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# **1.0 INSTALLATION**

## **1.1 Installation Notes**

1.1.1 Extent of Delivery / Notes / System Requirements

#### • A CD labelled "ISY-CAM 2.0 (Pictures by PC 2.6)"

The first CD contains the complete original basic software of Schott Systems. Compared with previous versions, version 2.0 contains some important features that have been added to the functions. The operator interface, however, has remained without changes, compared with the older versions.

#### • A CD labelled "isy stepbystep"

The second CD ROM provides additional modules, either with a modified operator interface or additional functions integrated. It is at any time possible to recover the original state by clicking a button. If you need these options, install this CD as described in the 2nd Section.

Contents: Parameterisation Module: This module can be used to generate parametric 2D constructions in a simple way. Through the reduced function and menu environment, it is easy to operate. This parameterisation function is extremely useful for the development of variants (similar contour images) ( see isy CAM Manual).

**Isy Stepbystep Module:** This option is used to switch the operator interface to an environment prepared didactically.

Three stages are provided to filter out the desired functions so that the user can freely choose "his" degree of difficulty.

This environment has been designed especially for use in the training area or for the CAD beginner (see "isy – sbs Manual").

**PowerTools:** The PowerTools have been implemented as a result of questions and suggestions that reached us via our hotline. The main objective was to design the operation of the entire program consistently.

Some additional input menus have been implemented to make the design work in the fields of 2D and 3D construction considerably more convenient (see "isy – CAM Manual").

Manuals as files: In addition to the program modules, a directory that contains various program files has been created on your CD: \acrobat3 \ ar16d301.exe (WINDOWS 16-bit, German)

ar32d301.exe (WINDOWS 32-bit, German) If you have called one of these files, the ACROBAT READER will be installed, which can then be used either to display the manuals directly or to print them in

which can then be used either to display the manuals directly or to print them in DIN A4 format. To this aim, the PDF files **isy-CAM.pdf** and **isy-sbs.pdf** of the Manuals from the CD directory \sbs\acrobat\ must be opened in this program.

- Manual "isy CAM 2.0" in DIN A5 format
- Manual "isy stepbystep" in DIN A5 format

- isy CAD / CAM as a 16-bit program has been designed deliberately under MS DOS for two reasons:
- The system has minimum hardware requirements so that it can already be used in low-budget areas, such as places of training and schools.
   For example, you only need a minimum of 50 MB free space on your hard disk, a 486 processor, 8 MB RAM. a Microsoft mouse. a VGA card and MS DOS (version 3.3 or higher).
- The REMOTE program that controls the machine has been designed as a DOS program for safety reasons.

Although Microsoft operating systems, such as WIN95 (WIN98) or WIN-NT, have meanwhile found wide extension, the hardware requirements are considerably higher due to the multimedia, multitasking and multiuser functions implemented in these operating systems. For example, WIN95 (WIN98) requires min. 16 MB (WIN-NT min. 32 MB RAM) and a fast Pentium processor. Generally, isy - CAM is designed to run under both operating systems in the DOS window. However, there are some restrictions as far as the graphical representation is concerned. When running WIN-NT in DOS mode, for example, only the relatively low VGA resolution of 640 x 480 pixels can be used whereas under WIN95 using VESA compatible graphics cards higher resolutions (e.g. 1024 x 768 or 1280 x 1024) are provided. When running isy – CAM under WIN95 you should therefore make sure that your graphics card has not only an appropriate Windows driver but also a VESA-BIOS extension (version 2.0 desired). When running the program under MS DOS, a control program for switching the image refresh rate should be included in the extent of supply of your graphics card.

To be able to use both operating systems, an appropriate memory configuration should be selected. DOS programs directly address a memory area of 640 KB and manage additional memory using a 64 KB window that dynamically makes available parts of the expansion memory. For DOS programs, the management is carried out using XMS (extended memory) or EMS (expanded memory) drivers included in the files CONFIG.SYS and AUTOEXEC.BAT (see below). Windows programs may directly address the full memory area and therefore do not require any special settings on side of the user.

# 1.1.2 First Installation of ISY-CAM 2.0

Generally, the first installation under WIN95 (WIN98) only slightly differs from the installation under DOS. If you start a computer on which WIN95 (WIN98) is installed, the graphical user interface automatically appears after a short time whereas a computer on which DOS is installed merely shows a simple DOS prompt (e.g. C:>).

In order to be able to make DOS inputs under Windows, you must change to the MS-DOS prompt. Proceed as follows:

# Only for WIN95 (WIN98) users:

Start in the left bottom corner
 Programs
 MS-DOS prompt

# **1.0 INSTALLATION**

The window as shown below will appear.

KS-DOS-Eingabeaufforderung	_ 🗆 🗵
lievosoft(R) Windows 95	
(C)Copyright Microsoft Corp 1981-1996.	
::\WINDOWS>	

4. Either use the key combination <ALT> + <ENTER> or click the ICON with the four red arrows to switch to full-screen display. You will recognise it by that no more graphical windows of WIN95 (WIN98) are to be seen. (Inter alias, you may return to normal Windows mode using the key combination <ALT> + <ENTER>.) It is now only important that you can now (if the window is active (blue margin)) directly enter DOS commands and can go on as you would have a computer booted under DOS.

Now we are at the DOS prompt (or under Windows in the DOS window) and will check the available hard disk capacity by typing in

#### dir

The free hard disk capacity is displayed in the last line. As already mentioned, at least 50 MB of your hard disk should be available so that all programs can be installed.

Secondly, we want to check the memory available (RAM). Enter the command

тет

to display the memory available. That what's interesting for us is the column 'Total'. You should remember the value indicated there at least roughly.

Now start the first installation. At DOS prompt (assuming that your CD-ROM drive is D:), type in the following:

d:\first

This will start the program FIRST.EXE. Now follow the user dialog according to the inputs listed below. Any expressions in acute brackets <...> are default values and can be accepted by pressing <ENTER> if you wish to.

#### Answer the questions below as follows:

1	(one); selects German as the dialog language for the installation
	(2 for English)
xxxx-xxxx-xxxx	Please enter the installation code.
	The software ID number is to be found on the page "isy-CAM Final
	Customer Registration". (No distinction between capital letters and
	small letters is made; the hyphens must be entered.)
п	Do not install another language; or type "Y" and "1" for English
c:\isy	Main directory to which all program parts are copied
j	(yes) to confirm that you want to install the program in the directory c:\isy

Now you will be asked which hardware components you are using. To avoid any conflicts, you should first accept the standard device types as suggested. You can modify them any time later using the INSTALL program.

- 1 Single-screen version
- 9 VGA-compatible adapter
- 2 Installation without ANSI drivers
- 7 Microsoft mouse
- 2 EPSON printer
- 6 EPSON LQ-2500 DIN A4 (21cm x 12")
- 2 LPT1

The printers offered in this place are needle printers used in the traditional 8-bit mode. They can only be used to print rough sketches without varying the colour or the thickness of the lines. To achieve professional printing results, you should use vectororiented printers (e.g. HPGL or Postscript capable printers) operated as plotters. Bitmap printers (24-needle or inkjet printers) can only be run optimally under DOS if you have installed the additional program PIXPRINT (see below). We will select a tvoical representative of a plotter driver:

- 2 Pen plotter
- 4 HEWLETT PACKARD
- 3 HP 7475 A
- 1 DIN A3
- 1 DTR Hardwire Handshake
- 1 LPT1

Generally, the 'plotters' installed under isy – CAM are logical, vector-oriented devices, i.e. it is also possible to install a Postscript laser printer as a plotter. For some isy – CAM functions (conversion, detail zoom, etc.), a special data format is important, which is installed as follows:

- 6 Special data formats for plotter No. 2
- 13 PIC syntax 2.0

If you do not want to install any further plotters and/or paper formats now, you can complete the first installation by typing in the following sequence:

# **1.0 INSTALLATION**

1

i

- (one) no plotter No. 3
- (yes) if the selection enlisted is correct
- (yes) match CONFIG.SYS (only the entry FILES=20 will be added)

After the last input has been made, match all files will be copied from the CD into the corresponding subdirectories. If the installation has been successful, the message

PICTURES BY PC 2.6 First installation completed successful!

#### will appear.

Important note: Even if you have cancelled the installation after the third plotter, isy - CAM will install some further useful default devices (among others, HPGL and Windows metafiles, Draftmaster ISO-A0 Expanded) and the standard memory configuration using the file FIRST.RDB. If you wish to, you can check this using the installation program (see below). Up to 8 logical output devices ('plotters') can be installed in total.

It should also be noted that special calculation programs have been copied in the extended 32-bit mode under WIN95 (WIN98), which differ from the DOS programs. Therefore never use a program installed under DOS to run it under Windows. This will inevitably result in conflicts.

Although all essential program parts have been copied with the first installation, it is still necessary to carry out the system optimisation mentioned above. To check the system components, Isy – CAM offers some useful tools (see below).

#### 1.1.3 DOS System Files

Since DOS only provides 640KB standard memory, it is recommended to utilise this memory as best as possible and to load all drivers not needed into the High Memory area or to deactivate them. The file CONFIG.SYS should contain the following entries (among others):

#### CONFIG.SYS

DEVICE=C:\DOS\HIMEM.SYS BUFFERS=20 (or more) FILES=20 DOS=HIGH,UMB

The automatic start file AUTOEXEC.BAT should contain the following entries (among others):

#### AUTOEXEC.BAT

....

C:\DOS\SMARTDRV.EXE 300 /X (enter 300 only for the minimum configuration of 4MB RAM) PATH C:\;C:\DOS;C:\ISY;C:\ISY;TOOLS; (add the existing path by the isy-CAM entries)

#### 1.1.4 WIN95 (WIN98) System Files

Use the EDIT program to edit the two system files CONFIG.SYS and AUTOEXEC.BAT. For example, type:

edit \config.sys

Please make sure that your CONFIG.SYS file contains the following entries:

# WIN 95:

#### CONFIG.SYS DEVICE=C:\WINDOWS\HIMEM.SYS DEVICE=C:\WINDOWS\EMM386.EXE NOEMS RAM DOS=HIGH,UMB

#### WIN 98: CONFIG.SYS

DEVICE=C:\WIN98\HIMEM.SYS DEVICE=C:\WIN98\EMM386.EXE NOEMS RAM DOS=HIGH,UMB

Save the changes you have made using the editor. Use the EDIT menu assistance (<ALT> <D>).

Furthermore, the start file AUTOEXEC.BAT should contain the following lines: WIN 95: AUTOEXEC.BAT PATH C:\C:\WINDOWS;C:\ISY;C:\ISY \TOOLS\WIN95;C:\ISY\TOOLS; LH C:\ISY \TOOLS\WIN95\PICUMB 60 WIN 98: AUTOEXEC.BAT PATH C:\C:\WIN98;C:\ISY;C:\ISY \TOOLS\WIN95;C:\ISY\TOOLS; LH C:\ISY \TOOLS\WIN95\PICUMB 60

The program PICUMB.COM makes available 60 KB of conventional memory for isy – CAM, which otherwise would be used by WIN95 (WIN98). This memory is urgently needed, e.g. in conjunction with the Modelling Package for Pictures by PC 2.6, which is available as an option.

Make sure that the path specification contains first the directory ISY\TOOLS\WIN95 and only then the directory ISY\TOOLS. This ensures that always the tools of the Windows version are used from the tools installed both under WIN95 (WIN98) and under DOS. This, however, requires that isy – CAM (Pictures by PC) has been installed under Windows 95 (WIN98), since otherwise the corresponding tools will not be copied at all.

If the above entries have been made in both system files, you can reboot your computer. The simplest way for DOS computers is by simultaneously pressing the key combination <CTRL> <ALT> <DEL>. On WIN95 (WIN98) computers, you simply click with the mouse on Start in the taskbar (left bottom corner), then "Shut Down..." and "Restart the computer?".

After rebooting, isy - CAM is ready to operate.

However, now you can only use a resolution of 640 x 480 pixels. If the VGA mode is sufficient for you, you can start the program (see "Starting the ISY Program").

# **1.0 INSTALLATION**

However, in any case you should check whether your graphics card supports VESA modes of a higher resolution. This can easily be tested using the program SSI.EXE included in the extent of delivery of isy – CAM. Nearly all tool programs of isy – CAM provide some help information if you type in the topic you want to information about followed by a question mark '?'. For example, if you type

#### modify ssi ?

in the isy input line, all parameters will appear which you can measure using SSI. The following list will be displayed:

Format: 'ssi [ <key> ...]' By <key>, special information can be displayed: Data carried in the drive A: ... Z: COM# Serial interface No. # CMOS Contents of CMOS RAM CPU Processor information DEVICES Installed device drivers DISKS Installed drives (DOS) DPMI DOS Protected Mode Interface DRIVES Installed drives (BIOS) FILE <Name> Information on the <Name> file LPT# Parallel interface No. # PARTITIONS Hard disk partitions PORTS Serial and parallel interfaces SFT System File Table Standard information STD TTGA TIGA Graphics Adapter Resident programs TSR VCPI Virtual Control Program Interface VESA VESA Graphics Adapter Register of the VGA card VGA-REG VIDEO Installed screen adapters The key words can be abbreviated, e.g.: 'ssi de'

To check the graphics card, you can use the following command:

#### ssi video

Please note that it is important to know how much video RAM your card has (e.g. 2MB). (If you use WIN95 (WIN98) press <ALT> <ENTER> again if necessary.) Not the manufacturer is important, but it is imperative that the graphics adapter supports VESA mode. To check this, enter

#### ssi vesa

Ideally, a list extending over several pages will appear which lists all VESA compatible graphic modes. It is only important that at least 800 x 600, 1024 x 768 or 1280 x 1024 is offered with as many as possible colours. Furthermore, please pay attention to the VESA version number. Release 2.0 is desired. If the graphics card installed in your computer supports a VESA mode, it must be set separately using the installation program provided by isy – CAM (INSTALLEXE) (see below).

## 1.1.5 Installing VESA-Compatible Display Drivers

If the test for the VESA mode (see above) has been completed successfully, type

cd \isy

to switch to the ISY directory (in the DOS window).

Then type "Install" to call the installation program.

Press <ENTER> to confirm the name of the installation program offered (**PICTURES.INI**). The configuration currently installed will be displayed. To get to the main menu, also press <ENTER>. Use the menu item

<4> Install screen drivers

to get to the installation menu for the graphics cards. Press <PgDwn> or <n> <ENTER> several times to browse through the alphabet until VESA is displayed and enter the number for a VESA mode supported by your graphics card (always as 'No Ansil'), e.g.

<286> VESA VGA 1024 x 768 2MB (No Ansi)

Then you will return to the installation main menu and can save your changes by

<9> Save configuration

and pressing <ENTER> to confirm your changes made in the installation file. Then choose

<0> Return to DOS

to quit the INSTALL program; now you are at the DOS prompt again. You can start the program at a higher resolution (see below).

# 1.1.6 Starting the ISY Program (Program Call)

Change to the directory where you have installed ISY.

cd c:\isy

Call the program

pictures

Now go on with your work you originally wished to do, e.g. with the Section "Using the Controls". If you use isy-CAM under WIN95, you should also read the next Section in order to make the program start under Windows easier and set the program properties correctly.

#### 1.1.7 Creating a Shortcut to WIN95 (WIN98) and Setting the Properties for isy - CAM

To make the program start easier, you can create a shortcut, e.g. with isy - CAM and REMOTE on your desktop (see your Windows Manual).

Place the mouse pointer on any free place of your desktop, press the right mouse button, select "New" and "Shortcut" and type

C:\ISY\PICTURES.EXE

# **1.0 INSTALLATION**

in the command line for the name of the shortcut, e.g

#### ISY-CAD/CAM

(without spaces) and select an icon for the shortcut. Click 'Finish' to complete your shortcut. From now up you can start the isy – CAD/CAM program directly under Windows simply by double-clicking the icon. Now check the special properties of the isy – CAM shortcut. The Properties dialog is displayed if you click the right mouse button if the mouse pointer is positioned on the icon. Make sure that the *Memory* tab contains the following settings: All fields should be set to "Automatically", except: Expanded (EMS) Memory (*none*) and Extended (XMS) Memory (select the largest possible number from the list); check the box "Uses *HMA*", and uncheck "*MS-DOS protected (DPMI) memory*". Make sure that the settings of the "*Program*" tab "Run in:" are set to "Maximised" and that the checkbox "Close on exit" is checked. On the "*Screen*" tab, "*Full-Screen*" in the "*Usage*" menu item should be checked.

Eigenschaften von Verknüpfung mit power.bat	Eigenschaften von Verknüpfung mit power.bat
Allgemein Programm Schriftart Speicher Bildschirm Sonstiges	Allgemein Programm Schriftart Speicher Bildschirm Sonstiges
Destellung C Eeniter Ursprüngliche Größe Stendard X C Molibid	Vordergrund Maus
Fernter I⊄ ∫symbolisiste anzeigen I⊄ j⊑nstellungen beim Stat wiederherstellen	Hintergund     Abbuch            Г.Imere vorübergehend aussetzen      Imere vorübergehend aussetzen             Leistadativität      Weitere Diptoren        Niedig     Hoch     Imere Schnell ginfügen
Leistung G Schnelle <u>B</u> OM-Emulation G <u>Dynamische Arbeitsspeicherreservierung</u>	Zugilfitatien von Windows Alk-Tab Strg=Esc Alk-Diuckitaste Alk-Leeitaste Alk-Esc Diuckitaste Alk-Eingabetaste
OK Abbrechen Ügernehmen	OK Abbrechen Übernehmen

Note: isy-CAM Rev. 2.0 will copy the icon (ISYCAM.ICO) into your main directory. From there, it can be loaded into the shortcut of the program call for ISY with "Properties", "Program" and "Change Icon".

Use the same procedure to create shortcuts to call the optional modules (to be found on your isy-stepbystep CD-ROM) by double-clicking the shortcut on your DESKTOP.

Creating a shortcut to the machine control program REMOTE: The command line must be:

#### C:\REMOTE\REMOTE.EXE



The REMOTE program must be executed in MS-DOS mode. Activate MS-DOS mode under "Properties" / "Program" and "Advanced". The special memory-resident drivers can also be loaded there.

#### 1.2 Special Installation Notes

The installation notes given in the following are not absolutely essential for every isy – CAM user. Take a quick look at the information provided in the following to check whether you find it important for you.

## 1.2.1 Installing "PixPrint" (Bitmap Printer under DOS)

If you use a computer on which a DOS operating system is installed, pixel-oriented printers (laser, needle and inkjet printers) can only print colours and special line thickness if the additional program PIXPRINT is installed. Since isy – CAM Rev. 2.0, PixPrint has been included in the extent of supply. To install this program, type the following line at DOS prompt (provided D:) is your CD-ROM drive):

d:\pixinst

First, you will be requested to enter the installation code. This is the same as that you know from isy – CAM (16 letters separated by a hyphen). If you have entered this code, you will be asked to specify the directory to which you wish to copy the program. This should always be the same directory as that to which isy – CAM has been copied. That means that the suggestion

#### <c:\isy>

should only be acknowledged by pressing <ENTER>. The next question refers to the directory where the drawings to be printed are. Press <ENTER> to confirm the suggestion

#### c:\isy\vector

offered. Then some printer manufacturers are listed. As an example, let's select

#### 4

This corresponds to EPSON printers. Now a list of all possible devices and configurations is displayed. Note: Nearly all bitmap graphics printers (except HEWLETT PACKARD) are EPSON (or NEC) compatible. Therefore, first always select

#### LQ-2550-C-360

Thus, you have selected a colour printer EPSON-LQ-2550 with 360 dpi (pixels per inch). Newer device types not explicitly displayed in the list usually also operate in this mode. To be absolutely sure, please refer to your Printer Manual to check the graphics compatibility. Then you will have to select the paper format and the kind of paper feeding. As an example, let's select

1

corresponding to endless paper DIN A4 (12in x 210 mm). Then you will be asked whether you wish to have a margin. Answer with "N" for "no" if you want to print the full page. The question with regard to the interface can be acknowledged, e.g. with

1

Thus, you have connected the printer to the 1st parallel port (LPT1) and have completed the first installation of PixPrint. The program is now ready to work and can also be used independently of isy – CAM to print pictures by PC (isy – CAM; VEC files or HEWLETT-PACKARD-GRAPHICAL-LANGUAGE files (HPGL).

# 1.0 INSTALLATION

# Brief note on printing directly using PixPrint (cf. also Section: "Printing with PixPrint under isy –CAD")

Start the program from the isy directory by typing in

pixprint

If you then want to print an isy – CAM-2D drawing (.VEC) over the full page (without ruler), simply type the name of the drawing you want to print, e.g.

test

To print a HPGL file (.HP) over the full page, simply type, e.g.

hptest -h

To quit PixPrint after printing, type

exit

Of course, PixPrint provides considerably more possibilities that, however, will not be described here in detail. isy-CAM Rev. 2.0 provides simple button operation for the most important printing functions (see below).

#### **Reconfiguring PixPrint**

To modify the existing PixPrint configuration later, proceed as follows:

Start PixPrint from the DOS prompt by typing

cd \isy pixprint

After PixPrint has been started, the starting message will appear, and you will be prompted to type the appropriate command after the colon (prompt:'pixprint:'). You will start a program called STD.PPP by typing

#### std

Then you will get to the same dialog as with the first installation of PixPrint; only select the appropriate settings and save them. To quit PixPrint, type

exit

True-to-scale output using PixPrint (see below, button operation)) For true-to-scale output of existing drawings to your printer, proceed as follows:

Start PixPrint from the DOS prompt by typing

cd \isy pixprint

After PixPrint has been started, the starting message will appear, and you will be prompted to type the appropriate command after the colon (prompt:'pixprint:'). You will start a program called DIALOG.PPP by typing

dialog

A dialog will appear, which you must follow. To guit PixPrint, type

exit

#### 1.2.2 Memory Settings

#### 1.2.2.1 Optimum Memory Configuration

As already mentioned earlier, it is recommended to configure the computer for isy – CAM always such that as much as possible DOS memory remains. A typical configuration is listed below. You can test it by yourself if you type

ssi

in the modify input line at DOS prompt or under isy-CAM.

<b>Operating system:</b> under Microsoft WINDOWS Processor: Numerical processor:	MS-DOS, version 7.10 ??? in virtual 8086 mode ???
Conventional memory:	639 k (0000-9FFF)
Free for programs:	583 k (0E13-9FFF)
DOS Upper Memory:	154 k
Free DOS UMBs:	0 k
Memory manager:	Microsoft WINDOWS Ver. 4.03
XMS driver:	3.00 (3.5F)
High Memory:	Used by DOS - 7056 bytes remaining
Upper Memory:	0 k
Extended Memory:	31744 k
Free XMS memory:	31432 k (2048 k in a block)

If you obtain values under "Free for programs" (in this case 583 k), which substantially differ from the values given above, check the memory for RAM resident programs, e.g. by typing

ssi tsr

The list below shows a typical configuration for WIN95. Please pay attention to the program PICUMB installed previously. It is out of question that all drivers in the files CONFIG.SYS and AUTOEXEC.BAT which are not needed should be deactivated by Remarks (REM in front of the entry you want to disable); then reboot your computer.

# **1.0 INSTALLATION**

Addr.	Memory	Env.	Name	Para
0850	6.8 k	0000	KEYB	gr,
0AE3	67.0 k	0000	vmm32	
0B14	7.3 k	0C7A	COMMAND	tsr
OCEF	4.6 k	0000	DOSKEY	/i
D05C	60.4 k	0000	PICUMB	60

arameter gr,,C:\WINDOWS\COMMAND\keyboard.sys

#### 1.2.2.2 Checking the Configuration

You should read this Section only if you come to the system-relevant memory limits when working with ISY, i.e. if the free DOS memory is limited by unnecessary RAM drivers or the drawing buffers for large data quantities (max. 10 MB per buffer) are not sufficiently configured. To check the configuration, start isy – CAM (Pictures by PC) and check the following items:

- 1) Type the command *sp* -*f* to display the memory available. The value displayed should not be less than 120.000 bytes.
- The command ssi tsr displays the memory addresses of loaded tools. Make sure that Picumb is loaded in the upper area (address starts with a letter).
- 3) The commands set path and set toolpath display in which directories the search for the individual tools is carried out. The directory "tools\Win95" must be prior to the directory "tools".

#### 1.2.2.3 Setting the Buffer Size

The cause most frequently occurring for error messages under isy – CAM is that the data quantities of drawings (or milling contour files) are greater than the preinstalled buffer size. Generally, 4 buffers are provided, which can be used in parallel and may house max. 10 MB of data. By default, they are configured as follows:

5000,1000,3000,3000 1st text buffer 5MB, then 1MB, 3MB and the 4th also 3MB

Buffer 1 usually contains the drawings (here: max. 5 MB), buffer 2 is intended for auxiliary constructions (here: 1 MB), buffer 3 for the simulation of milling contours (here: 3 MB) and buffer 4 for editing the NC data (NCP files (here: 3 MB).

Note: The buffers should be increased only if absolutely necessary since the management of the buffers, in turn, will reduce the conventional DOS memory so that the 3D modelling functions may be limited in an undesired way.

If you nonetheless must set any special configurations, proceed as follows:

Change to the directory where ISY is installed.

7

cd \isy

Call the installation program.

#### install

Press <ENTER> to accept the installation name **PICTURES.INI** suggested. The version currently installed on your computer will be displayed; press <ENTER> again to confirm. Then you will get to the INSTALL main menu. Select the menu item

Select memory configuration

#### to display the current configuration, e.g.

Use High Memory : Use Upper Memory Blocks: Data Memory: Text buffer

Test 16000,64k XMS 1:5000k, 2:1000k, 3:3000k, 4:3000k 560k XMS

Select the menu item

Overlay memory:

<5> Text-Puffer

Test

to get to the buffer size input box. Supposed you have to load, e.g. a 7 MB file, isy-CAM with the current configuration (5 MB) would show the message "Buffer full" and the data would not be loaded completely. You would therefore have to increase buffer 1 and would type, e.g.

#### 8000,1000,3000,3000

This would be one possible way to solve the problem. Now you must only save your configuration. This is done using the menu sequence

<0> Return to main menu

<9> Save configuration

Press <ENTER> to confirm the name of the installation file (PICTURES.INI).

Then select

<0> Return to DOS

to quit the installation program.

## 1.2.3 ISY Language Switch

It is possible to switch the language of isy – CAM (or Pictures by PC) between German and English even while the program is running.

setlang en;gm for English

setlang de;gm for German

Of course, this requires that the language in question has been copied during the first installation (see above).

# **1.0 INSTALLATION**

#### 1.2.4 Installing the Add-on Modules "3D Modelling" and "Exchange Package"

After isy – CAM has been started, you may install the add-on modules "3D Modelling" and "Exchange Package" of Schott Systems by typing *ADDON* in the modify line (if you wish to install them). Of course, first the diskette 1 of an add-on module must be inserted into floppy drive a:.

#### 1.2.5 Installing the CD "isy stepbystep"

Before installing these modules, isy – CAM must be installed completely from CD 1! Observe the order given here.

#### 1. Parameterisation Module

After isy – CAM has been started, install the Parameterisation Module by typing d: PARAINS in the "modify" input line (CD-ROM drive with installation routine).

#### 2. isy stepbystep

After isy – CAM has been started, install "isy stepbystep" by typing *d*:\SBSINST in the "modify" input line (CD–ROM drive with installation routine). For detailed information on this package, refer to the second part of the Manual "isy stepbystep"

#### 3. PowerTools

After isy – CAM has been started, install the PowerTools by typing d:\POWERINS in the "modify" input line (CD–ROM drive with installation routine).

Of course, you can also in this case create shortcuts on your desktop, as already described in the previous Section. However, in this case the calls must be realised using the following files:

 isy stepbystep – stage 1:
 isy1.bat using the icon from the main directory: isy1.ico

 isy stepbystep – stage 2:
 isy2.bat using the icon from the main directory: isy2.ico

 isy stepbystep – stage 3:
 isy3.bat using the icon from the main directory: isy3.ico

 isy stepbystep – stage 3:
 isy3.bat using the icon from the main directory: isy3.ico

 Spower.bat using the icon from the main directory:
 isy3.bat using the icon from the main directory: isy3.ico

 Spower.bat using the icon from the main directory:
 sbspower.bat using the icon from the main directory:

 Spower.ico
 sbspower.ico

PowerTools only with isy without isy stepbystep: **power.bat** using the icon from the main directory: **power.ico** 

Of course, you can also call these add-on modules directly from isy - CAD/CAM or switch by typing: P1, P2, P3 for the stepbystep stages power and sbspower for the PowerTools in the "modify" input line.

Switching back to the isy basic module without the add-on modules is possible by



Notes: If you press the Windows button under WIN95 while isy is running, your system will 'bomb' under certain circumstances. You can remedy this problem if you block this key for the isy application. The installation CD isy stepbystep contains the directory \POWER\WINTools. Click once on DOSWINKY.INF in the explorer. Then use the right mouse button to call the context menu. Use the Install menu item to copy the drivers. If you then reboot your computer, the key is blocked for isy if these access keys have been disabled for the Start icon (see: 'Properties of Shortcut', 'Miscellaneous').

**Direct** language switch is only possible in the main module **isy – CAM**! (see previous page). The add-on modules on the CD "isy stepbystep" are installed directly in the language selected as the 1st language during the installation of the CD isy-CAM 2.0.







Selection menu



Position the arrow on an icon. **Press and hold** the **left** mouse button so that the context menu opens itself.

он С

BOX ALL

area

Menu

View menu

Position the arrow on an icon and press the **right** mouse button to get support.

Position the arrow on an icon and **press shortly** the **left** mouse button to recall the most frequent used command.

# 2.0 USING THE CONTROLS

#### 2.2 Screen Layout of the Graphical Button Menus

The button headbar at the upper screen border consists of 19 buttons visible on the screen at all times (also called Global menu or Global bar).

The second range (laterally, top right corner) consisting of 24 buttons contains the basic operating groups and switches the third function block (laterally in the right bottom corner) if the appropriate button is pressed for a longer time. This function block consists of max. 20 buttons that change according to the rough selection of button range 2 depending on the range of functions (point, line etc.).



With a number of 19 buttons for the headbar, 24 buttons for button area 1 and 20 buttons for button area 2, the operation is independent of the screen resolution. Even with a VGA resolution of 640 x 480 pixels, PICTURES 2.6 can be operated.

# 2.3 Function of the Buttons

Generally, the buttons are operated by clicking on them with the mouse. The left mouse button creates the comma stored in the button. If you press the right button while simultaneously pointing with the mouse pointer on the button bar, a brief explanation of the function of the corresponding button is displayed. If you then activate the function using the left mouse button, it is quite often the case that two operating modes can be distinguished. If you press the mouse button extremely quickly (timeout, can be set by IEDIT.PRC), a quick function is executed (QC - quick click) whereas if the button is pressed longer (LC – long click) in some cases a different function (depending on the command indicated in the button definition) appears. With buttons in the headbar or with buttons with a little yellow triangle in the left bottom corner, a drop-down window appears if the button is pressed longer.



#### 2.4 Button Menu / Text Menu

Two menu interfaces are provided for the program operation. On the one hand, the graphical menu interface described above (button menus), and on the other hand the traditional text menu environment (Pictures by PC 2.0).

The switch between button and text menu is carried out by means of the icon. TEXT



# 2.0 USING THE CONTROLS

## 2.5 The Global Menu (Headbar)

The Global menu (headbar) is intended to display current system states and make available frequently used function to switch system variables. For reasons of space, two buttons each are arranged one above the other. The labelling consists of 3 letters describing the English abbreviation of the function. Normally, the buttons are displayed in grey or yellow. Critical system states are highlighted in red and should only be used by the user deliberately. Below you will see a little overview:

HAT

(HATCH=hatching) If 'HAT' is displayed in yellow, new geometry elements (such as a circle) will be hatched when they are created. If 'HAT' is enabled, 'BOR' is automatically disabled. Normally, the hatching flag 'HAT' is disabled and 'BOR' enabled.

(BORDER=border) The 'BOR' button is normally enabled and is used for bordering geometry elements. For example, when drawing a circle, a circle border is created with 'BOR' enabled, 'BOR' is preferably switched alternatively with 'HAT'. If you, however, wish to create a circle with border and hatching, enable both 'HAT' and 'BOR'.

(HTCHPLOT=hatch plotting) If you want to suppress many hatching structures in a drawing for a short HPL time to get a guick overview, enable this button. In this case, 'HPL' will appear in red. This indicates a critical state, since existing hatches are normally not displayed in this way. Normally, 'HPL' is disabled (see also HTCHPLOT).

(USER=user units) With numerical constructions, user-defined coordinates provide an automatic reducing/enlargement of the values entered (e.g. when assigning dimensions to detail enlargements). These are set by assigning the variables 'UNIT' (or 'USER'). You can set this variable directly in the "modify" input line. unit=2 <ENTER> will immediately switch the display to red. This statement will assign a user unit to isy standard units (gdu=Grafical Display Unit). The drawing is thus internally drawn in its double size. Since the variable is very critical, it should usually be disabled (unit=). It is automatically disabled when restarting the program.

DI-VERSE LC

will restore the 'adu' coordinates (command: 'set unit=').

(GROUP=geometry group) If this field is red, a special object snapping facility has been defined. In this case the group set will be taken into account for all snapping operations for existing objects. Clicking 'GRP' will display the menu for the object snapping facility (see below). Each snapping to special geometry elements are assigned numbers that will be stored in the variable 'group'. You can derive from the checked boxes to which geometry types the snapping is carried out if a certain value is set. 'GRP' must only be activated for special problem definitions. Generally, for all menu functions a reasonable standard object snapping is used. This also applies if 'group' is not set ('group= '). In the menu for special object snapping you also see the field 'Tolerance' (tol=20). The tolerance

defines the distance from the crosshair position to the next near, calculated object point in thousandths of the screen width. The smaller the value, the closer the crosshair must be to the object when selecting the element to make sure that will be 'found'.



(TOLERANCE=tolerance) By clicking 'TOL', the snapping tolerance will change between 0.01% (1 thousandth) and the set value 2% (20 thousandths). If many objects are extremely close another to one, in some cases it can only be reasonable to select the value "1 thousandth". Please note that this only corresponds approximately to the width of the crosshair (i.e. the range of snapping nearly disabled). Any values for 'group' deviating from 20 thousandths are displayed in the 'TOL' field in red. Of course, you can also enter your own (e.g. greater) values for 'tol' in the object snapping menu.

(T3D=3D transformation matrix) If this box is active (red), a transformation matrix has been defined. This 4x4 matrix defines the position of a 2D plane in a 3D space. New objects will then automatically be imaged in the plane defined in this way. This is also called a 2.5D object in a 3D space. The essential effect of 2.5D is that all 2D manipulations can also be used in 3D space. The selected plane is enabled or disabled by clicking 'T3D'. Any planes can be selected in the drop-down menu 'View' under 'Plane'. 'T3D' can be either enabled or disabled (set3d=OFF).

(ZOOM) If this field is yellow, a cut-out zoom the zoom factor currently selected.

has be selected. Clicking 'ZOOM will display



SNP

T3D

(DUPLICATE=duplicate) If this field appears in yellow, copies of the original are made when objects are moved, rotated, or mirrored. The duplicate flag can be either enabled or disabled.

(SNAP=coordinate snap function) If 'SNAP' is called for the first time, the coordinate distance of a continuous grid snap is polled. A regular dot grid will appear on the screen background. On drawing, the grid snap points closest to the crosshair are hit. If the snap distance is defined once, the snap function can only be enabled or disabled with 'SNP'.

(COLSNAP=colour snapping) Clicking 'CSN' will call a menu in which snapping to the 16 colours used for ISY

# 2.0 USING THE CONTROLS

can be enabled or disabled. Even if the objects remain visible, snapping is only possible to the colours checked in the Snap menu provided the colour snapping is enabled (e.g. COLSNAP=2,4.5). If a value is set for COLSNAP, the display 'CSN' will appear in red, i.e. COLSNAP can also be used to define to which objects snapping is carried out and to which not.

	ColSnap, ColPlot, Group
	Farbe Objekt
to objects of the 4 to 16; a with the colours 1, ole.	Snap Plot       Snap Plot         1       X       X         2       X       grün         3       X       rot         1       X       X         3       X       rot         11       X       X         3       X       rot         10       X       X         4       X       gelb         12       X       X         5       X       X         6       X       x         7       X       cyan         8       X       weip         16       X       x         ColSnap       312,14         ColPlot       12,514,16         Snap       Iöschen       Snap allgs         Plot       Iöschen       Plot_alles



Snapping is possible

colours 3 to 12 and 1

selection for objects 2 and 13 is not possi

(COLPLOT=colour filter) This menu item hides or unhides objects with certain colours. For a description of the remaining details, see

Display of the active character buffer (MODEBUF=1:) and buffer switch between buffer 1 and 2 (by clicking).

(LAYER=image layer, layer technology) If a 'LAYER' has defined, the number of the active LAYER is displayed (e.g. AUTOLAYER=99). New objects will be assigned to this layer. Clicking 'LAY' will open a menu that displays all layer numbers currently used in the drawing (from 1 to 999). Layer and associated objects can be hidden or unhidden on the screen. Layers can be assigned commands, e.g. all objects of layer 1 can be coloured in blue, all objects of layer 10 can be transferred to the 2nd buffer.



#### 2.6 Emergency Cut-Offs

If program functions are called which must be **aborted earlier than scheduled**, several possibilities are provided, depending on the function concerned,:

1. The crosshair for element selection is displayed on the screen.

Abortion: Use the mouse to move the crosshair to the menu level (on the right-hand side outside the active drawing area in X) and click the left mouse button.

2. The values will be requested on the Modify input level.

Abortion: Use the key combination <STRG>+<PAUSE>; if necessary, <Enter> in addition. 3. In dialog boxes

Change drawing	irret	rievable	or 'un	do'-secur	ring ?
<u>Y</u> es		<u>N</u> o		<u>S</u> ave	1

Press either <ESC> or No to abort the function. Select Save to undo your changes

later using the function

Yes will modify your drawing elements irreversibly.

Selecting  $\underline{Y}$  es will call the file menu for saving. Then you will be asked whether you want to quit the program finally.

## 2.7 The coordinate range

Initially after calling the ISY program (with PICTURES), the left lower corner has the coordinates X0, Y0 and the right upper corner X639, Y511 (within the active drawing area in X/Y). No unit of measurement is defined. Thus, it is unimportant to the program whether the drawing is made in mm. inch, or km. However, the coordinate conversion to the machine is always made 1:1. The dimension have also to be entered in mm if the machine is configured for mm. At the machine, the processing of the geometry program (\* NCP) is made in the 1/1000 notation. The conversion of mm to the 1/1000 notation is automatically performed by the post-processor. However, perform the drawing in ISY in mm. Thereby, the drawing area is not limited in any-direction. However, draw also at the location where the homing point is to be set at the milling machine. During the design, the homing point is also respectively to be defined in the center of the workpiece if a rectangle or a circle should be processed. If drawings are imported, e.g. in the DXF or HPGL format then these geometries can be offset in the coordinate source (0.0) to mill these subsequently. Geometries can be scaled to achieve the desired result if they are not designed using a scale (mostly by importing). Use this icon if the current screen section should be offset. If you have loaded a drawing or if you designed your own objects then these are displayed in the maximum possible size by a short click (later called 'SC') onto the icon. Thereby, the X to Y side relationship remains preserved. In the program overview, you find additional possibilities for modifying the section in the ZOO M context menu. Or just try it by performing a long click (later called 'LC') with the left mouse button onto the ZOOM icon.

#### 2.8 Saving/loading of drawings

The screen buffer is empty if the ISY program (with PICTURES ) execution is started. Altogether, four screen buffers are available to modify your drawings. In the menu environment, the switching between 2 buffers (in CAM, also a third buffer is available) is possibly. These four text buffers can be used for editing arbitrary ASCII text (files, e. g. 'AUTOEXEC.BAT' or 'CONFIG.SYS'). The size of the files to be processed in the buffer was determined during the installation process. Load/save respectively refers to the **active buffer** (refer to: Global menu). Two different drawings can be simultaneously processed.

# 2.0 USING THE CONTROLS

# By SCing onto the

icon, the current buffer content is saved under the 'SOS.VEC' name in the active vector directory. The file with this name is repeatedly overwritten and is thus not suited for permanent saving. The active vector directory is 'C:\ISY\VECTOR'. Some example drawings (also partially containing CAM information) included by the program maker are also located in this directory. These files are ASCII transparent and have the ".VEC' file extension. The file extension is automatically assigned by ISY at the saving time to indicate the program membership and to guarantee an easier finding on the hard disk. The geometry data are vector and object-oriented. They are in an easy to understand language for direct editing. Save your work at certain intervals so that the data survive also a possible power outage. By LCing onto the File icon, the context menu contains the following additional functions that are described later in this manual.



Calls up the file manager for loading a file.



Calls up the file manager for saving a file.

All files in the vector directory are shown in the File selection menu. Thereby, the search name is automatically set to all files located in the 'C:\ISY\VECTOR\\*.\*' directory. To accelerate the file search, specify one or some initial letter(s) for the search name of the file, e.g. 'C:\ISY\VECTOR\3D\*.\*' to list all files beginning with '3D'. No distinction is made between the backslash '\' and the slash '/' for the DOS access path of files if you work with the 'ISY' program. In our menu mask, you see that ISY was installed on drive 'D:'. Select a file so that this is displayed in red. Confirm the selection with OK to load it into the active buffer.

	_							
			Fil	le Select	ion			
	1	File <u>n</u> ame						
		C:/ISY/VECTOF	{/*.* <mark></mark>				<u> </u>	
	]	<u>F</u> ile				<u>D</u> ir	ectory	_
Current file name for load		3DL IB-4. VEC 3DL IB-5. VEC 3DL IB-6. VEC 3DL IB-7. VEC 3DL IB-8. VEC 3DROB. VEC 3DROBH. VEC 4ZACK. VEC 44LEER. VEC	4341 : 4341 : 4341 : 4341 : 4341 : 15418 : 65612 : 107039 : 10244 : 6580 :	26.09.98 26.09.98 26.09.98 26.09.98 26.09.98 26.09.98 17.05.90 09.08.91 09.08.91 25.11.98 17.05.90	21:24:02 21:24:48 21:25:30 21:26:24 21:26:58 17:44:50 17:31:22 17:31:48 11:16:12 16:23:06		CTURE A F EL AINING A	* *
or saving drawings.	$\rightarrow$	/ C:/CIM_DAT/PI	C/VEC/3DP	DT.VEC			<u>v</u> c	
	Í		ок		Cano	el		

The following inquiry is made if data are found in the active buffer



With Yes, the drawing data are deleted. With No, the activated file is loaded in addition to the existing drawing. Thus, there is the possibility of double object names. Assign unique names to prevent this.



OBRE-NAME OBJX 'OBRENAME.PRC' assigns unique object names. This is necessary to select objects and to change these subsequently (colorizing, resizing, stretching, deleting, or scaling). Pay attention that this procedure is only accomplished before a technology processing since milling or drilling jobs refer to objects.

obrename unique numbering of objects in the 'defbuf' buffer.



# 2.9 Exiting ISY

Before you exit the program, save your drawing to permanently store it on the hard disk.





The ISY program is exited. A safety inquiry is made before finally exiting the program if data is still present in one of the 4 text buffers.

Do you	want	to	save	buffer	1:?
	<u>Y</u> es	Ľ		No	

The file menu for the saving is called if Yes is selected. Subsequently, the following inquiry is made before finally exiting the program

Do you	really want	to exit	PICTURES	BY PC?
	<u>Y</u> es		No	

# 2.0 USING THE CONTROLS

# 2.10 The on-line help system

If there are **no characters** in the **Modify input area** present, the **help overview** can be accessed using **F1**. Thereby, commands are language elements of ISY. The commands listed there can be directly processed at the Modify input area. Several commands successively written in a file yield the approx. 600 interpreter programs (=procedures) contained in the scope of delivery. These procedures are also directly processed at the Modify input area. The help support for this function is directly displayed if a command or a procedure is entered at the Modify input area by means of keys (without confirming with <ENTER>) and pressing the F1 key. Issue the following command at the Modify input area if you would like to prepare a reference about all available procedures:

header -f

Now, all help headers of the procedures are copied into the 'C:\ISY\HEADERS.TXT' file. This process can last some minutes. Then, this file can be processed using a word processing program. It can also be printed subsequently. Thus, you get a practical reference to familiarize yourself with the quite extensive programming possibilities.

Within the ISY-CAM dialogue boxes, you access the help by moving the mouse pointer to an input field and by subsequently pressing the right mouse button.

Using the same procedure, you access the help to the buttons (refer to: program overview). The **external utility programs** are located in the 'C.\ISY\TOOLS' directory. To convert a drawing in the ISY format to DXF, the external 'V2D.EXÉ program is used. All external utility programs can be directly accessed in ISY. Change to the MAIN program part (refer to: The different program parts of ISY). Ensure that the current directory is 'C.\ISY'. The

DOS command without an addition statement shows the current directory (otherwise enter 'cd c:\isy').Subsequently, enter the external utility program followed by an '?'.

tools\d2v ? To see all external utility programs, type

dir tools\\*.exe

cd

Enter again 'tools\<name> ?' to learn more about the possibilities these utility programs offer. The integrated prompting language selection for the help is German or English. The language selection for the external programs is set using the DOS variable

set sslanguage=d for German help text or

set sslanguage=e for English help text

Enter this line in the 'autoexec.bat' file if the language selection is to be set at start of the computer.

#### 2.11 The different program parts of ISY

We got to know the Modify program part in the program overview. It used to change and check drawings.



The MAIN part corresponds to the entire textual DOS screen. However, ISY is still active. This program part is suited for accessing external utility programs, e. g. to convert a DIN-ISO NC program into the vector format.

tools\g2vec haken.nc haken.vec -0 -a Using F6 or by entering modify you are returned to the Modify plane.



The EDIT program part calls the drawing editor. Performed changes become immediately visible on the screen if the modification session is terminated using <ESC>.



The SHEET program part corresponds to a spread sheet for processing values of, e. g. measuring data. The diagram generation uses also this program part. The defined cells can be directly processed by the procedures.



If you would like to know more over the possibilities of the calculation commands call up the help overview using <F1>. Then, select 'Commands' and 'Cal calculations on the sheet'. There, select 'Functions' or 'Operators'. The fields containing the search item are shown in different color in the help mask. They can be selected using the mouse.

As an exercise example, the 'test.txt' ASCII file should be created whereby the values 'Label-1', 'Label-2', 'Label-3' a.s.o. are automatically entered into the individual cells.

```
sheet: cell a1
sheet: cal a1..a20='Label-'+(1..20)%0"
sheet: write test.txt a1..a20
```

The 'test.txt' file can be directly processed by 'Tabular labels' to automatically generate labels. 'Tabular labels' is an additional application that is charged for and can be purchased from the 'Configuration Center'.

The mathematical performance of the cal command can also be used in the assignment of variables in the parametric language part of ISY-PAR.

Z1,SIND(30) Z2,(SIND(30)+10) P1,XZ1,YZ2 refer to :cal are(<x>) sine angle in degrees

A point with the coordinates X0.5 and Y10.5 is drawn.

# 2.0 USING THE CONTROLS

# 2.12 The Individual isy Modules without the Add-on Modules



In the command area 1, buttons are called for the two-dimensional design (2D).

-three-dimensional design (3D)

-ISY CAM module for generating the milling path.

Optional package for scanning and vectoring (center line framing and outline vectoring based on frames).

ISY-PAR parametric module for the two-dimensional, parametric design of geometries.

# 3.0 PRINTING WITH PIX-PRINT UNDER ISY-CAM

#### 3.1 Requirements for Printing with PixPrint:

If you cannot use your printer or plotter satisfactorily with the standard printing (plotting) functions (see Seminar, Example 7), an intelligent driver is provided by ISY-CAM, Version 2.0.

ISY-CAM and the PixPrint printer driver program must be installed (under DOS prompt, e.g. with d:first or d:\pixinst ). Among others, the following files must exist:

in PRCPATH (/procs): or ISY main directory: PIXPRINT.PRC and PPP####.PRC PROFILE.PPP and PLT#.PPP (#=1,2,3,4)

#### Function:



The PixPrint menu is called from ISY CAM with a long click (LC) on the **PixPrint** button; this will enable the drawing displayed on the screen to be plotted true-to-scale. A quick click (QC) will call **PixPrint.exe**; this can be used, e.g. to make the standard settings for the output device (pixprint: **std**).

From a menu, four different printers can be selected, depending on the specification contained in the file PLT1-4.PPP (e.g.: A4 or A3, 180 or 360 dpi, different line widths: => wthtable ... etc.); furthermore, Portrait or Landscape formats can be chosen.

# 3.2 Standard Settings / Changing the Output Device:

After PixPrint has been started (quick click on the PixPrint button or calling the command PIXPRINT.EXE), the output for a device can be configured using the PixPrint command **std**. Saving the output device as "Standard" will create the PixPrint initialisation file (PROFILE.PPP) in the main directory, which contains all important settings for the printer selected (Edit with **proc profile.ppp**)

**Note:** If the error message "std: Error saving profile.ppp" occurs when saving these settings for the standard printer, this may be caused by a memory problem. In this case start PIXPRINT.EXE directly under DOS from the isy – CAM main directory and try again.

# 3.3 Different Line Strengths:

To achieve different line strengths, the drawing colours can be assigned individual line widths using the variable **WTHTABLE**. In the configuration files PLT1.PPP, PLT2.PPP, PLT3.PPP or PLT4.PPP, the variable WTHTABLE, for example, can be used to define different line widths for the individual output devices.

# 3.0 PRINTING WITH PIX-PRINT UNDER ISY-CAM

#### Examples:

wthtable=1x,3x,4x.. (Colours 1 and 2 -> 1 pixel width, colours 3 and 4 -> 3 pixel widths, from colour 5 up -> 4 pixel widths) wthtable=0.1,0.1,0.15,0.2,0.25,0.3,0.1.. (Colours 1 and 2 -> 0.1mm, colour 3 -> 0.15mm, colour 4 -> 0.2mm, colour 5 -> 0.25 mm, colour 6 -> 0.3mm, from colour 7 up -> 0.1mm) wthtable=2mm.. (all colours: 2mm line width)

# 3.4 Different Paper Formats (A4 / A3):

The assignment of the paper formats to the four PixPrint output devices is also possible using the variables (contained in the PLT#.PPP files):

plength={paper length},{margin}
pwidth={paper width},{margin}

"Paper end" (if necessary cutting off the paper) after a given paper length can be enforced using the variable PCONTROL1:

"pcontrol1=len 290mm"

## 3.5 Building Up PLT1.PPP Using an Example:

The values to be entered can be accepted from the PROFILE.PPP when installing a printer with **std** under PixPrint. For example, it is possible to specify the same printer with 360 dpi (or slower) in the PLT1.PPP or with 180 dpi in the PLT2.PPP. Or the same printer can also be used either as an A4 or A3 output device, as a colour or black/white printer. Just as well, line widths can be assigned in an individual manner.

PLT1.PPP 1st line: plength=280,4 2nd line:pwidth=205,5 3rd line:dv NEC-360 4th line: wthtable=1x,1x,6x,1x,1x.. Last line: \$1 [paper length, margin] [paper width, margin] [output device acc. to **std**] [e.g. line widths] [Important: must always be specified !]



# 3.0 PRINTING WITH PIX-PRINT UNDER ISY-CAM

The border displayed indicates the printing format for the printer specified by key operation (PLT1 or PLT2 or PLT3 or PLT3) (Portrait or Landscape) whereby the border itself will not be printed. The inside of the border will be printed if the key "PixPr" is pressed; i.e. it is essential to move or scale the drawing with reference to the border such that the desired section is printed.

**Note:** If you wish to print 3D drawings, the drawing must first be converted to 2D format in any view.

(Otherwise, the error message: *plot: bad internal command (t2)* is displayed.)

- Use the View function to position the drawing in 3D space as required.
- Select the appropriate drawing elements (in some spaces, it is recommended to create MACROS first).
- Convert the drawing from 3D to 2D. The max. tolerance may not exceed 0.1.
- If desired save the drawing under a **different** name in order not to overwrite the original file.
- Print

The section can be moved as desired by picking off two points (PAN). The assignment to the relevant dimensions for true-to-scale output is carried out by picking off the dimensions from two points in the drawing whereby the distance is entered either numerically or by direct scale specification (is only recommended if u=1 mm). The drawing is always scaled with reference to the centre and can be moved as desired using "PAN".



Switching to the text menu environment is possible.

Selecting the menu item PRINT will print the cut-out displayed to the selected output device.

=> Click the EXIT button (text menu: "G0: Exit") to quit the menu !

#### 3.6 Recommended Drivers for Various Printer Types

#### Standard printer drivers

The printer driver LQ-2550-C-360 should always be tested as the first driver (as already described in the PIXPRINT installation), since this driver supports the EPSON format and new device types normally understand this EPSON format.

If you nonetheless have no result, install one of the printer drivers listed in the following.

This is described in the Section "Special Installation Notes" / "Reconfiguring PixPrint".

# 3.0 PRINTING WITH PIX-PRINT UNDER ISY-CAM

#### Drivers for inkjet printers

It is recommended to test the inkjet printer BJ - 130 - 360 (CANON driver ), since this printer also supports colour output.

#### **Drivers for Hewlett Packard printers**

For Hewlett Packard printers, the following HP drivers should be tested: DJET -300 for black/white output DJET -C - 300 for colour printing

#### **Drivers for LaserJet printers**

For LaserJet printers, the HP driver L JET - 300 should be tested.

To achieve the fastest test of the function of the "Printer driver installed as the standard driver" under isy-CAM, proceed as follows:

- Start isy CAM.
- Load a 2D drawing.
- Long mouse click on the Plot button in the upper menu bar.
- Long mouse click on the PixPrint button in the pull-down menu.
- Click the PixPr button in the right page menu.

The output of the printing process will be displayed.

If the printer driver now operates successfully, you can make the individual fine settings for this standard printer installed ( colour, bw / wb, line strengths, sizes etc.).

You can make four different standard settings for the standard printer installed and save them in the configuration files PLT1.PPP, PLT2.PPP, PLT3.PPP and PLT4.PPP. (see Section "Printing with PixPrint under isy – CAM" in the Description:

"Standard Settings / Changing the Output Device"

#### 4.1 Scanning Prerequisites:

Isy-CAD/CAM provides a direct software interface for EPSON scanners (GT series with EPSON parallel or SCSII interface) in DOS mode, i.e. you can scan directly from isy–CAD/CAM without additional software. To achieve this, however, the parameter file ESCAN.ESP must be matched with the particular hardware (see below).

If you have a scanner software and hardware other than specified above, it is merely necessary that your hardware and software can generate black/white TIF files (B/W-TIF) with an appropriate resolution (e.g. >300 dpi). The scan result should be stored in a file TEST.TIF in the isy main directory. It is thus possible that the vectorisation (TIF2VEC.EXE, PIXEL.PRC) may access it. If you run isy–CAD/CAM in a Windows 95/98 environment, virtually every scanner (e.g., via TWAIN) can be used. It is even possible to start an external scan program directly from isy–CAD/CAM if the relevant command call is assigned the variable SCANPROGRAM=... (see below).

You activate the menus by opening the module bar with a long click.



You will get to the menu environment for scanning, vectorisation and post-processing by opening the module bar with a long click and then clicking on the icon "Scan and Vectorise".

The menu environment shown below will appear. It grants access to all important functions.



# 4.0 SCANNING AND VECTORISATION UNDER ISY-CAM

## 4.2 Brief Overview: Scanning, Vectorisation, Post-Processing:



"PIXEL" will switch to the bitmap menu. "TIFF-VEC" will activate vectorisation. "CLEAN" is used to enhance lines (to smooth them and clear them from burrs). "SMP" provides smoothing functions. "MANIPUL" provides the most important smoothing functions. "SPLIT-TRIM" provides splitting and trimming functions. Object structures can be modified using "STRU". New drawing objects can be generated using "NEW" whereas "PROOF" provides the most important measuring functions.



"CAM" can be used to switch to the CAM module, "2D" grants access to general 2D drawing. The button "BLEND. ALT. BUF" can be used to display a drawing stored in the alternative buffer (e.g. lay the drawing from buffer 2 over the drawing from buffer 1). "COPY" copies the active object into the alternative buffer. "FILE" opens a menu for file handling.

If you click "PIXEL" in the upper button area, the bitmap picture handling bar appears.



The buttons assigned to the functions will be described further below separately.



This button will start the scan operation provided the correct configuration has been selected first (see below).

# 4.3 Scanning

# 4.3.1 SCANNING with EPSON:

Scanning with EPSON scanners requires that first on side of the hardware an EPSON scanner (GT series) is installed correctly and that on side of the software the parameters in the file ESCAN.ESP have been matched with the particular conditions (see below).

After clicking the button, a prescan will be carried out on the screen. Use either the cursor arrow keys (right, left up, down), the mouse or the digitiser to move the crosshair in order to define a window cut-out to be scanned. The PgUp and PgDn keys can be used to double or half the cursor step interval for mouse operation. Use ESC, F1 or M1 (of the left mouse button or of the digitiser button 1) to fix the left point of a window section. The window cut-out arising as a result of the cursor movement is scanned once more by pressing ESC, F1 or M1 again and is thus displayed on the screen in its enlarged form. If you, however, acknowledge the second window point using the ENTER key or M2 (the right mouse button or digitiser button 2) during the prescan, the selected window cut-out will be scanned using the set parameters without displaying the scanned image cut-out and without zooming the image; it will then be stored in the file you have specified. That means that the ENTER key of M2 key is generally used to start the final scanning process for the selected cut-out to the entire image cut-out by mistake, which you do not want to scan, you can reset the selected cut-out to the entire image using the function key F6. You may also use the function key F6 to quit the SCAN program without creating a scan file.

#### 4.3.2 Scanning Using any SCAN Programs:

If you want to start an external scan program simply by clicking the scanner button, the variable SCANPROGRAM must be assigned an appropriate direct call. This can be done either under DOS or under WIN95/98. The simplest way is to insert an appropriate sequence in the procedure PIXEL.PRC. Today both scanning hardware and software are offered at extremely good prices, and nearly all can programs generate black/white TIF files as required for vectorisation. For example, a typical assignment to the variable SCANPROGRAM for a scan program could be:

#### set "SCANPROGRAM=C:\IPPLUS\IPPLUS.EXE"

The program used in our example is called IPPLUS.EXE and is to be found on drive C: in the directory IPPLUS. If now after the assignment of the variable the scanner button is pressed, the scanning program is started.

It is out of question that under Windows the program is only loaded the first time and will then be activated from the taskbar (since it already runs in the background and would otherwise be loaded several times). Inter alias, it should be mentioned that the scan function under isy–CAD/CAM is not extremely important. Only the vectorisation is important. To make use of it, a black/white TIF file (e.g. TEST.TIF) providing an appropriate resolution must be available in the isy directory. Of course, it is not absolutely necessary to scan such a file under isy-CAD/CAM; you may also import these data from a diskette.



This button is only needed for scanning with EPSON scanners. The function is intended for editing the parameter file EPSON.ESP and matching it to the particular conditions.

# 4.3.3 EPSON Parameter File (ESCAN.ESP):

To you use an EPSON scanner with an EPSON standard interface (serial, parallel or SCSI), press the button "EPSON-PARAM" and edit the ASCII file. All parameters are described in clear text. Each line of this files, which does not start with ": "" (colon + space), will be interpreted together with the corresponding key word, the assignment (equality sign) and the parameter value. Capitalisation or small letters do not have any influence. Prior to calling ESCAN.EXE for the first time (e.g. by clicking on the SCANNER button), you should in any case check whether the correct interface (port), the correct brightness, the desired colour or greyscale mode (colours and bits) are selected. Furthermore, make sure that the correct display driver (VGA / EGA) and the pointing device used together with the keyboard (MOUSE) is specified (see below). Please make sure that no errors occur in the specifications you make since this will result in errors in the functions.

A typical extract from the file ESCAN.ESP used for the configuration of the device interface may have the following appearance:

: Standard interface : Port = SCSI2:D000 Port = SCSI5:ASPI : Port = LPT2 : Port = COM1:19200,n,8,2 : Permissible entries are LPT#:<type> : or COM#:<baud>,<par>,<bits>,<stop> : or SCSI#:ASPI[<adapter>] : or SCSI#:ASPI[<adapter>] : or SCSI#:seg> : <type> is the type of the parallel interface. Possible entries: : EPSON: Bi-directional parallel interface of EPSON : TOSHIBA: TOSHIBA laptop : PS30: IBM PS/2 with ISA bus

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- : PS2: IBM PS/2 with MCA bus
- : 16552: Serial / parallel module 16552
- : The '#' entry following SCSI is the set target ID of the
- : scanner (0...7). <adapter> is the number (counted from 1)
- : of the ASPI-SCSI adapter if several adapters are installed.
- : <seg> is the memory segment set for the <code>EPSON/NCR-SCSI</code> adapter
- : in the hexadecimal notation.
- : The interface entry must be the first entry in the file. It may
- : not be overwritten by a direct parameter.

In the case above the SCSI interface is configured with the address 5 and ASPI. If you use a configuration other than specified there, put the respective port assignment to the beginning of the line and deactivate any other port assignments by ": " (colon + space).

You should always select VGA mode for the display driver (not Ansi). This corresponds to the following:

- : The EGA entry defines the display mode and the resolution
- : Normal VGA
- : EGA = 18,640,480
- : Entry for EGA:
- : EGA = 16,640,350
- : Any additional entries for a DRV driver are possible, e.g.:
- EGA = 18,640,480,C:\ISY\OVERLAYS\PICVGA.DRV
- : Specification for Hercules (with PICHERC.DRV):
- : EGA = 6,720,348,C:\ISY\OVERLAYS\PICHERC.DRV

# Since usually the mouse is used as a pointing device, the configuration should be as follows:

- : The MOUSE entry defines the pointing device.
- : The left mouse button (#1) corresponds to <RETURN> for the second corner;
- : all the remaining keys correspond to <ESC>.
- : Clicking any other key than the left one when selecting the left
- : corner, will accept the area displayed on the screen.
- : Microsoft Mouse
- MOUSE = 90,6390,4790
- : Summasketch digitiser MM 961 (coml)
- : MOUSE = 8,3200,2400
- : Summasketch digitiser MM 961 (com2)
- : MOUSE = 9,3200,2400

## Further typical parameter setting could be:

: No compression Compression = None

: The number of rows in the TIFF file per index entry : must be one for TSHOW -z ROWS = 1  $\,$ 

: Adaptation of brightness: : Brightness (-3 dark, 3 bright) Brightness = -3

: Standard halftone method Halftone = None

: Scan resolution: Resolution = 600

: Zoom value: Zoom = 100

```
: Bits per colour
Bits = 1
```

: Colour selection: Colors = Monochrome

It is taken for granted that brightness and resolution must be matched with the corresponding pattern. The following simple rules apply:

The smaller the pattern is and the higher the edge sharpness, the higher should be the resolution, and the lower the contrast (brighter) of an image to be scanned is, the lower should be the value for the brightness.

# 4.4 Working with Bitmap Files

#### 4.4.1 Bitmap Handling:

Since for vectorisation under isy–CAD/CAM black/white TIF files are needed, the menu provides some functions to check the bitmap files (pixel data). The TIF file format has been continuously further developed during the last few years so that, e.g. very different data compression algorithms are used. The buttons listed below can be used to check the bitmap files and to convert them such (if necessary) that they can be used for vectorisation.



TIFF

ROM

The b/w TIF file will be copied and uncompressed.

To enlarge pixel image details from TIF files under isy-CAD/CAM (TSHOW.PRC -z) using the zoom function, the TIF files must meet the following requirements: The number of lines in the TIFF file per index entry must be 1 (cf. in ESCAN.ESP ROWS = 1)

TIFF

Select this button to call the bitmap information on the selected TIF file.

For example, if you select the isy-CAM example file LEO.TIF in the VECTOR subdirectory by clicking the TIFF-INFO button, the following information is displayed:

```
cb: copy bitmaps with conversion - Rev. 1.2
Copyright by Schott Systeme GmbH 1989
```

Bitmap:	vector\leo.tif
Length:	80530 bytes
Format:	II TIFF CCITT compression
Width:	2128 pixels (90.09mm)
Height:	1359 pixels (57.53mm)
Pixel:	0.042mm x 0.042mm (600dpi x 600dpi)
Strips:	1 row(s)
Orientation:	1
FillOrder:	1
Planes: 1 (1 z	< 1)

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Please note that it is a b/w (black/white) TIF file (Planes: 1) with a resolution of 600 dpi. It is compressed to the CCITT standard and row-oriented, i.e. "zoombar" (Strips: 1 row). We will use this file later for vectorisation (see below).



These three buttons can be used to view TIF files under isy-CAD/CAM on the screen

If you click the left button you can view virtually all types of TIF files (also Colour Shading images etc.). If first the vectorisation has been used and the result has been loaded as a VEC image, TIF and VEC images will be displayed such that they cascade. The two right buttons can only be used if the TIF file is row-oriented. If necessary it must first be reformatted (cf. button "TIFF-ROW"). Furthermore, in any case the image selected with "TIFF-SHOW" or "TIFF-INFO" is displayed (no separate file selection). That means if any error messages occur if you press the two right buttons, the TIF file cannot be zoomed (Strps: 1 row). The button in the middle ("TIFF-ZOOM") can be used to display certain sections of a (row-oriented) TIF file already selected and displayed in its enlarged form by zooming. For example, this is useful if you want to draw (vector) lines on a TIF image displayed. The right button ("TIFF-DRAW") is used whenever vector and pixel graphics cascade. If you now modify, e.g. the zoom sector or if you start to build up a new image (redraw), the TIF image will disappear from the screen. To display it once more as a scaled image, use "TIFF-DRAW".



This button is intended to invert (and copy) b/w TIF files. The corresponding negative image of the original file will be created.

Note:

If you use any graphics settings for isy-CAD/CAM, which does not provide at least 64 colours (e.g. VGA), the display of the TIF image (using TSHOW) will switch the colour palette to grayscale. This will modify all screen colours. The resetting is carried out by clicking on the button "STD.-PAL." (standard palette).

## 4.4.2 Practical Handling of the Bitmap Functions:

Now you can test the functions listed above in practice. Activate the menu for scanning, vectorisation and post-processing via the module bar. For example, the button "TIFF-INFO" will grant you access to the file selection menu. In this menu, use the scrollbar to browse down the names alphabetically listed in the List tab and click "VECTOR". The example file LEO.TIF contained in the subdirectory VECTOR will appear. If you select this file with the mouse (what can be seen by that file name appears in red) and then press "OK" to confirm, the information on this TIF file will be displayed on the screen in the form as already described above.

If you click the button "TIFF-SHOW", the file LEO.TIF can also be displayed on the screen using the file selection menu. Any vector images already stored in the active buffer will also be displayed. It is thus possible to cascade pixel and vector images of the same scaling (hybrid display). Within a pixel image, you may zoom details using "TIFF-ZOOM" or (after modifying the zoom section) using "TIFF-DRAW".

If you use the conversion buttons "TIFF-DECOMPR.", "TIFF-ROW" or "TIF-NEGATIV", in every case first a temporary file TEMP.TIF (to be found in the isy main directory) is generated. If this file already exists, either confirm that you want to overwrite the file or specify an alternative name for this file. Generally, the names of source and destination files must be different when the file is copied.

## 4.5. Vectorisation of Patterns Using a Raster Image (B/W TIF-File):

# 4.5.1 Introduction:

Since isy-CAD/CAM, version 2.0, this important add-on program has been part of the standard extent of supply. It is useful for the following tasks:

Loading of drawings into the CAD system

Digitising and measuring of complex patterns (e.g. maps, technical drawings)

Importing of scripts, sketches, logos, symbols and signets

Why is it so important to convert raster scan images to vectors ? The answer to this question is quite easy: Because all CAD programs, plotters, CNC machines etc. operate line-oriented, i.e. on a vector basis. Let's try to explain the difference between raster and vector images using a simple example.

Supposed we want to modify, e.g. move a straight line as a typical representative of a raster image within a mosaic image. In this way you will have to move all mosaic stones (pixels) describing the line separately. This requires a great deal of work, in particular, if the image consists of many, especially small mosaic stones, thus possessing a high resolution. Just as the mosaic, the scanned image also consists of many, many points that are independent of each other. For example, if these dots would constitute a line you could say: Every dot of the line neither knows that it is a part of the line, nor it knows its immediate adjacent dot on the line.

Vector-oriented CAD programs operate differently than pixel-oriented drawing programs. In a vector system, merely an imaging rule for the geometry to be described is stored. For example, a straight line is only defined by its start and end points. This means if you want to modify a line in a vector drawings, only start and end points must be moved. Then the system will automatically calculate all intermediate points for pixel-oriented output devices (e.g. screen, needle printer etc.). Simply speaking, it would mean:

The CAD system knows where the points are and how many points constitute a line.

It is therefore quite easy to understood that modifications in a vector drawing system can be made easier than in a raster-oriented system.

Furthermore, vector system provide a considerably higher resolution that the conventionally output media. This means that on peripheral devices, the maximum pixel density must be used. Moreover, the number of points to be managed for drawings created on a vector basis is considerably smaller than with pixel-oriented systems. Generally, this has positive effects for the required memory space.

In addition, vector character and CAD program operate object-based. This means, for example, that even complicated line characteristics can be addressed in total (e.g. deleted, coloured, moved etc.).

Through the above mentioned advantages, virtually all high-class CAD systems operate on a vector basis, similar to plotters or CNC machines (i.e. line-oriented); this also applies to isy-CAD/CAM.

## 4.5.2 Principle of Raster-Vector Conversion:

When pixel images are converted to vector images, the provided program module can be used to choose between two vectorisation methods – on the one hand, the contouring vectorisation mode, and on the other hand, the line-reducing vectorisation (thinning, line thinning). Where are the main differences? Let's take a simple, wide line as an example. After scanning, many individual pixels (depending on the scanner resolution) result, which are located very close another to one. The width of the line is thus represented by a row of pixels (dots).

# 4.0 SCANNING AND VECTORISATION UNDER ISY-CAM

The vectorisation may, on the one hand, start such that all pixels are traced along the bright/dark border until the line contour is closed. Because of the finite line width, this contour constitutes a closed rectangle with (ideally) 4 corner points. This method is called contouring vectorisation.

The other method of vectorisation generates a 2-point line running (ideally) in parallel in the middle of the outer contours of the rectangle provided the distance of the parallel is less than the selected line width. This method is called vectorisation with line reduction or thinning.

Whereas the contouring vectorisation is suited, e.g. for the hatching, cutting or double-milling of signets, logos or symbols etc., the vectorisation with line reduction is used mainly for technical drawings, documentation or engraving.

In case of the software module used here, depending on the particular application, either of the two vectorisation methods can be chosen or the two can be combined.

Naturally, first of all the following general rules applies to scanning and vectorisation:

No drawing will be better than its pattern.

Post-processing using a CAD program is therefore desirable or even necessary. Isy-CAD/CAM provides sophisticated deleting, smoothing, bending and trimming facilities so that even bad originals can be improved decisively.

# 4.5.3 Vectorisation Practice:

Now let's test the vectorisation using the provided file LEO.TIF as an example. Click "TIFF-VEC" in the top right button bar. You will see the file selection menu that you already know. Use the scrollbar to browse through the names sorted in the List by alphabet and click "VECTOR". The example file LEO.TIF will appear in the VECTOR directory.



modify:toolbar@TimeOut "pixel@Standard" "pixel@Standard"

If you select this file with the mouse (if the file is selected it appears in red) and click OK to confirm, a beep tone will sound, and the following message will appear:

c:/1		VLEO.VEC exi	ists, overwrite?
	<u>Y</u> es	No	<u>C</u> ance l

The file LEO.VEC already exists in the subdirectory "VECTOR" and should therefore under no circumstances be overwritten. This is the example drawing (cleared from burrs) with CAM definition blocks provided by isy-CAD/CAM. You should therefore in any case click "No". A selection menu to choose from will appear again. Type the desired file name in the bottom line (in this case: TEST.VEC) and click OK to confirm.

# **4.0 SCANNING AND VECTORISATION UNDER ISY-CAM**



modify:toolbar@TimeOut "save sos -p" "call DDown d file"

If this file name also already exists, the warning will be displayed again and you can decide whether you want to overwrite the file or save it under a different name. If you finally have acknowledged the desired file name without conflicts with "OK", you will be asked whether you want to carry out contouring vectorisation or not.



Click "Yes" to confirm; this will start the vectorisation. While the TIFTOVEC program is running, the current program steps are displayed on the screen as texts.

tiftovec: Converting a TIFF file to a PICTURES BY PC VEC file Rev. 1.3 - Copyright by Schott Systeme GmbH 1989 - 1991 Series number: 012345

Lines	Contours	Output
Total   Done	Sim.   Running  Dots   Obj	.   Open  Vect.
00:04   1359	1359   51  0  15763  47	6 0 7125

Processing time, number of pixel lines, number of the pixel lines already processed, as well as the number of contours created (objects) and vectors with their current states are displayed. Finally, the destination file (here: TEST.VEC) will be loaded into the current buffer (here 1: ) and be displayed.



You probably see that it would not make sense to draw such a drawing (the heraldic arms of the Land Bavaria) manually. In the display above, in addition to the vector image (green contours) the pixel image (LEO.TIF) is displayed with the same scaling using "TIFF-SHOW". If you now zoom out certain details (if desired or necessary several times) using "TIFF-ZOOM", you can easily see the limits of the pixel resolution what naturally also has negative effects on the quality of the vector image. Please note that the original image arises from a newspaper cut-out of only approx. 90 x 60 mm and has been scanned at 600 dpi.

In the vector image, one GDU (Graphical Display Unit ) corresponds to the size of a pixel. If you compare the measured values of the file LEO.TIF using "TIFF-INFO", the image must be scaled using the factor 25.4/600=0.042333 in order to correspond to the original size in millimetres. Later we will go into details of processing vectorised drawings.

In this place it would be important to go into another vectorisation method. First switch to the second buffer (modbuf=2:;defbuf=2: ). This is done by clicking the upper right button in the status bar (now marked with 1).



# **4.0 SCANNING AND VECTORISATION UNDER ISY-CAM**

Then proceed as described above. Click the button "TIFF-VEC" and select the source file LEO.TIF (in the subdirectory VECTOR). Do all actions until the question

Vectorize contours ?						
<u>Y</u> es	<u>N</u> o	<u>C</u> ancel				

in the same manner as you did before. But now answer the question whether you want to use contouring vectorisation with "No". In the Info line the question will appear:

Line width in pixels <20>

You may acknowledge the default value 20 with <ENTER>. This means that virtually all lines of a width of 20 pixels (in our example: approx. 0.9 mm) would be reduced to the centre line, and lines that have a larger pixel width would remain as double lines.

After the start, the vectorisation passes two stages; the first one corresponds to the contouring vectorisation, and the second one is intended for the generation of the centre lines (CLINES.EXE). This means that the last one must analyse all contour lines to the criterion entered above. This process may take a while. At the end of this process consisting of two stages the drawing will be loaded into the current buffer (now: 2:) (see below).



modify:

As you see, a two-colour image results. The red lines are centre lines, whereas the yellow lines are not reduced, i.e. wider than the line width criterion. Naturally, the image LEO.TIF is not an extremely good example to illustrate the representation of a line. Nevertheless, you may recognise by the lozenge pattern that the transition from centre to double lines is determined by this limit value. Of course, lines created in a drawing with thinning vectorisation are no longer closed curves, and lines crossing in the original drawing have a small gap at their cross point.

In most cases, the contouring vectorisation is used for milling (pocket milling), whereas for the engraving of thin lines the thinning method is used. Both vectorisation methods can be processed without due problems using the appropriate manipulation functions (see below), and if necessary it is even possible to apply them together. In this point, for example, you can make yourself clear the differences between the two vectorisation methods once more if you click the button "BLEND-ALT.BUF"



Click and cascade the lines of buffer 2 with the contours of buffer 1. Use CLS or REDRAW to return to single (uncascaded) display.



# 4.0 SCANNING AND VECTORISATION UNDER ISY-CAM

#### 4.6 Post-Processing

## 4.6.1 Post-Processing of Vectorised Drawings:

The Section above has explained how to handle the vectorisation. The quality of such a drawing vectorised decisively depends on the image to be scanned. The following example orients towards a vectorisation drawing obtained from LEO.TIF. Let's start with the contourised drawing. In the previous example the vectorised drawing was maintained in buffer 1.

Now let's save it by adding the following line to the "modify" line:

save test1

If the drawing is no longer available, vectorise the drawing once more as described above.

Generally, it is recommended to use a contourised drawing for (pocket) milling; however, that means that all contours must be closed, i.e. that they do not have gaps and that no single or double lines exist. Irrespectively, any graphical cleaning, smoothing, aligning or scaling operations may only be carried out such that only closed contours result.

If you have a look at the drawing just vectorised, you will see a large number of smallest contours that result from impurities of the pattern. First you should remove the contours that in the calculation of the milling contours would result in conflicts (double lines, see below).

Such faulty contours are to be found in the drawing, e.g. in the image section shown below. If you extremely zoom out any of these contours, you will see that it seems to be only one line (even this seems to result in conflicts). In reality, it is a closed contour whose lines coincide (collinear lines).



You may see it in the editor, e.g. using the function



and select this contour deviating in such a way (line). Use ESC to quit editing.

It is taken for granted that isy-CAD/CAM will clean such faulty contours automatically. The appropriate button combination is as follows:



After the activation, the complete drawing will be filtered in order to remove the faulty 3D contours as shown above. In principle, the remaining contours could already be milled. However, the optical cleaning is still missing. Any impurities and unnecessary objects, such as the labelling and bordering residues, can be removed using multiple deletion. The post-processing by data reduction and smoothing, however, is even more complicated or, rather: richer in variants. First some simple examples will be put in front of it as a preliminary exercise, and then the learned knowledge will be applied using a current drawing.

Switch to the second buffer, clear the buffer (e.g. with "New") and reset the zoom to standard view (e.g. with "zoom="). Now draw the following figures calling the sketch function three times (e.g. with "sketch \* ") utilising the full drawing area:



In this case it is desired that the curves show clear burrs, as shown here. Nevertheless, it can be seen that the uppermost (green) line is a straight line, the central (red) a jagged polygon and the bottom figure a sinusoidal (blue) curve. Save the drawing with the name 'TEST1.VEC', for example. The fastest way to save it is to enter the command:

# 4.0 SCANNING AND VECTORISATION UNDER ISY-CAM

#### save test1

In order to achieve "good" curves from the sketches above, they should be smoothed. This term, however, is not defined very exactly. What is needed here is not a smoothing function but a dot compensation function. We can prove it very easily. Simply enter the command



and select, e.g. the uppermost, "straight" curve. Now, all polygon points will be marked. If you apply the smoothing command

smp \* -d 0.01

to the same curve, enforce a re-establishment of the image (cls, redraw or 2nd mouse button) and then use



again, you will see that the smoothing has taken place (considerably more dots have been created), but the effect was not as expected. Although the curve is smoother, a dot compensation has not taken place. What is really needed is rather a dot reduction. If you click the button "CLEAN", some variants will be offered:

Let's have look at the easiest variant first. To reduce separate "straight" lines consisting of many polygon dots to min. 2 dots, use the following button in the CLEAN menu:

If you apply this function (pred "" –a 100) to the "straight line" and the "jagged polygon" in our example, our problem will be solved to a large degree, i.e. many dots will be reduced to a few dots (min. 2 per straight line). If there are nonetheless slight deviations, the function may be used once more if it seems necessary, or various dots can be moved manually.

If you try to use the same function as mentioned above to reduce the sinusoidal curve, it will naturally not end in a good result. For this case, you should rather use the following function:



If you will be prompted to "Enter the minimum pixel distance <20>", simply press <Enter> to confirm and select the lowest curve. The number of dots will be considerably reduced. Use the Undo command to undo the process and to repeat it with modified values if you wish to. To check use MARKPNT.PRC (see above). This reduction function is intended to maintain the characteristic of the curve to a large degree so that, for example, a continuous bending is achieved by moving some dots. In the example above, good results can be achieved using dot distances of 20 to 30. Then you can smooth the few dots remained by calling the smoothing menu as follows:



Here you will find an appropriate solution to solve your problem (PBEZ.PRC). Click "POLY BZ" →, specify approx. 10 for the dot deviation (difference value) and as the limit value approx. 60 (overshot). A new curve will result, which is considerably smoother. In contrast to the original, this curve additionally has the advantage that it is a Bezier curve that can interactively be bent (see below MVP.PRC (move-points)). Please note that the smoothing curve is always a duplicate. For the next little exercise, however, we should save the new (red-green) Bezier curve and delete the original (e.g. with "mdel"). Now we want to use the remaining geometries to exercise moving dots and bending Bezier curves. The function (MVP.PRC)

provides a flexible tool. Click the button; you will be prompted to select the object you want to modify (only straight lines, polygons or Beziers). In the simplest case, select the upper "straight line". After the selection. the polygon dots will be marked. Now position the crosshair in the snapping area of a corner point and hold down the left mouse button: the straight line segment will follow the movement of your mouse. If you have reached the desired end position, release the mouse button. Now you can acquire another dot of the same object and also modify its position. Use POLYEND (F6 or click outside the drawing area) to guit the function. While the function is activated, a text menu is displayed laterally on the right-hand side, which refers to some add-on functions of MVP.PRC (but does not provide function selection). For example, the function key F8 can be used to convert a straight element to a Bezier and vice versa. Let's apply it to the second curve. After calling MVP first select the curve, and then mark its intermediate points. Other than in the previous example. place the crosshair in the middle of a straight line without clicking the mouse. In the opposite, press the function key F8, and the straight line will be highlighted on its ends. Now place the crosshair on the inner end (showing to the middle) of a line marked in yellow/red, hold down the left mouse button and "bring along" the Bezier tangent by moving it with the mouse. You will see the curve bend, and will also see that the bending is determined by the tangent end point. Release the mouse button in the desired position and complete the function using POLYEND (F6). You can also reconvert such a Bezier curve to a straight line if you press F8 again while placing the crosshair on the curve.

In our example, we will apply the MVP function to the lower curve that is already a Bezier curve. Select as usual and place the crosshair on a place where curve and (internal) Bezier tangents coincide in a point. Hold down the left mouse button and drag the curve in this segment to the desired position. For example, if you select a point on a tangent and drag it away, a bend in the curve will result. You can compensate this bend if you position the crosshair on the end of the tangent of the corresponding (bordering on the bend) Bezier curve and press the function key F10 (or the right mouse button (M2)). The bend will disappear, since the two tangent directions will be matched another to one.

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MVP.PRC also allows to insert an additional dot into the curve (F9) or to modify the ZOOM section using F7, e.g. to make details better visible. G0 (Shift-F10) can be used to remark the curve dots. Use F6 to quit the function (POLYEND).



After this little preliminary exercise let's return to our vectorised drawing in buffer 1 and use some smoothing examples in practice. For example, zoom out the detail shown below in the drawing. It is taken for granted that the smoothing functions can not always be applied to the entire curve. Usually, only homogenous curve pieces between two "sharp edges" are smoothed. The function PPSMOOTH.PRC is quite convenient because it is not necessary to split the curve first. This function is contained in the menu with the sequence:



If you only select a partial polygon piece on the "sharp corners", the old part will be cut and a new Bezier curve will be inserted. In this way you can post-process all curve characteristics depending on the quality requirements.

The curves inserted are Bezier curves and can therefore be very easily post-processed or bent using MVP.PRC. Naturally, the drawing also contains many straight line elements that must be treated in

a different way. Let's have a look at a typical area in the drawing in the enlarged form. If the impurities are not removed, the following image would result:



In the image section shown below you see that all straight lines need to be worked over. In particular, the triangles and lozenges are still considerably blurred. It should be noted that the straight line smoothing we know should only be used between sharp edges. Therefore we have to undo the polygons at their sharp corners first. The appropriate function is to be found in the menu with the sequence:



# 4.0 SCANNING AND VECTORISATION UNDER ISY-CAM

The polygons must be cut (undone) at all sharp corners (see below) before the straight line dots are reduced. After splitting, the function

LIN
$\overline{2}$
1.2

that we already know can be used to reduce all partial polygons undone to a "straight line" in one go. If any undesired side effects occur during this, e.g. since the line segment has not yet been undone, select "Undo" immediately after the corresponding operation. The result will be approximately the following image:



As you see we have to a large degree corrected the straight lines. It is, however, conspicuous that the bordering of the inside of the heraldic arms are missing completely. This is due to the lack of contrast in the bitmap original (see above).

Of course, you can also create new objects, instead of the old or missing objects. When doing this, you should merely make sure that all contours are closed and do not overlap, since otherwise a "milling out" of the contour results in an error.

Let's have a look at the final result in the provided example file LEO.VEC that is included in the standard extent of supply of isy-CAD/CAM and already contains milling technologies. In contrast to our drawing, this is scaled to a size of 100 x 60 mm, rotated to a minimum (aligned) and moved to a zero position. A curve smoothing (e.g. using PPSMOOTH) has not been carried out. Only in the central part of the image, heraldic arms has been corrected using simple means, and the bordering of the inside of the heraldic arms has been completed for the above mentioned reasons. In addition, the drawing has been summarised under a name (e.g. "cover all leo; box leo")



As you see quite reasonable results can be achieved in a very short time using the vectorisation and simple post-processing even if the quality of the pixel pattern was not very exciting.

Of course, isy-CAD/CAM provides a large number of further smoothing and cleaning functions suited to postprocess vectorised drawings. For a function not yet mentioned until now, please refer to the following brief overview. Please test the effect using simple examples that you have generated by yourself. If you need more information on the functions (e.g. mvp + F1 or "proc mvp"), you should also use the procedure help. The procedure names and the corresponding commands are named in the accompanying text.

## 4.6.2 Overview of Add-on Functions:

The dot reduction function (PRED.PRC) allows to specify a limit angle. This is the general function that is also used to process the "straight lines", however, with a limit angle >= 90 degrees. For standard curves, limit angles between 25 and max. 60 are suited.

The dot reduction using a constant limit angle of 30 degrees is useful for curves that are to be maintained to a large degree but have too many dots. An example would be a circle generated by many polygons using "arc \* -tp 1000". The function is to be found on the following button (PRED.PRC):



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Application of smoothing to polygon curves consisting of at least 3 points (e.g. applying the smoothing for jagged polygons using "poly \*; smp \* -d 0.05"). The result will be polygons with a higher dot density (cf. SMP.PRC), which go through the intermediate points.



Application of smoothing to polygon curves consisting of at least 3 points (e.g. applying the smoothing to jagged polygons using "poly \*; smp \* -zd 0.05"). The result will be Bezier curves going through intermediate points (cf. SMP.PRC).





Application of smoothing to polygons for straight line and/or circle segments and specification of a maximum dot deviation (REDPNTS.PRC).

CAUTION:

Due to the function REDPNTS.PRC, slight gaps may occur between the individual geometry elements. The function is therefore rather suited for drawing sketches than for contours.

Note:

If you instead of the contourised, vectorised drawing use the line-reduced drawing, the required postprocessing is generally easier, since the lines and curves are already undone, i.e. standing alone. In this case, the professional can enforce smoothing for certain geometry groups in one go using a multiple command (SCMMD.PRC). Such a typical command could be, for example:

scmmd "pred \* -a 25"

For this command, both crosshair and window selection are admissible (dot reduction with limit angle 25).

In conjunction with the smoothing, it should be noted that it is under certain circumstances easier (in particular, in case of a bad pattern quality) to redraw certain areas of the curve(s) using the appropriate function and by selecting appropriate dots. Important note: Always use a new colour for redrawing. Some important menu functions can be called, e.g. using the following menu sequence:





automatically).

"Poly" is intended to redraw straight line contours (e.g. jagged polygons). Select relevant intermediate points

# 5.0 POSTSCRIPT FONT CONVERSION

#### 5.1 Using Postscript Fonts with isy-CAD/CAM

Isy-CAD/CAM provides approximately 80 character sets (cf. also Procedure FONTS.PRC) stored as CDF files (character definition format) in the subdirectory CDF&MNU. The quality of these fonts ranges from the primitive plotter font style "TXT" up to the Postscript-style Bezier-based font. Even full fonts "FNT..." can be used for printer output (but not for milling tasks).

For demanding engraving tasks, however, the customer often calls for certain font types. Analogously, e.g. when making large-scale displays, extremely high quality demands can be made on the fonts. In order to be able to meet all these requirements, a postscript font converter has been implemented in version 2.0 of isy-CAD/CAM. This can be used to integrate the great number of postscript fonts available on the free market into the isy-CAD/CAM system, using them in any scaling and quality.

Typical suppliers of such postscript font collections are the type-machine manufacturers, such as LINOTYPE or, e.g. ADOBE, URW, AGFA, Bitstream and others, Please note that fonts are copyrighted and you as the user must have a legally acquired license. Today many software products (such as Corel-Draw, Adobe-Illustrator etc.) are offered, which already in the standard version contain a great variety of postscript fonts. This means if you have a legally acquired license, there is nothing preventing you from using these fonts under isy-CAD/CAM once you have converted them to the CDF format (see below).

Note: When using fonts please observe the relevant license terms of the corresponding supplier.

The conversion program PS2C.EXE allows you to convert postscript fonts (Type 1 format, .PFB format) to the specific character sets of "Pictures by PC" (.CDF). This also provides access to huge numbers of fonts of any manufacturers (download fonts for postscript laser printers) for lots of printing applications, such as foil cutting, engraving and milling under "Pictures by PC". It is taken for granted that the Bezier fonts are freely scalable and shapable. In addition, full fonts for pixel output media can be generated using the option -t.

The simplest method to convert postscript fonts to the isy-CAD/CAM format is to use the Import function. To this aim, activate the following buttons:



If you have clicked the IMPORT button, the Import File ... menu will appear, which you already know:

to which you want to snap. This is the same function as described above, only for closed polygons (1st and last points are linked This spline function (SPL.PRC -z) creates Bezier curves that can easily be post-processed using MVP.PRC. It is only necessary to select three relevant intermediate points to obtain a curve. This function (SPL.PRC -cpz) is used to create closed, periodic Bezier curves whereby the 1st and the last points are closed automatically and a bend is generated between start and end points. This function (ROUND.PRC -i) is used to create a Bezier rounding between the end points of free standing lines or Beziers, which can interactively be manipulated. After the selection of the corresponding end points. an angle marked in red/yellow appears. If you now position the crosshair between the legs and you release the button, you can bend the Bezier rounding as desired. Of course, you can also use all the remaining functions provided by isy-CAM (e.g. 2D) for drawing. When redrawing please always make sure that the elements located beneath (and only these) are carefully deleted (e.g. by element deletion "trimx -md" or partial polygon solution "delpoly").

File-Import
File <u>n</u> ame
C:/ISY/*.HP 🛓 Sort
File type
Hewlett-Packard Graphical Language HPGL 🛨 Options
File 3D-Data in Data Exchange Format DXF Encapsulated Postscript EPS (AI,a. Corel) SLA-Data STL Tagged Image File Format (tif-images) NC Code (G-syntax) convert postscript-fonts VOUENLHYS PEX PROCS SECURE TOOLS Drige C:
<u>O</u> K <u>C</u> ancel

Click the arrow right of the file type field to display the list of import filters offered. In our case we will select "Convert Postscript Fonts". Then switch to the drive in the directory where the postscript fonts to be imported are. In our example, this is the file "FTB\_\_\_\_\_\_.PFB" in the directory "PSFONTS" on floppy drive A:

			File-Impo	rt					
File <u>n</u> am	ne								
A:/PSFO	NTS/*.PF	'B					Ŀ	<u>S</u> ort	
File <u>ty</u> p	pe								
convert	postscr	·ipt-for	nts				Ŀ	Option	s
 <u>F</u> ile						Dire	cto	ry	
FTB FTUBL GYB GY	PFB PFB PFB PFB	29677 31182 28371 26564	02.03.90 02.03.90 02.03.90 02.03.90 02.03.90	11:32 11:32 11:40 11:40	:52 ::54 ::38 ::36				
A:/PSFO	NTS/FTB_	E	PFB			A:			
		<u>o</u> k	1	[	<u>C</u> ance	el			

The designation "PFB" means "Postscript Format Binary". After you have selected the Postscript font (here: FTB.PFB), you will be asked to specify the file name of the associated Kerning table (= individual, character-dependent letterspacing table). If no Kerning file exists, skip this file selection by clicking "Cancel" and follow

# **5.0 POSTSCRIPT FONT CONVERSION**

the dialog displayed on the screen; otherwise, the Kerning file usually bears the same name as the character set but with the extension "AFM" (Adobe Font Metric File). In our example we select it as follows:

		Kerr	ning-Datei				
File <u>n</u> am	е						
A:/*.AFM						± <u>S</u> or	t
<u>F</u> ile					<u> </u>	rectory	
FTB FTUBL GYB GY	AFM AFM AFM AFM	16105 16177 16056 16025	03.03.90 03.03.90 02.03.90 02.03.90 02.03.90	11:52:52 11:52:52 11:46:36 11:46:34	* * Dri	<u>v</u> e	
					A:		
		<u>o</u> k	]	<u><u>C</u>a1</u>	ncel		

If you click OK to confirm, the postscript font converter PS2C.EXE will be called. The converted characters of the character set quickly run over the display, similarly as shown below:

Ucircumflex	Code=234	127.00 158.00 Länge=115	
Uacute	Code=233	203.00 158.00 Länge=109	
Scaron	Code=207	62.00 158.00 Länge=145	
Otilde	Code=229	165.00 158.00 Länge=194	
Ograve	Code=227	204.00 158.00 Länge=150	
Odieresis	Code=153	181.00 158.00 Länge=159	
Ocircumflex	Code=226	184.00 158.00 Länge=156	
Oacute	Code=224	260.00 158.00 Länge=150	
Ntilde	Code=165	110.00 158.00 Länge=137	
Igrave	Code=221	-68.00 158.00 Länge=57	
Idieresis	Code=216	-91.00 158.00 Länge=66	
Icircumflex	Code=215	-88.00 158.00 Länge=63	
Iacute	Code=214	-12.00 158.00 Länge=57	
Egrave	Code=212	59.00 158.00 Länge=91	
Edieresis	Code=211	36.00 158.00 Länge=100	
Ecircumflex	Code=210	39.00 158.00 Länge=97	
Eacute	Code=144	115.00 158.00 Länge=91	
Ccedilla	Code=128	215.00 0.00 Länge=179	
Atilde	Code=205	175.00 158.00 Länge=145	
Aring	Code=143	246.00 143.00 Länge=144	
Agrave	Code=183	214.00 158.00 Länge=101	
Adieresis	Code=142	191.00 158.00 Länge=110	
Acircumflex	Code=182	194.00 158.00 Länge=107	
Aacute	Code=181	270.00 158.00 Länge=101	
: <u>t</u> ools\ps2c	a:\psfonts\ftb	pfb cdf&mnu\ftb -k a:\ftbafm	i

If this process has been completed successfully, a new CDF character set "FTB.CDF" is available in the directory CDF&MNU (to be sure check it with "dir cdf&mnu\\*.cdf"). Then select the font menu and use the PageUp command to browse to the new character set you want to find (here FTB).



Select a font to test it in a labelling text. This can be done either from a menu or by typing, e.g.

#### label \* ABCabc -s

and placing the scaling window appropriately.

In order to check exactly which characters are contained in the character set and how they are assigned to the ASCII table, it is best to enter

cvc name -s

whereby 'name' is the file name of the character set just converted. In our case this would be

## cvc ftb -s

The command stated above is used to convert the binary CDF character definition to a tabular representation of the drawing (VEC). This may take a while, depending on the computer speed. Then each converted character is assigned the corresponding ASCII code. Each character is summarised as a macro object with its contour and its red spacing definitions (with reference to the base line) under the name CHR-%#. For example, the capital letter ,G' corresponds to the designation ,CHR-%71'.

# 5.0 POSTSCRIPT FONT CONVERSION



If the character arrangement created using CVC.PRC is displayed on the screen, you can add or modify individual characters as necessary and save these changes in new character sets using the font generator V2.EXE that comes with isy-CAD/CAM. It is only necessary that you observe the conventions of the object structure (CHR-%#) (see below).

Please note that through the procedure CVC.PRC a (grid) raster has been set (red marking SNP in the status display; if necessary type "set snap" to check). In our example the grid raster is set to 0.02. In case of font modifications this is quite useful for drawing. Since we do not want to do any modifications, click on the red "SNP" in the menu header bar; this will disable the snapping (SFLAG=OFF).

Now you can enter, e.g. a curved letter and zoom it to check the quality standard of your font. You will see whether the font consists, e.g. of square polygons or "smooth" Beziers (with tangent compensation). In case of a good font supplier, it is taken for granted that you will have Bezier contours, which are smooth at any zooming factor. Of course, you can also use the element info to check whether you have Bezier curves.

	HAT USR GH	RP T3D DPL ( DL 000 SNP (	CSN 1: CPL LAY		SEL &		1EXT
					POINT	LINE	ARC
	Dr	awing eleme	ents			EXT ABEL HATC	H OBJ
	Lines	<b>2 D</b>	2.5 D	3 D 	ARRAY N HOVE C	ORH E	
	Polylines	1	-	-			<u>n</u>
	Circles	-	-		<u> B</u> ici >		CON- VERT
	Arcs	-			MEA SUR		DI- VERSE
	Bezier curve	s 8			NUH		
	Poly meshes					RTHO EQUI	AUTO
	Bezier surfa	ces				? <mark>6</mark> م م	9 <u>6</u>
	Hatched area	s					
Object "chr-%71" with red	Label	L -				$\sqrt{0}$	$\mathbf{Y}$
spacing markings				<u>O</u> K		9 J	HULTI
Ŀ3					Schot	tt Sys <sup>.</sup>	teme
	find -elf;plo	t -o * -cs1	00;set a	actobj"	"cali	l DDow	nd_

The notes provided in the following are only intended for the interested reader who wants to learn how to interactively handle TOOL programs. This is especially useful if problems occur or if you want to automate the font conversion process.

Generally, in case of command-oriented operation of the TOOLS you should always switch the main module to the text mode so that any error messages can be displayed on the screen. This is done, e.g. by

main logo

The postscript font converter PS2C.EXE is an external TOOL program. If you call the name followed by the parameter ,?' an easy operating aid will be displayed, i.e. if you enter

ps2c?

or if TOOLPATH is not set correctly

tools\ps2c ?

A message of the following kind may appear:

# 5.0 POSTSCRIPT FONT CONVERSION

Format:	'ps2c <pfb-datei> [ <cdf-datei> ]' Ist der Name der PFB-Datei mit '_' auf acht Zeichen verlängert, brauchen diese nicht angegeben werden</cdf-datei></pfb-datei>			
Optionen:	-c Bei zusammengesetzten Zeichen wird die Position der Akzent-Zeichen aus der AFM- Datei übernommen – nur mit -k			
	-e <pec-datei> Codes werden aus Datei übernommen -f# Vergrößerungsfaktor</pec-datei>			
	-k <afm-datei> Kerning-Informationen werden aus der angegebenen Datei übernommen</afm-datei>			
	-t Die Buchstaben werden gefüllt			
Beispiel:	'ps2c a:magic -k a:magic cdf&mnu/ps-68			
-	Der PostScript Zeichensatz 'MAGIC.PFB' (oder			
	'MAGICPFB') auf der Diskette im Laufwerk A:			
wird umgesetzt und im Verzeichnis 'CDF&MNU' als				
	'PS-68.CDF' gespeichert. Kerning-Informationen			
	werden aus der Datei 'MAGIC.AFM' bzw. 'MAGICAFM'			
	ubernommen.			

ps2c: Konvertierung von PostScript Type 1 Fonts in PICTURES BY PC CDFs - Copyright by Schott Systeme GmbH 1992/93 -

As all conversion programs, the conversion is initiated by specifying the program name (if necessary including all subdirectories), the source file (as the 1st parameter) and the destination file (as the 2nd parameter). The program call can be added by the options listed below. Normally, a TOOL program is stored in the subdirectory TOOLS (or TOOLS\WIN95).

The conversion for the process carried out above is called using the menu, e.g. by:

tools\ps2c a:\psfonts\ftb\_\_\_\_.pfb cdf&mnu\ftb.cdf -k a:ftb\_\_\_\_.afm

or

tools\ps2c a:\psfonts\ftb.pfb cdf&mnu\ftb.cdf -k a:ftb.afm

If you use the option -k, the Kerning information (individual spacing definitions) will be loaded from the file FTB.AFM.

Some other options are provided to modify the conversion. For example, the option-t (t=trace) is provided to use full fonts also in the CAD system or-f# (f=factor) to specify zoom-out factor, etc.

#### 5.2 Additional Notes on Fonts under isy-CAD/CAM:

## 5.2.1 Procedure FONTS.PRC:

To create a simple overview table of all isy-CAD/CAM fonts stored in the standard subdirectory CDF&MNU, which can be printed out, type the following in the command line:

#### fonts

The procedure will generate some drawing sheets and save them in the VECTOR directory under the name FLIST#.VEC. To check it, type

dir vector\flist\*

You can load the files, e.g. by typing

load flist2

etc. If you wish to print them, use the commands "Plot" or "PixPrint" as usual.

# 5.2.2 Generating a CDF Font or Character Set from a Drawing (\*.VEC)

Supposed you want to modify a font provided by isy-CAD/CAM or to add some characters. In this case it is best to start out from a table created with CVC.PRC (see above). This has a certain data format for the font generator V2C.EXE. As you already know, each character consists of its line (created by drawing) (generally in green) and two perpendicular, red letter spacing markings (sometimes also a different line type) (on the left and on the right whereby the lowest point is on the base line of the letter). The object must first contain the red spacing markings and then the letter or character contour and must bear the designation "chr-%#". "#" is the code number of the ASCII character set. For example, the capital letter "A" corresponds to the number 65. That means that a designation for this letter according to our definition is "chr-%65". Please note that the names of the objects are specified with small letters.

There are still another two conventions to be met by a character set created by yourself:

- The definition must in any case contain at least one character chr-%65 (i.e. the letter "A"). This is intended to define the size of the character set. For interactive kerning (procedure KERNED.PRC), it is also recommended to define the Space (chr-%32).
- 2.) The drawing must also contain a text, e.g. "cdf:grid=0.02,0.02". The value for "grid" must be matched with the character size. As an orientation value, a character (letter) should always be less than the twohundred fold of the grid spacing.

Let us repeat the above mentioned in practice using a funny example. We want to generate a very simple special character set that consists of only a single character. To this aim, we will load the drawing "Camel" by

load camel

which we have already used for conversion. Select the entire camel (if necessary using a macro) and scale it approximately to the size of 200 coordinates anywhere on the screen. Now draw two red vertical bordering lines on the left and on the right whereby the lower edges of the lines close with the lower object limit. Let's summarise all this using the command

#### macro chr-%65

whereby first the red spacing marks are selected and the rest (if necessary by selecting <F10>). Of course, we could generate further characters in a similar way. For reasons of simplicity, we will do not do this. Now it is only necessary to set the labelling text with compliance of the convention of the font generator. This is done using the command

#### label \* "cdf:grid=1,1" -s

and placing it in any position on the drawing area. The image should look approximately like the image below:

# 5.0 POSTSCRIPT FONT CONVERSION



tools/v2c vector/test cdf&mnu/test -n

An error is supposed to be signalled since the character is too large with reference to the grid and the contour too complex. This error can easily be avoided if you add the options-s# and -d# with at least the error borders, e.g.

tools/v2c vector/test cdf&mnu/test -n -d1000 -s1000

If an error is reported again, you must reduce the character. If the command has been successful, you will have a character set TEST.CDF, which only consists of the camel assigned to the letter "A". We will type

txtspec=test//;label \* AAA -s

to check it or select the appropriate font and position the mouse on the appropriate menu item. As you see, our "text" consists of 3 "camels".

Passing this preliminary exercise it will be easy for you to generate new character sets or to modify or add existing character sets (if possible using a different name). If you want to add a font table generated with further characters using CVC.PRC (see above), you must only observe the letter conventions, save the entire table with a different name and start conversion. For testing, you can modify some characters in a character set table (e.g. bending with MVP.PRC) and restart the font generation. As you see the character and font generator is a powerful and useful tool, in particular for tasks in the field of printing and documentation.

# 5.2.3 Basic Knowledge on Kerning – Individually Selected Spacings

After we have learned in the previous Section how to generate fonts, some words must be lost on how to manage the letterspacings in the character sets. To achieve a balanced typeface for a text typed using proportional fonts, kerning, i.e. the spacing between the individual characters is very important. Professional character sets include very expensive kerning tables (see above AFM files). This means that depending on the layout of a character, the distance to the next one is varied by certain value specifications. Let's demonstrate this using a simple example. Let's create two labellings arranged one beneath the other and aligned to the left using the command sequence

and

txtspec=table/15/2;label \* AVVaV

# txtspec=simple/15/2;label \* AVVaV

From the view of printing technology, the fonts TABLE.CDF and SIMPLE.CDF are nearly identical. Whereas the first one is a tabular font, i.e. has equal letter spacings, the second one is a proportional font with different letter widths. Tabular fonts are well suited – as the name already says – for tables and appear "woodenly" in the flowing text. With proportional fonts, just the opposite is the case.

Kerning can be improved by the ~ Kerning function

Proportional font: simple Variable letterspacing

Tabular font: **table** All letters have the same

spacing.

# 5.0 POSTSCRIPT FONT CONVERSION

When we have generated our two fonts (without using the procedure KERNED.PRC) we did not have an immediate influence on the letterspacing. But even this is subject to user-defined, design-technology and printing-technology aspects. Even with the tabular font, you may have a different opinion whether the spacing is not generally too large. If we would make here a general change, we would have to intervene into the character set. Generally, this may be done using the TOOL program KERNING.EXE. Let's apply it in practice. A first aid will be provided by calling

#### tools\kerning ?

A message of the following kind will appear:

kerning: change kerning of PICTURES BY PC .CDF (Character Definition File) Rev. 1.1 Copyright by Schott Systeme 1991

Usage:	'kerning <cdf file=""></cdf>	1
Options:	-C	Write kerning information from .CDF file
		to .KRN file
	-a	Kerning values are in grid units
	-k <kerning file=""></kerning>	Name of .KRN file
		default is same as .CDF
Examples:	'kerning test'	Kerning information is copied from
		'TEST.KRN' to 'TEST.CDF'
	'kerning test -c -k	old' Kerning information from 'TEST.CDF'
		is written to 'OLD.KRN'

The operation is thus already explained roughly. First let's modify the character set TABLE.CDF for a short time. First, however, we have to save the old kerning values. This is done using the following command:

tools\kerning cdf&mnu\table -c -k old

This means that the old spacing values from the character set TABLE.CDF are saved in the file OLD.KRN. If we now have a look at this file using the command

proc old.krn

the file contains only one line:

std:0

This means that no special spacings are defined, i.e. the original spacings will be used (corresponding to the red borderings in the drawing). Now let's quit the editor with <ESC> and copy the file OLD.PRC into a file NEW.KRN using

cp old.krn new.krn

We will edit this file with

proc new.krn

will modify the value from "std:0" to "std:-5", quit the editor with <ESC> and save our changes by pressing <Y> to confirm our changes. If we then call

tools\kerning cdf&mnu\table -k new

we will clearly see the change on the screen. All letters of the font TABLE.CDF have been moved closer another to one. You may test it if you type:

tools\kerning cdf&mnu\table -k old

Of course, you can also generate larger spacings in an analogous manner if you specify a positive number in the kerning file NEW.KRN. You must only make sure at the end of your attempts the standard spacing is recovered.

Now let's devote our attention to the font SIMPLE.CDF. The labelling displayed on the screen, which contains the letter combination "AVVaV" has been chosen deliberately, since it has some defects from the point of view of printing technology, which we could change in the font if we wished to. Due to the special form and sequence of the letters, the spacings, e.g. between 'A' and 'V' or 'a' and 'V' could be considerably reduced. This will result in a considerably more balanced typeface. We want to do it in practice and will edit the file NEW.KRN with

proc new.krn

#### We will modify the data as follows

std:0 `A`,`V`:-5 `V`,`A`:-5 `V`,`a`:-5 `a`,`V`:-5

This means that we have reduced the spacings of special letter combinations accordingly. Let's do it again with

#### tools\kerning cdf&mnu\simple -k new

The correction is obvious. All letters move closer another to one and differ from each other considerably. Here you guess what a great deal of work a good kerning table requires and how valuable balanced fonts are. The modification of the kerning in standard fonts should never be carried out in the original isy-CAD/CAM character sets, but even by professionals only in copies. For this reason, we will recover the standard conditions by

tools\kerning cdf&mnu\simple -k old

If you want to modify the kerning in a special labelling without modifying the character set in its whole, it is reasonable to use the procedure KERNED.PRC with all its options. Among other functions, it is possible to interactively modify the kerning in an existing label text later.

# 6.0 DATA IMPORT

## 6.1 Post-Processing of Imported Drawings

This exercise is intended as an addition to the seminar example 6 (importing, exporting). Let's take a concrete example to import data from other applications via (AI)-EPS, to scale the drawing, position it and check it for errors.

We will use an EPS file (Encapsulated Post-Script) CAMEL.EPS (in the VECTOR directory) as an example. We will import this file by clicking on the left upper button (for file handling) in the button bar or – as now – on "FILE" in the scanning and vectorisation environment.



When you click the IMPORT button, the corresponding menu opens.

File-Import	Click have to
File <u>n</u> ame	select the
C:/ISY/*.HP 🛓 Sort	import formats.
File type	
Hewlett-Packard Graphical Language HPGL	
File 3D-Data in Data Exchange Format DXF Encapsulated Postscript EPS (AI,a. Corel) SLA-Data STL Tagged Image File Format (tif-images) NC Code (G-syntax) convert postscript-fonts PEX PEX PEX PEX PEX PEX PEX PEX PEX PE	
<u>QK</u> <u>Cancel</u>	

Click on the arrow right of the file type window to display the import filters offered in the form of a list. In our case we select "Encapsulated Postscript EPS (AI and Corel)". Our test file CAMEL.EPS is in the VECTOR subdirectory. Use the scrollbar to browse to the directory VECTOR and click it. Then select the file CAMEL.EPS. Click "OK" to start the conversion and to load the image. Since generally the size of an imported image and its data structure are not known, you should analyse these parameters first. Simply select a line of the image. Then check whether this object is a part of a macro object ("Sel.Macro"). In our case it is the case:

# 6.0 DATA IMPORT



Since our drawing only consists of a few elements, we can test which geometry elements are these. Access to the most important measuring functions is granted in the menu using the following sequence that is to be found at "Scanning and Vectorisation":



As you see, our camel consists mainly of Beziers. This is not surprising, since the symbol is taken from Corel Draw and this program (such as isy-CAM or Pictures by PC) uses Beziers as the most flexible curve type.

To scale the existing drawing to a certain size for milling, first we must determine the current size. This is done by clicking the button "SIZE \*". The following data will appear in the Info line:

size: Objekt=1:obj1 2D=178.664,140.106 R=1.275

This means that the object has a horizontal dimension of 178.664 and a vertical dimension of 140.106 (the side/height ratio is 1.275). Supposed we mill our object at a width of 50 mm, the drawing must be scaled using a factor of 50/178.664. If we type this value into the pocket calculator:

val 50/178.664

# 6.0 DATA IMPORT

we will have an appropriate result. The first value is the set value (in this case: 50), and the second value is the actual value (measured value: 178.664). To reduce the scaling, switch to the "Manipulation" menu; at "SCALE-NUM-REL." you will find the function you need.



Moving to the box zero point

When you are requested to specify the "Scaling Factor(s): ", use the ArrowUp key to browse until you have found the numerical value "val 50/178.664" in the command stack. If you now delete the beginning of the line, except the numbers (including spaces) and press <Enter> to confirm, the drawing (in the centre of the box) will be scaled. If you repeat the measurement with "SIZE \*", 50 should be displayed as the first numerical value.

The item for moving to the box zero point (top right button) is to be found in the manipulation menu. After moving, zoom everything ("zall"). Our drawing is now in the bottom left corner of the coordinate space (bottom left corner = 0.0) and has a width of 50 coordinates. Any manipulations of this kind must always be carried out if the size of the original image does not match with the desired size (cf. LEO.VEC above). Moving to the zero point will provide an unambiguous reference point. Then save the image again with

save camel

and overwrite the "old" file with "Y" (yes).

## 6.2 Contour Problem on Pocket Milling

Now we want to try to mill the image converted from the Corel Draw file above. To this aim, switch to the CAM menu and there to pocket milling ("POCKET" is the default setting). Click the menu "New"; to select an object, first use F2 to select a contour, and then use F10 to select the macro object. Fill in the remaining fields of the menus as follows


## 6.0 DATA IMPORT

Please do not forget to specify a tool in the tool menu (e.g. 3 mm cylinder cutter). If you now calculate the tool paths, an error message will appear and a mark will be set on the screen. This means that the contour closest to the marking point contains errors. Before we analyse the error more exactly, let's consider a milling contour with a very useful variant. Enter the value "1" in the Tolerance field currently empty and recalculate the milling contours. No further error messages will appear, i.e. the milling program tolerates an "error" of max. 1 mm in the contour. Our error, however, is considerably smaller (see below) and can be tolerated with such an easy contour even if it would be the best to correct the contour. Before you make any corrections, delete the tolerance value and save the values. In this case the error would occur again.

To check the faulty contour (closest to the marking), select it and zoom it out as much as possible ("ZOOM-OBJ", see also the illustration above). If you enlarge the image section on the left side of the curve once more. you will clearly see the contour error. It is a contour loop (Bezier loop), which is, of course, not admissible. The most reasonable way to eliminate the problem is to correct the contour. Trim the crossing lines such that all projecting corners disappear. Delete the rest with "Delete Element" (trimx -md). As an alternative variant, you can also move the curve points using MVP.PRC. It is merely important that the curve loop disappears and that no residual elements remain.

If you have done all corrections, reset the zoom to "All", edit the existing technology block and recalculate the milling contours. This time no error will be generated (although the tolerance value is not set).

You have learned using this example how to find errors in existing contours and how to correct them if necessary. Inter alias, contour loops as mentioned above cannot automatically be corrected (see below), but must be treated individually.

It is easier if the contour provides small gaps (irrespective of the tolerance settings). In this case the PROOF menu provides some nice testing functions (CLOSE.PRC). These, however, can only be applied for consisting of polygons and Beziers (no arcs); sometimes, it may be necessary to convert contours these contours.

We can demonstrate this using a simple example. To maintain the existing image, use buffer 2. Use the command

arc \* -tp1000 or the button in the 2D module

to create a full-screen, round polyaon consisting of 1.000 dots. If you then use the Delete Elements command (trimx -md) to delete a segment in any position, you will have created a small gap that is scarcely to be seen on the screen. For analysis and "repair", the procedure CLOSE PRC with its options can be used. If you switch to the menu "PROOF", you will find the corresponding buttons in the bottom line.

MARK- PNT	SHOH	LEN.	2
L.	SI ZE X	$\bigotimes$	EDITX
POINT EDIT	POINT	×GEO	GEO
ALL .	HIN .	6.	1 m

Clicking the left button "All" will display all gaps within polygon or Bezier contours. If you apply this function for our problem that we have created especially for this exercise, the start and end points of the contour (which coincide here), as well as the gap will be marked. This means that you could not carry out an appropriate geometry correction in the marked position. In our case we will simply use the third button (from the left) in the lowest row, which can be used to automatically close gaps by specifying a tolerance value. If we use this function and admit "0.1" or greater as the tolerance value, the gap we have created deliberately will automatically be closed. This means that the tolerance value specifies up to which gap size the contours are to be closed.

## 6.0 DATA IMPORT

As you see, the procedure CLOSE.PRC with its options is very useful for finding errors in contours. It is guite easy to understand that such errors are only made by very simple drawing programs or ungualified handling of a CAD system (e.g. faulty trimming). If the contours contain arcs, CLOSE PRC cannot be directly used. In such cases make a duplicate of the contour (e.g. in buffer 2) and convert it, e.g. using the command:

cvtopic \* -bt 0.01

CON-You will also find this function as a button in the conversion or manipulation menu under

The command above will convert the contour to polygons (whereby any Beziers will be maintained).

CLOSE.PRC may also only be used for contours and not for individual objects. This means if you want to create a contour from individual objects of a line, first enter the command:

acontour



POL

and

#### 6.3 Data Import in Conjunction with ACAD

#### ACAD 12 / LT12 (output of 2D data under ACAD as DXF)

2 D drawings should be exported from ACAD 12 as DXF files. These can then normally be read directly into isy-CAM using the Import function. Circles and arcs will be maintained (what is not the case with HPGL).

#### ACAD R14 (output of 2D data under ACAD as DXF)

To export drawings under ACAD, enter the following command in the command line: - DXFOUT

- Output after R12 - DXF format

- Select "Objects" from the "Options" menu; activate ASCII format (The selected objects may not be blocks.)

#### ACAD R14 (output of 3D data under ACAD as STL)

Enter in the command line: - STLOUT - "No" for binary output (Make sure that all body edges are in the positive X,Y,Z octants.)

- Resolution in the menu "Preferences"

- Performance data
- Raise smoothing of jagged objects accordingly (default: change 0.5 to 5..8)

#### 7.1 General Information

In every exercise example, we have introduced various procedures and functions described there in detail. These procedures and functions occur in the individual exercises several times. To ensure that the exercise examples remain "reproducible", the corresponding icon has been copied from the operator interface of the program into the Manual.

Note: Please note that the examples refer to the standard operator interface of isy – CAM (without the add-on functions of **isy stepbystep** and the **PowerTools**), i.e. if the add-on functions installed the parameter entries may be a bit modified (e.g. via the input menu of the PowerTools instead of the "modify" level), or the buttons of the menu interface of isy stepbystep are slightly modified

These icons are often linked with command lines or procedures. The approx. 800 icons, however, are by far not sufficient to assign all possibilities provided by ISY to menu items. The reason is to be found in the number of approx. 400 procedures contained in the scope of programs. In addition, there are a lot of external programs and internal commands. In order to be able to bring this part of the program structure a bit closer to you, the name of such commands will be explained in our exercise examples.

However, before you start we recommend to do some exercises to check your knowledge: - Basic knowledge on DOS

- You are already a computer user and know the function of your keyboard.
- You can answer questions, such as: What is a drive, a file, a directory, a hard disk or a full DOS access path?
- You know the DOS conventions (not Windows !) for file and directory names.
- You know the difference between RAM and hard disk memory.
- You are a system user and are able to create or delete directories.
- You know how to use the commands: *dir, copy, cd, md, rd* in the operating system.
- All these questions are answered in your MS-DOS Manual.

#### - Using the controls

You have read and understood the ISY basic functions described in this Manual.

Every user will find 'his' special 'program corner' in the individual example exercises. It is nevertheless recommended to work over all examples, as the note on a procedure or a command to be used is given only once.

If you nevertheless get 'stuck', don't hesitate and call our hotline support 0190-875602. In addition, individual training courses and seminar series are offered. Get in touch with us!

## 7.0 SEMINAR EXAMPLES

#### 7.2 SEMINAR EXAMPLE 1



#### 7.2 SEMINAR EXAMPLE 1

An existing 3D-drawing should be loaded to subsequently mill it.

#### Starting of ISY

Depending on the used operating system, the ISY program is started differently. In DOS:

C:\>CD ISY C:\ISY>PICTURES

The ISY CAD/CAM program starts. In the 'Modify input area' (refer to: WORKING WITH THE OPERATING ELEMENTS, page 4), the lower left corner displays modify:

## Loading of the 'OPENER.VEC' file from the hard disk

The existing drawing of the bottle opener is loaded into buffer 1. The file is found in the 'C:\ISY\VECTOR' directory and is named 'OPENER.VEC'



SC calls up the file manager for file loading.

SC: short click onto the button (refer to: WORKING WITH THE OPERATING ELEMENTS, page 6) LC: long click onto button

The Vector directory is displayed that has been specified during the installation.  $\rightarrow$ Using the mouse, click into the field and enter an 'O' in front of the first asterisk '\*'.

After pressing <ENTER>, all files starting with 'O' are displayed.

File Selection					
File <u>n</u> ame					
C:/ISY/VECTO	)R/*.*	🛨 Sort			
FileDirectory					
1992.VEC	11771 03.09.9	2 19:22:10 1			
3DANSI.VEC	96934 03.09.9	2 19:05:50			
3DBSP1.VEC	29467 17.05.9	0 17:45:44			
3DBSP3.VEC	21077 10.07.9	0 10:14:36			
3DPOT.VEC	15418 17.05.9	0 17:44:50			
3DROB.VEC	65612 09.08.9	1 17:31:22			
A4LEER.VEC	6580 17.05.9	0 16:23:06			
A4POS.VEC	13597 17.05.9	0 16:23:40 + Drive			
		C:			
, 	<u>O</u> K	<u>C</u> ance 1			

The file is marked for loading by clicking onto 'OPENER.VEC'. Subsequently, the file loading is started by clicking onto 'OK'.



File Selection

## 7.0 SEMINAR EXAMPLES

#### 7.2 SEMINAR EXAMPLE 1

Delete and create a CAM definition block



150 activates the isometric representation.

CAM technology processings always refers to finished geometries (=drawings) that are stored in screen buffer 1 or 2. CAM processings are managed in technology windows and saved with the drawing when storing these on the hard disk.

The 'OPENER.VEC' file already contains three CAM processings (3D-milling cutter and 3D-engraving). After loading, all definition blocks must be recalculated before performing the conversion into the controller-specific NCP format (post-processing). In our example, the 3D-roughing block and the 3D-finishing block should however be deleted and re-created for the exercise.



SC starts ISY CAM



the technology type is selected first. This is the 3D-milling cutter in our example. Subsequently, both technology blocks are deleted.

The menu shows all definition blocks in buffer 1 that have been created for the 3D-milling technology.

DEL

SC



By selecting 'All', both processings are entered into the list of the 'Selected definition blocks'.

Subsequently, the delete process is performed by pressing 'OK'. Answer the safety inquiry with 'Yes'

Delete data?			
No	<u>Y</u> es		



She the fastest way to activate the click fields is to enter the underlined characters on the keyboard, 'v' for 'Yes' or 'l' for 'All'. There is no difference between capital and small keyboard. 'y' for 'Yes' or 'l' for 'All'. There is no difference between capital and small letters.

#### 7.2 SEMINAR EXAMPLE 1

#### Create a CAM definition block



SC a new technology window is opened.

All processings refer to drawing objects. These are individual Bezier areas in our example. Since object names are automatically assigned during the design their names are shown only after selecting. The line is activated by clicking into the Objects field. Now, the cross-hair cursor is activated for selecting using the <F2> function kev.

ISY: F	reeform-milling on 3	ID-surfaces
Denotation B	LOCK 1	
0b jects		Dimensions
		copy block
2D contour		
🗌 Roughing opt	<u>R</u> oughing	<u> </u>
e paral.to X	🔘 paral.to <u>Y</u>	🔿 o <u>n</u> contour
Offset	<u>Cy</u> l-diameter	
<u>P</u> lane 0	depth 1	Pat <u>h</u> distance 48%
Retreat 1	<u>S</u> afety <u>1</u>	<u>T</u> olerance
<u><u>T</u>ools</u>	Caiculate	<u>Store values</u>
Stock	Postprocessing	Cancel
	Litting	

Position the center of the intersecting lines on an arbitrary area and press the left mouse button. The selected area is alternating colored in red and green. By press the right mouse button (or by clicking onto the right outside area of the permissible drawing area) the context menu with following possibilities is displayed:

<G2> search for a superior linking of the just selected object. This process is repeated until all areas of our opener light in the red/green pointer color. By clicking below the permissible drawing area the selection process is finished. The name is automatically entered on the object line.

The maximum dimensions are entered in the 'Object dimensions' menu. The bottle opener is 72mm in length, 40mm in width and 8mm in height. The entry is made in absolute drawing dimensions. Thus, we can see also the zero point for later milling. The tool menu is displayed by clicking onto 'More'.

SCMMD	
F6 : End	G1:Continue
F7:Zoom F8:Zoom all F9:Zoom back	G2:F0:Select cover G3:Winded sel. G4:UnSelect last G5:Cancel

ISY: Freeform-milling on 3D-surfaces
Denotation Objects 2D contour Dimensions 2D contour
Roughing opt     Roughing     Finishing       • paral.to X     • paral.to Y     • on contour       • Offset     • Qul-diameter     •       • Plane     • depth     1       • Retreat     1     Safety     1
Iools         Calculate         Store values           Stock         Postprocessing         Cancel

Block has changed, save?

No

Yes

Confirm the inquiry with 'y'





7.0 SEMINAR EXAMPLES

7.2 SEMINAR EXAMPLE 1

field and offered in a list for the editing.

By clicking onto the blue 'Object dimensions' bar the window is shown as wire frame and can be freely positioned on the screen.

In the NCP program, the 'tool number' appears at the tool change command. Depending on the tool geometry, the radius correction is performed in 3D and considers covered cuttings that are not to be milled. In our example, we use a cylindrical shaft milling cutter with a diameter of 3mm. The tool should cut using the center' since it cuts into the material when milling.

If an allowance is defined, the milling cutter is kept away from the areas by the entered measure. The correction is made in X,Y, and Z.

Thereby, the chip depth should total 3mm. The entry of the feed is made in mm per minute. The 1/1000mm per second requested by the 'Remote' are automatically incorporated by the post-processor. The entry of the number of revolutions is specified in rotations per minute. By clinking onto 'More', the object dimension menu is called up again.



#### 7.2 SEMINAR EXAMPLE 1

The tool diameter is now also considered in the 'Milling area' menu. If a piece of suitable raw material is looked for than this must be larger than the actual dimensions of the workpiece. The milling area specification should then exceed the dimensions of the raw material. During positioning, the tool 'enters' then the 'material' where none is present.

The height of the workpiece is 8mm. The first Z-processing step is also located at Z8. Suitable dimensions of the raw material: 74 x 42 x 10



ISY: Freeform-milling on 3D-surfac

Roughing

O paral.to

Safety 1

Calculate

Postprocessing

< 1 Þ

copy block

Dimensions

depth 0,2 Pathdistance 48%

Finishing

on contour

<u>T</u>olerance

<u>S</u>tore values

Cancel

BLOCK 1

Offset 0,2 Cyl-diameter

surfaces

Denotation

2D contour

🗵 Roughing opt

e paral.to X

Ob.iects

Plane 0,2

Retreat 1

Tools

Stock

Note: To trigger a new calculation of the "dimensions", you should simply delete the xvalves from the input field "milling area". After that, a new calculation of the object size takes place. This is, for example, not necessary if an already existing block was copied and therefore the old object dimensions are still entered here. A new calculation, of course, is necessary then.

Click into the white small square on the left beside 'Optimized roughing'. Then, the cross is displayed. There are two roughing cycles. We use optimized roughing in our example. This is meaningful if groves are present in 3D workpieces. Then, the respective layer depth is completely milled before positioning to the next pocket. This results in shorter processing times. Since the <u>'Optimized roughing'</u> occupies more internal memory it can not be used for processing very complex workpieces.

However, try simply both cycles and observe the difference (description on the next page) using the simulation. The processing should be performed

parallel to the X-axis. The path distance should total 48% of the milling cutter width. The specification is automatically interpreted in mm if the '%' sign is omitted. An <u>'oversize'</u> of 0.2mm is to be set for roughing. The <u>'Tolerance'</u> field determines the maximum deviation in millimeters that the calculated paths may have to the actually designed free-form area. Without input (default), this value is set to 0.01mm. If the workpiece is roughed with oversize then the precision factor can be lowered to 0.05 mm to achieve an acceleration of the calculation time (only necessarily for very extensive workpieces).

Subsequently, click onto 'Calculate'. Save the block again after confirming using 'Yes'.



For every input item, the integrated help can be accessed by positioning the arrow onto the field and pressing the right mouse button.

## 7.0 SEMINAR EXAMPLES

## 7.2 SEMINAR EXAMPLE 1 calculate paths Definition-blocks in buffer ( Now, the CAM block is automatically selected. Selected definition-blocks MILLING - BLOCK 1 It can be subsequently calculated using the 'OK' button. A11 No Cancel OV ncf: Berechnung von NC-Werkzeug-Bahnen für PICTURES BY PC Rev. 1.20.533 - Copyright by Schott Systeme GmbH 1992 NCS T1: 5478 Flächen / 22308 Ecken TOTAL: 5478 Flächen / 22308 Ecken / 1028 kByte EBENE: -5.4000 (38.4 %)

The drawing data are saved to disk. The external program for calculating the NC tool paths is started. Thereby, the progress is indicated in %. After the calculation, an automatic return to ISY is performed.



The external programs for calculating the tool-corrected path are called 'NCF.EXE', 'NCS.EXE' and 'NCP.EXE'. The milling path calculation can also be performed command line-oriented outside of ISY if the data quantity of 10MB is exceeded. Change to the 'C:\ISY\TOOLS' directory and access the help system using 'NCF ?'.

Altogether, four individual commands are necessary for the calculation the roughing paths (technology block 1). Thereby, 'ISY' calls the external programs with the 'XXXX.RSP' control file. The correct usage of the options can be checked by printing the control file.

C:/ISY/TOOLS/NCF.EXE	C:/TEMP/NCF1.RSP	calculation of the paths
C:/ISY/TOOLS/NCS.EXE	C:/TEMP/NCS1.RSP	splitting up of the individual layers
C:/ISY/TOOLS/NCF.EXE	C:/TEMP/NCS2.RSP	second call of NCF
C:/ISY/TOOLS/NCS.EXE	C:/TEMP/NCS2.RSP	insertion of the cross-connections

#### 7.2 SEMINAR EXAMPLE 1

Two individual commands are altogether necessary for the later creation of the finishing paths (technology block 2).

C:/ISY/TOOLS/NCF.EXE C:/TEMP/NCF.RSP calculation of the paths ... C:/ISY/TOOLS/NCP.EXE C:/ISY/SECURE/CMRX.VEC C:/ISY/SECURE/CAMMX -m

Do you want to see the paths?	
<u>Y</u> es <u>N</u> o	



The individual meander layers are displayed.

SC

SC The calculated milling path is displayed layer for layer. The milling direction is also shown.

## 7.0 SEMINAR EXAMPLES

#### 7.2 SEMINAR EXAMPLE 1

The individual processing layers are displayed. The next path is shown by pressing the enter key. Keep this point in mind that only those definition blocks can be correctly shown whose milling path calculation agrees to the current buffer data. In other words: save the

In other words: save the current buffer content to the hard disk and load another drawing. The result is not correct if the definition block is to be simulated without prior re-calculation.





If drawings are loaded that already contain definition blocks then these must be re-calculated to simulate the data, or to perform a post-processor run.



already created 3D definition blocks can be edited to change these or to copy them.

## Copy a CAM definition block

Click directly onto the 'MILLING BLOCK 1' line to re-display the data.



## 7.2 SEMINAR EXAMPLE 1

By a single click onto 'Copy', the currently saved data are copied to the definition block 2 since finishing should take place as the next processing step.

The 'Optimized roughing' field is deactivated by a new mouse click and 'Finishing' is activated. The 'Path distance' is set to 0.25mm.

Subsequently, the calculation is started by clicking onto 'Calculating'. Since the designed areas are traversed with toolcorrection applied during the finishing processing, the setting for the depth movement is ignored for the tool. Therefore, no change is required .

Confirm the question using 'Yes'

button.



ISY: Freeform-milling on 3D-surfaces

## 7.0 SEMINAR EXAMPLES

#### 7.2 SEMINAR EXAMPLE 1

ncf: Berechnung von NC-Werkzeug-Bahnen für PICTURES BY PC Rev. 1.20.533 - Copyright by Schott Systeme GmbH 1992

NCS_T1:	5478	Flächen /	22308	Ecken		
TOTAL:	5478	Flächen /	22308	Ecken	/ 1028	kByte
EBENE:	68.5000	(92.5 %)				

The drawing data are save to disk. Next, the external program for calculating the NC tool paths is called. The progress is indicated in %. After the calculation, an automatic return to ISY is performed.





Depending on the workpiece size, the data quantity for the finishing path can become very large. After clicking onto the 'Yes' field in the 'View path' menu, the program tries to load the calculated data into the screen buffer for display. If this is not successful and depending on the memory configuration, the space requirement of the 3rd buffer can be increased (refer to: 'Configuration of the ISY program'). For the correct generation of the NCP file it is however not necessary to view the calculated data on the screen.

#### Re-calculate a CAM definition block

CAM block 1 for the '3D engraving' is selected. It is calculated after clicking onto 'OK'. Subsequently.

In the loaded drawing, there is still a definition block that has to be re-calculated by the data:



the path can be redisplayed.

the menu for the block re-calculation is called.

delete definitionblocks Definition-blocks in buffer 1 Selected definition-blocks ENGRAVE3D - BLOCK 1 <u>o</u>k A<u>1</u>1 No <u>C</u>ancel

#### 7.2 SEMINAR EXAMPLE 1

#### Preparing a CAM production schedule list



the sequence of the processings is determined.

The sequence of the definition block creation must not conform to the processing sequence in the NCP file. With extensive processings using different technologies (drilling, milling, engraving ...), the block assembly is performed before the post-processor run.

make workplan				
Definition-blocks in buffer 1				
MILLING - ENGRAUE3D - MILLING -	BLOCK 1 BLOCK 1 BLOCK 2		*	
Selected definition-blocks				
			*	
<u>O</u> K	A <u>l</u> l	No	<u>C</u> ancel	

 We organize the sequence and click as follows:

 MILLING
 - BLOCK1

 MILLING
 - BLOCK2

 3DENGRAVING
 - BLOCK1

 The production schedule list is saved after confirming using the 'OK' button.



We use the same tool (number 1) for 3D milling (roughing and finishing). Tool number 4 was preselected for 3D engraving. The magazine is correctly to be filled if the automatic 'Isel Tool Changer' is used. It is sensible to generate two separate NCP files that are individually to be processed by the 'Remote' using the post-processor if the machine tool does not feature a tool changer. The preparation of the production schedule list can then be omitted.

## 7.0 SEMINAR EXAMPLES

#### 7.2 SEMINAR EXAMPLE 1

Post-processing of a CAM block



The block structures are displayed in the production schedule list.



The blocks are calculated individually if the machine features no 'Isel Tool Changer':



SC SC

In the list window, all NCP files stored in the standard 'C:\ISY\NCDATA' directory are displayed. If an existing file was loaded into the buffer at the beginning, the file name is automatically taken over and the file extension (='NCP') is assigned. The conversion is started by confirming using the 'OK' button.

selects a technology.





Within the ISY CAD/CAM program, both the backslash \' as well as the slash '/'are allowed for separating directories and files.

C:\ISY\NCDATA\OPENER.NCP is equivalent to C:/ISY/NCDATA/OPENER.NCP

#### 7.2 SEMINAR EXAMPLE 1

#### Edit a CAM NCP file

The calculated NCP machine file is transparently and legibly set up in the Isel temporary format. All machine commands were set up using key-words. You find a comprehensive description of these commands in the manual of the general interpreter with user interface of the machine (='REMOTE'). Depending on the application and operational area, changes can also be directly performed in the NCP format. E.g. Port assignments - setting of hardware outputs for controlling superior control processes, or the optimization of feed values, and number of revolutions of the spindle etc.



starting of the integrated NC editor

```
Now, the processing can start.
Collision free success!
Select the file to be edited.
```

Structure of an NCP file:
The semicolons ';' at the beginning of
a line start a documentation text that
is skipped by the 'REMOTE'.

	File Select	ion	
File <u>n</u> ame			
C∶∕ISY∕ <b>N</b> CDATA	/*.NCP		± Sort
lile			Directory
LABEL . NCP NONAME . NCP OPENER . NCP	68522 11.06.99 42 10.06.99 68522 11.06.99	08:10:30 15:27:40 08:20:48	Drive
C:/ISY/NCDATA	/NONAME.NCP		c:
	<u>o</u> k	Cance	ə1
	C:/ISY/NCDATA/0	PENER . NCP	
00001 THE PBL UI	0 - PICTURES BY PC		1 End

	C:/ISY/NCDATA/OPENER.NCP	
nning of ext that	000001 TF_PEL_U1.0 - PICTURES BY PC 000002 ; T02 - D4.0 - S4 - HSS - SCHAFTFRRESER 000003 ; WT2ERD ; Nullpunkt festlegen 000005 FRSTB8 Z10200 ; Werkzeuguechselpos. 000006 GETTUDL 20 V Herkzeuguechselpos. 000007 STINDL 20 V HERK5000 000007 STINDL 20 V HERK5000 000007 STINDL 20 V HERK5000 0000007 STINDL 20 V HERK5000 0000017 HOUSABS Z7200 000011 VEL 16657 000011 VEL 16657 000011 VEL 16657 000015 HOUSABS Z7200 000015 HOUSABS Z1200 000015 HOUSABS X15600 000015 HOUSABS X15600 000015 HOUSABS X15600 000017 HOUSABS X15600 000017 HOUSABS X15600 000021 HOUSABS X15600 000021 HOUSABS X15600 000021 HOUSABS X15600 000021 HOUSABS X15600 000021 HOUSABS X15600 000021 HOUSABS X15600 000022 HOUSABS X1500 000025 HOUSABS X1500 000005 HOUSABS X15	End New Open ± Search
the Save men	u is selected.	

Answer all saving questions using 'No' to exit ISY.

The machining can start now.

FILE

Please make sure that the "opener" is within the positive Z range Attention! and therewith the origin of the workpiece is within the material.

## 7.0 SEMINAR EXAMPLES

## 7.3 SEMINAR EXAMPLE 2



## 7.3 SEMINAR EXAMPLE 2

#### Drawing text

Both character sequences should be created. Next, the processing is made using ISY-CAM.

ISY is started and signals it's readiness on the lower left with modify:



calls the 2D geometry functions in the menu area.

LC and then RECT 2D OBJ NUM

draws a numerical rectangle.

Enter width: 80 Enter height: 50 Enter center (x, y): 0,0



recta creates an axis-parallel rectangle with or without edge and rounded corners, or an oval.



SC shows the drawing in the maximum size.



the 'OK' button.

LC

SC calls the menu for selecting the font





TEXT

label generates a label text

## 7.0 SEMINAR EXAMPLES

## 7.3 SEMINAR EXAMPLE 2

Then, repeat the setting of the font and convert the text into Bezier curves. Within the rectangle, position the cross-hair cursor on the lower left corner of the text window and press the left mouse key. The text window opens and the second upper point on the right is selected.



CON-LC POLY + BZ



Toleranz: 0.01 The character sequence is converted into Bezier curves and straight lines.

cvtopic converts the internal command syntax. The command syntax of an object is converted into move and drawing commands (ma,da).

Repeat the process and select the 'PS-8' font type. Within the menu, paging through the font selection is performed by clicking onto the 'PAGE' button on the 'ADV' line.

This time select the .. label-text": CAD/CAM

Then, repeat the setting of the font and convert the text into Bezier curves.

#### 7.3 SEMINAR EXAMPLE 2

# IS Y CAD/CAM

## Create a CAM definition block for a pocket



Click into the 'Objects' line. Then, select the outer rectangle and the lower character sequence using 'F2'.

Select 'Roughing'. Enter a 'Depth' of 5. In the 'Tolerance' field, the maximum deviation in millimeters related to contouring errors can be entered. Contouring errors are intersection errors of geometry elements. Without entry, the error limit is set to 0.005mm.

Just for data import, the limit can be increased for miscalculations to 0.1mm. Then, click onto 'Tools'.

The 'Opening angle' in degrees specifies the complete cutting
angle. A workpiece edge of 45 degrees is created by entering
and using a tool with '90' degrees. In our example, we assume a
cylindrical shaft milling cutter with a diameter of 6 mm. If, in
addition, an 'Opening angle' would be entered then the milling
paths would keep away the cutter about the distance of the
collision point (radius + 0.414 at a 45° tool and 1mm depth).
An 'Entry angle' can be defined if tools do not cut using the
milling cutter center. The feed into the material is then made in
the specified angle with two tool axes.

By clicking onto 'OK' the program returns to the main mask. There, click onto the 'Calculate' field.

SY: Pocket-milling and stamp-generation with closed contours
Percentation     BLOCK 1       Objects     obj1,obj3
K Roughing       Finishing       Cut off         Roughing       Einishing       Io/from         Plane       depth       Cyl-diameter         Pathdistance       48%       Retreat       Safety         Restmaterial       Max dist.       Iolerance
Iools         Calculate         Store values           Postprocessing         Cancel



## 7.0 SEMINAR EXAMPLES

## 7.3 SEMINAR EXAMPLE 2

Confirm the question with 'Yes'

Bl	ock	has	c	ha	nged ,	save?
	3	les			<u>N</u> o	



Yes

The calculated milling paths are displayed. It is obvious that the tool with diameters 6 leaves remainder material untouched. Now, the remainder material should be machine-cut. Copy the technology block for the second processing since solely the tool diameter changes.

into the 'Selected definition blocks' field and is

calculated after clicking onto 'OK'.



Do you want to see the paths?

No



SC the just calculated definition block is entered into the list of the production schedule.

#### 7.3 SEMINAR EXAMPLE 2

SC

## Copy CAM definition block for remainder material processing



'Block 1' is selected.

First, click onto 'Copy'. Next, the changes are performed. The calculation of the 'remainder material' should refer to definition block '1'. The redefined second tool tries to cut everything that was not being machine-cut in the 1<sup>st</sup> block. Click onto the 'Tool' field.

ISY: Pocket-milling and stamp-generation with closed contours
Denotation BLOCK 2
X Roughing     Finishing     Cut off       Roughing
Plane         0         depth         5         Cul-diameter           Pathdistance         48%         Retreat         1         Safety         1           Restmaterial         1         Max dist.         Iolerance         1
Iools         Calculate         Store values           Postprocessing         Cancel

'Tool number', 'Diameter', and 'Feed' are changed. Subsequently, confirm the entry by clicking onto 'OK'. Then, click onto 'Calculate' in the main mask to view the paths of the second definition block.



## 7.0 SEMINAR EXAMPLES

## 7.3 SEMINAR EXAMPLE 2

The calculated paths remain in the third screen buffer after pressing a key.





the just calculated definition block is entered into the list of the production schedule.

Now, we would like to see the calculated paths in an isometrical view:

1: BUF3:	SC	Change to the simulation buffer.
-------------	----	----------------------------------

BOX ALL

ZOOH



SC

1: 🕇

BUF3:

SC Mit BOX ALL werden die Abmaße der Bahnen neu berechnet, um diese anschließend mit ZOOM ALL in den maximalen Abmeßungen anzuzeigen.

SC redisplays the complete drawing in buffer 1 in the maximum size

SC isometrical paths are shown.

## 7.3 SEMINAR EXAMPLE 2

## 'Max. distance' pocket CAM definition block



Some applications require the machine-cutting of the selected contours in a freely definable 'maximum distance'. All selected contours are equidistant bordered if this distance measure is entered in the size of the milling cutter diameter or smaller (when entering 100% 'path distance'). After simulation, these calculated contours are available in the third buffer for display ('View paths: YES').

ISY: Poc	et-milling and stamp-generation with closed contou
	otation BLOCK 1 I Dojects obj3,obj1 copy bloc
X <u>R</u> o Pat <u>h</u> d i Rest <u>m</u> a	Loughing     Finishing     Cut off       ghing     Finishing     Io/from       Plane     0     depth       1     Cyl-diameter       stance     48%     Retreat       1     Safety     1       serial     Max     dist.
	Iools     Calculate     Store values       Postprocessing     Cancel
	Do you want to see the paths
<b>H B</b>	
	X Schott System

The selected contours are bordered once.

# 7.0 SEMINAR EXAMPLES

## 7.3 SEMINAR EXAMPLE 2

## Create an engraving CAM definition block



create a new processing block for engraving (milling cutter on center path)

The processing depth totals 0.3. The highest Z-value of the workpiece has the measure 0. The entire processing proceeds according to Z-.

TECH

The deepest point of the character sequence is located at Z-5. The engraving should also be milled at that location. The 'Retract distance' should lift the tool to the zero level (Z0=Z-5+Z5). Next, the tool is defined.

Denotation BLOCK 1
Plane     -5     depth     0.3     Cyl-diameter       Retreat     5     Safety     1     Iolerance
Tools Calculate Store values Postprocessing Cancel

The data in the field for the opening angle for the engraving on the center path has no influence. Nevertheless, it can be entered since it is taken over into the tool list. Click onto 'OK' Click onto 'Calculate' Confirm 'Save block' using 'Yes' Click onto 'OK' at the 'Selected definition block' Click onto 'YES' at 'Display path'



The engraving paths are processed exactly in the sequence of their design. No automatic path optimization occurs. However, since ISY is an object-oriented CAD program, the sorting of the objects can be manually made (sequence in the screen buffer). This is sensible if data were read-in using the geometry import.



Manual milling path optimization with the specification of the milling sequence:



modify: scmmd
Enter command: trans \* 2:
1. Select object (After selecting all objects, call the context menu using the right mouse

button. There, click onto 'End') modify: *cover all teil* 

modify: box teil

modify: trans teil 1:

Switch back to screen buffer 1:

Within the engraving definition block, the name is entered on the 'Objects' line using the keyboard (part).

#### 7.3 SEMINAR EXAMPLE 2

This method is also used for processing many milling objects.

#### Create a CAM definition block for V-shaping

The 'Finishing' button in the 'Pocket milling' menu describes the V-shaping technology. For this, a graver with a small diameter at the top (mostly 0.3) and a slender angle (e.g. 30°) is moved along the geometry. A collision checking with adjacent contours is performed. Thereby, the tool is lifted in the corners resulting in sharp edges at the contours. The V-shaping can be used for stamp manufacturing.



Click into the 'Objects' line. Select the outer rectangle and the lower text. Activate 'Finishing'. Machine-cutting depth of 5mm. Click onto the 'Tools' field.

ISY: Pocket-milling and stamp-generation with closed contours
Denotation BLOCK 3
🗌 Roughing 🕱 Finishing 🔲 Cut off
Roughing Finishing Io/from
Plane 0 depth 5 Cyl-diameter
Pathdistance 48% Retreat 1 Safety 1
Restmaterial Max dist. Iolerance
Iools         Calculate         Store values           Postprocessing         Cancel

Use the same tool for V-shaping and engraving: a graver with 0.3 mm diameter and an opening angle of 30°. The processing direction is opposed to the course of the geometry elements if the 'Reverse' button is active. The program returns to the main mask after clicking onto 'OK' . Click onto 'Calculate' Confirm 'Save block' using 'Yes' Click onto 'OK' at the 'Selected definition block' Click onto 'YES' at 'Display path' 'Add to production schedule'



## 7.0 SEMINAR EXAMPLES

#### 7.3 SEMINAR EXAMPLE 2

It is obvious that the milling paths extent to the small corners of the individual letters. The tool reaches the full depth of 5mm only at the outside of the letter.



After the modification, we have immediately entered every of our technology commands in the 'production schedule'.

#### CAM block post processing



the already determined processing sequence is displayed.

Since the shown list has not to be changed anymore it is confirmed by clicking onto 'OK'.



#### 7.3 SEMINAR EXAMPLE 2



SC the already ordered blocks in the 'production schedule list' are redisplayed and confirmed using the 'OK' button.

Click onto the lower entry line to enter a name using the keyboard. Confirm the entry by clicking onto 'OK'.

Saving the drawing



KC the safety menu is called.

In the 'Directory' field, click onto the down scroll bar to see 'VECTOR'. Then, click onto 'VECTOR' to select the default directory for the drawings. Now, all files located in the 'C:\ISY\VECTOR' directory are shown in the 'File' window.

 File name
 Sort

 C:/ISY/UECTOR/\*.\*
 Eile

 File
 Einectory

 1992.UEC
 11771 03.09.92 19:22:10

 3DBNSI.UEC
 96934 03.09.92 19:05:50

 3DBSP1.UEC
 27343 17.05.90 17:45:44

 3DBSP2.UEC
 27343 17.05.90 17:46:14

 3DBNSI.UEC
 201077 10.07.90 10:14:36

 3DROB.UEC
 65612 09.08.91 17:31:22

 3DROB.UEC
 6580 17.05.90 15:23:66

 AtLEER.UEC
 6580 17.05.90 16:23:40

 C:/ISY/UECTOR/LABEL.UEC
 C:

 QK
 Cancel

File Selection

The entry mode is activated by clicking onto the line. Enter the 'LABEL.VEC' name. The drawing is saved on the hard disk after clicking onto 'OK'.



answer all savings inquiries with 'No' to exit ISY.

The memory-resident driver for driving the machine is called.

Subsequently, the 'C:\ISY\NCDATA\SIGN.NCP' file can be milled using the 'REMOTE'. The calling of the driver is different for each machine type. It is comprehensively described in the included documentation of the machine.

## 7.0 SEMINAR EXAMPLES

#### 7.4 SEMINAR EXAMPLE 3



#### 7.4 SEMINAR EXAMPLE 3

#### Training example 3

The example is structured in 3 parts.

- 1. Geometry generation with the ISY PAR parametric module
- 2. Geometry generation with the CAD functions of ISY
- 3. Technology processing with ISY CAM and generation of the NC tool paths.

#### PART 1. ISY PAR

After calling the ISY program, the change to the ISY PAR part is made using



In the ISY PAR part, we will construct the '4-toothed' contour. '4-toothed' is generated by designing an 1/8 of the contour and completing it subsequently by mirroring and rotating. Using points, lines, and circles as support, a two-dimensional outline is created that we then join to a direction-oriented contour using the contour command. Thereby, a series of temporary design is created. Let us look at our example drawing. We start with the elements showing all dimensions for the clear geometry creation. The extreme radius of our '4-toothed' is located tangentially within the 12 corner image. Thereby, the radius is automatically generated. Therefore, we must draw first a part of our 12 corner image.

define a numerical point with X88.13/2 Y0 and a second point with X0 Y0

,	6	
/	PW	

Line through P1 (select) with angle of 105 degrees and a second through P2 with angle of 15 degrees

Furthermore, use buttons for the design. As shown in the print-out of the example, the area text is thereby automatically generated. The design steps listed on the next page are not imperative. There are several possibilities for an successful implementation. After completion, compare your resulting geometry with the geometry of the '4zack.vec'. The file is stored in the 'C:\ISY\VECTOR' directory. Proceed as follows.



₽-

Save your drawing

Then, exit the parametric module. The created contours are automatically taken over into ISY-CAD. Using the

modify: trans all 2:

command (that is directly entered in the 'Modify input area' using the keyboard) all geometry elements are transferred into the second buffer. Call up 'ISY Par' again to load the '4zack.vec' file. Then, exit 'ISY Par' again. The same result should be visible by switching from buffer 1: to buffer 2: (refer to: The Global menu). You have succeeded? We congratulate!



## 7.0 SEMINAR EXAMPLES

#### 7.4 SEMINAR EXAMPLE 3



The source text of the parametric drawing is directly shown by clicking onto the EDIT icon if 'ISY Par' is active. It is exited again by pressing the <ESC> key.



Z1.88.13/2 P1,XZ1,Y0 P2,X0,Y0 L1,P1,W105 L2.P2.W15 P3,L2,L1 K1.P2.P3 Z2, XZ2, Y0, R7.87 L4.K2.W135 K3, -L4, -K1, -R6.289 K4,X0,YZ2,R7.87 L3.K4.W315 K5, -L3, -K1, -R6.289 L5.Y0 L6,X0 P4.L5.K2 P5.L6.K4 CO1,P4,-K2,L4,K3,NE,K1,NE,K5,L3,-K4,P5 DU.CO1.P2.W90.S3 P6.X0.YZ1 L7,P6,W-15 L8,P2,W30 P7.L1.L8 L9,P7,W135 C02,P1,L1,L9,L7,P6 DU,C02,P2,W90,S3



## 7.4 SEMINAR EXAMPLE 3

#### PART 2, ISY CAD

After drawing the '4-toothed' contour check whether you are back again in screen buffer 1 (refer to: The Global menu).



SC shows the drawing in it's maximum size.





LC and subsequently calls up the 2D geometry functions in the menu area.



LC and subsequently

Enter width: 100 Enter height: 100 Enter center point (x,y): 0,0

The finally constructed object is automatically marked as active. Most commands refer to the active object. In ISY the active object is abbreviated by a star '\*'. This star is often found on buttons:



However, this star represents the area name of the geometry element.

Commonly, these names start with 'obj' followed by a number. Thereby, the number is automatically incremented for any newly drawn object ('obj1', 'obj2', 'obj3' a.s.o). Later, milling commands also refer to these objects. For changing an object select it first to make it active. The object is then shown in the special pointer color (red and green shaded). The marking is removed using *CLS*.



cls Clearing the screen

The selections buttons in the Global menu

The current coordinates are displayed in the lower right corner whenever the cross-hair cursor is visible on screen after clicking onto a selection button. The coordinates are reset to zero by pressing the <F3> key. By pressing <F4>, they are reset to the original units. The function is used for measuring purposes and is only effective for the moment.

At the selection, a possibly defined group snapping is considered (refer to: The Global menu). Character sequences are selected at their reference point (on the lower left). Additional selection possibilities are offered by LC ing:



Select element, corresponds to SCing onto SEL



The previously selected object is excluded at a repeated search. This is sensible if two objects are located one on the other.



This special function selects hatchings. They are to be selected at their respectively corners, e.g. at the corners of a rectangle.

## 7.0 SEMINAR EXAMPLES

## 7.4 SEMINAR EXAMPLE 3



The object name can be entered using the keyboard.



From the active object, the higher-level envelop (macro) is selected.



Elements within the window are selected. Objects located completely within the window are entered into a list as found elements (see below: Select list).



All objects in the active Buffer are activated (e.g. to move the entire buffer content into another buffer).

The starting and ending points of lines and circles are marked.

The segments of the active object alternate their colors between red and green (color change ma').



find selection of objects



Thereby, some modify functions have an integrated selection command. Often, these are commands labeled as 'MULT' or 'MULTI'.

Now we know that the rectangle is already active if it should be deleted. Thus selecting can be omitted.



the rectangle has disappeared





del deleting an object

This was a short excursion into selecting and deleting objects.

Now, we want to proceed to design the 3D torus and the 3D hemisphere. The design is thus structured that the milling process can take place subsequently. The external calculation program searches for 3D areas in the drawing if 3D milling processes are to be performed. The tool diameter and the tool form are considered for the following milling path computation. The chip removal is made thereby in the direction of the positive tool axis until 3D areas "stop" the tool. Thereby, holes or gaps between the areas do not falsify the calculation. However, if the tool diameter is smaller than a gap the tool penetrates into the crack. In this example we will design two types of areas.

#### 7.4 SEMINAR EXAMPLE 3

The torus must be surrounded by an area that exceeds the raw dimensions of our work piece (100x100) on all sides. The edge contour of the '4-toothed' is later milled using 2D functions. To achieve even 3D areas (imagine a piece of paper that you can arbitrarily turn in the room) a 2.5D matrix is set. The 2D object is subsequently hatched. 2.5D hatchings are automatically presented as areas. Since the plane surrounding the torus is on Z10 (we assume that the lowest layer of the 12-corner is at Z0 and the height difference from contour to contour totals 5mm), we set our spatial plane onto it.



#### VIEN OO

LC

2000

Enter the vertical axis to the desired plane:  $\langle z \rangle z$ Enter the height of the axis direction: 10

setm2 setting of the 2D drawing area into the 3D room

Values indicated by the system are enclosed in pointed brackets '<>'. They are taken over using <ENTER>. Thereby, the vertical axis describes the direction of the area standards. The 'T3D' indicator of the Global menu is red. Additional axes crosses are visible.

## 7.0 SEMINAR EXAMPLES

#### 7.4 SEMINAR EXAMPLE 3

If possible, the small axis intersection is drawn in the origin. Thereby, the inscription is always XY (representation of the 2D commands). For 2.5D designs, select the view always head-on (vertical axis not visible).



The original 3D axes are displayed to visibly represent the location in the room.

After selecting the 3D plane, the view is automatically turned to look frontally onto the design plane.





The circle determines the outer limit of the torus.



arc creation of ellipses (circles) or splines (arc) and regular polygons.



Enter height: 120 Enter center (x,y): 0,0

On each side, the rectangle is drawn 10mm larger than the finished contour. The drawn objects are automatically generated as 2.5D objects. Hatch these now to create the area.



click into the field with the asterisk hatching.





click onto Size and enter 0.3.

The cross-hair cursor for the element selection is displayed. Position the cross-hair cursor onto the internal circle and click with the left mouse key. The selected object is shown in the pointer color. By clicking onto the right side out of the permissible drawing area, a context menu is opened offering the necessary functions for selecting.



#### 7.4 SEMINAR EXAMPLE 3



acontour automatic generation of closed curve traces (hatching areas) with a change of the sense of the rotation (similarly to contour.prc and econtour.prc).

Next, select the larger rectangle. By clicking below the permissible drawing area, the function is started. The hatching should change to blue.



LC select the blue color.



the hatching object is colored.

Then, select yellow as a new color. All newly drawn objects are now automatically drawn in yellow.

The two 3D bodies should be drawn.



3D design



pole axis in (x,y,<z>,a=free) z direction Center point <0,0,0>: 0,0,10 Radii <[IG.1S>: 16.5



3dtorus create a 3D torus.

pole axis in (x,y,<z>,a=frei) z direction Center point <0,0,0>: 0,0,10 Radius: -11 (by using minus, the hemisphere is drawn downward oriented)

3dsphere create a 3D ball (as Bezier area).

## 7.0 SEMINAR EXAMPLES

## 7.4 SEMINAR EXAMPLE 3

The 'ISY CAD-CAM' character sequence should be engraved on the torus. We set our 2.5D plane above the torus.





Normal (n) or reverse inscription (r): <n>nSelect the object (the circle) Enter the text: ISY CAD/CAM

Select the center of the base line (select the circle at 12h and close to the circle, but outside).

## 7.4 SEMINAR EXAMPLE 3



*lblcirc* outside and inside inscription of a circle and/or arc.





LC

tolerance: 0.1 POLY



The character sequence is moved to the plane of the set Z16 conversion matrix.



CON-VERT

trans3 conversion of a two-dimensional into a three-dimensional object.



Activate Duplicate in the Global menu

Enter the displacement (dx,dy,dz): 0,0,-6



scale3 moving, scaling and duplicating of a three-dimensional object.





the short click saves the buffer content in the 'SOS.VEC' file in the set vector path.



save saving of a drawing or text contained in one of the four buffers to a file.

## 7.0 SEMINAR EXAMPLES

## 7.4 SEMINAR EXAMPLE 3

ISO



the screen view is set to isometric.



setpp determine parallel projection for 3D commands.



By clicking onto ICON, the menu is defined for determining the object capture arrangement (refer to: WORKING WITH THE OPERATING ELEMENTS). Check, that the Group input field contains the value '100879' (3D objects are only then found during selection processes).



selecting the upper and subsequently the lower character sequence. The 3D ribbon is now locate in the torus.



3dband create an 3D area between two objects.





3D cutting is externally calculated. The result is then loaded into the drawing. The cutting curve is displayed in red.



the macro of the cutting curve is selected. Enter the displacement (dx,dy,dz): 0,0,-0.3

In CAM, the cutting curve is then directly converted into the milling path.



ifaces calculate3D cuts



the integrated Shading module computes the photo-realistic displays of our desian.



There are numerous setting possibilities for lamp points, materials, gloss, brightness and so on. By selecting TIFF image, black and white TIFF images or color TIFF images can be created that can be further processed by graphic programs for presentation purposes.



## 7.4 SEMINAR EXAMPLE 3

## PART 3, ISY CAM

After finishing the design of all geometries, we want these to be milled. Thereby, the following processings should be performed:

- 1. 3D roughing and finishing to free form.
- 2. Finishing of the pocket of the 4-toothed with contour.



The 'Tolerance' field determines the distance of the maximum deviation between the designed area and the calculated NCP path. The default deviation is 0.05mm if no value is entered.

By clicking onto the 'Dimensions' menu field, the question is answered with 'Yes'.

The size dimensions of our 'obi3' 3D torus are now

displayed in the table.



7.0 SEMINAR EXAMPLES

## 7.4 SEMINAR EXAMPLE 3

For machines with tool changer, the 'GETTOOL 1' command \_\_\_\_\_ line is included in the NCP file.

The face-milling cutter creates sharp contours at the outside diameter of the 3D torus.

The depth movement is made in 3mm layers.



After clicking onto the 'More' field, we see that now also the milling area for the diameter 3 tool was adjusted. By clicking onto the 'X' and 'Y' fields, we increase the value of the limits to

<u>X</u> : -40	40
<u>Y</u> : -40	40
Z: 5.0	15.0



for the entire processing of the surface of the 4-toothed.

Select the type of the processing. Machine-cutting is made in layers of 3mm by means of 'Roughing'.



And then you select calculate.

#### 7.4 SEMINAR EXAMPLE 3

'Block was changed, save ?' Yes.

calculate paths Definition-blocks in buffer 1 The first technology block is displayed. . Selected definition-blocks MILLING - Roughing Torus -> After confirmation by clicking onto OK, all data of the buffers are saved onto the hard disk and the external A11 <u>o</u>k No <u>Cancel</u> calculation program is called. >



*ncf* calculate tool-compensated paths for Pictures by PC drawings.



*ncp* post-processing of NC paths for Pictures by PC.

#### Note:

Area data exceeding 10Mb can not be read into the ISY text buffer. The external command line-oriented 'ncf.exe' calculation program is used in this case.

Now, the paths are calculated layer for layer. After calculation, a return to ISY is performed.

The calculated milling paths are loaded into the third buffer. The 'Buffer full' error message is issued if the path data exceed the reserved space (refer to: CONFIGURE THE ISY PROGRAM). This has however no influence on the conversion into the NCP format since this display is solely used for visualizing.

Doy	jou	want	to	see	the	paths?
		<u>Y</u> es			No	

## 7.0 SEMINAR EXAMPLES

#### 7.4 SEMINAR EXAMPLE 3

Retreat 1

Tools

Stock

We copy the content to the second technology block since the finishing is equal to roughing except for a few entries.



Safety 1

Calc<u>u</u>late

Postprocessing

Tolerance

Store values

Ca<u>n</u>cel

The path distance is specified either in % of the milling cutter diameter, or directly in mm.

The input fields are adjusted. The technology block is subsequently re-calculated. Next, save your file onto the hard disk. With the drawing, also all entry parameters of both technology blocks are saved. The calculated milling path are updated at every re-calculation. Therefore, it is important to perform this re-calculation after every loading of a new drawing containing technology blocks before the converting the data into the NCP format.

After technology processing, it is to be kept in mind that these used names remain unchanged since all processings refer to objects. Thereby, the following commands are contained in the prohibition list:



obrename unique numbering of objects in the 'defbuf' buffer.



name changing of an object name.

The next processing should be the milling of the 3D engraving. The conversion of the internal data of 3D engravings is made without tool compensation, i.e. The machine tool will have process the data exactly as these are to be seen on the screen. For this reason, the paths are deepened by 0.3mm into the workpiece.

## 7.4 SEMINAR EXAMPLE 3



Using corresponding color filters and the isometric view, the macro of the 3D character sequence can be simply selected.

command area ? TECH

a new processing block is created.



Click into the 'Objects' line and enter the 3D engraving name. This is 'engrave' in our example.

#### ISY: Definition of tool



The '2' tool should be used to mill-cut the engraving. The diameter and the tool angle are taken over into the tool list. However, they have no influence on the calculated geometries. The tool setter uses the tool list to find the fitting tools at the machine. The program returns to the main menu after confirming using the 'OK' button. Next, the block is converted using 'Calculate'.

Do you want to see the paths? Yes No

The guestion is answered with 'Yes' and the calculated milling paths are loaded into the third buffer where they remain.

After switching to the third buffer, the object boxes of the simulated blocks must be re-calculated.



The next processing should be the milling of the 4-toothed as pocket. Use the settings in the color snapping/color display menu to select the correct geometry elements.

## 7.0 SEMINAR EXAMPLES

#### 7.4 SEMINAR EXAMPLE 3



a new processing block is created.

ISY: Pocket-milling and stamp-generation with closed contours

TECH



'Finishing' is selected as additional processing.

During roughing, a meander-type pocket is machine-cut. During finishing, the contours are again moved along (completed by the approach and departure movements). In our example, the same tool is used for both processings.





The larger outer 'obj2' rectangle is used as limit.

#### 7.4 SEMINAR EXAMPLE 3

The different processing technologies are subsequently listed in a production schedule. Step-by-step, the post-processor processes the production schedule to generate the NCP file.



the processing sequence is selected in this menu.

the menu for converting the blocks is called







Assign unique names for the milling file.

## 7.0 SEMINAR EXAMPLES

## 7.5 SEMINAR EXAMPLE 4



## 7.5 SEMINAR EXAMPLE 4



LC LINE

LINE using the line drawing function, straight lines are inserted on both sides. ı

line drawing of lines (arc) with numerical coordinate entry (absolutely, relatively, polar (3D)).

## 7.0 SEMINAR EXAMPLES

#### 7.5 SEMINAR EXAMPLE 4



After calling the procedure, the cross-hair cursor appears and the 'Select 1st point' is displayed. Position the cross-hair cursor as exactly as possible onto the circle quadrant but slightly above the circle. The point is selected by clicking with the left mouse button. A rectangular marking symbol shows that the capture arrangement has exactly locked onto the coordinate point.



The current point is displayed. The process can be repeated by pressing the <ENTER> key if clicking has not exactly caught the X60 Y15 coordinate (PNT, NEW; <ENTER>), A textual menu with help is displayed on the right screen side. You can not click onto the listed points using the mouse. All entries are performed in the Modify input area. The operation of this program is comparable with a crayon that is either moved on a sheet of paper with a lifted hand or draws lines with a lowered hand (LINE NUMERICAL and/or MOVEMENT). Within both groups, it can be distinguished between absolute, relative and polar movements.

The actual coordinates are preceded by identifiers without gaps (<SPACE>) between them. In the example, a line should be drawn starting at the current position that does not change in the X-direction (0) and moves 3mm upward in the Y-direction.

> Next point: r0,3 or Next point: a60,18 or Next point: p3,90 3mm below 90°

If you can not click onto the point from which the line should start then 'a', 'r' or 'p' must be preceded by a 'm'. Thus, only movements occur. A deficient last entry is taken back by using a 'b'. Using 'o' within the procedure, the coordinate source is set to the current position. Disabling the zero point shifting is automatically made after the procedure end using 'e'.

## 7.5 SEMINAR EXAMPLE 4



LC Radius: 20 The selection points are located on the line and on the circle with R80.

Since the 'R20' radius is located tangentially

between 'R80' and the line, we draw the last straight line of the polyline somewhat longer.



ct2e creation of a tangential arc using two elements (circle or line).

The upper half of the contour should be drawn. Then, mirror it across the horizontal straight line in Y0. Now, we draw also the mirror line using the same 'line.prc'.

Next point	t: ma-75,0
Next point	t: a75,0
Next point	t: e

Trimming can start since now all edge limiting elements exist. Trimming moves two selected elements to the intersection.

## 7.0 SEMINAR EXAMPLES

## 7.4 SEMINAR EXAMPLE 4

Examples for trimming a line with a line:

At the first

Examples for trimming a line with a circle:

At the first

Both

Both



ĥ.

#### 7.5 SEMINAR BEISPIEL4

Examples for trimming a circle with a circle:



AL AL

trimx trimming of elements with a simple object selection (with cross-hair cursor)

The following rules apply for the trimming of segments of the function:

- 1. The object selected first changes.
- 2. It remains visible on the screen at the place where it was selected.
- 3. Select closely in the proximity of the to be expected intersection.

A complete circle has no starting or ending points before the first trimming. Therefore, no optic result is visible at the first trimming process. A control function is executed using:



the circle is selected. Next, the center, circle starting and ending points are identified by a marker.

All starting and ending points in the entire drawing are marked using

modify: markpnt all

The function is important since trimming is always related to segments (smallest part within an object). During trimming, always the segment between the two markers is selected.



markpnt marking of points in an object.

## 7.0 SEMINAR EXAMPLES

#### 7.5 SEMINAR EXAMPLE 4

Since trimming does not automatically re-calculate the internal object box (maximum dimensions of an object), the function must be manually executed after finishing.





*box* calculation of the object dimensions (object box)



Save your drawing before you start the trimming. All elements are now trimmed with each other and the outer rectangle (150x72) is deleted. After re-calculating the object boxes and setting the screen section to the maximum size, all objects should be summed up to a closed, direction-oriented contour.

#### Contour starting point





Select object number 1 to 14. The mirror axis is not selected. The function is started by clicking below the active drawing area.

A contour is created as duplicate. This is then transferred into the second buffer. modify: *trans* \* 2:

All previously selected objects are deleted. Switch to the second buffer .



1:	
	1
	1

Select the contour and using modify: trans \* 1: move it back to the first buffer. The finished contour is mirrored as duplicate.

#### 7.5 SEMINAR EXAMPLE 4

The upper and lower character sequences proceed parallel to the outside contour. Two equidistant (=parallel to the contour) auxiliary contours are generated. Then, the 'Objects between curves' procedure positions the character sequence as form-required.



distance: 2



*econtour* interactive creation of closed curve traces (hatching areas) with a change of the direction of rotation.The creation of equidistant curve trains is also possible.



Using the cross-hair cursor, the starting point of the line is selected. The selection point is located negligibly above and somewhat on the left of the actual starting point of the line. Thus, it is ensured that the nearest starting point belongs to the horizontal line. The starting point is identified by a triangle mark pointing downwards. The marker with the upward directed tip marks the end of the element.



Using 'Select distance/position', the crosshair cursor is displayed below the line to draw the inside contour trace. Next, the segments are selected one after the other. Always, click on the nearby second marker (upward directed tip) but more closely to the next segment. The contour identification is opposed in the direction if the displayed markers are suddenly reversed. In this case, the contour identification must be aborted (<CTRL> + <PAUSE>) to restart the process from the beginning.

# 7.0 SEMINAR EXAMPLES

## 7.5 SEMINAR EXAMPLE 4

The sense of the direction must be the same as the direction of the text sequence. Therefore, the direction must be reversed.





revco reverse the sense of the direction of a contour.

The procedure for the automatic positioning of a text between two curves requires polygons as the geometry basis. Currently, our contour trace is made up by polygons and circles. The conversion is made by using



input of the conversion tolerance <0.01>: 0.1

After conversion, handles are still defined within the contour. These 'ma' (starting points) in the internal data structure must be removed for the procedure to process the entire curve.



rmma remove superfluous 'ma' and join polygons.



distance: 13 Select the first object. Click below the permissible drawing area Select distance/position; click below both triangles



SC

LC

mirror point: 0,0

Select the upper contour

mirror point: 0,0

## 7.5 SEMINAR EXAMPLE 4



mirror mirrors an object across a vertical or horizontal axis

The PS-64 font type is selected. The size of the upper and lower character sequence is thereby automatically calculated since they are scaled between both curves.



label text: ÈX (Hier wohnt Familie) This is where we live

Select the first corner of the text window Select the lower line Select the upper line

LC

The upper text is used as temporary measure and can be deleted at any time. The same process is also used to create the lower character sequence.

Label text: (Feuerstein)

Flintstone

The 'Flintstone' text is created. The 'PS-75' font type with a size of 10 mm is defined. Check, whether duplicating is deactivated.





enter the new position of the object center (BOX): 0,0 Now, the 'Flintstone' character sequence is exactly aligned in the center.

## 7.0 SEMINAR EXAMPLES

## 7.6 SEMINAR EXAMPLE 5



## 7.6 SEMINAR EXAMPLE 5

Create a drawing copy and delete the CAM definition block

Load the existing 'C:\ISY\VECTOR\FRPL.VEC' drawing from the hard disk for subsequent cutting. modify: *load frpl* modify: *zall* 





#### Create a drawing copy and delete the CAM definition block

The loaded drawing already contains CAM technology blocks. Four blocks for contour milling and one block for the inscription. For the exercise, the original source drawing should stay untouched. All changes are performed to a copy. modify: save firtest

The copy it is loaded again since we want to process. modify: *load frtest* 



SC calls ISY CAM



the four technology blocks are deleted.

first, the technology type is selected. This is contour milling in our example. Subsequently,



the engraving process is deleted.

The marking symbols for the contour starting points at the lower front panel remain. The functions for the point management are explained later. The upper of the two front panels should now be processed. Since all milling commands refer to existing geometries, now only the object interrelating should be examined: How many objects make up the first and second contour to be mill-cut?



## 7.0 SEMINAR EXAMPLES

#### 7.6 SEMINAR EXAMPLE 5

## Create a macro



The cross-hair cursor for the element selection is displayed. Now, position the intersection of both lines on an element of the 'first contour' and press the left mouse button.

The entire pocket is marked in the red/green color as active object. It is already chained. In this case, the macro creation is skipped.

modify: cls

Now, the second contour should be examined using the same procedure.



Selecting showed that only an object of the contour trace is active.

For the later technology processing, these individual objects must be addressable using one name since the 'Objects' line in the technology window is limited to an input length of 80 characters. The second contour is composed of 4 circles. By selection, they are taken over into the definition block and present thus no problem. However, a macro should be created for an exercise. The macro creation functions also if many individual object are created by geometry imports of 'EPS' or 'DXF' data. The number of objects required for the generation of a contour is then not limited anymore. For the 'contour milling-cut' technology however, the selected objects must respectively belong to **one** contour. One definition block mill-cuts **one** contour trace whereby this can be open or also closed. For the directional sense.



No macro is defined - enter the name for object chaining: <part1> Enter



Presently, no object exists yet: part1 chaining to MACRO.PRC Delete (SPACE), overwrite or accept the name: cpart1> Enter

Click onto 'Save' in the 'Undo' safety menu Select the first object.

DEF.

The right mouse button selects the context menu. In this menu, the correction possibilities and zooming can be activated. The function is started by clicking below the permissible drawing area.

#### 7.6 SEMINAR EXAMPLE 5

## Contour milling



macro select objects and regroup to a macro object.







ISY: Definition of tool

Number of tool 1

Aperture-angle

Increment depth

OK

Diameter

Velocity 500

Spindle-Speed 6000 6000

Cancel

A new definition block for contour milling is created

In the 'Objects' line, the 'part1' name can be directly entered using the keyboard. Roughing with a 0.2mm accomplished. Depending on the contour starting point, the direction (synchronous/reversed) and right maximum permissible contour errors are entered into the 'Tolerance' field. Without input, contour gaps my not exceed 0.005mm.

Roughing Finishing

500



In the tool menu, a roughing and a finishing cutter is entered. Using 'OK', the program returns to the main window. After clicking onto the 'Calculate' field, the selected definition block is confirmed using the 'OK' button. Using the cross-hair cursor, a contour starting point is selected by clicking onto the white contour.

The sense of the direction is displayed. A directional change is performed by clicking onto 'No'. There is one inquiry for roughing and one for finishing. Thus, roughing can be performed in the reversed direction and finishing synchronously.



## 7.0 SEMINAR EXAMPLES

## 7.6 SEMINAR EXAMPLE 5

The contour was machine-cut at the inside. Two contours are to be seen completed by a tangential approach path at the beginning and at the end. The marking symbol for the starting point was inserted. For exercise purposes, the contour starting point should be moved to the opposite side of the contour. The already created first technology block is re-loaded.





The approach and departure geometries automatically generated by CAM (radial or straight) are not verified with the milling contours regarding collisions. Thus, the contour starting point must be selected at a location causing no collision.

TECH

The just created first technology block is edited once again. The 'Objects' line was completed with the 'CAM-ZERO-5'. The contour starting point is determined by the 5th point. Click onto the 'Edit point' field to change the entry.

Pointmanagement		
X 97.082 ¥ 116.896		<u>e</u> nd
1	П.	
2: start	1	<u>N</u> ew
3: start		Edit
4: start	H	<u>Chave</u>
5: start		37 <u>0</u> 0
	Ш	Selection
		Move
		De <u>l</u> ete

The four still available contour starting points are shown. The 5<sup>th</sup> point should be changed. Click on the 5th point. The 'X' and 'Y' coordinates are displayed. Using the 'Move' field, the cross-hair cursor is selected and the new point can be choosen. Subsequently, the milling path is updated by selecting 'Calculate'.

To mill-cut the three further pockets, edit again the created first technology block and create a copy. The content of the 'Objects' line is completely deleted. Next, select the left 'Sub D Plug' using 'F2'. The same process is twice repeated (rectangle and circle).

## 7.6 SEMINAR EXAMPLE 5

#### Design circles and drill

Two drillings should be specified for the 'Sub D plug' for tightening the connector. The drilling distance should be 47.5mm and the drilling diameter 3mm:

#### Select contour 1 (Sub D plug)

Æ



Design a rectangle in the size of the maximum dimension of the Sub D of plug.



size: Object=1:obj103 2D=39.523,15

size calculation of the size of an object box (calculation of the maximum dimensions of an object).

At the 'Modify input area', if you enter the

LC

modify: size

command followed by 'F1', you see in 'Global Variables' that the horizontal length has been entered in the 'WIDTH' variable. The vertical height has been entered in the 'HEIGHT' variable. The integrated pocket calculator is called 'val'. Now, it should calculate the incremental distance from the right lower corner of the rectangle to the center of the drilling. modify: val (47.5-\$width)/2

With this calculation command, variables can also be directly entered beginning with the '\$' substitution character. The result is 3.988mm.

Using 'line.prc', the horizontal line is now drawn interconnecting the 3mm circles with it's ending points.





PLUG 1 1.



Enter the radius of 1.5mm. Select the ending points of the line to draw the circles.

#### Subsequently, the line is deleted.



Both circles should be drilled now



## 7.6 SEMINAR EXAMPLE 5



Create a new definition block for the drilling

#### Both circles are selected. Circles must be drawn for performing the drillings.

ISY CAM



SY:	Def	ini	tion	of	too
<u>N</u> um	ber	of	tool	1	

mber of tool 1	
Diameter 3	11
erture-angle 60	
Velocity 500	11
pindle-Speed 5000	
<u>O</u> K <u>C</u> ancel	l

If an opening angle is entered, the post-processor automatically increased the drilling depth by the value of the drill tip up to the outer diameter.



Generally, two types of drilling cycles are available to the user. The default drilling cycle of CAM calculates each approach and writes this value also line for line into the '\*.NCP' file. Just for deep hole drillings with chip removal, files with large volumes can sometimes be created. However, since the 'Remote' interpreter supports an own cycle for drilling operations, every drilling command consists of two lines in the '\* NCP' file. Thus, reading of the programs is eased for the user. The

modify: set ISELDRILL=ON

variable is to be set if the second cycle type is to be used.

Mit dem Befehl

modify: set ISELDRILL=OFF wird der Zyklus wieder zurückgesetzt.

Use

modify: *pe* profile to edit the file if this change should be automatically set at system start. There, perform the entry in line 108.

PLUG 1

#### 7.6 SEMINAR EXAMPLE 5



Different input fields are available depending on the selection of the three 'Drilling', 'Deep drilling' or 'Chip breaking' fields. The following figures show the movements.

## Drilling

In rapid feed, the tool positions to clearance plane + retract plane. Subsequently, using rapid feed to the clearance plane. Next and using the work feed, it positions onto the programmed depth and ultimately to clearance plane + retract plane using rapid feed again.



Retract



## 7.0 SEMINAR EXAMPLES

#### 7.6 SEMINAR EXAMPLE 5

#### Chip Breaking

In rapid feed, the tool positions to clearance plane + retract plane. Subsequently, using rapid feed to the clearance plane. Next and using the work feed, it positions onto the 'Depth increment'. The measure of the 'Depth increment' is the first approach movement. With each chip, the 'Depth increment' is decreased by about the measure of the 'Incremental reduction' until only the 'Depth increment' remains. After each feed movement, a retract is made specified by the 'Retract increment' measure.



#### Deep Drilling

In rapid feed, the tool positions to clearance plane + retract plane. Subsequently, using rapid feed to the clearance plane. Next and using the work feed, it positions onto the 'Depth increment'. The measure of the 'Depth increment' is the first approach movement. With each chip, the 'Depth increment' is decreased by about the measure of the 'Incremental reduction' until only the 'Depth increment' remains. After each feed movement, a retract is made specified by the 'Retract increment' measure.



## 7.6 SEMINAR EXAMPLE 5

LC

#### Engraving of the inscription



At the 'Engrave' technology processing, the drawing data are directly converted into milling paths. The tool moves to the center path. No radius is considered. No path optimization is performed and no monitoring of the path behind the cut. Contours are also repeatedly processed if several geometry elements are located one on the other.

Before the engraving, fonts and hatchings are to be converted using 'cvtopic.prc'.

#### Some information about hatchings:

Hatching can be shown or are faded out to check where and whether they are to be found in the drawing.



hatchings are re-displayed by another click.

In the drawing editor, hatchings are stored by specifying the filling pattern and the pertinent corner points. Only the four coordinates of the corner points are internally stored if a rectangle is hatched for instance. You must click exactly at these corner points with the cross-hair cursor. Thereby, a special hatching selection is available:



- 4<sup>2</sup>

click onto corner points, circle or Bezier curves.

The hatching pattern is converted into polygons using 'cvtopic.prc'. Since the conversion not can be reverted it is necessary to save the drawing previously onto the hard disk (as a copy). Before conversion, the active hatching can also be copied into the alternative (mostly the second) Buffer:

The active object (the hatching) is copied into the alternative buffer.

For mill-cutting, the conversion of complete hatchings is not recommended since the generated data quantities become very large. Also, the real manufacturing tolerance is not automatically considered. For the exercise, the existing complete hatching of the dimensioning arrows should be prepared for the production.

- Selection of the hatching at the corner point



## 7.0 SEMINAR EXAMPLES

### 7.6 SEMINAR EXAMPLE 5



In our example, the upper hatching should also be converted. Both meander paths can now be mill-cut.

#### Some information to texts:

If a letter is visible in the drawing then this can be stored as graphics or as internal text. Only internal text can be changed with regard to the content, e. g. 'HALLA' to 'HALLO'. Texts converted into graphics can not be reverted anymore. Therefore, here also applies: Save your object! The examination of the object geometry occurs as follows:



the entire character sequence is included using the window selection.



ACTOBJ=1:obj52

#### 7.6 SEMINAR EXAMPLE 5





The character sequence to be seen is a text that is still to be converted into graphics. Using the 'ZOOM' function, the screen section is again to be set to the maximum size of the upper front panel since the object link of our 'obj52' text is to be checked.



all texts including the identification lines belong to the 'engrav1' macro link.

These objects are now to be converted into Beziers. Polygons, line traces, and circles remain unchanged by the conversion.



SC enter the conversion tolerance <0.01>: 0.001

The conversion tolerance is specified in % related to the maximum dimensions of the object box. The total dimensions of all engraving objects totals 122mm for X. 0.001% of this are 0.0012mm. Therefore, the converted character sequence deviates by 0.0012mm at the maximum from the original. At first a glance, this is too high for the demanded manufacturing tolerance of 0.001mm! With extensive drawings, the data quantities would become very large. Since you have created a copy of the 'engrav' object in that second Buffer, you can ascertain that the font type is called 'simple'. Internally, this font consists of polylines. Thus, high conversion tolerances have none influence on the data quantity. The fonts have the ".cdf' file extension and are stored in the 'C:\ISY\CDF&MNU' directory. This font is now to be edited.



Change to the second buffer. modify: *new* 

deletes the buffer

modify: zoom=

modify: cvc simple the Simple font is loaded



cvc ration of a character set table for editing and converting using VECTOCDF.

the set screen section is set to the area 0,0..639,511

## 7.0 SEMINAR EXAMPLES

#### 7.6 SEMINAR EXAMPLE 5

The font is displayed as vector graphics and sorted according to the ASCII values. Using you can analyze the individual letters whether this is a Bezier or polygon font.

					С	h	arq	ac	tei :df:g	rid=	- i  :0.5	е ,0.5	si	m	ole	9				
	۵	1	2	3	4	5	в	7	8	g	10	11	12	13	14	15	16	17	18	19
a	$\boxtimes$																			
20		Б											ю.	di.	15	#	\$	74	8	h
40	4	)	A	i+i	y	-	u	4	۵	đ	2	3	4	5	6	7	â	<u>ð</u> i	n.	9
60	4	-	Э	8	ø	А	B	a	D,	Б	Fi -	G	н	d.	di	K	Ь	м	۰N	O,
80	P.	Q	R	s	Ъ	JU.	м	ж	Х	Ж	Zi	6	Ŋ.	3	î۵.	ш	ð.	٥	Ь	۵
100	d	e	ń	9	h	ì	ð	k,	4	m	n	a	ρ	9	n	a	ιt	u.	м	m
120	×.	м	ø	6	ŧ	ֆ	м	۵	Ģ	ŭ,	à	â	ä	à	å	ø	â	ä	à	ñ.
140	û	ŵ.	Ă	Å	Ē	æ	Æ	â	ã	À	Â	ù	ÿ	Ä	ü,	¢۵,	£	ð.	A	fi
160	á	ú	á	ů.	ñ	Ñ	A	8	ŕ,	n.	a.	為	ሑ	à	ĸ	۵	w.			
1813	U	н	٠	w	N	8	U	H		v										
200	9	1	ł.	ŝ	n.	5	ĥ	2	÷	ł										
220					a	β	q	đn	Σ	a	щ	æ	ŵ	A	۵	d	æ	۵	6	U.
240	(III)	ф	≥	s.	ſ	ſ	÷	m	ů			di	<u>.</u>	2 L			$\boxtimes$	$\times$	X	X

Now, the existing font can be changed or completed (insertion of special characters). Also, an ASCII table is integrated into ISY. The table is displayed using the 'F1' help key.



#### 7.6 SEMINAR EXAMPLE 5

Now, we want to return to our engraving exercise target and link the two meander arrows with the 'engrav1' object. The macro creation or completion by means of screen icons was addressed in the previous seminar examples. Now, a new keyboard command is introduced. The meander arrow is selected and concatenated.

modify: cat \* engrav1 -i



cat concatenating of objects

The command is repeated for the second meander arrow.



To avoid unnecessary typing, use the Stack command that automatically records your last entry. The last 'cat \* engrav1 -i' command is recalled using the 'Up arrow' key. This is the '8' with a deactivated 'Num Lock' function.

A possibility of the manual optimization is explained at 'MANUAL MILLING PATH OPTIMIZATION OF THE MILLING-CUT SEQUENCE' in the hint section. The tool positions always to the clearance plane plus retract distance if an internal 'ma X Y' coordinate contains a value that is different to the current position. This occurs frequently at geometry imports (\*.DXF, \*.HP, \*.EPS). The control of the milling-cut direction can be performed using 'revco.prc'.

Employ different colors for the new design of geometries using 'econtour.prc' and 'acontour.prc'. The thus newly created contours can be 'collected' in the second buffer. Subsequently, they can be

A processed there using CAM. A contour processed using 'acontour.prc' is already-direction-orientated. The contour is traversed in one go.

The CAM module is selected and a new technology block is created for engraving. The post-processor converts Beziers automatically into circles. At the conversion into circles, the maximum permissible deviation is specified in the 'Tolerance' field. The default value without input is '0.005' mm.

ENGR. Denotation BLOCK 1
Ubjects gravur1
Plane 0 depth 0.3 Cyl-diameter
Defined a Solety a Televine Sole
Ketreat 1 Safety 1 Iolerance 0.001
<u>T</u> ools Calc <u>u</u> late <u>S</u> tore values
Postprocessing Cancel

## 7.0 SEMINAR EXAMPLES

#### 7.7 SEMINAR EXAMPLE 6


### 7.7 SEMINAR EXAMPLE 6

#### Import, export, vectorization in graphic programs

In this exercise example, a Corel-Draw drawing is prepared so it can be exported and read-in by ISY as a vector file.

#### Preface

The processing is specially described for Corel-Draw 7.0. However, the problems treated here also apply to all other graphic programs. The solution may be product-specifically different.

### The 'Winner.cpt' file on the 'Seminar 6' diskette

The existing 'Winner' drawing is loaded from the installation diskette into Corel-Draw.

selects the file manager in Corel-Draw for loading a file

Select drive 'A: and the 'Winner.cpt' file; 'Open'

zeichnung or	inen	
Suchen in:	🔁 Temp 💌 💼	Öffnen           Abbrechen
winner1.co	ar dr	
Datei <u>n</u> ame:	winner.cdr	✓ Vorschau
Dateityp:	CorelDRAW (CDR)	
Notizen:		Ebenen und Geiten beibehalten

Check the geometry content of the drawing before starting an export of the data in a format readable by ISY. Corel-Draw processes vector graphics, bitmaps, and fonts. Before exporting, all data must exist in the vector format.

#### Checking the format of the data content in Corel-Draw

To check the data, the 'Properties bar' in the 'View' menu must be active in Corel-Draw. Also, the individual objects of the entire drawing are to be selected (in the example, the doodle, the wreath, and the character sequence). After selecting the doodle, you can see the format of the object in the 'Properties' window. The

doodle is a bitmap. These data could not be usefully interpreted by ISY if exported in a vector Format such as 'DXF'. The only meaningful way is the vectorization of the doodle. Vectorization is an element of Corel and is described separately.



# 7.0 SEMINAR EXAMPLES

### 7.7 SEMINAR EXAMPLE 6



By selecting the wreath, you can only recognize that it belongs to a grouping of several objects. To determine the format of the wreath, the grouping of the objects must be removed. Also, after the removal of the grouping, the format of the elements of the wreath it is still not recognizable. Normally, each individual element of the wreath would have to be selected to check it's format because also bitmaps could be grouped with curves.



When selecting a sub-object of the wreath we can see that there are curves. This format is suitable for the export. Therefore, we can export it in the vector format.

genschaftsleiste : Text 🛛 💌
104,177
146,392
) • 0,0 💶 🗠 🚆
Demendet Die DT
T Bengular BK BT
4 🔻 F K 🗓
abl 🖄 🗘

The font type and size are to be recognized if text is selected. With some export filters, text is output with the pertinent font name. This kind of the export assumes the application of the same type of font. 'Windows' based programs of the local computer fulfill this condition. The 'Arial' font must not imperatively correspond to the installed 'Arial' type if the data is transferred onto another computer. To exclude this type of transfer problems it is necessary to change the character sequence into curves.

### Conversion of character sequences into curves



For converting character sequences into curves, the sequence must be selected. The conversion is performed by using the 'Conversion into curves' menu item in the 'Arrange' menu or the button in the 'Properties' window.

### Exporting of bitmaps

To vectorize the doodle, it must be isolated as a bitmap from the standard file. The 'Corel Trace' vectorizing program can directly read-in TIFF files. Select the doodle for exporting and click onto theExport button , or start the export using the 'Export' menu item in the 'File' menu.

There, the file manager is displayed showing already the name of the file to be exported. Change this to 'DOODLE'. The file type is set to TIFF. To export only the doodle, activate the 'Only marked objects' field. The process is concluded by 'exporting'.

Exportieren				? ×
Speichern jn:	🚖 Temp	-	<u>ð</u>	Exportieren
🐜 männch.ti	(			Abbrechen
Dateiname:	winner. tif			Datejtypen
Dateityp:	TIFF-Bitmap (TIF)	-	Komprimierungstyp: Unkomprimiert	<b></b>
Notigen:			, ₩ Nur <u>m</u> arkierte 0 ∏ Eilter-Dialogfeld	bjektej unterdrücken

### 7.7 SEMINAR EXAMPLE 6

Bitmap-Export	? ×
Earbe	OK
Schwarzweiß	Abbrechen
V Lierastert J Farbgrohl verwenden	
Größe	Zurücksetzen
Breite: 282 Pixel	
Höh <u>e</u> : 542 – Pixel	
🗖 Seitenverhältnis beibehalten	
Auflösung Freies Format	
H <u>o</u> rizontal: 300 600 📩 DPI	
⊻ertikal: 300 <u>600 </u> DPI	
☑ Identische Werte	
A <u>n</u> ti-Alias	
C Keines C Standard C Super-Sampling	
Voraussichtliche Größe der unkomprimierten Datei: 19,2	241 Byte

#### Vectorizing of bitmaps

The conversion accuracy can be set for the vectorizing of bitmaps. Use the test and trial procedure so that the lines cohere as much as possible and no data loss emerges. Vectorizing is influenced using the button. With each image, you have to retry setting that achieves the best result. The window for our settings for the doodle.

Size, resolution, and color are set in this window. The size

should set to 1:1. The resolution should correspond to the

inch that is approx. 1 pixel at every 0.04 mm

production precision. Thereby, 600 pixels correspond to one



The vectorizing setting can be adjusted after loading of the doodle. Vectorizing is started using the outline vectorizing button , or the 'According to outline' menu item of the 'Vectorizing' submenu in the 'OCR vectorizing' menu. After vectorizing, the doodle must still be stored in the vector format. Here, several selection possibilities exist to store the vector file in different formats. 'ISY' can import the DXF, EPS, and HPGL formats. The format best suited for the respective application remains part of the user experience.

# 7.0 SEMINAR EXAMPLES

### 7.7 SEMINAR EXAMPLE 6

### Importing of vector files into Corel

Now, the created vector file can be read back into Corel after deleting the doodle bitmap. This is made either using the rule button or the 'Import' submenu of the 'File' menu.

### Exporting of vector files

Exporting of vector files is to be performed in the same way as exporting of bitmaps. Depending on the selected export format, a selection window appears. There are no special setting possibilities for DXF exports.

OK Abbrechen Hille
Abbrechen Hille
Abbrechen Hille
<u>H</u> #e
128
128 🛋
128
128 -
128
128 🛋
Graufstufen umwandeln
ifen automatisch eihöhen
gen beibehalten
il verwenden
renzungsrahmen verwend
e ₽ 9

For EPS exporting it is important to activate 'Exporting using curves'.



For HPGL exporting, various pin widths and speeds can be set for the different colors like for a plotter.

#### Test files on the 'Seminar 6' diskette

Winner.cdr	output drawing with character sequence that can be edited. Doodle in BMP pixel format
Winner1.cdr	conversion of the character sequence into graphics. Doodle in BMP pixel format.
Winner2.cdr	character sequence in graphic and doodle as vector CMX
Winner1.dxf	created by converting Winner1.cdr
Winner2.dxf	created by converting Winner2.cdr
Winner1.plt	created by converting Winner1.cdr
Winner2.plt	created by converting Winner2.cdr
Winner1.eps	created by converting Winner1.cdr
Winner2.eps	created by converting Winner2.cdr
Doodle.tif	exported from Winner1.cdr
Doodle.cmx	created by vectorizing DOODLE.TIF
Winner2.vec	created by EPS importing Winner2.eps

### 7.7 SEMINAR EXAMPLE 6

### Importing of vector files in the Pictures by PC VEC format

#### General information

The import filters for DXF and HPGL are external programs and are called 'D2V.EXE' and HPTOVEC.EXE'.

They are started using the screen menu of the import. The conversion of EPS files is made in the Modify input area using

modify: coreleps

# HPGL import

The file extension for the HPGL import must be '\*.HP'. The files are to be renamed if necessary. modify: ren a:\winner2.plt winner2.hp

In most cases, HPGL files contain polygon traces. The command set is held very very simple. Character sequences are automatically converted into polygons at the generation of the HPGL file. For the export, an accordingly high resolution has to be selected so letters do not become angular.

The mask of the import filter is called up.





Click onto 'Drive' and 'A:' to load the files from the diskette. The filter for HPGL is already active. In addition, the external conversion programs are controlled via options. Using these options, the conversion program is controlled. The converter is started using '?' to learn more about the options, the external programs feature.

modify: hptovec ? Then, these options can be permanently saved in the '\*.DPA' file. These settings become automatically effective at every program start. These 'Advanced' settings can be edited by clicking onto 'Options'.



Do you want to create 'C:/ISY/TOOLS/HPTOVEC.DPA' ?

The file is created when selected for the first time.

# 7.0 SEMINAR EXAMPLES

### 7.7 SEMINAR EXAMPLE 6



The file is saved by clicking onto 'End'. The '-c' option is used at every call of the HPGL converter.

For the exercise, load both files and analyze the import result.

#### DXF import

The DXF command set is far more extensive. Therefore, there are also more options to control the conversion.

modify: d2v ?

For the exercise, delete the screen and load the 'Winner2.dxf' file as 2D drawing. Then, use the 'ZOOM' function and increase a small corner of the wreath.



The individual lines are automatically broadened, although no line width was specified in the Corel source drawing.



The function shows, that the lines are broadened due to hatching areas. The DXF filter should be analyzed again to find a problem solution.

modify: d2v ?

The '-w 1' option reduces all lines with a width of up to 1mm to the minimal line width. This corresponds to simple lines.

### 7.7 SEMINAR EXAMPLE 6

Import, export, vectorization in graphic programs



Now, the result of the conversion shows, that simple lines exist. This option can be permanently entered into the 'd2v.dpa' file.

The DXF format supports fonts, circles, polygons, macros, and layers.

#### EPS import

Load the 'Winner2.eps' file. modify: *coreleps* 



Click into the first line. Enter here 'A:/\*.EPS' followed by <ENTER>.

The 'WINNER2.EPS file is selected and loaded with 'Okay'. The conversion starts. The activities are indicated in the status line. In the current version of the data interface, information lines are simply taken over into the editor. These lines must be removed for further processing:



modify:editF1jump to the text startDelete the lines three and four.Change to the third line using the cursor control keys.F9deletes the current lineF9deletes the current lineFSC> exits the edit mode

The data are further prepared using the ISY commands.

modify: bzcor

the direction of the Bezier tangents is revised.

# 7.0 SEMINAR EXAMPLES

### 7.7 SEMINAR EXAMPLE 6

The 'object' macro object is split into single objects.

modify: *mkobj* object modify: *scale* object -md0,0 subobjects are created the internal coordinate format is updated



A numerical rectangle of 200x230 forms the edge limits. The rectangle should have it's origin at 0,0. Then, the graphic should be centered in the frame.



mkobj procedure for the creation of objects based on ma- (move), da- (draw absolute), pr- (print) and hatching commands (object reorganization).





select the reference object (previously designed rectangle) Undo saving? Yes 1st object (an arbitrary object in the drawing) 2nd object (press the right mouse button within the active drawing area to call up the context menu. The 'object' macro is activated by using <F10> 'G2:F0: Select wrapping'.) The function is started by clicking below the active drawing area.

The character sequence must exist as a macro before starting the milling process. The 'iam' and 'winner' macros are created.

'CAM' is started using the 'Module' button and processes the workpiece.

### 7.7 SEMINAR EXAMPLE 6

### Exporting of vector files in ISY CAD/CAM

#### General information

The export filter of the DXF format is an external program. It is called 'V2D.EXE'. The other supported formats are created using plotter drivers that must be installed. The start is made via the screen menu of the export or as described in seminar example 7 using the plotter output. These plotters must be installed for the conversion of following formats:

Plotter driver

Encapsulated PostScript format (EPSF)

WINDOWS METAFILE format (WMF)

Encapsulated color PostScript format

WINDOWS METAFILE format (WMF)

WINDOWS METAFILE format and tagged

Tagged image file format (TIFF)

image file format (TIFF)

Pic - SYNTAX 2.0

HPGL (File)

(EPSF)

#### Export format

Hewlett-Packard Graphical Language HPGL Encapsulated Postscript B/W (Ai u. Corel) Encapsulated Postscript B/W via wmf (Ai u. Corel) Encapsulated Postscript color (Ai u. Corel)

Encapsulated Postscript color over wmf (Ai u. Corel) Tagged image file format (TIF images) Windows Meta File

For program-internal vector data conversion

### Installation of plotter drivers

On the MS-DOS command line, plotter drivers are installed in the 'C:\ISY' directory using 'INSTALL'. These information are lost again at the program end if the installation is performed within 'ISY'.

### Installation using 'INSTALL'

#### In menu item

3 Install plotter up to 8 plotters can be installed. The location for installing the plotters can be selected. However, it is an advantage to install the most frequent used plotter as the first of the export plotters and to install further plotters next. By entering the plotter number, the available drivers for the individual plotters are displayed for the selection. Page through the list to find the applicable plotter driver and enter the preceding number below. The installation program returns to the previous screen. It is ready to install further printers or exit the screen by entering

9 save and exit the installation.

#### Installing plotter drivers using the drawing interface

The plotter drivers installed using the drawing interface are not permanently saved. The installed plotter drivers are lost after the program end (for test purposes only). To enter the installation mode:

To enter the installation mode.



Perform the installation of the plotter drivers as described above.

#### Exporting of vector files

When exporting drawings, pay attention that only the visible part on the screen is exported. The export is started by clicking onto the following button sequence



## **7.0 SEMINAR EXAMPLES**

### 7.8 SEMINAR EXAMPLE 7



### 7.8 SEMINAR EXAMPLE 7

### Plotting of drawings in ISY CAD/CAM

Load the 'C:\ISY\VECTOR\FRPL.VEC' drawing to subsequently export it. In addition, output it to an installed plotter.

#### General

The correct plotter driver must have been installed to plot the drawings (refer to: CONFIGURATION OF THE ISY PROGRAM). These plotter drivers creating a file for processing store these files under the name 'PICTURES' with the format-specific file extension. All driver information are stored in the 'C:\ISY\PICTURES.CFG' file. No size is included for some drivers. This is however required for the scaled plotting. In this case, complete the driver information in the 'PICTURES.CFG' file by entering the following line:

size: x,y (x and y represent the size in millimeters that the file occupies as working surface)

Next, the plotter driver must be re-installed at the MS-DOS command line to take over the changes. Also, printers work with plotter drivers.

On the Modify plane, the installed components are displayed using 'main;logo -d' or in the Main mode using 'logo -d'. The program returns to the graphics mode by pressing the 'F6' key.

#### Unscaled plotting of the screen view

The current screen view can be directly (unscaled) output to a PLOT DEVICE. The size is automatically scaled to the maximum printable area.



Then, the output device is inquired. Specify a number in the range of 1 to 8 under which the driver was installed.



plot plotting of drawings on the screen, to a file, or directly onto a plotter/printer.

#### Scaled plotting of a drawing in a DINFORM frame

Using this procedure, all drawing objects lying within a DINFORM frame are scaled output to the specified plotter. Thereby, the current screen view is not relevant.



dinform creation of a frame according to DIN



formplot scaled plotting of drawing objects in a DINFORM frame

# 7.0 SEMINAR EXAMPLES

### 7.8 SEMINAR EXAMPLE 7

#### True scale output with windows and object selection

The output of certain objects or screen areas with the input of scales and scalings are possibly using the 'mplot.prc' procedure. The procedure is called using:



### device ? (prtr,plot2(,plot3,plot4)) <plot1>:

The plotter is requested in the first dialogue step. Plotter1 is the default plotter that is confirmed using <ENTER>. E, g, 'plot3' must be entered for selecting the third plotter. 'prtr' has to be entered to select the printer.

#### mplot: maximum size of plot1: 404mm x 276mm plot-window ? (o=obj,o=?,w=x,y..x1,y1,w=?) <ENTER>=all:

Next, the size of the printing area is output that depends on the installed printer driver. For an A0 printer, e. g. 1169x884mm are available.

The question of the plot window inquires the area or the objects that should be plotted. Different specifications are possible in this step. Using <ENTER> you confirm 'all', i. e. that all objects of the drawing are plotted.

Different input possibilities:

**'o=obj8'** the object box of the 8<sup>th</sup> object is the plot area (displayed using shading).

'o=?' the object who's object box is responsible for the output can be selected using the cross-hair





T'w=x1,y1..x2,y2' 'w=?' The plot window is determined by entering a lower left and upper right point the plot area is determined by using a window for the selection

### Do you want the drawing to be rotated (90°) $\langle N \rangle$ ?

If confirmed using 'No' the vertical side of the screen corresponds also to the vertical side of sheet. The drawing is rotated by about 90° clockwise if 'Yes' selected.

### 7.8 SEMINAR EXAMPLE 7



#### Drawing rotated by 90°



#### mplot: maximum size of window: 345.135029mm x 276mm size ? p(,u,x,y)=#mm(,cm,i) or s=#,#mm(,cm,i):

In the 4th step, the 'mplot.prc' procedure outputs the maximum size of the plot window also considering a possible rotation. Thus, at least one direction is taken fully advantage of. The required plot area is calculated by the following entry. The 'Plotter area too small' message is issued if the calculation result is larger than the maximum window size. Then, the input can be repeated.

#### Standard output:

If the entry is only confirmed using '<ENTER>', the drawing is output covering the entire sheet without defined scale and in the maximum window size.

# True scale output:

### Input: 'p=100mm'

A distance between two arbitrary points on the drawing should correspond to 100mm on the output. If the distance between points was designed using 50 units then the printout corresponds to the 1:2 scaling. The specification of the unit of measurement is also possible in cm or in inch.





#### Input: 'u=.5cm'

An unit of the drawing corresponds to in 0.5cm in the printout (1:5 scale).

### Input: 'x=100mm'

The x-axis of the plot window has a length of 100mm. The y-axis is proportionally adjusted Input: 'y=2i'

The y-axis of the plot window has a length of 2 inches. The x-axis is proportionally adjusted Input: 's=80,100mm'

The plot window has a size of 80 x 100mm on the printout, i. e. depending on the entry, the drawing can be distorted on the printout.

# **7.0 SEMINAR EXAMPLES**

### 7.8 SEMINAR EXAMPLE 7

mplot: maximum size of window: 345.135029mm x 276mm size ? p(,u,x,y)=#mm(,cm,i) or s=#,#mm(,cm,i):

After the determination of the plot area, the position of the drawing must be determined on the sheet. The specification of the unit of measurement is possible in mm, cm or inch. If the entry is confirmed only using '<ENTER>', the drawing is centered on the sheet.

Without rotation

With 90° rotation





#### Area inputs:

- c center (center of sheet)
- II lower left (left lower corner)
- Ir lower right (right lower corner)
- ul upper left (left upper corner)
- ur upper rright (right upper corner)

#### Do you want the drawing to be clipped $(0,0..639,511) \langle Y \rangle$ ?

'<Y>' is preset and can be taken over using '<ENTER>'. 'N' must entered if the drawing exceeds the standard screen area and the objects should also be considered.

#### Plot-object ? <ENTER>=all:

All objects are printed in the area of the plot area if the entry is confirmed using '<ENTER>'. If the name of

#### Plot-color ? <ENTER>=normal:

an object or a macro object is entered then only this is printed.

If no entry is confirmed using '<ENTER>', the colors are printed equivalent to the screen and/or the colors are assigned to pen sizes. Precondition is that the output device supports, e. g. HPGL/2 and the correct driver is installed. The entire drawing is output using only one line width if these requirements are not fulfilled. Different line width can then only be achieved using the additional 'PIXPrint' program. For color printers, the associated color and line width is output under the specified requirements if a color number has no effect on black/white printers.

### 7.9 SEMINAR EXAMPLE 8



# **7.0 SEMINAR EXAMPLES**

# 7.9 SEMINAR EXAMPLE 8

### Dart arrow

The Dart arrow is composed of a 2D curve cross-section that generates an 3D body by rotating. The wing is composed of a Bezier curve that has a 0.5mm roundness radius at the outside. The design is made polygon-oriented (coon area as polygon mesh and a 3D sweep on polygon). Bezier based modeling requires the additional functions of the '3D Modeling Packages' that can be optionally acquired from the 'Configuration Center'. Beziers are mathematical curves used as basis for a calculation formula. Thereby, the demanded manufacturing tolerance always lies size-independently within the calculation precision (eight decimal places). A new curve is calculated if the interpolation points of a Bezier curve (2Ds or 3D) are changed. Different design drafts are thus created in short times. The polygon-oriented model requires the specification of the manufacturing precision at the time of the design. E. g., a phase displacement would be visible at the curve area if our dart arrow should be enlarged after completion.

### Drawing of the rotation body



calls up the 2D geometry functions in the menu area..



enter the vertical axis to the desired plane: <z> <ENTER> enter the height in the axis direction: <0> <ENTER>

The 'T3D' switch in the global menu turns red. It indicates that the subsequently drawn objects are now spatially presented.

LINE	LC	LINE

the center line is drawn using the line drawing function (refer to: EXAMPLE 4) The cross-hair cursor appears and an arbitrary point within the drawing area is 2. Next point: ma-5.0 3. Next point: a105.0

- Next point: ma46.751,-10
- Next point: r0.20
- Next point: e



shows the line in the maximum size



Enter center (x,y): 12.229,-67.844 Enter radius (rx(,ry)): 69



4.

5.

6.

Enter center (x,y): 20,0 Enter radius (rx(,ry)): 5



Enter center (x,y): 45.526,-300.648 Enter radius (rx(,ry)): 305

### 7.9 SEMINAR EXAMPLE 8

### Trimming of elements

Trimming was discussed in example 4. There, all circles have been moved together to the intersection.







select ellipse (circle(arc)) (1.) select point outside of the ellipse (2.)





# 7.0 SEMINAR EXAMPLES

### 7.9 SEMINAR EXAMPLE 8

Contour description

The four objects are grouped to a contour trace.



First, select the forth object. The rotational axis is not selected. The function is started by clicking below the active drawing area. There, a contour is duplicated that is then transferred into the second buffer.



All objects selected before in the first buffer are deleted.



Select the contour and using COPY modify: trans \* 1: or

move it back into the first buffer. Switch again to the first buffer and select the contour trace. The complete contour trace is now presented in the pointer color.



All circles are converted into Bezier curves since the procedure for generating the rotation body only processes these and polygons.

The rotation body is generated between 0° and 180°

switch to the isometric view

modify: 3drev -s 0..180 or



First, the contour trace is selected then the rotational axis.



3drev 3D rotation body with Bezier mesh.

modify: new 2: modify: trans all 2:

The design of the is thus finished. Now, the wings are designed.

### 7.9 SEMINAR EXAMPLE 8

### Dart arrow, wings



calls up the 2D geometry functions in the menu area.



UA

enter the vertical axis to the desired plane: <z> y <ENTER> enter the height in the axes direction: <0> <ENTER>

modify: setpp -y All newly drawn objects are drawn on the ZX plane.



using the line drawing function, the tangents of the Bezier curve are drawn. The cross-hair cursor appears. An arbitrary point within the drawing area is selected. 2.

F0: Bezier 4 P.

Select the points 1 to 4.

- Next point: ma61.46,2.28
- Next point: a64.05,1.68 3.
- Next point: ma94.86,36.17 4.
- Next point: a94.79.0.56 5.
- 6. Next point: e



#### TEXT The textual menu is activated





# The button interface is called.

modify: color \* 3

The curve is colored in red

# 7.0 SEMINAR EXAMPLES

### 7.9 SEMINAR EXAMPLE 8



the Bezier is converted into polygons. Input of the conversion tolerance <0.01>: <ENTER>



The object is again converted to 2.5D



Conversion into a 3D polygon



The connecting line of point 1 to point 4 is drawn.

A semicircle is drawn across the 3D polygon. Draw a 2D semicircle with a radius of 0.5mm nearby the curve. Thereby, a vertical line is drawn down from the center of the circle since this center is needed for the selection.





3dsweep draw object(s) across a curve

Select the basic object (=semicircle) Select the 3D curve (=3D poly) Select the center(=center of the semicircle)

#### or by then function buttons:





30 / Fi S 3D-menu

coon area

Number of the edge curves 2..4 <4>: 2 Number of divisions <20>: Enter Select the 1st edge curve (1.) Select the 2nd edge curve (2.)



enter displacement (dx,dy,dz): 0,-1,0

modify: cover all wings modify: box wings modify: find wings



cover creation of a new object that contains an existing object.



SC Enter rotating angle: <90>: 90 Eenter rotating axis (x,y or <z>): x Enter pivot <center> (\*=center): 0,0,0



SC Enter rotating angle: <90> : 180 Enter rotating axis (x,y or <z>): x Enter pivot <center> (\*=center): 0,0,0

# 7.0 SEMINAR EXAMPLES

### 7.9 SEMINAR EXAMPLE 8



modify: trans 2:all 1: modify: cover all pfeil modify: obrename modify: box all modify: setpp -i

The rotation object will be loaded to the first buffer again. A macro about all elements named 'pfeil' Definile naming Calculation of the size dimensions Isometric view will be chosen



As an exercise, the arrow should now be milled (refer to: EXAMPLE 1, BOTTLE OPENER).The Macro name "pfeil" can be typed into the line "Objects" directley by using the keyboard.

## 7.10 Seminar Example 9



# 7.0 SEMINAR EXAMPLES

### 7.10 Seminar Example 9

### General

Nearly all machines from isel automation (except this one equipped with a PC control card MPK3) can be completed with a 4th axis as a rotary axis.

This rotary drive operated under isy – CAM provides cylindrical machining, i.e. all CAM functions / milling contour calculations for 2D and 3D machining can be unwound on a cylinder.

Fields of application are, e.g.:

- Engraving on a rotation-symmetric body
- Drilling of cylindrical parts
- Pocket milling with pointing for the manufacture of printing rollers
- Unwinding of a 3D freeform surface on a cylindrical body
- Conditioned possibilities of multiple side machining

#### Function / settings

If the rotary axis is disabled, the milling contours will not be output as X, Y or Z data, but written as X, A and Z data into the NC file with an internal axis switch in the post-processor, i.e. the 2nd axis (Y axis) is assumed to be the rotary axis by default. It is therefore recommended to install the rotary axis in parallel to X.

If the rotary axis is arranged in parallel to Y, an axis switch from the X axis to the A axis must be carried out. This is done by a change in the post-processor in the following way:

- Call iedit at the "modify" input line in the isy program.
- Type the key cam.diaaxis in the Name line.
- Enter the axis to be modified in the Value line: 1 (1 for X, 2 for Y)

Analogously, it is possible to switch the name of the rotary axis if necessary:

- Call iedit at the "modify" input line in the isy program.
- Type the key cam.dianame in the Name line.
- Enter the name to be modified in the Value line: A (B, C, ...)

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### Creating a CAM definition block

The single change in the CAM block for the cylindrical machining in contrast to the machining with linear axes in a Cartesian coordinate system is the entry "Cylindrical diameter" in the intended input field.

The value of the "Cylindrical diameter" is the diameter of the unmachined workpiece.

Once a numerical value has been entered here, the rotary axis will be set during the processor operation, and the NC data will be generated during a rotary movement.

ISY: Pocket-milling and stamp-generation with closed contours
Denotation Objects 0bj4,obj3,obj2,obj1 Eopy block
X Roughing       Finishing       Qut off         Roughing       0.2       Finishing       Io/from         Plane       0       depth       1       Cyl-diameter       100         Pathdistance       48%       Retreat       1       Safety       1         Restmaterial       Max dist.       Iolerance       1       1       1
Tools         Calculate         Store values           Postprocessing         Cancel

This means that in the simulation carried out after the milling contour calculation a check of the milling contours with rotary axis is not yet possible.

Only after the NCP file has been written and saved, it can be displayed on the screen in an isometric view using the Simulation menu in the submenu item of an NCP file.

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### **Contour-oriented 3D milling:**

isy-CAM, Revision 2.0, provides improved milling strategies for 3D finishing. Whereas only axis-parallel 3D cutting has been supported to date, thanks to the use of tool-oriented projection of 2D contours it is now possible to specify a great variety of 3D finish-milling strategies for 3D spaces. This considerably reduces the milling times, removes residual material and makes possible special rework (e.g. steep edges etc.). Simply speaking: If you look at a 3D part from top (x-y plane), the machining travels of the tool on the 3D surface can be determined either by "drawn lines" or paths automatically generated (e.g. meanders, helixes, pockets, etc.). Let's demonstrate it using a simple example of a volumetric body. We enter the following command sequence:

3dcube -1 100 -w 60 -h 30 -o 0,0,-30 3dsphere -c 50,30,0 -r25 setpp -i

A cuboid with a ball will result. The illustration below shows the corresponding 3D menu if you want to generate the body with a mouse click.



Prior to the next following volume operation, we will decrease the mesh of the ball by typing

mspart \* -p 24

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and save the image to be able to modify it later (if desired) with

save test

Then we enter

sop obj1-obj2 -vrs

to subtract the ball (obj2) from the cuboid (obj1 (order of selection: first the cuboid, then the ball) so that we receive the following image. The illustration shows the menu for the 3D volume operations.



Of course, you can mill this body three-dimensionally in the known manner. For demonstration, we will describe here only the contour-oriented 3D finishing. Our first task is to generate helical 3D finishing contours only within the hollow half sphere. To this aim, first let's have a look at the milling part from top. This is done by typing

#### setpp -z

Then we will generate the desired helix with a travel distance of d=0.5 using the command

spr \* -c 50,30 -i 0 -r 25 -t 0.5 -d 0.5

The two-dimensional helix is now directly above the hemisphere and will be generated from inside out. In order to turn the "milling contours", type

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revco \*

It is also reasonable to colour it by

color \* 6

Let's have a look at the entire figure from the isometric view

setpp -i

and save it as test1.

save test1



Don't get confused that the 2D helix seems to stand completely foolishly in the open space. From top view, it is located exactly where it must be – where milling is to be done. Now call the CAM module as usual and branch to 3D milling.

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FLE PLOT MELP NOW PRATE SOUR HAT USR GRP I3D DPL CSN 1: VIEW 2000 SEL EN CONTRACT OF CONTR
ISY: Freeform-milling on 3D-surfaces
Denotation BLOCK 1 Objects obj1 Dimensions Copy block 2D contour ob i3
Roughing opt       Roughing       Finishing         Oparal.to X       Oparal.to Y       0 on contour
Offset 0 Cyl-diameter Plane 0.0 depth 30 Pathdistance 48%
<u><u>T</u>ools <u>Calculate</u> <u>Store values</u></u>
<u>Stock</u> <u>Postprocessing</u> Ca <u>n</u> cel
Schott Systeme
nodify:isy edit

Use F2 in the dialog box to select the volume body from the "Objects" menu item; then use F2 again to select the 2D helix from the 2D Contour menu. Then check the "Finishing" box and "as per contour". Browse to the tool menu via "Dimensions". Select there, e.g. "Cherry" "6mm"

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and use the "Continue" command to go further to the main menu.

Now click "Calculate", select the technology block and select OK to confirm. This will start the calculation of the tool-oriented 3D finishing contour path. On completion of the calculation, the 3D tool contour paths will be displayed above the part.



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As you see by the contour paths displayed in red, the finishing is carried out only inside the hemisphere. Save the drawing with the technology definitions, e.g. by

save test2

May be we will return to this topic later. For testing purposes you can select a preview of a page (e.g. x-y plane) in order to be able to see the tool offset compensation for the cherry better. To this aim, you must display the calculated travels again using the simulation buttons. Then reset the 3D view to isometric.

setpp -i

Please make yourself once more clear how the contour-oriented 3D finishing works. A 2D contour with tool offset set by the user (in this case a helix) is projected to the surface of a 3D body. Since the geometry characteristic of the 2D contour is generally not defined exactly, all 3D finishing strategies can be realised in this way.

Since it is also possible to specify an admeasure (offset) for contour-oriented 3D finishing in the tool menu, this contour-oriented technology can also be used for re-finishing or fine-finishing by machining several technology block staggered in the depth, before they are finished.

To obtain 2D contours, pocket milling contours or hatches are often used, which are usually linked to meanders. Both cases will be demonstrated using a simple example.

First let's use the pocket milling cycle for finishing in a hollow sphere. First clear the 2D helix from the screen, which you have just generated. Of course, to create the 2D contours you could simply draw a circle having a radius of 25 in the appropriate position and broach it as a circular pocket. The border edges of a 3D body are usually geometrically not easily structured, but are complicated curves whose characteristic is gained from 3D cuts or 3D projections. For demonstration, as far as this example is concerned, we will therefore also proceed in this way. In order to achieve an appropriate border contour, undo the body along its upper edge. This is achieved using the button sequence

30 💉	Z=
A 🖓 😔	€LL

If you activate the button for Z cut and enter the value z=0, probably no cutting curve will be generated (due to the mathematical rounding). If you then cut the body a bit deeper, e.g. with z=-0.001, you will receive a rectangle and a circle (polygon) as 2.5D cutting curves (marked in red).

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For auxiliary construction, we will copy the cutting curves into buffer 2:; then we will switch to buffer 2. Then switch to the view at the x-y plane by typing

setpp -z Convert the 3D contour to 2D by typing cvtopic \* and save the result with the file name test3, i.e. save test3

Then switch to pocket milling in the CAM module and generate a roughing cycle for the circle, for which a very small, fictive tool (e.g. 0.01mm) and a contour distance of 0.5mm will be used. The penetration depth is not relevant here.

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ISY: Pocket-milling and stamp-generation with closed contours
Denotation     BLOCK 1       Objects     obj2
Image: Second
Roughing     Finishing     Io/from       Plane     0     depth     1
Pathdistance     0.5     Retreat     1     Safety     1       Restmaterial     Max dist.     Iolerance     Iolerance     Iolerance
Iools     Calculate     Store values       Postprocessing     Cancel
Schott Systeme

#### modify:isy edit

After the calculation, the circular paths will be displayed (as shown below).



These are to be found, e.g. in buffer 3, but can also be loaded as a drawing from the SECURE directory by typing the command

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load secure\cam\_pr.1

You can also do this operation using the menu (see below):

	Fil	e Select	ion		
File <u>n</u> ame					
C:/ISY/SECURE	/*.*			± <u>S</u> ort	
<u>F</u> ile				Directory	
CAMIN1.VEC CAM_CF.1 CAM_CR.1 CAM_RR.1 CAM_N.1 CAM_PF.1 NCPOST.DAT	207 472 1535 56871 10759 823 12295 701	$14.06.99 \\ 14.06.99 \\ 14.06.99 \\ 11.06.99 \\ 11.06.99 \\ 11.06.99 \\ 14.06.99 $	13:10:32 13:11:22 13:11:18 08:08:52 08:19:00 14:57:52 14:57:52 10:11:04	•	+
C:/ISY/SECURE	/CAM_PR.1			C:	
	<u>O</u> K		<u>C</u> an	cel	

Now select the paths, calculate the object dimensions, convert the geometry to a 2D polygon and remove the colours using the following program sequence:

box \* cvtopic \* pack \* -c

Copy the result into buffer 1 and use the contours in the same manner as before the 2D helix, i.e. we must merely edit the existing 2D technology block (if necessary load it using "load test2") such that the "2D contour" in it is reselected with F2. You can trace this sequence of operations once more analogously to the description above:

As another variant, the contour generation by hatching and meanders will be explained. To this aim, let's change to buffer 2: and load the cutting contour with

load test3

Now let's finish the plane surface outside the circle at an angle of 45 degrees (i.e. diagonally to the machine axes). This is often used for 3D milling, since it improves the machine dynamics without always completely decelerating one of the drive motors. Since in our case the surface is even, we will use a face-milling cutter for finishing. Let's choose 10 mm as an example so that a contour distance of 8 mm is well suited.

In order to maintain the  $45^{\circ}$  lines, we will change to hatching on 2D drawing, select  $45^{\circ}$  hatching and set the metric distance to 8 mm.

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Use "econtour" or "acontour" to hatch the rectangle such that the circle remains blank.



Convert the diagonal hatching to a polygon with zigzag connections on the line ends using the command

meander \*

It is a duplicate. The original hatching drawn underneath remains. It is recommended to recolour it.

color \* 6

Copy the meander curve back to buffer 1 and use it as a 2D contour for the "3D" finishing strategy. You may follow the handling using the description above. The result should look approximately as follows:



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Of course, you could also have milled only the hollow sphere of the body using a meander. It is taken for granted that in this case the contour (hatching) distance should be set considerably lower (e.g. 0.5). Furthermore, it would be better to use a cherry.

The principle of contour-oriented 3D finishing should thus have become clear. Since our simple example, however, has been quite unrealistic, in the following we will describe the typical example of a die part that, inter alias, can also quickly be generated using Standard-isy-CAM (i.e. without the optional 3D modeller).



As you see by the illustration, the hollow grooves of this part will probably be machined contour-oriented by 3D finishing whereas the 3D roughing operation and face milling of the plane surface will be carried out using a face-milling cutter (cylinder cutter). Acc. to the description above you will have to generate only a closed border contour that you will then mill, e.g. as a pocket. The contours achieved in this way will then be used for 3D finishing. The individual difference to our simple example above is that the 3D cutting contour cannot be accepted directly. Some line elements must be deleted and 3 new straight lines must be added on the tube ends, since for pocket milling a closed contour is required, as known. The procedure is shown once more in the illustrations below.

### 7.11 Seminar Example 10





The final result of contour-oriented 3D finishing looks approximately like that:



As you see contour-oriented 3D finishing is very useful for all more complex 3D technologies. This is a good method to rework areas in which residual material has been left due to the selected milling cutter. Furthermore, special machining of steep edges and fillets using special user-defined milling contours is also possible with no need to select extremely small milling cutter diameters and contour distances for the entire component. You define for yourself which areas are to be machined in this special way.

Just use this 3D finishing technology for your next 3D part.

# 8.0 PARAMETERISATION MODULE

#### 8.1 General

Using the additional 'ISY Par' geometry module, parametric contours are simply created. Using the basic design elements, e. g. points, lines and circles, an outline is created that is subsequently concatenated to a direction-oriented path using the contour command. The advantages are the short training period (the ISY-CAD functions are not required) and the geometric dependence of the basic elements. The plain text automatically generated during the design creates a fully new contour after changing only one parameter on pressing a 'button'. This parametric function is very useful for developing variants (similar contour images that differ by relevant main measurements). In addition, variables were integrated into the command set. Variables can be used everywhere, where numerical entries are expected. This applies also to defined inquiries at the program start to enter main dimensions using the keyboard.

'ISY Par' is seamlessly integrated into ISY. Thus, the change between both design possibilities is possible at any time. The contours generated by 'ISY Par' can then be converted to milling paths using CAM. Thus, there is no difference for the milling path generation based on geometries generated by 'ISY Par', 'ISY-CAD' or by importing.

#### 8.2 Starting of the program

The 'ISY Par' parametric module is started by LCing onto the Module button (refer to: THE DIFFERENT MODULES).

The following message is displayed if 'ISY Par' commands are already found in the vector geometry drawings:

### The current drawing will be deleted ?

<u>Y</u> es	No

Geometries created by 'ISY Par' have the '<sup>oo</sup>parm\_ge' macro name. By answering using Yes, all thus generated contours and points are deleted and updated by the plain text commands (Parametric command set). If several variants are to be generated that should remain then these contours are to be selected in ISY-CAD and subsequently to be transferred into the second buffer.



Select object The object is displayed in the pointer color and shaded in red/green. The active object is then copied into the 2nd buffer

The No input terminates the program.

The following message is displayed if drawings are loaded into 'ISY-Par' that do not contain plain text commands:

ERROR :	no	object	°°parm_code1
		<u>o</u> k	

The 'Input' Modify input area appears instead of 'Modify' as soon as 'ISY Par' is active. If the cross-hair cursor is displayed on the screen for the element selection, the context menu is called by pressing the right mouse button. In this menu, the command is interrupted or additional commands can be selected. 'ISY Par' is also interrupted by using the <CTRL>+<PAUSE> key. This is meaningful if source text errors occur at the 'ISY Par' interpretation. Then, the Modify input area shows 'modify' again. Using



the drawing editor is then accessed. The error can then be corrected in the 'ooparm\_geo' object. The Edit mode is exited using the <ESC> key. 'ISY Par' is called up again by using <TAB> <I> or by entering 'isy-par'.

### 8.3 The button – Functions in the headbar

## SAVE Saving of a file

Using this command, drawings are stored in a file. A menu appears after clicking onto the button. In this menu, you name the file and store it in a directory. By clicking into the lower entry line, the file is named by changing the "noname" designation. By clicking, the corresponding drives and directories can be selected in that right search window.

## LOAD Loading of a file

Using this command, you retrieve a saved file. A menu is shown after clicking onto the button. In this menu, you select the drive, the directory, and the file. A file is opened by double clicking onto the name or by pressing the OK button in the parametric module. The current buffer content is deleted.

### ED Editing of a file

Using this command, the editable type of the file is accessed. By pressing the "Escape" key the file is newly processed. Then, the editor content corresponds exactly to the calculated drawing.

# 8.0 PARAMETERISATION MODULE

ZO, I Increasing the size of the image section

ZO, O Reducing the size of the image section

ZO, R Zooming of an image section



Ē

Using the left mouse button and a window, you determine an image section that is then displayed in full size on the screen.

ZO, L Access of the last image section

ZO, P Moving of the image section using two points

### AC Displaying of the axes intersection

Using this command, you display an axes intersection on the screen. It is useful for the better orientation or for the clarification of scales.

The axes intersection remains visible until the button is pressed again.



### **NEW** Creation of a new drawing

This command deletes an existing drawing that is shown on the screen. Thus, a new drawing can be created. Before discarding a drawing that has not been saved, an inquiry is made whether you are sure or not. The command is aborted if the inquiry is denied.

### FI Selection of objects

After selection, an element is displayed in color. The 'FI,CO1' entry shows directly the first contour.

### **Delete** Deletion of objects

**a** 

This command is used to correct drawings. It enables to delete available objects. The program prompts to select the object to be deleted using the cross-air cursor. After the selection, an inquiry is made whether the object should really be deleted. Simultaneously, the selected area appears in a contrasting color to the drawing. Both are safety precautions to avoid that you unintentionally delete parts of your drawing. The emphasized object is deleted if you confirm the inquiry. The command is interrupted if the inquiry is denied.

# CLS Eliminating of auxiliary marks on the screen

 $\checkmark$ 

Using this command, you delete auxiliary marks that have been created, e.g. when selecting elements. After completion, the drawing is re-displayed without the marks. The command can also be accessed using the right mouse button.

### END Exiting the Parametric module



Using this command, you exit the parametric module. You return to the PICTURES CAD system. The created contours and points are taken over as geometry.

# 8.0 PARAMETERISATION MODULE

### 8.4 Using Variables for Input

The parameterisation module can be used to define variables to substitute numerical data. You may thus create several design variants. For example, you may substitute radii, distances, values, numbers, etc. by a variable that can then be used to generate or modify drawings or structure them using a modular design. Variables can be assigned values, formulas or other variables. In case of formulas, all functions and arithmetic operations are permitted, which are contained in the Calculate Pictures command, e.g. sin, cos, tan, root ... etc. All variables have the designation "Z" and a number, e.g. "Z5". If the variable is not automatically numbered, it will be assigned a number. A variable can be at any time defined via input. It can be modified by redefining or using the editor.

#### Format of the variable definition: Z(numbering), (assignment)

Examples:

Z2, 50	The variable number 2 will be assigned the value "50".
Z1, Z10 - 5	The variable number 1 will be assigned the value from the difference between the
	variable number 10 and the number 5.
Z9, sin(3)*2	The variable number 9 will be assigned the value of the result of the formula.

The assignment of values can also be carried out via a request. After loading a file you will be requested to provide information on the variables so that you will be able to vary the drawing. You may design the type of the request and the text via the format.

### Format of the variable definition using a request: Z(numbering), ?, (text)

#### Examples:

Z22, ?, radius	After the program has been started you will be prompted to enter the radius.
	Your input will be assigned the variable number 22.
Z8, ?, number of dots	The question is "number of dots". Your input will be assigned number 8.

Another possible application of the variable input is the input of distances using two points. Enter two points whose distance will be assigned as a value of a variable.

### Format of the variable definition using two points: Z(numbering), P(Num.), P(Num.)

#### Example:

*Z4, P1,P2* The distance between the points P1 and P2 will be assigned to the variable number 4 as a value.



# 8.5 MEN, R, PAR\_P Activating the Point Menu

This menu command is used to activate the point menu, i.e. all buttons summarised in this menu item will be displayed on the screen. It is a group of yellow buttons intended to define points, and a group of green buttons to define point patterns. The menu remains active until another menu is called.



# P, (-) X, (-) Y Defining a point by Cartesian coordinates

With this command, you will be asked to enter first the X coordinate and then the Y coordinate of the point. After the input of both coordinates, the point defined in this way will be displayed on the screen.

Example



 Button menu:
 P1: X150, Y150
 P2: X-50, Y100

 Manual input:
 P1: P. X150, Y150
 P2: P. X-50, Y100

# **8.0 PARAMETERISATION MODULE**

# **P**, $(\cdot)$ **L**<sub>0</sub>, $(\cdot)$ **L**<sub>0</sub> Point as the intersection point of two lines

<mark>- د</mark>

Use this command to define a point as an intersection point of two lines. The command will prompt you to select both lines whose intersection point defines the position of the new point. These actions are carried out one after another using the crosshair. It is imperative that the lines have an intersection point and are not parallel. Any signs of the lines do not play any part for this command and are indicated in the headline only for completeness.



Button menu: The intersection point P5 is created by selecting L1 and L2.

Manual input: *P*, *L1*, *L2* (any signs put in front of it will have the same result)

The points P1 to P4 are construction points of the lines.

 $\boldsymbol{P}$ , (-)  $\boldsymbol{K}_{_{\boldsymbol{0}}}$  Point as the centre point of a circle



This command is used to define a point as a centre point of a circle.

You will be requested to select a circle in the centre point of which the new point will be set. The selection is done using the crosshair. The sign of the circle has no influence on the result.

#### Example:



Button menu:	Selecting of K1	using the cross-hai	r cursor creates P1.

### Manual input: *P*, *K*1 or *P*,-*K*1

**P**, (-)  $\mathbf{K}_{0,2}$  (-)  $\mathbf{L}_{0}$  points as intersections of circle and line

This command defines points as intersections of a circle and a line. Depending on the inquiry and using the cross-hair cursor, you select a circle and a line. Indeed, this might return different results. When applying this command, there are three cases that could lead to a different number of points.

Always, two intersections exist if circle and line intersect. Only a point can be defined if circle and line touch only, i.e. The line proceeds tangentially to the circle. No point is created in case line and circle neither cut nor touch. Only one point is defined first if two intersections exist. With the input using the menu, the point depends on the location of the selection. With a manual input, it depends on the sign of the line.

# 8.0 PARAMETERISATION MODULE







Button menu:

 $\mathcal{O}$ 

Selecting K1 and L1 in the lower right area yields P3 Selecting K1 and L1 in the upper left area yields P4

Using a menu entry, always the intersection located nearby the selection point is created.

Manual input: P3: P, K1, L1 P4: P, K1, -L1

Using a menu entry, always the point is created that first cuts the circle in the direction of the line. This consideration is based on the view of the area outside of the circle. Thus, the sign of the line decides which of the intersections is created.

# **P**, **P**<sub>0</sub>, $(\cdot)$ **L** Projection of a point onto a line



Using this command and based on a point and a line, you can create a point that is defined as the intersection of the line with the perpendicular of the point onto the line.

The command inquires the selection of a point and a line using the cross-hair cursor.



Button menu: Selecting P1 and L1 yields the projection point P4.

**Manual input:** *P*, *P1*, *L1* or *P*, *P1*-*L1* The P3 and P2 points are design points of L1.

# **P**, (-) $\mathbf{K}_0$ , (-) $\mathbf{K}_0$ Intersections of two circles

Using this command, you define points as intersections of two circles. The command inquires the selection of two circles that are successively determined using the cross-hair cursor. Three possibilities exist. Firstly, it would be possible that the circles touch only in a point, i.e. only a point of contact exists. Secondly, there are always two intersections if both circles intersect. The third case exists if the circles are located too far from each other and no common point is available. With two intersections, not both points are automatically created; i.e. your entry determines the intersection that is shown in the drawing. The differences based on the input. Their consequences are shown in the following examples.

# 8.0 PARAMETERISATION MODULE

### **Example 1: Two intersections**



Button menu:

Using the menu, the intersection is created that is located most closely to the first selection point. The procedure is as follows:

- P1: Select the first circle close to P1. Subsequently, select the second circle.
- P2: For creating P2, the first selection point must be located nearby. Thereby, it is unimportant which of the circles is selected first.

Manual input: P1: P, K1, K2 or P, -K2, K1 P2: P, -K1, K2 or P, K2, K1

#### Example 2: Point of contact of two circles



Button menu: Selecting both circles

Manual input: P, K1, K2

P, K1, K2 or P, K2, K1 (possible signs do not matter)

Using a menu entry, the sign of the first entered circle determines the created point. The rotation direction of a circle is determined in the mathematical positive direction, i. e. counter-clockwise. Based on the larger sector of the first named circle, always the intersection is defined that is first reached in the rotation direction of the circle. In the following example, the principle is presented once again.

#### Example 3: Two intersections



P2: P, -K1, K2 or P, -K2, K1

Based on the largest sector, select the sign of the first named circle to follow its directional sense up to the first desired intersection. The sign of the second circle does not matter anymore.

# P, P, A, W Defining of a point by using polar coordinates

With this command, the definition of a point is based on a starting point to which an angle is applied to the horizontal. Along with the angle, the distance from point to point then determines the exact location of the new point.

After entering the command, you are inquired to select a point that is used as starting point. This happens using the cross-hair cursor. Next, the distance and subsequently the angle is requested. The point is displayed on the screen after these entries.

Example 1:



# **8.0 PARAMETERISATION MODULE**

Button menu:

Select P1 Enter the distance; in this example A = 350Enter the angle; in this example W =  $60^{\circ}$ 

Manual input:

P, P1, A350, W60

### Example 2:



Button- menu:	Select P1
	Enter the distance; in this example A = 300 Enter the angle; in this example $W = 230^{\circ}$
	Enter the angle, in this example w = 250

Manual input: *P, P1, A300, W230* 

# $\mathbf{P} \mathbf{L}, \mathbf{P}_0, \mathbf{P}_0, \mathbf{S}$ Linear point pattern between two points

This command enables you to create a point pattern between two points. The pattern is always in a straight line between both points. After issuing the command, you are prompted to select the two points. This is performed using the cross-hair cursor. The next input request asks for the number of desired points that should be located between both points.

### Example:



Button menu:Select P1 and P2 as starting and ending points<br/>Enter the number of desired points; in this example S = 12Manual input:PL, P1, P2, S12 or PL, P2, P1, S12

(Exchanging the starting and ending points does not change the result.)

# PL, $P_0$ , W, S, A Linear point patterns defined by a starting point, an angle and the distance between the points



Using this command you can create a linear point pattern. First, select a starting point using the cross-hair cursor. Next, specify the angle with which the point pattern slants to the horizontal. In the next step, enter the desired number of points. By specifying the distance between the individual points you determine the density and the length the point pattern.

# 8.0 PARAMETERISATION MODULE



# PZ, $P_0$ , S, R, B, E Circular point pattern, defined by a starting and ending angle, circle center and number of points

This command enables to create a circular point pattern. Its starting and ending angle can be freely selected. First, select a point that is used as circle center. Then, the program prompts for the number of points that should form the point pattern. Following, the radius, starting and ending angles are requested. Thus, you create a section of a circle drawn as point pattern.

### Example:



 Button menu:
 Select P1 as circle center

 Enter the number of desired points; in this example S = 15

 Enter the radius; in this example R = 160

 Enter the starting angle; in this example B = 100°

 Enter the ending angle; in this example E = 290°

 Manual: PZ, P1, S15, R160, B100, E290

Manual input: *PZ, P1, S15, R160, B100, E290* 

# **8.0 PARAMETERISATION MODULE**

### 8.6 MEN, R, PAR\_L Selecting the line menu



Using this command, the line menu is activated, i.e. all blue line buttons are shown on the screen. The line menu remains active until another menu is selected.



# L, X Linie parallel to the Y-axis



This command creates a line that proceeds parallel to the Y-axis. You are prompted to enter the axis section of the X-axis, i. e. The X-value at which the line should cut the X-axis.

### Example:

	700
	600
	.500
	400
	.300
	200 L1
	100
-300-200-100	100 200 300 400 500 600 700 800 900
	-100
	-200
	-300

Button menu:

Enter the X-value; in this example X = 150

Manual input:

*L*, *X150* With this command, the direction of the line can not be infl

With this command, the direction of the line can not be influenced. The line always proceeds in the direction of increasing Y-values.

# L, Y Linie parallel to the X-axis

Using this command, you create a parallel line to the X-axis of the coordinate system. You are inquired to enter the axis section of the Y-axis, i. e. The Y-value at which the line should cut the Y-axis.

Example:	+ <sup>700</sup>	
	-600	
	_500	
	_400	
	_300	
	_200	
	L1.	
	-100	
	-200	
	-300	

Button menu: Enter the Y-value; in this example Y = 100

### Manual input: L, Y100

With this command, the direction of the line can not be influenced. The line always proceeds in the direction of increasing X-values.

# L, $\mathbf{P}_0$ , $\mathbf{P}_0$ Line between two points

Using this command, two points are interconnected by a line. You are prompted to select two points using the cross-hair cursor. The first point to be selected is the starting point. The second point is the ending point, i. e. The line proceeds from the first selected point to the second selected point. It has thus a determined direction.

# **8.0 PARAMETERISATION MODULE**



This command creates a line in a certain angle. Starting from one point that is selected in the first step, specify an angle, the line is slanted by to the horizontal. The direction of the line is always from the selected point to the specified angle.

### Example:



Button menu:	Select the point, the line should cut. Enter the desired angle.		
Manual input:	L1: L, P1, W100	L2: L, P1, W20	L3: L, P1, W250

# L, (-) L, (-) A Line parallel to another line with a fixed distance

Using this command, you draw a line parallel to another line and at a specified distance. Using the cross-hair cursor, select a line to which the new line should proceed in parallel. Next, enter the distance. The distance receives a negative sign if the line should proceed to the left of the selected line. With a positive sign, the line proceeds to the right of the selected line. The specification of right and left always refer to the direction of the selected line, i.e. in direction of the line on the right or on the left.

#### Example:



# L, $\mathbf{P}_{n}$ , $\mathbf{W}$ , $(\cdot)$ $\mathbf{L}_{n}$ Line in an angle to another line

This command creates a line in an arbitrary angle to another line. Using the cross-hair cursor, select first a point, the created line should cut. Next, specify the desired angle. Finally, select the reference line, the newly created line should intersect at the specified angle.

# **8.0 PARAMETERISATION MODULE**



The direction of the created line is the same as the one of the reference line but only rotated by the angle.



The L, P2, W50, -L1 input would result in a directional change of L2 since the direction of the created line always follows the direction of the reference line.

# 8.0 PARAMETERISATION MODULE

# L, ( ) $\mathbf{K}_{_{0}}, \mathbf{P}_{_{0}}$ Line starting at a point and tangentially touching a circle

Using this command, a line is created that proceeds tangentially to a circle and cuts it a specified point. First, the program prompts to select a circle. Then, the program requests a point that the line should cut. During the entry, a couple of things are to be considered since the line can either touch the circle on the right or on the left as seen from the starting point. In the menu, the course of the line is decided by the selection point at the circle.

The line always proceeds to the circle half at which the selection point is located. Therefore, select always the area of the circle that the line should touch.

Using a manual entry, the sign of the circle decides the course of the line. At the point of contact, the direction of the line and direction of the circle must be opposite.

Example 1:



#### Button menu: Select K1 at the side at which the line should proceed Select P1

Manual input: L1: L, -K1, P1

L2: L, K1, P1

Example 2:



# L, K<sub>a</sub>, W Line tangentially touching a circle in freely selectable angle



Using this command, a line is created that tangentially touches a circle in an arbitrary angle. After selecting a circle, the program requests the input of an angle. This angle is applied to the horizontal in the center of the circle and defines the point of contact of circle and line.



This command creates a line tangentially touching two circles.

After entering the command, you are requested to select two circles that the line should touch. Basically, there are four possibilities of the course of the line. The number is still doubled taking the directional option of the lines into account. The course of the line through the selection points at the circles is decided at the time of the entry via the menu. The program always selects the points of contact between the line and the circle having the shortest distance to the selection points. The direction of the line proceeds from the first selected to the second selected circle. Using a manual entry, the sign of the circles and the sequence of the circles decide the course of the line. In the following examples, the differences are pointed out. The manual entry is especially explained in example 2.

L1: L. K1. K2

Example 1:



Button menu: Select the circles according to desired course and direction of the line. The course depends on the selection points. The direction of the line depends on the sequence of the selection. L1 proceeds from K1 to K2, L2 from K2 to K1.

Manual input:

L2: L, K2, K1 L3: L, K1, -K2

Example 2:



Manual input: L1: L, K1, - K2 L2: L, - K2, K1 L3: L, K1, K2 L4: L, -K1, -K2

The direction of the line always proceeds from the first selected to the second selected circle. The course of the line depends on the sign of the circles, i.e. on the rotation direction of the circles. In their point of contact, circle and line always show in the same direction.

L1: The line should proceed from K1 to K2, i.e. in the command, K1 is named first. L1 should proceed in the upper area of K1. In the upper area of K1, the positive directional arrow would point to K2. Therefore, K1 receives a positive sign. L1 should touch K2 in the lower area. In the lower area, the negative directional arrow would point to the same direction as the line, i.e. K2 receives a negative sign.

L4: In the command, K1 is selected first, i. e. L4 proceeds from K1 to K2. The negative sign means that the line proceeds at the lower area of K1 since the negative directional arrow of K1 points in the direction of K2. -K2 specifies that L4 must also proceed in the lower area of K2 since the negative directional arrow of the circle points in direction of the line.

# 8.0 PARAMETERISATION MODULE

### 8.7 MEN, R, PAR\_K Activating the circle menu

Using this button, you activate the circle menu. In this menu, all buttons are available for the creation of circles. The menu remains active until another menu is selected.

Circle menu: Circle:

( K )



# K, R, X, Y Circle defined by its center and radius

Using this command, a circle with an arbitrary radius is created around a point. The point is used as the center of the circle. The command requests to select a point. This is done using the cross-hair cursor. Next, enter the radius if requested.



# K, $\mathbf{P}_{0}$ , R Circle defined by its center and radius

 $\bigcirc$ 

Using this command, a circle with an arbitrary radius is created around a point. The point is used as the center of the circle. The command requests to select a point. This is done using the cross-hair cursor. Next, enter the radius if requested.

## Example:



Button menu:	Select the center of the circle.
	Enter the radius; in this example $R = 100$

Manual input: K, P1, R100

# K, $\mathbf{P}_{0}$ , $\mathbf{P}_{0}$ , $\mathbf{P}_{0}$ Circle created by using three points

 $\bigcirc$ 

Using this command, a circle is created by using three points. You are quested to select three points that will then be cut by the circle. Requirement is that none of the points are located on a straight line since this would mean an endlessly large radius.

### Example - refer to the next page

# 8.0 PARAMETERISATION MODULE



# $\mathbf{F}_0, \mathbf{F}_0, \mathbf{K}$ on the radius

Using this command, you create a circle with an arbitrary radius that cuts through two points. You are requested to select two points and to specify a radius. With this type of circle definition, there are two possible locations of the circle that are determined by the selection sequence of the points. The command always assumes a positive rotation direction of the circle, i. e. it directly creates an arc from the first to the second selected point in the positive direction (counter-clockwise). Then, it completes the circle.

Example:

Button menu:



**K2:** Select P1 selecting of P2 Enter the radius; in this example R = 300

Manual input: K1: K, P2, P1, R400 K2: K, P1, P2, R300



# K, $_{(\cdot)}$ L $_{_0}$ , P $_{_0}$ , R Circle cutting through a point and touching a line tangentially

Using this command, you define a circle that cuts through a point and tangentially touches a line. You are prompted to select a line and a point. Then, you specify a radius that determines the size of the circle. Also with this command, there are some possible locations of the circle. Therefore, pay already attention to the selection point when selecting the line and the intended location of the circle.

Example:



- Button menu: K1: Select a line; in this example L1. Select a point; in this example P3. Enter a radius; in this example R = 200
  - K2: Analogous to K1. Only the selection point of the line must correspond to the location of K2 (to the left of P3). R = 150

Manual input: K1: K, -L1, P3, R200 K2: K, L1, P3, R150

At the manual entry, the location of the circle depends on the direction of the line. Starting at the point, a direct arc to the line is created always pointing in the direction of the line. Then, the circle is completed.

# 8.0 PARAMETERISATION MODULE

# K, R, $(\cdot)$ L<sub>0</sub>, $(\cdot)$ L<sub>0</sub>, Circle between two lines

This command adjusts a circle to two lines. Enter the radius after selecting two lines using the cross-hair cursor. The program fits the circle to the lines that both tangentially touch the circle. With two lines, there are four possible locations of the circle. These are the four sectors located at the intersection of the lines. Using the menu, the selection point determines the sector, the circle is finally located in. Seen from the intersection of the lines, the sectors can be respectively subdivided into a left, a right, an upper and a lower sector. Also both selection points must be located on the left side of the intersection if you would like to locate a circle, e. g. in the left sector. The circle is also created in the upper sector if both selection points were selected in the upper sector. Using a menu entry, the sign of the lines is responsible for the location of the circle. Examples 2 and 3 describe this type of entry more comprehensively.









K, L1, L2, R100 or K, L2, L1 R100

The directions of the lines are decisive for the location of the circle, i.e. The signs at the time of the input. Originated at the intersection, the circle is created in the sector that is formed by these directional beams if you draw the directions of the lines as a kind of beams. In example 2, P2 is the point, the lines intersect. Starting at P2, line 1 proceeds in direction of P1. Line 2 proceeds from P2 in the direction of P3. Based on these directional beams originated at P2, the right sector is formed that also contains the circle. The sequence of the lines is of no importance when entering the data. Example 3 shows further manual entry examples.

Example 3:



Manual input:

 K1:
 K, -L2, -L1, R70
 K2:
 K, L1, -L2, R150

 K3:
 K, -L1, L2, R100
 K4:
 K, L2, L1, R50

 L1 and L2 can also be exchanged in their sequence.
 K1
 K2
 K1

# **8.0 PARAMETERISATION MODULE**

# K, (.) L<sub>0</sub>, K<sub>0</sub>, R Circle tangentially located at a line and at a circle



This command enables the adjusting of a circle to a line and to a further circle. The program prompts for the selection of a circle and a line. Next, the radius is inquired. The selection points determine the location of the circle to be created. The explanation of the manual entry is omitted for this command. Based on the many location possibilities, the manual entry is too complicated and thus not practicable. The examples present an overview.

Example 1:



Button menu: K2: Select a line; in this example L1. Select a circle; in this example K1 Enter a radius; in this example R = 80

> **K3:** Select a line; in this example L1 Select a circle; in this example K1 Enter a radius; in this example R = 50

Besides their radius, K2 and K3 differ only by the different specification of the selection points of the circle and the line. For K3, these are located in the upper left area of the example drawing, for K2 in the lower right area.

Example 2:



Example 2 shows further design possibilities for the "K, L, K, R" command. Only the corresponding choice of the selection points is responsible for the location of the respective circles.

# **8.0 PARAMETERISATION MODULE**

# K, (·) K<sub>0</sub>, (·) K<sub>0</sub>, R Circle touching to two further circles



This command enables the design of a circle that borders two further circles. You are inquired to select two circles and to subsequently enter a radius. An error message is output if a too small radius was entered, i. e. The distance of both circles is too large for the desired radius. Also, an error message is output if concentric circles are requested. The command offers a large number of design possibilities. Based on this number, no individual descriptions can be given. This applies also to the manual entry option which is also impracticable to the user due its large extent. In this case, the documentation is limited to some examples with short explanations.





Button menu:

K3: Select two circles; in this example K1 and K2 Enter the radii; in this example R = 150
K4: same as K3 but only with R = 140

The difference in the location of the circles K3 and K4 is based on the choice of the selection points. The selection points of K3 are located in the upper left area of the circles and for K4 in the lower right area. Also to this command applies that the selection points determine the location of the elements.





Design examples for the "K, K, K, R" command

# K, $\mathbf{P}_{0}$ , $\mathbf{P}_{0}$ Circle defined by a circle center and a point on that circle

Using this command, you create a circle using two points whereby one point is used as the center of the circle. The second point is defined as a point on the circle. The order of the selection must be observed if you are requested to select the points, i. e. The point selected first defines the center of the circle, the second the point on the circle.

Example:



Button menu: Select the circle center; in this example P1 Select a further point; in this example P2

Manual input: K, P1, P2

# 8.0 PARAMETERISATION MODULE

# 8.8 MEN, R, PAR\_C Activating the contour menu

This command activates the contour menu, i.e. all contour command buttons are visible on the screen. The contour menu remains active until another menu is selected.

Contour menu:



Contour command:


# 8.0 PARAMETERISATION MODULE

#### 8.8.1 Creating a contour

# RONTUR

#### General:

Using this command, you develop a contour based the draft drawing consisting out of dotted lines, circles and points. This contour does not contain any help lines anymore and represents the real result or the real drawing. When applying this command, the exclusive use of the menu is recommended since a manual entry of the contour paths is too extensive and thus impracticable. For this reason, the description of the manual entry is omitted.

#### Structure of the command:

First, the contour command inquires the selection of a starting point. Next, the course of the contour is inquired based on elements (circles, lines, points) that relate to each other, i. e. intersect or touch. The inquiry of objects is made until a final point is selected and the procedure is terminated. After selecting the final point, the procedure is terminated using an additional menu. This additional menu is accessed using the right mouse button. It contains the "END" command of the procedure. The contour command always begins with the selection of a starting point and can only be successfully terminated after selecting an ending point.

#### The additional contour menu:



Select the additional menu using the right mouse button. Beside the zoom command on the right side, it contains four further contour commands. Each of these commands is selected using the mouse. They are executed by clicking onto a command and pressing the left mouse button. The functions of the contour commands are described in the following.

#### End:

This command terminates the contour command after selecting an ending point. The selection of an ending point and the following termination are inseparably interrelated. The ending point concludes the contour and the "end" command the complete contour command with a finished created ?????

#### Continue:

With "Continue", the additional contour menu is exited without aborting the contour command. This is appropriate, e. g. after a correcting of the course of the contour or after an incidental selection of the additional menu during the selection of a contour.

#### Undo:

Using this command, a selected contour course can be undone piece for piece. Thus, an error correction is possible during the selection of a contour. This command is no more applicable to an already finished contour.

#### Abort:

The entire contour command is interrupted by the "Abort" command. After executing this command, you are returned to the contour menu without having created a contour.

# 8.0 PARAMETERISATION MODULE

#### Creation of a contour:

After selecting a starting point, the inquiry of elements describing the course of the contour begins. The sequence of the element selection determines the course. Please consider that only adjacent elements can be selected, i. e. The contour must be nonstop. An error message is issued if a non-adjacent element is selected. Using the cross-hair cursor, click only onto elements at locations that should actually be processed as part of the contour. This procedure ensures that the contour takes no unintentional course. This is possibly, e. g. at circles since the contour can proceed on the right or on the left of the circle (seen from the intersection). Seen from a starting point, also each contour must end with a point as each contour proceeds across a certain number of elements up to an ending point. After the selection of this ending point, the contour command is completed using the "end" command.





- Select a starting point; in this example P1.

- Select the first element; in this example L1.

- Select the second element; in this example K1. (K1 is selected at the outer edge since the contour should proceed outside)

- Select the third element; in this example L2.

- Select the fourth element; in this example K2. (The selection of K2 happens again at the outer edge)

- Select P1 as fifth element and simultaneously as ending point.

- Select the additional contour menu and terminate the contour command using the "end" command.

# **8.0 PARAMETERISATION MODULE**





Starting point : P2 Elements : K1, L1, K2, L3, K3 Ending point : P1 Command conclusion : "End"

Also and including this example, it is important for the definiteness of the course of the contour to select elements at locations at which the contour should proceed. In the lower example, another course of the contour is outlined including the same starting and ending points and the same elements.

#### Example 3:



# **8.0 PARAMETERISATION MODULE**

8.8.2 CO, CO<sub>0</sub>, X, Y, S Moving a contour by specifying a vector



Using this command, you move a contour by specifying a vector. Sequentially, the input of the X-value and the Y-value of the displacement are inquired. Next, the number of the desired contours is requested. Thereby, you receive a linear arrangement of an arbitrary number of contours.

Example 1:



# 8.0 PARAMETERISATION MODULE

# 8.8.3 $CO_0$ , $CO_0$ , $L_0$ Mirroring of a contour on a line



This command enables to mirror a contour on a line. Thereby, you receive a copy of the mirrored image of an available contour. After entering the command, you are requested to select a contour and a line that is used as the mirror axis.

Example:

Button menu:



Select a line; in this example L1

**Manual input:** As for all contour commands, the exclusive use of the menu is recommended since a manual entry of the contour paths is too extensive and thus impracticable.

8.8.4 DU,  $CO_0$ ,  $P_0$ , W, S Rotating a contour around a point



This command creates images of a contour that are arranged with a freely selectable angle around a pivot point. You are requested to select a pivot point and an angle by which the new contour should be rotated. The last input request prompts you for the number of copies that you want to create. The drawing of rotation-symmetrical parts is greatly simplified by using this command.

# 8.0 PARAMETERISATION MODULE

#### Example:



#### 9.1 Preface

These tools have been created upon questions and suggestions from the hotline. These have been analysed, and the results have been integrated into the extent of supply of the CAD part of isy-CAM. Special attention has been devoted to the fact to make the operation of the entire program consistently. All obsolete procedures have been worked over:

- Arithmetic functions directly during the input/selection

- Active zoom
- List of selected objects remains stored
- New object orientation
- New context menu of right mouse button

This has no influence on the original extent of supply of the program collection.

#### 9.2 CIMPOINT MENU

The integration of the PowerTools in the operator interface results in a consistent operation. All buttons that call the crosshair for construction to snap to existing geometries have been extended by a new menu. If the crosshair for element selection is visible on the screen, the menu is called using the right mouse button.

CIMPOINT		
Referenz         karthesisch         polar           X         433.7537         X         12*8.73         R         8.733           Y         244.3668         Y         0         U         0		
Absolute O Relativ	/e	
Cancel Select Take CIM		

#### Reference

All points selected or entered numerically will automatically be loaded into the reference list. In the reference list, you can use the arrow keys to browse. The reference points come into effect by activating the Relative box. The input to be made there will refer to these coordinates. The list contains 20 points in total, which are updated continuously. The buttons "Next Point" and "Last Point" can be used for browsing through the list.

#### Cartesian

It is also possible to enter arithmetic operations SHEET CELLS or formula terms directly in the input boxes. The following entries are permitted:

100\*10+20 a1\*3.16 sind(30)

pi\*a1

The assignment of SHEET CELLS is done as follows: modify: cal a1=123\*567

```
The request is done as follows:
modify: echo $a1
```

or

modify: sheet;cell a1

# 9.0 POWER TOOLS

#### Polar

The way is defined with reference to the absolute and relative coordinates using distance and angle. Also in this case, it is possible to enter arithmetic operations directly.

#### Obj Snap

Clicking this button will call the menu for colour snapping/display and group snapping.

Layer

Clicking this button will activate the layer management.

#### Cancel

Clicking this button will disable the management menu; the crosshair for selection appears again.

Select

Using this button, you can accept any point into the reference list. This is useful in conjunction with the activation of the Relative input. It is thus possible to activate any points relative to the selection

#### Accept

If any numerical inputs are made in the boxes, these will be accepted into the corresponding box, and the coordinates will be sent to the procedure. At the same time, the result of the calculation will be entered in the reference list.

#### Example:

Numerical drawing of a rectangle with the coordinates 100x80:



KK Select any point Right MouseButton (RMB)



The coordinates 0.0 will be loaded.





	CIMPUINI	
Referenz           X         100           Y         80	karthesisch X -100 Y 0	polar <u>R</u> 100 <u>U</u> 180
	( A <u>b</u> solu	ute () R <u>e</u> lative
	ğ 💫 🔯	ALL T
Ca <u>n</u> ce l	<u>S</u> elect <u>T</u> a	ke CIM

CIMPOINT Referenz karthesisch polar <u>R</u> X 80 W Absolute O Relative STAT. •🗊 Cancel Select <u>T</u>ake

The coordinates 100.0 will be loaded.

#### The coordinate 100.80 will be drawn. Relative to 100.0.

Polar coordinates length 100, angle 180,

#### Absolute 0.0

# 9.0 POWER TOOLS

#### 9.3 CIMSEL MENU

The CIMSEL menu manages selected objects. Wherever any command on the operator interface refers to the active object, it is possible to call the CIMSEL menu using RMT. In order not to get lost the compatibility with the standard, the active object will also be taken into account. If the crosshair appears on the screen, the CIMSEL management will be selected. This is also done by RMT. Only if the snapping is done outside the permissible drawing area immediately after the function call, the corresponding command refers to the object previously activated.



This call activates the window selection immediately. A distinction is made whether the window is dragged either from the left to the right over the objects or from the right to the left:

#### From the right to the left:

All objects touched by the window will be selected.

#### From the left to the right:

Only objects whose object boxes are situated completely within the window will be taken into account.

#### Delete

Clicking this button will delete the entire list.

#### Remove

Clicking this button will remove the object marked by the red bar.

#### Cancel

Clicking this button will cancel the selected objects and cancel the function.

#### OK

Return to selection

#### Selection in the window

A second raster point defines the window size.

#### **Display Objects**

Displaying of the selected objects is active by default. For reasons of time, the function can be disabled.

#### Treat as a Macro

This function generates a macro for the selected objects and carries out the command only once.

#### 9.4 RMT Menu

If the mouse pointer is within the drawing area, clicking RMT will call a menu that provides the following functions:



Cleanup buffer

#### Buffer transfer

If the DPL flag is disabled, the objects will be moved between the buffers. Calling RMT will activate the CIMSEL menu.

#### Pack All, Cleanup Buffer

- This function provides the following commands:
- 1. Pack Object Structure Remove empty objects Remove unnecessary co commands Remove unnecessary t2 commands
- Elimination of object name overlap. If the drawing already contains any technology instructions, the object line will be matched automatically. In this case the reference is always on the object found first.
- 3. All object boxes will be recalculated.
- 4. Display of a new image

# 9.0 POWER TOOLS

#### 9.4.1 Object Alignment

The alignment refers to the box of the objects. The size dimensions of objects selected are determined automatically.

Objectadjustment				
Ob jectposition         Ob jectsize         Scale           X         376.75         X         40         X         in ×         100           Y         85         Y         44         Y         in ×         100				
X Proportionally				
Reference-point OOO				
• • •				
• • •				

# Object Position

The object position refers to the reference point.

#### Object Size

The object size can be varied by direct dimension input. The scaling of the size in % is calculated automatically.

#### Scaling

The % specification has a direct influence on the object size.

#### **Reference Point**

The nine corner points of the object box will be displayed. Clicking in the centre and then typing 0.0 for the object position will define the workpiece zero.

For 3D objects, in addition, the 3D planes 'bottom', 'centre' and 'top' appear.



# 9.5 Differences to isy without Installing the PowerTools

ACONTOUR.PRC

All objects that have been selected with contour tracing will be deleted. They will only be maintained if the DPL button **DPL** is active. Contour cascading thus does not occur any more. If during the selection the right mouse button is pressed, the following context appears:



ISYCALC.PRC ISY.PRC After the installation of the PowerTools, all procedures modified will be copied into the directory 'C:\ISY\CIMPRC'. The two main procedures of ISY-CAM 'ISY.PRC' and 'ISYCALC.PRC' have been extended. These extensions will be described in the next few lines.

If you do not wish to install the PowerTools in the most current version 2.0, revision conflicts may occur under certain circumstances. To eliminate them, there are two possibilities:

- Delete the two files 'C:\ISY\CIMPRC\ISY.PRC' and 'C:\ISY\CIMPRC\ISYCALC.PRC'. The extensions described below will no longer be available.
- 2. We recommend to use the PowerTools only in conjunction with version 'ISY CAD/CAM 2.0', which can be ordered with isel-automation.

The following supplements have been implemented in ISY-CAM:

1. Fonts and hatches are converted automatically, i.e. it is no longer necessary to convert them by



Tolerance: 0.01 The script lines will be converted to Bezier curves and straight lines.

2. The **Drilling technology** will now be applied to the following geometry elements:

Start points (intern 'ma') End points (intern 'da') Circles, (intern 'ma') standard Circle segments (intern 'ma')

# 9.0 POWER TOOLS



If 'ISY' drawings '\*.VEC' are loaded using the file manager, the destination directory of the current file automatically becomes the project directory. When saving the file,

this project directory remains active. The commands modify: load and modify: save will then apply to the project directory (variable: 'vecpath'). The direct commands modify: md can be used to create a new directory: modify: md c:\isy\vector\projektXY The project directory will only be active if the drawing currently created with



will be saved to hard disk. The destination directory 'C:\ISY\VECTOR\PROJEKTXY' will be defined by selection in the file manager.

The project directory set now remains active until the ISY program is called for another time or is set by reloading a \*.VEC file from an alternative directory for another time.

# **10.0 SPECIAL FUNCTIONS**

#### **10.1 Determining the Contour Length**

isy - CAM provides comprehensive measuring functions that can be used to determine the required data

An automatic length determination of 2D or 3D contours is provided by the command

#### modify: konlen \*

As it is to be seen from the command, first the contour must have been activated (selected). This function can be applied, e.g. to determine the length of a milling contour in order to calculate the rough milling time.

Please note that time delays are not taken into account by the control system (in particular, for stepper motor controls not operated in continuous-path operation!).

### 10.2 Setting the Dip Feed of Z Axis

This parameter should only be modified in an absolutely necessary emergency case! It refers to the input of the X, Y feed under CAM.

modify: proc isy

(RETURN)

F1 F3 F4

(text start) fReduce (confirm search name with RETURN) (press 3 x) approx. in line 3291 in Section "SetCamSpec:" cal fReduce=0.2 (Modify % value of Z feed ! 0.2 for 20 %)

## 10.3 NCF Error When Calculating the 3D Milling Contour

If the milling contours for complex 3D freeform areas are calculated, the following error message may result:

"NCF Error" (Use the option -h !) or (too many corners !)

This error message is normally a memory allocation problem and can normally be eliminated with an accordingly adapted setting:

In isy – modify:	proc isycalc	
, ,	F1	(Skip to text start)
	F3	(Search)
	\-h RETURN	(Enter search text)
	3 X F4 key	(Skip to the required position)
-h 1000 to -h 300	0	

#### 10.4 Example of Keyboard Programming

In practice certain functions or a fixed sequence of commands is always required. In this case it is possible to assign these commands to fixed keys so that you are able to activate these commands very quickly by pressing a key.

This will be demonstrated using an example. In this example, the graphics displayed on the screen will be re-established by pressing the key "b" if the display is no longer displayed optimally after isy has been called (or while working under isy).

# **10.0 SPECIAL FUNCTIONS**

When programming, observe the following sequence of operations:

- Start isy CAM.
- Call the following procedure in the "modify" input line: proc profile.prc (start procedure of isy) (from line 42, some keys are already programmed. which have been assigned using the command "alias short ?").
- Enter the following command, e.g. in line 54: alias short b main:logo:modify (This command sequence will switch to the main mode (DOS prompt) and then back again to "modify").
- If you press ESC after you have answered the question "Save / Overwrite" with "Y". you will return to the isy - CAM operator interface.

The programmed key assignment will be active again after the next restart of isy - CAM or immediately if you type "profile" in the "modify" line !

The operation or activation of the programmed key functions is by simultaneously pressing the keys: TAB (corresponding letter, e.g. "b") +