Infinum
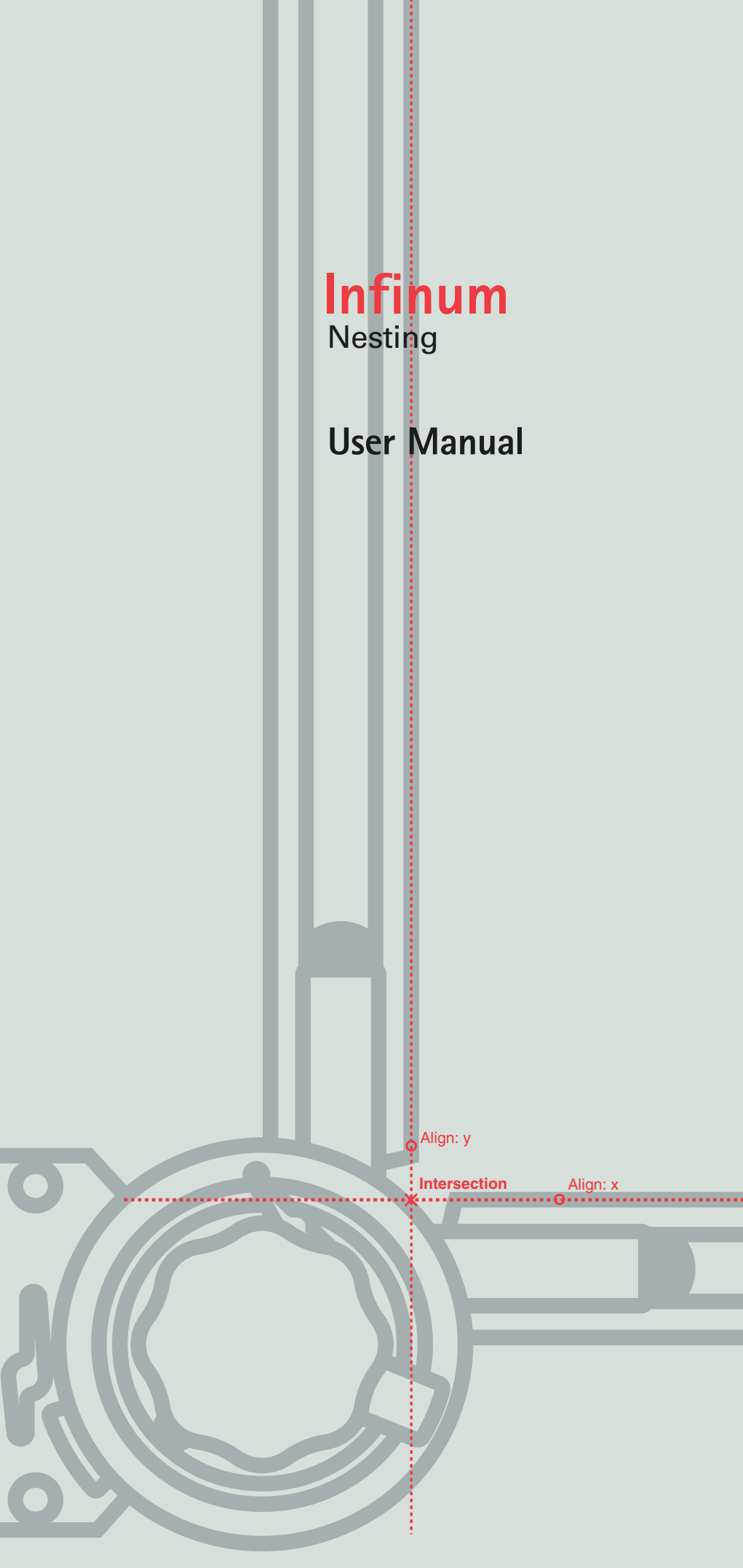Nesting

User Manual

Align: y

Intersection   Align: x

Infinum
Nesting-Handbuch

Manual version: I40U5Ge05

May 2005

Development: *Concepts Technology Co. Ltd.*

Documentation:

Infinum, DraftBoard and the Slogans *The smart Drawing Board*
und *The smart Drawing program* are trade marks of
Concepts Technology Co. Ltd.

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1

First Steps

This manual describes how to use *Infinum* on your computer.

The *Getting Started* chapter briefly describes the documentation of *Infinum*, tells you how to install the program on your computer and use it with *Microsoft Windows*. It lists the type of equipment you need, tells you how to register your copy of *Infinum and* tells you how to start and end *Infinum*..

Documentation

This manual describes *Infinum for* *Windows 98/ME*, *Windows 2000, Windows NT4 SP5* and for *Windows XP*.

Infinum consists of the following two parts

- *Nesting*
  and
- *Construction*

that are both integrated into one program, but are described in two manuals.

The documentation of *Infinum* consists of the following **Nesting** *manual* and, since the drawing tools of *Infinum* are identical with *DraftBoard Professional*, the User manual of *DraftBoard Professional*.

Before using this manual, you should install *Infinum* on your computer. Installation instructions are contained in this chapter.

After installation you should study the *Quick Introduction* chapter in the *DraftBoard manual* first and then continue with the chapter *Nesting Techniques* in this *Infinum manual*. This will familiarize you with the tools, features and commands of *Infinum* and enable you to maximize your productivity in the shortest amount of time.

Detailed informations about the user interface of your computer you find in the *User Guide* for *Microsoft Windows*.

Registration

Contrary to popular opinion, registration cards and trash aren't synonymous. In fact, the registration card for *Infinum*, conveniently located inside your software box, is quite valuable – to you and to us. We'd really like to encourage you to return it. Filling out the registration card is a painless process.

For such a minor investment of time, you'll become a registered customer . Only by registering *Infinum*, are you entitled to receive Telephone product support and Free updates

System Requirements

The system requirements for *Infinum* are identical with the den system requirements for *DraftBoard Expert* and listed in the enclosed *DraftBoard manual*. In addition *Infinum* requires a dongle for launching the program.

Installation

Infinum comes on a CD-ROM and can be installed as a *Single User License* for *Microsoft Windows*.

Single User License

The *Single User License* will be installed as follows.

Installing a Single User License for Windows

1. Start *Microsoft Windows*.
2. Insert the Infinum CD *ROM* into the CD ROM drive of your computer.
3. Start the *Explorer*
4. In the *Explorer* click on the icon for your CD ROM drive.
   The content of the CD ROM is displayed.
5. Start the installation by double clicking the file **Setup.exe**.
6. Follow the directions on the screen.
7. During the installation you are asked to enter your ***Authorization** Code*, that you will find on the enclosed *License Agreement*.
   After the installation **Infinum 4.0** is displayed in the *Windows-***Start menu**.
8. When the installation is complete, click the **OK** button.
   The installation automatically creates the submenu **Infinum 4.0** in the **Program** menu of the *Windows* **Start** menu.
   This menu contains besides other entries the menu item

   Infinum 4.0

   that will start *Infinum*.

You should read the **Read me** file first that you can open with the **Readme** menu item, since it contains information that was not available when this manual was printed.

Starting Infinum

You start and quit *Infinum* as follows:

1. Connect the enclosed **Dongle** to the ***parallel*** or ***USB** interface* of your computer. If you want to connect your computer to a printer using the parallel interface, the *printer cable* can be connected directly to the dongle.
2. Start your computer.
3. Select the menu item

   Infinum 4.0

   in the **Infinum 4.0** submenu in the **Start** menu.

Terminating Infinum

1. Click **File** in the **Infinum** menu bar.
    The **File** menu is displayed.
2. Select the menu item **Quit** in the **File** menu.

Quick Introduction

*Overview of the Nesting functionality of **Infinum***

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Quick Introduction

This chapter gives you a short introduction into the *Nesting* tools and commands of *Infinum*. A quick introduction into the drawing tools you find in the *Quick Introduction* chapter of the *DraftBoard*-*Manual*.
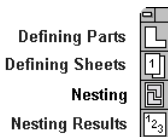
Nesting

All *Nesting* *commands* and *tools* are situated in the **Nesting** menu in the menu bar.

Nesting
Hide Palette
Options...

Nesting Palette

The *Nesting Palette* contains all tools required to nest parts in *Infinum*. You display the tool palette with the **Show Palette** command in the **Nesting** menu.

Defining Parts
Defining Sheets
Nesting
Nesting Results

In *Infinum* you first import or design the required parts and material plates, then you define these parts and sheets with the related Nesting commands, before you start the nesting calculation. After the nesting process is completed you can analyse the calculated nesting data.

Defining Parts and Material sheets

When all parts and material plates are designed or imported into *Infinum*, the geometry of each part or sheet must be grouped, before you can define them as parts and sheets.

Objects that exist only of one element such as a circle or an ellipse must not ne grouped. That is valid as well for symbols, that you plave in *Infinum*, since symbols are placed as grouped objects.

Defining Parts

When you choose the **Defining Parts** tool in the *Nesting Palette*, the following dialog window is displayed:

Part Options
Name	Teil 3
Target	12
Filler Parts	3
Step Angle	45°
Priority	1
Grain Direction	X
Type of Fit	Center of Gra

Assign

A detailed description for defining *Nesting Parts* you will find in the related section in the following *Nesting* chapter.

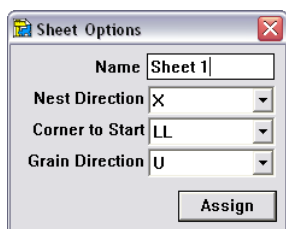After having specified the parts for the nesting process, you must define the material sheets. .

Defining Material Sheets

When you choose the **Defining Material Sheets** tool in the *Nesting Palette*, the following dialog window is displayed:
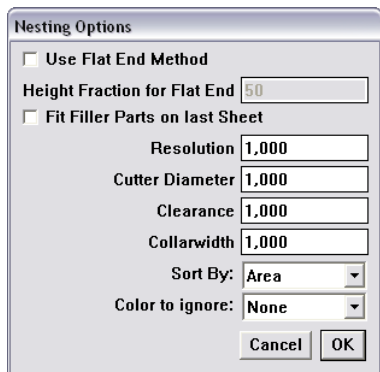
2

Setting the Nesting options

Before you can start the nesting calculation, you have to specify all nesting parameters. When you select the **Options** command in the **Nesting** menu the following dialog window is displayed:

After you have specified all *Nesting Options* you can start the Nesting calculation.
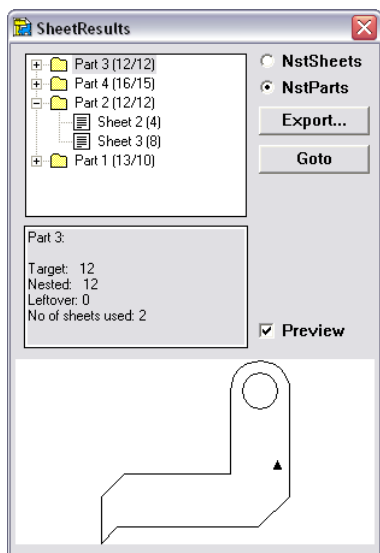
Nesting Process

For the Nesting calculation you select the **Nesting** tool in the *Nesting* Palette. This command nests automatically and according to your specifications all existing parts onto the defined material plates.

Analysing the Nesting Data

When the nesting process is completed you can analyse the calculated nesting data using the **Result** tool in the Nesting Palette. When you select this command the following dialog window is displayed:

A detailed description of all nesting tools and commands you find in the following Nesting chapter.

Nesting

Nesting

With ***Infinum*** you purchased a powerful Nesting program. It provides interactive and automatic nesting of an infinite number of shaped parts on any number of sheets.

You can import parts or design them within ***Infinum***. The powerful integrated CAD engine offers all professional tools such as for *Splines* or *Offset Curves* for constructing parts and designing material sheets.

After the definition of parts and material sheets and the specification of all related Nesting parameters such as *Collarwidth*, *Cutter Diameter*, *Clearance* etc., ***Infinum*** calculates in an one step process the optimized arrangement of the defined parts on all specified sheets.

An Analyze tool provides precise data of the optimization process. The results can be exported as ***ASCII*** *Data.*

Introduction

The *Nesting process* in ***Infinum*** requires the following steps:

- Construction or Import of parts and material sheets.
- Defining parts and sheets.
- Nesting.
  [Calculation of the optimum arrangement of the placed parts]
- Nesting Analysis.
  [Evaluation of the calculated data].

Before you can nest the parts you must first design the parts or import them into ***Infinum.*** .

Constructing Parts and Sheets

Infinum has an integrated ***CAD*** *Engine* for the construction of nesting parts and material sheets.

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For the construction of parts and sheets you can use all in *Infinum* available geometry elements such as

- Lines
- Connected Lines
- Parallel Lines
- Offset Curves
- Arcs
- Circles
- Ellipses
- Polygons
- Spline Curves

The related tools for constructing these geometry objects you find in the *Tool palette* located at the left side of the *Infinum* window.

Instead of designing parts and sheets you can import any type of geometry into *Infinum* that was created in other CAD or Graphic programs using the **Import** command in the **File** menu.

When you have designed the parts you must group all geometry elements using the **Group** command in the **Arrange** menu. That is not required for elements that exist of one entity like *circles*, *ellipses* or *symbols* that are already grouped when you place them into *Infinum* .

After having designed or imported and grouped all parts, they must be defined as parts and sheets for the nesting process..

Nesting Tools

All commands and functions for Nesting you find in the related menus in the menu bar.

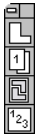All Nesting commands and tools you find in the **Nesting** menu in the menu bar.

When you select the **Show Palette** command the *Nesting Palette* is displayed.

Nesting Palette

The *Nesting palette* contains all functions required for nesting in *Infinum* .

Show Palette

This command displays the *Nesting Palette*:

For removing the *Nesting Palette* you select the **Hide Palette** command in the **Nesting** menu. The *Nesting Palette* can be moved on the drawing area and is handled like the *DraftBoard* *Tool Palette*. The *Nesting Palette* contains the following functions:
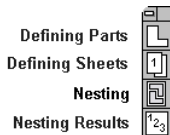
All functions are described in the next sections.

Defining Parts and Material Sheets

After you have all parts and sheets designed or imported into *Infinum*, all geometry objects must be grouped, before they can be specified as *Nesting Parts* or *Nesting Sheets*.

Objects that exist only of one entity like *circles*, *ellipses* must not be grouped. That is also valid for symbols that are already grouped when they are placed in *Infinum*.

Grouping Parts

Geometry elements are grouped using the **Group** command in the **Arrange** menu.

Group   Ctrl+Y

This command in the **Arrange** menu combines selected objects to function as a single object.

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Grouping Objects

1.   Select the objects to be grouped..

2.   Select **Group** from the **Arrange** menu.

Once you group geometry, you can't edit the individual objects within the group unless you ungroup them.

You can also combine groups. For hierarchical groups, *Infinum* ungroups each group in the order in which they were combined.

Preparing Parts for the Nesting Process

After having grouped all parts the must be defined for the *Nesting process*. To do so we display the *Nesting Palette* and select the **Defining Parts** tools.

Defining Parts

When you select the **Defining Parts** tool the **Part Options** dialog box is displayed:

Part Options	
Name	Teil 3
Target	12
Filler Parts	3
Step Angle	45°
Priority	1
Grain Direction	X
Type of Fit	Center of Gra
	Assign

This dialog box allows the following settings:

Name	In this entry field you can name the part. The name must be unique and may exist only once in the nesting file.
Target	This entry field requires the target number and specifies how often you want to nest that part on all defined material sheets.
Filler Parts	In this entry field you enter the quantity of so called *Filler parts* that should be nested in addition to the **Target quantity** in case there remains enough room on the sheets.
	In case you have defined several sheets, the parts are only nested on sheet that contain already parts. For placing *Filler parts* you must choose the option **Fit Filler Parts on last Sheet** in the **Nesting Options** dialog box.
Step Angle	In this entry field you can specify the desired **Step Angle** from **0°** to **360°**.
	When calculating the arrangement of the parts on a sheet, *Infinum* will rotate the parts around their center to find the optimum placement. The number of degrees *Infinum* is allowed to rotate the parts is specified in this entry field. The smaller the specified step angle the longer the calculation process will last. The default step angle is **90°**.

Priority	In this entry field you specify the priority a part should be nested in relation to other parts. The priority is defined in whole numbers where **1** specifies the lowest priority.

Infinum places a part with the highest priority number before all other parts on the first sheet.

In case parts have an identical priority, *Infinum* checks the sorting parameters (**Perimeter** or **Area**) you have set in the **Nesting Options** dialog box. *Infinum* will nests than the part with the largest perimeter or area first.

Grain direction In this List Field you can choose the **Grain direction** (**X**, **Y** or **None**).

If you want to nest a part independent of the *Grain direction*, select the option **None**.

You can select a specific *Grain direction* (**X** or **Y**) only, if you have also defined a specific *Grain direction* for the *Material sheet*.

If a specific grain direction (**X** or **Y**) is defined for parts, but not for the Material Sheet (**Grain direction** = **None**), the parts will not be nested.

Note: If a specific grain direction (X or Y) is defined for parts, it also must be defined for Material Sheets, Only then the parts will be nested.
Parts with specific grain direction (X or Y) will not be nested on sheets with **none** *grain direction..*

In case parts and material sheets have specific grain directions (**X** or **Y**), *Infinum* will rotate all parts to match the grain direction of the related sheets.

Type of Fit In this list field you can select if **Center of Gravity** or **Quicktest** (Area) should be the determining parameter for the nesting calculation.

With the **Quicktest** (Area) option the nesting process will be significantly faster than with the **Center of Gravity** option. Though the nesting calculation with the **Center of Gravity** option is slower, it may lead to better nesting results, especially if the parts have very irregular shapes.

If you select in the **Nesting Option** dialog box the **Flat End** method, *Infinum* will automatically switch to the **Center of Gravity** option.

Defining Parts

1. Select the part you want to define.
2. Choose the **Defining Part** tool from the *Nesting Palette*.
   The **Parts Option** dialog box is displayed. The entry fields show the parameters that were last-specified.
3. Define the part by specifying values or selecting one of the available options.
4. Click the **Assign** button.
   The specified parameters are assign to the part.

In the open dialog you can define additional parts. You just must select the next part, define the parameters and click then the **Assign** button.

Checking the assigned Parameters of Parts

1. Select the **Defining Part** tool from the *Nesting Palette*.
   The **Parts Option** dialog box is displayed. The entry fields show the parameters that were last-specified.
2. Deselect all objects by clicking somewhere on the drawing area with the dialog box displayed.
   All entry fields in the dialog box will turn blank.
3. Move the mouse over the parts without selecting them. As soon the mouse pointer comes over a part the related part parameters are displayed in the **Part options** dialog window.
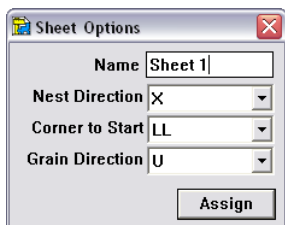
Preparing Material Sheets for Nesting

After the specification of all parts, the Material sheets must be defined for the Nesting Process. For that you display the *Nesting Palette* and select the **Defining Sheets** tool.

Defining Material Sheets

When you select the **Defining Sheets** tool, the **Sheets Option** dialog box is displayed:

The **Sheets option** dialog box allows the following settings:

Name   In this entry field you can name the sheet. The name must be unique and used only once in the nesting file.

Nest direction In this list field you select the *Nesting direction* (**X** or **Y**) the parts should be arranged, starting from the specified **Corner to Start**.

Corner to Start In this list field you select the **Starting Corner** from where the parts will be nested according to the specified **Nesting direction**. You can select the following starting points: **LL** (**L**ower **L**eft), **LR** (**L**ower **R**ight), **UL** (**U**pper **L**eft), **UR** (**U**pper **R**ight).

Grain direction In this List Field you can choose the **Grain direction** (**X**, **Y** or **None**).

If you want to nest parts independent of the *Grain direction* select the option **None**.

If you specify the Grain direction **None** for a Material Sheet, only parts will be nested on that sheet that also have the grain direction **None**. If a part has a specific Grain direction (**X** or **Y**), it will <u>not</u> be nested on a sheet with **None** *Grain direction*.

Defining Material Sheets

1. Select the sheet you want to define.

2. Choose the **Defining Sheet** tool from the *Nesting Palette*.
   The **Sheets Option** dialog box is displayed. The entry fields show the parameters that were last-specified.

3. Define the sheet by specifying values or selecting one of the available options.

4. Click the **Assign** button.
   The specified parameters are assign to the sheet.

In the open dialog you can define additional sheets. You just must select the next sheet, define the parameters and click then the **Assign** button.

Checking the Parameter of Material Sheets

1. Select the **Defining Sheet** tool from the *Nesting Palette*.
   The **Sheet Options** dialog box is displayed. The entry fields show the parameters that were last-specified.

2. Deselect all objects by clicking somewhere on the drawing area with the dialog box displayed.
   All entry fields in the dialog box will turn blank.

3. Move the mouse over the sheets without selecting them. As soon the mouse pointer comes over a sheet the related sheet parameters are displayed in the dialog box.

Nesting Process

Before we can calculate the arrangement of the parts on the material sheets, we have to specify the general options for the *Nesting Process*.
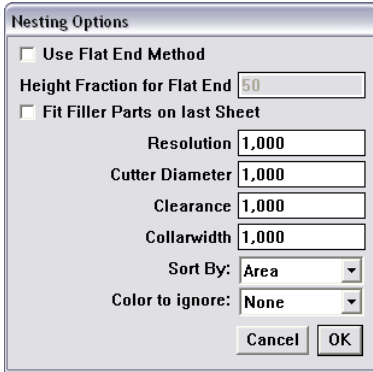
Setting the Nesting Options

To set the *Nesting options* you must select the **Options** command in the **Nesting** menu.

Options

When you select this command the following dialog box is displayed:

The **Nesting options** dialog box allows the following settings:

Flat end method	When the option **Flat end method** option is selected, ***Infinum*** tries to place the parts along the *nesting direction* with a minimum material waste (epitomised for minimum sheet length) and to create a flat end. This is done by rotating the parts in a way that the smallest side of a part shows in the nesting direction. At the sheet end ***Infinum*** arranges the parts to create a flat end. This option is important especially when parts are nested on endless sheets.
Height fraction	In this dialog box you specify a percentage value of the overall nesting sheet length required, where ***Infinum*** will switch from *Center of Gravity* nesting to the *Minimum length* (flat end) method.
	Normally ***Infinum*** optimizes the parts according to their *Center of Gravity*, in the opposite to the *Flat end method* that nests parts according to their smallest extension.
	Since the *Center of Gravity* nesting requires often less material, you can combine both methods by specifying a percentage value for the sheet length.. ***Infinum*** then will nest parts below that value according to their *Center of Gravity* and above that value according to their minimum extension to create a flat end.
	The best results you will get with a **Height fraction** between **60 %** and **80 %**. With **100 %** ***Infinum*** would exclusively use the *Center of Gravity* method with no flat end. With **0 %** ***Infinum*** would exclusively use the *Minimum Length* method with a flat end, but the material waste could be significantly larger than with the *Center of Gravity* method.
Fit Filler parts	If that option is activated, ***Infinum*** will nest the number of **Filler Parts** specified in the **Parts options** dialog window in addition to the specified **Target Quantity** on all sheets that contain already nested parts.

On all empty sheets that were not required to nest the specified **Target Quantity** no *Filler parts* will be nested.

If the **Fit Filler parts** option is not activated *Infinum* will nest only the **Target Quantity** specified in the **Parts options** dialog window.

Resolution	This value specifies the Nesting Resolution. The smaller the resolution the more compact the parts are nested, but will require more time to calculate the nesting.
	The smallest value allowed is **0,001 mm**. The largest value must be larger than the length of the longest sheet divided by 50 000.
	If the resolution is larger than this value no nesting will occur. Recommended is the default value **1**.
Cutter diameter	In this entry field you enter the **Cutter diameter** of the cutting tool you will use later to cut the nested parts.
Clearance	Here you specify the **Clearance** between two parts. For the absolute clearance between two parts you must add twice the **cutter diameter** (for each part).
Collar width	With this value you define the minimum distance *Infinum* should keep from the sheet edge.
Sort by	In this list field you define according to which parameter *Infinum* will place parts of equal priority: First parts with the *largest area* or parts with the *largest perimeter*.
Color to ignore	In this list field you can choose a color for geometry objects that *Infinum* will ignore during the nesting calculation. More information about this option you will find in the next section *Nesting Calculation*.

Nesting Calculation

Infinum offers the following Nesting functionality:

*   ***True Shape Nesting***

    Parts with irregular shapes are nested in a way that other parts can use the cutout of these parts.

*   ***Multilevel Nesting***

    Holes and cutouts can be nested with smaller parts to achieve a minimum material waste.

*   ***Multiple Orientation***

    Infinum rotates parts for an optimized arrangement by **1°** steps.

*   ***Non-rectangular Plates Support***

    Infinum is able to nest parts at any shape.

The Nesting calculation in *Infinum* is a fully automatised process, that starts as soon you select the **Nesting** tool in the *Nesting palette*.
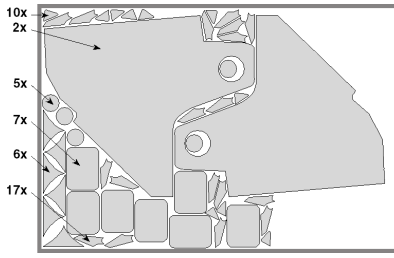
Nesting

When you select this tool all parts will be nested fully automatically according to the specified parameters. If a nesting calculation is not possible, an error message will be posted.

Center of Gravity Nesting

With this nesting option all parts will be nested on any sheet according to their *Center of Gravity*.

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Flat End Nesting

This Nesting option is design to nest endless sheets targeting for a *flat end* and use the *minimum sheet length* possible.

The default *Center of Gravity* nesting method normally uses less material but requires more sheet length and won't create a flat end.

In the following graphic you see a optimized arrangement of parts on an endless sheet nested by the *Center of Gravity* method.
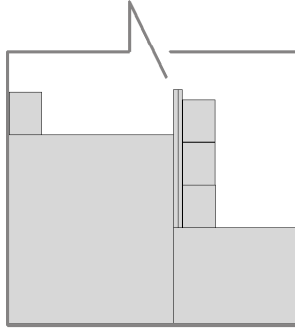
Nesting algorithm:
Center of Gravity with an endless sheet

The following graphic shows the same example nested by the *Flat end method*. There could be more material used than in the previous example.
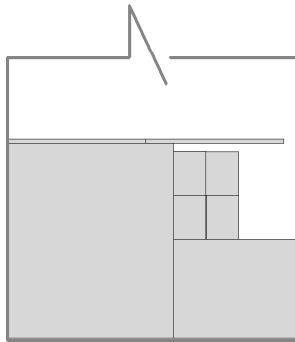
Nesting algorithm:
Flat end Method with an endless sheet

The best result you will achieve with endless sheets by combining both methods and using a **Height fraction** value between **60 %** and **80 %**.

With **100 % *Infinum*** would exclusively use the *Center of Gravity* method with no flat end. With **0 % *Infinum*** would exclusively use the *Minimum Length* method with a flat end, but the material waste could be significantly larger than with the *Center of Gravity* method.

Ignoring geometry with a specific color

*Infinum* interprets all closed shapes as part boundaries.

If for example a geometry object contains a circle, that doesn't present a part boundary (cutting boundary) it will be only ignored by nesting and not interpreted as a hole, if you assign this geometry an ignoring color.

But the **Color to ignore** option can not be used to exclude complete parts from nesting. In this case *Infinum* would generate the error message *No closed Geometry!*

In the following example a part has a rectangular outer boundary with a hole in the middle.
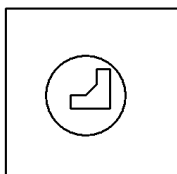
When you assign the circle an ignoring color, **Infinum** will handle this part as a rectangular shaped part and will not place smaller parts within the hole.
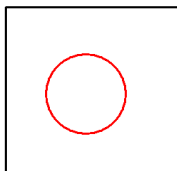
Notations within and assigned to parts will be automatically identified and ignored while nesting.

Nesting Analysis

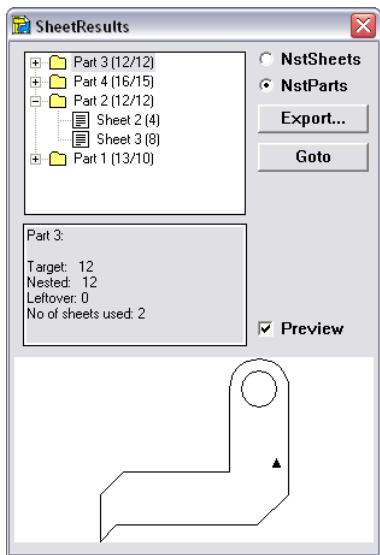After parts have been nested the calculated data can be analyzed.

Analyzing Nesting Data

The tool for the Nesting analysis you find in the *Nesting Palette*.

Nesting Results

When you select this tool the following dialog window is displayed:

The units of all areas displayed correspond to the units selected in the **Units** dialog box, that you find in the **Preferences** submenu of the **Layout** menu. The default value is **mm²**.

The **Nesting Results** dialog box contains the following Information:

Parts/Sheets With this option **NstSheets**/**NstParts** you select if **Parts** or **Sheets** will be displayed in the *Selection Window*.

Selection Window The *Selection Window* displays depending on the option selected all parts or sheets listed in a tree structure. If you click on the **+ sign** in front of a list item the tree is expanded displaying all objects related to that item.

Each tree item is followed by a number in brackets that indicates how often that part is nested on all sheets. If two numbers are displayed the first number represents all defined parts (*Target Quantity + filler parts*) and the second number shows nested Target quantity.

Assumed you have selected the **Sheet** option and you click on the plus sign in front of a sheet, than all parts will be displayed that are nested on that sheet.

If you have selected the **Part** option all sheets will be listed where the selected part was nested.

Result Window

The *Result Window* lists all calculated nesting data of a part or sheet that is selected in the *Selection Window*.

Sheet Option

Sheets selected in the Selection Window:
Nested Parts
Here you find the number of different parts that were nested on that sheet.

Sheet Area
shows the whole area of the selected sheet.

Nested Area
lists the summarized area of all parts nested on the selected sheet.

Used Area
shows the used area of all nested parts on that sheet including the specified *Clearances* and *Cutter diameters* in the **Parts options** dialog box.

Usage (%)
shows how many percent of the area of the selected sheet is used.

Parts selected in the Selection Window:
Target Quantity
shows the quantity specified in the **Parts options** dialog as **Target Quantity** for that part.

Nested
shows how often this part is nested on all sheets including all possible filler parts.

Nested on sheet 'Name'
shows how often the selected part is nested on the selected sheet.

Part Option

Part selected in the Selection Window
Target Quantity
shows the **Target Quantity** defined for that part in the **Part Options** dialog box.

Nested
shows how often the selected part is nested on all sheets including any *filler parts*.

Remaining Quantity
shows how many parts of the **Target Quantity** were not nested. This number does not include any *Filler Parts*.

Used Sheets
shows on how many sheets the selected part was nested.

Sheets selected in the Selection Window
Target Quantity
shows the **Target Quantity** for that part specified in the **Part Options** dialog box.

Nested
lists how often the related part is nested on the selected sheet including any possible *Filler Parts*.

Nested on sheet 'Name'
shows how often the selected part is nested on the selected sheet.

View

When you select this option the *View window* is displayed showing the selected part or sheet.

Export	When you click this button the **Save as** dialog window is displayed, where you can specify a name for the data you want to export. As soon as you click the **Save** button all Nesting Results are saved as *ASCII File*.
Show	When you click this button the selected part or sheet is selected on the drawing area and displayed at full screen size.