display (brightness, contrast and gamma) on the real image “Jasmin und Sabrina”.

Reference Test Pattern: Gray Values

4.3.1.1 Brightness too low

This example shows the real image “Jasmin und Sabrina” at a too low adjusted brightness. The effect of too low brightness on this image is as followed:

- Background becomes gray
- Dark parts like the hairs of the right woman don't show any differences



4.3.1.2 Contrast too high

Too high adjusted contrast causes no differences in bright and dark parts in the image. You see the effect clearly on the following real image (red marked). The shoulder and face area of the left woman and the hairs of the right woman respectively are displayed as one bright (at left woman) and dark (at right woman) surface.



Reference Test Pattern: Gray Values

4.3.1.3 Gamma too high

In case of a too high adjusted gamma the background keeps still its neutral white color. Therefore dark areas in the image like the hairs of the right woman don't show any differences.

Unfortunately you aren't able to change the gamma setting at the most displays.

You see the effect of a too high adjusted gamma really clearly on the following real image.



Reference Test Pattern: Gray Values

5 Norms / Standards

For a correct playback of a film or a video or even of an image there have to be a neutral transfer. You often hear the argumentation that these aren't necessary because the vision of every human is different and so a objective playback isn't possible. As a matter of principle is this argumentation right. Admittedly there will be ignored that it's only possible if the signal transfer acts neutral and straight. Only when the expressed image is similar to the recorded image by the camera, the human is able to perceive what he would saw at location by his individual sensation. The transfer itself has to behave neutrally. Big worldwide institutes look after the standards so that the neutrality is warranted.

In German speaking countries is the institute for broadcast engineering of the public broadcasting corporation of ARD, ZDF, DLR, ORF and SRG/SSR mainly responsible for the standards:

www.irt.de

For the whole European area the European Broadcast Union, EBU in Switzerland handles super ordinate to the local development institutes:

www.ebu.ch

On international floor established in 1865 in Paris the International Telecommunication Union, ITU is included:

www.itu.int

For best image evaluation and calibration you use the test pictures from this document. It works also with real, filmed motives but with reservations. The big advantage of test patterns from BUROSCH Audio-Video-Technik is the knowledge how the test patterns have to look and the knowledge how to reproduce them. Only this way the neutrality of the transmission and the playback can be measured exactly and if necessary to correct it:

www.burosch.de

Reference Test Pattern: Gray Values

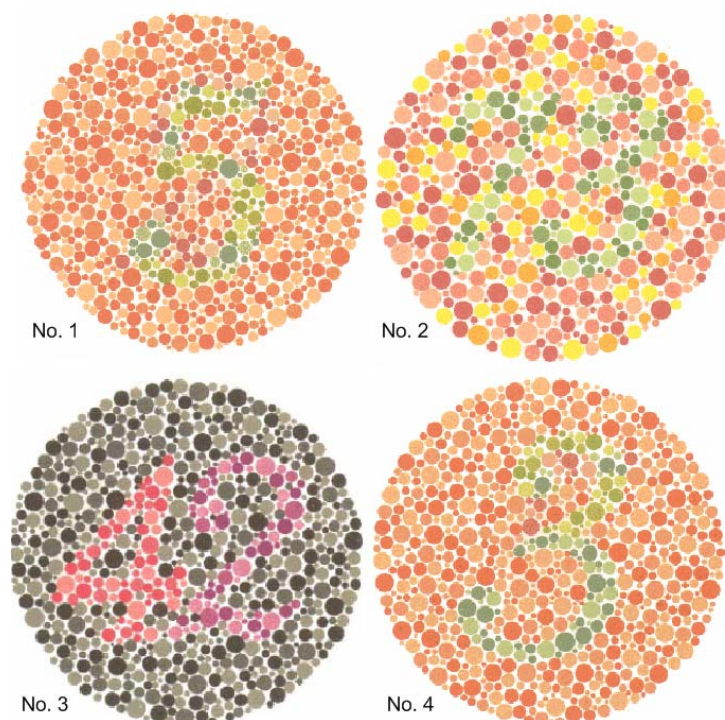
6 Visual Test

The basic prerequisite for an optimal focus and color perception is a good work of the human eye. In this chapter will be tested your vision rudely.

IMPORTANT: Because of scaling artifacts the following tests mustn't be done on your PC screen. Please pay attention to optimal printer settings therefore!

6.1 Colors

Scientifically proven are many people especially men afflicted with color blindness. This means that colors especially red and green are misinterpreted. By the help of "Ishihara Color Test Plates" this amblyopia can be easily detected. On this page you see 4 typical Ishihara Color Test Plates which prove your color perception.



On the left you see 4 numbered Ishihara Color Test Plates for a check-up of potential red-green and yellow-blue weakness.

The numeral "5" should be clearly visible at No.1 to viewers with normal color vision. No. 2 should be visible as "73", No.3 as "42" and the last one clearly as "3".

Please check this fact on yourself.

Congenital color blindness occurs mostly at men and increase or decrease over the years.

Note: These small relative visual tests just show a trend and don't replace the way to the eye specialist!

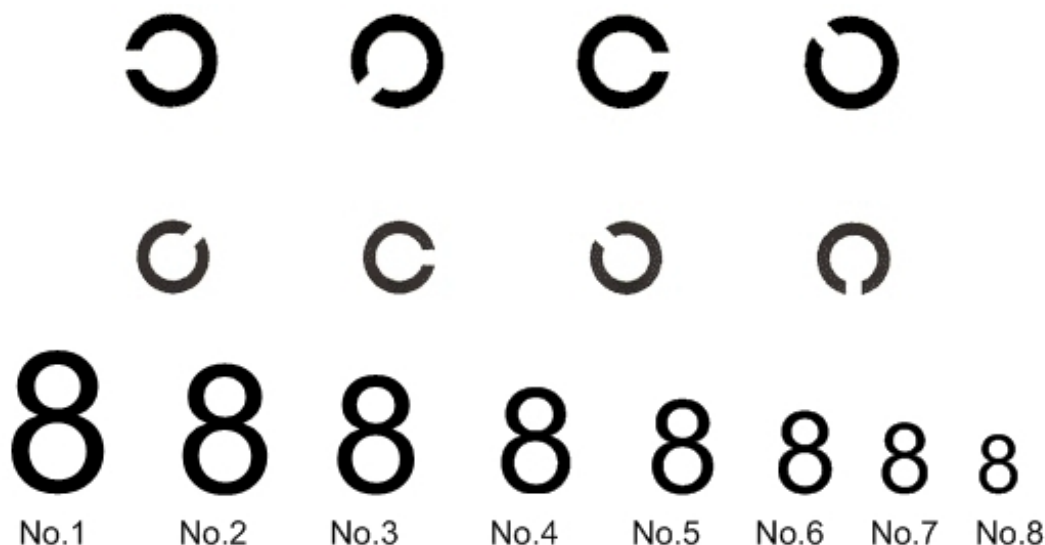
Reference Test Pattern: Gray Values

6.2 Visual Acuity

The following visual test is posing a really good challenge to your visual acuity. By the help of the following image on this page which shows two rows of rings with openings and a numbered decreasing number "8" and the image on the next page which shows 3 vertical stripe patterns you can check your visual acuity very easily. Please print the images on this page out and hang them up at a distance of approx. 4 meters.

The ring openings at least from the upper row should be clearly visible. If you don't see any ring openings we advise a check-up at your eye specialist. The decreasing "8" should be also clearly visible from 4 meter in every size. At most the smallest (No.8) could be a little tricky to identify it as an "8" from 4 meter.

This test can't be arranged on your PC screen because the resolution can affect the perception badly.



At optimal visual acuity all ring openings and all "8's" are clearly detectable and readable respectively.

Note: These small relative visual tests just show a trend and don't replace the way to the eye specialist!

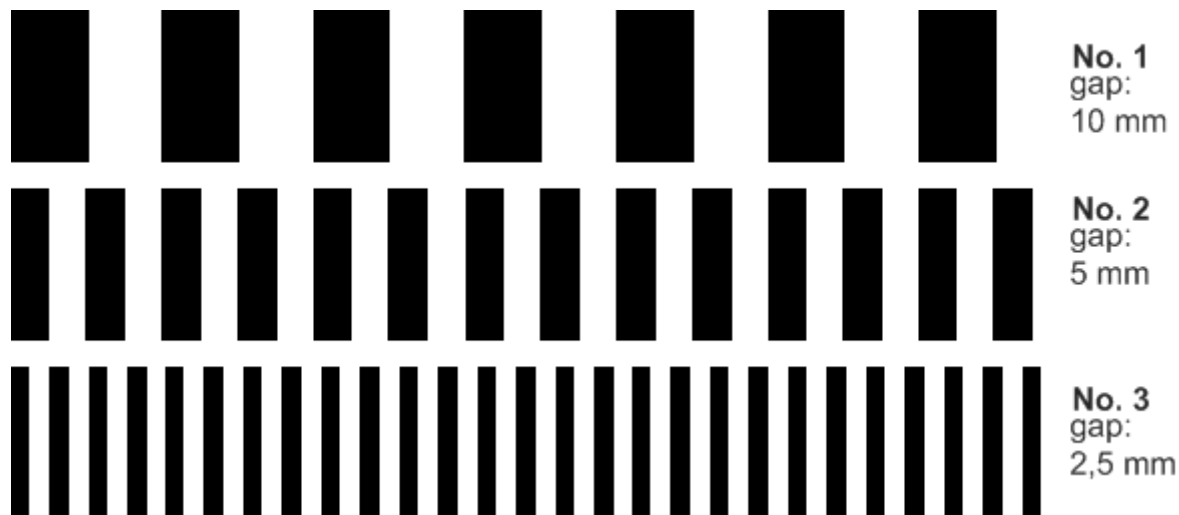
Reference Test Pattern:

Gray Values

The image on this page shows 3 vertical stripe patterns which are also vitally important for the visual acuity. All gaps between the stripes are over the whole horizontal direction absolutely identical.

The black and white gaps of the upper row are approx. 10 millimeter; the gaps of the middle row are approx. 5 millimeter and the gaps of the bottom horizontal row are about 2.5 millimeter.

Most important at this image are the hard and sharp outlines of the stripes. At least the upper 2 stripe patterns should be clearly visible and distinguishable at a distance of ca. 5 meter.



If all visual tests proceeded positively you could emanate from a visual acuity of 90 to 100%.

Note: These small relative visual tests just show a trend and don't replace the way to the eye specialist!

Reference Test Pattern: Gray Values

7 Credits

Editor of this technical documentation for the reasonable application of the reference test pattern:

BUROSCH Audio-Video-Technik

Owner: Klaus Burosch, Steffen Burosch, Andreas Burosch

Technicians: Paul Gaukler, Eberhard Graf, Philipp Smoldas, Raphael Vogt

Sigmaringer Straße 20

70567 Stuttgart / Germany

Telefon: +49 (0)711 161 89 80

Telefax: +49 (0)711 161 89 81

eMail: info@burosch.de

Web: www.burosch.de

VAT Nr.: DE147421720

Registriergericht: Stuttgart – Germany

Handelsregister Nr.: HRA 6322

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