Photoplotter FilmStar-PLUS
Instructions to Use

Translation of the original instructions

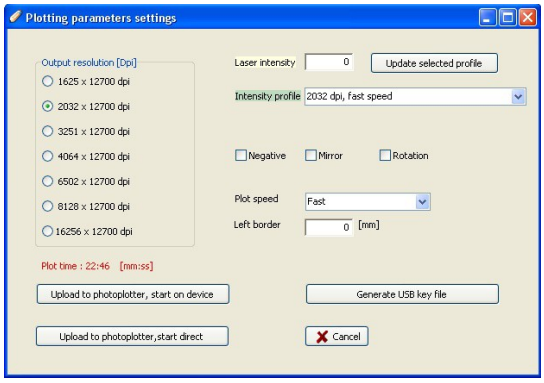
Table of Content

Introduction

Filmstar-Plus is the name of the next generation of our bitmap photoplotter series. Optimized for in-house production of high end film layouts at reasonable price level the system can directly process Gerber files or bitmap files. Filmstar-PLUS does an excellent job, comes with an attractive design and a remarkably low price.

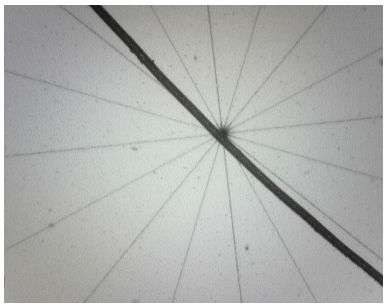
Features:

- precise edge definition in photo quality
- perfect blackness results in perfect opacity
- extended software package included in delivery



Improvements compared to Filmstar FP 8000:

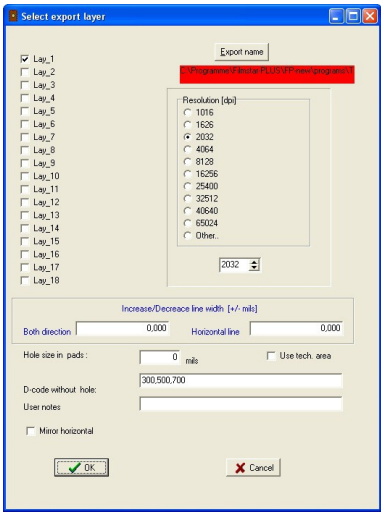
- higher resolution; up to 16 256 x 25 400 dpi
- Stand alone unit - no separate PC necessary. Data can be transferred to plotter either via USB-stick or via USB-cable
- New electronics with Touch-Display and intuitive user interface
- Software update: customized Windows optics, Windows routine for opening and saving of files, higher resolutions in Gerber2Bitmap, various calibration programs in Run_Filmstar
- 3 different plot speeds for either high precision or less time consumption



Description:

- The film is fixed on a rotating drum. A highly focused red light laser diode is moving step-wise alongside that drum, driven by a precise stepper motor with worm and gear drive. Of course, all settings are software adjustable, calibrated and controlled.
- Data are either transferred via USB-cable from your computer to the plotter or read in from any USB stick. Software is part of delivery. It allows panelization of layout and drill data, rework of aperture tables and contains functions like negative plot, mirroring, preview and drill data export.
- Interactive, absolute or relative positioning of the layouts on the film.
- Preview and rework of various aperture tables of different layout systems.

Technical Data



Dimensions:	710 x 340 x 200 mm (L x W x H)
Weight:	Approx. 25 kg
Power supply	External power supply Input 100V-240V / 47–63 Hz; Output 36V- DC
Prerequisites	Darkroom area with safelight, constant temperature and humidity, as few dust as possible, power supply, red sensitive film, fixer, developer
Maximum plot size:	365 x 375 mm (L x B)
Maximum film format:	405 x 395 mm (L x B)
Maximum file size:	256 MB
Speed:	7 mm of film width / min. at 2032 dpi
Light source:	Laser-diode 670 nm (red)
Data formats:	Gerber, Extended Gerber, Hi-Res BMP
Extent of delivery:	Photoplotter and Software on CD
System requirements:	Windows XP / Windows 7 / Windows 8

Technical resolution:

Resolution X:	1625, 2032, 3251, 4064, 6502, 8128, 16256
Resolution Y:	25 400dpi

Graphical resolution:

1) Finest point/ Finest line = 5 µm (0.005 mm/0.19685 mil).	
2) Finest space between 2 lines = 10 µm (0.01 mm/0.3937 mil)	
3) Finest space between 2 areas = 18 µm (0.018 mm/0.70866 mil)	
4) Finest inverse spot diameter (transparent point in black area) = 25 µm (0.025 mm/0.98425 mil)	

EG-Declaration of Conformity

EG-Konformitätserklärung/Declaration of Conformity

Hersteller / Supplier:	Bungard Elektronik GmbH & Co. KG Rilkestraße 1 51570 Windeck Germany
Bevollmächtigte Person für die Zusammenstellung der technischen Unterlagen: Person in charge	Jürgen Bungard, Geschäftsführer /general director Rilkestraße 1 51570 Windeck Germany
Produkt:	Fotoplotter Filmstar-PLUS

Hiermit erklären wir, dass die oben beschriebenen Maschinen allen einschlägigen Bestimmungen der Maschinenrichtlinie 2006/42/EG entspricht.

Die oben genannte Maschine erfüllt die Anforderungen der nachfolgend genannten Richtlinien und Normen:

We hereby declare that the machines described above complies with all relevant provisions of the Machinery Directive 2006/42/EC.
The above machine meets the requirements of the following guidelines and standards:

- **Maschinenrichtlinie 2006/42/EG / Machinery Directive 2006/42/EC**
- **EMV-Richtlinie 2014/30/EG / EMC Directive 2014/10830EC**
- **Niederspannungsrichtlinie 2014/35/EG / Low Voltage Directive 2014/35/EC**

- **DIN EN 60204-1** Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 1: Allgemeine Anforderungen / Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- **DIN EN ISO 14121-1** Sicherheit von Maschinen - Risikobeurteilung - Teil 1: Leitsätze / Safety of machinery - Risk assessment - Part 1: Principles
- **DIN EN ISO 12100-1** Sicherheit von Maschinen - Allgemeine Gestaltungsleitsätze, Risikobeurteilung und Risikominderung / Safety of machinery - Basic concepts, risk assessment and risk reduction
- **DIN EN 55014-1 2012-05** Elektromagnetische Verträglichkeit, Anforderungen an Haushaltsgeräte, Elektrowerkzeuge und ähnliche Elektrogeräte, Teil 1: Störaussendung / Electromagnetic compatibility Requirements for household appliances, electric tools and similar electrical appliances Part 1: Emission
- **DIN EN 55014-2-2009-06** Elektromagnetische Verträglichkeit - Anforderungen an Haushaltgeräte, Elektro-werkzeuge und ähnliche Geräte - Teil 2: Störfestigkeit - / Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity
- **Niederspannungsrichtlinie / Low Voltage Directive 2014/35/EG**
- **Maschinenrichtlinie / Machinery Directive 2006/42/EG/37/EG**

Windeck, 10.1.2017

Jürgen Bungard Geschäftsführer

Intended Use

The photoplotter Filmstar-PLUS is designed for making exposure artworks in photographic technology.
All other applications require our written consent or happen on full risk of the user.

Safety Regulations

General

Please read the following instructions carefully and pay particular attention to information on operating safety and set up.

Keep these instructions at a safe place. It contains information which also refer for later maintenance and cleaning.

The machines are intended for chemical-physical treatment of printed circuit boards.

The machines are not designed to be embedded or interconnected with other machines or systems. They may only be used in specially equipped rooms and be operated only by qualified staff. Children and pets are to be kept away!

Transport

Only use suitable lifting and transport equipment such as forklifts or pallet lifts. Secure the machine against sliding / tilting.

Place of installation

The machine must be standing level and around the machine there has to be sufficient space for operation and maintenance work.

Temperature and humidity affect the accuracy of the plotter. Avoid variations in temperature and humidity. Environment should be clean, dust-free and corrosive under any circumstances!

Electricity

The machine is made from certified parts according to standard practice for electrical safety. This does not relieve the user of his duty of care when handling electrically powered devices.

The main switch disconnects the machine from the power supply. We presuppose that the safety fuses of the circuit and the residual current circuit are provided by the building's power supply.

After completion of work, the main switch should always be turned off.

Before all maintenance work on the machine turn off machine and pull the plug.

Inside the Plotters are no user-serviceable parts. The housing must be opened only by experts.

Connect only to the prescribed voltage.

Personal protection equipment

During the plot operation, the film is exposed by a laser beam. This can damage the human eye. Do not look into the laser beam during operation!

When handling the chemicals wear personal protective equipment (lab coat, gloves, goggles).

When handling corrosive chemicals make sure to wear protective clothing, gloves and face protection. Observe the safety instructions of the manufacturer or the supplier.

Films and chemicals

The photo films are very light-sensitive. Protect from light till the end of the fixing process!

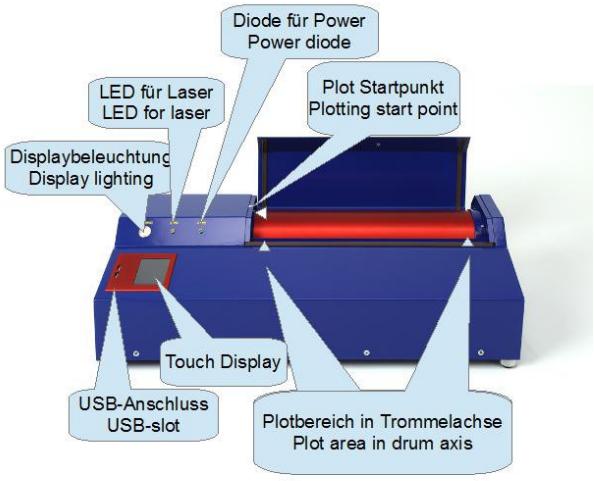
Store chemicals and film cool and dry.

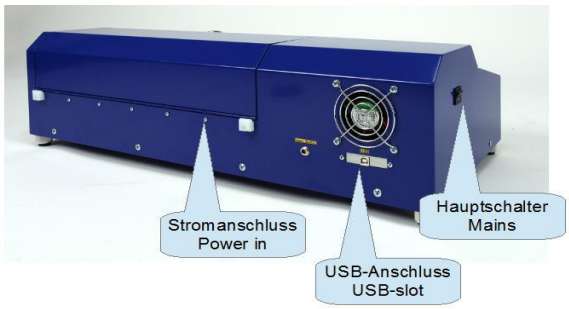
Let the film acclimatise 24 hours in processing temperature.

Cleaning and maintenance work

The drum surface must be kept clean and dry. In order to remove any remnants of adhesive tape, please use a soft cloth moistened with a liquid cleanser. Please do not use a spray.

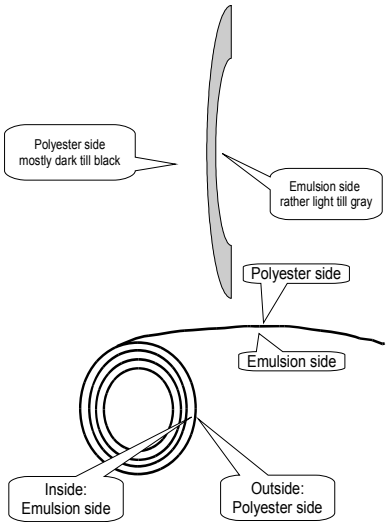
Composition





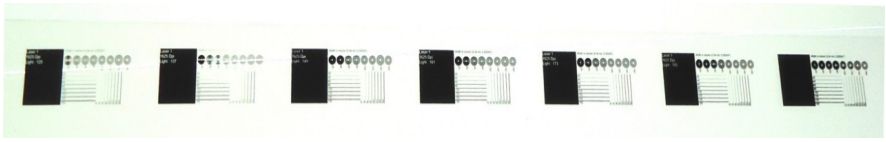
Short Instructions

Take Filmstar-PLUS from the packaging and inspect for shipping damage.
Set up darkroom (no light may penetrate from the outside !!).
Install and connect the special safelight.
Place plotter into the darkroom and connect it to power supply.
If plotter is to be controlled directly from a PC, establish USB cable connection to the outside.
Make a first test plot
Check if all materials are in place and that there is no light entering the darkroom.
Lock darkroom. If anybody opens the door, your work will be lost.
Filmstar must be turned off.
Cut a +-100 mm piece of film and put the film with emulsion side on the drum. Make a dog ear at the left top corner. This way you will always know, how you placed the film on the drum.
Start to tape the top left corner at the white arrow on the drum. Tape the diagonal corner bottom right, then the top right. Release the first tape again to avoid tension on the film.
Tape the complete horizontal sides of the film, so no air can creep underneath the film, when the drum is rotating.
Rotate the drum, so the white arrows on the left face each other.
Make sure the film is lying flat on the drum and there is no tension on the film.
Close the lid, turn on machine. At the touch display press **Lightbar**, then on **1625** and after that **125/12**. Now press **START**. Filmstar-PLUS will now plot 8 test samples with 1625 dpi and with light intensities of 125, 137, 149, 161, 173 etc.
While the Filmstar-PLUS plots, set up chemicals in the cuvette:



1. Set up developer (2 parts water, one part developer)
2. Set up fixer (2 parts water, one part fixer)
3. Fill middle chamber with water

After plotting, turn off plotter, remove film in the darkroom area and develop a minute and fix a minute. Finally rinse well and dry with a lint-free cloth.
This is how your film should look like:

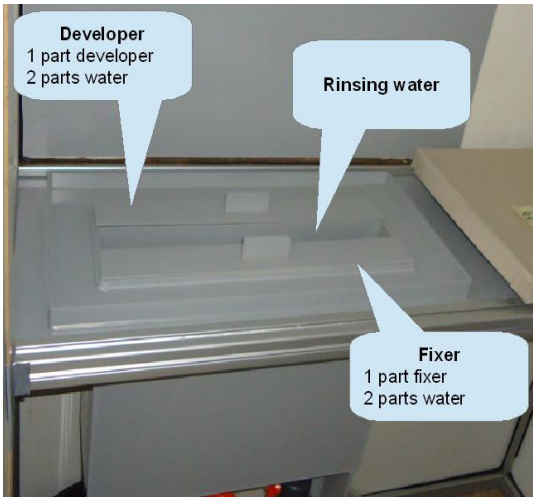


Lightbar

Your photoplotter is now set up and ready to use.
Next, install the software and import the machine parameters (Setup - Import setup table). A detailed description of how to install, see the chapter Software.
We now propose to make 2 test plots:
1. a **multiresolution lightbar** to check the light settings
2. a **test grid** to verify the correct lengths

The creation of test plots is described in the chapter Run-Filmstar.

Never drop fixer into the developer. The developer will break down immediately!



How to trouble shoot
1. Test chemicals:
Cut 2 pieces of film. One develop, fix and rinse. Film must be completely clear.
Expose the other piece to daylight. Again develop, fix and rinse.. The film must be completely black.
If the result is ok, you know, chemicals and film are ok.
2. Test photoplotter:
cut a piece of film of +- 100mm width. Tape it on the drum and plot a light bar directly from the machine (touch screen, select light bar!). If the light bar is ok, you know, your machine is working correctly.
3. Control settings:
Open software Run-Filmstar. Go to Setup – Setup table. Compare the values with the print out that came with the machine.

Maintenance:
The complete dark room environment must kept clean and as dust free as possible!
Clean drum with soft sponge or cloth and some window cleaner.

Changing chemicals: Clean the tanks thoroughly! Make a final rinse with Di-water. Residues of old developer will spoil the new developer!
Mix 1 litre of developer with 2 litres of water. Dispose chemicals according to the disposal regulations of your country!

Essential Spare Parts: Developer, safelight

Amount of Delivery

1 Plotter

1 Software CD

3 Test films (1 x lightbar for light calibration, 1 x test grid film for dimensional calibration, 1 x test film with plot samples

1 power supply

Accessories

Darkroom	Safelight	Film	Developer
Fixer	Film Rivets	Film Punch	Filmstar Cuvette
Tab Water	Film Dryer (Hair dryer)	Tape	Knife/Scizzors
Paper Towel (ZEWA)	Bucket	Measuring Cup 2,5 or 5 l	Covers for Film
Rubber Gloves	Apron/Overall	Light Table	Timer (not illuminated!)

Set up and Commissioning of the Photoplotter

The machine is delivered in special packaging. First check the state of the packaging upon receipt of the goods. Acknowledge the receipt of the goods to the forwarder only as okay, if the packaging is in perfect condition. Otherwise you might endanger any claims on the transport insurance.

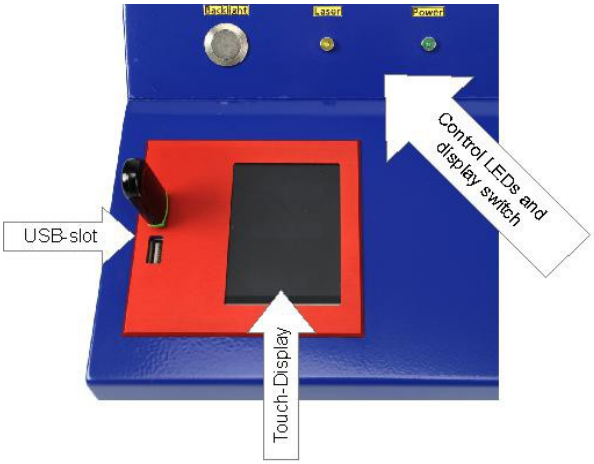
If you notice any damage after unpacking the goods, please report them as hidden damage immediately in written form to the carrier, your transport insurance and to us.

You need red light sensitive films, as they are also used for large photoplotter. These are available in 0.1 mm thickness or 0:18 in rolls or sheets by e.g. Agfa or Fuji. We supply films as cut sheets fitting the size of the Filmstar plotting area. The films will be as usual wet developed and fixed. This requires a dark room with green illumination.

Dark Room

All feeding or removing of film from the photoplotter, as well as the subsequent development and fixation, require Dark Room conditions and a special green safe light. Install the unit in an appropriate room together with trays or tanks one each for development, fixation and rinse. In this room you will further need a main supply for the plotter and the safe light. If you want to run the plotter directly from the PC, then you need to establish a USB connection from the plotter inside of the Dark Room to the PC outside of the Dark Room.

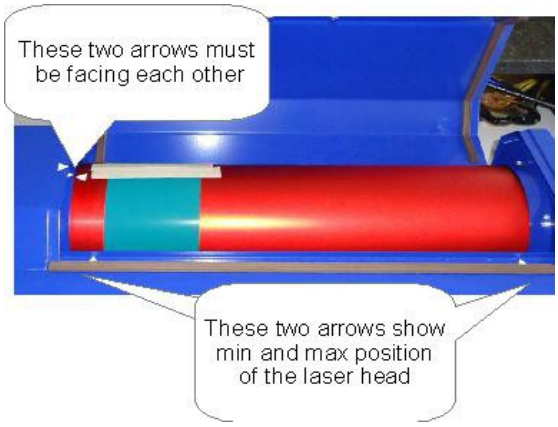
We recommend vertical mounted tanks with cover for the chemical processing. These need little installation footprint and the liquids have a small surface compared to their volume, which increases their life time. Further, vertical film handling has the big advantage that no air bubbles can stay underneath the film and spoil development.



Installation

On the front of the plotter is the touch screen
with the two USB ports, two LEDs and a switch for the touch-display-backlight. On the left side of the case there is the main switch. On the back of the plotter there is the plug for the power supply and the connection for the USB cable. The power supply also has a pilot light. Of the two USB ports only one can be used. The other is intended as a hidden reserve.

Place the photoplotter in the Dark Room and connect the power supply unit. Do not turn on the plotter yet. If you want to run the plotter directly from the PC, connect the supplied USB cable.

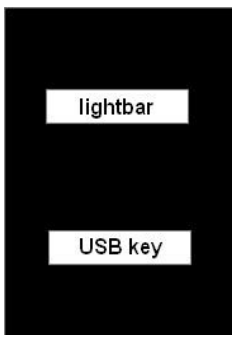


Test run

You will need some adhesive tape to mount the film on the drum. We suggest you use 20mm white paper tape (painter's utilities), as this white tape can be best seen in the Dark Room light and it can easily be cut off the roll by hand.

Enter the Dark Room, turn on the green safe light and make sure there is no extra light from outside dropping in. Open Filmstar´s lid. You will see the drum. Turn it by hand until the white arrow on the drum faces the white arrow on the left of the drum housing. Take a sheet of film from its box and tape the upper end to the drum in a way that the tape sits about 5 mm on top over the arrow.

Since we only need a small strip for the first test plot, you can cut the film with a scissor or similar to strips of approx. 100 mm.



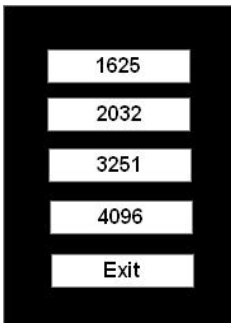
The emulsion side of the film must be facing the drum. Films coming on rolls are already wound accordingly. Under the green light, the emulsion side of the film normally looks grey, the top side is darker.

It is also possible to place the emulsion side (grey) to the other side (the laser diode). But be careful, in this case the correction factor for drum circumference changes, because the picture will now appear on the outer diameter of the film and not on the inner diameter of the film (= the diameter of the drum). If you want to plot with emulsion side outside, then you need to correct the drum diameter in Run-Filmstar software according to the film thickness.

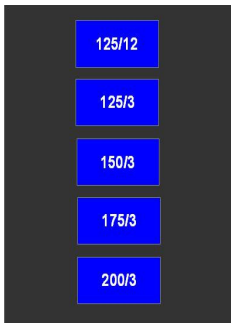
There is another white arrow on the lower part of the drum housing that you should use for lateral positioning of the film. After you fixed the upper edge of the sheet, turn the drum by hand and sweep over the sheet so it goes tightly on the drum. It is important that the sheet edges are parallel to the drum axis and that the upper and the lower sheet corners are facing each other, i. e. the film is not twisted, else the image will be distorted or the line edges will not be sharp. (Mounting films correctly will need some practice.)

In that state use adhesive tape to fix also the lower end of the film to the drum. Finally, it is very important that you turn the drum further to the starting position with the two white arrows in one line.

Close the lid and re-pack all film material into a safe box (!!). You can now turn on the plotter. The Laser LED will light up several times very shortly and you will hear some beeping noise. After that the LED light will be barely visible. When the exposure process has been started the LEDs will light up permanently.



Resolution



Light intensity

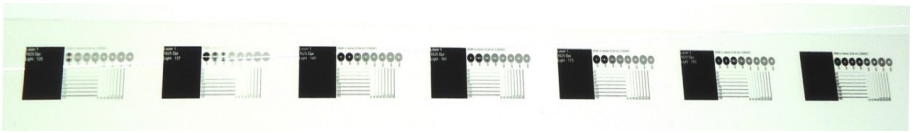
Annotations:

Films form different film supplier can have a different light sensitivities. In Addition the developing chemicals may differ. For that reason it is possible and necessary to adjust the intensity of the laser light depending on your personal working conditions as and in accordance to the desired resolution. To do so you can plot a so called **lightbar** either directly from the machine's touch panel or you produce a single **lightbar** or a **multi-resolution-lightbar** with the software “Run-Filmstar.exe“. For a first test we will plot a lightbar directly from the machine with a resolution of 1625 dpi, a start laser intensity of 125 and steps of 12.

When you turn on the plotter, the welcome message *Bungard Filmstar-PLUS* appears. In the next dialogue you can chose between *lightbar* and *USB key*. Chose *lightbar* and in the upcoming screen *1625,* after that *125/12* and at last press *START.*

Filmstar-PLUS will now plot 8 test samples with a resolution of 1625 dpi and with light intensities of 125, 137, 149, 161,173,185, 197 and 209. After plot process has finished, go back into the Dark Room, take the film from the plotter and develop as described in the chapter below.

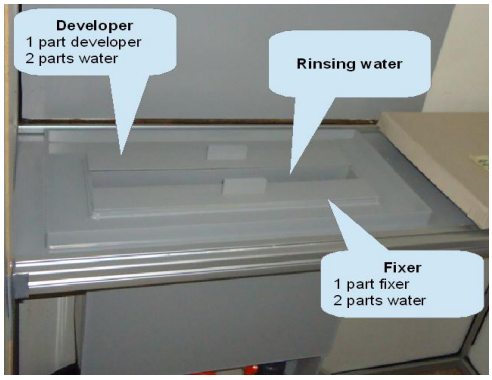
After the developing and fixing process your test plot should look similar like the picture below:


Lightbar

The drum rotates at first slowly and with considerable noise (normal resonances of the stepper motor). After the drum reaches its operating speed, it rotates with a constant rotational speed and the plotting begins. During the exposure process the "laser" labeled LED lights or flashes. Pressing STOP on the display, you can interrupt the process at any time (press several seconds). If the plotting is completed or interrupted, the drum stops to rotate and the laser head will return to its starting position.

Before you start a new plot, please wait, until the laser head has fully achieved its zero position on the left side of the drum.

Film Developing and Fixing



In this chapter we assume that you are using the film and chemicals that we supplied and that you are treating the film in the Dark Room also made by us. If you are using other consumables or equipment you will have to adapt to your working conditions the instructions given here below.

The setup concentration of the developer and fixer concentrate are written on the jerry cans: Dilute one part of concentrate in 2 parts of water. As a precaution, if your tap water is very hard please use deionized water. The three vertical tanks in our Dark Room take 9 liters each, so you will need each 3 litres of concentrate and 6 litres of water at room temperature.

The fixer goes in the first tank from the front, the middle tank takes the rinse water and the last tank is to be filled with developer. Be careful when filling in the liquids. The developer will be destroyed if fixer drops in. Please keep all tanks closed by the lids. The water in the middle tank will need to be replaced frequently. Components of the film emulsion will leave pasty residues in this tank. To empty the tanks, take the flexible hose from the holder, close the opening by your thumb, put the end over the container where you want to drain the liquid in and release the thumb. Wash all tanks with water and make sure there are no residues sitting on the walls. If necessary rub the walls with paper towel. From 2013 on the cuvettes will be delivered with cock valves instead of hoses.

The procedure to develop a film exposed on Filmstar-PLUS takes not more than a minute. If you do not like to touch the liquid by hand (wear thin Latex gloves) you should use a film clamp.

Especially big sheets of film tend to stick to the tank wall. To avoid this, try to handle the sheet so that it goes in the tank in an S-shape. This little disadvantage in handling is minor compared to the advantage that there will be no air bubbles at all under the film surface, as known from horizontal development trays. Moreover, the tank offers only a small liquid surface to the air, so that the destructive oxidization of the developer will be delayed. In addition the annoying process of decanting the liquids from and back into the storage containers can be omitted.

After exposure a short rinse is sufficient. In the fixer the film will mostly be clear after 30 seconds. It is good practice and gives better long term stability, though, to keep it in the fixer for double time. Rinsing after fixing is highly important. Finally, to dry the film, put it to the Dark Room wall and wipe the first side with a smooth fuzzle-free paper tissue. Remove the film, dry the wall, reverse the film and wipe the second side. Repeat the procedure with a fresh tissue. You may also profit from a hot air dryer. A well dried film looks fully transparent. Rests of opaque, bluish color indicate insufficient drying. The ambient humidity and the drying grade of the film will highly affect the film precision!

As mentioned, the developer will oxidize when in contact with air. It will take a brown color and cannot blacken the film sufficiently any more.

Test: Expose a piece of film for 2 seconds to normal daylight. After max. 1 minute of development at ambient temperature the film must be entirely black opaque. If this is not the case the developer must be exchanged. If you use the tank lid and take care not to pollute the developer it will have a life time of approx. 6 months. For frequent use the developer may be replenished with concentrate that you add in portions. The life time of the fixer mostly depends on the throughput. The time needed to clear the film will be longer with increasing use.

Attention: The fixer contains silver and must be recycled! Safety data sheets for the developer and fixer concentrates are available. These are actually no dangerous goods for road transportation.

Software

Overview:
The CD contains the file *SetupFilmstar.exe*. Please double click on this file and run the software installation. The Filmstar-PLUS software will be installed in the directory C:\program files\Filmstar. In the Filmstar folder you will find plotter software *Run-Filmstar.exe* and these additional folders:

Convert Bitmap to FPF: BMP2Fpf.exe and BMP_Gray2Fpf.exe. With these programs you can convert high resolution Bitmaps into the plotter format FPF. For BMP2Fpf.exe you need monochrome files, BMP_Gray2Fpf.exe also processes grey-scale pictures.

Convert Gerber to FPF: Contains the program Gerber2Bitmap.exe. With the help of this program you can convert your vector based Gerber data into raster based Bitmap-files.

Drivers: contains the drivers for the plotter when running the plotter directly from the PC. Please install the file CDMxxxxx_Setup.exe (current version:CDM20824_Setup.exe) in this case. If you are going to transfer the data via USB-stick, you do not need to install any driver.

Inspect FPF: Contains the program „View_FPF.exe“. This program inspects your created FPF-files.

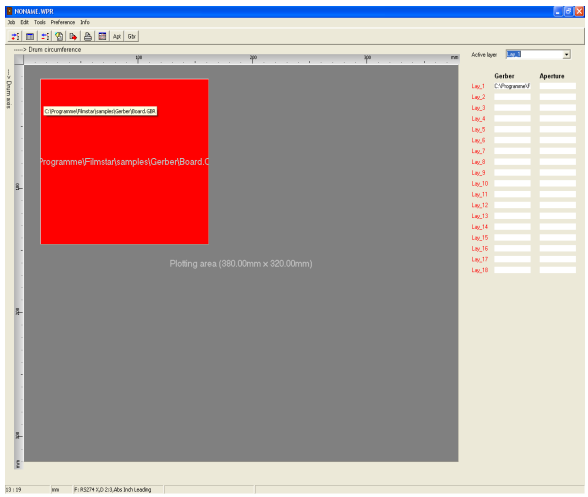
Machine parameters - import to Run_photo_USB2.exe: This folder contains the PHS-file with the machine configuration. Please import this file into the program „Run_photo_USB2.exe“.

Manual: Contains this manual.

Samples: Contains sample data for your first steps.

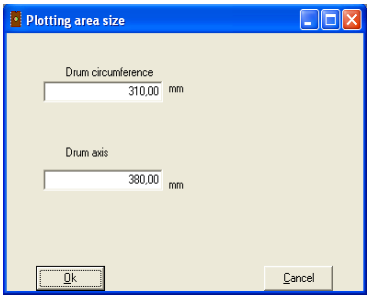
Gerber2Bitmap

Gerber2Bitmap handles Gerber data. You may load files, place the artwork image on the plot area, and view them. You may also convert the aperture tables of non-extended Gerber data. Further, this software can panelize boards and generate drill data from the panels. Finally, Gerber2Bitmap creates raster data that are ready for use with the following program that drives the photoplotter. These raster data are actually a bitmap that comes in a special FPF format. There is an additional output possibility for 250 dpi Windows BMP files, so that you can inspect the conversion results by double clicking the BMP file in Windows Explorer.

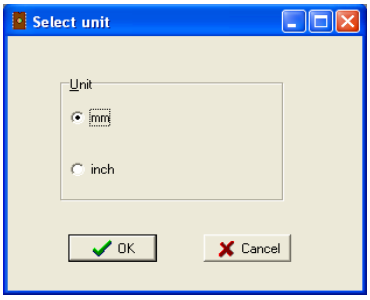


Here we describe only the features that are required to create the plot data. For more CAD / CAM functions such as panelization, drilling data export and fiducials we recommend the software IsoCam. Upon request, we will provide a more detailed guide to the program Gerber2Bitmap and Run-Filmstar.exe.

The program screen is divided in the menu bar, the icon bar, the (dark grey) plot area and, at the right of the screen, a vertical list of layers and aperture files. The icons have bubble help coming up if you place the mouse cursor over them.



The plotting area shows the maximum film size that the plotter can handle. Please set the value to what applies to your unit. This is done in the menu *Preference / Plotting area*. In *Preference / Units* you may set your preferred measuring unit (metric, inch). A last, but important setting that must be done only once, is under *P reference / memory size*. Set this value according to the table below.

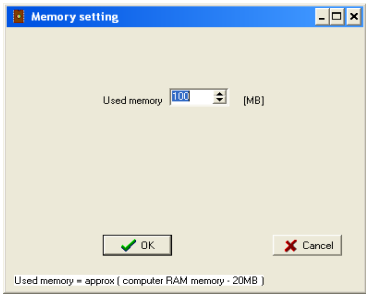


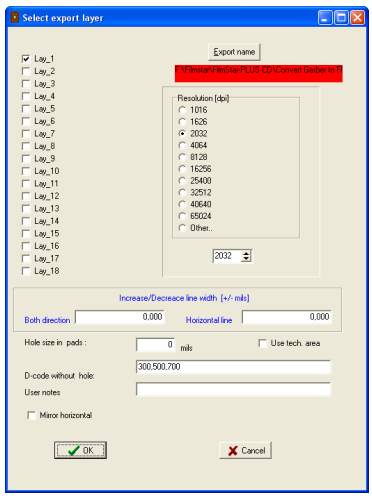
Computer RAM	Set used memory
less than 0,5 GB	128 MB
0,5 - 1 GB	384 MB
1 - 1,5 GB	512 MB
more than 1,5 GB	768 MB
768 MB is max. allowed value for "used memory".	

Here is a typical work flow with Gerber2Bitmap:

1. *Job / Import Master Gerber* opens a file selector that allows to import Gerber files, either standard or extended. In a first approach we assume you have selected a file in Extended Gerber format, since the Standard Gerber Format is not state of art anymore. A rectangle comes up in the upper right corner that corresponds to the artwork in size and orientation. You drag this rectangle versus the plot origin in the upper left corner.

Repeating this step you may arrange several layouts on the plot surface. If you right click the red rectangle a pop up menu comes up that allows to position, lock, unlock and delete the particular image. If you have several images on the screen the one in red color is the active one.



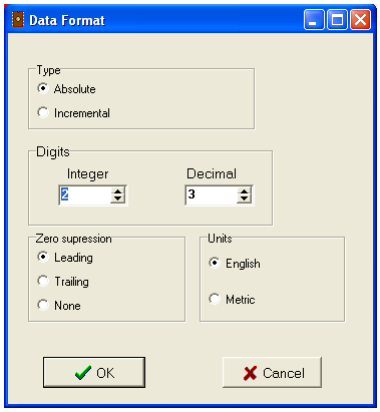


Some programming reasons require that the assignment of the X and Y axes on the screen look different than on the photoplotter: The plot image is both mirrored and twisted by 90 degrees. That causes that the direction of the drum circumference shows from the left to the right, and the laser head movement is on an axis showing vertically on the screen (you can imagine looking from inside of the drum against the film). For maximum execution speed you should try to arrange all artwork horizontally on the screen (in the direction of drum rotation).

2. *Job / Preview* opens a preview window to show you the total of all layouts that you loaded.

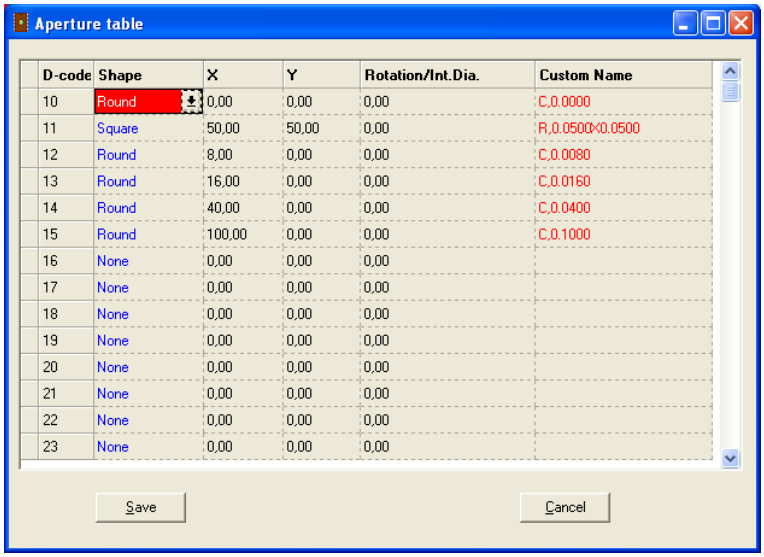
3. *Job / Export Fotoplotter File (FPF)* creates the raster data in an internal format called FPF. These data are written into a file of your choice that can later be used by the Run-Filmstar software. In this menu you select also the resolution (dpi) in which data will be converted. If you choose high values, the film will be structured more fine and

the file size increases, however, enormous. Since today's computers do well with large file sizes, we recommend to choose a rather high resolution and reduce the resolution in the plotting process.



Annotation: Standard-Gerber:

If you have no Extended Gerber files you need to specify the measuring unit and the zero suppression for each Gerber file. This is done in *Preference / Data Format*. Second, and again for all Gerber files, you need to load an appropriate aperture file. This is done from the *Job / Import Apertures* menu. A dialogue window will show up that allows to select the type of aperture file to load, and allows to select to use an aperture converter. The aperture files from CAM350, GC-CAM or IsoCam are supported directly. (You may also use the external ViewMate software to convert aperture files to the Lavenir format .ENV.)



The aperture converter built into Gerber2Bitmap will take all necessary information automatically. You just press "Guess format" and "Start". To quit the converter, press *Cancel*.

The name of the aperture file will show in the column right to the one with the name of the Gerber file. Each Gerber file needs its own aperture table. If a Gerber image was removed from the plot area, the associate aperture table will be removed as well. Using standard Gerber files with no or wrong aperture tables gives faulty results.

You may view and edit the aperture file assigned to the actual layer: Select *Preference / Aperture table*. This menu also allows to create a new table. Each entry needs to have the right shape and size information typed in. After you clicked on *Save* and named the file this will be written to disk as a Lavenir aperture file with the *.ENV extension.

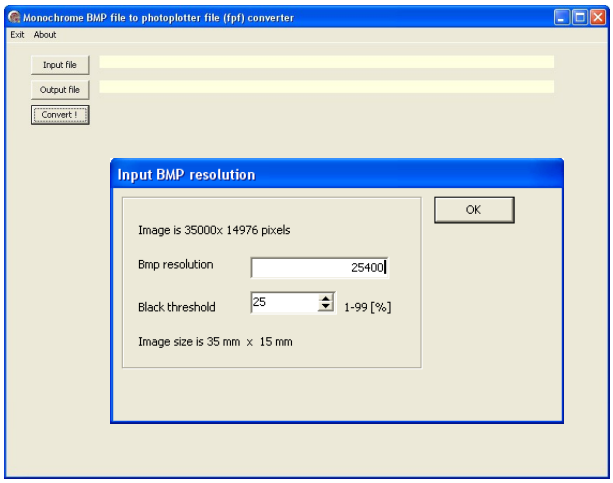
By the way, the above mentioned column of several layers will only be necessary if you have one Gerber master file and want to create a set of films in the same spacing and arrangement, like a four color film set for publishing / printing. The *Tool/Panelize* function will then handle all associated Gerber files according to the Master file on layer 1 and the *Tools / Panelize* drill function will further allow to duplicate the drill data accordingly.

Viewmate

On Request we will supply the Gerber-Viewer *Viewmate*.

Bitmap2Fpf

Bitmap2Fpf is a simple converter, that converts high-resolution monochrome bitmaps into the FPF plotter format. The bitmap format is universal, but has the disadvantage that the files can be very large with a corresponding resolution. For this reason we supply the converter Bitmap2Fpf.



If your design program is not capable to produce Gerber files, you can save your layout with the highest possible resolution as a monochrome Windows bitmap. If monochrome is not possible, you can eliminate the color information with e.g. Windows Paint. Note the original image size and the selected resolution!

You need to enter the proper resolution value of input BMP file in BMP2FPF program. In case you set wrong resolution value, you get wrong film result (smaller or larger image).

Example: you want to to convert the file TestBitmap25400.bmp into the FPF-format.

Load the file into the converter, define the name of the output file and click *Convert*.

In the upcoming dialog, the input resolution is displayed in pixels.

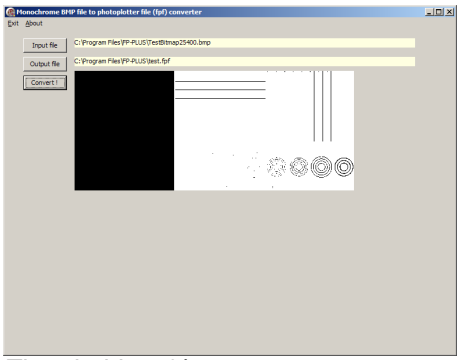
In the field *BMP resolution* you can enter the desired resolution and the program calculates the resulting picture size of the FPF file:

35.000 Pixel / 35 mm x 25,4 mm / Zoll = 25.400 Pixel / Zoll = 25.400 DPI

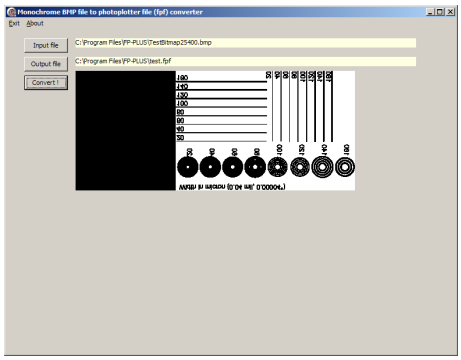
14976 Pixel / 15 mm x 25,4 mm / Zoll = 25.400 Pixel / Zoll = 25.400 DPI

When the FPF-file is generated a preview image is created automatically, too.

This preview image is stored into the FPF file and displayed as preview when the FPF file is loaded into the program Run_Photo_USB2. This preview image has a low resolution (200 x 200 pixels), so many pixels need to be merged. In the field threshold you can set at what percentage of black dots the merged dot will be black or transparent. On the left the preview picture is rather light, because 75% of the pixels have to be black before the merged pixel will become black. On the right the preview picture is rather black, because only 10% of the pixels have to be black before the merged pixel will become black. Note: The threshold has only effect on the preview picture, not on the real plot picture.

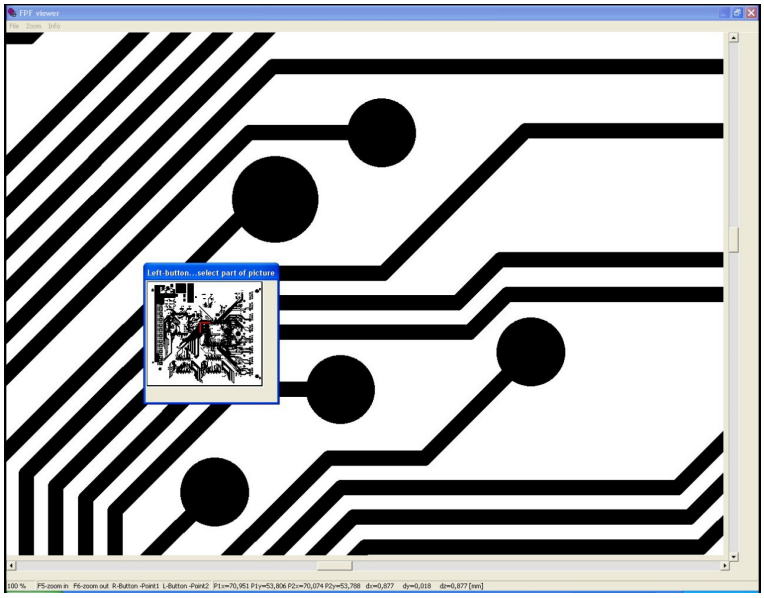


Threshold 75 %



Threshold 10 %

View_FPF

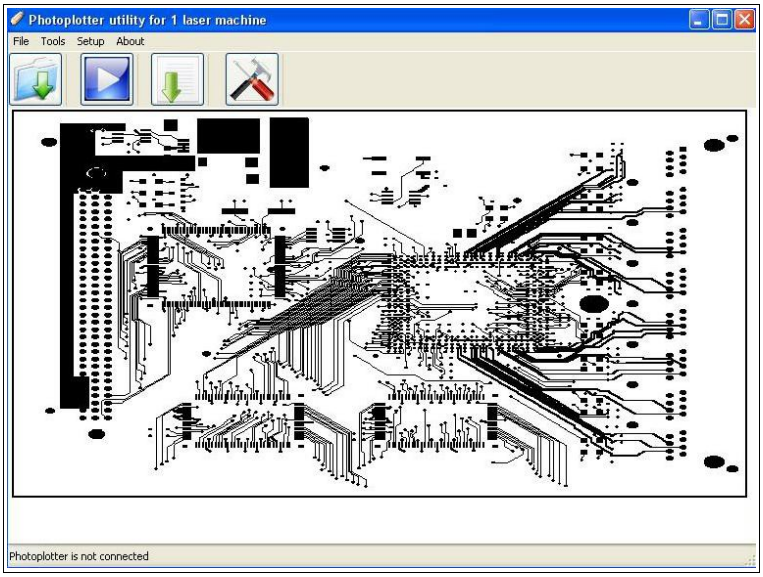


View_FPF is a simple image viewer for the plotter format FPF. You can load files, zoom into the image with *F5* (in steps 10, 11, 14, 16, 20, 25, 33, 50, 100%) and zoom out by pressing *F6*. You can adjust the viewing section with the *scroll bars* on the right and below, or click in an area in the small *preview window*.

View_FPF also contains a measuring function e.g to compare the bitmap dimensions with the original Gerber data.

First select an appropriate magnification, then move the cursor on the first measuring point and click with the left mouse button. The point is displayed as P1 in the bar at the bottom of the program (P1x = 114.983 P1Y = 67.504). Proceed with the mouse to the 2nd measuring point and click the right mouse button. This point is displayed as P2 in the bar at the bottom (P2x = 120.547 P2y = 67.443). Now you can read the distance in the X direction (dx = 5.564), the distance in the Y direction (dy = 0.060) and the diagonal (dz = √(dx2 + dy2)= 5.564). All values in mm.

Run-Filmstar

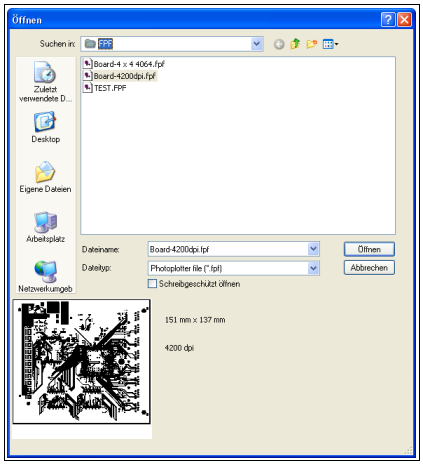


Run-Filmstar reads in in the FPF file generated in Gerber2Bitmap and controls the plotter. To get precise plot results the individual machine parameters have to be loaded once.

In addition, you can decide on the output resolution of your plot and whether the image shall be positive or negative, mirrored and/or turned. If you want to run the Filmstar-PLUS directly from the PC, you need to install drivers. To do this, go to folder Filmstar - Drivers and run the file CDMxxxxx_Setup.exe (current version: CDM20824_Setup.exe).

In Run-Filmstar the operating sequence begins with loading the file (*File / Open*). A preview pictures of your selected file is shown as well as the input resolution and, if there, user comments made in Gerber-2Bitmap.

If you confirm with OK, you will return to the main screen. Here the plot image will be displayed (dimensions will vary with the size of the software window).

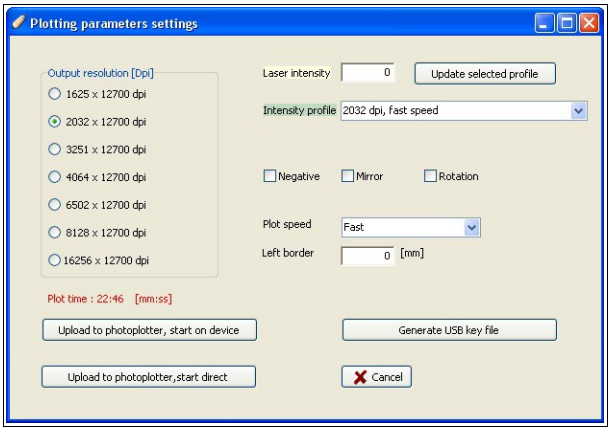


To continue click on the triangular *START*-button or press *F5*.

In the next dialog please set the desired output resolution, check the corresponding laser light intensity and chose whether you want to mirror or turn the image or make a negative plot.

The choice of plotting speed (*Slow*, *Medium* or *Fast*) influences the drum speed and hence the plotting speed. Depending on the natural resonance of the device, a certain speed can lead to higher vibrations. Default setting is *Fast*.

The execution time is shown at the bottom left. It depends on the output resolution. With a slow computer the calculated time may not match the real execution time.



There are 3 options to forward the data to the plotter:

Upload to photoplotter, start on device:

data is transferred via USB-cable, but plotter is started with the touch panel of the plotter.

Upload to photoplotter, start direct:

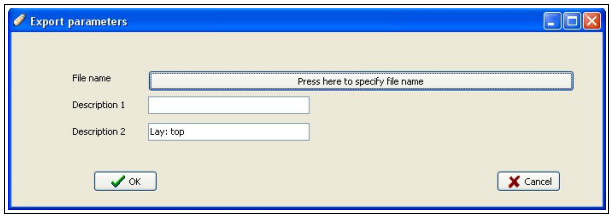
You transfer the data via USB-cable, the plotter will start automatically.

Generate USB key file:

Here you do not need any connection to the plotter.

The software will create a plot-file (.fp2), which you can transfer to the plotter with a USB-stick.

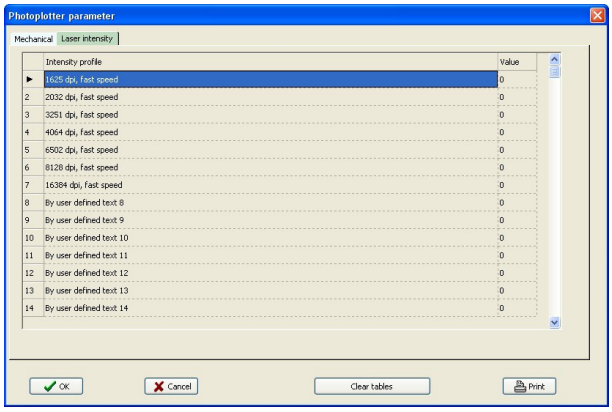
Attention: the USB-Stick needs to be formatted in FAT16/FAT32 (NTFS is not supported!).



If you want to transfer the data via USB-stick, insert the stick containing the plot file into the USB-slot, switch on the plotter and select "USB key". If you have multiple plot files on the stick, you can jump between the files back and forth with the arrow keys. Select a file by pressing *Enter*. With *X* you go back to the welcome screen. The next steps in the display are self-explaining. Pressing *X*, *Return* or *Stop* you will always return to the welcome screen. The stop button while plotting has a delayed reaction, so the plot-

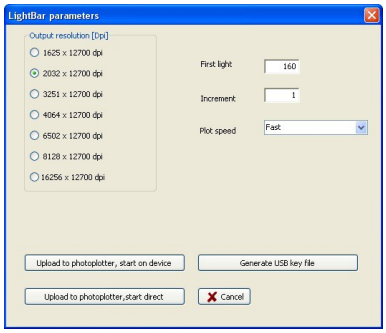
ting is not stopped by accidental contact. If you want to cancel the plotting, press the *Stop* button for a few seconds.

After the start, it can take several seconds before the plotter drum reaches its rated speed. Then the plot starts. The screen displays a progress bar. To prevent accidental exposure of the film, the display shuts off after a few seconds. To light the display again press the silver button.



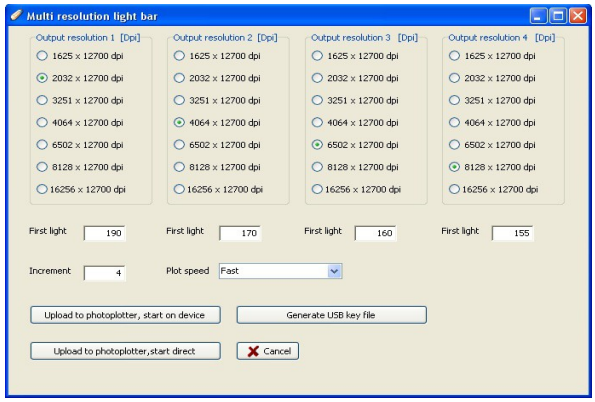
Configuration:

When you install the software for the first time, the configuration will contain default values. To get proper layouts it is absolutely necessary to run the plotter with the machine specific parameters. To do so you can either go to *Setup – Setup Table* and type in the values from the printed data sheet, or, even better, go to *Setup – Import Setup Table* and import the file from the CD. This configuration file is named xxx-yy.phs (with xxx as serial number and yy as year, e.g. 707-13.phs).

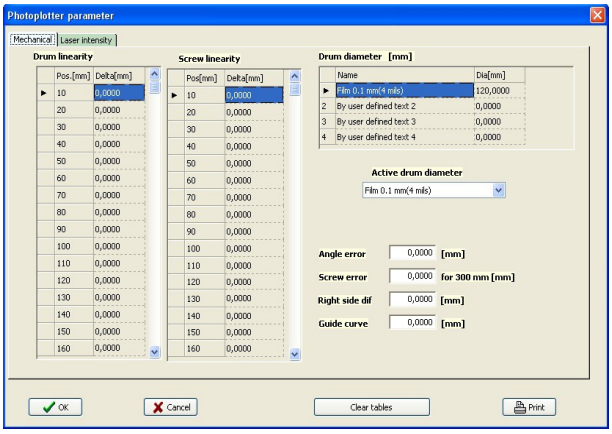


Test light intensity: The light intensity settings are of course proposal values only. They will vary with the type of film and developer that you use, so you have to adapt them to your specific conditions by test. The settings are stored at menu *Setup – Setup Table* and there on register *Laser intensity*. To find out the correct laser intensity the software comes with two integrated calibration functions.

If you need the laser intensity for only one resolution, choose *Tools – Plot Lightbar*. In the upcoming menu you need to select the desired resolution, the start intensity of the test row (*First Light*) and the laser gradations between the samples (*Increment*). Leave *Plot speed* for this moment on *Fast* and select the way of transferring the data to your plotter, as described above.



If you want to test more than one resolution at the same time, go to „*Tools – Multi Resolution Lightbar*“. There you can configure a test row as before, but you have the opportunity to select 4 different resolutions with different start light. A sample of a test row is coming with the plotter and will give you a hint at what point to start your own testings.



Test dimension precision: If there are very special requirements on the plotter precision - and suitable measuring devices assumed - the plotter can be calibrated both in the drum and spindle direction. For this purpose the *Tool / Generate Test Grid* menu creates a grid with lines each 10 mm. You may measure the actual line spacing and enter the results into the columns *Error on drum diameter* and *Drum linearity*. As you will rarely need these micrometer range corrections we are not going more into details at this point. If you need further assistance please call our support.

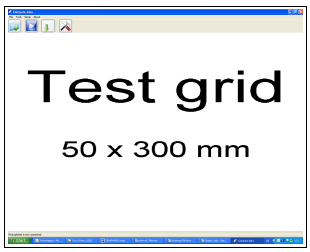
We prefer the test grid, which is generated with *Tools - Generate Test Grid* to external produced test patterns, because this way all sources of errors from previous preparation steps are eliminated (error in design, error in transformation etc.). Insert the desired length and width at *Drum axis* and *Drum circumference*. *Line width*, should be set to 2 mil..

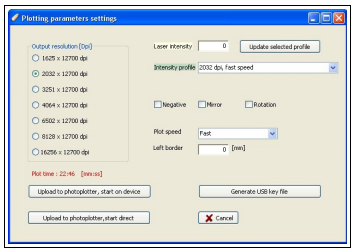
If you click „*OK*“ the picture will be generated internally.

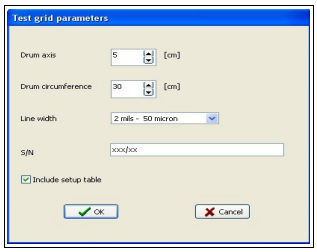
To continue click on the triangular START-button or press F5.

In the next dialog please set the desired resolution, control the corresponding laser light intensity and chose whether you want to mirror or turn the image or make a negative plot of the image.

After that you have again the choice between the 3 ways of transferring the data to the plotter : *Upload to photoplotter - start on device, Upload to photoplotter - start direct:* and *Generate USB key file.*







Cleaning and Maintenance

The darkroom environment must be kept clean and as free from dust as possible.

Similarly, the drum surface. In order to remove any remnants of adhesive tape, please use a soft cloth moistened with a liquid cleanser. Please do not use a spray. Remove residues of the cleaner.

The chemicals must be changed from time to time. A test for the chemicals is described at commissioning.

When changing chemical: Clean the tanks of the cuvette thoroughly. If necessary, Rinse with DI water! Remains of old developers spoil the new!

Mix 1 liter of developer with 2 liters of water. Dispose of chemicals according to local regulations.

Should it not be possible to produce directly from the device out a light bar with sharp lines, the laser lens could be contaminated (eg by glue residues of a loose tapes). In this case can be tried using a cotton swab moistened with pure alcohol to clean the lens.

Spare Part List

83010		FILMSTAR DUNKELKAMMER	Dark Room for FilmStar,	
83020		FILMSTAR DUNKELKAMMER-LEUCHTE	Dark Room safelight green with socket 60 cm	
83021		FILMSTAR LEUCHTSTOFFROEHRE	Special Safelight 60 cm green	
83022		FILMSTAR AUFBAUFASSUNG	Socket 60 cm f. Dark Room Safelight	
83030		FILMSTAR FILMSTANZE	Film Punch as shown on CD-ROM/ MPEG Film	
83031		FILMSTAR Fixierstift 100ST	Fixing Rivets (D3.0 x 2.5mm) to fix layout during exposure	
83040		FILMSTAR KUEVETTE	Triple Tank for FilmStar (PVC)	
83050		FILMSTAR USBBox (früher NETBOX)	USB Box f. FilmStar	
6000		Diode	Laser Diode	
6000		Repairkit (Laserdiode mit Leiterplatte, Optik, und graue Hülse	Repairkit (Laser diode with pcb, optics and grey housing	
6000		Trommelmotor	Stepper motor for drum (P22NRXB) costs	
6000		Lasermotor	Stepper motor for laser head (SL23-704)	

Guarantee

All machines are submitted before distribution to examination on function and continuous operation firmness. On the machine we grant a work warranty of 12 months to our customers starting from purchase date on accuracy in material and processing. We warrant at our choice by exchange of incorrect parts or by repair of the machine in our house. Old parts change into our possession.

Disclaimer of Warranty

Bungard GmbH & Co.KG reserves the right to change or enhance its machines or machine specifications according to its judgement, if necessary. Bungard cannot be held responsible to implement aforesaid changes into machines sold already.

Bungard products and services are liable to the current prices and conditions, which are subject to change.

The instructions and definitions in this document are also subject to change and mark no assurance on the part of Bungard.

This manual contains informations of the Bungard Filmstar-PLUS and is the translated English version.

Please regard the “Sales terms and delivery conditions”. These are available after fulfilment of the contract. We don't furnish a guarantee or warranty in cause of damages at material or hurts of people because of

Incorrect use of the machine

Wrong setup, installing and operating of the machine or incapable service

Use of the machine with defective safety equipment

Non-observance of the service manual in regard to transport, stocking, setup, installation and service of the machine

Unlicensed modifications at the machine

Incorrect or incomplete repairs

Destructive force effect at the machine in cause of foreign objects or external use of force

Use of non-original spare parts

normal wear parts.

We cannot accept subsequent claims from damage or destruction of work pieces worked on in the machine, because we have no knowledge or control over the operating conditions at your site. This is valid in a general manner also for requirements from damage to articles, buildings and persons as well as the environment.

We do not warrant that the function of the machine will meet the customer's requirements or that the operation of the machine will to this regard be error free.

In no event will we be liable to the customer for any incidental, consequential, or indirect damages of any kind, including loss of profit and prosecution for environmental pollution, even if we could have been aware of the possibility of such damages.

All information was arranged with great care. We reserve ourselves however mistake and technical changes without previous announcement.

Running the machine in corroding, humid, dusty, extremely hot or explosive atmosphere happens at the operator's own risk and responsibility.

We explicitly exclude any warranty for damages resulting from running the machine in in corroding, humid, dusty, extremely hot or explosive atmosphere.

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