

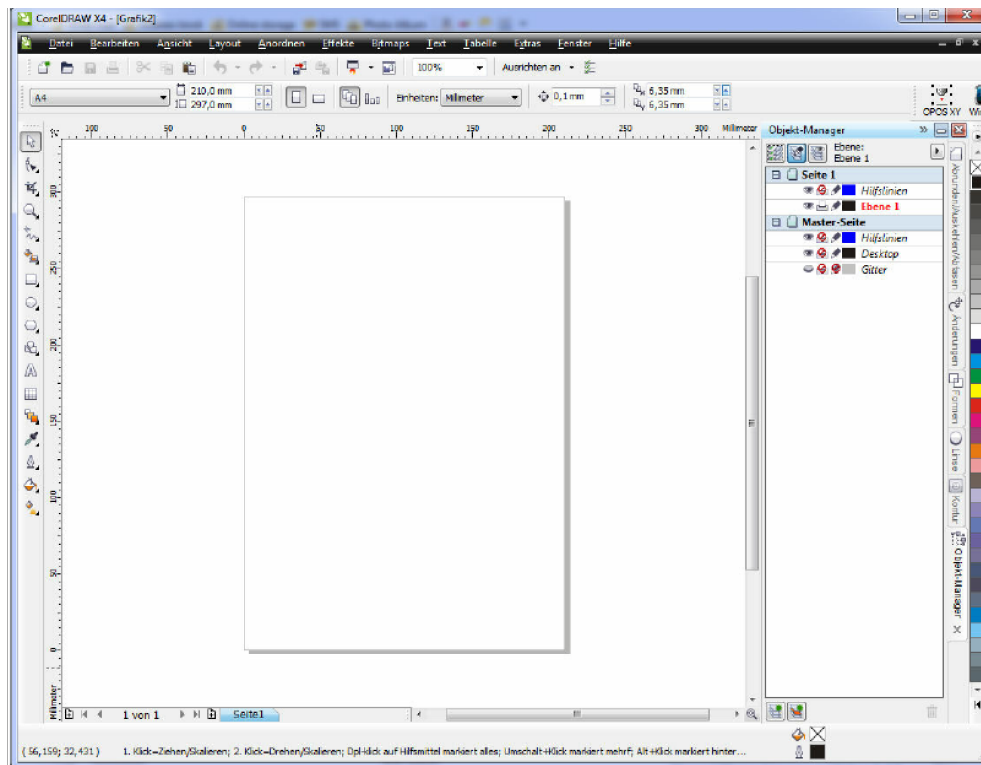
The video-positioning-system

This chapter is divided as follows:

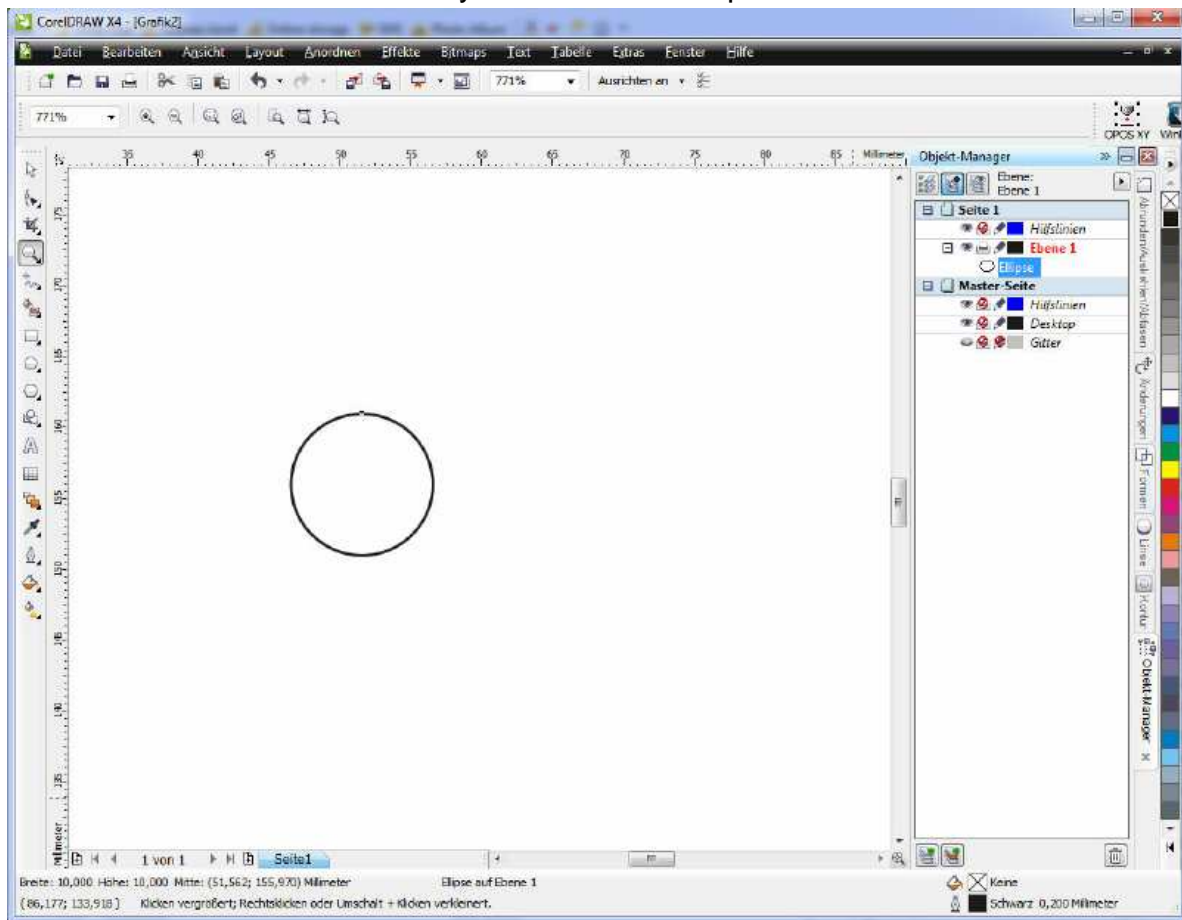
1. Prepare of master for the calibration by CorelDraw (117)
2. Calibration of camera positioning system
3. Prepare of data for print and cutting/milling by Corel Draw (124)
4. Use of camera positioning

1. Prepare of master for the calibration

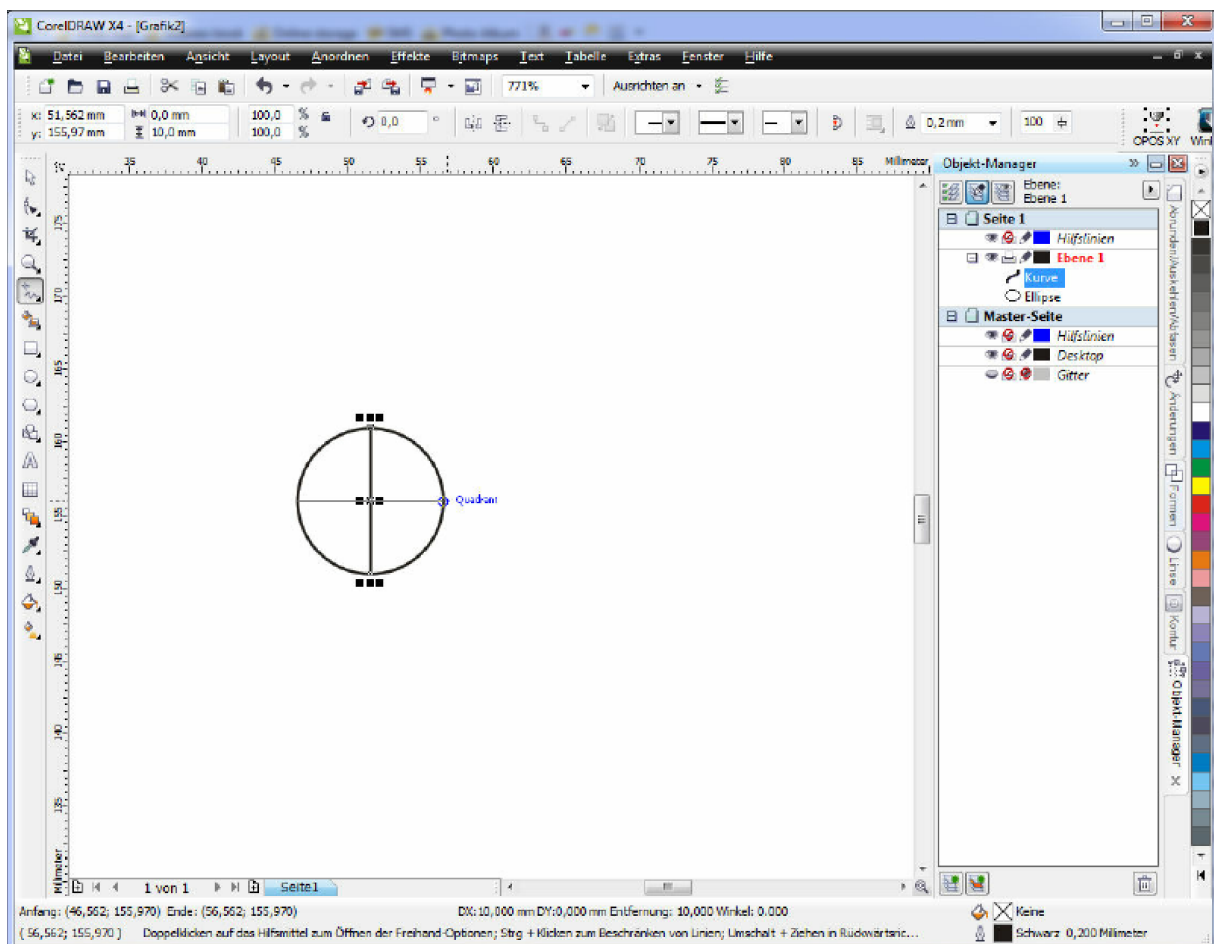
Start Coral Draw with empty sheet DIN A4



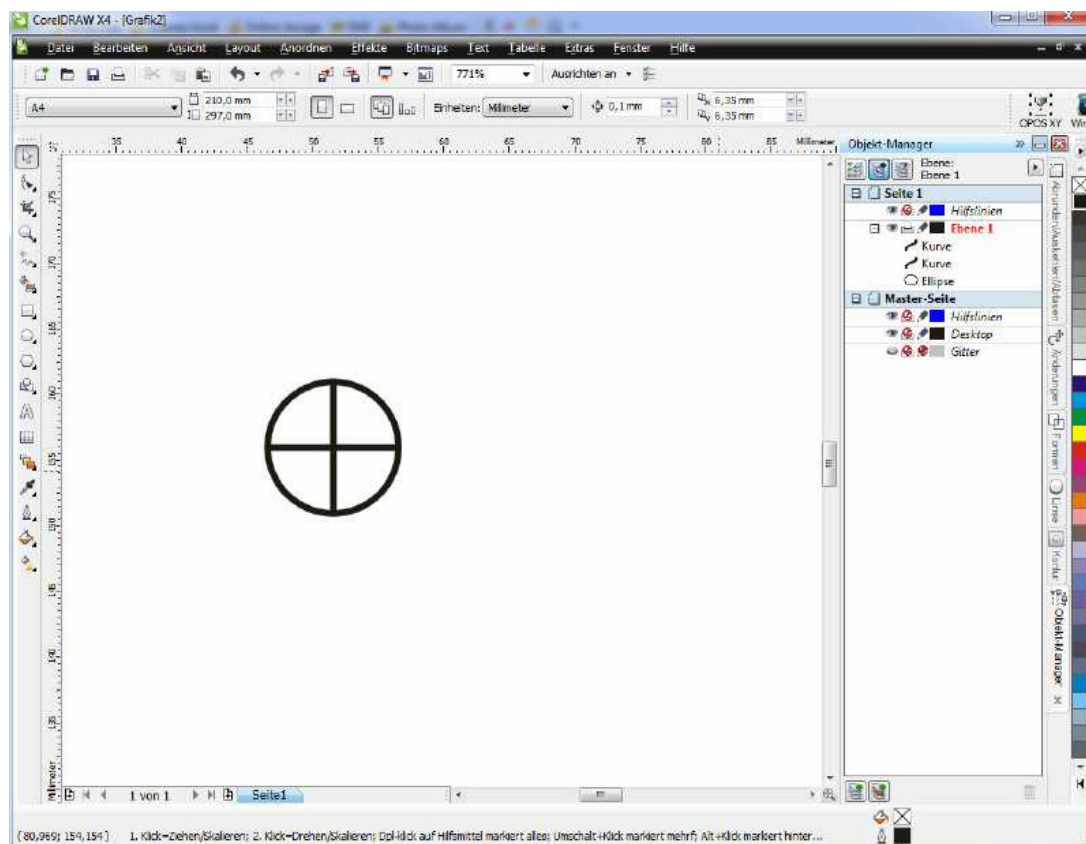
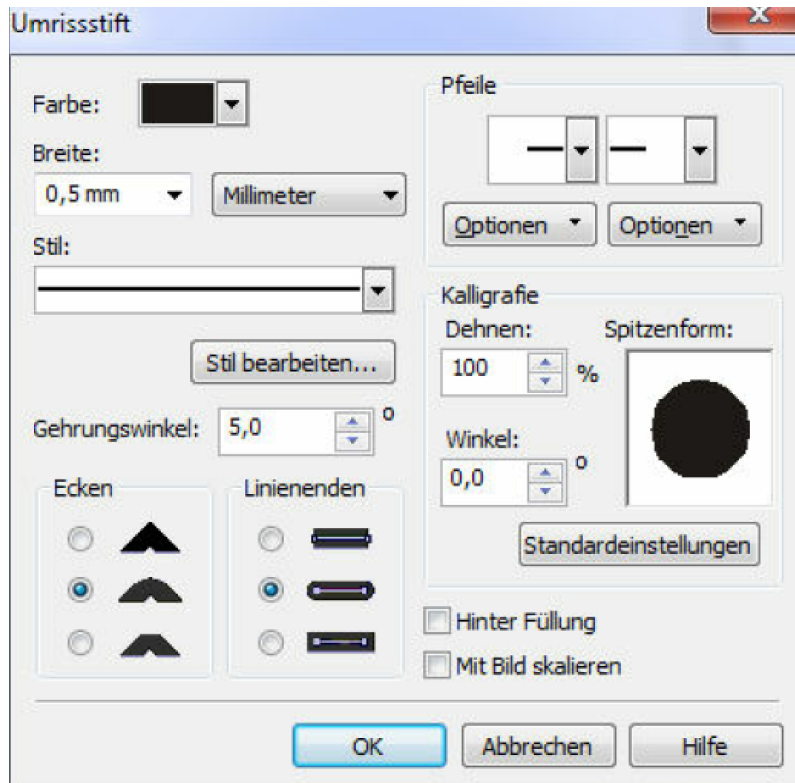
Draw a 10 mm diameter circle by function circle/ellipse



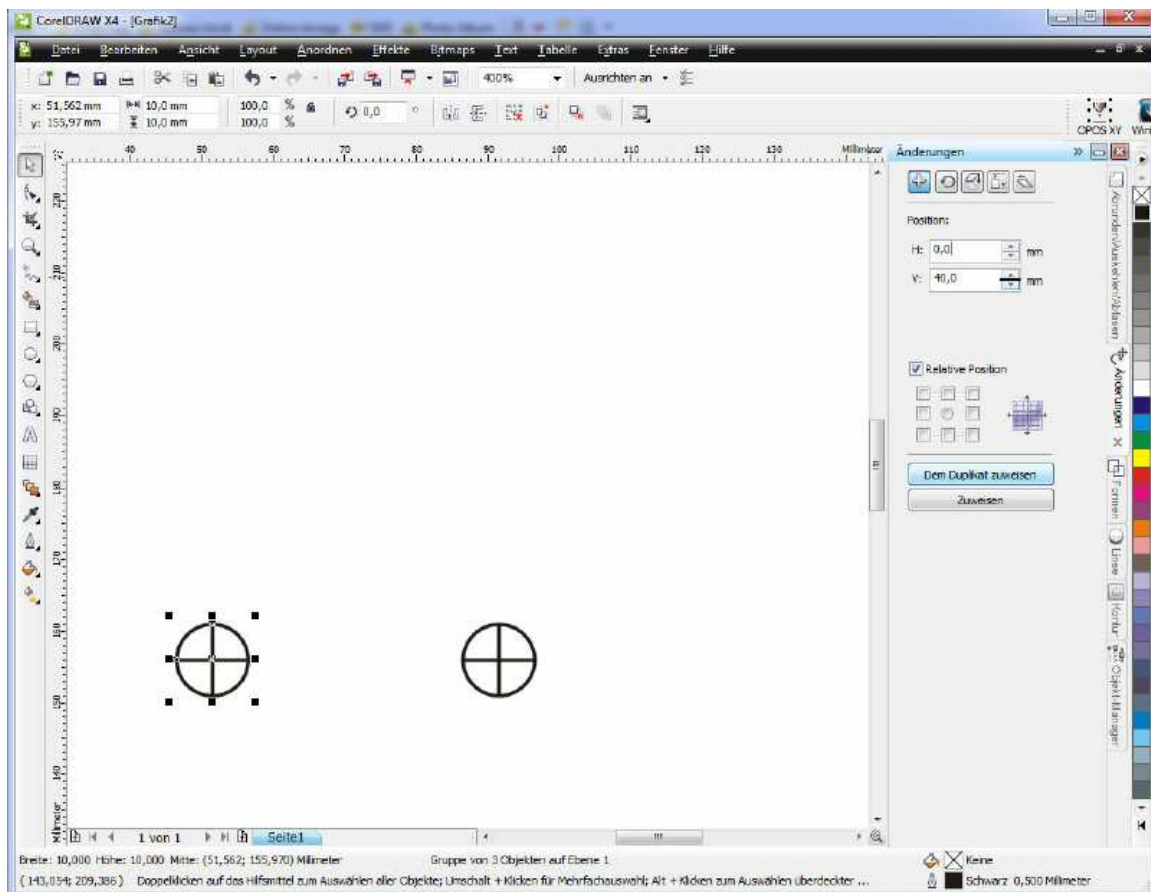
For the preparation of 4 quadrants (see below) draw the both lines by the support of the option **align at object Alt Z**



Select all three objects and make a group of them. Hereby you made a marker for the positioning. Now the attributes should be assigned of lines to the marker. Recommendation of the line width is 0.5 mm

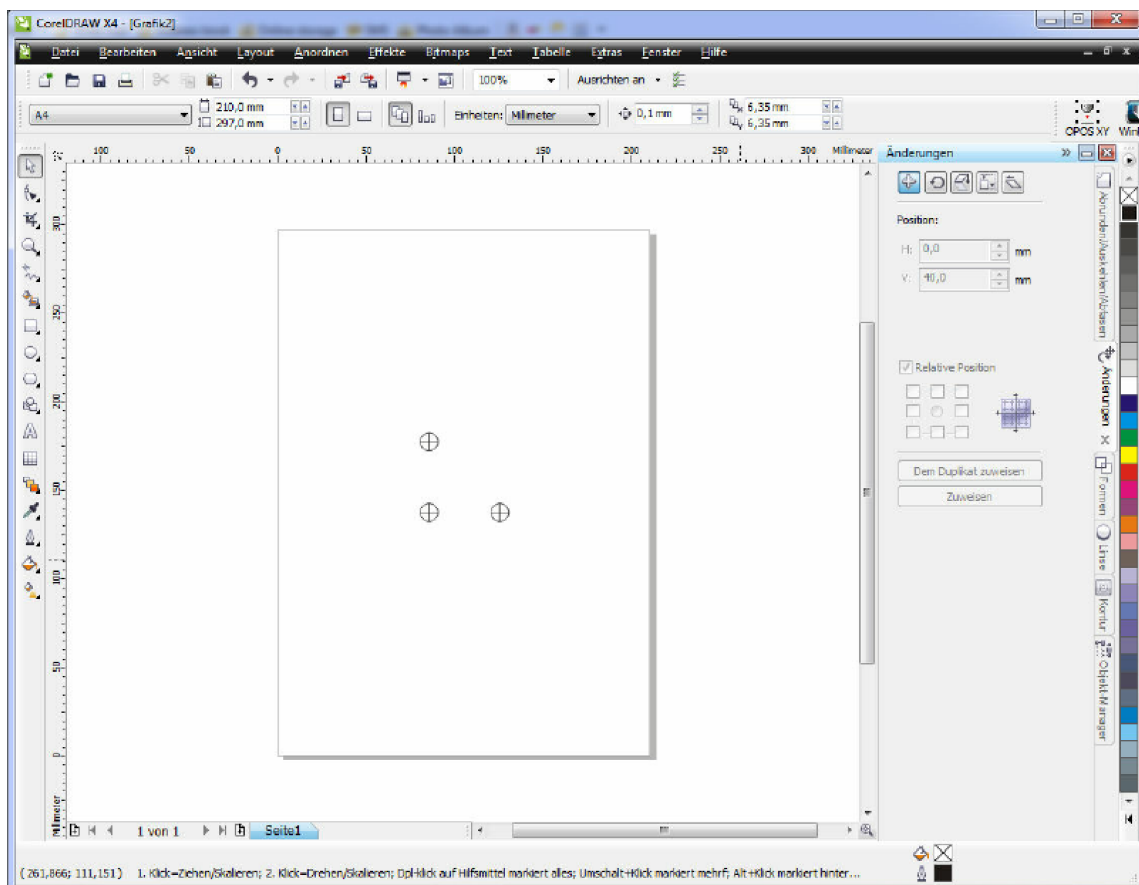


This marker you should copy once in „x” direction...



.....and once in „y” direction.

After copying you get a ready master as below.



Save this file as master for the calibration. The distance between the markers and their size can vary and be adapted for the individual needs. This mentioned sizes of marker prove itself in practice by the distance of the camera of 120 mm.

2. Calibration of camera positioning system

Before using the function "Camera positioning system" the system should be calibrated as follows:

1. Open the dialogue „ Setting> Camera & Calibration”
2. In the interface first select the type of camera
3. Print the sheet paper with the 3 markers (by the same distance between the markers). A master of them is there in program index. Put the paper sheet with the markers so that the picture should be visibly in the middle of display window.
4. Under „Marker type and size” select the form of marker. For this example of the drawing choose „circle and lines” (exactly version). Per radius define the size of circle.
There is another option of the master e. g. three black points (big dots).
5. Write up the marker distance in the field „Distance from object”.
6. Write up the camera position (distance from camera to milling cutter for the „x” and „y” axis).
7. Move the camera manually along „z” axis so long that you get a very clear picture in the camera display (the camera doesn't have auto focus). Put the values for “z” in the field „Z position”.

Important: If you change the thickness of material it is necessary to adapt the value „z” - otherwise the picture will be not sharp and the recognition of the picture could be disturbed.

8. In „Marker settings” >”Marker recognition settings” you can take a fine adjustment to enhance the camera detection.

There are following settings:

„Threshold” – this parameter defines the visibility of the line to be recognized by the system. The lower the value, the better the recognition. But please be careful, misinterpretation can be caused. On the other hand – the higher the value, the lines can be recognized lower. In this case the system will recognize the best visible lines only.

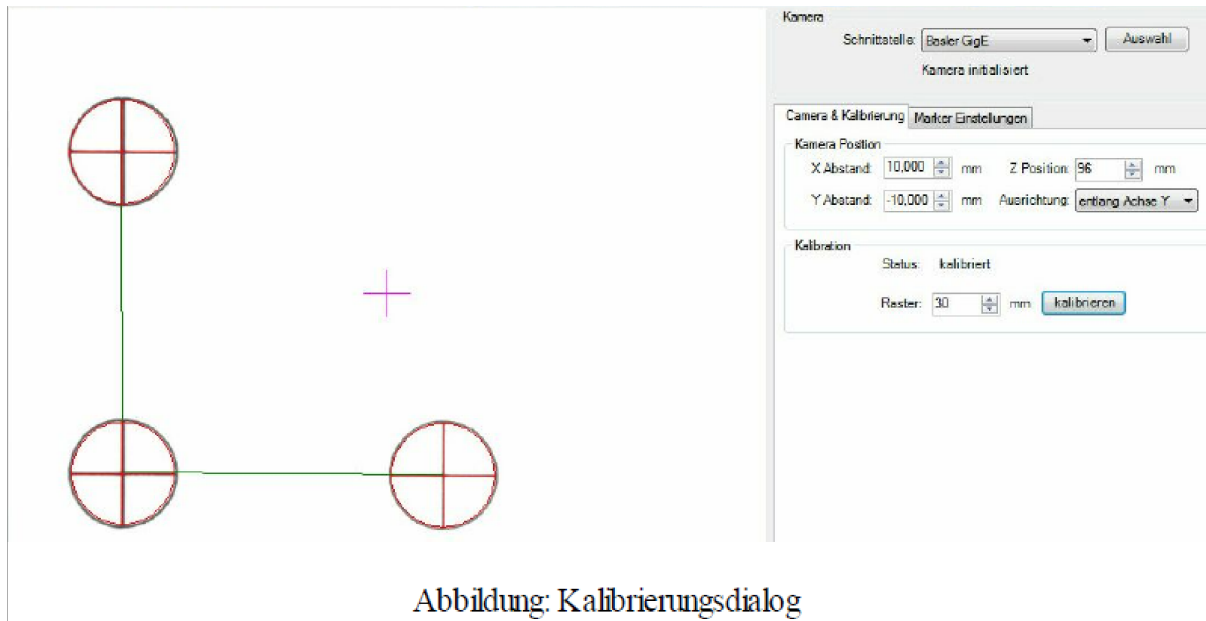
„Minimal line length” - this parameter defines the minimal length of line. Recognized lines with a shorter length as minimum will be ignored. The lower the value, the shorter lines will be recognized.

„Maximal line gap” - this parameter defines the maximal gap on the same line and treats this line as would be one line only. If the recognized line gap is bigger as maximum defined gap then the system recognized two lines.

9. Start now the calibration by pushing the button „Calibrate” in the mask „Camera&calibration”.

Then should appear 3 red crosses (cross hairs) congruent with the marker points and connected with each other by two green lines (L – form).

Please pay attention to a very good illumination level and good quality of printing. Otherwise the markers will be recognized not right.



In this case the calibration is finished and you can close the calibration dialogue.

Measurement of camera offset:

For this purpose put a small and thin piece of material on the machine table and move down the spindle with a tool (knife or cutter) slowly to mark the material. At this position reset the relativ coordinates to zero and move up the spindle along „z” axis to camera position. Now move the spindle along the “x” and “y” axis to get the cross hairs in exact center of marking position (see screenshot above). The displayed values for RX and RY are offset of camera.

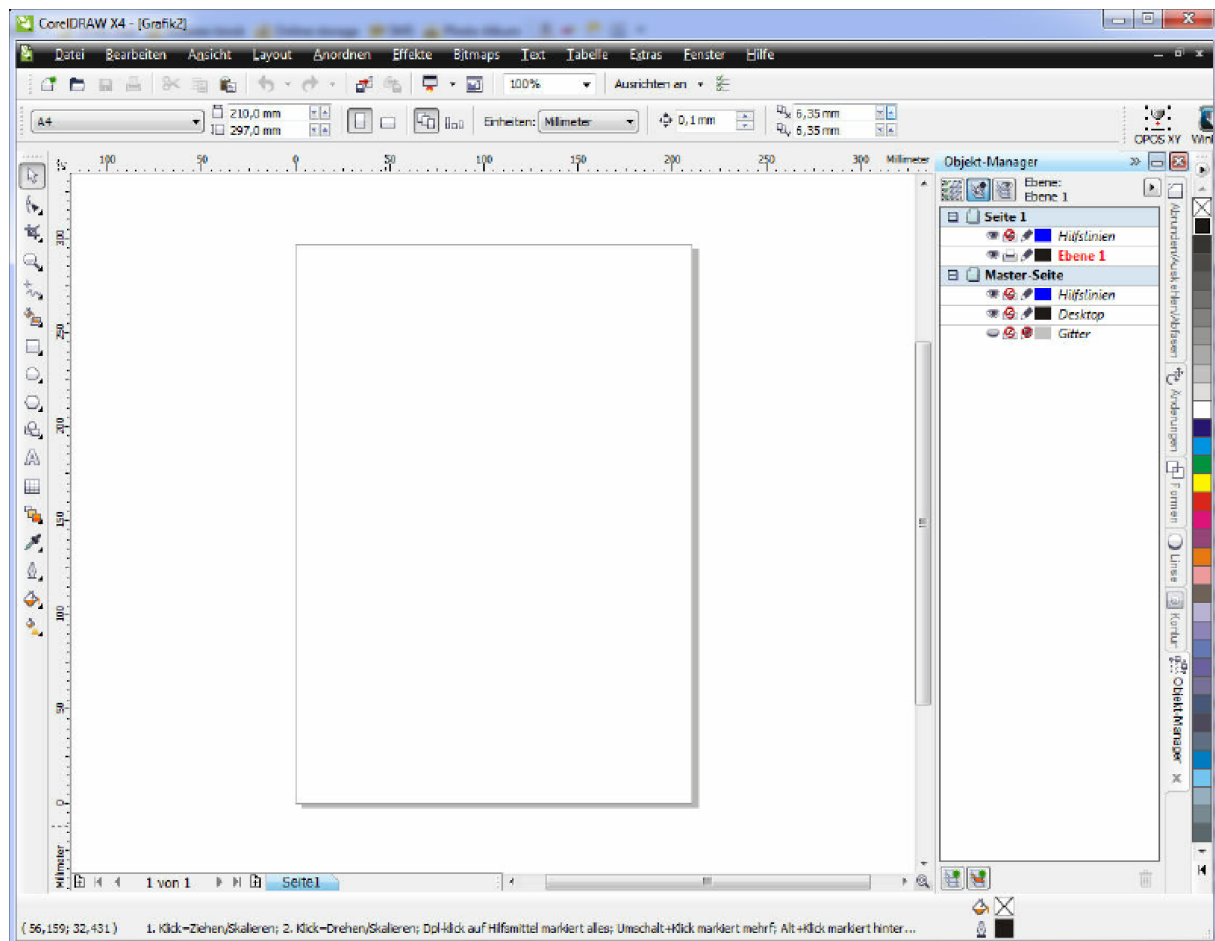
3. Prepare of print data and cutting/milling data by Corel Draw

For preparing there are a few important things to take notice of:

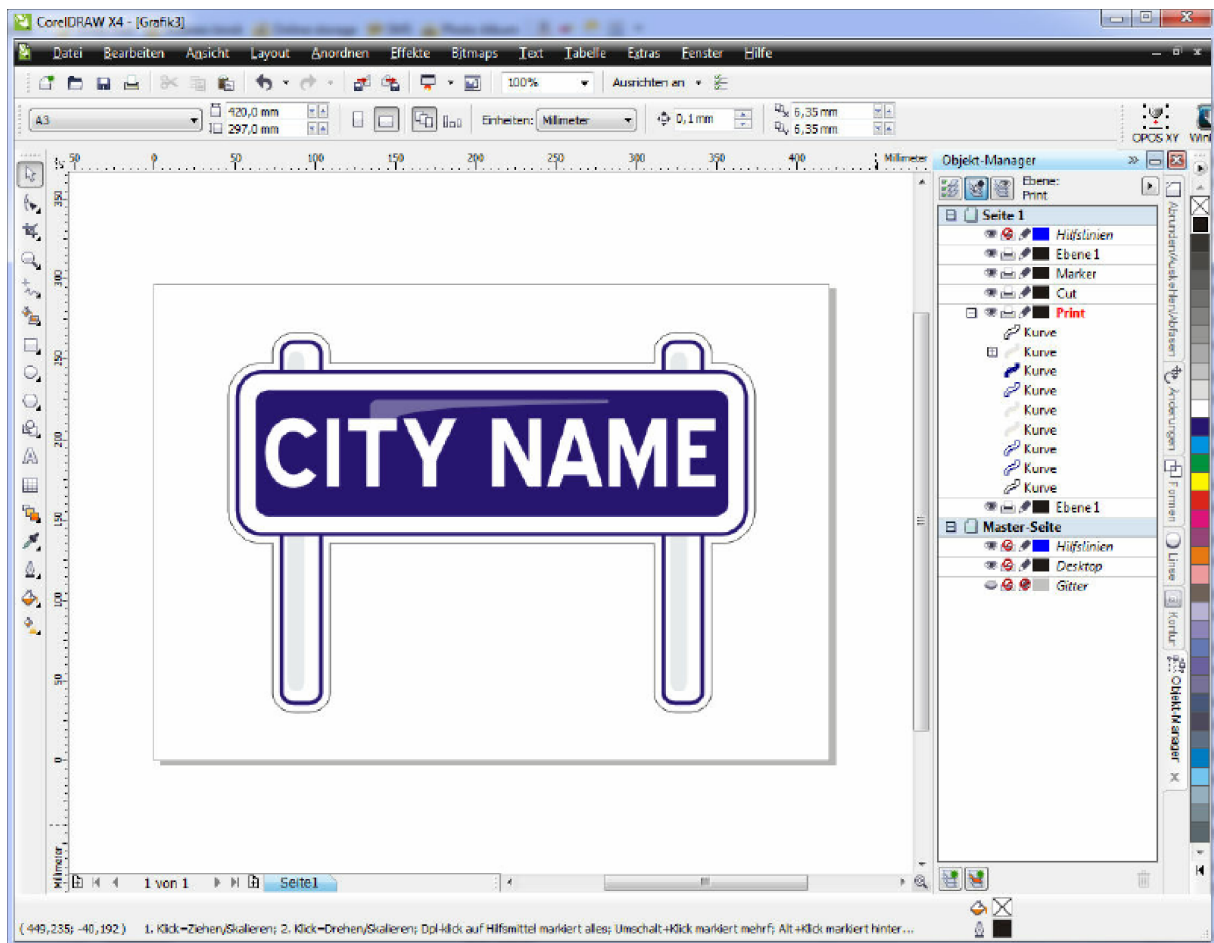
The following example should show the procedure on principle and was prepared -analog to making of calibration markers - by Corel Draw. Of course you can use for preparing of printing and cutting/milling data another programs, e. g. Adobe Illustrator.

Start the CorelDraw with an empty sheet DIN A4 and create 3 layers/levels: **Print**, **Cut** and **Marker**.

Select the level **Print** as active and import the print object. In our case it is a signboard, which will be printed by the plate printer (flat bed plotter) and which contour will be milled afterwards.

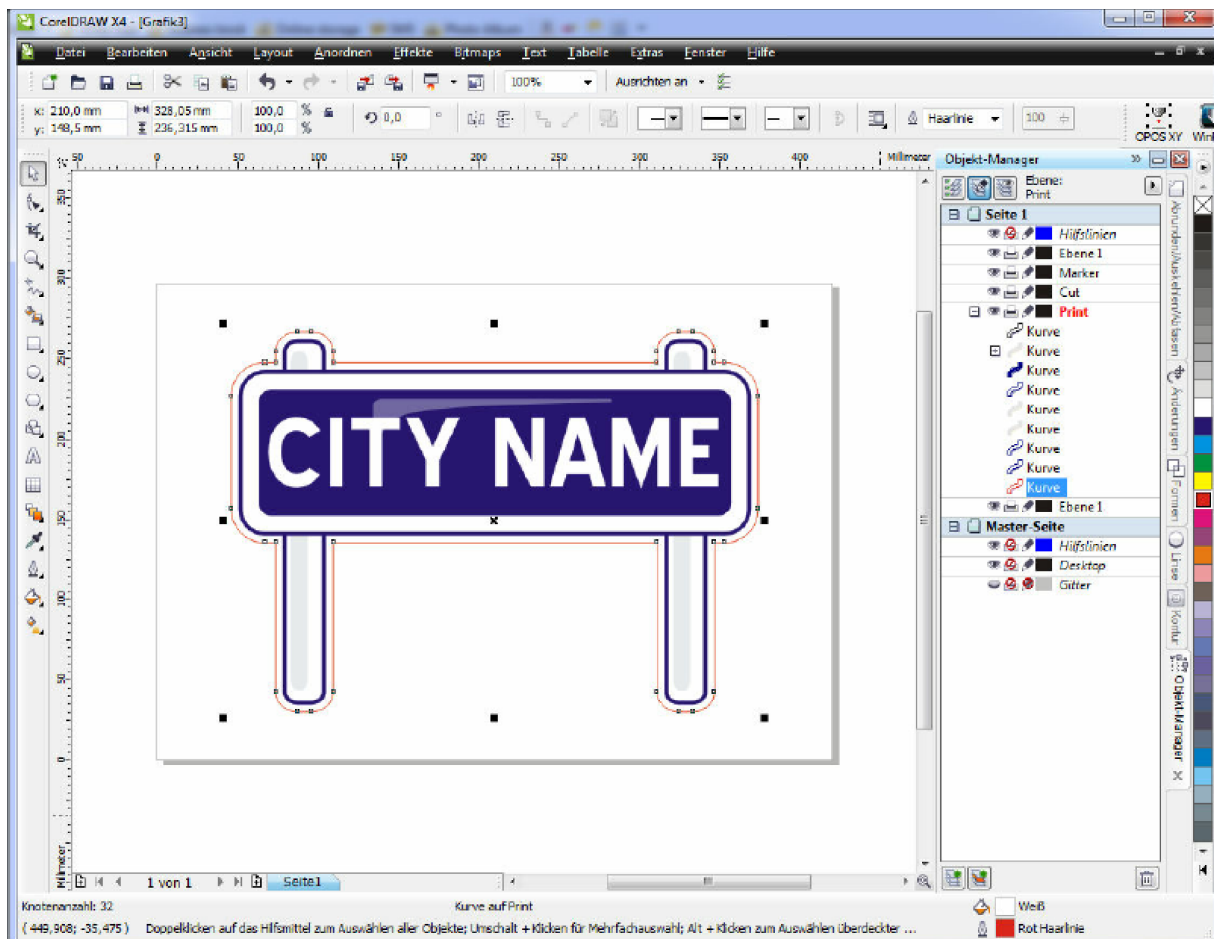


If the data does not exist on the right level/layer it is necessary to pick up these to level/layer **Print** by import.

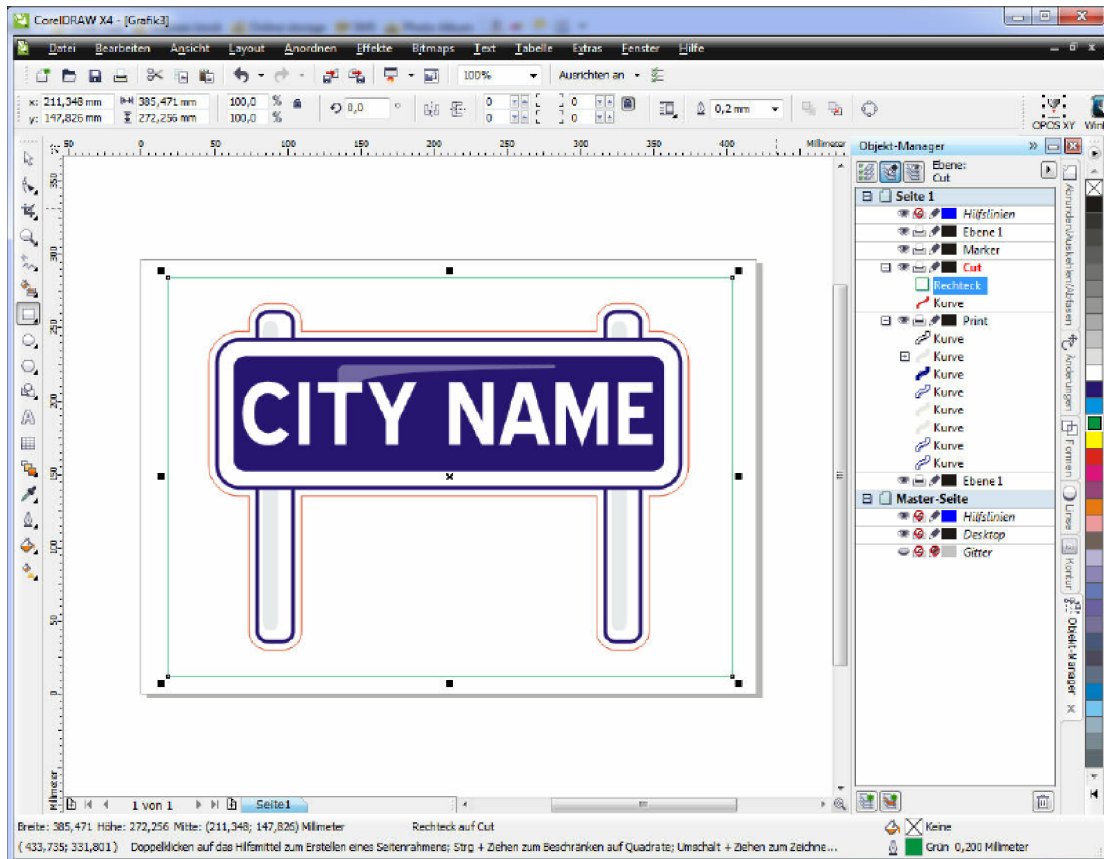


The file above includes already the contour lines (the light-blue line around the object).

Select this line and give it the striking color and move to level/layer **Cut**.

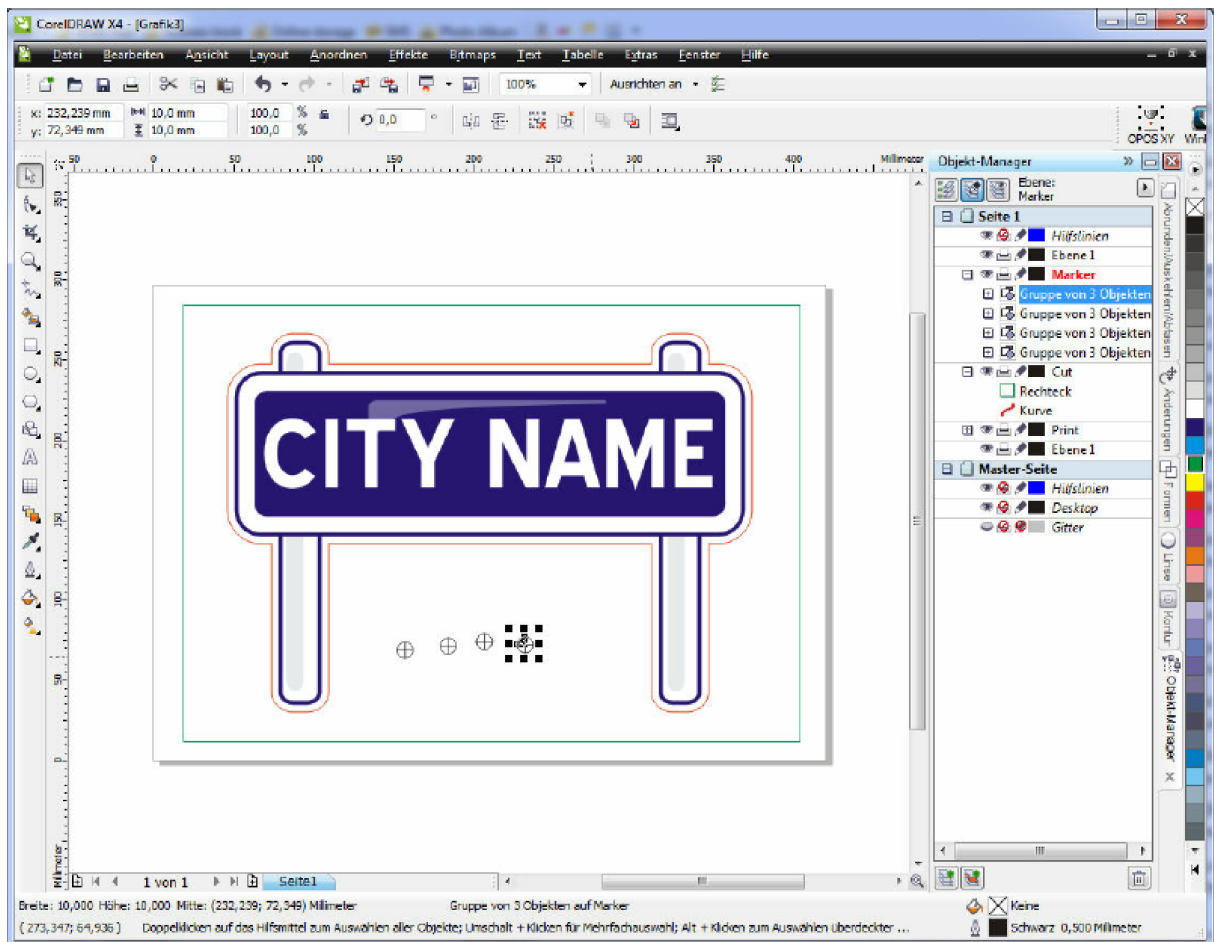


Draw a rectangle which encloses the complete graphic and give it a different, striking color. This rectangle should be left in the level/layer **Cut**.

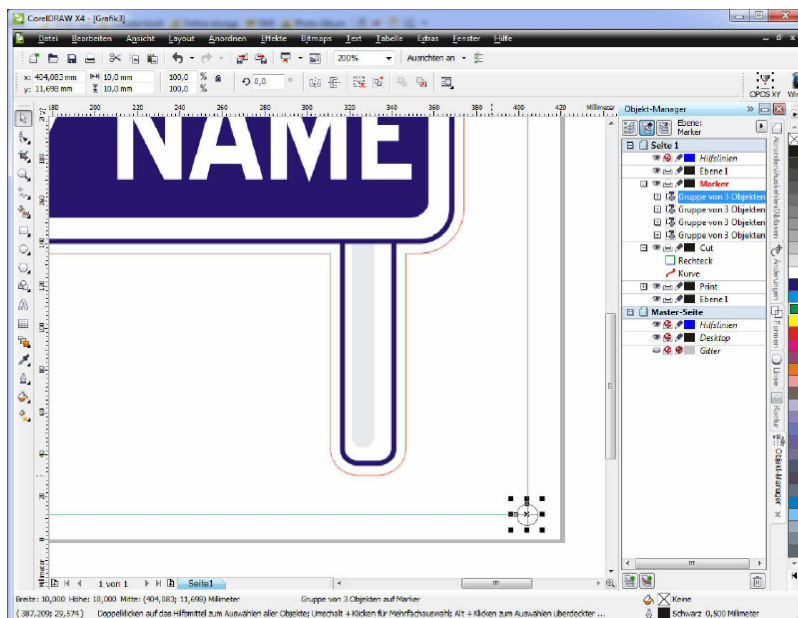


Now must be added the marker. Therefore open the calibration master file and copy one of the marker from here into the actually document.

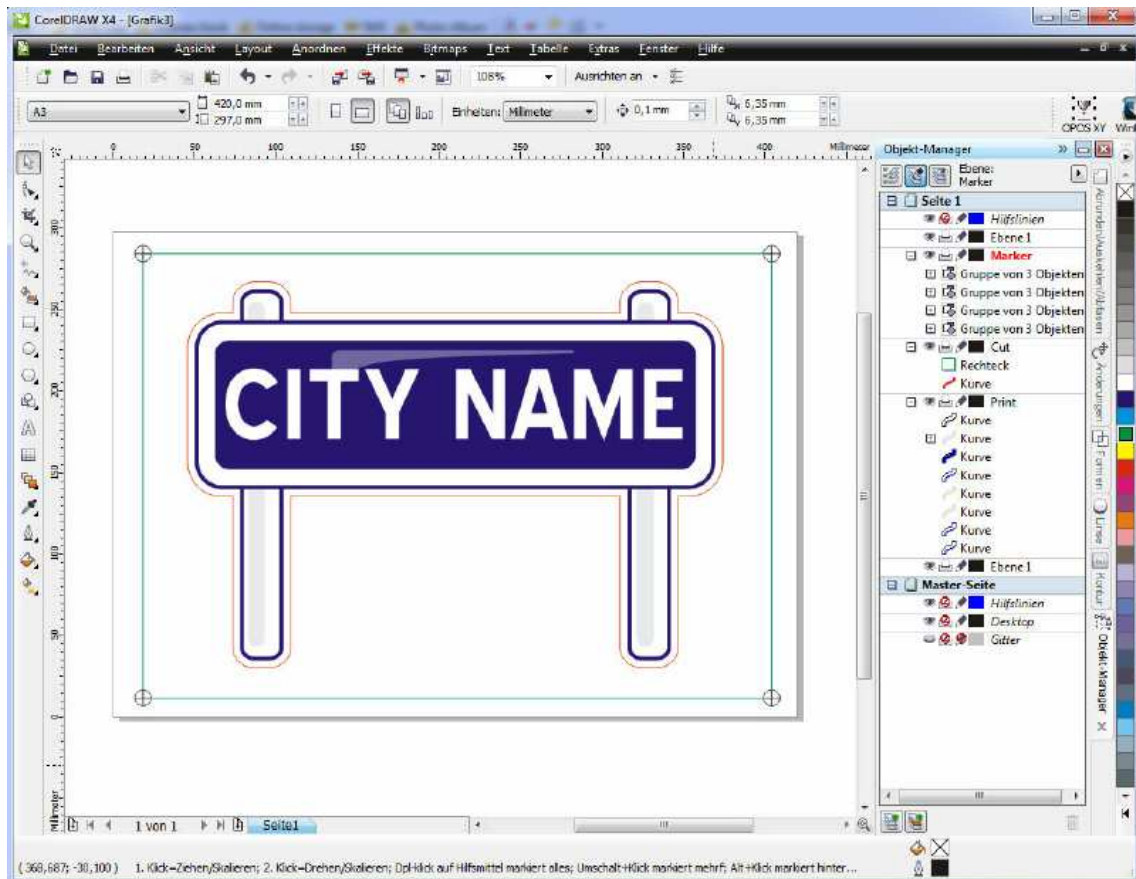
Copy this marker 3 times so you get 4 markers.



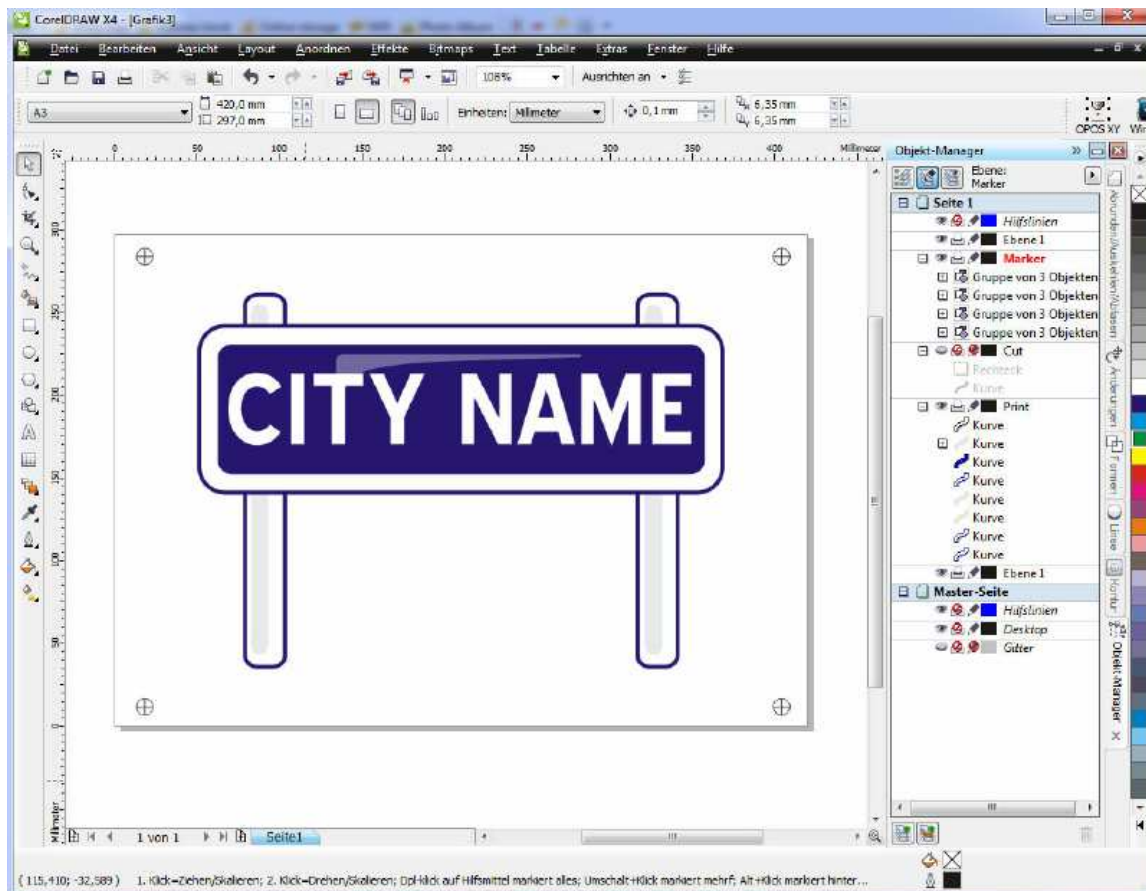
By use the option **Align at object AltZ** will be site the markers at the corners of rectangle so that the center of each marker stays at the corners of rectangle. If necessary the markers should be moved to level/layers **Marker**.



Above you see the finished document

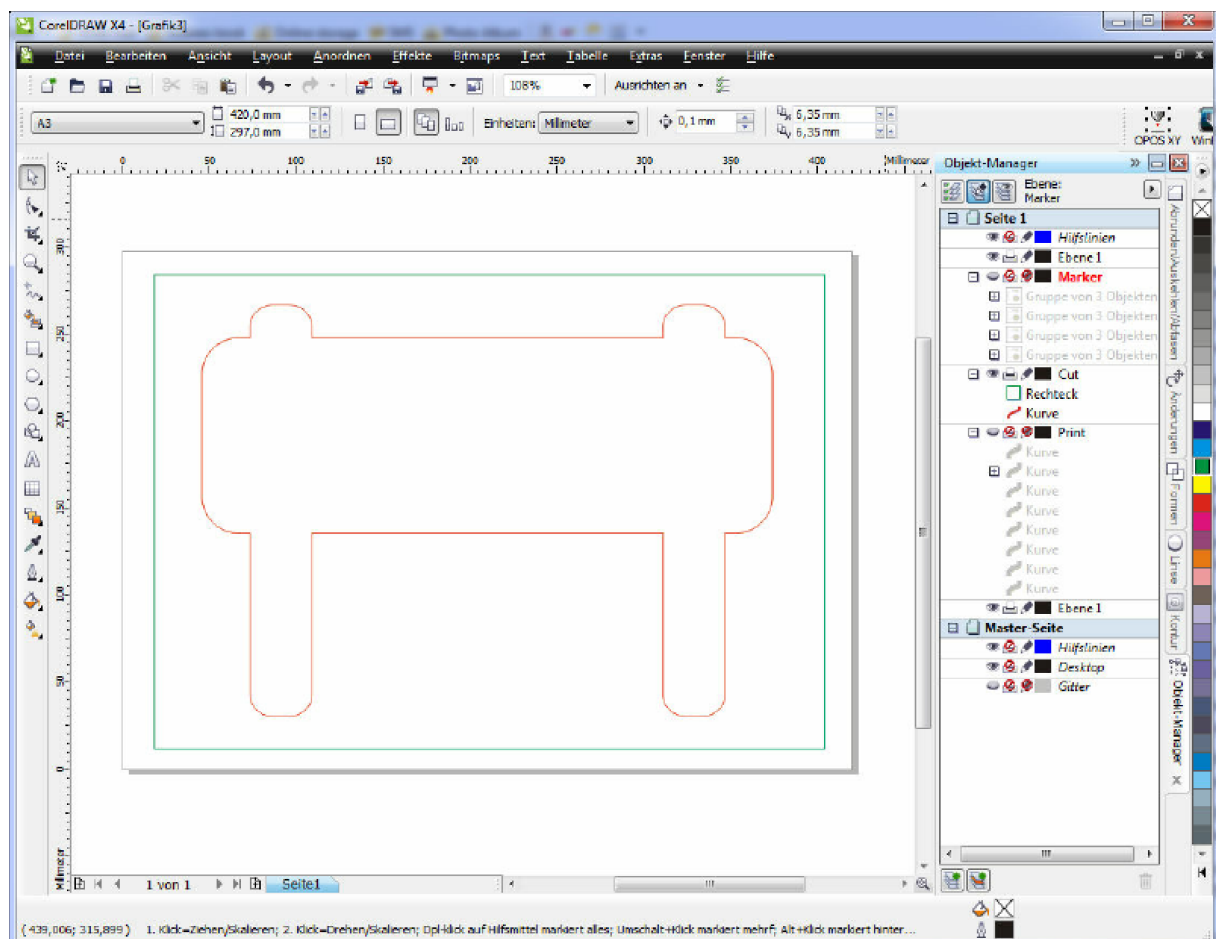
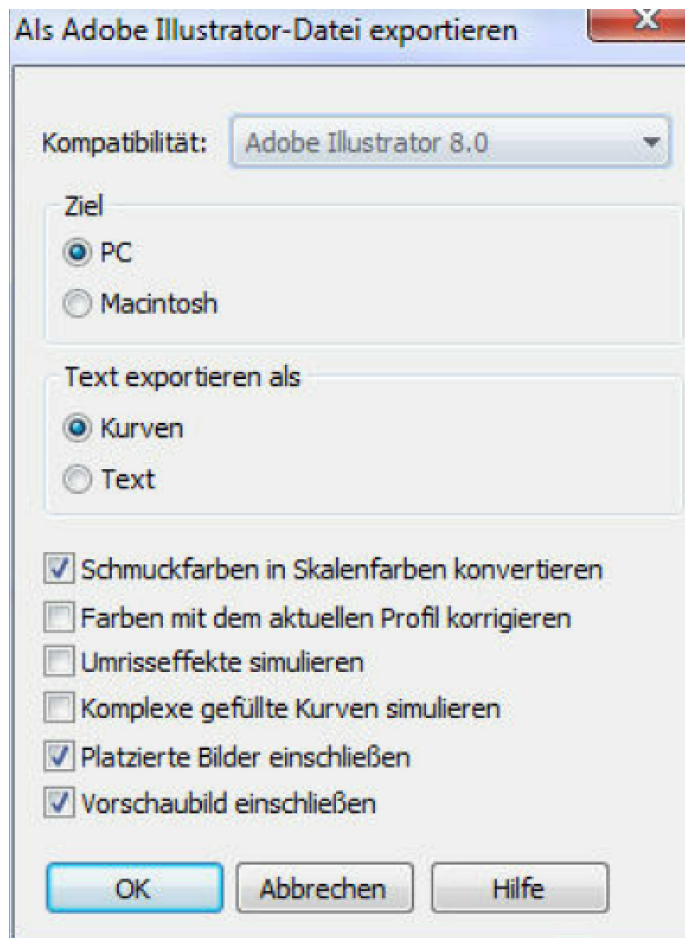


Now will be exported two files from this document. At creating the print data the level/layer Cut will be switched off and the print data as PDF or EPS will be exported to printing.

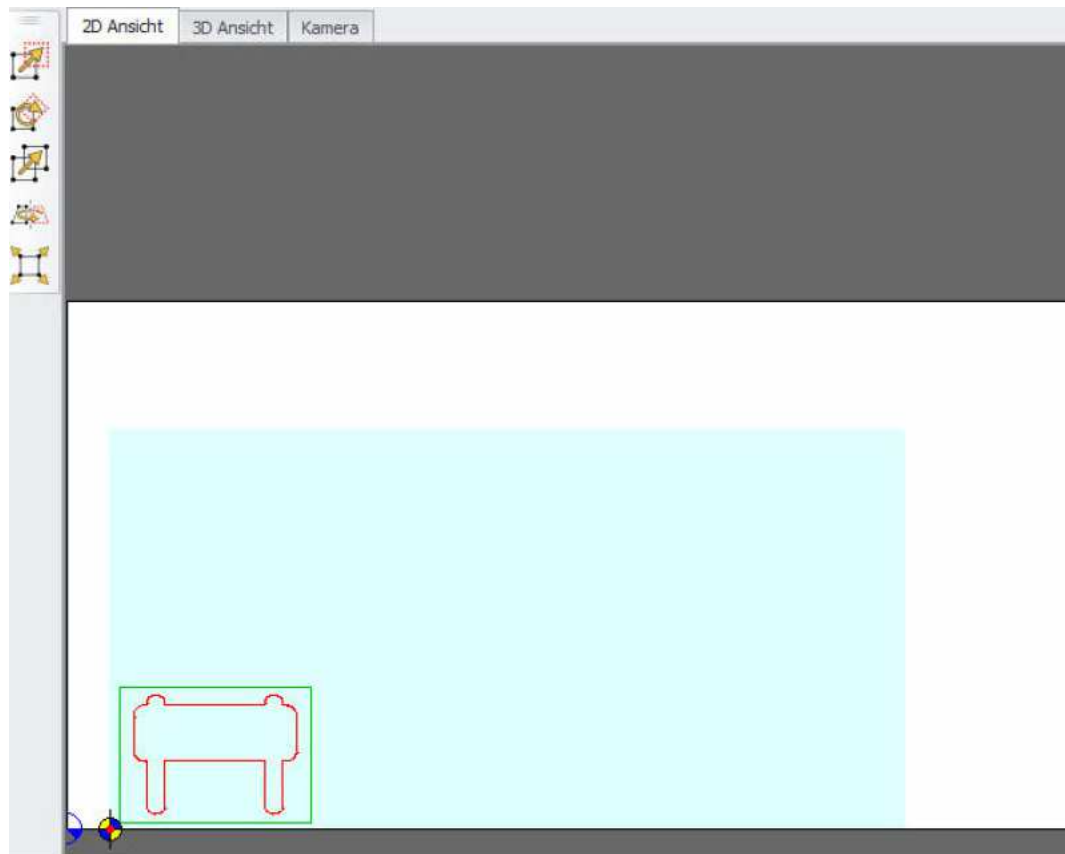


For the cutting/milling data the levels/layers Print and Marker will be switched off.

Afterwards follows export of data.
In our example by Adobe Illustrator (see dialogue window).



Adobe Illustrator has an advantage because it transfers over the several origin colors.
The data from exporting can be scanned at once into program cncGraf Pro.



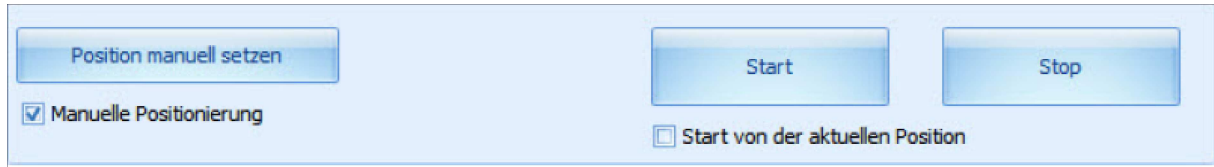
The rectangle around this contour is simple information about the size of sheet only and will be not cut / milled. In the tool box the corresponding tool can be switched out.

The printed plate can be put on the machine table - the position recognition of markers can be started.

4. Use of positioning by camera

After the selection of camera and the finished calibration you can use the camera positioning.

In the flag “camera” you can see the sketch with the function strip.



In the function strip there are follow options:

1. Button “start” starts the positioning by camera. The system approaches automatically the markers and recognize there

The print must be positioned at machine zero point $X = 0$, $Y = 0$ for the automatically approaching to markers. The drawing must be loaded up as original position.

The start by button „start from the actually position” provided that the left lower marker is visibly in camera display.

2. If the option „positioning manually “is active you can position the marker manually. The machine will be moved by menu „move manually” or by click on camera picture.

The switcher „set the position manually” take the actually position (position of cross hairs) as marker.

After the approaching on markers will be the drawing accordant stretched and positioned.