



ESAB Welding & Cutting Products

# Vision LE

## Computer Numerical Control

### Start-up Manual



*LE-Basic Module*



*LE-Color Basic Module*



*LE-S*



*LE-F*



*LE-CS*



*LE-CF*



*LE-X*



*LE-FX*



*LE-CX*



*LE-CFX*

**Form Number 0558005197**

**Start-up**

Date: 10/04

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The equipment described in this manual is potentially hazardous. Use caution when installing, operating and maintaining this equipment.

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This manual is ESAB Part No. 0558005197

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**ESAB Welding &  
Cutting Products**

**ATAS** GmbH

## **Preface**

There are optional features and configurations available. For completeness, all of these are described in this manual. However, not all options described in this manual are present on all controls. In addition, more capabilities and features may be added in the future, which are not covered in this manual. ESAB Cutting Systems reserves the right to change or add features and capabilities without notice.

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## 1 Introduction

VISION LE is a numeric contouring control system especially designed for the use with flame-cutting machines.

### **Note**

Since the various types of the VISION-LE control differ in their functional range it can occur that not all functions described in this manual are available on each specific control.

## 2 Safety

	<p><b>For your own safety, please heed the safety precautions and danger warnings given in this section!</b></p>
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### 2.1 Safety Precautions

	<p><b>I.</b> A copy of this safety-related information shall be provided to the operating personnel.</p> <p><b>II.</b> In order to safely operate the control system, it is necessary to have read and understood the operating manual provided with the cutting machine. The operating personnel must be properly trained under all circumstances.</p> <p><b>III.</b> All applicable safety guidelines and specifications for the "electrical equipment" on machines and auxiliary equipment as well as operating devices must be heeded.</p> <p><b>IV.</b> With regard to flame-cutting, the accident prevention guideline "Welding, cutting and related work operations" applies (UVV VBG 15).</p> <p><b>V.</b> In order to prevent the entry of non-authorized persons into the operating area of the machine, the operator must carry out, where necessary, suitable safety precautions for eliminating hazards in accordance with UVV VBG 5, e.g. as safety fencing as per DIN 24533, Danger signs.</p>
--	---

## 2.2 Danger Warnings



- I.  
When installing the control system on the cutting machine as well as the auxiliary equipment, the prescribed connection voltage and particularly the proper connection of the ground conductor must be checked.
- II.  
Test and repair work shall be performed exclusively by trained technical personnel.
- III.  
Only original spare parts shall be used for the electrical equipment.
- IV.  
Do not weld on the cutting machine!
- V.  
You must heed the danger warnings in the machine manual!

## 2.3 Accident Prevention



- I.  
The door to the control system should be kept closed under normal circumstances in order to avoid dust accumulation and to protect the operating personnel from accidentally touching the electrical equipment. The control system shall be opened only by technical personnel. Protective devices shall not be modified. Fuses shall not be jumpered, nor shall their characteristics be modified.
- II.  
When working with grounded test equipment such as an oscilloscope, make certain that the grounding jack of the test equipment is always connected to the ground point of the control system (test cable). If necessary, use an isolation amplifier for floating measurements.

**III.**

When working with live circuits, e.g. during test and alignment work, you should exercise great caution. It is wise to have a helper stand in the vicinity of the machine's MAIN POWER switch so that the power can be cut off immediately in case of an emergency.

**VI.**

If at all possible, work on the electrical equipment should be performed only when the machine has been switched off. During such work, make certain that the power switch cannot be flipped on (e.g. hang a safety lock).

**V.**

During the following work, the system or parts thereof must be switched off:

When the work is completed or during longer interruptions in the work, power down the MAIN POWER switch of the machine as well as the auxiliary equipment.

**VI.**

If any cables, connectors or electrical devices are damaged, immediately power down the MAIN POWER switch of the machine. The damaged parts must be repaired by trained technical personnel.

**VII.**

Boards or connections may be removed only when the machine is switched off. Avoid mixing up boards or connections --> Read the label or code. In case of doubt, refer to the documentation or ask someone who knows.

**VIII.**

Please heed the following guidelines as well:

Connection conditions of the power company

OSHA safety guidelines

IEC safety guidelines

Safety precautions in operating manuals for the various work procedures, such as oxy-fuel cutting, plasma cutting, etc.

## 2.4 Emergency Measures

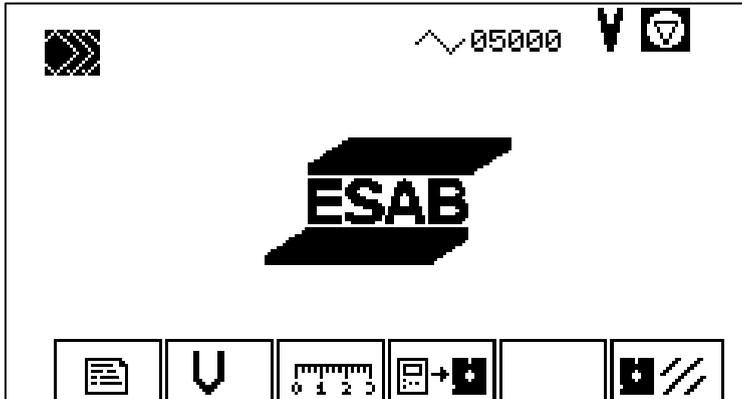
	<p>If the machine or control system catches on fire, only use carbon dioxide (CO<sub>2</sub>) or a suitable powder to extinguish the fire!</p> <p>If your clothes catch on fire, do not run away!</p> <p>Lie on the ground and roll around to extinguish the flames, or use fire-extinguishing blankets.</p>
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## 2.5 Application and Usage Conditions

	<p>This control system is a component of a machine and may be used only for this machine.</p> <p>Only those applications are allowed which the operating manual of the respective machine expressly permits.</p> <p>See the appropriate machine description for the allowable ambient conditions for operating this control system.</p> <p>For safety reasons, do not attempt to modify, upgrade, or enhance the control system.</p>
--	--

### 3 Startup Window

This window contains all the functions for starting up the control.



	Constant editor.
	Speed startup.
	Startup help.
	Copy system files
	Format floppy disk.

#### Constant Editor

- For editing machine constants (page 9)
- For editing device constants (page 9)
- For editing system constants (page 9)
- For editing MIP constants (page 9)
- For editing the configuration (page 9)
- For editing station constants (page 13)

#### Speed Startup

- For determining the axis speed (page 13)
- Rotational speed display (page 20)

## **Startup Help**

For adjusting working ranges (page 28)

For defining the machine zero point (page 30)

For determining tool offsets (page 31)

## **Creating A System Floppy**

For creating a backup copy of the system floppy disk (page 22)

## **Formatting A Floppy** (page 24)

**More Key of the Startup Window**



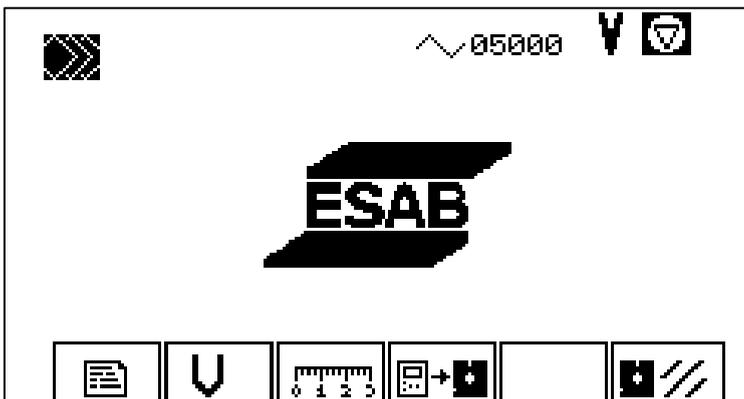
MM/Inch conversion

### 3.1 Constant Editor

The control is adapted to the environment such as machine and communication by means of various constants and parameters. Constants and parameters are filed in the internal memory.

Setting of the constants is done once during startup.

The description of the constants regarding content starts on page 46.

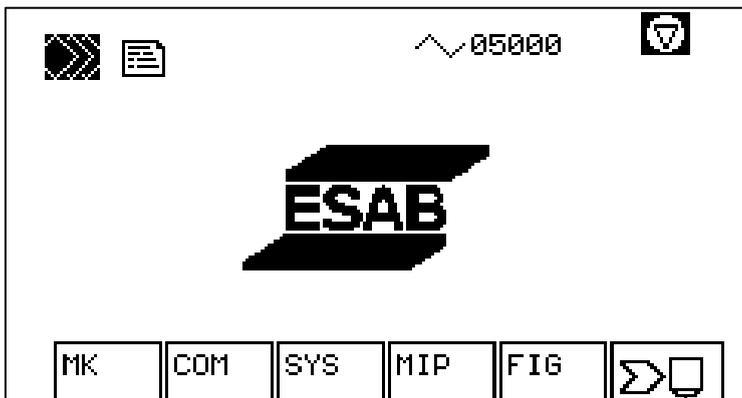


- |   |                                   |
|---|-----------------------------------|
|  | <b>Constant editor.</b> (page 10) |
|  | Speed startup.                    |
|  | Startup help.                     |
|  | Copy system files                 |
|  |                                   |
|  | Format floppy disk.               |

## Selecting Constants

The constants are divided into five groups:

- Machine constants for moving the machine
- Device constants for external devices
- System adaption
- MIP constants
- System - configuration constants (only display)
- Parameters of the stations

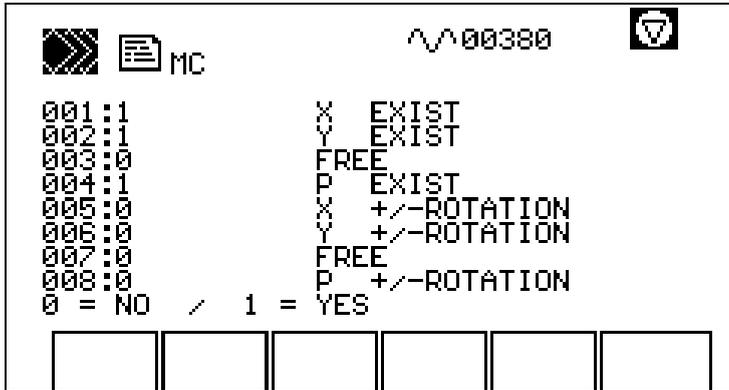


MK	Machine constants (page 58)
COM	Device constants (page 74)
SYS	System constants (page 48)
MIP	MIP constants (page 69)
FIG	Configuration constants - cannot be changed (page 78)
	Station parameters (page 13)

### Editing Constants - Machine Constants: An Example

All constants and parameters are treated the same way. The representation of constants and their alteration is shown for the machine constants as an example. Device, system, and MIP constants are treated the same way. The configuration constants cannot be changed.

Constants can only be edited in the service mode.



End editing procedure. If changes have been made, the changed constants will be adopted in the internal memory.

The identification character is in the top line, indicating which constants are dealt with. The symbols are taken from the preceding menu.

The following eight lines list, in extracts, eight of the constants at a time.

The numbers followed by the colon are firmly assigned to the constants. It is possible that constants are summarized according to different aspects in the column machine constants. In this case, the numbers are not longer sequential.

The colon is followed by the actually set parameter. Place and meaning of the digits are defined per constant.

The remaining part of the line is the description of the parameter. The description does not have any further effect.

The constant that is to be edited in this window, can be selected with the cursor keys.

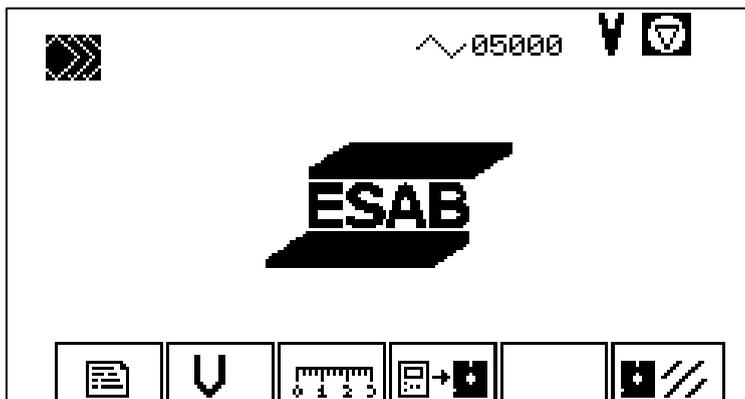
The bottom line shows the type of entry and the scope per constant.

<u>Text</u>	<u>Character Set</u>
0=NO / 1=YES	0 and 1
Decimal entry from <n> to <n>, with signs	0 to 9, +/-
Positive entry from <n> to <n>	0 to 9
Hexadecimal entry	0 to F
Binary entry	0 and 1
No entry	

Every entry is checked to find out whether the value is within the scope. If necessary, it is limited to the maximum value. No entry indicates that these constants cannot be changed.

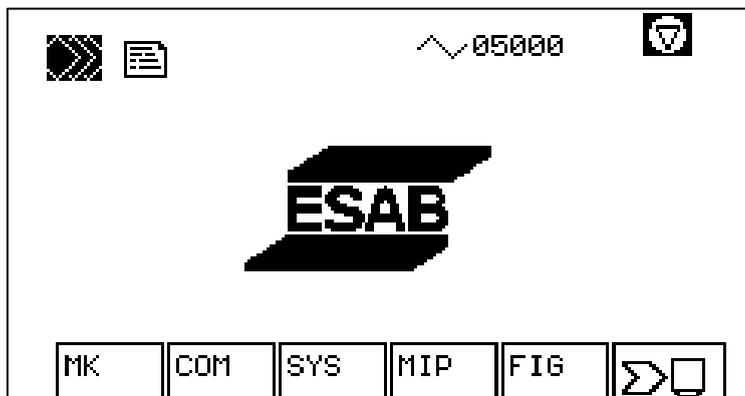
### 3.2 Parameters of Intelligent Stations

Stations are adapted to their tasks by means of parameters. The parameters of the stations are edited on the control and then loaded at the stations.



	<b>Constant editor</b> (page 9)
	Speed startup
	Startup help.
	Copy system files
	
	Format floppy disk

### Selecting Constant Editor

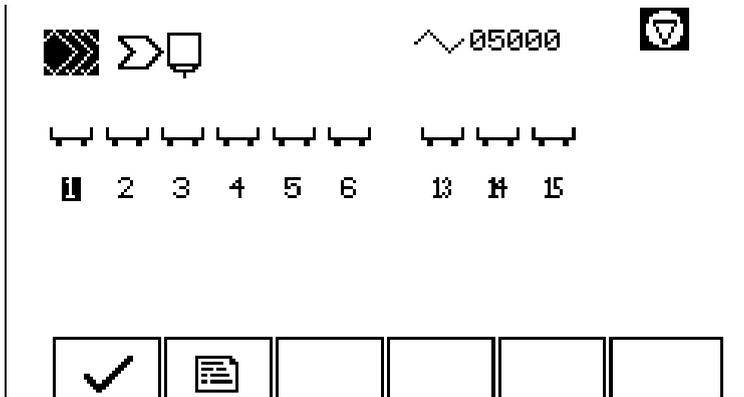


MK	Machine constants
COM	Device constants
SYS	System constants
MIP	MIP constants
FIG	Configuration
	<b>Station parameters</b> (see next page)

### Station Parameters

The station whose parameters are to be changed, is selected with the cursor keys.

The machines are designed for a maximum of six stations (burner holders). The "stations" 13, 14 and 15 are actually not real stations. Parameters for central tasks are filed here.



- Send parameters to selected station (see next page)
- Edit parameters of selected station (page 17)
- 
- 
- 
-

### Sending Parameters To Selected Station

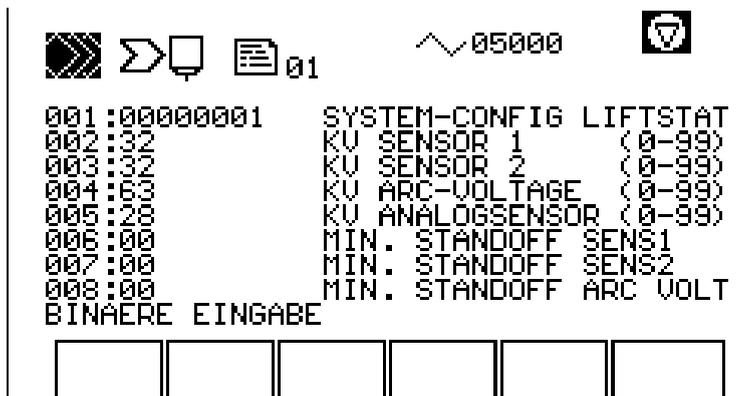
Parameters are only sent to a station if this station supports a process, i.e. the first station constant (SYSTEM CONFIG LIFTSTATION) indicates whether and if yes, which process the corresponding station supports. If the value is 0, the station does not support a process.

In case of successful sending (positive station response), a so-called derivation for this station takes place. The station is added to the process screens. The process that the station supports is activated so that it can be preselected and launched.

If this function is executed for a station that does not support any process (first station constant = 0, or no constant file is available for this station) only the above mentioned derivation (no sending) will take place. If the station was visible on the screen, it is made invisible. If the process that the station supported, is not available on any other station, it is deactivated (the process can no longer be preselected and launched).

### Editing Parameters

The description of the constants regarding content starts on page 46.



End editing procedure

The bottom line shows the type of entry and the scope per constant.

Text	Character Set
0=NO / 1=YES	0 and 1
Decimal entry from <n> to <n>	+, -, 0 to 9
Positive entry from <n> to <n>	0 to 9
Hexadecimal entry	0 to F
Binary entry	0 and 1
No entry	

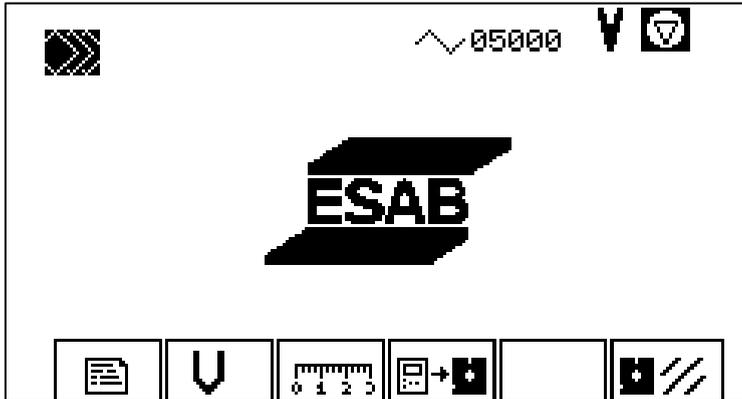
The constant that is to be edited in this window, can be selected with the cursor keys.

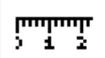
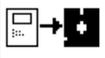
Every entry is checked to find out whether the value is within the scope. If necessary, it is limited to the maximum value.

When the changes have been adopted, the data is stored and then sent automatically to the corresponding station.

### 3.3 Speed Measurement and Display of Rotational Speed

For the position control of the system, it is important that the speed of the individual axes is determined and defined as precise as possible.



-  Constant editor
-  **Speed startup** (only in service mode) (page 19)
-  Startup help
-  Copy system files
-  Format floppy disk
- 

### Speed Startup

The axes speeds are measured in this window.



- |          |                                    |
|----------|------------------------------------|
| X        | Measure axis speed of X-axis       |
| Y        | Measure axis speed of Y-axis       |
|          |                                    |
|          |                                    |
|          |                                    |
| Fan icon | Display rotational speed (page 20) |

The speed measurement in one of the two axis "X" or "Y" is started by pressing the corresponding menu key. The machine axis is moved a little bit at 1/10 of the nominal speed. In view of the measuring time, the distance covered this way is converted into an axis speed.

The start symbol is displayed immediately and disappears after the measurement has been completed. After measurement, the display shows the determined maximum speed of the axis.

For portal machines, the speeds for both portal axes are measured and displayed simultaneously.

- |            |  |
|------------|--|
| Adopt icon | Adopt measured values in machine constants |
|------------|--|

**Rotational Speed Display**

In case of different values during speed measurement, the rotational speed can be displayed in order to control the linearity of the rotational speed. Advantageously, the drives on the machine are not in mesh during measurement. This assumes that the actual value encoder is mounted to the motor/gearing block.



**Caution**

When the rotational speed is being measured the machine drives should not be engaged, so that the machine is not moving. However, this requires that the actual-value sensors be mounted on the motor/gearing block.

If the actual-value sensors are not mounted on the motor/gearing block, then the drives must be left engaged for this measurement. If a defined voltage is applied to the drive, the machine starts up immediately at the corresponding speed. Be sure that there are no persons or objects within the operating area of the respective axes. There is a high risk of injury.



- X Display set voltage at X-axis
- Y Display set voltage at Y-axis
- 
- 
- ⏏ Display set voltage as square-wave-signal
-

The display of the rotational speed of one of the two axis "X" or "Y" is activated by pressing the corresponding menu key. A voltage can be set at the override potentiometer. This voltage is sent directly to the drive.

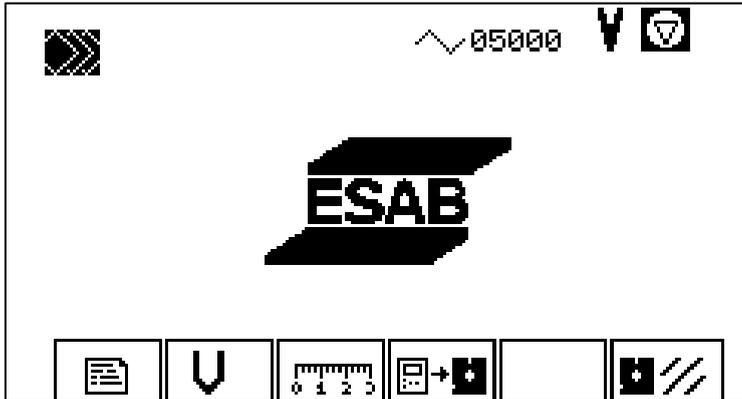
The currently reached speed is displayed periodically from the received actual value impulses. Required is that the machine constant for the number of impulses per 1000 mm (inch) has been entered correctly.

Voltage output is interrupted when the axis is no longer selected.

An impulse output of voltage to the drives is provided for drive optimization. The voltage level is variable. The frequency amounts to approx. 1Hz.

### 3.4 Creating a Copy of the System

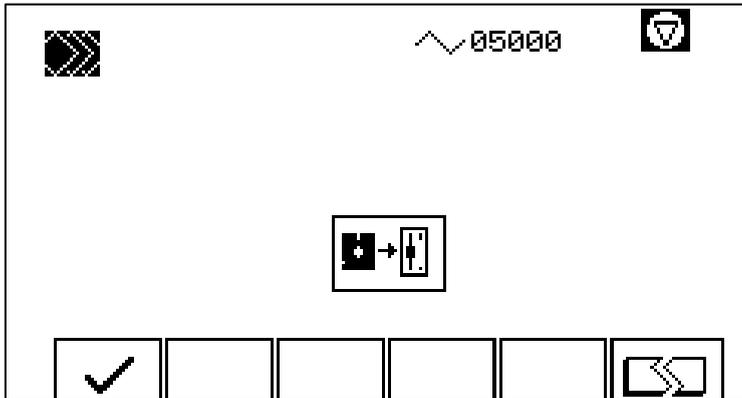
The startup window provides the possibility of filing the system of the internal memory on an external drive.



- |   |                          |
|---|--------------------------|
|  | Constant editor          |
|  | Speed startup            |
|  | Startup help             |
|  | <b>Copy system files</b> |
|  |                          |
|  | Format floppy disk       |

### Copy System Files

Insert 1.44 MB floppy disk in drive 2.



- Start copying process
- 
- 
- 
- 
- 
- Do not start copying process

Since the floppy disk is formatted during the copying process, it is not possible to cancel the process after it has been started. If the disk is removed from the drive during copying, an error message will be displayed and the disk will not contain usable data.

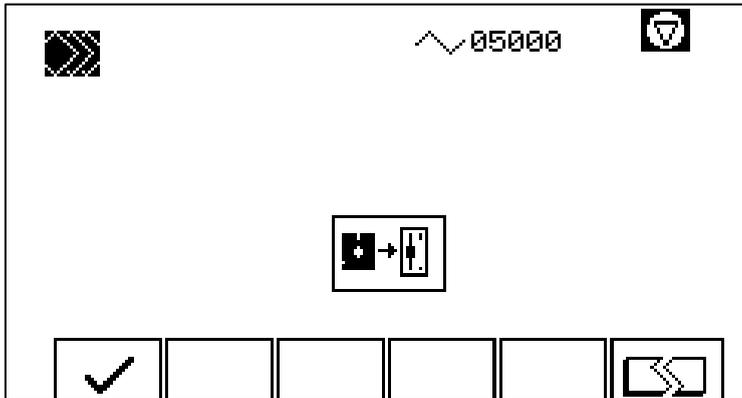
### 3.5 Formatting a floppy disk



- |   |                           |
|---|---------------------------|
|    | Constant editor           |
|    | Speed startup             |
|  | Startup help              |
|  | Copy system files         |
|  |                           |
|  | <b>Format floppy disk</b> |

### Formatting a floppy disk

Insert 1.44 MB floppy disk in drive 2.



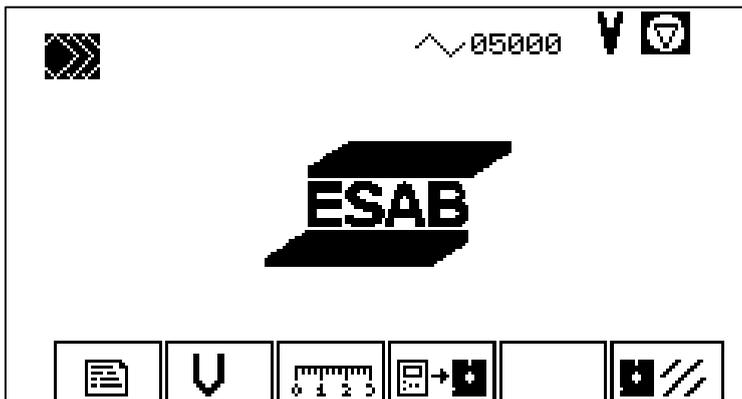
- Start formatting process
- 
- 
- 
- 
- Do not start formatting process

Do not cancel the formatting process. Do not remove disk from drive during formatting process. Otherwise the disk cannot be used.

### 3.6 Startup Help

The control provides startup help for setting the machine zero point, for determining working ranges and measuring tool offsets.

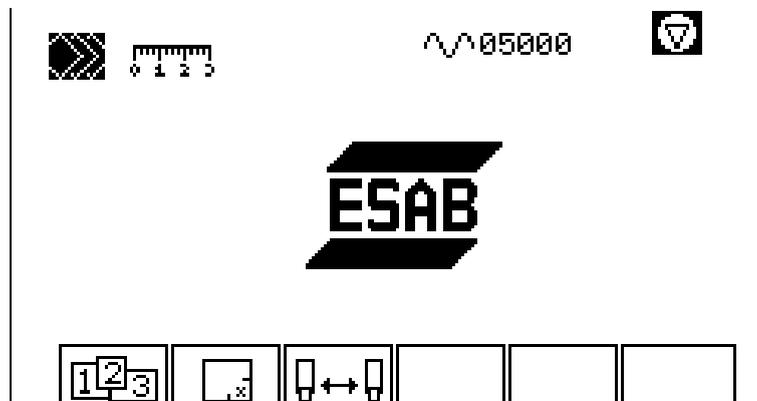
These values can be entered manually in the machine constants.



- |   |                               |
|---|-------------------------------|
|  | Constant editor               |
|  | Speed startup                 |
|  | <b>Startup help</b> (page 27) |
|  | Copy system files             |
|  |                               |
|  | Format floppy disk            |

### Selecting Startup Help

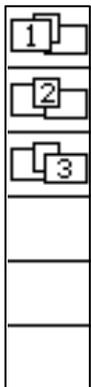
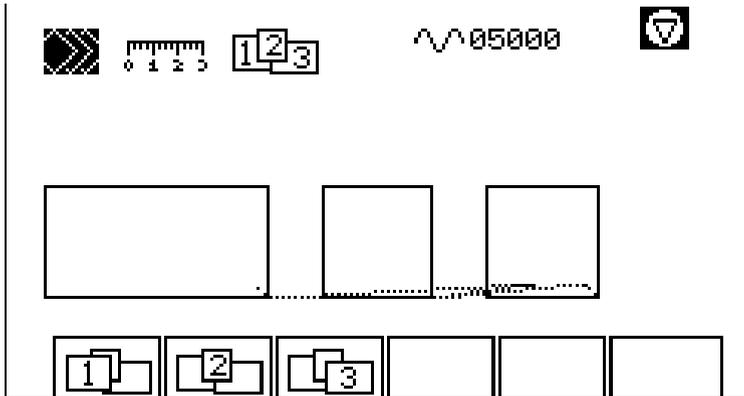
This help function should only be executed after speed startup.



-  Determine working ranges (page 28)
-  Setting the machine zero point (page 30)
-  Measuring tool offsets (page 31)
- 
- 
- 

### 3.6.1 Determining Working Ranges

Graphical display of the currently set working ranges, visual control to check whether ranges overlap. When applying this function for the first time, the graphics will show only one point since all values are set to zero.

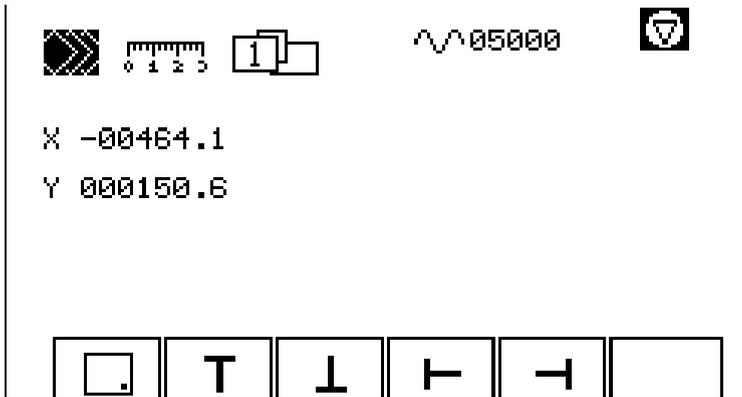


- Select range 1 (page 29)
- Select range 2 (optional) (page 29)
- Select range 3 (optional) (page 29)

## Adjusting Ranges

Explanation of the function with the example of the first range.

Move axes as in manual control with the cursor keys. Adopted points are displayed inverse in the key line.



- |   |  |
|---|--|
|   | Adopt fixed point of working range.                    |
|  | Adopt limit switch in positive longitudinal axis (X+). |
|  | Adopt limit switch in negative longitudinal axis (X-). |
|  | Adopt limit switch in positive lateral axis (Y+).      |
|  | Adopt limit switch in negative lateral axis. (Y-).     |
|  |  |

- |   |  |
|---|--|
|  | Adopt range in machine constants (page 28) |
|---|--|

### 3.6.2 Setting the Machine Zero Point

Before using this function the machine must be referenced.

As in manual control, the machine is moved with the cursor keys to the point that is to be adopted as machine zero point. After the point has been adopted, the display of the machine coordinates will be corrected.



Adopt point as machine zero point.



Adopt values in machine constants.

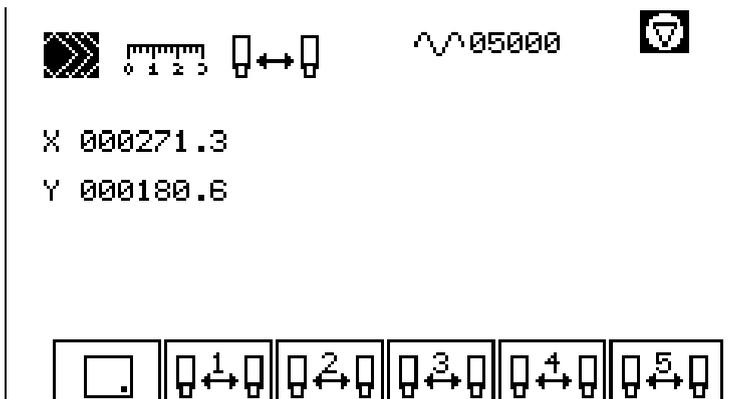
### 3.6.3 Measuring Tool Offsets

The offset of the individual tools to the main tool is determined with this function.

Mark a point on the plate. Position the main tool on this point. Press key "Adopt reference point".

Now, position all other tools one after the other on this point. Press the key with the corresponding number and the distance covered is adopted as tool offset.

The keys of the adopted points are displayed inverse.

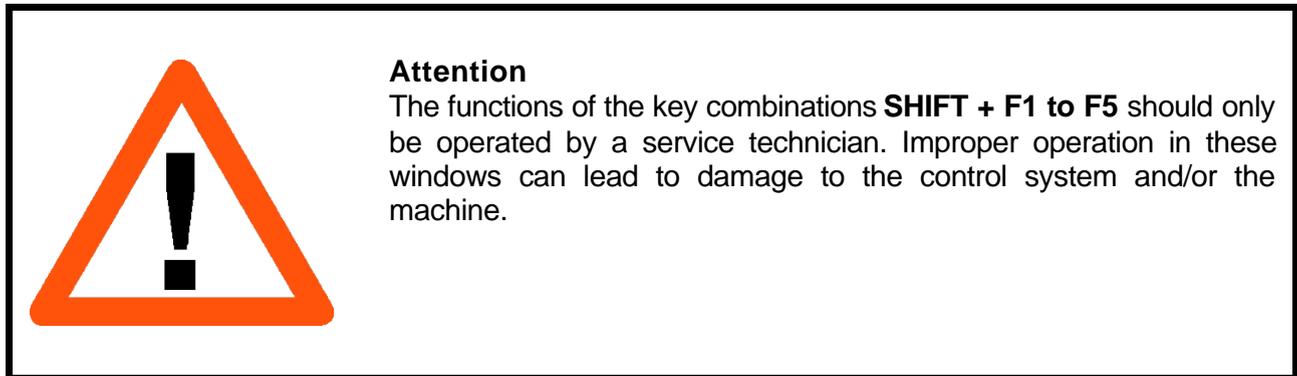


-  Adopt reference point
-  Adopt offset - tool 1
-  Adopt offset - tool 2
-  Adopt offset - tool 3
-  Adopt offset - tool 4
-  Adopt offset - tool 5

 End function and adopt values in machine constants. (page 27)

## 4 Service Window

The service windows provide support for fault location in the case of service, as well as, a status display of the system. The functions of the keys SHIFT/F1 through SHIFT/F5 should only be operated by a service technician.

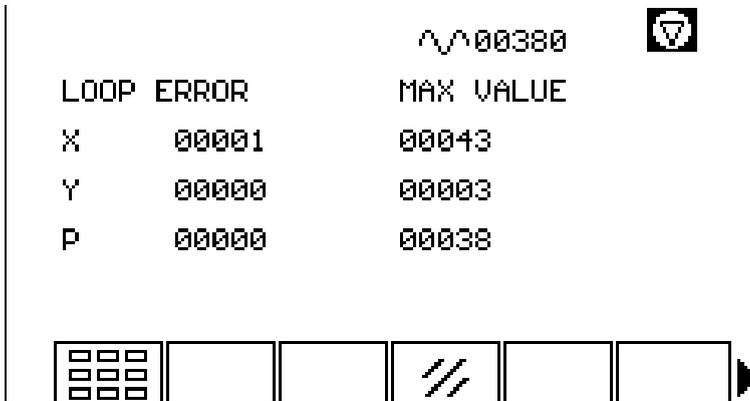


The following functions are available:

SHIFT/F1	Deviation display (page 33)
	LCD contrast setting (page 34)
SHIFT/F2	MIP signal display (page 35)
SHIFT/F3	AF / KF control (page 37)
SHIFT/F4	Display synchronization error (page 38)
SHIFT/F5	Mini operating system (page 38)
SHIFT/F6	Error / status display (page 41)

### 4.1 Deviation Display

Display of the current deviation in encoder impulses, as well as, the maximum deviation per axis.



Test button

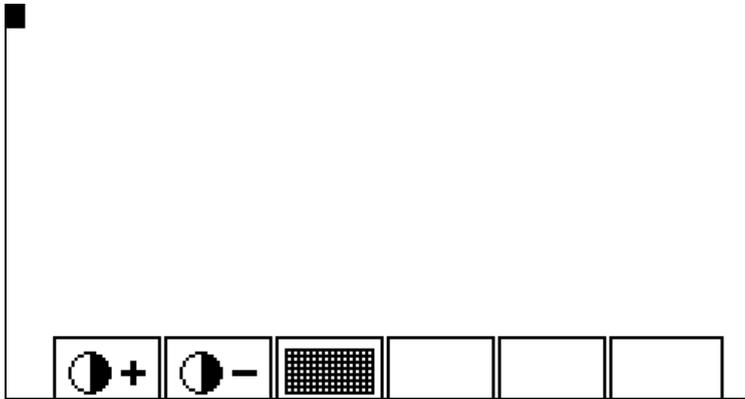
Delete display of maximum value



Switch to LCD contrast setting (page 34)

## 4.2 LCD Contrast Setting and Testing

The contrast of the LCD screen is set in the service window SHIFT/F1. In addition, it is possible here, to test the screen on its operatability.



-  Increase LCD contrast
  -  Reduce LCD contrast
  -  Test screen (FONT, BLACK, WHITE)
  - 
  - 
  - 
- 
-  Return to deviation display (page 33)

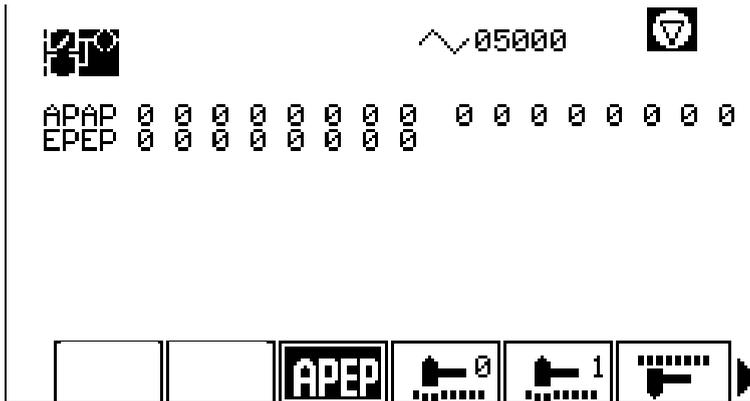
Note: The contrast can be changed to the extent that nothing is visible on the screen. The setting remains even after the machine has been switched off.

### 4.3 MIP Signal Display

The MIP signal display is for checking the MIP behavior. Input and output can be monitored and the signals that correspond with the control, can be seen. It is possible to force signals (value forcing).

Positioning the cursor is done with the cursor keys.

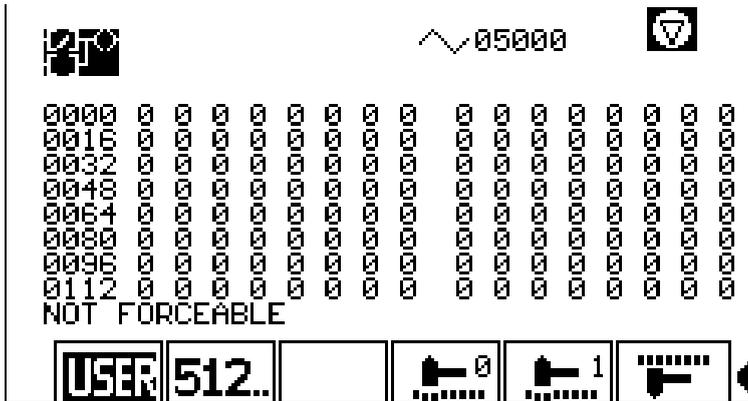
The inverse key indicates which of the signal groups is displayed.



	ASI OB output
	ASI OB input
	Static input and output
	Force value 0 at cursor position
	Force value 1 at cursor position
	Cancel forced value

If the value for a signal is forced, this value is displayed inverse.

**More Key of the MIP Signal Display**



-  MIP signal
-  MIP signal higher than 512
- 
-  Force value 0 at cursor position
-  Force value 1 at cursor position
-  Cancel forced value

#### 4.4 AF-KF Control

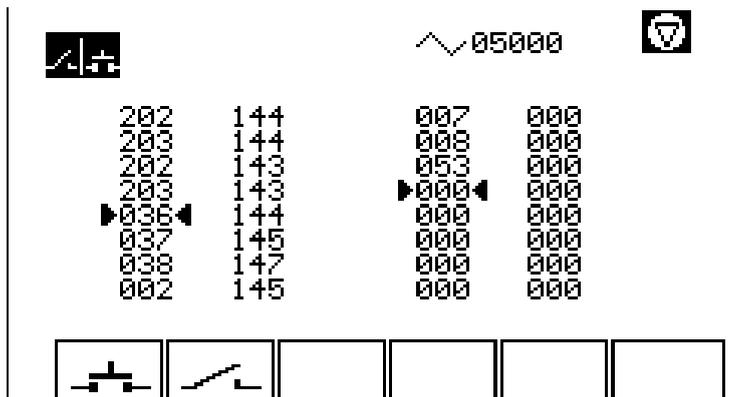
Display of the last 16 key and auxiliary functions that were sent to the MIP. The key functions (KF) are displayed on the left side of the screen. The auxiliary functions (AF) are displayed on the right side of the screen.

The arrow on the left side of a column indicates that the function is included in the internal list. The arrow on the right side of the column indicates that the function has been excluded from the internal list for the MIP.

If both arrows point away from the column, the MIP does not take anymore key or auxiliary functions.



**Warning**  
 This function is only to be used by authorized personnel, since it requires precise knowledge of the functions. Erroneous input into the AF-KF display can lead to erroneous behavior of the machine. There is a high risk of injury, and damage can occur to the machine.



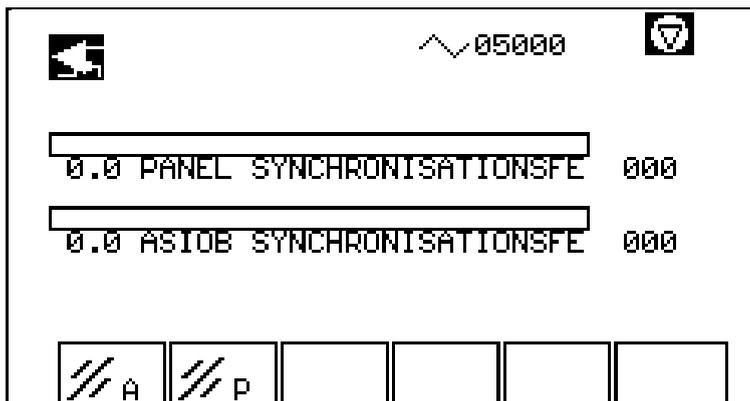
-  Send a key function to the MIP
-  Send an auxiliary function to the MIP
- 
- 
- 
- 
-  Return to previous window

## Display of Synchronization Errors

May only be activated by a service technician!

Percentage display (0-100) of ASI0B or panel synchronization errors (interferences, etc.). Interferences with more than 30 percent are indicated by an additional error message.

Next to the bar display, there is a display of the maximum value.



-  Delete display of ASI0B maximum value
-  Delete display of panel maximum value
- 
- 
- 
- 

## 4.5 Mini Operating System

Individual data areas of the control can be monitored and changed by means of the mini operating system.

In this case, detailed knowledge of the RAM distribution is necessary. This function is only for service technicians.

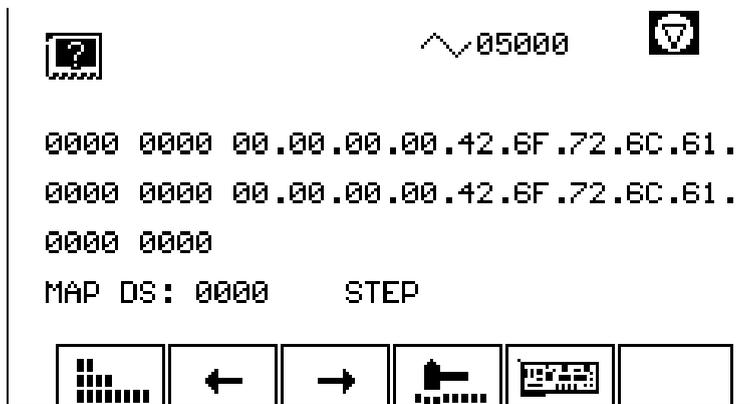


**Warning**  
This function is only to be used by authorized personnel, since it requires precise knowledge of RAM organization. An erroneous input into the mini operating system can lead to a system crash or to erroneous behavior of the machine.  
There is a high risk of injury, and damage can occur to the machine.

In two independent lines, memory addresses can be entered. The step size for incrementing and decrementing is always entered in bytes.

If addresses outside of the data segment are to be displayed, then the address of the data segment has to be entered in the column "MAP DS", and the segment address of the memory in the first column of the display line. Addresses are to be taken from the ANC.MAP file.

For a display within the data segment these two values have to be kept on ZERO.



	Switch to word, long or byte display
	Decrement address by step size
	Increment address by step size
	Set value
	Switch to absolute addresses (hardware)
	

Certain memory addresses can be accessed directly via an index. For this, enter "F000" in the first column (segment address). In the second column (offset) enter the index of the desired memory address according to the following list.

The "MAP DS" value is not relevant for this display. Switching to absolute addresses does not have any effect, either.

Ind Description

Deviation in encoder units (32 bit)

1 X-axis

2 Y-axis

4 P-axis

Voltage of deviation share 7FFF = 10 volt (16 bit)

5 X-axis

6 Y-axis

8 P-axis

Voltage of speed pick-up Vmax axis (MC) = 8 volt (16 bit)

9 X-axis

A Y-axis

C P-axis

Total voltage output of deviation share and speed pick-up (16 bit)

D X-axis

E Y-axis

10 P-axis

Actual values in encoder units (32 bit)

1D X-axis

1E Y-axis

20 P-axis

Tool path feed rate in [ $\mu$ ] or [mil] (32 bit)

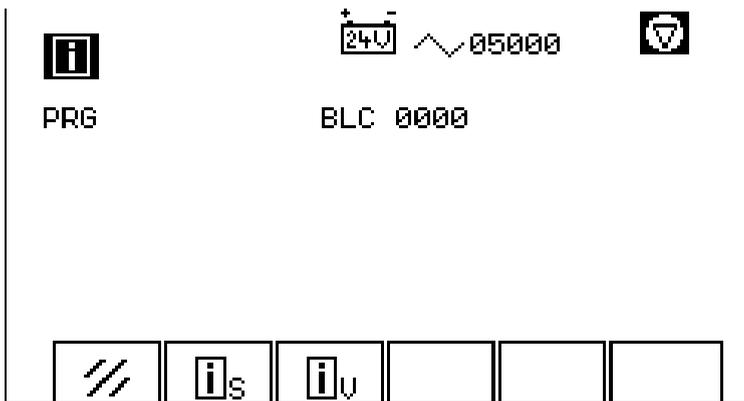
21 X-axis

22 Y-axis

24 P-axis

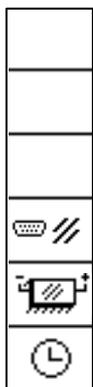
## 4.6 Error - Status Display

Errors that have occurred are displayed, if possible, with additional information. The name of the current or last processed program is indicated with PRG. BLC indicates the current block number of the processed program.

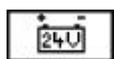


	Delete error
	Switch to status display (page 42)
	Switch to version number display (page 45)
	
	
	

**Status Display**

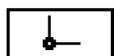


- Reset I/O ports
- Reset battery ram
- Time setting (page 44)



**Turn-on voltage.**

This symbol is displayed in the top right corner of the screen when the turn-on voltage is switched on.



**Reference.**

The letters to the right of this symbol indicate from which of the axis the reference was adopted.



**Controller release X.**

Indicator for controller release in the X-axis. If this symbol is not displayed, the machine cannot be operated along the X-axis.



**Controller release Y.**

Indicator for controller release in the Y-axis. If this symbol is not displayed, the machine cannot be operated along the Y-axis.



**SPC release.**

Indicator for SPC release. If this symbol is not displayed, no auxiliary or key functions are sent to the MIP.



**Feed release.**

Indicator for feed release. The feed release is set by the MIP. It allows machine movements.

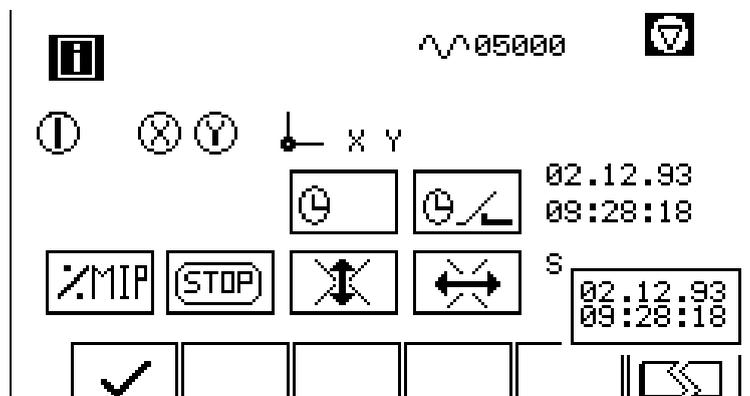


**Feed interlock.**

Indicates that the feed release is missing. The signal is the inverse representation of the feed release. Axis movements are prevented.

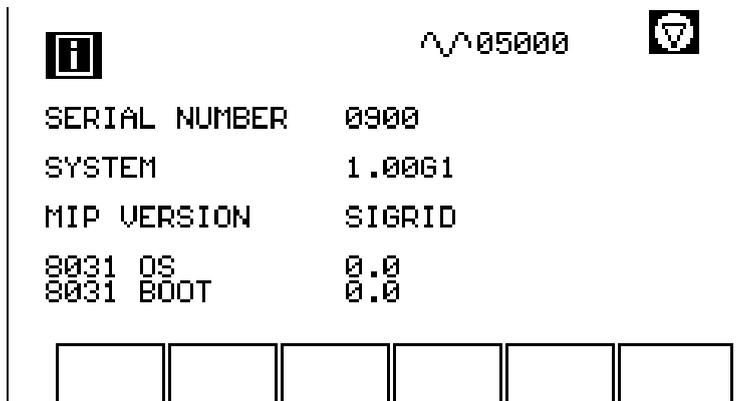
### Time Setting

Setting the time. The adjustment is done with the cursor keys.



- Adopt time
- 
- 
- 
- 
- 
- No adoption

### Display of Version Number



Serial number:	Control number
System:	Version number of the basic system (ANC.EXE)
MIP version:	Version number of the MIP program (MIP41.MIP)
8031 OS:	Operating system number of the sub system (NOS8031.BIN)
8031 Boot:	Version number of the boot loader of the sub system (BOOT8031.HEX)

## 5 System of the VISION LE

The system of the VISION LE is located on a flash disk.

### 5.1 Files of the internal memory

The following is a listing of the files that constitute the system of the VISION LE.

Name	Ext	Type	Description
ATASSYS	B		Boot loader for VISION LE-L
ANC	EXE	B	System file VISION LE-L
BOOT8031	HEX	B	Boot loader for 8031
BOS8031	BIN	B	Subsystem 8031 (ABIMBO)
NOS8031	BIN	B	Subsystem 8031 (ATHC2)
LCD	GOM	B	System user interface
LCDMIP	GOM	B	Process user interface
MIP41	MIP	B	Machine interface program
ALL	SHP	B	Standard shape library
ANCDEF	KON	A/B	Add-ons configuration
DEV	KON	A	Device constants
SYS	KON	A	System constants
MAS	KON	A	Machine constants
MIP	KON	A	MIP constants
MAKROS	DEF	A	Macro key definitions
DEF	TEC	A	Technology definitions
PARAM	CUT	A	Technology data
STAT01	KON	A	Constants station 1
STAT02	KON	A	Constants station 2
STAT03	KON	A	Constants station 3
STAT04	KON	A	Constants station 4
STAT05	KON	A	Constants station 5
STAT06	KON	A	Constants station 6
STAT13	KON	A	Constants central station 1
STAT14	KON	A	Constants central station 2
STAT15	KON	A	Constants central station 3
EIA_ESSI	DEF	B/A	EIA definition file
ALL	BUG	A	Character generator library

In the category "Type", B indicates a binary data record and A an ASCII record that can be read with any editor.

Only for those stations that are actually available on the machine, the corresponding constants are located on the system flash drive. This is also true for add-ons that need a data record.

The file ANCDEF.KON determines the expansion of the control with add-ons. This data record should not be altered, it could otherwise endanger the functioning of the control.

The remaining data files with the extension "KON", as well as the files MACROS.DEF, DEF.TEC and PARAM.CUT contain constants and settings that are defined during the startup of the machine. They cannot be altered during operation. Exceptions are marked and, if necessary, they can be adapted by the user of the machine.

EIAMHF.DEF is an additional EIA definition file. Customer-specific adaptations of the M-function can be done in this file. Adaptations take place as follows:

“M function“=“ESSI function“.

For example: M0=42

converts the EIA function M0 into the ESSI function 42.

## 5.2 System Constants

List of system constants

01	DECIMAL SPEED
02	NOT USED
03	TYPE KERF CALCULATION
04	ENCODER SIMULATION
05	MIP SIMULATION
06	CIRCLE MODE
07	DECIMAL POINT N/Y 0/1
08	MM OR INCH 0/1
09	EIA KEYS
10	PROCESS HANDLING
11	CUTTING PACKAGE RESET
12	NOT USED
13	NOT USED
14	DO NOT MOVE TO GRID POSITION
15	NOT USED
16	NOT USED
17	NOT USED
18	NOT USED
19	NOT USED
20	NOT USED
21	NOT USED
22	NOT USED
23	NOT USED
24	NOT USED
25	NOT USED
26	NOT USED
27	MIXED ESSI-EIA
28	STANDARD SHAPE IN EIA
29	BASETTEXT
30	LUBRICATION
31	NOT USED
32	NOT USED
33	NOT USED
34	EIA PROGRAMMING ACCURACY MM-COORDINATES
35	EIA PROGRAMMING ACCURACY INCH-COORDINATES
36	NOT USED
37	NOT USED
38	NOT USED
39	NOT USED
40	NOT USED
41	NOT USED
42	REFERENCE MODE
43	NOT USED
44	NOT USED
45	NOT USED
46	NOT USED
47	NOT USED
48	NOT USED

---

49	ESAB/LTEC LOGO
50	NOT USED
51	ERROR WAITING TIME
52	NOT USED
53	NOT USED
54	CUSTOMER
55	BUS VERSION
56	NOT USED
57	RESERVED (ES)
58	RESERVED (P)
59	RESERVED (A)
60	RESERVED (WD)
61	RESERVED (SC)
62	RESERVED (I)
63	RESERVED (DIO)
78	START WITH PART
79	MANUAL INPUT RELATIVE
105	INVERSE CUTSENSE SIGNAL
106	EXT. TRACER CONNECTED
107	US LOGIC
108	TYPE OF HARDWARE
109	ERROR SUPPRESSION
110	KEYBOARD

---

## Description of the system constants

### 1 Decimal speed

The value for speed is displayed in either mm/min or inches/min. The decimal point of the speed display can be shifted.

- 0 No decimal point.
- 1 Decimal place before the last digit; indicates 1/10 of a unit.
- 3 Decimal place before the second from last digit; the last digit indicates 1/100 of a unit and the second from last digit indicates 1/10 of a unit.

### 3 Type of kerf calculation

The procedure of the kerf calculation can be controlled with this constant. The following input values can be entered in form of a binary sum in order to combine characteristics.

- 00001 Activates collision checking.
- 00010 Small segments of arcs with a section height smaller than 1/10 mm are interpreted as a line. This measure prevents collision of the offset contour with the programmed segment for small arcs.
- 00100 Forces a linear movement from the last point without offset activated to the first point with activated offset. A jump in the form of a line with half of the offset value is not generated.
- 01000 Movement proceeds from the last offset point of a contour directly to the first subsequent point without offset, if the offset mode is not activated. Here again, no line with half of the offset length is generated from the corrected point to the same point uncorrected.
- 10000 Kerf on the fly. Permits changing the offset by rotary knob during the program movement. The offset can be adjusted by +/- 50%. It must be kept in mind that sets which are already precalculated are not affected by the changed offset. After an AF 30/29 the changed offset is visible immediately.

### 4 Encoder simulation

For testing purposes, control functions can be simulated without encoders. The setpoint of a contour is taken as actual value. Position control as well as reference point movement are of no relevance.

**Note:** When axis simulation is activated, individual functions are no longer available.

## 5 MIP simulation

In order to override certain actions of the existing MIP program, the following settings can be made. The following input values can be entered in the form of a binary sum in order to combine characteristics.

- 0001 MIP is not able to cancel the feed release.
- 0010 Error messages generated by the MIP are not displayed.
- 0100 Simulation of a positive response after a download of station constants. Missing stations are treated as if they were present.
- 1000 Display of all ATHC messages for existing stations.

## 6 Circle mode

The interpretation of circle center point coordinates for EIA programs is set with this constant.

- 0 Standard interpretation. Circle center point coordinates are programmed absolute or incremental to the starting point in dependence of the path conditions.
- 1 Circle center points coordinates are always incremental to the starting point independent of path conditions.
- 2 Missing circle center point coordinates are supplemented, assuming that the arc is always within a quadrant.
- 3 Missing circle-center coordinates are added, using the most recently used circle-center coordinates.

## 7 Decimal point

Programming decimal points in EIA format.

- 0 No decimal point in EIA format is expected. Coordinate values are interpreted according to machine constant 49 as 1/10mm, 1/100mm or 1/1000 inch.
- 1 A decimal point in EIA format is expected. For a missing point, all values are interpreted in millimeter or inch units.

## 8 MM or INCH

The setting for MM, MM/MIN or I, IPM is set by the manufacturer of the machine. The setting depends on the machine. Modification of these constants may only be done by the manufacturer of the machine.

- 0 Text displays in MM or MM/MIN.
- 1 Text displays in I or IPM.

## 09 EIA keys

If EIA programming is mainly used, the assignment of the +/- keys can be redefined:

- 1 key without shift is the decimal point  
key with shift is the plus character

## 10 Process handling

Whenever the control is switched on, the process used last is activated and the corresponding stations are selected.

- 001 Stations and process are not activated automatically at system start.
- 010 No option level available after manual process selection - control level is activated immediately (American version only).
- 100 The process selection level can be accessed via the **PAGE** key (American version only).

## 11 Cutting package reset

If only the data of the basic cutting package (no additional SDP cutting data files) with the values specified therein (no values specified in the battery RAM) are to be used, set this constant to "1" (yes). When the system is **started again** the basic cutting package is loaded. Set this constant back to "0" (no) afterwards.

**Notice:** Deleting the battery RAM results in a reloading of the basic cutting package with its basic setting. Other data however are lost.

## 14 Do not move to grid position

The option "Accept program zero point (grid)" sets the machine so that all programs begin at a fixed absolute machine point. If this constant is set, the program zero point is the position at which the program is started.

This constant is in effect only when the constant is activated.

- 0 Manual definition of the program zero point (optional feature) is deactivated in the basic setting.
- 1 Manual definition of the program zero point (optional feature) is activated in the basic setting.

## 27 Mixed ESSI-EIA

Programs written in ESSI and EIA format are used.

- 0 No mixed programming.
- 1 Mixed programming.

### 28 Representation of standard shapes in ESSI/EIA

If the control system is equipped with the optional feature "EIA format", this constant serves to define which program format (ESSI or EIA) the control system uses to generate main programs from standard shapes or in the "Teach-Trace mode."

- 0 Program generation in ESSI format.
- 1 Program generation in EIA format.

### 29 Basetext

Language setting

- 0 The language used in the system is the non-native language stored in FREMDTXT or FREMDMIP.GOM.
- 1 The language used in the system is the basic text stored in LCD or LCDMIP.GOM.

After changing this constant you must restart the system for the new language to become effective (after saving the system constants)

### 30 Lubrication

Specification of the movement path in meters after which the MIP receives a message for automatic lubrication of the axes.

### 34 EIA programming accuracy MM-coordinates

### 35 EIA programming accuracy INCH-coordinates

These constants determine the precision of a programming unit. If the machine is set to millimeters, the program accuracy is taken from constant 34; for inches, from constant 35 (also see constant SYS 8).

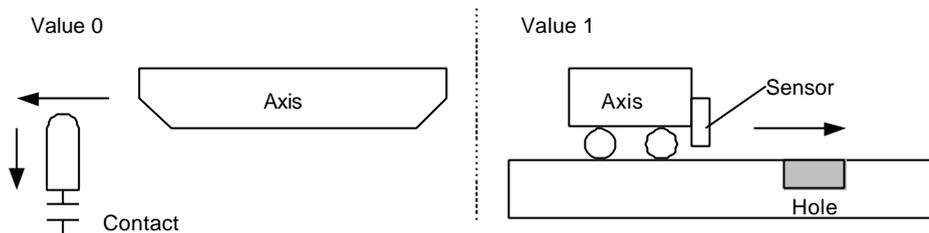
- 0 Do not enter decimal points in the EIA format. Coordinate values are programmed in 1/1 [mm] or 1/1 [inch].
- 1 Do not enter decimal points in the EIA format. Coordinate values are programmed in 1/10 [mm] or 1/10 [inch].
- 2 Do not enter decimal points in the EIA format. Coordinate values are programmed in 1/100 [mm] or 1/100 [inch].
- 3 Do not enter decimal points in the EIA format. Coordinate values are programmed in 1/1000 [mm] or 1/1000 [inch].
- 8 Decimal points are expected in the EIA format. Coordinate values are programmed in [mm] or [inches] (X1005 means 1005 mm or inches).
- 9 Decimal points are expected in the EIA format. Coordinate values are programmed with one decimal place in [mm] or [inches]. (X100.5 means 100.5 mm or inches).

- 10 Decimal points are expected in the EIA format. Coordinate values are programmed with two decimal places in [mm] or [inches] (X10.05 means 10.05 mm or inches).
- 11 Decimal points are expected in the EIA format. Coordinate values are programmed with three decimal places in [mm] or [inches] (X0.005 means 0.005 mm or inch).

#### 42 Reference mode

Specifies the manner in which the control system automatically references the axes.

- 0 Standard. The reference points are recognized on the basis of a cam (mechanical switch). The reference point is the contact point of the switch.
- 1 Alternative. The reference points are set by recognizing holes (inductive sensor). The reference point is the center of the recognized hole.



#### 49 ESAB/LTEC logo

- 0 The startup message of the control is "ESAB".
- 1 See SYS54

#### 51 Error waiting time

If an error occurs, it is displayed immediately by the control system. After it is acknowledged by the operator, the error is deleted. If the error occurs again immediately after the attempt at deletion (for example because of responses from the hardware), the repeated message is suppressed. The error continues to be displayed in the error window.

This constant defines the waiting time (in units of 16 ms) during which the error message is suppressed.

Values 10 to 90 are admissible.

#### 54 Customer

- 0 The startup message of the control is "NCE290" if SYS49 = 1.
- 1 The startup message of the control is "VISION LE" if SYS49 = 1.

55 BUS version

Information on the hardware connected to ASI OB.

- 0 ATHC-2 card (intelligent station) at the ASI OB.
- 1 ABIMBO connected to the ASI OB (American version).
- 2 No ASI OB

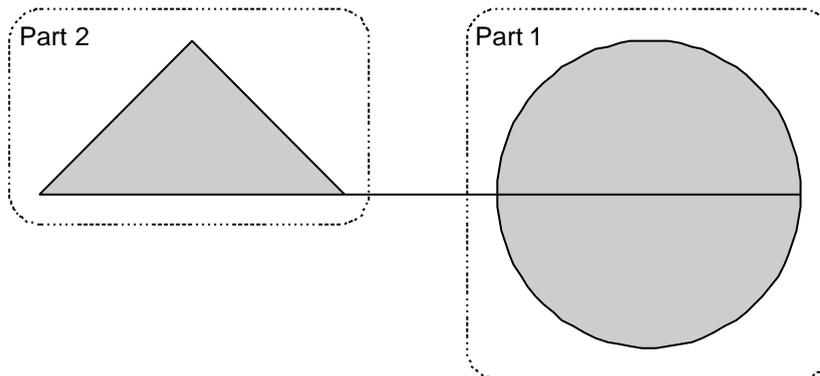
78 Start with part

On the automation menu, analogous to "Start with block number," "Start with part" is possible. A part in the parts program begins with an AF+n (or M0 for EIA), where n is the part number. The end of a part is identified by "EOS" (End Of Sheet).

- 0 Input of "Start with part" not possible.
- 1 Input of "Start with part" possible.

Sample program:

```
0
6
++++50+
7
++150
EOS
0
6
++100
+50-50
-50-50
7
EOS
```



The graphic display is not supported in the editor.

79 Manual input relative

The machine can also be positioned by means of direct entry of coordinates. This constant is used to set whether the input is interpreted absolutely or relative to the current position.

- 0 Relative.
- 1 Absolute.

105 Inverse onpattern signal

Definition of the signal "On pattern" of an optical copying attachment.

- 0 Marker 882 is 1 at "On pattern"
- 1 Marker 882 is 0 at "On pattern"

### 106 External tracer connected

Type of optical copying attachment, that is connected to the control:

- 0 AK5 is connected
- 1 HL70 / HL90 is connected

### 107 US logic

The output of the 24 volt power and thus also the run time of the MIP can be defined differently:

- 0 24 volt power is always switched on. No signal output by the control.
- 1 24 volt power is switched on by means of an external signal, No signal output by the control.
- 2 24 volt power is switched on/off by Start/Stop. Signal output via APAP16. (Relais X12 7/-X12.8)
- 3 24 volt power is switched on/off by Start/Stop. Signal output via APAP. External signal defines release of the 24 volt power. ( X8.9)
- 4 See 3. In addition the message 163: „Emergency stop chain interrupted“ is issued, if the external signal (Usok, X8.9) switches from 1 to 0.
- 5 24 volt power is switched on/off by Start/Stop. Signal output via APAP16. (Relay X12 7/-X12.8): Emergency braking behaviour with input Usok, (X8.9) as emergency stop input (like ANC41).

### 108 Type of hardware

Hardware available on the control

- 0 No hardware for VISION LE
- 1 no joystick connected, manual movement by means of the cursor keys.
- 2 Joystick connected, no manual movement by means of the cursor keys.

### 109 Error suppression

Control of the display of cable faults and frequency errors considering the machine constant MAS51.

- 0 Suppression of cable fault is possible, no suppression of frequency error.
- 1 Cable fault and frequency error are suppressed as long as the communication marker is M994=1. The machine constant is ignored. That way the MIP can suppress the error display during the plasma ignition.
- 2 Cable fault and frequency error are always suppressed.

## 110 Keyboard

For testing purposes a PS2 keyboard can be connected to the control.

**Caution:**

Exclusively for service operation, the connected keyboard leads to malfunctions.

### 5.3 Machine constants (MAS.KON)

List of machine constants.

01	X EXISTENT 1/0
02	Y EXISTENT 1/0
03	NOT USED
04	P EXISTENT 1/0
05	X ENCODER ROTATION DIRECTION 0/1
06	Y ENCODER ROTATION DIRECTION 0/1
07	NOT USED
08	P ENCODER ROTATION DIRECTION 0/1
09	X LA [1/SEC]
10	Y LA [1/SEC]
11	NOT USED
12	P LA [1/SEC]
13	X SPEED/8V [MM/MIN]
14	Y SPEED/8V [MM/MIN]
15	NOT USED
16	P SPEED/8V [MM/MIN]
17	X PULSES/1000 MM
18	Y PULSES/1000 MM
19	NOT USED
20	P PULSES/1000 MM
21	REFERENCE X [1/1000MM]
22	REFERENCE Y [1/1000MM]
23	HOME POSITION 1 X [MM]
24	HOME POSITION 1 Y [MM]
25	SOFT LIMIT 1 +X [MM]
26	SOFT LIMIT 1 -X [MM]
27	SOFT LIMIT 1 +Y [MM]
28	SOFT LIMIT 1 -Y [MM]
29	NOT USED
30	NOT USED
31	NOT USED
32	NOT USED
33	NOT USED
34	NOT USED
35	NOT USED
36	NOT USED
37	NOT USED
38	NOT USED
39	NOT USED
40	NOT USED
41	MAX SPEED [MM/MIN]
42	ACCELERATION TIME [MS]
43	MANUAL FAST MOTION [MM/MIN]
44	MANUAL FEED [MM/MIN]
45	TEACH TRACE KV [1/SEC]
46	TEACH QUER KV [1/10SEC]
47	PORTAL DEVIATION [1/10MM]

48	SMOOTH FACTOR
49	MACHINE UNIT 0/1/2/3
50	NOT USED
51	SUPP CABLE ERROR 0/1
52	REFERENCE Y/N 1/0
53	LOOP MODE
54	TIPP/LATCH
55	AC DRIVES
56	NOT USED
57	NOT USED
58	NOT USED
59	NOT USED
60	NOT USED
61	NOT USED
62	NOT USED
63	NOT USED
64	AUTOREF X
65	AUTOREF Y
66	NOT USED
67	NOT USED
68	TOOL OFFSET 1 X[1/1000MM]
69	TOOL OFFSET 1 Y[1/1000MM]
70	TOOL OFFSET 2 X[1/1000MM]
71	TOOL OFFSET 2 Y[1/1000MM]
72	TOOL OFFSET 3 X[1/1000MM]
73	TOOL OFFSET 3 Y[1/1000MM]
74	TOOL OFFSET 4 X[1/1000MM]
75	TOOL OFFSET 4 Y[1/1000MM]
76	TOOL OFFSET 5 X[1/1000MM]
77	TOOL OFFSET 5 Y[1/1000MM]
78	2. ACCELERATION TIME [MS]
79	DEVIATION X1/X2 [1/1000MM]
155	EMERG. DECCEL [MS]
156	X BACKLASH COMP
157	Y BACKLASH COMP
159	P BACKLASH COMP
160	TIME ON EDGE
161	MIN. ANGLE STOP ON EDGE [DEGREE]
169	LASER POINTER OFFSET X [1/1000MM]
186	LIMIT SEARCH SPEED TT
232	X NEGATE OUTPUT VOLT
233	Y NEGATE OUTPUT VOLT

## Description of the machine constants

### 1,2 Axis definitions

Enter whether X-axis and Y-axis exist. Usually both constants are 1.

- |   |                    |
|---|--------------------|
| 0 | Axis not available |
| 1 | Axis available     |

### 4 Portal axis

Machines with a portal can be moved along the X-axis via two separate drives. These drives, however, have to be synchronized. Such portal control is an additional function to the VISION LE. When this function is installed, this constant can be set to 1. The following axis constants have to be entered separately (from the X-axis) also for the P-axis.

### 5,6,8 Rotation direction

After mounting and cabling, the encoders on the machine will not always produce positive actual values with positive axis direction. This matter is checked during automatic speed startup and, if necessary, a 1 is entered automatically during measurement in order to correct the rotation direction of the encoder.

In case of a wrong entry in this constant, the position control cannot work. Deviation errors can also occur in case of axis standstill.

#### **Caution:**

Do not enter the value manually. With an incorrect input for these constants the closed-loop position control may not be available

### 9,10,12 Amplifying factor (LA) of control loop

The value given in this constant defines the amplifying factor of the position control loop as a ratio of speed and positional deviation. It is indicated in [1/sec]. In the case of gantry axes, all amplification factors have to be the same. In order to reduce tool path errors during acceleration, the amplifying factor for the X axis and Y axis should be the same. Using the amplifying factor and the maximum speed of an axis, a maximum deviation is defined. Exceeding this value leads to a loop error.

For testing purposes, the position control can be disabled with an LA value of zero.

### 13,14,16 Maximum axis speed

The maximum axis speed indicates the speed and, thus, indirectly the rotational speed of the drive that the axis can reach with a presetting of 8V.

A wrong adaptation due to incorrect values can lead to unstable traversing behavior and overtravelling when approaching a specified position. This is why the constants may not be used for limiting the maximum axis speeds.

The maximum axis speed is determined during the automatic startup of the axes. The determined value is automatically accepted.

The speed is measured at 0.8 V. Prerequisite is that the drive has a proportional characteristic curve (x = speed and y = output voltage) even beyond 8 V.

#### 17,18,20 Encoder pulses

The constants indicate how many pulses are generated by the encoders at a certain distance (1m). In practical operation, these specifications will deviate from theoretically calculated values if steering rack and gearing errors are included in the specification of pulses.

The values of the two gantry axes do not have to be exactly the same.

When comparing the actually generated pulses with the nominal values of the encoders note that the nominal values are quadrupled within the control system (the control system evaluates both tracks, and rising and falling edges by means of two scanning procedures). An encoder with a nominal value of 100 pulses/revolution generates 400 pulses/revolution in the control system.

#### 21,22 Actual values at the reference point

Using the reference point cam on the machine and the encoder zero pulse, a machine zero point or a Y-carriage zero point is defined that can be reproduced with the accuracy of one measuring unit time after time following a shutdown.

In most cases, it is desirable that the coordinate zero point of an axis be located at the end of the operating range of this axis and not at the point where the reference cam happens to be mounted. Furthermore, the machine coordinates should be positive. This can be done by modification so that the actual value at the reference point is not zero but a value that moves the zero coordinate value to the end of the traversing path. MC 23ff gives an example of the location of the reference point and the machine zero point.

#### 23,24 Home position 1

Any point within the respective working range can be defined as home position. The function "Change working range" moves the axes to the defined home position.

#### 25 - 28 Limit switch

In connection with the reference system, an absolute coordinate system is installed on the machine. This makes it possible to define "soft limit switches" that cannot be exceeded in manual or automatic mode. Trying to exceed these limits leads to a "Limit switch error".

#### 41 Maximum speed

All manual and automatic movements are limited to the maximum speed. Higher speed requests are not permitted, not even by forcing via override.

The maximum speed refers to the tool path traveled. The maximum speed is used as fast traverse speed during automatic program execution.

The maximum speed serves as reference value for the calculation of the acceleration based on the run-up time (see constant 42)

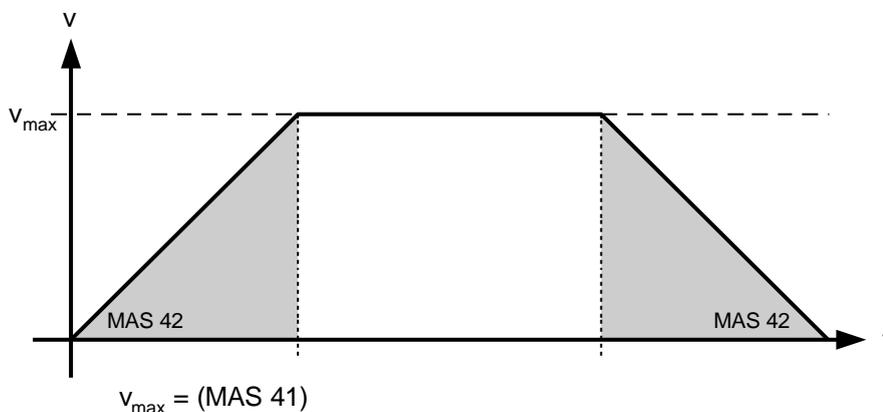
The maximum speed serves as reference value for the calculation of the second acceleration based on the second acceleration time (MC 78) (see second acceleration).

The maximum speed serves as reference value for the calculation of the acceleration based on the emergency braking time (MC 155) (see emergency braking time).

The maximum speed may not be set higher than the lowest of the axis speeds, since there is no check during automatic processing.

#### 42 Acceleration time

Here the time required for the machine to reach the maximum speed (MC 41) is entered in milliseconds. The calculation of the machine acceleration for all operating situations is based on this value.



#### 43 Manual fast motion

Speed under manual control in fast traverse mode (fast traverse key ON).

The fast traverse speed refers to the individual axes. Accordingly, the tool path time can be higher than the fast traverse speed. It cannot exceed the maximum speed of the machine, however (see constant 41).

#### 44 Manual feed

Maximum speed of manual control without fast traverse mode (fast traverse key OFF).

#### 45 Teach trace KV

The value of this constant defines the amplifying factor of the position control loop as a ratio of speed and positional deviation. The constant is stated in units of [1/sec].

During scanning the deviation can be regarded as the radius of the optical scanning circle. For higher speeds, this circle (R = 1 mm) is advanced in the traveling direction in order to gain a higher deviation. The maximum advance is 6 mm.

The LA value must be set in such a way that the machine can be moved free from vibrations at the specified maximum scanning speed. If the LA value is set to < 5, the maximum scanning speed is indirectly raised according to the following formula:

$$v = \frac{(v_{current} \cdot 300)}{MAS45}$$

The current speed is set in the Teach-Trace menu. Raising the maximum scanning speed is only necessary for scanning speeds of less than 300 mm/min.

Specify the maximum scanning speed together with the LA value.

$$Radius = \frac{v}{MAS45} = \text{present} \quad \text{advance}$$

At MAS45 = 5 and with a radius of = 6 mm the maximum scanning speed is 30 mm/sec, or 1800 mm/min.

#### 46 Teach quer KV

The value of this constant defines the amplifying factor of the position control loop as a ratio of speed and positional deviation. The constant is stated in units of [1/10sec].

Additive traverse control is effective in particular at low speeds. If you need to scan mainly at lower speeds the normal forward control is not sufficient to keep scanning on a line. In such a case, enter a smaller value.

**Notice:** Loop amplification in the traverse direction should be set to approx. ¼ of the loop amplification of the machine.

#### 47 Portal deviation

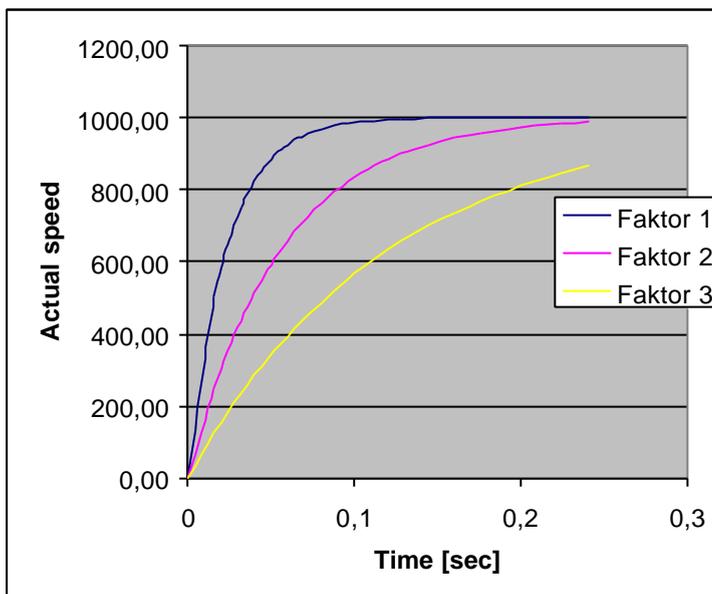
Monitoring a gantry with two separate drives (absolute gantry control) is provided as an optional feature. The two gantry axes are accessed and controlled separately. In this process, the position of the two axes to one another is constantly monitored and the deviation is compared with the value preset in this machine constant. If the limit has been exceeded "(109) Loop error P" is displayed and all drives are deactivated via the controller release.

#### 48 Smoothing factor

Acceleration of the individual axes is "smoothened" with the smoothing factor, i.e. the starting and stopping procedure is carried out more gently. The smoothing factor must not be excessively large in order to avoid contour inaccuracies with circles. Depending on the machine and application, values between 1 and 3 are recommended (1=hard, 3=soft).

Formula:

$$v_{i+1} = \frac{v_{target} - v_i}{2^{MAS48}} + v_i$$



#### 49 Machine unit

Here the resolution (precision) of the sub-programs carried out on the machine is to be entered. It also serves as interpretation default for coordinate values within the ESSI programs.

- 1 one decimal place (1/10 mm)
- 2 two decimal places (1/100 mm)
- 3 three decimal places (1/1000 mm)

### 51 Cable error suppression

The encoder pulses are transferred to the control system as push-pull signals. The control system checks whether the signals are almost the same in opposition, and thus gains information about the condition of the lines (strand breakage!).

It maybe useful to relax monitoring of the encoder and cabling to the control system during startup. In this special case, "1" can be entered in this constant so that cable errors are suppressed. For safety reasons, however, a zero must be entered here during regular operation.

### 52 Reference

Setting the value of this constant to 1 indicates that a reference point system has been installed.

Small machines are sometimes not equipped with a reference point cam. If you want to stop the control system from running check tests, enter "0" (= no reference point system) here.

Even though a reference point system is not available, a reference point can be defined by means of a manual reference point movement (confirm current machine position on the reference screen with the F1 key).

The option "Automatic reference point movement" (C0.521.00) can be deactivated by setting the machine constant 52 to "2." Manual reference point movement is possible.

### 53 Loop behavior

This constant controls the behavior of the control loop.

- 0 The position control loop is enabled in automatic as well as in manual mode. The control loops will only be disabled in case of errors or interrupted voltage supply.
- 1 In manual mode, the position control loops are only enabled when a moving command has been given.

### 54 Tipp/Latch (operation)

This constant controls the type of manual traversing.

- 0 Jogging mode. Movement of the machine starts when the cursor key is operated. The machine stops as soon as the cursor key is released.
- 1 Latch mode. The traversing direction is preselected with the cursor keys. The movement itself is triggered with the start key.

55 AC drives

This constant is in particular intended for modern-day indexing mechanisms that combine motor and encoder as one unit. When the drives are disabled, the encoder is simultaneously disconnected from the supply. After reconnecting the power supply, make sure to wait until the encoders of the drives are operational again!

- 0 DC drives, i.e. no reference point movement after power outage
- 1 AC drives, i.e. reference point movement necessary after power outage. The axes are released approx. ½ second after the 24 volt power supply is switched on.

62 2. acceleration time

78 Speed 2. acceleration

A second acceleration ramp can be defined by combining constants 62 and 78.

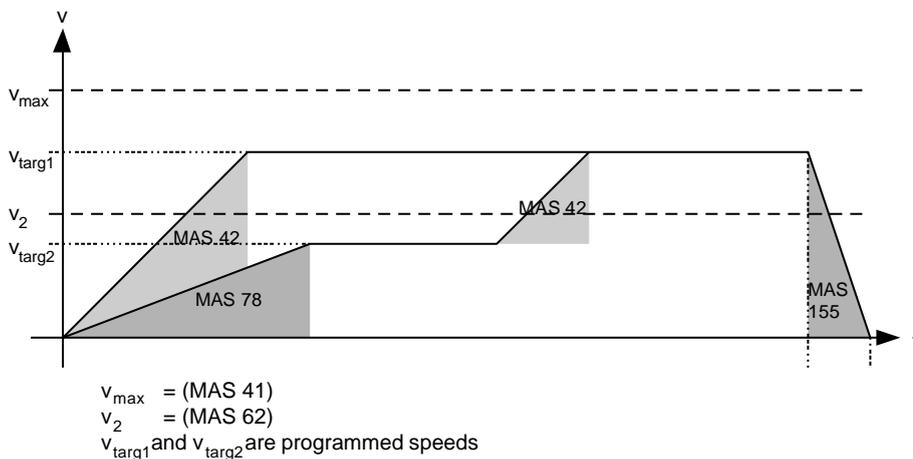
The second acceleration is active when the speed is greater than the value in constant 62 (limiting speed for second acceleration).

The value for the second acceleration is derived from the constant 41 (maximum speed) and the constant 78 (acceleration time).

Units

Constant 62 [mm/min]

Constant 78 [ms]



See also constant 155 (Emergency deceleration).

64.65 Automatic reference point movement

An automatic reference point movement can be installed as add-on in the control and on the machine. For regular operation, the constants explained below are irrelevant.

For an automatic reference point movement, the reference cams on the machine have to be prepared. The controlling system must be able to recognize on which side of the actual reference point (flank and first range of the cam) the machine is positioned.

In this procedure, the system first checks whether the machine is located on a cam and then moves it away from the cam in the opposite direction. Only then the actual reference point movement in direction of the cam is executed. The procedure is completed when the reference point with the encoder zero pulse has been recognized.

The machine constants define with a corresponding number which of the axes can start the reference point movement first (1) and which second (2).

A sign indicates in which direction the reference cam is to be searched if the machine has not yet found it.

### 68 - 77 Tool offsets

These constants define the mechanical distance of the individual tools to the main cutting tool. The point is that a program should not have to know the position of the individual tools in use with regard to the position of the other tools, in order to produce a workpiece that complies with the geometric specifications. These distances are calculated and positioned independently by the control system when an offset is requested by the program. If offsets are assigned to processes (version V3 only), the appropriate offset is selected and traveled after each change of processes.

### 78 Speed 2. acceleration

See machine constant 62

### 79 Deviation X1/X2

In this constant the value of the maximum deviation of the two drives is entered which is compensated according to the reference in the case of operation. If the gantry axes show a greater deviation than specified, an error message is generated.

### 155 Emergency deceleration

MC 41 (maximum speed) combined with this machine constant defines the emergency deceleration. This deceleration is activated by the MIP (e.g. water table detection).

### 156 X backlash comp

### 157 Y backlash comp

### 159 P backlash comp

Enter the inaccuracies found between motor, encoder and gear rack for the axes X, Y, and P. These values are used for compensating inaccuracies.

When switching between forward and backward movement of the axes inaccuracies occur between the distance indicated by the control system and the distance actually traveled by the machine.

Determine the differences and enter the value determined for each individual axis in the respective constant.

160 Time on edge

The dwell time of the machine at corners can be entered here.

161 Min. angle stop on edge

If the specified angle is exceeded during a change of direction of the programmed geometry, the control system will execute a corner stop.

169 Laser pointer offset x [1/1000mm]

A separate, non-programmable offset is provided for the light pointer. The operator turns this offset on by pressing a key. The constants designate the distance between the light pointer and the reference tool in the X and Y directions.

This offset is used with tool position correction.

Constant MIP 19 does not apply.

186 Limit search speed Teach Trace

The value of this constant defines the speed under which the system no longer cuts in half the speed specified in the Teach-Trace menu. If this constant is not available or is zero, the limit is set to 500 mm/min (approx. 20 ipm). If the speed is lower than the speed specified in the constant it is not reduced to half the speed.

232 X negate output volt.

233 Y negate output volt.

To control pre-configured drive units (e.g: HL90) the output voltage is negated

- 0 positive set value for positive movement direction  
negative set value for negative movement direction
- 1 negative set value for positive movement direction  
positive set value for negative positive movement direction

## 5.4 MIP Constants (MIP.KON)

List of MIP constants

01	NOT USED
02	NOT USED
03	NOT USED
04	NOT USED
05	NOT USED
06	NOT USED
07	NOT USED
08	NOT USED
09	NOT USED
10	ORDINAL NO. FOR ACCELERATION/BRAKE DISTANCE
11	NOT USED
12	NOT USED
13	NOT USED
14	NOT USED
15	NOT USED
16	PRESTOP [MSEC]
17	DIST. BEFORE LINE [1/1000MM]
18	DIST. AFTER LINE [1/1000MM]
19	NOT USED
20	NOT USED
21	NOT USED
22	LOGICAL PROCESS NUMBER
23	ON-THE-FLY AF 1
24	ON-THE-FLY AF 2
25	ON-THE-FLY AF 3
26	ON-THE-FLY AF 4
27	ON-THE-FLY AF 5
28	ON-THE-FLY AF 6
29	ON-THE-FLY AF 7
30	ON-THE-FLY AF 8
31	AF IN EXCHANGE FOR AF 7
32	AF IN EXCHANGE FOR AF 8
33	NOT USED
34	NOT USED
35	MIP OVERRIDE 1
36	MIP OVERRIDE 2
37	MIP OVERRIDE 3
38	NOT USED
39	NOT USED
40	INFORMATION FIELD 1
41	INFORMATION FIELD 2
42	INFORMATION FIELD 3
43	INFORMATION FIELD 4
44	INFORMATION FIELD 5
45	INFORMATION FIELD 6
46	INFORMATION FIELD 7
47	INFORMATION FIELD 8

48	INFORMATION FIELD 9
59	INFORMATION FIELD 10
50	INFORMATION FIELD 11
51	INFORMATION FIELD 12
52	INFORMATION FIELD 13
53	INFORMATION FIELD 14
54	INFORMATION FIELD 15
55	INFORMATION FIELD 16
56	NOT USED
57	MIP SETTING 1
58	MIP SETTING 2
59	MIP SETTING 3
60	MIP SETTING 4
61	MIP SETTING 5
62	MIP SETTING 6
63	MIP SETTING 7
64	MIP SETTING 8
65	MIP SETTING 9
66	MIP SETTING 10
67	MIP SETTING 11
68	MIP SETTING 12
69	MIP SETTING 13
70	MIP SETTING 14
71	MIP SETTING 15
72	MIP SETTING 16
122	MACHINE WITH CLUTCH (0/1)
123	DISTANCE TO AF STOP [1/1000MM]

## Description of the MIP Constants

### 10 Ordinal no. for acceleration/brake distance

Process values and time values are stored in the cutting packages. Process values that have an influence on the geometry processing are stored in the cutting package with a variable process value number:

Die Beschleunigung während dem Handsteuern wird durch die Maschinenkonstante MAS42 definiert. Im Automatikbetrieb wird die Beschleunigung (bzw. Hochlaufzeit) aus den Schneiddaten entnommen.

Diese Konstante gibt die Nummer des Schneidwertes an, der die Hochlaufzeit in Millisekunden definiert.

### 16 Prestop

In this constant the time before a function that switches off the process is determined in milliseconds.

This function is used to reduce the pressure in time so no burning damage occurs in the position the process is switched off. The condition is reported to the MIP by the marker 885.

Auxilliary functions with which this function works:

On	Off	On	Off
7	8	70	75
7	54	71	75
9	10	90	91
9	111	100	10
13	14	100	111
15	16	157	159
35	36	158	159
53	8		
53	54		

### 17 Distance before line

This constant determines the distance in 1/1000 mm before the next line (next corner).

This function is used to switch off the automatic height control at corners. This is reported to the MIP by the marker 859.

### 18 Distance after line

This constant determines the distance in 1/000 mm after the last line (last corner).

This funktion is used to switch off the height control at corners. This is reported to the MIP by the marker 859.

### 22 Logical process number

The input format of the editor is the hexadecimal format. For example, the number "6" is entered in order to obtain the process "oxy-fuel" and "punch marking" (0110).

On the VISION LE the maximum number of processes is limited to three. Any combination of processes is possible (for example 1+2+5).

A process is set up by the system under the following conditions:

1. The process number must be entered into the MIP machine constant 22.
2. The process must be defined in the MIP.
3. The process must be defined in the cutting package (Nx in PARAM.CUT; x=process number).
4. The maximum number of processes must not be exhausted.

### 23 - 30 Auxiliary functions without machine stop

Usually, auxiliary functions are issued when the machine has stopped. In specific cases this is not the desired procedure, however. Then certain auxiliary functions are issued on-the-fly. These are, for example, instructions to the height control, when the active cutting process should not be interrupted by a machine stoppage.

ESSI functions that are issued without machine stoppage are entered into these MIP constants in random order.

31 AF in exchange for AF 7

32 AF in exchange for AF 8

When the Teach Trace mode is turned on, the auxiliary functions 7 and 8 are replaced by the auxiliary functions entered here.

If a fixed program with variable cut is called, the auxiliary functions 7 and 8 are replaced by the auxiliary functions entered here.

### 35-55 MIP override 1-16

If a marker for speed reduction is reached within a program, the processing speed of the machine is reduced to the indicated percentage. The speed reduction can differ for each of the 16 constants.

### 57 - 72 MIP setting

The machine interface program MIP can be parameterized with these 16 constants so that alternative forms of behavior can be selected in dependence of the machine constellation. The meaning of the individual constants is, thus, defined by the installed MIP. Only 0 and 1 can be entered in the constants.

### 122 Machine with clutch (0/1)

This constant defines whether there is a gear clutch present on the machine. This is used in order to uncouple the drives and shift the machine by hand. The uncoupling is accomplished by means of a keypress on the control panel.

### 123 Distance to AF stop

This constant defines a distance before a machine stop (for example by means of an auxiliary function or traversing a corner). During this travel the height control is deactivated.

This function is used in order to deactivate the automatic height control. This makes it possible to traverse kerfs. Dem MIP wird der Zustand durch den Merker 962 mitgeteilt.

It is entered in 1/1000 millimeter [mm].

The auxilliary functions with which this function works are:

On	Off	On	Off
7	8	70	75
7	54	71	75
9	10	90	91
9	111	100	10
13	14	100	111
15	16	157	159
35	36	158	159
53	8		
53	54		

## 5.5 Device Constants (DEV.KON)

List of constants for serial interfaces.

01	COM1 DEVICE
02	BAUD RATE
03	PARITY N/O/E 0/1/2
04	DATA BITS
05	START/STOP BITS
06	HSK NO/XON-XOFF 0/1
07	TIMEOUT (SEC)
08	NOT USED
09	COM2 DEVICE
10	BAUD RATE
11	PARITY N/O/E 0/1/2
12	DATA BITS
13	START/STOP BITS
14	HSK NO/XON-XOFF 0/1
15	TIMEOUT (SEC)
16	NOT USED
17	NOT USED
18	NOT USED
19	NOT USED
20	NOT USED
21	NOT USED
22	NOT USED
23	NOT USED
24	NOT USED
25	NOT USED
26	NOT USED
27	NOT USED
28	NOT USED
29	NOT USED
30	NOT USED
31	NOT USED
32	NOT USED
33	UDL/COLUMBUS 0/1
34	END CHARACTER
35	NUMBER OF END CHARACTERS

## Description of the Device Constants

The VISION LE supports a maximum of two serial interfaces, COM1 and COM2.

### 1,9 Device

With these constants, an interface is allocated to the used driver in the system of the VISION LE.

- 3 Serial data transfer without protocol. The connected device should support transfer control with XON / XOFF. See below.
- 4 UDL (Up Down Load). UDL enables a secured data transfer between the control and a computer. An appropriate UDL host program is necessary on the computer. Data transfer to the host computer is controlled with UDL by the control.
- 5 ASOD (ATAS Serial Online Debugger). ASOD is a tool integrated especially for testing and startup purposes.
- 6 Terminal. Every arriving character is displayed, every keypress is sent. No processing of the characters occurs. Useful for testing the interfaces.
- 17 DDE2. Transfer of data with the protocol appropriate to the ANCDDE2 Server. Reporting, monitoring, PPT, UDL and DNC modes.
- 18 SERVICE. Interface test. All received characters are returned 1:1.
- 21 DDE3. Transfer of data with the protocol appropriate to the ANCDDE3 Server (32-bit server). Reporting, monitoring, PPT and UDL with long file names and DNC mode. Report data are stored temporarily when there is no connection. UDL and reporting run simultaneously.

### 2,10 Baud rate

The transfer speed of a serial connection is defined by the baud rate. The baud rate has to be set to the same value on both sides. All serial interfaces in the control system support the following baud rates:

- 300 baud
- 1200 baud
- 2400 baud
- 4800 baud
- 9600 baud
- 19200 baud (for COM1 and COM2 only)

### 3,11 Parity

Individual characters can be protected by a parity bit during transmission. As for the baud rate, both partners, control and data device, must have the same setting. The following three settings are possible:

- 0 No parity supplement
- 1 Odd parity supplement
- 2 Even parity supplement

### 4,12 Data bits

This constant defines the number of data bits for a character. Seven bits are sufficient for program data since only the ASCII data record is being used and no special characters or graphics are transmitted. The number of transferred bits per character have to be identical between the control and the connected device or computer. The control admits the following two values:

- 7 Seven data bits
- 8 Eight data bits

### 5,13 Number of stop bits

Each character in serial transfer is completed with a stop bit. For the control, the two valid values are:

- 1 One stop bit
- 2 Two stop bits

In most cases, the choice of stop bits depends on the setting of the connected device. Remember that the sum of data bits, parity bits and stop bits per character may not exceed eleven.

### 6,14 Handshake

During transfer of a serial data stream, it may be necessary to give the two partners the time to process or store the received characters. In many cases this takes longer than the transmission of an individual character, so that transfer has to be interrupted for this processing procedure. The control characters XON and XOFF are provided for this type of control.

Examples: During transfer to the control system, the latter sends the XOFF character to the sending device in order to communicate that the data received before must first be written from a buffer to internal storage (floppy disk) first. During this time no more than five subsequent characters can be buffered. After completion of the storage procedure, the control system sends the XON character. The connected device must therefore interrupt the transfer in the time period between receiving XOFF and XON.

- 0 No handshake possible
- 1 Handshake with XON / XOFF is available
- 2 Hardware handshake RTS / CTS (for COM1 and COM2 only)

If handshaking is not available, tests may be needed to determine the maximum baud rate that can be used for transfer without losing data. This baud rate must not be exceeded. The DOS "COPY"

command does not support the control procedure with XON / XOFF! Make sure to use the appropriate cable with the appropriate number of leads for options 1 and 2.

### 7,15 Timeout

This constant defines the period of time, the system waits if a UDL connection could not be established. It then sends an error message.

With serial transfer, this time is used in order to determine a transmission end. (see also constants 33/34).

### 33 UDL Setting

With this constant the various types of the UDL protocol can be set.

- 0 UDL host system versions 3 & 4
- 1 UDL host system in connection with the programming terminal Columbus
- 2 UDL host system with terminal display on the control system
- 3 UDL host system in connection with the programming terminal Columbus including the terminal display on the control system

Long file names must not end with blank characters.

### 34,35 End character, number of end characters

The end of the serial data transfer with the driver 3 (XON / XOFF) cannot be specified unambiguously.

- The data stream ends with CTRL Z, code 1AH. The control system interprets this character as the end of the data and completely ends the transfer in the control system.
- It is not possible to insert the character CTRL Z as an end-of-message marker in existing data blocks. So the procedure used with punched tape has established itself here as well: To identify the end of the data, a certain number of characters (ZEROs or BLANKs) are used. Constant 34 defines the character itself and constant 35 the minimum number of such characters.

#### **Example**

Constant 34 contains the value 048 (the ASCII code for the number 0) and constant 35 contains the value 20. The control system recognizes the end of a transmission by the 20 repeated zeros. The zeros themselves, as well as any subsequent data, are not accepted.

## 5.6 Configuration (ANCDEF.KON)

01	PORTAL AXIS
02	RESERVED
03	RESERVED
04	AUTOMATIC REFERENCE
05	PLATE ALIGNMENT
06	AXIS ROTATION
07	RESERVED
08	CORRECTION PROGRAM EXECUTION
09	RESERVED
10	RESERVED
11	RESERVED
12	RESERVED
13	RESERVED
14	TEACHTRACE, TRACE
15	PARKING PROGRAM EXECUTION
16	RESERVED
17	RESERVED
18	ADJUSTABLE PROGRAM ZERO POINT
19	PROGRAM ROTATION
20	RESERVED
21	RESERVED
22	RESERVED
23	EIA FORMAT
24	RESERVED
25	PARALLEL MDI
26	RESERVED
27	RESERVED
28	RESERVED
29	RESERVED
30	RESERVED
31	RESERVED
32	XON/XOFF
33	UDL
34	RESERVED
35	RESERVED
36	RESERVED
37	RESERVED
38	RESERVED
39	RESERVED
40	RESERVED
41	RESERVED
42	RESERVED
43	RESERVED
44	DDE-LOGGING
45	RESERVED
46	RESERVED
47	RESERVED
48	RESERVED
49	RESERVED
50	RESERVED

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<b>51</b>	<b>RESERVED</b>
<b>52</b>	<b>RESERVED</b>
<b>53</b>	<b>RESERVED</b>
<b>54</b>	<b>RESERVED</b>
<b>55</b>	<b>RESERVED</b>
<b>56</b>	<b>RESERVED</b>
<b>57</b>	<b>RESERVED</b>
<b>58</b>	<b>RESERVED</b>
<b>59</b>	<b>RESERVED</b>
<b>60</b>	<b>RESERVED</b>
<b>61</b>	<b>RESERVED</b>
<b>62</b>	<b>RESERVED</b>
<b>63</b>	<b>ADDITIONAL COM-PORTS</b>
<b>64</b>	<b>COMMISSION</b>

---

## 6 Error Messages (Codes of Disk Errors)

### (155) FLOPPY DISK <0>: GENERAL ERROR <m>

Error when accessing the memory. Floppy disk 0 is the internal memory. Possibly, the control system is no longer operational.

The error number <m> is displayed as an 16 bit integer value in hexadecimal format. While possibly two errors may occur, the values are separated in LowWord and HighWord. The HighWord includes the BIOS-Messagecodes and the LowWord the error numbers from the IRQ-Service.

### Description of the hexadecimal error numbers

a) Floppy disk errors (internal device is referred to as floppy disk 0):

error number (HighWord)	description (part I)
01	invalid drive number
02	error reading boot sector
03	error reading FAT
04	error reading ROOT-DIR
05	read/write error, status != 0
06	disk changed
09	invalid ADOS-function
0B	invalid size of RootDir (>224 entries)
16	invalid start cluster
2A	invalid cluster index
34	invalid cluster access

error number (HighWord)	description (part II)
3E	error writing FAT
3F	error writing DIR
49	error writing DIR
51	error writing FAT
52	error writing DIR
5B	formatting aborted with error
5C	invalid disk format
5D	drive missing
5E	error reading BOOT/FAT/DIR
5F	error reading BOOT/FAT/DIR
60	error reading BOOT/FAT/DIR
61	invalid volume label

error number (LowWord)	description
01	invalid function code
02	address not found
04	sector not found
06	disk changed
08	DMA overflow
09	segmentation violation
10	error while reading
20	controller failure
40	Track not found

b) Boot errors

error number (LowWord)	description
B1	error reading FAT
B2	error reading DIR
B3	error reading boot sector
B4	error during disk reset
B5	error reading a single sector
B6	error in file structur
B7	error in file structur
B8	error in file structur
B9	error while comparing FATs
F1	error reading FAT
F2	error reading DIR
F3	error reading boot sector
F4	error during disk reset
F5	error reading a single sector
F6	error in file structur
F7	error in file structur
F8	error in file structur
F9	error while comparing FATs

## 7 Symbol Overview

### 7.1 Startup window



**Startup window.**

This symbol is displayed in the top left corner of the screen when the startup window is the active window.



**Constant editor.**

For editing machine, device, system and MIP constants, as well as, displaying the configuration.



**Station parameters**

Editing the station parameters and transmitting the parameter values to the stations.



**Speed startup.**

For determining the velocity of the axes.



**Rotational speed startup.**

For displaying the revolutional speed per axis with adjustable voltage supply.



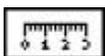
**MM/Inch selection**

Changing between millimeter and inch geometry.



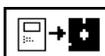
**Impulse.**

Clocked voltage supply for drive optimization.



**Startup helps.**

Working ranges, reference point, tool offsets.



**Copy System Files**

Making backup of system files on several disks.



**Format floppy**

Formatting a disk in disk drive.



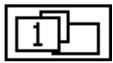
**Insert Disk**

Request for confirmation with the functions that create system disks and format disks.  
Insert disk in disk drive.

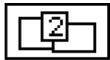


**Working ranges.**

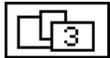
Graphical display of the adjusted working ranges and adjusting help.



**Working ranges.**  
For adjusting the first working range.



**Working ranges.**  
For adjusting the second working range.



**Working ranges.**  
For adjusting the third working range.



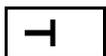
**Working ranges.**  
For adopting the **fixed point** (home position) for the selected working range.



**Working ranges.**  
For adopting the current position of the X-axis as **positive** demarcation of the selected working range (software limit switch).



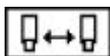
**Working ranges.**  
For adopting the current position of the X-axis as **negative** demarcation of the selected working range.



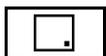
**Working ranges.**  
For adopting the current position of the Y-axis as **negative** demarcation of the selected working range.



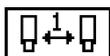
**Working ranges.**  
For adopting the current position of the Y-axis as **positive** demarcation of the selected working range.



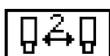
**Tool offsets.**  
For setting up tool offsets.



**Tool offsets.**  
For adopting the reference point for setting the tool offsets.



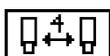
**Tool offsets.**  
For adopting the offset for the first tool.



**Tool offsets.**  
For adopting the offset for the second tool.



**Tool offsets.**  
For adopting the offset for the third tool.



**Tool offsets.**  
For adopting the offset for the fourth tool.



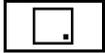
**Tool offsets.**

For adopting the offset for the fifth tool.



**Reference point adjustment.**

For selecting a reference point adjustment followed by a reference point movement.



**Reference point adjustment.**

The current position of the machine is adopted as machine zero point.

## 7.2 Deviation Display / LCD Test (Shift/F1)



### **Test button**

Check the functioning of the keys and controls.



### **Delete display of maximum value**

Clear the displayed maximum value.



### **LCD Test.**

Contrast minus.



### **LCD Test.**

Contrast plus.



### **LCD Test.**

Display of basic font. All black, all white.

### 7.3 MIP Signal Display (Shift/F2)



**Signal display window.**

This symbol is displayed in the top left corner of the screen when the window of the MIP signal display is the active window.



**ASIOB Input**



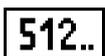
**ASIOB output**



**Display of static input and output.**



**Display of internal MIP signals.**



**Display of MIP signals higher than 512.**



**Force.**

For forcing value 0.



**Force.**

For forcing value 1.



**Force off.**

For cancelling the force instruction.

## 7.4 AF/KF Control (Shift/F3)



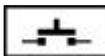
### **AF/KF.**

Display of the last 16 auxiliary and key functions. This symbol is displayed in the top left corner of the screen when the AF/KF control window is the active window.



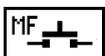
### **AF.**

For displaying the auxiliary functions sent last to the MIP.



### **KF.**

For displaying the key functions sent last to the MIP.



### **MF**

For displaying the miscellaneous functions sent last to the MIP

## 7.5 Synchronization Display (Shift/F4)



### **Synchronization display**

This symbol is displayed in the top left corner of the screen when the "synchronization control" window is the active window.



### **ASIOB**

Delete display of ASIOB maximum value



### **Panel**

Delete display of panel maximum value

## 7.6 Mini Operating System (Shift/F5)



### **Mini operating system.**

For displaying internal RAM addresses. This symbol is displayed in the top left corner of the screen when the window of the mini operating system is the active window.



### **Mini operating system.**

For switching between the displays of byte, word, long.



### **Mini operating system.**

For switching to absolute addresses.



### **Mini operating system.**

For changing the value.

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**CUTTING SYSTEMS**



ESAB Welding &  
Cutting Products

# Vision LE

## Computer Numerical Control

### Operation and Parts Manual



*LE-Basic Module*



*LE-F*



*LE-Color Basic Module*



*LE-CF*



*LE-X*



*LE-FX*



*LE-CX*



*LE-CFX*

**Form Number 0558005198**

Date: 10/04

Updated 12/05

**Operation**

**Replacement Parts**

---

The equipment described in this manual is potentially hazardous. Use caution when installing, operating and maintaining this equipment.

**The purchaser is solely responsible for the safe operation and use of all products purchased, including compliance with OSHA and other government standards. ESAB Cutting Systems has no liability for personal injury or other damage arising out of the use of any product manufactured or sold by ESAB. See standard ESAB terms and conditions of sale for a specific statement of ESAB's responsibilities and limitations on its liability.**

ESAB Cutting Systems is not responsible for any errors that may appear in this document. Information in this document is subject to change without notice.

This manual is ESAB Part No. 0558005198

This manual is for the convenience and use of the cutting machine purchaser. It is not a contract or other obligation on the part of ESAB Cutting Systems.

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Printed In U.S.A.



ESAB Welding &  
Cutting Products

## Revision History

Revised 12/05

- Eliminated M71
- Added Parts Section



## Preface

There are optional features and configurations available. For completeness, all of these are described in this manual. However, not all options described in this manual are present on all controls. In addition, more capabilities and features may be added in the future, which are not covered in this manual. ESAB Cutting Systems reserves the right to change or add features and capabilities without notice.

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## 1 Introduction

VISION LE is a numeric contouring control system especially designed for the use with flame-cutting machines. Special effort was made to standardize the operation of the control system and the machine. The means of a numeric control system for the operating sequence and the information of the operator should be available for both areas: for the sequence control of the geometric program and the monitoring of machine and process.

The basis of the operating concept is that the operator is supported by a menu. This, however, is not sufficient in order to handle an upcoming requirement quickly and securely in any situation: searching for the currently necessary branch could be too time-consuming. Therefore, "parallel windows" or "concurrent sessions" were introduced as a supplement to the menu-driven component. With these parallel windows it is possible to reach single, logical main groups of the operation with just one keystroke each.

A modern controlling concept with a multi-tasking operating system supports the "simultaneous" control of different parts of the machine. This also allows the operator to access all parts of the machine in next to no time. An additional advantage becomes clear here. The system makes sure that only those alternatives are offered which can be applied in the given situation without cutting back on the variety of possible ways of influencing the process.

One further special characteristic of operating the VISION LE is worthwhile mentioning at this point: the use of symbols. Of course, one has to get used to symbols first but in the long run, they are easier to remember than abbreviations, and sometimes even easier to remember than explanatory texts which can be more confusing than clarifying because of their length.

### **Note**

Since the various types of the VISION-LE control differ in their functional range it can occur that not all functions described in this manual are available on each specific control.

## 2 Safety

	<p><b>For your own safety, please heed the safety precautions and danger warnings given in this section!</b></p>
---	--

### 2.1 Safety Precautions

	<p><b>I.</b> A copy of this safety-related information shall be provided to the operating personnel.</p> <p><b>II.</b> In order to safely operate the control system, it is necessary to have read and understood the operating manual provided with the cutting machine. The operating personnel must be properly trained under all circumstances.</p> <p><b>III.</b> All applicable safety guidelines and specifications for the "electrical equipment" on machines and auxiliary equipment as well as operating devices must be heeded.</p> <p><b>IV.</b> With regard to flame-cutting, the accident prevention guideline "Welding, cutting and related work operations" applies (UVV VBG 15).</p> <p><b>V.</b> In order to prevent the entry of non-authorized persons into the operating area of the machine, the operator must carry out, where necessary, suitable safety precautions for eliminating hazards in accordance with UVV VBG 5, e.g. as safety fencing as per DIN 24533, Danger signs.</p>
--	---

## 2.2 Danger Warnings



- I.  
When installing the control system on the cutting machine as well as the auxiliary equipment, the prescribed connection voltage and particularly the proper connection of the ground conductor must be checked.
- II.  
Test and repair work shall be performed exclusively by trained technical personnel.
- III.  
Only original spare parts shall be used for the electrical equipment.
- IV.  
Do not weld on the cutting machine!
- V.  
You must heed the danger warnings in the machine manual!

## 2.3 Accident Prevention



- I.  
The door to the control system should be kept closed under normal circumstances in order to avoid dust accumulation and to protect the operating personnel from accidentally touching the electrical equipment. The control system shall be opened only by technical personnel. Protective devices shall not be modified. Fuses shall not be jumpered, nor shall their characteristics be modified.
- II.  
When working with grounded test equipment such as an oscilloscope, make certain that the grounding jack of the test equipment is always connected to the ground point of the control system (test cable). If necessary, use an isolation amplifier for floating measurements.

**III.**

**When working with live circuits, e.g. during test and alignment work, you should exercise great caution. It is wise to have a helper stand in the vicinity of the machine's MAIN POWER switch so that the power can be cut off immediately in case of an emergency.**

**IV.**

**If at all possible, work on the electrical equipment should be performed only when the machine has been switched off. During such work, make certain that the power switch cannot be flipped on (e.g. hang a safety lock).**

**V.**

**During the following work, the system or parts thereof must be switched off:**

**When the work is completed or during longer interruptions in the work, power down the MAIN POWER switch of the machine as well as the auxiliary equipment.**

**VI.**

**If any cables, connectors or electrical devices are damaged, immediately power down the MAIN POWER switch of the machine. The damaged parts must be repaired by trained technical personnel.**

**VII.**

**Boards or connections may be removed only when the machine is switched off. Avoid mixing up boards or connections --> Read the label or code. In case of doubt, refer to the documentation or ask someone who knows.**

**VIII.**

**Please heed the following guidelines as well:**

**Connection conditions of the power company**

**OSHA safety guidelines**

**IEC safety guidelines**

**Safety precautions in operating manuals for the various work procedures, such as oxy-fuel cutting, plasma cutting, etc.**

## 2.4 Emergency Measures



If the machine or control system catches on fire, only use carbon dioxide (CO<sub>2</sub>) or a suitable powder to extinguish the fire!

If your clothes catch on fire, do not run away!

Lie on the ground and roll around to extinguish the flames, or use fire-extinguishing blankets.

## 2.5 Application and Usage Conditions



This control system is a component of a machine and may be used only for this machine.

Only those applications are allowed which the operating manual of the respective machine expressly permits.

See the appropriate machine description for the allowable ambient conditions for operating this control system.

For safety reasons, do not attempt to modify, upgrade, or enhance the control system.

## 2.6 Control System Breakdowns



Control system breakdowns may be corrected only by persons who are trained in such work and are authorized to perform it.

In case of control system breakdowns that generate an error message, please refer to chapter 6.

In case of control system breakdowns that do not generate an error message, immediately power down the machine.

Contact ESAB service and await their instructions.  
Do not attempt to correct the error on your own.

### 3 Control panels

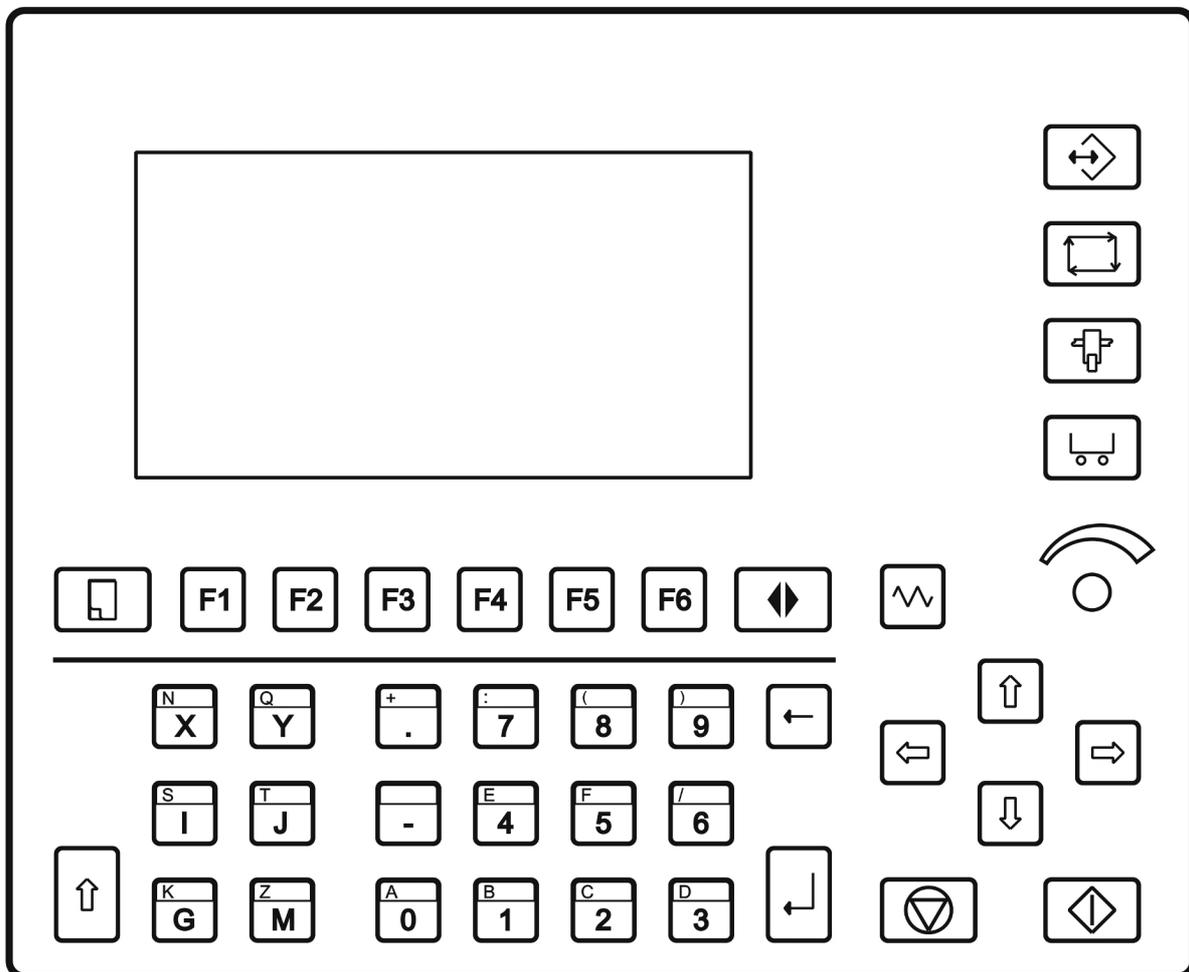
The control can be equipped with three control panels:

- Basic control panel
- Machine control panel
- Additional control panel

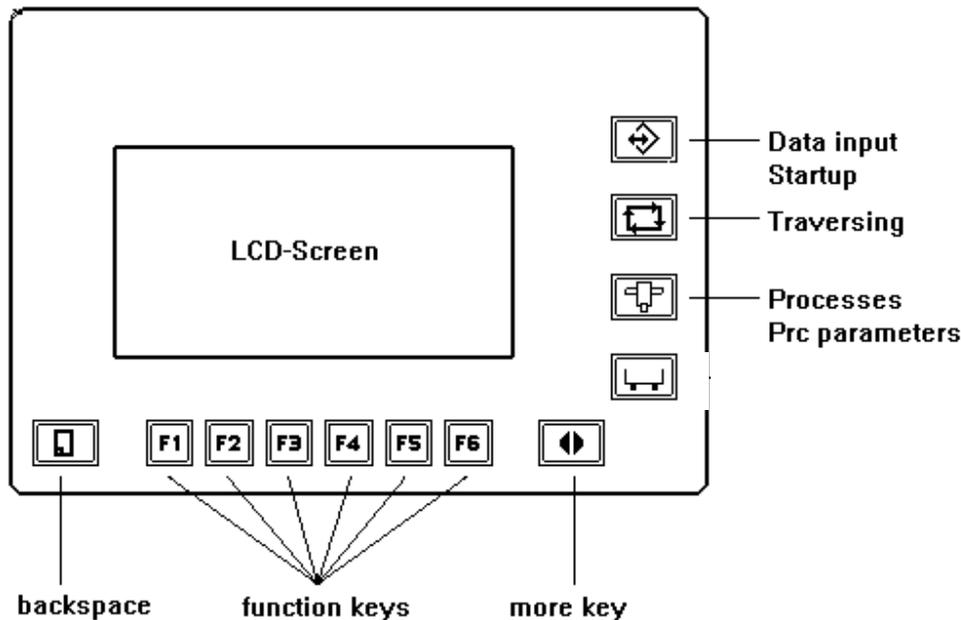
#### 3.1 Basic control panel

The basic control panel consists of:

- Screen
- Window keys and function keys
- Character and number block
- Traverse block



## Window and Function Keys



The keys to the right of the screen are called **window keys**. With these keys the operator can switch between the main operating groups "data input", "traversing" and "processes". In combination with "shift", they switch to the windows "startup" and "process parameters". Normally, it is possible to switch between the different windows at any time without completing an initiated function. In only a few exceptional cases, a corresponding message is displayed. The range of functions of the individual windows will be explained at a later point.

The six **function keys** at the bottom of the screen are used to control the menu. This is usually the selection of a function, as well as its branching and further processing up to the command of executing the desired function.

The functions of the individual keys in the current menu are indicated by the symbols in the fields above the keys. If a field remains empty on a certain screen, the key underneath does not have any function in this picture.

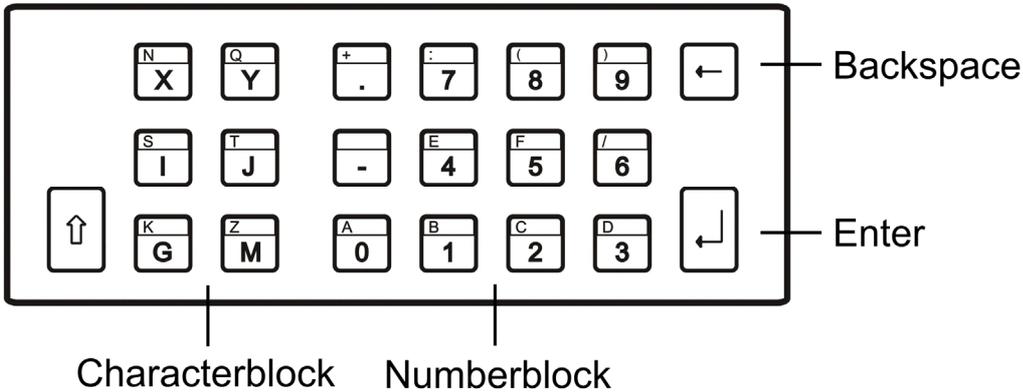
**Shift/function keys** lead to additional, independent service windows. The active window is not affected.

The **backspace key** switches back one screen in the sequence of screens. This can be continued up to the basic screen of the current window.

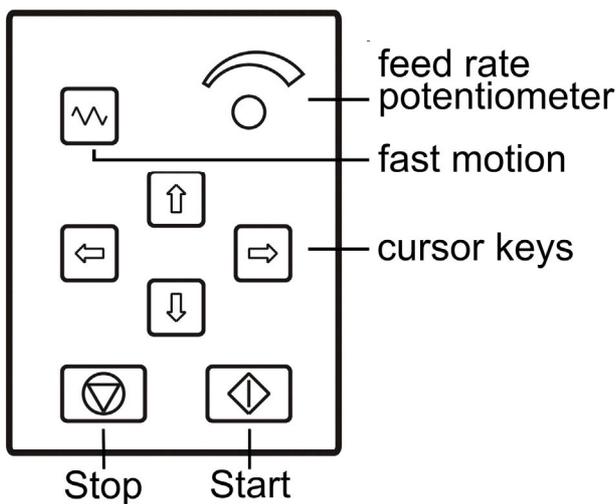
The combination of **shift/backspace** switches back directly to the basic screen of the current window.

If there are more than six functions simultaneously available in one menu, there will be an arrow "to the right" of the function descriptions on the screen. In this case, the operator can switch between the two function groups with the **more key**.

### 3.1.1 Character and Number Block



### 3.1.2 Traverse block



The operating elements of the traversing block are exclusively for controlling machine movement. They are effective in any situation independent of the active window. An exception are the cursor keys. In the editor they move the cursor and not the machine.

The cursor keys can be used for moving in any direction in manual mode or in case of program interruption. The axis/axes is/are moved as long as the corresponding cursor key is pushed. Releasing the cursor key will make the axis/axes come to a standstill.

With the function reference point movement, only axis and direction are defined with the cursor keys. The movement itself is triggered with the **start** key.

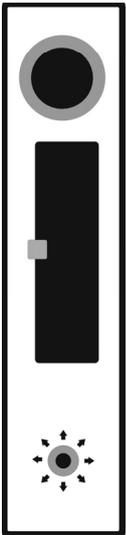
The **fast motion** key can only be used in the manual mode with the cursor keys. It switches to a higher traversing speed.

The feed rate potentiometer affects all movements in manual and automatic mode. The operator uses the keys **<start>** and **<stop>** foremost for controlling the automatic program run.

### 3.2 Additional control panel "Floppy disk"

The additional control panel consists of:

EMERGENCY POWER-OFF switch  
Floppy disk cover  
Joystick



**Note**

This control panel is an option. Not all controls are equipped with this panel.

### 3.3 Additional control panel "Floppy disk"

The additional control panel consists of:

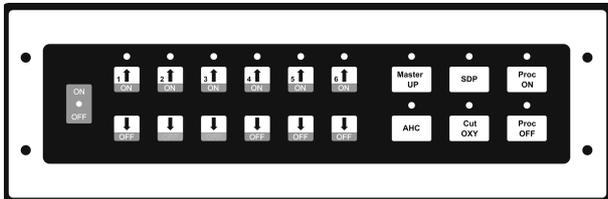
EMERGENCY POWER-OFF switch  
Floppy disk cover  
Joystick

**Note**

This control panel is an option. Not all controls are equipped with this panel.

### 3.4 Machine control panel

The machine control panel consists of a key panel with 12 keys for the operation of the six process stations (ON/OFF, UP/DOWN) and six keys for the process operation that can be assigned by means of the MIP.



#### Note

This control panel is an option. Not all controls are equipped with this panel.

The six keys for process operation are assigned as follows:

Master up: All stations are lifted up as long as the key is pressed, the maximum is limited by the mechanical stop.

SDP: The selection box of the cutting data is displayed.

AHC: Switching on resp. off automatic height control



#### Warning!

With the following three keys the current process can be activated resp. deactivated. In your own interest please heed the safety instructions about the particular processes given in the machine manual. Failure to observe this precaution can result in injury or equipment damage.

Proc on: Switching on the current process, if the current process is oxy-fuel cutting then only high preheat is switched on.

Proc off: Switching off the current process, if the current process is oxy-fuel cutting then only high preheat is switched off.

Cut oxy: If the current process is oxy-fuel cutting then the cutting oxygen is switched off.

### **3.5 LCD Screen**

A standard format is followed with the picture setup on the LCD screen.

The symbol of the current window will always be displayed inverse in the top left corner of the screen.

The two bottom lines of the screen describe the functions that are currently assigned to the function keys (menu line). Empty description fields on the screen indicate that the corresponding function keys are irrelevant for this screen.

With every further branching into subfunctions (submenus) via one of the function keys, the symbol of the key will be added to the top line of the screen. Thus, it is always easy to find out how far the branching of a function has proceeded.

For keys that do not effect further branching but that trigger a command, the status of the chosen function is usually displayed in the field for key description in original or inverse type. An inverse key field indicates an active function. This symbol is not added to the top line.

### 3.6 Function Range of the Windows



#### **Data Input:**

All functions for data control:

- Program input-output
- Controlling internal memory
- Programs from standard shapes
- Editing main programs



#### **Startup:**

All functions for startup

- Constant editors
- Station parameters
- Store machine data
- Format floppy disk
- Speed startup
- Rotational speed startup
- Working range adjustment
- Tool offset
- Machine zero point adjustment



#### **Traversing:**

All functions for machine movement

- Preparation for program execution
- Processing of a program
- Manual control
- Reference point movement
- Fixed point movements



#### **Processes:**

All functions for process control:

- Process selection
- Process adaption
- Process control



#### **Process parameters:**

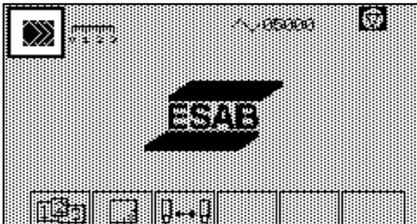
All setting parameters for the process:

- Time adjustments
- Values for cutting media

- Shift/F1:** - Deviation display
- Shift/F2:** - MIP signal display
- Shift/F3:** - AF/KF control
- Shift/F4:** - ASI0B synchronization display
- Shift/F5:** - Mini operating system
- Shift/F6:** - Error / status display

## 4 General Description of Screens

The top line on the screen is reserved for general information.

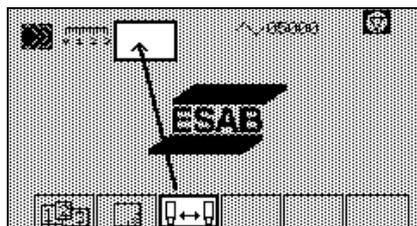


The symbols in the top left corner mark main groups and the branching of the menu tree for the active screen.

The symbol at the far left shows the main group that the active window belongs to. This symbol is always in inverse type.



The symbols to the right of the window symbol display the branches that were used to arrive at this window.



Whenever branching down in the menu is continued by pressing another key, the symbol of the key will be added to the top left line.

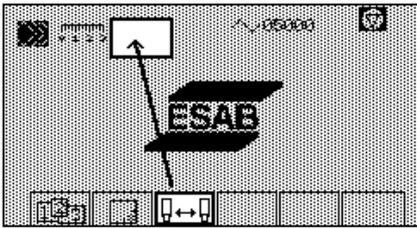


The top right corner is reserved for displaying the current speed, the traversing direction, start/stop and errors. Which kind of error has occurred is displayed in the information screen.

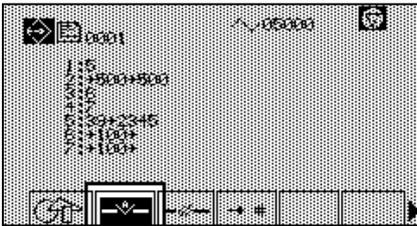


The bottom line of the screen displays the symbols referring to the current significance of the function keys (menu keys). An empty field above a key indicates that at the moment no function has been assigned to this key.

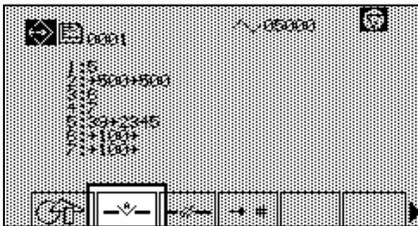
The function keys can fulfill two tasks: further branching within the menu tree and triggering of a command.



Whenever a key branches down in a further picture of the menu tree, the symbol of the key will be added to the top left corner in order to characterize the menu.



If pressing a function key does not lead to further branching within the menu tree, this function key triggers a command that leads to a status change of a control or machine function in most cases. Inverse means that this function is active.



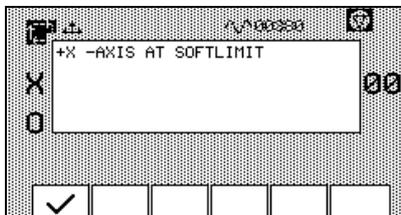
Not inverse means that this function is not active.

The description of the individual functions does not always point out that the described function is an add-on and has to be acquired in addition to the machine.

In most cases an additional function is not included in the menu if it has not been acquired.

### Boxes for Information, Selection, Input and Inquiry

**Information Boxes** display errors and messages. It is not important here which window or which screen is active. If there is a limit switch error, for example, while the editor's picture is active in the data window, an information box will be opened with the message about the limit switch error.

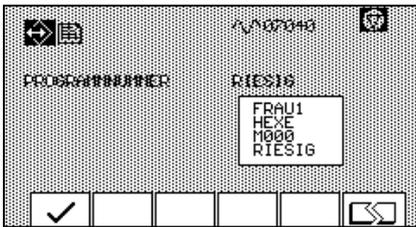


The current menu line above the function keys of the actual picture will be overlaid. Above the F1 key, the symbol for "confirm" is displayed. The remaining five key fields are empty.

Errors and messages have to be confirmed with the F1 key. At the time of confirmation the error will be eliminated. However, if the error occurs again within a certain period of time, the error cause has not been removed. The error box will not be opened again. The error symbol at the top right corner of the screen will not disappear. The error message will still be displayed in the information window.

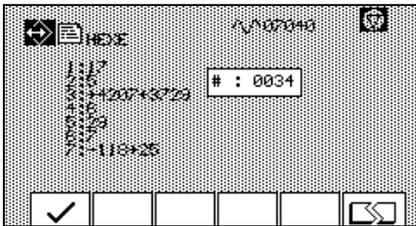
**Selection Boxes** are opened for selecting a program. They display a list of available programs. The names of the programs are listed in alphabetic order.

The programs are selected with cursor keys or keys with letters and digits. With every letter or digit that is typed, the cursor is moved to the corresponding program.



The current menu line above the function keys of the actual picture is overlaid. Above the F1 key, there is the symbol for "confirm". The program marked by the cursor has been selected. The selection is terminated by pressing the F6 key.

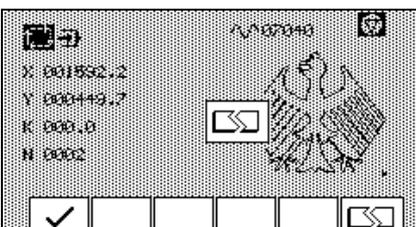
**Input Boxes** are opened for functions that require a value. For example, for jumping to a block number in the editor, the appropriate block number has to be entered. The input box is then opened.



Again, the actual menu line of the current picture is overlaid with the symbol for "confirm" above the F1 key and the symbol for "cancel" above the F6 key.

The required data is entered with the letter and digit keys.

**Inquiry Boxes** are opened when the operator carries out actions that might cause damage. For example, if the operator presses the backspace key during automatic program processing, the program would be aborted. Such actions have to be confirmed with the inquiry box.

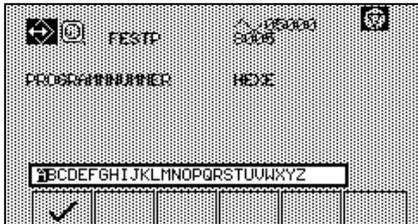


Again, the menu line is overlaid with the symbol for "confirm" above the F1 key and the symbol for "cancel" above the F6 key.

If the F1 key is pressed, the initiated action will be executed. With F6 the operator can return to the original status.

## Letter Line

Since not all letter keys are available on the control panel, a letter line appears in form of images with alphanumeric entries.



The cursor is positioned on the individual letters of the letter line by simultaneously pressing the shift key and cursor left/right. With the **enter** key, the selected character from the letter line is entered into the input field.

## Individual Screen Description

An individual screen description explains:

- the content of the screen
- the corresponding function keys
- possible additional keys

## Function Keys

A description of the function keys will follow with a reference to page numbers in brackets indicating on which page of the operating instructions the following screen is described.

## 5 Symbol Overview

### 5.1 General

The following description of symbols refers to all generally used symbols that can appear in any window.



**Start.**

This symbol is displayed in the top right corner of the screen when the machine is in the start status.



**Stop.**

This symbol is displayed in the top right corner of the screen when the machine is in the stop status.



**Error.**

This symbol is displayed in the top right corner of the screen when there is an error. Further information is displayed in the information window.



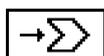
**Confirm.**

For further processing after the input has been completed.



**Cancel.**

For cancelling a function, for example, of an inquiry box.



**Save.**

Symbol of an inquiry box. It is displayed after data has been changed. This is a request for confirmation that the changed data should be saved.



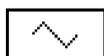
**Delete.**

Depending on the window, for deleting errors or programs.



**Direction indicator.**

Indicates the current direction of the axes movement. The indicator is on every screen in the top right corner.



**Feed rate.**

The speed of the manual control corresponds to the defined feed rate. This indicator is on every screen in the top right corner.



**Fast motion.**

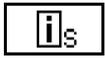
The speed of the manual control corresponds to the defined fast motion. This indicator is on every screen in the top right corner.

## 5.2 Information Windows



### **Information window.**

This symbol is displayed in the top left corner when the information window is the active window.



### **Information window - status.**

For switching to the information window - status that displays the releases.



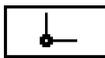
### **Information window - version.**

For switching to the information window - version that displays version and serial numbers of the control.



### **Turn-on voltage.**

This symbol is displayed in the top right corner of the screen when the turn-on voltage is switched on.



### **Reference.**

The letters to the right of this symbol indicate from which axis the reference was adopted.



### **Controller release X.**

Indicator for controller release in the X-axis. If this symbol is not displayed, the drive is not released. The machine cannot be operated along the X-axis.



### **Controller release Y.**

Indicator for controller release in the Y-axis. If this symbol is not displayed, the machine cannot be operated along the Y-axis.



### **SPC release.**

Indicator for SPC release. If this symbol is not displayed, no auxiliary and key functions will be sent to the machine interface.



### **Feed release.**

Indicator for feed release. The feed release is set by the machine interface.



### **Feed interlock.**

No feed release. The machine cannot be operated.



**Reset I/O ports**

The serial ports are reset.



**Reset battery ram**

For deleting the battery RAM



**Time.**

For setting time.

### 5.3 Data Window



**Data window.**

This symbol is displayed in the top left corner of the screen when the data window is the active window.



**Internal memory.**

This symbol is usually displayed in combination with another symbol. It indicates that the function effects the internal memory (read - write functions).



**Input - output.**

This symbol is usually displayed in combination with another symbol. It indicates that the function effects an external device. (read - write - selection functions)



**XON-XOFF protocol.**

For selecting an external computer for data transfer with XON-XOFF protocol.



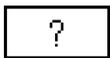
**UDL.**

For selecting an external computer for data transfer with UDL protocol.



**Floppy disk drive.**

This symbol is usually displayed in combination with another symbol. It indicates that the function effects the floppy disk drive. (read - write - directory functions).



**Directory.**

This symbol is displayed only in combination with a device symbol. It displays the directory of all main programs of the corresponding device.



**Standard shapes.**

For selecting the generation of main programs from standard shapes.



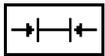
**Type of lead-in.**

For switching between the types of lead-in "straight" and "circle" for standard shapes with variable lead-in.



**Type of lead-out.**

For switching between the types of lead-out "straight" and "circle" for standard shapes with variable lead-in .



**Lead-in lengths.**

For entering angles and lengths of lead-in and lead-out for standard shapes with variable lead-in.



**Editor.**

For selecting the editor in order to generate and change main programs.



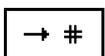
**Overwrite / insert.**

For switching between the overwrite and insert mode in the editor.



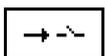
**Delete line.**

For deleting the line marked by the cursor in the editor.



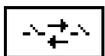
**Search block number.**

For searching a block number in the editor.



**Search auxiliary function.**

For searching an auxiliary function in the editor .



**Replace auxiliary function.**

For replacing auxiliary functions in the editor.



**Mark.**

For marking lines in the editor.



**Delete block.**

For deleting marked lines in the editor.



**Insert block**

For inserting a deleted block in the editor.



**Graphics.**

For switching to the graphical display in the editor.

## 5.4 Movement Window



### **Movement window.**

This symbol is displayed in the top left corner of the screen when the movement window is the active window.



### **Manual control.**

This symbol is displayed in the basic picture of the movement window and it indicates that the machine can be operated in the manual mode.



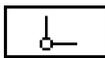
### **Feed.**

The speed of the manual mode corresponds to the defined feed.



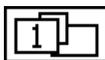
### **Fast motion.**

The speed of manual control corresponds to the defined fast motion.



### **Fixed point movements.**

For moving to the program zero point or machine fixed points.



### **Fixed point movement.**

For moving to machine fixed point 1.



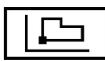
### **Fixed point movement.**

For moving to machine fixed point 2.



### **Fixed point movement.**

For moving to machine fixed point 3.



### **Zero point movement.**

For moving to program zero point.



### **Reference point movement.**

For adopting the reference point and setting up the machine coordinate system.



### **Automatic.**

For automatic processing of main programs.



### **Program repetition.**

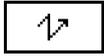
For repeated processing of the program run last in the automatic mode.



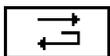
**Sectional kerf.**  
For calculating the kerf during operation.



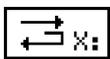
**Parked program.**  
For restarting a parked program.



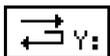
**After power failure.**  
For restarting a program that was being executed but interrupted because of power failure.



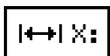
**Repetitions.**  
Selection for entering the repetitions of the program in matrix format.



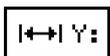
**Repetitions.**  
For entering the number of repetitions in the X - direction.



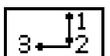
**Repetitions.**  
For entering the number of repetitions in the Y - direction.



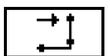
**Repetition distance.**  
For entering the distance in direction X. The distance refers to an assumed container around the program. If the distance is zero, the parts will be located directly next to one another.



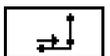
**Repetition distance.**  
For entering the distance between the repeated program runs in direction Y.



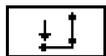
**Plate alignment.**  
For determining the zero point, as well as, the tilt of the plate.



**Plate alignment.**  
This symbol is displayed with the function "plate alignment" and it indicates that at the moment a point at the **right edge at the top** is going to be adopted.



**Plate alignment.**  
This symbol is displayed with the function "plate alignment" and it indicates that at the moment a point at the **right edge at the bottom** is going to be adopted.



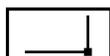
**Plate alignment.**

This symbol is displayed with the function "plate alignment" and it indicates that at the moment a point at the **front edge at the left** is going to be adopted.



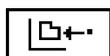
**Strap bridge.**

A symbol in the automatic preselection screen for entering the parameters for the strap bridge, or for activating the strap bridge during program processing.



**Zero point adoption.**

For setting the program zero point for automatic operation.



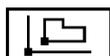
**Return to contour.**

For returning to the contour after program interruption in automatic mode. The contour was left during manual control.



**Program offset.**

For returning to program execution after the program was interrupted in the automatic mode and was not returned to the contour. The program will be continued offset.



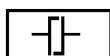
**Switch in coordinate display.**

For switching between machine and program coordinates during automatic operation.

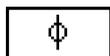


**Forwards / Backwards.**

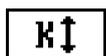
For switching between forward and backward movement during automatic operation.



**Enable/disable control loop and toggle axes output**



**Trace / Teach trace**



**Kerf on the fly**

Adapting the kerf while the program is interrupted.

## 5.5 Startup window



### Startup window.

This symbol is displayed in the top left corner of the screen when the startup window is the active window.



### Constant editor.

For editing machine, device, system and MIP constants, as well as, displaying the configuration.



### Station parameters.

For editing station parameters, as well as, sending the parameters.



### Speed startup.

For determining the velocity of the axes.



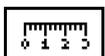
### Rotational speed startup.

For displaying the rotational speed per axis with adjustable voltage supply.



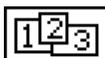
### Impulse.

Clocked voltage supply for drive optimization.



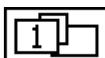
### Startup helps.

Working ranges, reference point, tool offsets.



### Working ranges.

Graphical display of the adjusted working ranges and adjusting help.



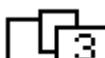
### Working ranges.

For adjusting the first working range.



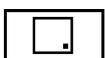
### Working ranges.

For adjusting the second working range.



### Working ranges.

For adjusting the third working range.



### Working ranges.

For adopting the **fixed point** (home position) for the selected working range.



**Working ranges.**

For adopting the current position of the X-axis as **positive** demarcation of the selected working range (software limit switch).



**Working ranges.**

For adopting the current position of the X-axis as **negative** demarcation of the selected working range.



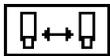
**Working ranges.**

For adopting the current position of the Y-axis as **negative** demarcation of the selected working range.



**Working ranges.**

For adopting the current position of the Y-axis as **positive** demarcation of the selected working range.



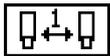
**Tool offsets.**

For setting up tool offsets.



**Tool offsets.**

For adopting the reference point for setting the tool offsets.



**Tool offsets.**

For adopting the offset for the first tool.



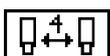
**Tool offsets.**

For adopting the offset for the second tool.



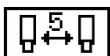
**Tool offsets.**

For adopting the offset for the third tool.



**Tool offsets.**

For adopting the offset for the fourth tool.



**Tool offsets.**

For adopting the offset for the fifth tool.



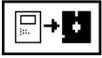
**Reference point adjustment.**

For selecting a reference point adjustment followed by a reference point movement.



**Reference point adjustment.**

The current position of the machine is adopted as machine zero point.



**Save data.**



**Formatting.**

For formatting a floppy disk in drive B.



**Insert floppy disk.**

Request for confirmation with the functions that create system floppy disks and format floppy disks. Insert floppy disk in drive B.

## 5.6 LCD Test (Shift/F1)



**LCD Test.**  
Contrast minus.



**LCD Test.**  
Contrast plus.



**LCD Test.**  
Display of basic font. All black, all white.

## 5.7 MIP Signal Display (Shift/F2)



**Signal display window.**

This symbol is displayed in the top left corner of the screen when the window of the MIP signal display is the active window.



**Display of the data bus input signals.**



**Display of the data bus output signals.**



**Display of static input and output.**



**Display of internal MIP signals.**

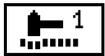


**Display of MIP signals higher than 512.**



**Force.**

For forcing value 0.



**Force.**

For forcing value 1.



**Force off.**

For cancelling the force instruction.

## 5.8 AF/KF Control (Shift/F3)



### **AF/KF.**

Display of the last 16 auxiliary and key functions. This symbol is displayed in the top left corner of the screen when the AF/KF control window is the active window.



### **AF.**

For displaying the auxiliary functions sent last to the MIP.



### **KF.**

For displaying the key functions sent last to the MIP.

## 5.9 Synchronization Display (Shift/F4)



### **Synchronization control.**

This symbol is displayed in the top left corner of the screen when the window of synchronization control is the active window.



### **ASIOB.**

For deleting the display of maximum value.



### **Panel.**

For deleting the display of maximum value.

## 5.10 Mini Operating System (Shift/F5)



### **Mini operating system.**

For displaying internal RAM addresses. This symbol is displayed in the top left corner of the screen when the window of the mini operating system is the active window.



### **Mini operating system.**

For switching between the displays of byte, word, long.



### **Mini operating system.**

For switching to absolute addresses.



### **Mini operating system.**

For changing the value.

### 5.11 Process Parameter Window



**Process parameters.**

This symbol is displayed in the top left corner of the screen when the process parameter window is the active window.



**Parameter change.**

For confirming the change of parameters.

## 5.12 Process Window



### Process window

This symbol is displayed in the top left corner of the screen when the process window is the active window.



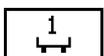
### Plasma Porcess.



### Oxy Fuel Process.



### Mark Processes.



### Station.

Station numbers from 1 to 6. All available stations are visible. If the symbol is in inverse type, the station has been selected.



### Toolholder clamping

For selecting toolholder clamping



### Toolholder clamping.

For switching the status of the station that is marked by the cursor to "free".



### Toolholder clamping.

For switching the status of the station that is marked by the cursor to "bar".



### Toolholder clamping.

For switching the status of the station marked by the cursor to "equal".



### Toolholder clamping.

For switching the status of the station marked by the cursor to "mirror".

### 5.12.1 Plasma Process



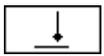
**Plasma.**



Plasma options.



AHC allow.



AHC on/off.



Cut gas test



Test preflow.



Cut Plasma.



Water table low.



Water table medium.

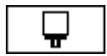


Water table high.



Manual plasma-punch mark

### 5.12.2 Oxy Fuel Process



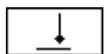
**Oxy Fuel.**



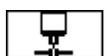
Oxy Fuel options.



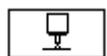
GAS AHC allow.



GAS AHC on/off.



Cut Oxy Fuel.



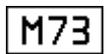
Oxy Fuel preheat.



Oxy Fuel ignite.



Water basin control.



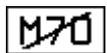
M73 process stop.



Travel.



M70 process start.



Edge start.



Water table low.



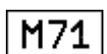
Water table medium.



Water table high.



Manual punch mark.



M71 Not Used (formerly Process Stop)

### 5.12.3 Punch Mark Process



**Punch Mark.**



Punch marking options.



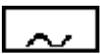
AHC allow.



AHC on/off.



Manual Punch Mark.



Water table low.

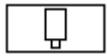


Water table medium.



Water table high.

### 5.12.4 Zinc Mark Process



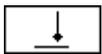
**Zinc Mark.**



Punch marking options.



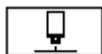
AHC allow.



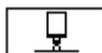
AHC on/off.



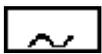
Zinc marker swirl



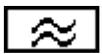
Zinc marker preheat



Zinc marker ignite



Water table low.

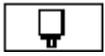


Water table medium.



Water table high.

### 5.12.5 Plasma Mark Process



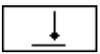
**Plasma Mark.**



Plasma Mark options.



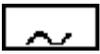
AHC allow.



AHC on/off.



Plasma Mark



Water table low.



Water table medium.



Water table high.

## 6 Error messages

The following is a listing of all error messages in numerical order. Texts in pointed brackets "< >" are dummies. Some of the indicated errors can be eliminated by the operator. Other errors that influence the usability of the machine should be reported to technical service immediately.

For the service it is important to have as much information available as possible in order to eliminate these errors:

Number of the error

With which function does this error occur?

What is on the screen?

Which data is involved? (program, parameter such as kerf, speed, etc)?

Did inconsistencies occur before?

Can any complex connections between the occurring error and the operating sequence be recognized?

**A detailed description of the error makes it easier and faster to eliminate the error.**

## **PROGRAM ALREADY EXISTS**

The selected program name is assigned to a program that already exists on the control system. The new program would overwrite the existing program.

An input box is then opened.

If you wish to overwrite the existing program, confirm the program name displayed. Enter a new program name if you still need the existing program.

## **(100) PROGRAM DOES NOT EXIST**

A non-existent program has been selected for processing. For example:

- Nesting: In the shape chain selected, a program is displayed that does no longer exist on the system floppy disk. Correct shape chain.
- UDL: There are no programs available on the host computer. No programs can be transferred from the host to the control system.
- IO: A non-existent program has been selected for transfer. When this error occurs the system floppy disk might be defective, since programs can only be selected from the directory displayed by the control system. Inform our after-sales service.
- Auto.: A non-existent program has been selected for processing. This can occur during a call-in of a subroutine or processing of shape chain. Check selected program.

## **(101) ERROR READING PROGRAM**

Program file <n> is defective and cannot be read.

If the machine is equipped with an optional external drive, insert or check floppy disk in drive.

If the error occurs when accessing the internal memory (system floppy disk), use a copy of the backup disk and contract service.

## **(102) ERROR FORMAT**

Error message in program editor.

There is a format error in the program line marked by the cursor.

Eliminate error or exit editor with **shift/backspace**.

This error can also occur when data is entered in an EIA format although there is no system add-on "EIA-Format (DIN 66025)".

If the system add-on "EIA-Format (DIN 66025)" does exist, the transducer file on the system floppy disk might be defective. In this case, use a copy of the backup disk and contact service.

The transducer file of the EIA-format is called EIAWDL.BIN.

### **(103) INTERNAL STRUCTURE ERROR**

Error during program interpretation. A program line has more than 80 characters. This line cannot be processed. The program cannot be used.

### **(104) ERROR KERF CALCULATION**

Error during kerf calculation. If this error has occurred in a program do not continue using this program. The machine can still be used.

Contact service and have the following data available for error elimination

- program that caused the error
- the kerf value chosen
- the machine constants

### **(105) STATION <n> REPORTS <n>**

Only for machines with ATHC stations.

This message only appears if the MIP simulation bit 3 (SYS.KON,5) is set. In that case, all messages from the ATHC boards are displayed (only for stations that are logged on).

Station <n> = Station 1 - 16  
reports <n> = Message 0 - 15 with the following meaning:

- 0 Voltage error
- 1 Collision
- 2 External station switched off
- 3 Lower limit switch
- 4 AFUE error
- 5 Station constants invalid
- 6-9 not assigned
- 10 Guide limit switch tripped
- 11 Guide limit switch released
- 12 Upper limit switch tripped
- 13 Upper limit switch released
- 14 IHS error/ download error
- 15 IHS confirmation / download confirmation

### **(106) 8031 BOOT LOADER NOT AVAILABLE**

The control is equipped with a multiprocessor system. Some of its programs are loaded from the system floppy disk.

When this message is displayed, one or more of these files are missing or defective.

The control can no longer be operated. Use a copy of the backup disk and contact service.

The system files for the multiprocessor system are

BOOT8031.HEX  
NOS8031.BIN (machines with ATHC stations)  
BOS8031.BIN (ABIMBO version).

### **(108) ERROR FREQUENCY IN AXIS <n>**

A frequency error is displayed when there are interferences in the connecting line between the encoders and the control system. This means that the machine is provided with wrong encoder pulses and, thus, with wrong path data.

Possible causes for these interferences are:

- parting of a cable or connector not plugged in correctly
- extreme electromagnetic interferences (plasma interferences)

Contact service.

### **(109) DEVIATION ERROR IN AXIS <n> AT SPEED <m>**

The deviation  $D$  is defined as the difference between the target position value and the actual position value. The deviation is constantly monitored.

The maximum deviation value  $D_{\max}$  is defined by the ratio of maximum speed  $V_{\max}$  and control loop amplification  $LA$ .

During regular operation, the value of deviation is next to zero, i.e. the machine is located at the position that was calculated beforehand.

If an error in deviation occurs, it means that the axis drive was not able to reach the target value that was predefined by the control, within one loop pulse. The value of the deviation exceeded the maximum value of deviation. .

Possible causes are:

- the velocities measured by the automatic startup of the axes (machine constants MC 13 - MC 16) were changed.
- the rotation direction of the encoder (machine constants MC 5 - MC 8) was changed.
- inappropriate data was entered into the machine constants for the control loop amplification (MC 9 - MC 12).
- the value entered into the machine constant of acceleration time (MC 42) is too small, i.e. the required acceleration is too high.

- the machine ran into an obstacle
- drive or encoder is defective.

Check machine constants. If necessary, carry out a new speed startup. If the error cannot be eliminated, contact service.

### **(110) CABLE ERROR AXIS <n>**

There is a cable error at the link between control system and encoder of axis <n>. A cable error is displayed when the connecting line between encoders and control system has been interrupted.

Possible causes for these interferences are:

- parting of a cable or connector not plugged in correctly
- extreme electromagnetic interferences (plasma interferences)

Contact service.

### **(111) CONSTANTS NOT FOUND**

System files are missing on the system floppy disk. The operative sequence of functions cannot be guaranteed.

Use a copy of the backup disk and contact service.

### **(112) ERROR WRITING FROM <n>**

File <n> cannot be written. If this error occurs when accessing the internal memory (system floppy disk), error-free functioning of the control system can no longer be guaranteed.

Use a copy of the backup disk and contact service.

If the machine is equipped with an optional external drive, the floppy disk might be defective.

Insert or change floppy disk in external drive. If the error cannot be solved this way, contact service.

### **(113) ERROR LOADING MACHINE PROGRAM**

Each control system is equipped with a machine interface program MIP that has been adapted to the machine. It is read from the system floppy disk when the system is started. If this error message is displayed, the machine interface program is missing or the file on the floppy disk is defective.

Use a copy of the backup disk and contact service.

The file with the machine interface program is called MIP41.MIP.

#### **(114) SUBSYSTEM MALFUNCTIONING**

The control system is equipped with a multiprocessor system that is responsible for the functionality of the control panel and the bus input/output signals. If this message is displayed, one of the processors is malfunctioning.

The control system can no longer be operated. Please contact service.

Possible causes are problems in reading the files necessary for the multiprocessor system, i.e. BOOT8031.HEX and/or NOS8031.BIN (machines with ATHC stations) or BOS8031.BIN (ABIMBO version) on the system floppy disk. A defective subsystem card (DIO) may also have caused this error message.

#### **(115) MEMORY OVERFLOW**

This system error is displayed in the following cases:

- the machine interface program, MIP, does not fit in the memory. The error message is displayed when the system is started.

Contact service.

- the data file ALL.SHP of the standard shapes is too big. The message is displayed when the editor of the standard shape is activated.

Contact service.

- the program that is to be edited is too big.
- in the program editor, when using the copy function because the intermediate storage uses part of the program memory. The program to be processed is too big.

If possible, do not use the intermediate storage.

#### **(116) DRIVE NOT READY**

Message displayed during a read-write operation on the floppy disk. The floppy disk is missing or not inserted correctly into the drive.

Insert floppy disk (correctly).

### **(119) MACHINE STILL RUNNING**

This message can be displayed, for example, during automatic mode. Selected functions cannot be executed as long as the machine is still running.

Press **stop** and wait for machine standstill.

### **(121) SYSTEM ERROR IN STANDARD SHAPES**

This error occurs only in connection with standard shapes.

An error has occurred during evaluation of a standard shape. This can be caused by:

- Parenthesized expressions invalid.
- Invalid characters within standard shape .
- Invalid statements in arithmetic unit.
- System file ALL.SHP is defective.

Use a copy of the backup disk and contact service.

### **(122) CONSTANT TOO LONG**

This error occurs only in connection with standard shapes.

A constant (number) exceeds the maximum number of digits. At the most, 10 digits are admissible. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

### **(123) INVALID @ SYMBOL**

This error occurs only in connection with standard shapes.

The variable declaration of an internal standard shape variable is defective. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

### **(124) INVALID PARAMETER**

This error occurs only in connection with standard shapes.

The variable declaration of an input variable is defective. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

#### **(125) ERROR IN OFFSET**

This error occurs only in connection with standard shapes.

The offset declaration is incorrect. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

#### **(126) ERROR USING #F+**

This error occurs only in connection with standard shapes.

The loop statement "#F+" may not be nested. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

#### **(127) INVALID NUMBER OF SIGNS**

This error occurs only in connection with standard shapes.

A geometric statement with a wrong number of signs was found in the standard shape. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

#### **(128) ERROR SMOOTHING**

This error occurs only in connection with standard shapes.

One of the two lines necessary for smoothing or recessing is missing. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

#### **(129) AXES TOO SHORT (WITH #K OR #R)**

This error occurs only in connection with standard shapes.

When smoothing or recessing between two lines, one of the lines is too short or the radius of the smoothed/recessed section is too big.

Possible causes are:

- logic error in the standard shape structure.  
Have standard shape checked.
- wrong input values with standard shape evaluation.  
Evaluate again with corrected input values.

### **(130) BLANK LINE**

This error occurs only in connection with standard shapes.

A blank line was found in the standard shape. Blank lines are not permissible in standard shapes. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

### **(131) ERROR IN SKIP FUNCTION**

This error occurs only in connection with standard shapes.

A variable assignment is expected after a skip function. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

### **(132) CALCULATION ERROR**

This error occurs only in connection with standard shapes.

This error message is displayed if a calculation error has occurred in mathematical functions. (for example, negative root argument  $\text{SQRT}(-5)$ ). Mathematical functions are often used with standard shapes and kerf calculations. Possible error causes are:

- Logic error in structure of standard shape

Contact service and have standard shape checked.

- Number overflow because input values are too high

Evaluate again with smaller input values.

### **(133) PROCESS STILL RUNNING**

Certain functions such as download of station constants, can only be executed if the basic state for the preselected process has been set.

"Switch off" the process in process control.

### (134) SELECT PROCESS FIRST

After setting up stations with the so-called station constants download, no process was preselected. If the operator, nevertheless, switches to the display of process dependent parameter values, this message will be displayed.

Preselect process in process control.

### (135) ALFE REPORTS ERROR <n>

Only for machines with an ALFE subsystem (Teach Trace Equipment).

Apart from the ALFE subsystem faults that are reported explicitly, other messages from the ALFE subsystem are displayed if the servicing mode is active. <n> is a hexadecimal number whose bits each have a different significance. Only the following bits are assigned:

xxxx xxxx xxxx xxx1	0001 RAM fault. The power-on self-test by the ALFE subsystem has discovered a memory error. The ALFE subsystem is no longer functioning reliably. LFE board defective.
xxxx xxxx xxxx xx1x	0002 ALFE system cycle time has been exceeded. The ALFE subsystem is no longer functioning reliably. Restart the control system. If the fault occurs again, inform our after-sales service.

The next three errors occur only in conjunction with the ASOD test system:

xxxx xxxx x1xx xxxx	0040 Overflow at ALFE interface. Only in conjunction with an ASOD test system connected to the LFE board. Check the interface parameters.
xxxx xxxx 1xxx xxxx	0080 Framing error at ALFE interface. Only in conjunction with an ASOD test system connected to the LFE board. Check the interface parameters.
xxxx xxx1 xxxx xxxx	0100 Parity error at ALFE interface. Only in conjunction with an ASOD test system connected to the LFE board. Check the interface parameters.
xxxx xx1x xxxx xxxx	0200 error 24 Volts. See error (220).
xxxx x1xx xxxx xxxx	0400 error 15 Volts. See error (221).
xxxx 1xxx xxxx xxxx	0800 DMA error. See error (222).
1xxx xxxx xxxx xxxx	Internal ALFE error. The ALFE subsystem is no longer functioning reliably. Restart the control system. If the error occurs again, inform our after-sales service.

### **(136) AUXILIARY FUNCTION <n> REPLACED <n> TIMES BY <n>**

Message in the program editor after the function "replace auxiliary function" has been performed. Thus: Auxiliary function 7 replaced 3 times by 51. Instead of the auxiliary function 7, the auxiliary function 51 has been employed, and this 3 times.

### **(137) KEY <n> DEPRESSED**

When starting the system, all keys of the control panel are checked. If one key is recognized as being depressed, this message is displayed.(except for keys activating the servicing mode).

If you have not pressed any key (including the joystick) during system startup, a key might be jammed. Switch off machine, press all keys and restart the system. If the fault has not been eliminated this way, the control panel might be defective.

Inform our after-sales service.

### **(138) SERVICING MODE ACTIVATED**

The servicing mode is activated by pressing the key combination SHIFT/F1 during the booting process of the control system. The following functions are then switched on:

- Blocked machine constants may now be edited
- Additional displays
- Display of synchronization errors of the ATHC and Panel-ASIOB-Bus
- Display of all messages of the ALFE subsystem
- Normalizing the battery RAM is now possible
- Expanded representation of the cutting data

You can only exit the servicing mode by restarting the control system.

### **(143) FUNCTION NOT ADMISSIBLE DURING PROGRAM RUN. SET BASIC SCREEN IN MOVEMENT WINDOW.**

During automatic program processing, functions such as "Edit constants" or startup functions may not be executed.

Complete program processing.

### **(144) END FUNCTION**

Functions such as "Edit constants" do not allow window switching. Enter all data in the service menu first and then end function with the **backspace** key.

### **(145) END PROGRAM EXECUTION**

You have tried to switch to the servicing menu while a program execution was running in the movement window. This is not allowed. Changing constants or executing start-up functions while the machine is processing a program would interfere with the processing of the program.

### **(147 - 150) WRONG PARAMETER INTERFACE <n>**

An invalid value has been entered in the device constants for the serial interface <n>. This error message can also be displayed when a device has been assigned more than once to various interfaces.

Check device constants.

### **(151) MARKED SECTION TOO LARGE**

The marked section cannot be loaded into the buffer memory since the number of marked characters is too large.

Copy or shift the program part in several steps.

### **(152) PROGRAM EXPANSION TOO BIG**

The dimensions of the program for automatic processing is bigger than the current working range or the starting point (program zero point) is located at an incorrect spot within the working range. The program expansion can also exceed the limits because of wrong scale setting.

However, the program can be executed until it reaches the soft limit switch.

Correct program zero point.  
Check scale.

### **(153) FLOPPY DISK <0 | 1> IS WRITE PROTECTED**

Floppy disk is write protected.

Remove write protection or use a different floppy disk.

#### **(154) FLOPPY DISK <0 | 1> IS FULL**

A maximum of 200 programs or 1MB can be stored in the internal memory (floppy disk 0). If these limits are exceeded, delete some existing programs.

A maximum of 224 programs or 1.44MB can be stored in the external memory (floppy disk 1). If this error occurs on the external drive (option), a different floppy disk can be used.

#### **(155) FLOPPY DISK <0 | 1>: GENERAL ERROR <m>**

Error when accessing the floppy disk. Floppy disk 0 is the system floppy disk (internal memory), Floppy disk 1 is for the external drive. Possibly, the control system is no longer operational.

Note error number <m> and forward damaged floppy disk to ESAB service. If the damaged disk is the system disk, inform ESAB service.

#### **(156) ERROR READING FROM <n>**

File <n> on the system floppy disk is defective or missing. The error-free functioning of the control system is no longer guaranteed.

Use a copy of the backup disk and contact service.

#### **(158) MACRO DEFINITION FILE NOT FOUND**

The control can be equipped with the option "Key Teach". With "Key Teach", operating sequences can be recorded and later on executed by just one keystroke. In order to have these operating sequences available even after restarting the machine, they are stored in the system file MAKROS.DEF. If this file cannot be read from the system floppy disk, this error message is displayed. MAKROS.DEF is created without content.

Some functions for controlling the burner-holder are connected to macro keys. It is possible that these functions can no longer be executed. If this is the case, use a copy of the backup disk and contact service.

#### **(159) SYNTAX ERROR IN MACRO DEFINITION FILE**

The control system may be equipped with the system add-on "Key Teach". With "Key Teach", operating sequences (macros) can be recorded and later executed by just one keystroke.

The macro definition file MAKROS.DEF is defective.

MAKROS.DEF is created empty.

Functions for controlling the cutter-holding carriage that are connected to macro keys can no longer be executed. If this is the case, use a copy of the backup disk and inform our after-sales service.

### **(160) WATCHDOG**

The 8031 subsystem broke down or is malfunctioning. If this error occurs, the voltage is switched off immediately. The 8031 subsystem board (DIO) may be defective.

If this error occurs repeatedly, inform our after-sales service.

### **(161) ERROR ASIOB / ATHC-2**

Data transfer to and from the control and the stations is done with a serial bus, the ASIOB. For machines with ATHC stations, the data is transferred to these station cards. For the ABIMBO version, the bus ends at a converter card.

The serial transfer of the ASIOB is protected by a so-called synchronization error bit. Single errors are compensated by the subsystem software. If there is more than an average of 30% synchronization errors within a certain period of time, this error message will be generated .

Possible causes are: The involved bus cards (DIO, ABIMBO) are defective or there are powerful interfering fields (especially with plasma machines).

If the error occurs again after restarting the system, contact service.

In the service mode, the display of synchronization errors gives information on the rates of the interfering errors that have occurred.

### **(162) ERROR CONTROL PANEL**

Keyboard information is sent from the control panel to the control system via a serial bus, the ASIOB. The serial transfer of the ASIOB is protected by a so-called synchronization error bit. Single errors are compensated by the subsystem software whereby key information may possibly be lost. If there is more than an average of 30% synchronization errors within a certain period of time, this error message will be generated. Possible causes are: The involved bus cards (DIO, BD) are defective or there are powerful interfering fields (especially with plasma machines).

An interruption of the connection (cable) to the control panel can also cause this error.

If the error occurs again after restarting the system, contact service.

In the service mode, the display of synchronization errors gives information on the rates of the interfering errors that have occurred.

### **(163) EMERGENCY STOP CHAIN INTERRUPTED**

Either "Emergency stop" is pressed or the power supply is interrupted.

Check emergency stop

### **(164) # <n> ERROR FORMAT**

Program line <n> contains a syntax error.

Program format ESSI:

- wrong number of signs
- auxiliary function not recognizable.
- wrong axis index
- wrong parameter

Program format EIA:

- system add-on "EIA-Format (DIN 66025)" does not exist
- wrong M-function
- invalid addresses
- with existing system add-on "EIA-Format (DIN 66025)", the transducer file (EIAWDL.BIN) on the system floppy disk might be defective. Use the backup disk in this case and contact service.

Check program structure.

### **(165) # <n> ERROR CIRCLE**

The programmed geometry in program line <n> is not correct.

- the machine constant "circle mode" is not set correctly.
- the radius of the circle measured from starting to center point deviates in more than 10 program units from the radius between center and finish point

Check program structure.

### **(166) # <n> LOSS OF AUXILIARY FUNCTION**

The auxiliary function in program line <n> is not being executed. Possible reasons for this are:

- there are too many auxiliary functions following one another in the program
- geometries with a zero length of path are generated because coordinates are too small. Auxiliary functions that originally belonged to these coordinates are assigned to the following geometry. A wrong kerf value or scale can also cause existing geometries to be disregarded.

Check program structure.

**(167) # <n> LOSS OF COMMENT**

Comment in program line <n> can not be displayed during program execution.

Check program structure.

**(168) # <n> LOSS OF GEOMETRY**

The secondary axis geometry in program line <n> is not being executed. There are too many secondary axis geometries in the program following directly one another without a main axis geometry.

Check program structure.

**(169) # <n> CENTER OR FINISH POINT GREATER THAN 1.3 MILES**

The arc of circle in program line <n> contains a value that exceeds the maximum size (1.3 miles or  $1 \cdot 10^6$  inches) of the internal working cells. The arc can not be processed.

**(170) REFERENCE CAM <n> - FREE AXIS**

The reference point of the machine can only be recognized if the machine finds the reference point switch only during movement. This error message is displayed when the machine is located at a reference switch and the operation mode "Reference movement" is activated.

Free machine from reference cam by manual control. .

**(171) DEFINITION FOR STATION <n> NOT FOUND**

Only machines with ATHC stations.

Parameters that are used to set an intelligent station (ATHC card) are read from a file on the system floppy disk. Every station has its own parameter file. The parameters for station <n> do not exist on the system floppy disk or the relevant file is defective.

This error message is only relevant for stations which are attached to the machine. If there is a station attached to the machine, use a copy of the backup disk and contact service.

The parameter files are called STATn.KON. Replace n by a number from 01 to 06.

### **(172) ERROR WRITING <n>**

File <n> cannot be written. If this error occurs when accessing the internal memory (system floppy disk), error-free functioning of the control system can no longer be assured.

Use a copy of the backup disk and inform our after-sales service.

If the machine is equipped with the optional external drive, the floppy disk might be defective.

Insert or change floppy disk in external drive. If the error cannot be corrected in this way, inform our after-sales service.

### **(174) FORCE LIST FULL**

At the control, there is a so-called signal display used as a service help. With this display messages from and to the machine program (MIP) can be traced and partially changed. Changing input and output signals is done by forcing. This message indicates that the maximum number of signals (max. 16) that can be forced simultaneously has been reached. .

Cancel forcing orders that are no longer necessary.

### **(175) TIMEOUT**

Serial link could not be established in predefined time (device constants). This error can occur when:

- the timeout value for an interface is too low
- interface parameters are set incorrectly
- the serial link cable is defective.

Increase timeout value in device constants or check serial link.

### **(177) TRANSFER ABORTED**

Error during program transfer with UDL. Data transfer is protected by a checksum. After the transfer of a block has been completed, the receiving computer calculates the checksum. If the calculated checksum does not correspond to the one transferred, the receiving computer sends a negative acknowledgment. If this error occurs three times in a row the control system aborts the data transfer.

### **(180) INVALID CONSTANTS AT STATION <n>. EXECUTE DOWNLOAD!**

Only for machines with ATHC stations.

The ATHC board of station <n> reports that the parameters set are not logical. Execute a station-constants download to this station. If this error occurs repeatedly the ATHC board might be defective.

Inform our after-sales service.

### **(181) DOWNLOAD ERROR AT STATION <n>**

Only machines with ATHC stations.

After parameter transfer to station <n> (station constants download), the control does not receive positive feedback from the ATHC card that the download was successful. This station should not be used, since it is not clear with which parameters the station is being provided at the moment.

Contact service.

### **(182) POWER SUPPLY INTERRUPTED AT STATION <n>**

Only for machines with ATHC stations.

All stations report defective states to the control system. This error message is displayed if

- the power supply is interrupted at an active (selected) station
- the station is selected manually or by means of the partprogram
- a MIP initialization takes place. A MIP initialization takes place each time 24 Volt is switched on.

Contact service.

### **(183) TURN ON SWITCHING VOLTAGE**

The switching voltage has to be turned on for certain functions, for example, traversing.

Press SHIFT/START to turn on the switching voltage.

### **(184) NO RESPONSE FROM STATION <n>**

Only for machines with ATHC stations.

No response from the station after a station constants download (set-up) to the station.

The ATHC card must react to a download in form of either a negative or a positive confirmation. If there is no response after a certain period of time necessary for reaction, this message is displayed.

This message is suppressed if the MIP simulation bit 2 is set (SYS.KON 5).

Contact service.

### **(185) AUTOMATIC REFERENCE MOVEMENT NOT POSSIBLE**

Only for machines with system add-on "Automatic reference point movement".

The automatic reference point movement cannot be executed due to incorrect machine constants. For this movement, direction and sequence of the individual reference point movements are entered in the machine constants MC 64 and MC 65.

Check machine constants MC 64 and MC 65.

### **(186) ERROR CHECK SUM BATTERY RAM**

If this message is displayed after a change in software, ignore it. If it occurs during operation, it may indicate a defective RAM module or an empty battery. The DIO card has to be exchanged. It may be possible to continue work, however, all input data and parameters such as repetitive offsets have to be checked for correctness. <n> determines the battery-RAM area.

If this error occurs repeatedly, contact service.

### **(187) INCOMPATIBLE FLOPPY DISK FORMAT**

System cannot write to 720KB floppy disks.

Use 1.44 MB floppy disk.

### **(195) NO POTENTIOMETER DATA**

Only for machines with ATHC stations.

This error message is displayed when the menu for additional cutting records (flame control menu) has been selected, the corresponding data, however, cannot be read error-free.

Use a copy of the backup disk and inform our after-sales service.

### **(196) THIS MACRO KEY HAS BEEN ALLOCATED MACHINE FUNCTIONS AND CANNOT HAVE A NEW MACRO RECORDED**

You have tried to record a macro for a macro key that is pre-assigned to a machine function, such as "Raise station". This is not allowed. Only those macro keys can be re-assigned that are not already assigned to machine functions.

### **(197) MACRO RECORDING TERMINATED, MEMORY FOR MACRO KEYS FULL**

The control system may be equipped with the system add-on "Key Teach". With "Key Teach", operating sequences can be recorded and later executed by just one keystroke. The necessary data is stored in a "macro memory". If no more memory is available during recording, this message is displayed. The recorded macro cannot be used.

Delete macros that are no longer needed.

### **(200) TOO MANY INPUT VARIABLES**

This error occurs only in connection with standard shapes.

There are more than 45 input variables declared in the standard shape. This is caused by a logic error in the structure of the standard shape.

Contact service and have standard shape checked.

### **(201) FOR RENEWED PROCESSING - SELECT PROGRAM AGAIN**

In automatic mode with sectional prekerf, a processed program cannot be processed again by pressing the start key, because the necessary data has to be read again.

Select program anew.

### **(202) <X Y Y2 P> -AXIS REACHED SOFT LIMIT SWITCH**

The corresponding axis/axes has/have reached the soft limit switch.

Free axis/axes.

Soft limit switches are set in the machine constants MC. If there is a system add-on "Separated working ranges", it is possible that the machine is operating in the wrong working range.

### **(203) TOO MANY DATA RECORDS FOR PROGRAM PREPARATION**

The program for automatic processing contains too many data records (program lines). This program cannot be processed.

The system add-on "Sectional prekerf" is available for processing bigger programs.

#### **(204) REFERENCE NECESSARY FOR THIS FUNCTION**

This message can occur after selecting the automatic resp. teach trace mode.  
After switching on the control system or after voltage loss, the current position of the machine in relation to the machine zero point or the reference point is unknown.

If the machine is equipped with a reference point system (MC 52 = 1), a reference point movement has to be executed.

For machines without a reference point system (MC 52 = 0), the machine has to be moved to the zero point. This position will then be adopted as a reference point.

#### **(205) SET REFERENCE POSITION OF MAIN TOOL FIRST**

The control system supports the measuring of the tool offsets when several tools are put into operation.

Before the tool offsets can be measured, the reference position of the main tool has to be defined.

#### **(206) REFERENCE POSITION OF MAIN TOOL ALREADY SET**

Message displayed during adjustment of tool offsets. For a new adjustment of the reference position, the function has to be terminated and restarted from the beginning.

#### **(207) PPT ACTIVE**

This message is displayed when PPT and UDL have been installed at one interface and UDL is activated while a PPT data transfer is active. A UDL connection cannot be established at the moment because the line is used for PPT.

Wait and try again later.

#### **(208) <Type of error> IN FUNCTION <Mathematic function>.**

For example, DOMAIN IN FUNCTION SQRT. If this error occurs, please contact service. The machine has to be restarted. Possible error causes are:

- Standard shapes were not evaluated with useful values
- Kerf calculation with very small coordinates
- Discrepancy between program unit and geometry (extremely large, extremely small)

**(209) DIVISION BY ZERO WITH <n>**

Internal error. Normally, it is possible to continue processing the current function after restarting.

Note down message together with current function and contact service.

**(210) CAUTION - INVALID SYSTEM CONFIGURATION!**

The checksum of the system file ANCDEF.KON is not correct. A different configuration of the machine has been entered compared to the one at the time of delivery. It is possible that optional functions are no longer available or that functions are displayed that the machine is not equipped with.

The machine can still be operated. However, it is necessary to inform our after-sales service.

**(212) COMPLETED CONTOUR**

This message is displayed in Teach Trace. The contour has been completed and the recording was stopped.

**(213) # <n> TOO LONG**

This message is displayed during program execution. Block number <n> has more than 80 characters. Only the first 80 characters are interpreted. This might result in geometry being lost or the block being shortened to such an extent that a format error arises.

The execution of the program should be aborted. Check program structure.

**(214) FUNCTION ABORTED**

**(215) ERROR READING CUTTING-DATA FILES**

The cutting data (timer and process values] are displayed in the "parameter" window. When starting the system, they are read from the corresponding files on the system floppy disk. When this error occurs, one or more of these files are defective or missing.

If the machine is equipped with the function "Programmable cutting data" this message is also displayed when you try to reload a defective cutting file.

Use a copy of the backup disk and inform our after-sales service.

The cutting-data files include:

DEF.TEC  
PARAM.CUT

and POTI.CUT if the machine is equipped with "Flame control".

### **(216) NO CUTTING DATA AVAILABLE**

This error only occurs if the machine is equipped with the function "Programmable cutting data".

This message is displayed if the identifiers for the cutting data cannot be found in the cutting file when it is reloaded, or if a main program contains cutting-data identifiers but no cutting data.

Use a copy of the backup disk and inform our after-sales service.

### **(217) NO VALID CUTTING DATA STORED**

This message is displayed when the "parameter" window is activated and there are no valid cutting data available. A possible reason for this is an incorrect reading of the cutting files at system start, i.e. the files

PARAM.CUT and/or  
DEF.TEC

are defective or missing.

Use a copy of the backup disk and inform our after-sales service.

### **(219) EXCESSIVE NESTING OF SUBROUTINES**

Message during a program execution. Subroutines within subroutines within subroutines are being called. The maximum nesting level is ten deep. The program cannot be executed.

Check program structure.

### **(220) ALFE - 24-VOLT SUPPLY MISSING**

Only for machines with an ALFE subsystem.

The ALFE subsystem requires a 24-volt supply. This is no longer available. Possible reasons for this include:

- Cable break.
- Plug has slipped off the LFE board.
- LFE board is defective.
- Power supply unit is defective.

The controls continue to operate correctly, but the Teach Trace function is no longer available.

Inform our after-sales service.

### **(221) ALFE - 15-VOLT SUPPLY MISSING**

Only for machines with an ALFE subsystem.

The ALFE subsystem requires a 24-volt supply. If this is no longer available, the 15 volts generated from it are also missing. Causes for the lack of the 24-volt supply are described under error number 220.

If only the message that the 15-volt supply is missing appears, the voltage transformer of the LFE board is defective.

The controls continue to operate correctly, but the Teach Trace function is no longer available.

Inform our after-sales service.

### **(222) ALFE - DMA ERROR**

Only for machines with the an ALFE subsystem.

DMA is a technique for transmitting data between the AK5 camera head and the LFE board. If no data can be transmitted, this message is generated. Possible causes are:

- Plug of LFE<->AK5 connecting cable is not plugged in properly (on AK5 or on LFE board).
- Break in LFE<->AK5 connecting cable.
- AK5 camera head defective.
- LFE board defective.

The controls continue to operate correctly, but the Teach Trace function is no longer available.

Inform our after-sales service.

### **(223) INTERNAL LOGGING ERROR A:<n> D:<n> B:<n>**

An error has occurred when writing the logging data. The current data record is lost. If this error occurs note the values displayed in the error message, store logging file on external floppy disk and inform our after-sales service.

The machine can be operated as before.

### **(231) DIRECTORY TRANSFER IS ACTIVE**

Message during UDL. You have requested the host computer's directory. As long as this message is displayed, transmission of the directory is active. This may take some time, depending on how many programs there are on the host computer.

As long as this message is showing, no UDL function keys can be pressed.

### **(232) MEASURING POINT CANNOT BE REACHED**

During automatic plate alignment, the edges of the plate are detected at three points with a sensor. For this measuring procedure, the sensor is lowered into its operating position and traversed in the direction of an edge of the machine.

This error message is issued if no plate edge is detected.

Possible causes of the error:

- The sensor is defective or set incorrectly
- The sensor cannot reach the edge of the plate because its positioning range does not allow it to detect the plate edge. It may be necessary to place the plate in a different position on the machine.

### **(233) THIS FUNCTION IS BLOCKED BY ANOTHER FUNCTION AT THE MOMENT.**

Different sections of the control system use the same memory area to store data. Thus, certain functions cannot be performed at the same time. These are:

- Editor and Teach Trace
- Editor and editing constants
- Nesting and Teach Trace
- Nesting and editing constants
- Standard shapes and Teach Trace
- Standard shapes and editing constants

Check which of these functions is still active. This function must then be ended first, before the desired new one can be performed.

### **(234) BLOCK <n> / OFFSET <n> NOT FOUND IN FILE <n>.**

Message during a program run. The return from a subroutine cannot be executed. Processing is faulty. Execution of the program should be aborted.

The most likely cause of this message is that the main program has been overwritten by a parallel program transfer, so that the return address from the subroutine back to the main program can no longer be found.

**(235) LABEL <n> NOT FOUND IN FILE <m>**

This error message occurs during program preparation if a destination address in a file was not found.

In order to correct this error, check the jump commands in the program.

**(236) SENSOR TRIGGERED**

During automatic plate alignment, the edges of the plate are detected at three points with a sensor. For this measuring procedure, the sensor is lowered into its operating position.

This error message is issued if the sensor already detects the plate surface before being lowered into the starting position for the measurement.

Possible causes of this error:

- The sensor is defective
- The measuring station's automatic height sensor is set so the station does not retract the sensor far enough from the plate surface in its idle state.
- The sensor's sensitivity has been set incorrectly.

**(237) PLEASE WAIT, MIP BEING INITIALIZED**

At each MIP initialization (switching voltage turned on), the ATHC stations are normalized. During this period, you must not switch to the process, parameter, or station windows. If this is attempted, this message will be issued.

**(238) MEMORY MANAGEMENT ERROR IN MODULE <n>**

Fatal error. An error has occurred in the internal memory management functions. The control system must be restarted in all cases. Inform our after-sales service.

**(241) PLEASE RESTART CONTROL SYSTEM NOW**

The battery RAM was reset. In order to have access to the current state of the battery RAMs on the control system, the control system must be restarted.

**(243) Y1 CARRIAGE MUST BE TRAVELLING DURING PLATE ALIGNMENT**

The position of the plate edge is determined using the points which were approached with the Y1 carriage. If the position of another Y carriage is important to the execution of the program, this Y carriage can be traversed in addition to the Y1 carriage.

## 7 Data Window

The data window opens functions for entering, receiving, controlling, changing and generating data. The main tasks are displayed as menu items in the basic menu of the data window.



	Program input-output
	Internal memory, administration (page 84)
	Activate standard shapes (page 87)
	Edit programs (page 94)
	
	

### Program Input-Output

UDL (Up Down Load) (page 69)  
XON-XOFF

### **Internal Memory, Administration**

- Directory of all main programs
- Deletion of programs that are no longer necessary

### **Activate Standard Shapes**

Standard shapes are programs with predefined contours. With a change in parameters, main programs can be generated from these standard shapes.

- Selection of an appropriate standard shape
- Change of parameter with graphic support
- Graphical representation of generated main program

### **Edit Program**

The program editor supports the functions:

- Creating a new program
- Changing an existing program
- Graphical representation of a program
- Line deletion
- Block deletion
- Copying of blocks
- Searching help functions
- Searching line numbers
- Replacing help functions

## 7.1 UDL (Up - Download)

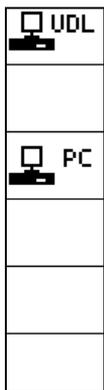
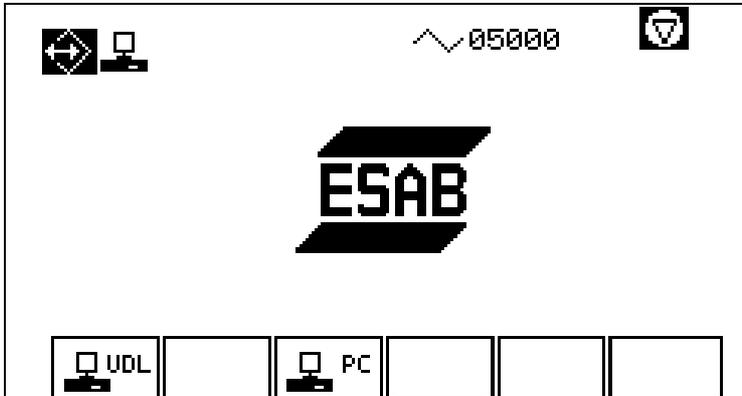
UDL is the abbreviation for Up - Down Load. UDL is used for the protected data transfer from an external computer to the control system. Supported by the directory display of the connected computer, main programs can be transferred to and from the control system.



	<b>Program input-output</b> (page 70)
	Internal memory, administration
	Activate standard shapes
	Edit programs

## Selecting UDL

Data transfer with UDL is an add-on to the control. The symbol for UDL is not displayed, if UDL is not available.



Select UDL (page 71)

Select XON/XOFF-mode

### UDL - Basic Screen

Loading and storing main programs.

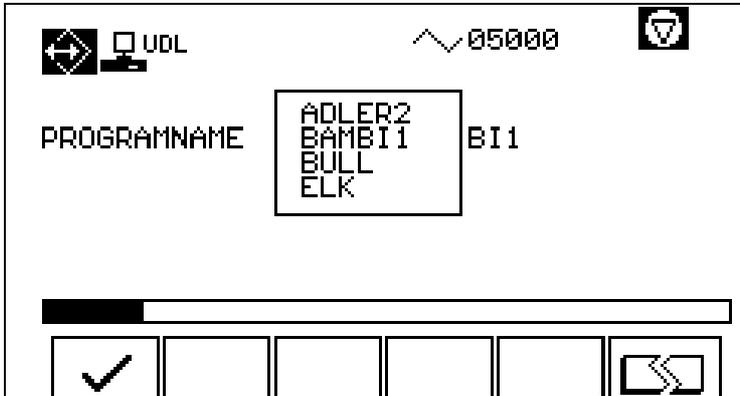


Load main programs (page 72)

Store main programs (page 73)

### Loading Main Programs

A selection box with the directory of the host computer is opened. The program that is to be transferred to the control system, is selected with the cursor keys.

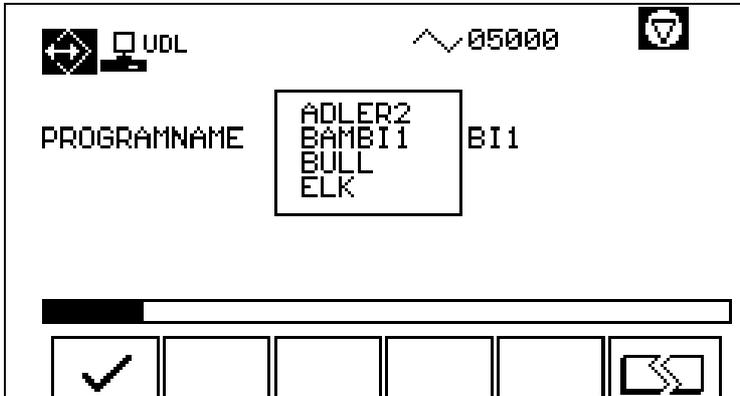


Adopt program name and start data transfer to control system.

No adoption. Terminate loading function.

### Storing Main Programs

A selection box with the directory of the control is opened. The program that is to be transferred to the host computer, is selected with the cursor keys.

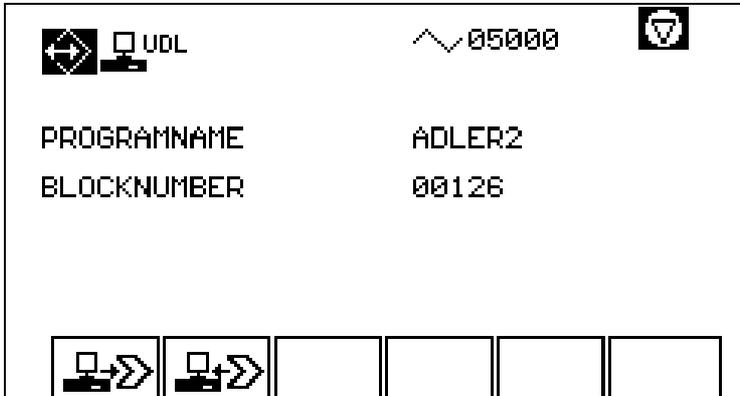


Adopt program name and start data transfer to host computer.

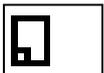
No adoption. Terminate the storing function.

### During Data Transfer

The number of transferred lines is displayed during data transfer, no matter whether to the control or to the host computer.



Function keys ineffective during transfer.



The **backspace** key terminates a data transfer.

## 7.2 Floppy Disk Drive

### Note

The following functions are only available if the control is equipped with a floppy disk drive.

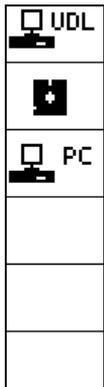
Selecting program input-output.



	<b>Program input-output</b> (page 76)
	Internal memory, administration
	Activate standard shapes
	Edit program
	
	

### Selecting Floppy Disk Drive

The floppy disk drive is an add-on. The symbol is only displayed when the add-on has been installed.



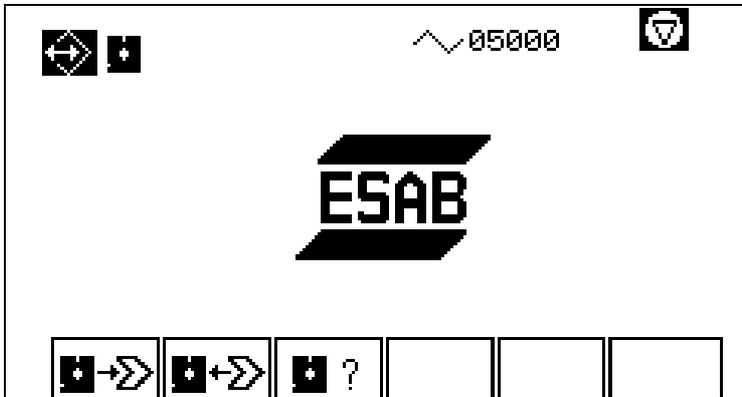
Select UDL.

**Select floppy disk drive** (page 77)

Select XON/XOFF-mode

### Floppy Disk Drive - Basic Screen

Loading and storing main programs as well as displaying the directory of all main programs.



	Load main programs (page Fehler! Textmarke nicht definiert.)
	Store main programs (page Fehler! Textmarke nicht definiert.)
	Directory of all main programs (page Fehler! Textmarke nicht definiert.)

### 7.3 XON - XOFF mode

Selecting program input-output.



**Program input-output.** (page 79)

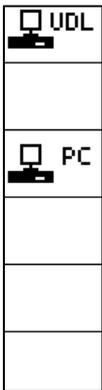
Internal memory, administration.

Activate standard shapes.

Edit program.

### Selecting XON - XOFF mode

XON - XOFF mode is an add-on. The symbol is only displayed when the add-on has been installed.



SelectUDL.

Select XON/XOFF - mode. (page 80)

### Basic Screen XON - XOFF mode

Loading and storing of main programs.

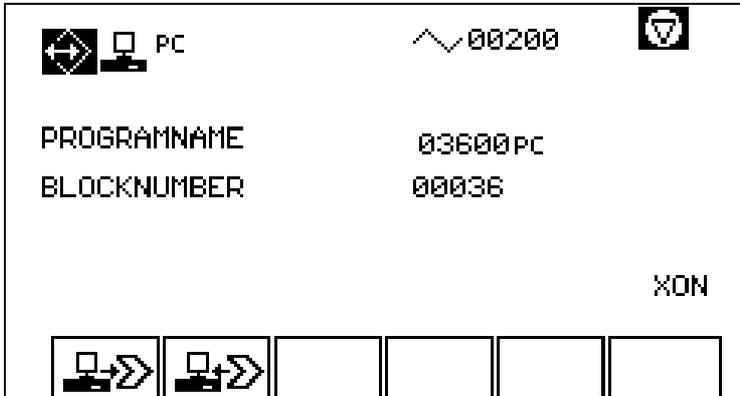


Load main programs. (page 81)

Store main programs. (page 82)

### Loading main programs

The number of transferred lines is displayed during data transfer. If the program has no name it will be stored under "NONAME".



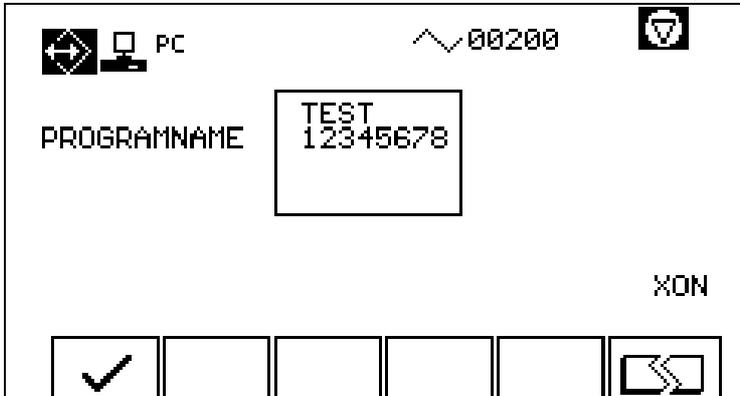
Function keys ineffective during transfer.



The backspace key terminates the data transfer. (page 80)

### Storing main programs

A selection box with the directory of the control is opened. The program that is to be transferred to the host computer, is selected with the cursor keys.

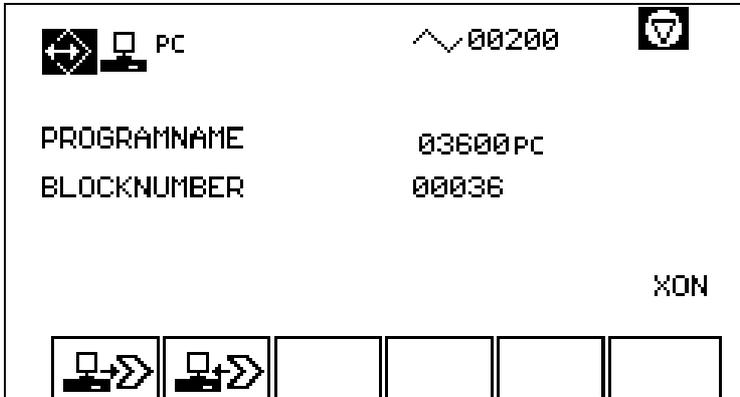


Adopt program name and start transfer. (page 83)

No adaption. Terminate the storing function.

### During program transmission

The number of transferred lines is displayed during data transfer.



Function keys has no effect during program transmission.



The backspace key abort the program transfer. (page 80)

## 7.4 Internal Memory, Administration

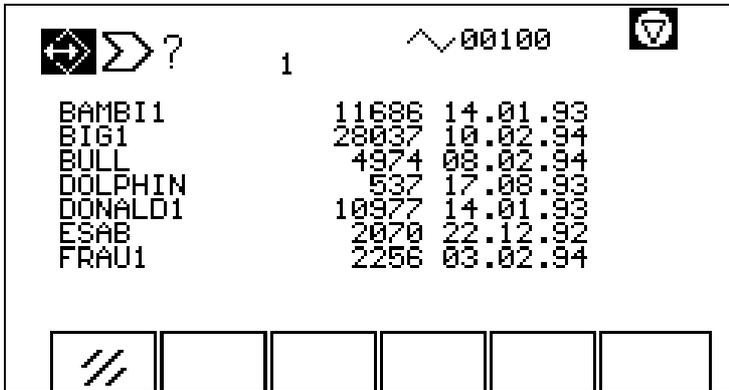
Directory of all main programs in the internal memory.



	Program input-output
	<b>Internal memory, administration</b> (page 85)
	Activate standard shapes
	Edit programs
	
	

### Overview Of All Main Programs

The first column lists the names of the programs in the internal memory. To the right is the corresponding size of the program in bytes as well as the latest transaction date. The program marked by the cursor can be deleted.



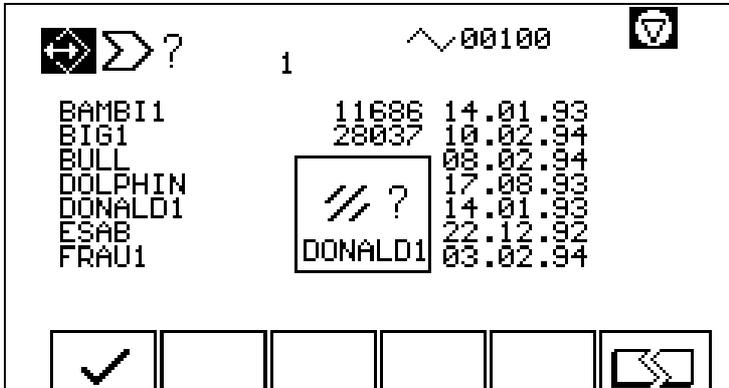
Program Name	Size (bytes)	Transaction Date
BAMBI1	11686	14.01.93
BIG1	28037	10.02.94
BULL	4974	08.02.94
DOLPHIN	537	17.08.93
DONALD1	10977	14.01.93
ESAB	2070	22.12.92
FRAU1	2256	03.02.94



Delete program marked by cursor. (page 86)

### Delete program

To make sure that files will not be deleted accidentally a inquiry box appears.



Delete program and return to overview. (page 85)

Do not delete program and return to overview. (page 85)

## 7.5 Activate Standard Shapes

Standard shapes are programs with predefined contours. With a change in parameters, main programs can be generated from these standard shapes.

The function "Activate standard shapes" provides a graphic overview of all existing standard shapes.

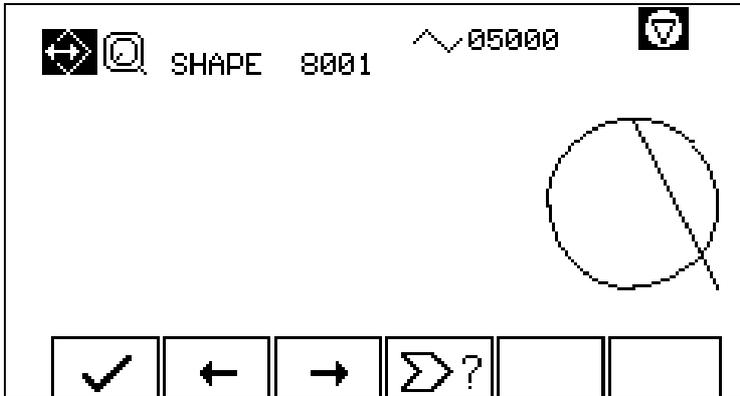
Changing parameters is done with graphical support.

Graphical representation of generated main programs.



	Program input-output
	Internal memory, administration
	<b>Activate standard shapes</b> (page 88)
	Edit programs
	
	

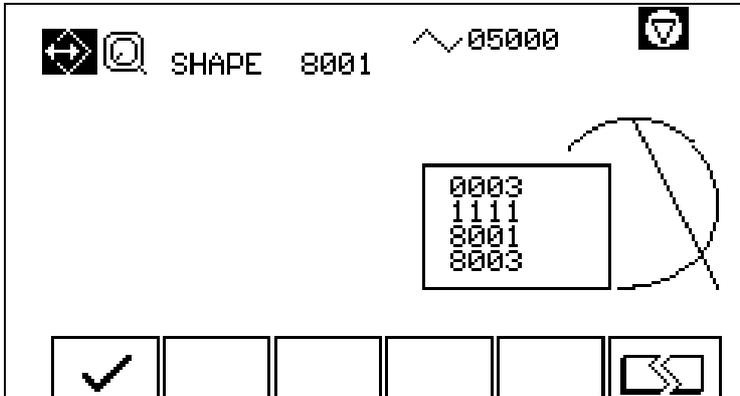
### Selecting the Standard Shape to be Activated



	Select standard shape (page 90)
	Display previous standard shape
	Display next standard shape
	Select standard shape through selection box Directory of all available standard shapes (page 89)
	
	

### Selecting a Standard Shape with the Selection Box

Select a program with the cursor keys. Or enter the program number directly. The cursor will then be positioned automatically.



Adopt program number, return to display of standard shapes (page 88)

No adoption, return to display (page 88)

### Entering the Name of the Main Program to be Generated

Enter the name of the program that is to be generated. Use digit or letter keys, or the letter line on the screen.

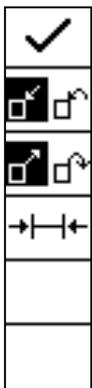
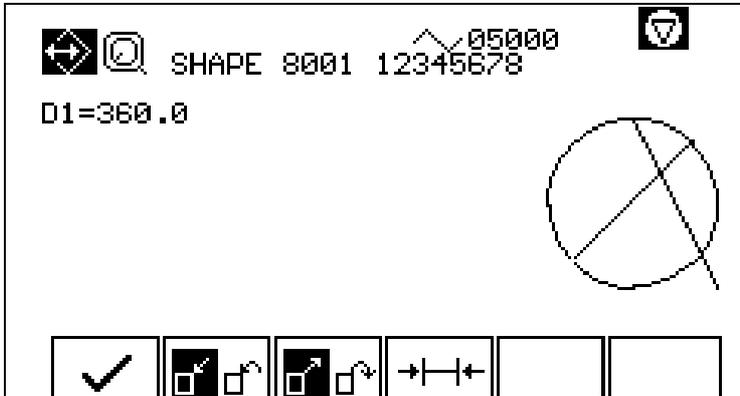
		SHAPE		05000	
			8001		
PROGRAMNAME		12345678			
BCDEFGHIJKLMNOPQRSTUVWXYZ					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Adopt program name and enter into parameter change (page 91)

## Changing Parameters

The flashing line in the graphical representation moves synonymously to the cursor in the textual representation. This way it is clear, which geometry part the current parameter refers to.



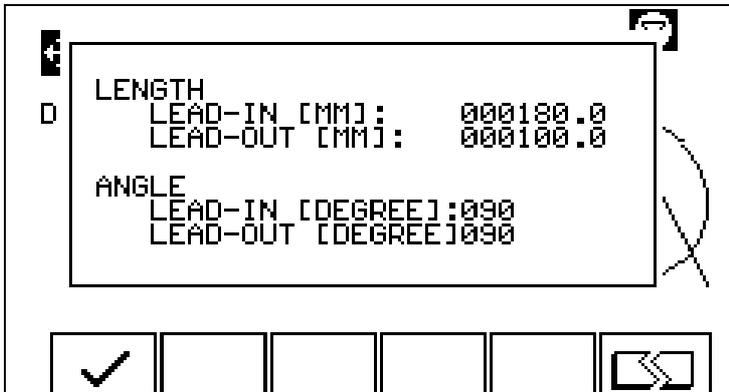
Generate main program (page 93)

Type of lead-in, straight line or circle

Type of lead-out, straight line or circle

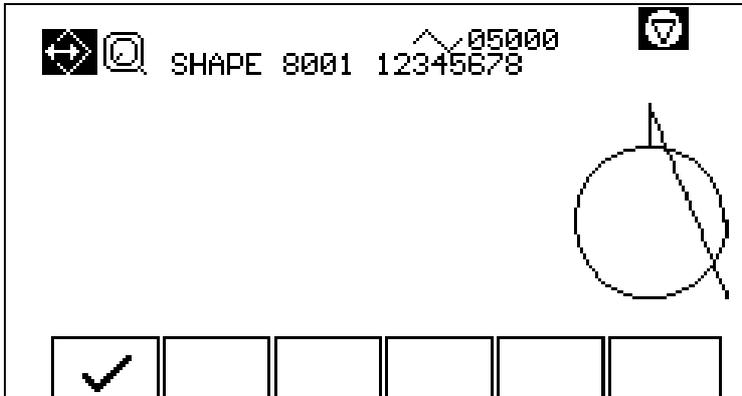
Enter lengths and angles for lead-in generation (page 92)

### Entering Lengths and Angles for Lead-in Generation



Adopt parameter and return to parameter entry (page 91)

### Representation of the Generated Main Program



<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Adopt generated main program (page 87)

## 7.6 Program Editor

Main programs can be created and changed with the functions of the program editor. In addition, the main program can be represented graphically.

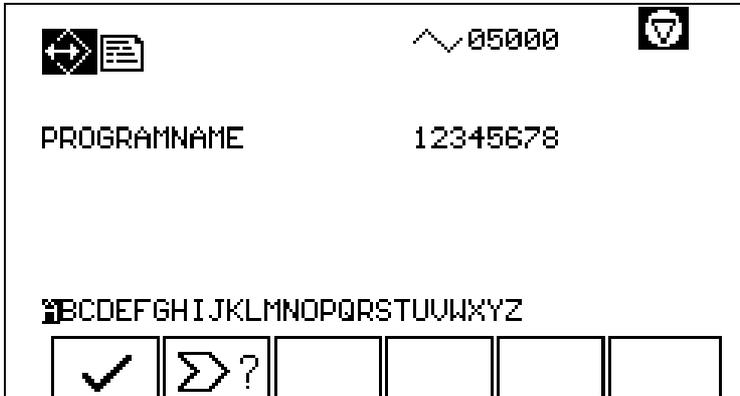
When selecting the program editor, enter the name of the program to be edited. If the program is available from the internal memory, it will be loaded into the editor. Otherwise the program will be created anew.



	Program input-output
	Internal memory, administration
	Activate standard shapes
	<b>Edit programs</b> (page 95)
	
	

### Selecting a Program Name

Enter the name of the program that is to be edited. Use the digit or letter keys, or the letter line on the screen. Furthermore, it is possible to select a program that already exists in the internal memory.

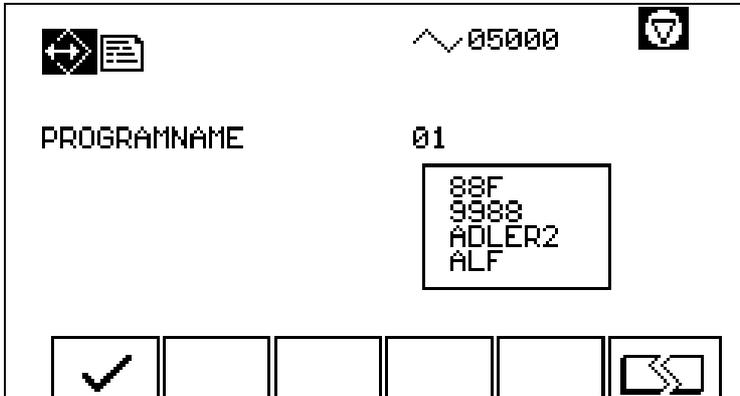


Adopt program name and enter into program editor. (page 97)

Display directory of internal memory for the selection of a program name (page 96)

### Selecting a Program Name from the Directory

Select a program with the cursor keys. Or enter the program name directly. The cursor will then be positioned automatically.

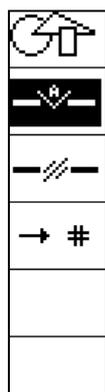
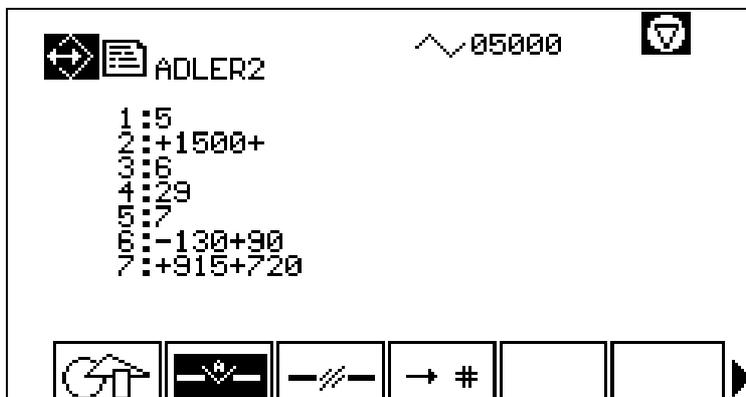


Adopt program name, open program and enter into editor. (page 97)

No adoption. Return to program name entry. (page 95)

## Textual Representation in the Program Editor - Basic Screen

The name of the current program is displayed in the top line. The cursor is controlled with the cursor keys.

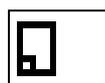


Switch to graphical representation (page 99)

Insert mode (inverse) or overwrite mode (normal). Basic setting is insert .

Delete line in which the cursor is positioned.

Go to block number. An input box opens. and the desired block number can be entered. (page 100)



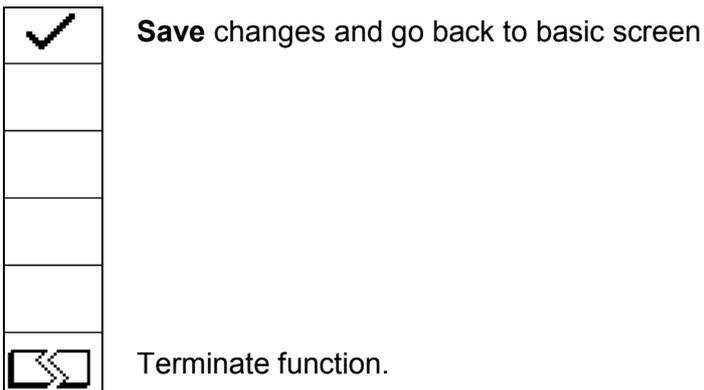
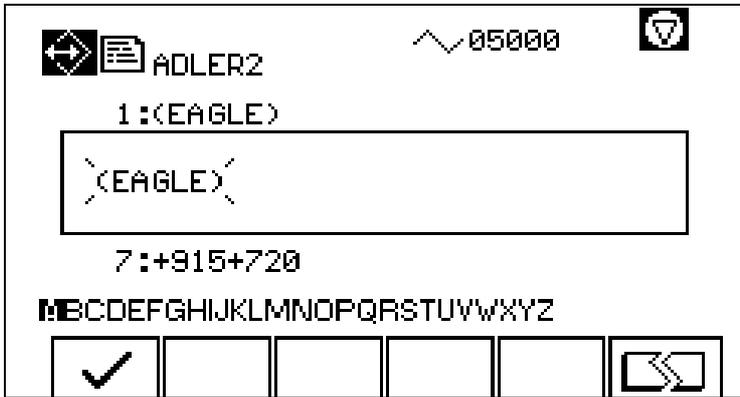
End editing (page 105)



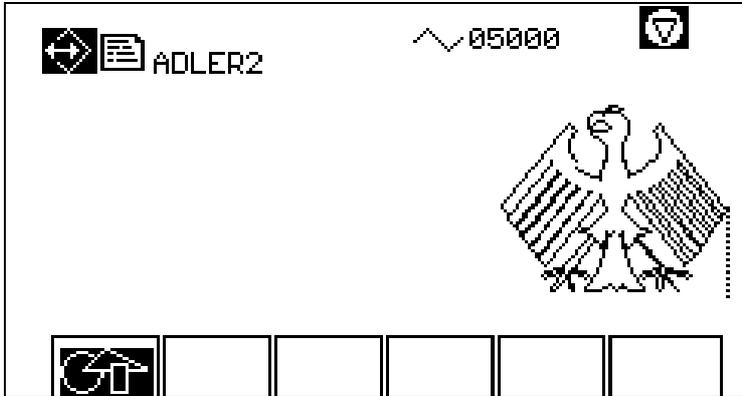
Further functions (page 101)

## Using Letter Line

Changing a program line use digit or letter keys or the letter line on the screen. To select a letter in the letter line press the shift key and cursor left/right simultaneously. The selected letter is added in the program line by pressing the enter key.



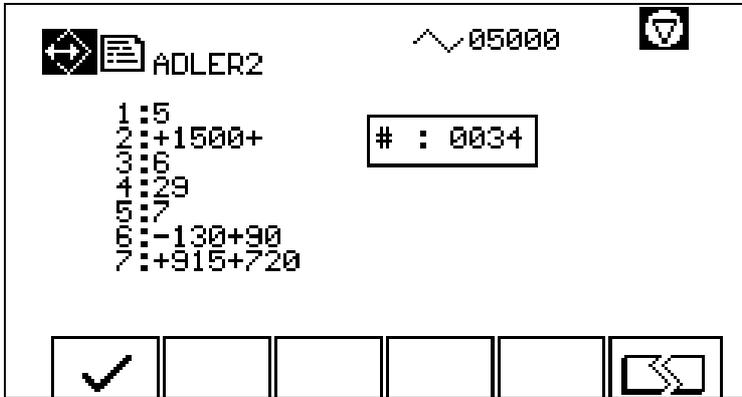
### Graphical Representation in the Program Editor



Graphical representation is active. Press key to return to textual representation. (page 97)

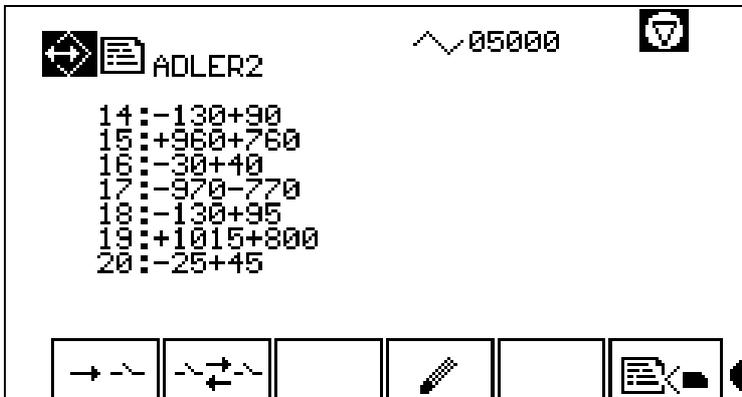
### Searching Block Number

Enter the block number to be searched.



- Search specified block number. (page 97)
- 
- 
- 
- 
- 
- Terminate function (page 97)

### Textual Representation in the Program Editor - More Key

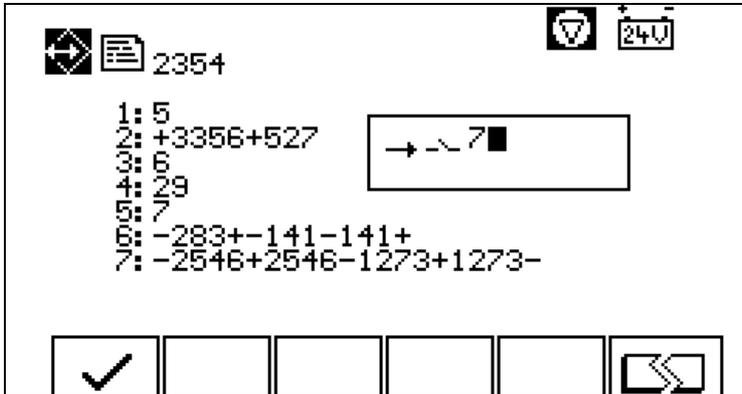


-  Search auxiliary function (page 102)
-  Replace auxiliary function with auxiliary function (page 103)
- 
-  Mark lines to delete (page 104)
- 
-  Insert block at cursor position

The **more** key switches back to the basic screen. (page 97)

### Searching Auxiliary Function

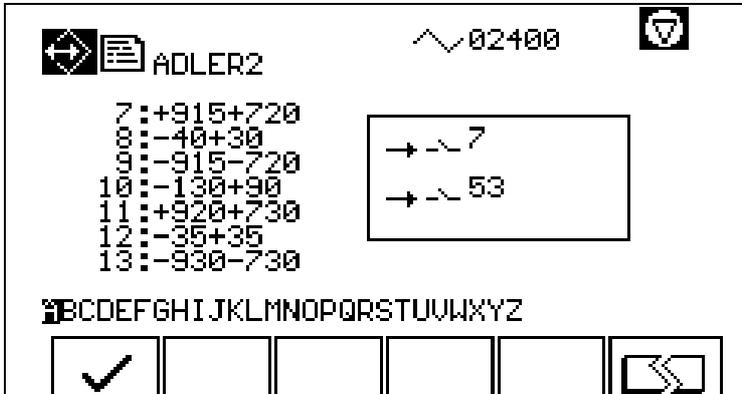
Enter the auxiliary function that is to be searched.



- Search specified auxiliary function (page 101)
- 
- 
- 
- 
- 
- Terminate function. (page 101)

### Replacing Auxiliary Function With A Auxiliary Function

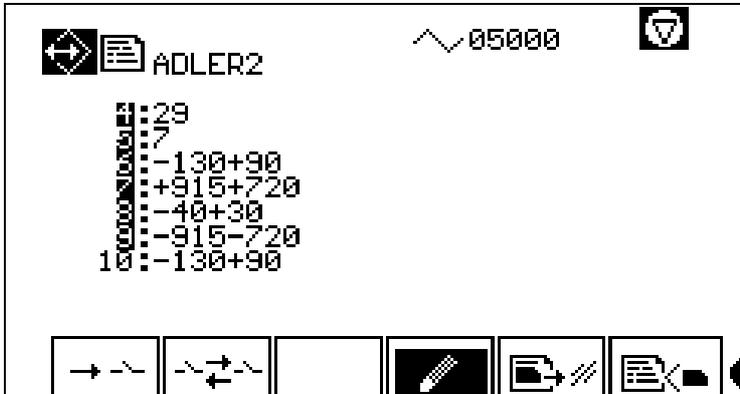
Enter the auxiliary function that has to be replaced and also the new auxiliary function .

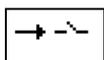
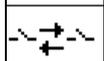
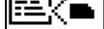


- Replace specified auxiliary function (page 101)
- 
- 
- 
- 
- 
- Terminate function. (page 101)

## Marking Program Lines

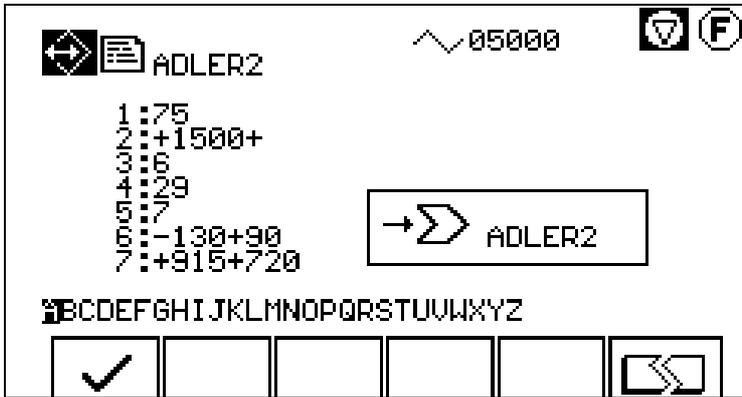
Mark the program lines with the cursor keys or the hand wheel.



- |   |  |
|---|--|
|    | Search auxiliary function.                                   |
|   | Replace auxiliary function with a auxiliary function.        |
|  |  |
|  | <b>"Mark lines to delete" is active.</b>                     |
|  | Pressing the key again will deactivate the marking function. |
|  | Delete marked lines.   |
|  | Insert deleted lines at cursor position.                     |

## Ending Edit Function

If a program was edited, a box will open and the program name can be entered. The current program name will always be offered. If the program should be saved under a different name, enter the new name in box.



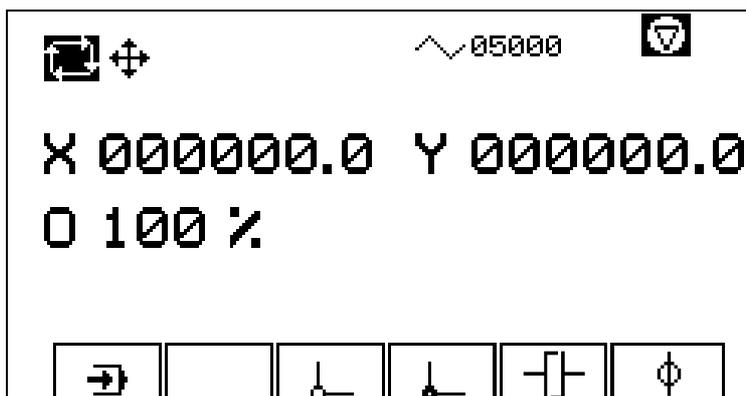
**Save** and exit editor.

Exit editor **without saving**.

## 8 Movement Window

The movement window provides a summary of all functions that are necessary to operate the machine manually and to prepare and control the automatic sequence of a program.

The following functions can be selected in this window.



	Automatic mode (page 108)
	
	Fixed point movements (page 123)
	Reference point movement
	Enable/disable control loop and toggle axes output
	Trace / Teach Trace

### Basic Menu

At the main level of the movement window, the axes can be moved by means of the cursor keys, i.e. normal manual control is active.

The coordinates of the X-axis and the Y-axis as well as the setting of the speed potentiometer are displayed. The coordinate values refer to the machine zero point, i.e. they are machine coordinates.

### Automatic Mode

Automatic processing of main programs.

Preparation of a program by selecting a program from the internal memory.

Entry of processing parameter such as speed, offset, scale and rotation.

Further processing of a discontinued program.

Repetitive function in matrix format.

Plate alignment.

### **Fixed Point Movements**

Moving to program zero point.

Moving to machine fixed point.

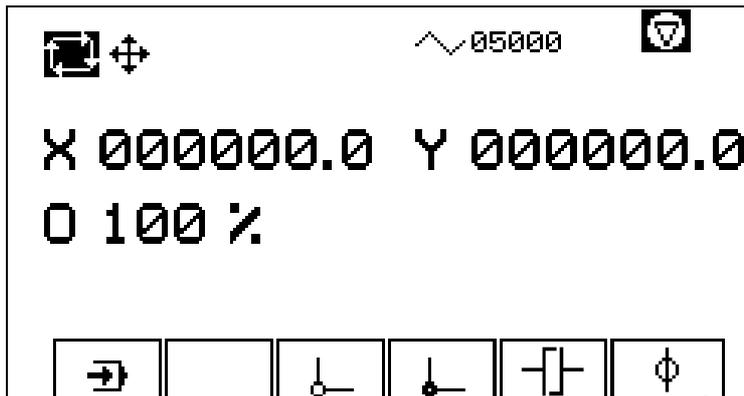
### **Reference Point Movement**

Setting up the machine coordinates after switching on the machine.

## 8.1 Automatic Mode

In automatic mode, programs are processed automatically. Parameters such as feed, kerf, rotation and scale are set beforehand as well as repetitive factors for multiple processing of a program. During automatic run, the operator has a number of possibilities to influence the sequence of operations and correct possible inconsistencies. Discontinued programs can be taken up again.

Switching on automatic mode.

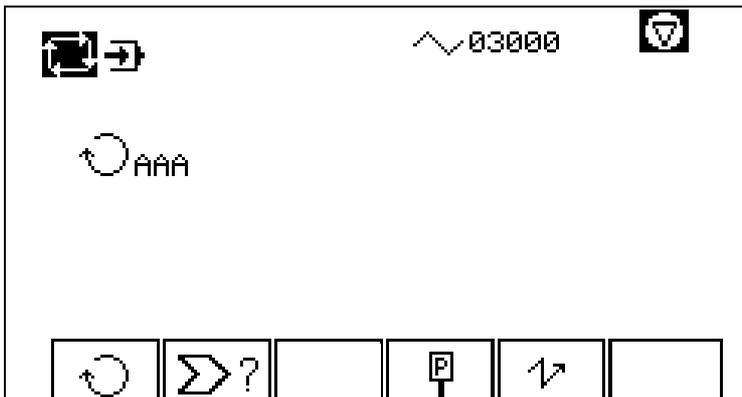


	<b>Automatic mode</b> (page 109)
	Fixed point movements.
	Reference point movement.
	Enable/disable control loop and toggle axes output
	Trace / Teach Trace

### Automatic Mode - Selection Window

There are at the most five possibilities for selecting a program as listed below in the menu.

The symbols for further processing of a program that was discontinued because of termination or power failure, are only displayed if the corresponding data exists. When this function is selected, the parameter entry is skipped.



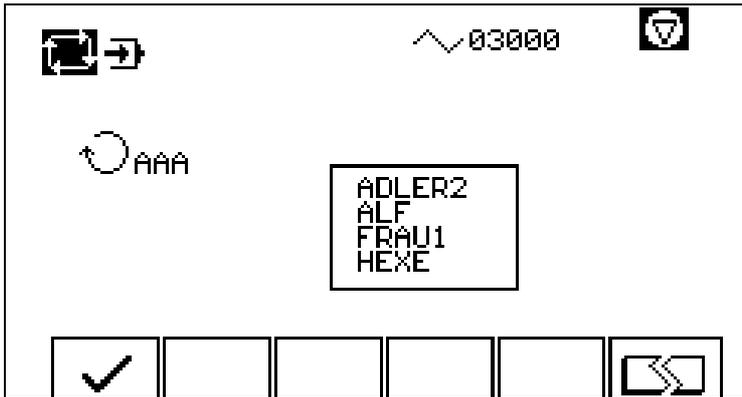
	Repeat last program with the same parameter values (page 120)
	Select program from internal memory (page 110)
	
	Continue processing the program interrupted last (page 120)
	Continue processing the program after power failure (page 120)
	

## Selecting a Program

The key

"Select program from internal memory"

opens a selection box with the directory of all available main programs. Select the desired program with the cursor keys.

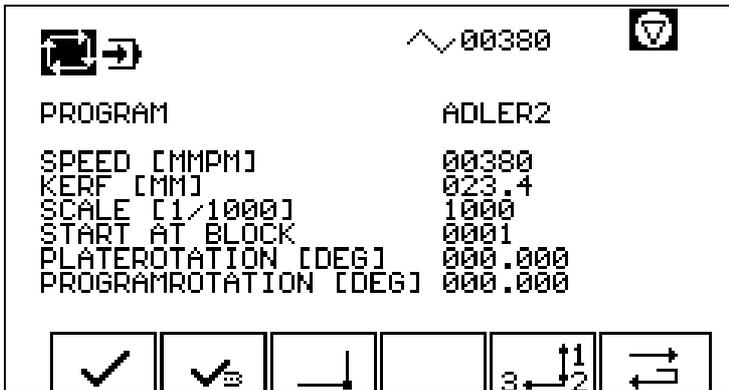


Select program for processing and enter into parameter entry (page 111)

No adoption and return to selection window. (page 109)

## Entering Parameters

Processing parameters are requested with the following screen, depending on the structure of the control system. Numeric values are entered directly with the digit keys. Input lines are selected by way of the cursor keys. Menu keys supplement the input field with the relevant boxes.



	End input. Prepare entire program before starting movement. (page 120)
	End input. Prepare program in sections. Start program execution after partial reparation. (page 120)
	Set program zero point (page 113)
	Plate alignment (page 115)
	Repetitions. (page 117)

## Parameter Explanation

**Feed:** is the feed rate with which the program is processed. Programmed rates in the program overwrite this value. During program processing, the feed rate can only be altered via the feed potentiometer.

**Kerf:** is the kerf with which the program is processed. Programmed kerf values overwrite these input values. The kerf cannot be altered during program processing.

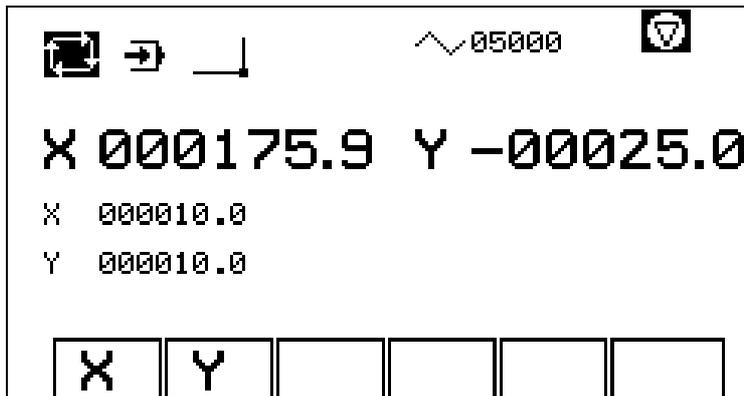
**Scale:** The value 1000 corresponds to the ratio 1:1, i.e. the program is processed in original size.  
 The value 500 corresponds to the ratio 1:2, i.e. the sizes in this program are halved.  
 The value 2000 corresponds to the ratio 2:1, i.e. the sizes in this program are twice as big as the programmed sizes.

- Starting block number    Block number at which processing is started. Normally, this value is set to 1, i.e. processing starts with block 1 .
- Plate rotation:            Rotation to align a plate that is slanting on the cutting table. The rotation is done for all repetitions around the bottom right corner of the plate. The angle for this rotation can be entered directly or determined automatically with the function "Plate alignment".
- Program rotation:        Rotation of the individual program around the program zero point. Among others, this rotation is applied in order to achieve a better utilization of the plate when processing single programs.

### Setting The Program Zero Point

The machine coordinates are displayed on the screen. When the program is started, the machine moves to the program zero point defined on this screen. The machine can be operated as in manual mode.

The program zero point can be entered directly or determined with the adoption keys.



Adopt the current position as program zero point for the X-axis

Adopt the current position as program zero point for the Y-axis.

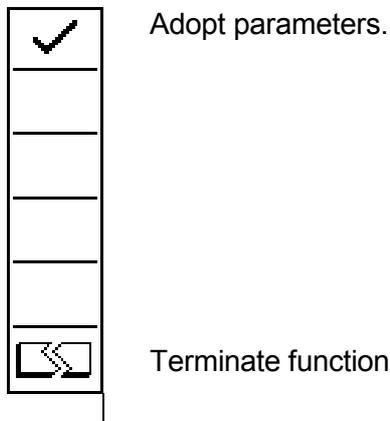
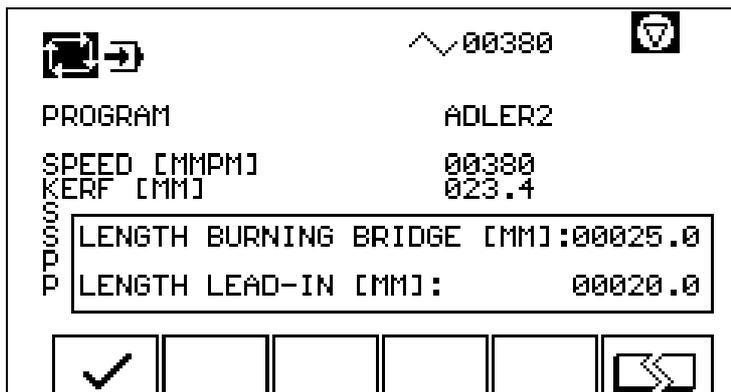


Return to parameter entry.

### Strap Bridge Parameters

Entering length and lead-in length of the strap bridge. If the lengths equal zero, a strap bridge will not be generated.

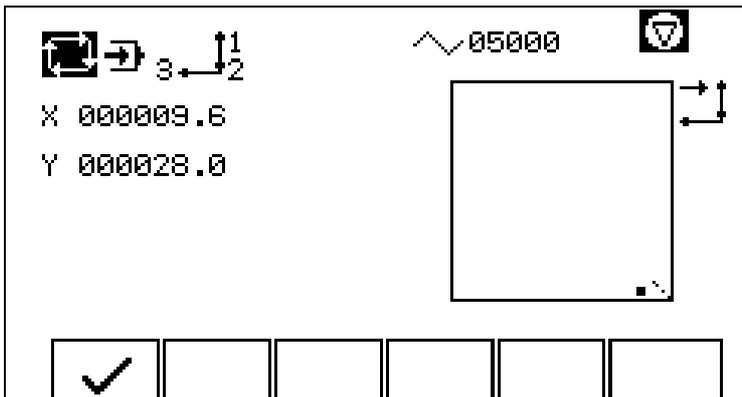
If the lead-in length of the strap bridge equals zero, the burner is ignited at the contour. If the lead-in length is not zero, the machine will move away from the contour by this value and at an angle of 90 degrees. The burner is ignited away from the contour.



## Plate Alignment

The optional add-on "Plate alignment" provides the possibility of determining the angle of the fed plate and the zero point with the machine.

The position of the plate is determined with three adopted points. The angle is entered under "Plate rotation" in the parameter entry.



Adopt points.

## Point Adoption for Plate Alignment

The screen for plate alignment shows a rectangle symbolizing the plate. Next to the plate, the symbols described below indicate one by one to which of the three points the machine should be moved. Once at the point, the position for the following internal calculations is stored with the point adoption key.

The measurements for alignment are completed with the adoption of the third point. The angle of the plate position on the machine is then calculated.



If the **backspace** key is pressed after point adoption, the current position of the machine will be the program zero point when the program is started again. Return to parameter entry (page 111)



Adopt point at the **top right edge**.



Adopt point at the **bottom right edge**.



Adopt point at the **front left edge**.

## Zero Point Adoption

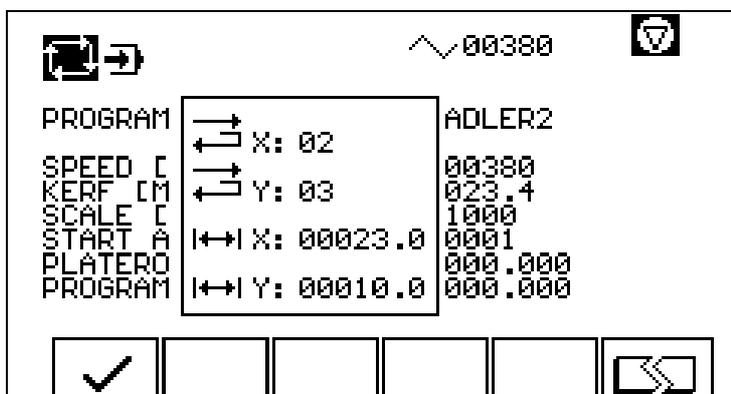
If the **start** key is pressed right after point adoption, the machine will move to the bottom right corner of the plate. This point will then also be the program zero point when processing is started. After the movement is completed, the control switches back automatically to the screen of the parameter entry, the determined angle will have been added to the screen. (page 111)

## Repetitions

A single program is processed automatically several times.

The number of processing runs as well as the distance between the individual repetitions have to be entered.

In order to define the distance between the repetitions, a rectangle is placed around the given program. This rectangle is called a container. The distance to be entered, is the distance between the containers. With a zero offset, the processing areas are right next to each other. With a negative offset, they overlap.



Adopt input and return to parameter entry. (page 111)

Terminate function and return to parameter entry. (page 111)

## Program Preparation and Kerf Calculation

Both of the two menu keys mentioned above complete the entry and trigger the calculations for program execution.

The two keys lead to different ways of carrying out the program preparation. In addition to the actual calculation, they also influence other factors of program processing.

**Total preparation** means that all preparations, including the complete offset calculation for the kerf, are done for an entire processing program before execution is started. The calculated program is completely buffered.

**Sectional preparation** means that the preparation of the program with kerf offset calculation is done before and during processing. The program is divided into single parts (sections). Parallel to the processing of one part, the next parts of the program are calculated. The program calculated in sections is administrated in a ring storage.

Both procedures can exist next to one another as the following comparison of advantages and restriction shows.

**Total preparation**

- A completely calculated program can be repeated in matrix form.
- Damages to the working range can be recognized before program start so that the position of the cutting material on the machine can be corrected.
- The graphics make optimum use of the available graphic window.
- Reverse movement after break-offs during cutting is not restricted.
- When the entire program execution is repeated, a new calculation phase is not necessary.
- Program length, however, is restricted. In first approximation, the program to be processed may not contain many more than 64k bytes of characters.

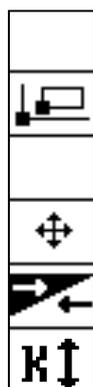
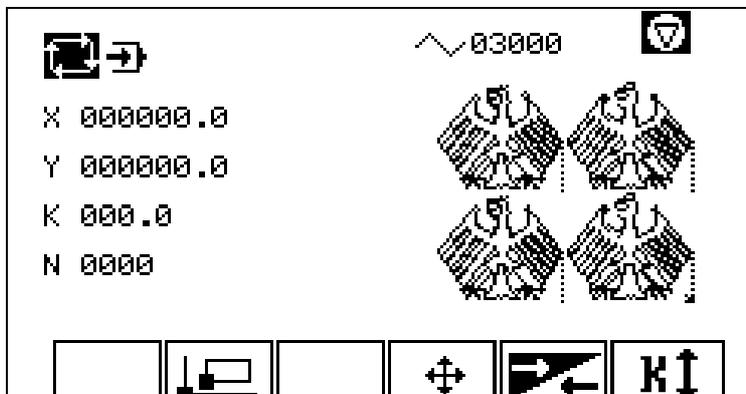
**Sectional preparation**

- Program length is not restricted. since the available memory is used as ring storage.
- Preparation time mainly coincides with processing time, i.e. it is hardly noticeable.
- However, every new start of the program makes a new calculation before running necessary.
- Repetition in matrix form is not possible.
- There are restrictions with reverse movement. Normally, however, they should not come into effect.

Graphics are displayed in such a way that the entire operating area of the machine is visible, because at the start of the program, the control does not know the size of the plate.

## Automatic Program Execution

The program is automatically processed when the **start** key is pressed.



Switch display, machine - program coordinates

Interrupt program, manual control during automatic mode (page 121)

Switch processing, forward - backward

Kerf on the fly

The coordinates of the X-axis and Y-axis as well as the kerf value (K) and the current block number (N) are displayed on the left side of the screen. At any time during processing, it is possible to switch between the displays of the program coordinates and the machine coordinates.

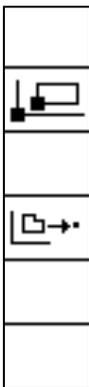
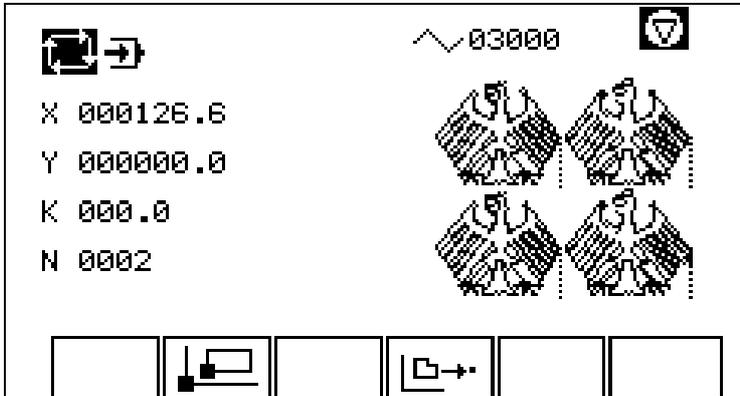
For switching between forward and backward mode, the machine has to be stopped with the **stop** key.



The execution of a program can be terminated with the **backspace** key when the machine is in the **stop** state. All data that is necessary to continue the program, will be stored. It will still be available even if the machine has been switched off in between. .

## Program Interruption

A program can be stopped and interrupted at any point. After pressing the interruption key, the machine can be operated as in the manual control mode.



Switch display, machine - program coordinates.

Back to program processing **without** returning to the contour. (page 120)

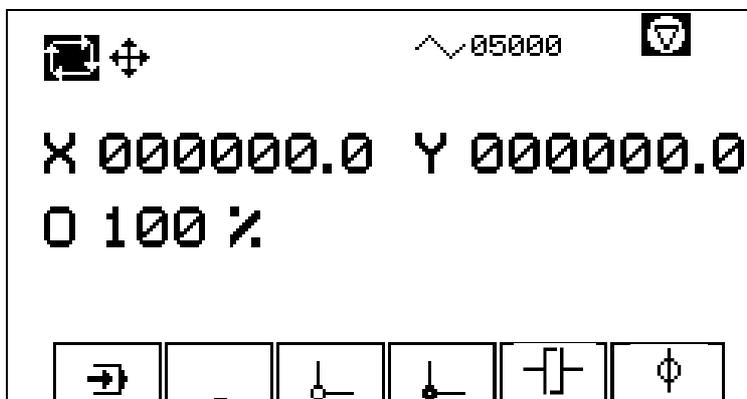


With the **backspace** key, program processing will be continued **with** a return to the abandoned contour.

When the **start** key is pressed, the machine moves to the point of the contour that it had reached last and stops. Now, process dependent functions can be started again. Pressing **start** again will continue processing.

If the menu key **without return to contour** is pressed, the main menu for automatic processing of the program is displayed instantly. With **start**, the program will be continued at the point at which the machine is currently located. The distance to the last contour point will be taken into account as additional offset. This offset remains until the entire program is completed, including possible program repetitions.

## 8.2 Manual Control



	Automatic mode
	Fixed point movements
	Reference point movement
	Enable/disable control loop and toggle axes output
	Trace / Teach trace

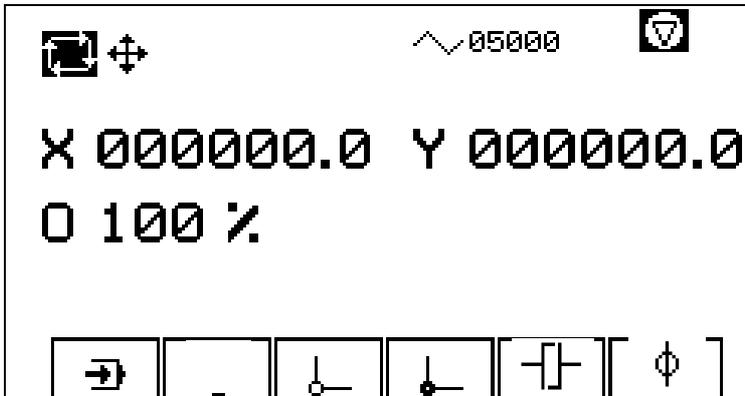
The picture above shows the main menu of the movement window. In this window, manual control with the cursor keys is activated. It is possible here, to differentiate between two types of movement. Both can be selected as machine constants.:

The setting of the direction **as well as** the triggering of the movement itself is done with the cursor keys. The start symbol is active as long as a direction is specified.

Setting of a direction is done with the cursor keys. The movement itself, however, is controlled with the **start** and **stop** keys.

In both cases, the key for fast motion is used to switch between the speed ranges. A fine graduation of speed in both ranges is done with the override potentiometer.

### 8.3 Fixed Point Movements



	Automatic mode
	
	<b>Fixed point movements</b> (page 124)
	Reference point movement
	Enable/disable control loop and toggle axes output
	Trace / Teach trace

## Selecting Fixed Points

The standard design of the control offers two automatic fixed point movements:

Movement to program zero point and

Movement to fixed point of working range.



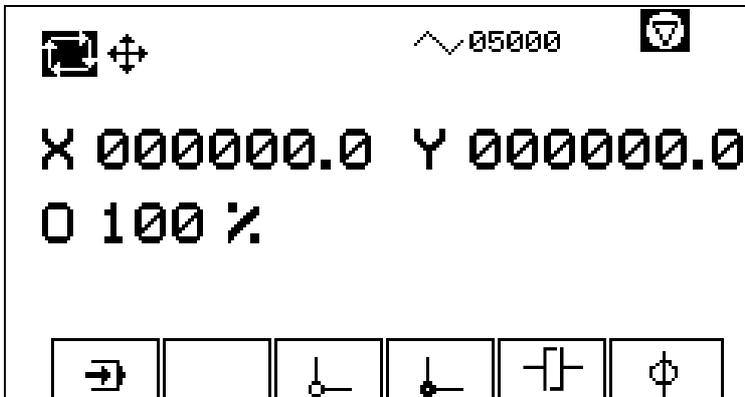
Move to program zero point

Move to fixed point of first working range

The inverse key shows the currently active working range. With the movement to the fixed point of the next working range, the system switches automatically to this working range.

Press the **start** key to start point movement. After completing the movement, the system will automatically return to the basic screen.

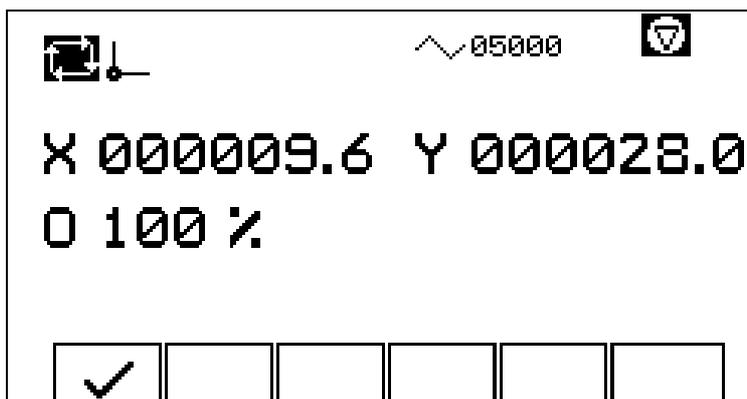
## 8.4 Reference Point Movement



	Automatic mode.
	
	Fixed point movements
	<b>Reference point movement.</b> (page 126)
	Enable/disable control loop and toggle axes output
	Trace / Teach Trace

## Reference Point Movement

The reference point of an axis is a mechanically and electrically firmly-defined point that can be recognized by the control as precise as one measuring unit. By means of the reference point, it is possible to receive absolute machine coordinates despite of incremental encoders. Every point of the machine has the same coordinates at any time.



<input checked="" type="checkbox"/>	Adopt (only for machines without reference point system)
<input type="checkbox"/>	

The reference is lost when the machine is switched off. Therefore, the reference has to be adopted by moving over the reference point of each axis after switching on the machine. Depending on the design of the machine and the control system, three different types of reference point adoption are possible.

### Manual Reference Point Movement

With the cursor keys, the operator selects the axis and pre-selects the direction for the movement to the reference point of the axis. The current direction is displayed in the top right corner of the screen. The movement is launched with the **start** key. The machine stops automatically after recognizing the reference point.

### Automatic Reference Point Movement

The entire reference point movement is launched by pressing the **start** key. Sequence and direction of the axes are defined in the machine constants.

### No Reference Point System

The machine is not equipped with a reference cam so that no reference point can be recognized as described above. Yet, in order to reproduce a somewhat reasonable machine coordinate system, the axes are moved to a fixed point. This position is adopted as reference point by pressing the menu key **adoption**.

## **9 Process Window**

The process window is used for process control.

When the control is switched on, the system switches to the main process level of the current process. Each of the three possible processes consists of the main process level and one or more option process levels. Please note, that not all functions are available on every machine.

Only processes that are actually available on the machine are displayed.

The X/Y-coordinates, and if a program has been selected for processing, its graphical representation are displayed on all process levels.

Pressing the BACK-key the General Options menu will be shown. If no process is selected, the General Options menu will be shown.

Within the process window, the preselected process is always displayed in the top left corner next to the symbol for the process window.

### The General Options Level

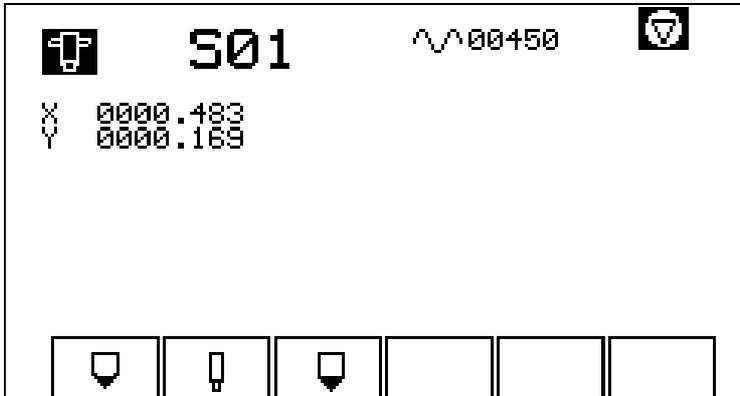
The General Options Level is used for further process options (No options actually).



	Plasma Process (page 132)
	Oxy Fuel Process (page 134)
	
	
	Mark Processes (page 130)
	

### The Mark Options Level

The Mark Options Level is used for further mark process options (No options actually).



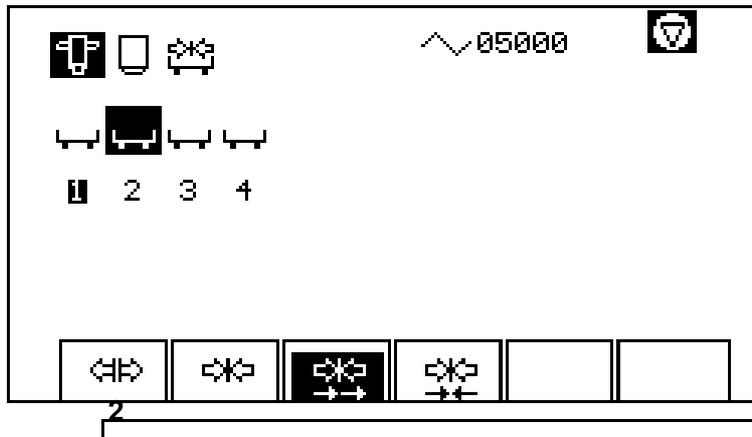
- |  |                                |
|--|--------------------------------|
|   | Punch Mark Process (page 137)  |
|   | Zinc Mark Process (page 139)   |
|  | Plasma Mark Process (page 141) |
|  |                                |
|  |                                |
|  |                                |

## 9.1 Manual Clamping

If the machine is equipped with the add-on "Station positioning", the menu for manual clamping can be activated, i.e. the current clamping status of the individual stations can be checked.

Again, active stations are displayed inverse.

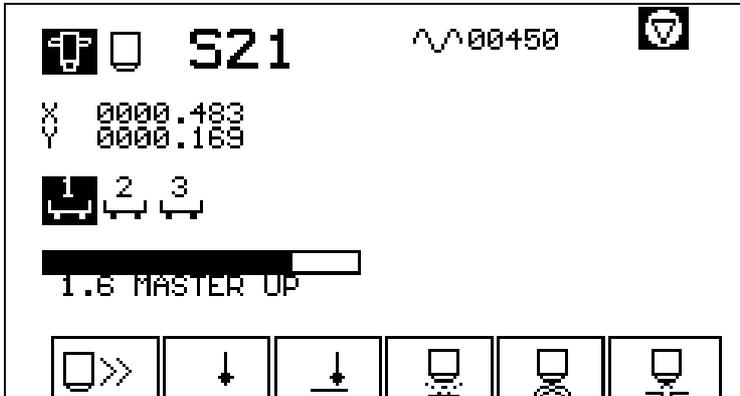
The station to be clamped is selected with the hand wheel or the cursor keys. The inverse number underneath the station line indicates the selected station. The current clamping status of this station is indicated in the key description line, the corresponding symbol is displayed inverse. The clamping status is changed by pressing a different clamping status key.



	Clamping status "free"
	Clamping status "bar"
	Clamping status "equal"
	Clamping status "mirror"
	
	

## 9.2 Plasma Process

### Main Level of the Plasma Process



	Activate option level (page 133)
	AHC allow
	AHC on/off
	Preflow on/off (test preflow)
	Cut gas test
	Plasma start/stop

If the process timer is on, it is displayed as graphical bar indicator.

**Plasma - Option levels**



- |   |                             |
|---|-----------------------------|
|    | Water table on low level    |
|    | Water table on medium level |
|    | Water table on high level   |
|   | ANC allow                   |
|  | AHC on/off                  |
|  | Manual Plasma-Punch Mark    |

If the process timer is on, it is displayed as graphical bar indicator.

### 9.3 Oxy Fuel Process

#### Main Level of the Oxy Fuel Process



	Activate option level. (page 135)
M71	M71 Not Used (formerly Process Stop)
M70	Edge Start
	Oxy Fuel Cutting
	Oxy Fuel High Preheat
	Oxy Fuel Ignite

If the process timer is on, it is displayed as graphical bar indicator.

### Oxy Fuel - Option Levels



	Further option levels (page 136).
	AHC allow
	AHC on/off
M73	M73. Process Stop
	Travel
M70	M70. Process Start

If the process timer is on, it is displayed as graphical bar indicator.

### Further Option Levels



	Water table on low level
	Water table on medium level
	Water table on high level
	Punch AHC allow
	Punch AHC on/off
	Manual Punch Mark

If the process timer is on, it is displayed as graphical bar indicator.

## 9.4 Punch Mark Process

### Main Level of the Punch Mark Process



	Activate option level (page 138).
	AHC allow
	AHC on/off
	Manual Punch Mark

If the process timer is on, it is displayed as graphical bar indicator.

### Punch Mark - Option Levels



	Water table on low level
	Water table on medium level
	Water table on high level
	
	
	

If the process timer is on, it is displayed as graphical bar indicator.

## 9.5 Zinc Mark Process

### Main Level of the Zinc Mark Process



	Activate option level (page 140).
	AHC allow
	AHC on/off
	Zinc marker swirl
	Zinc marker preheat
	Zinc marker ignite

If the process timer is on, it is displayed as graphical bar indicator.

### Zinc Mark -Option Levels



	Water table on low level
	Water table on medium level
	Water table on high level
	
	
	

If the process timer is on, it is displayed as graphical bar indicator.

## 9.6 Plasma Mark Process

### Main Level of the Plasma Mark Process



	Activate option level. (page142)
	AHC allow
	AHC on/off
	Plasma Mark start/stop

If the process timer is on, it is displayed as graphical bar indicator.

### Plasma Mark - Option Levels



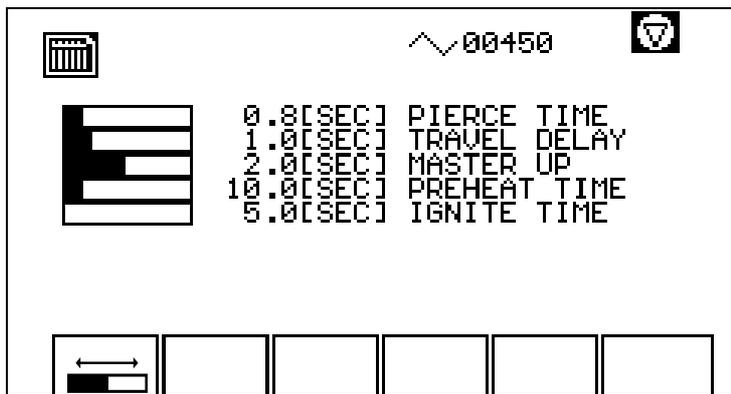
	Water table on low level
	Water table on medium level
	Water table on high level
	
	
	

If the process timer is on, it is displayed as graphical bar indicator.

## 10 Parameter Window

Process dependent values can be changed in the parameter window. The changes remain valid until another process is preselected.

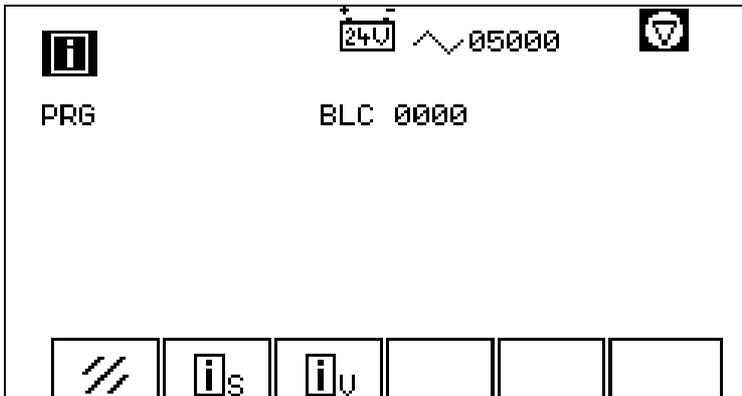
The current value within the possible range is indicated by the bar indicator. The cursor keys are used to scroll vertically within the display. Placing the cursor to the left of the bar indicator, marks the item selected to be changed. Changing the value is done by pressing the cursor keys and SIMULTANEOUSLY pressing the F1 key. Cursor up and cursor left reduces the value, cursor down and cursor right increases the value. Certain values cannot be changed.



Keep pressed when changing an entry in the parameter list.

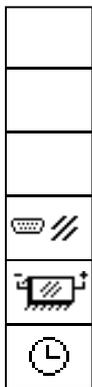
## 10.1 Error - Status Display

Errors that have occurred are displayed, if possible, with additional information.  
The name of the current or last processed program is indicated with PRG. BLC indicates the current block number of the processed program.



	Delete error
	Switch to status display (page 145)
	Switch to version number display (page 148)

**Status Display**



Reset I/O ports

Reset battery ram

Time setting (page 147)



**Turn-on voltage.**

This symbol is displayed in the top right corner of the screen when the turn-on voltage is switched on.



**Reference.**

The letters to the right of this symbol indicate from which of the axis the reference was adopted.



**Controller release X.**

Indicator for controller release in the X-axis. If this symbol is not displayed, the machine cannot be operated along the X-axis.



**Controller release Y.**

Indicator for controller release in the Y-axis. If this symbol is not displayed, the machine cannot be operated along the Y-axis.



**SPC release.**

Indicator for SPC release. If this symbol is not displayed, no auxiliary or key functions are sent to the MIP.



**Feed release.**

Indicator for feed release. The feed release is set by the MIP. It allows machine movements.

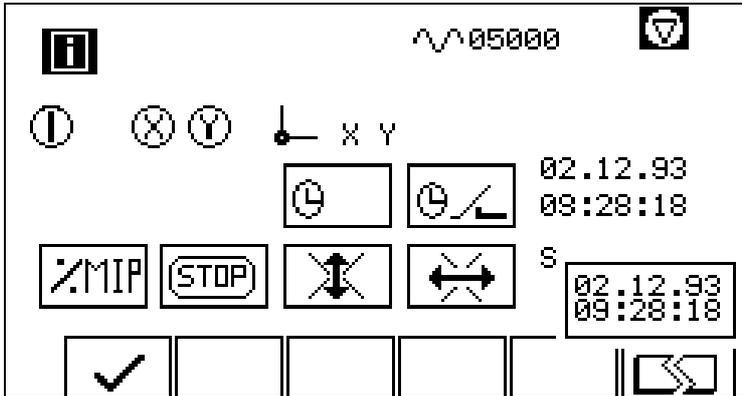


**Feed interlock.**

Indicates that the feed release is missing. The signal is the inverse representation of the feed release. Axis movements are prevented.

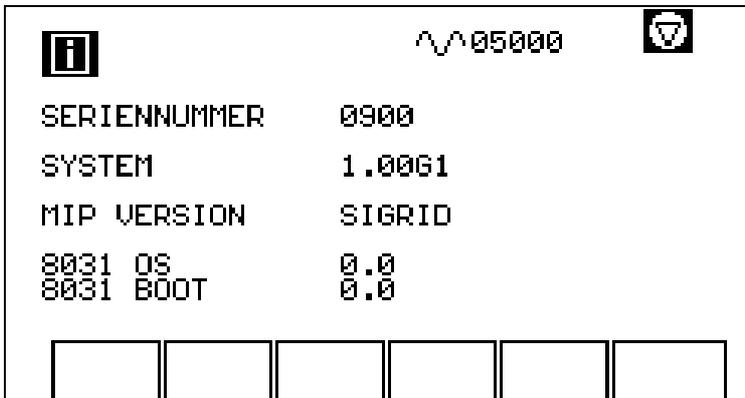
### Time Setting

Setting the time. The adjustment is done with the cursor keys.



- Adopt time
- 
- 
- 
- 
- No adoption

### Display of Version Number



Serial number:	Control number
System:	Version number of the basic system (ANC41.EXE)
MIP version:	Version number of the MIP program (MIP41.MIP)
8031 OS:	Operating system number of the sub system (NOS8031.BIN)
8031 Boot:	Version number of the boot loader of the sub system (BOOT8031.HEX)

## 11 Trace / Teach Trace

If the VISION LE is equipped with an additional opto-electronic tracing system, the control can be used for copying (Trace) and for digitizing (Teach Trace) graphical patterns.

The tracer and the control move the machine axes in such a way that the operating point of the tracer follows a line or an edge on a graphical pattern.

In the Teach Trace mode, the control continuously records measuring points in very short intervals. Some of them are then chosen and stored as scanning points.

The two final scanning points are connected with a line which only exists as numeric entity. The system then checks each following measuring point to see if it deviates to either side of the line with more than a given tolerance value or if its gap to the last scanning point exceeds a given limit. The last measuring point that meets both requirements is chosen as scanning point.

With this collected data, the control works out a complete main program which can be processed in automatic mode.

In order to understand the following instructions, it is useful to know just a little about the tracer's behavior. (In the following, we will only talk about line movement. It is the same procedure for an edge movement).

In the Trace mode, the machine axes first of all move in a preselected direction towards the line until the "eye" of the tracer recognizes the line.

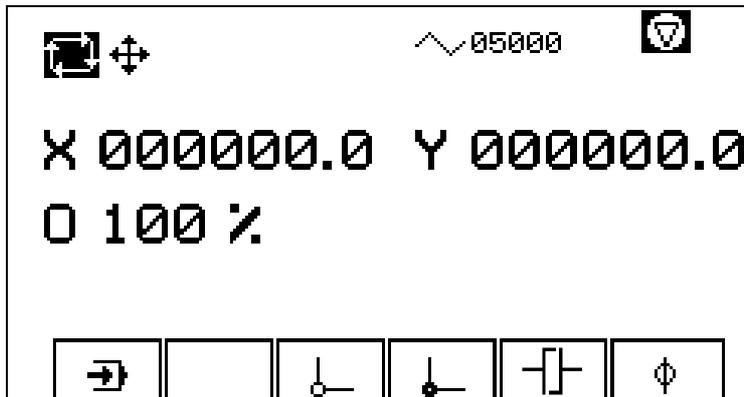
The "eye" is the rotating, flying spot of the tracer. In normal operation, this flying spot is not visible because it is covered by floodlight. The floodlight counteracts the influence of external light such as reflections.

When the tracer has recognized the line, the traversing direction is changed according to the preselected direction (to the left / to the right) in such a way, that the eye remains on the line.

The machine movement is stopped at the end of the line. A closed contour will thus be traced endlessly.

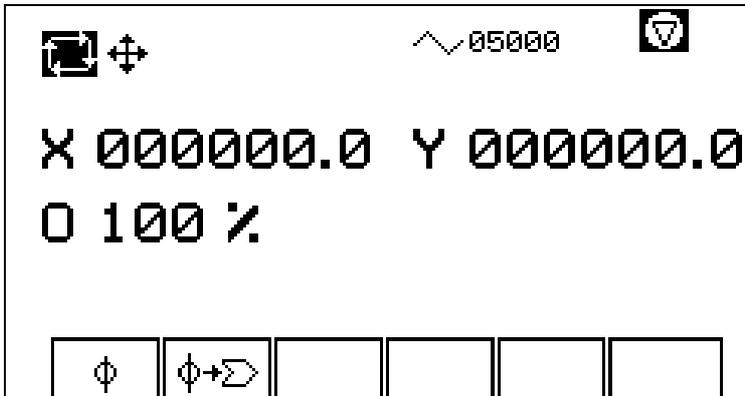
In the Teach Trace mode, the system recognizes the point at which the line was initially recognized and it ends the contour there.

**Selecting the Function: Trace / Teach Trace.**



	Automatic mode
	
	Fixed point movement
	Reference point movement
	Enable/disable control loop and toggle axes output
	<b>Trace / Teach Trace.</b> (page 151)

### Selecting Trace / Teach Trace

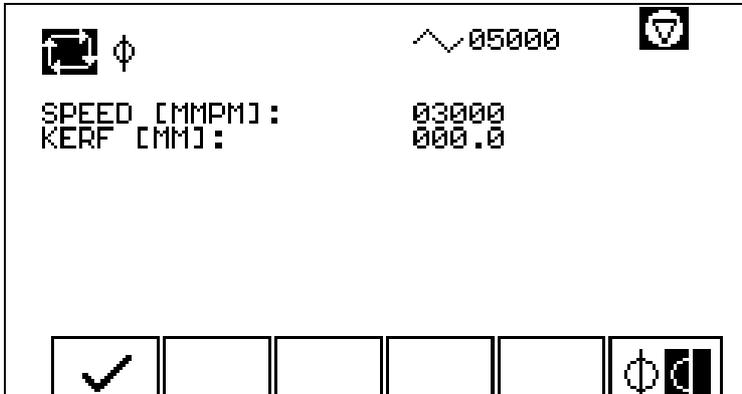


Trace (Tracing the contour without recording) (page 152)

Teach Trace (Tracing the contour with recording) (page 155)

### 11.1 Trace

Entering the parameters.



Adopt parameters and proceed to the Trace pre-phase (page 153)

Scan line / edge

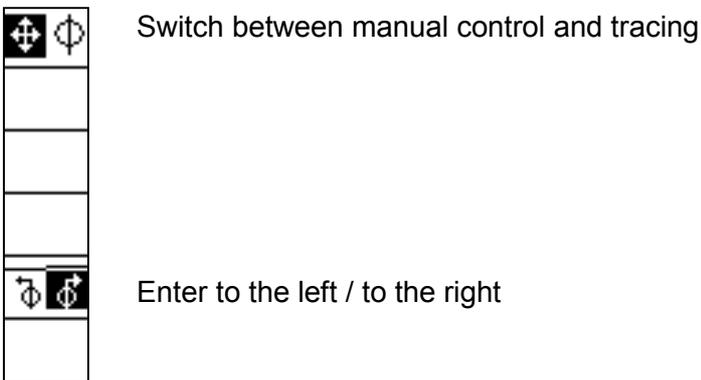
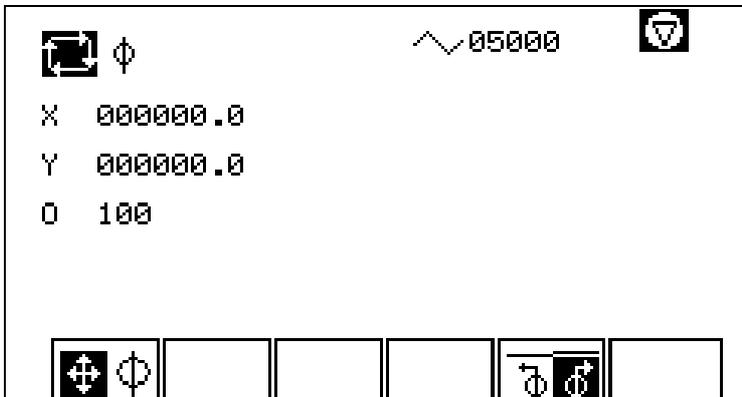
#### Parameter Explanation

**Feed:** is the feed rate at which the contour is scanned. During scanning, the feed rate can only be altered via the feed potentiometer.

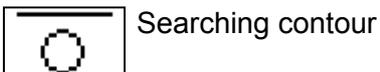
**Kerf:** The kerf value causes an offset of the machine to the side in relation to the scanning flying point so that the kerf of the copied part is also taken into account.

**Line / Edge** If the line width of the pattern is more than 1 mm you have to switch to "edge".

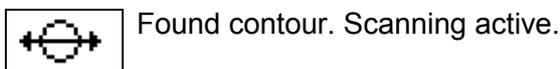
**During Scanning**



Status displays during the tracing process



Searching contour



Found contour. Scanning active.



Lost contour.

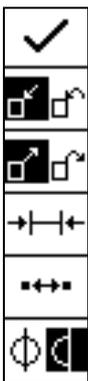
If the tracing process has not yet been started, the axes are moved with the cursor keys as in normal manual control.

When tracing, the search direction is defined with the cursor keys. The process is started by pressing the **start** key. The symbol "Searching contour" is displayed. During the search process, the axes are moved at half of the preset speed.

When the line has been found, the symbol "Found contour" is displayed. The machine now moves at the preset speed. Furthermore, the symbol for "forwards/backwards - switch" is displayed in the bottom line.

## 11.2 Teach Trace

Entering parameters.



Adopt parameters and proceed to the Teach Trace pre-phase (page 158)

Type of lead-in, straight line or circle

Type of lead-out, straight line or circle

Enter lengths and angles for the lead-in generation (page 156)

Enter point-to-point distances (page 157)

Scan line / edge

### Parameter Explanation

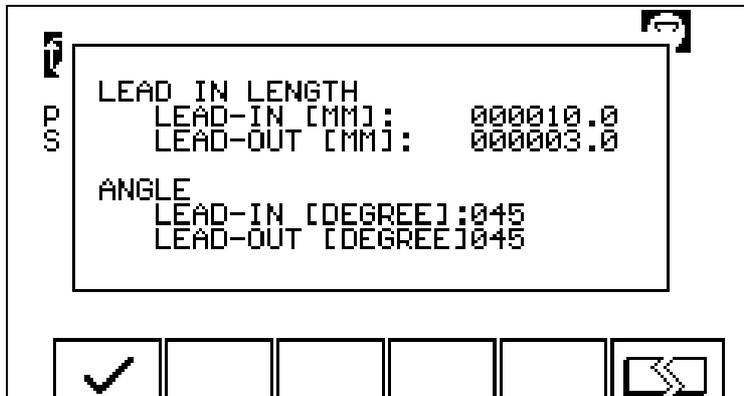
**Program:** Name of the program under which the scanned contour is stored. If a program with this name already exists the newly scanned contour is added to it.

**Feed:** is the feed rate at which the contour is scanned. During scanning, the feed rate can only be altered via the feed potentiometer.

**Line / edge:** If the line width is more than 1 mm you have to switch to "edge".

### Entering lengths and angles for the lead-in generation

After the contour has been recorded, a lead-in and a lead-out for the program is calculated. Parameters for this are set here.

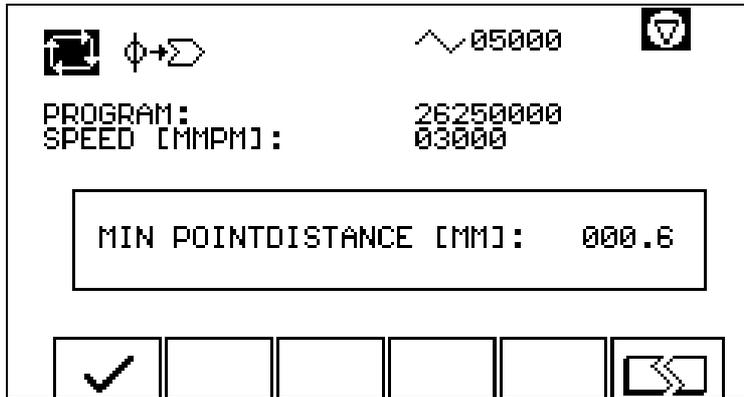


Adopt parameters and return to parameter entry (page 155)

Insignificant.

### Entering the Minimum Point-to-Point Distance

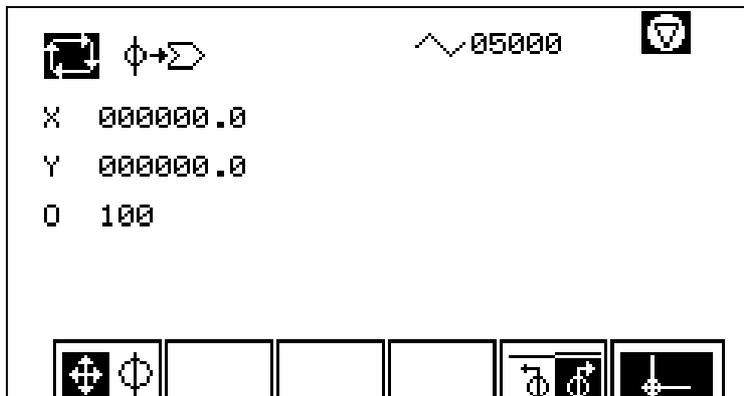
The larger the minimum point-to-point distance - the larger the smallest line sections. This is important for the speed at which the program is to be processed later on. High speed cannot be realized with only small line sections. However, there is a higher precision of the contour with small line sections.



Adopt parameters and return to parameter entry (page 155)

Insignificant

### During Recording



Switch between manual control and Teach Trace

Enter to the left / to the right

Adopt reference point

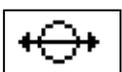
Adoption of the reference point:

Setting the program zero point. A line is drawn from this point to the first point of the line recognized by the tracer.

Status displays during the Teach Trace mode



Searching contour



Found contour. Scanning active.



Lost contour



Completed contour

If the Teach Trace process has not yet been started, the axes are moved with the cursor keys as in normal manual control.

When tracing, the search direction is defined with the cursor keys. The process is started by pressing the **start** key. The symbol "Searching contour" is displayed. During the search process, the axes are moved at half of the preset speed.

When the line has been found, the symbol "Found contour" is displayed. The machine now moves at the preset speed.

The contour is now being scanned and recorded until the machine recognizes the starting point of the scanning process. When the contour is completed the Teach Trace process is automatically terminated and the recorded contour is filed.

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## **General Information**

This section provides replacement parts information and will assist during machine maintenance. It is arranged by functional groups or assemblies for easy identification of individual parts and replaceable assemblies.

The Replacement Parts List consists of a parts list for the main assembly and one for each major assembly and subassembly. Item numbers that identify parts in the illustration are given in the list where applicable, along with part numbers and descriptive information.

**Ordering Information**

When ordering replacement parts, order by part number and complete part description as given in the description column. Also, give machine model number and serial number. Address all inquiries to your local ESAB Distributor or to ESAB Cutting Systems, P.O. Box 100545, Florence, South Carolina, 29501.

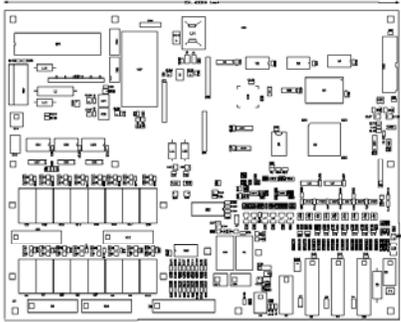
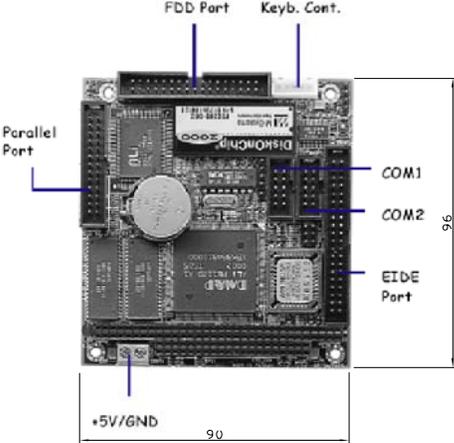
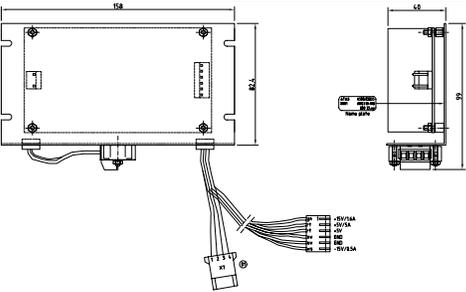
**NOTICE**

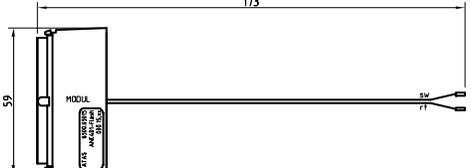
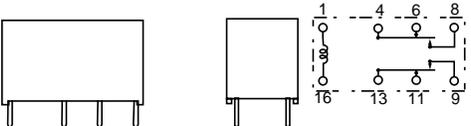
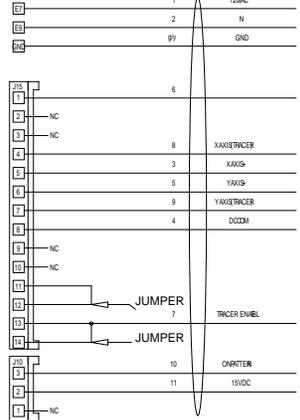
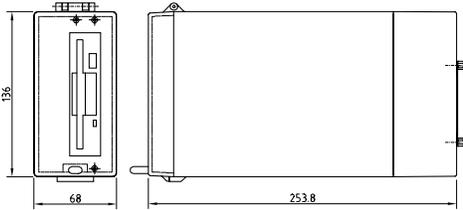
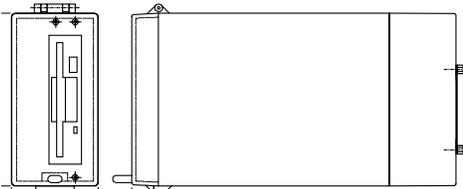
This manual may contain part illustrations not applicable to your specific machine. To avoid unnecessary delays, positively identify your correct assembly before ordering replacement parts.

**NOTICE**

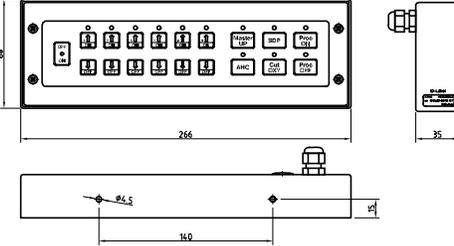
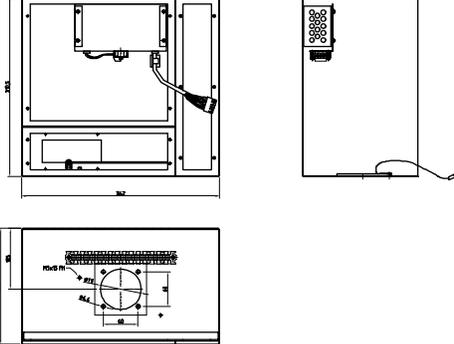
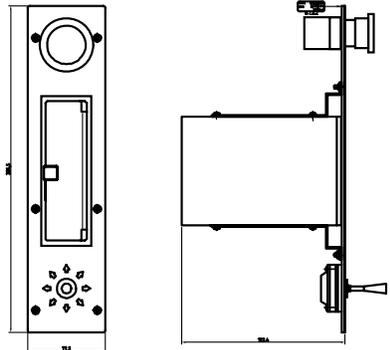
There are two versions of this machine. Heavy duty (standard) and metric rail lengths. If the rails are metric, 3m and 5 meter lengths, other components **MUST** be ordered to match. Lower carriage guide wheels, main wheels, drive pinion and other parts are different between the 2 systems. Make sure that you have identified your rail type before ordering parts.

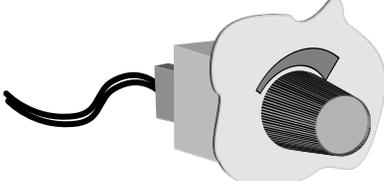
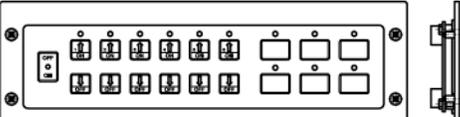
**Vision LE Parts**

Part Number	Qty	Description	Identifier Images (Not to Scale)
0560935209	REF	Vision LE without Connectors	Image Not Available
0560935210	REF	Vision LE -Teach/Trace kit includes LFE Bd, AK5 camera, connector, softw.	Image Not Available
0560935212	REF	Vision LE Connector Kit	
0560935535	REF	PIO Board	
0560935537	REF	CPU Board	
0560935538	REF	Front Panel	Image Not Available
0560935540	REF	Power Supply	

0560935567	REF	Flash Drive programmed	
0560935568	REF	Vision LE ADAP Relay	Image Not Available
0560935569	REF	Drive Allow Relay	
0560935582	REF	Vision LE Mono Basic with Connectors	Image Not Available
0560935585	REF	Vision LE Literature, Manuals, Schematics, Wiring Diagrams (including manuals 0558005197 Startup and 0558005198 Operation/parts)	<p>Form Number 0558005198 Date</p>
0560936060	REF	Vision LE to HL 90 Interface Cable	
0560936080	REF	Floppy Drive only	
0560936081	REF	Floppy Drive Cable Internal	Image Not Available
0560936082	REF	External Floppy Mounting Plate	Image Not Available
0560936083	REF	Floppy Drive Cable External	Image Not Available
0560936084	REF	Floppy Drive Kit (includes drive, cable and mount)	

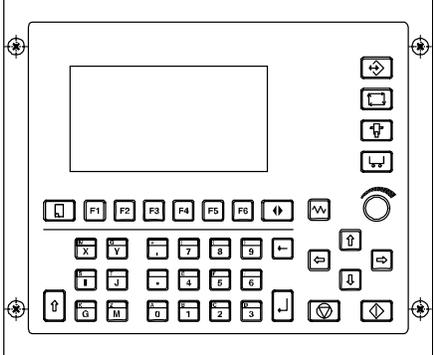
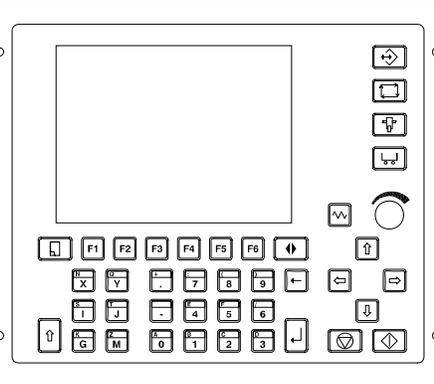
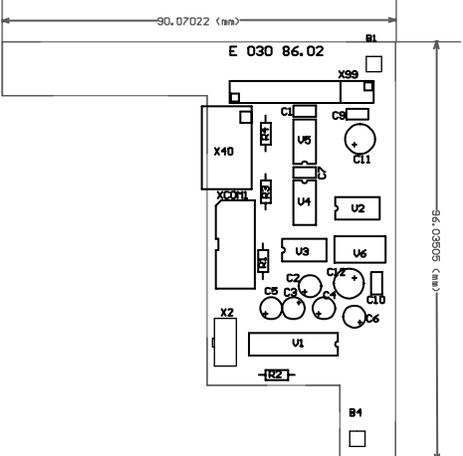
<p>0560936271</p>	<p>REF</p>	<p>Vision LE ASI0B</p>	
<p>0560936272</p>	<p>REF</p>	<p>Vision LE 6 Station Macro Key Panel</p>	
<p>0560936273</p>	<p>REF</p>	<p>Vision LE Teach/Trace Board</p>	

0560938015	REF	Vision LE C Package	
0560938016	REF	Vision LE Process Panel Kit includes ASI OB Bd	Image Not Available
0560938017	REF	Vision LE Extended Process Box	
0560938018	REF	Vision LE Large Cabinet	
0560938020	REF	Vision LE Floppy Drive Panel, includes floppy, e-stop, and joystick.	

0560938023		Vision LE F Package	
0560938024		Vision LE CF Package	
0560938025		Vision LE FX Package	
0560938027	REF	Vision LE Potentiometer Wheel w/Cable	
0560938028		Vision LE 6 Station Process Panel w/Buttons Only	

0560938029	REF	Vision LE Color CPU Board	
0560938030	REF	Vision LE Color Display	
0560938031	REF	Vision LE Joy Stick	
0560938032		Vision LE X Package	



0560938038	REF	Vision LE Mono Front Panel	
0560938039	REF	Vision LE Color Front Panel	
0560938040	REF	Vision LE RS232 to RS422 Converter	
0560938041	REF	Vision LE Front Panel Membrane	Image Not Available
0560938042	REF	Vision LE Process Panel Membrane	Image Not Available
0560938043	REF	Vision LE Floppy Drive Cover	Image Not Available
0560939699	REF	LCD Display	Image Not Available

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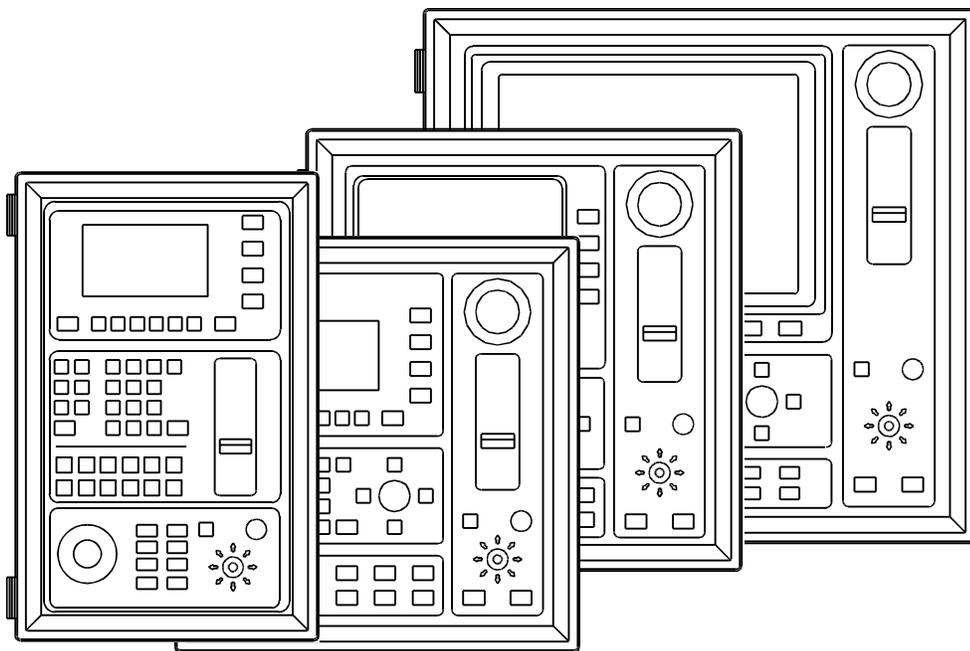
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# VISION CNC

## PART PROGRAMMING INSTRUCTIONS



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*This manual is ESAB Part Number F14-082*

*This manual is intended for the convenience and use of the cutting machine purchaser. It is not a contract or other obligation on the part of ESAB.*

*Printed In U.S.A.*

## **Preface**

*The Vision Computer Numerical Control System is a cutting machine CNC manufactured exclusively for ESAB Cutting Systems. The Vision CNC may be used on various machines and may utilize numerous different cutting processes. The Vision CNC is designed for ease of operation, flexibility, and precise control of cutting processes.*

*Part programs for the Vision CNC may be manually entered, programmed off-line, generated from a library of shapes, or digitized from traceable patterns.*

*This manual discusses standard part programming codes for all Vision Computer Numerical Control systems. For information regarding operation of the control, refer to the appropriate Vision CNC manual.*

*There are numerous optional features which can be supported by the Vision CNC. For completeness, most aspects of part programming have been covered in this manual. Not all capabilities discussed in this manual will be present on all machines. In addition, more capabilities and features may be added in the future, which are not covered in this manual. ESAB Cutting Systems reserves the right to change or add programming features and capabilities without notice.*

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## 1 General Information

### 1.1 File Format

Part programs are simple text files written in ASCII format. Any IBM compatible Personal Computer may be used with a simple text editor to create and edit part programs. Programs may be stored on hard disk, copied to a floppy disk, or transmitted via serial cable.

### 1.2 Program Names

Part programs are named using the standard DOS file name format. This format allows file names of up to 8 characters in length, with a file name extension of up to 3 characters. The Vision CNC requires the file name extension ".MPG" to denote part programs. The 8 character file name may include both letters and numbers, but not symbols.

For PC or NT one can use extension \*.cnc or \*.txt. Filename can be 128 characters long. Follow Windows format for naming convention.

EXAMPLE FILE NAMES:

PART001.MPG

16533423.MPG

### 1.3 Program Format

The standard programming format for the Vision CNC is EIA Format. EIA format (Electronic Industries Association) provides programming conventions for contouring/positioning numerical controlled machines which comply with the standard practices of the industry. The Vision CNC also accepts ESSI (Tab Sequential) programming.

### 1.4 Units Of Measurement

The Vision control can accept programs written in either inch or metric. Machines may be set up to use either inch or metric dimensions as a standard. To use a program written with metric dimensions on an inch machine, the code G71 (ESSI 84) must appear at the beginning of the program. To use a

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## Section 2: General Information

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program written with inch dimensions on a metric machine, the code G70 (ESSI 85) must appear at the beginning of the program.

### 1.5 Decimal Points

Decimal points may be included with the part program, or they may be omitted. System Constant #7 tells the control whether or not it should expect decimal points to be included in the program.

Set System Constant 7 accordingly:

0 = NO decimal points will appear in the program.

1 = decimal points are included in the program.

If System Constant 7 is set to 0, then Machine Constant #49 is used to tell the control how many decimal places to assume. The standard setting is 3, which means that the far right hand digit in any number will be assumed to mean 1/1000 inch.

If System Constant 7 is set to 1, then the control expects to see a decimal point in each dimensional value. If no decimal point is included in a value, then the value is assumed to be a whole number of inches.

#### **EXAMPLES:**

If System Constant 7 = 0 and

Machine Constant 49 = 3, then:

X14875 Y21031 will be read as X14.875 Y21.031

If System Constant 7 = 0 and

Machine Constant 49 = 2, then:

X14875 Y21031 will be read as X148.75 Y210.31

If System Constant 7 = 1, then:

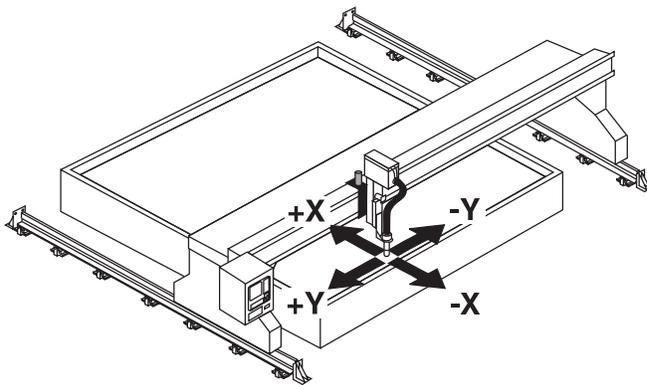
X1.25 Y2.50 will be read as X1.250 Y2.500

X125 Y250 will be read as X125.000 Y250.000

## 1.6 Programming Mode

Part programs can be written in either absolute or incremental modes. The default mode is absolute. Absolute programming can also be selected by a G90 code (ESSI 81). To switch to incremental mode, a G91 code (ESSI 82) must be entered. Programs that are written entirely in incremental mode should have a G91 (ESSI 82) at the very beginning of the program.

## 1.7 Axis Orientation



The X and Y axes of the cutting machine are oriented as shown here. The X axis is the longitudinal axis, down the length of the rails. The Y axis is the transverse axis, across the beam of the machine. When facing the machine's control console, positive X is away from the machine operator, negative X is toward the machine operator. Positive Y is to the left, negative Y is to the right.

## 1.8 Programming Limits

The following limitations should be taken into account during programming.

- The length of each program line is limited to 80 characters. A line with more than 80 characters will cause an error at run time.
- The maximum radius length for arcs is 1.3 miles, or  $1 \times 10^6$  inches.
- The tolerance for arc endpoints is 10 programming units. When using 3 decimal point precision and inch mode, this means 10 thousandths of an inch. When using 1 decimal point precision and metric mode, this means 1 mm. If the distance from the start point to the center point and the distance from the end point to the center point are different by more than this amount, a Circle Error will occur.

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## Section 2: Programming Codes

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## 2 Programming Codes

### 2.1 EIA Format

EIA format is the standard programming format supported by the Vision Controller. EIA format uses G-Codes (Geometry Codes) to program motion, and M-Codes (Miscellaneous Codes) to program processes. This section describes the standard programming codes supported by the Vision CNC. Support of other EIA codes is possible through an EIA converter.

### 2.2 ESSI Format

ESSI format, also known as Tab Sequential, is prevalent in the shipbuilding industry. The Vision Control will also accept and execute standard ESSI auxiliary codes. Where applicable, the equivalent ESSI codes, format descriptions, and program examples are shown.

### 2.3 G-Codes

G-Codes indicate movement or motion commands.

#### 2.3.1 Motion Codes

The motion codes are used to define programmed motions of the machine. These codes are modal; once they have been read, the control assumes the following lines to be the same type of motion, until a different G-Code is encountered. When entering actual program dimension values, the plus sign (+) is optional. The control will assume all values to be positive unless a negative sign (-) is present.

**G00 (ESSI 5)**

#### **RAPID MOTION ON**

For programming linear movement at rapid speed. This is used for traversing between parts. The machine will execute this movement at the maximum feed rate for that machine. The control will stay in rapid mode until a different G-Code is encountered. Required values: X, Y. See also: "R" in section 2.4, **Error! Not a valid result for table.** In ESSI programming, Rapid mode is canceled by Code 6.

EIA FORMAT: G00 Xn Yn

**G01**

## **LINEAR MOTION**

For programming linear cutting movements. Cancels rapid motion. In ESSI programming, Code 6 cancels rapid motion. Required values: X, Y.

EIA FORMAT: G01 Xn Yn

ESSI FORMAT: +n+n

**G02**

## **CIRCULAR MOTION - CLOCKWISE**

For programming circles or arc motions in a clockwise direction. Cancels rapid motion. Required values: X, Y, I, J. I and J define the position of the center point.

EIA FORMAT: G02 Xn Yn In Jn

ESSI FORMAT: +n+n+n+n-

**G03**

## **CIRCULAR MOTION - COUNTERCLOCKWISE**

For programming circles or arc motions in a counter-clockwise direction. Cancels rapid motion. Required values: X, Y, I, J. I and J define the position of the center point.

EIA FORMAT: G03 Xn Yn In Jn

ESSI FORMAT: +n+n+n+n+

### **2.3.2 Special Purpose G-Codes**

**G04 (ESSI 41)**

## **DELAY TIMER**

The Delay Timer may be used to program motion delays. The format is shown below, where nnn is the length of delay time in .1 seconds. One decimal place is assumed.

EIA FORMAT: G04Fnnn

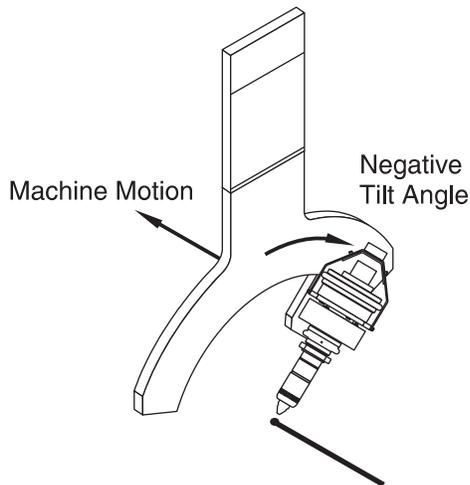
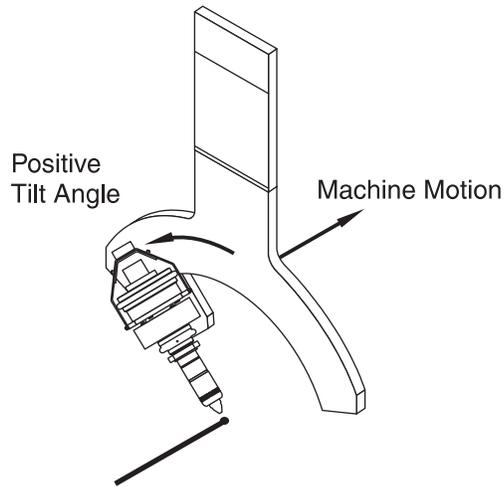
ESSI FORMAT: 41+nnn

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## Section 2: Programming Codes

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### G34 (ESSI 122) TILT ANGLE



G34 defines the tilt angle, or bevel angle, for the Programmable Plasma Bevel head. Measured from vertical, a positive angle tilts the head to the left, a negative angle tilts the head to the right.

The code AL also provides the same function as a G34.

The G34 is followed by an I parameter, which defines the tilt angle. One decimal place is assumed.

EIA FORMAT: G34Innn or G34I-nnn

EIA FORMAT: AL+nnn or AL-nnn

ESSI FORMAT: 122+nnn or 122-nnn

#### EXAMPLES:

G34I300	Tilt to Positive 30 degrees.
G34I-250	Tilt to Negative 25 degrees.
AL+275	Tilt to Positive 27.5 degrees.
AL-450	Tilt to Negative 45 degrees.
122+150	Tilt to Positive 15 degrees.
122-200	Tilt to Negative 20 degrees.

When the G34 is programmed, the control automatically interpolates the tilt motion over the next motion block. This is to avoid sudden rapid motion of the head. This can also be used to make a smooth transition from one tilt angle to another over a length of cut. However, usually a bevel cut needs to be done all at the same angle. Therefore, it is usually desirable to program a short straight movement block immediately following the G34 block, followed by the motion block that needs to be cut with a bevel.

## EXAMPLE

.	
.	
G34I-450	Tilt to -45 degrees
X.5	Short Straight Line allowing head to tilt
G1Y15.0	Straight Line to be cut at -45 degrees
.	
.	

An additional J parameter may be included, and must have the value of "1". When included, the J parameter tells the control to interpolate the tilt angle over the following motion blocks, until the next G34 code is programmed.

EIA FORMAT: G34InnnJ1

EIA FORMAT: AL+nnn+1

ESSI FORMAT: 122+nnn+1

## EXAMPLES:

G34I-355J1	Tilt to Negative 35.5 degrees over the following contour.
AL+400+1	Tilt to Positive 40 degrees over the following contour.
122-350+1	Tilt to Negative 35 degrees over the following contour.

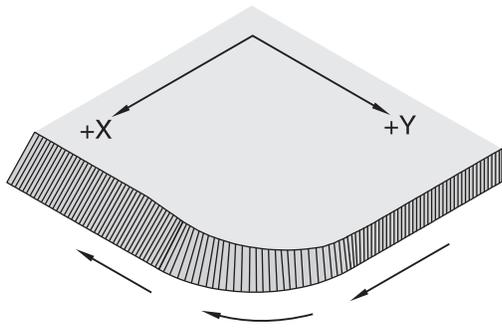
---

## Section 2: Programming Codes

---

### EXAMPLE

```
.  
.   
G1X10.           Straight Line  
G34I-45J1        Tilt to -45 degrees over the following contour  
X1.             Straight Line  
G2X5.Y-5.J-5.   Clockwise Arc  
G1Y-1.          Straight Line  
G34             End Tilt movement  
G1Y-10.         Straight Line  
.   
.
```



The result of this example is that the tilt movement is interpolated over the program lines between the G34I-45J1 and the G34.

In some situations it is necessary to tilt immediately from one angle to another, without interpolating over a motion block. In this case the tilt carriage will move very fast (up to 180°/second). To do this, simply program any other M-Code immediately after the G34. If it is inconvenient to use a valid M-Code, then an M1, Optional Stop may be used. In ESS1, code 46 may be programmed as a dummy code.

## **G40 (ESSI 38)      KERF OFF**

This code turns off the kerf compensation after being turned on by G41 or G42. It is not necessary to program G40 before changing from kerf offset on one side to the other, however, this should not be done when the torch is on.

## **G41 (ESSI 29)      KERF LEFT**

This code turns on kerf compensation offsetting to the left of the path. To determine the desired direction of kerf offset, it is necessary to envision the cut direction. Kerf Left will offset the cut path to the left, when facing the cut direction. The programmer need only consider the kerf direction. The machine operator will enter the kerf amount, which needs to be determined by measurement of the actual cut width, and will change with every thickness of material and type of cutting. The controller will automatically offset the cut path by 1/2 of the entered amount. This puts the edge of the cut along the actual programmed path.

G41 may also be used to program the actual kerf value.

## **G42 (ESSI 30)      KERF RIGHT**

This code turns on kerf compensation to the right of the programmed path. To determine the desired direction of kerf offset, it is necessary to envision the cut direction. Kerf Right will offset the cut path to the right, when facing the cut direction. The programmer need only consider the kerf direction. The machine operator will enter the kerf amount, which needs to be determined by measurement of the actual cut width, and will change with every thickness of material and type of cutting. The controller will automatically offset the cut path by 1/2 of the entered amount. This puts the edge of the cut along the actual programmed path.

G42 may also be used to program the actual kerf value, as shown in the following examples.

---

## Section 2: Programming Codes

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**G70 (ESSI 85) INCH MODE**

Informs the control that all programmed dimensions are in inches. When used, this code must appear at the beginning of the program. This is the default mode. If neither a G70 (85) nor a G71 (84) is programmed, the control will assume inch mode.

**G71 (ESSI 84) METRIC MODE**

Informs the control that all programmed dimensions are in mm. When used, this code should appear at the beginning of the program.

**G80 (ESSI 224) CHARACTER GENERATOR**

The Character Generator is an optional feature which enables the machine to “print” characters on the plate using any single point marking device.

The G80 code defines the text string to be printed. G80 must be used in conjunction with G81 and G82 to define the size and orientation of the text string. The text string must follow the G80 on the next line, and is enclosed in parenthesis. Marker offsets must be turned on prior to any character marking. Machines equipped with Automatic Offsets do this automatically. If not equipped with Automatic Offsets, they must be programmed explicitly.

The text string can be up to 80 characters long. The following characters can be used in the text string for the Character Generator:

A through Z, 0 through 9, +, =, :, ?, -, /, .., \*

EIA FORMAT: G80  
(text string)

ESSI FORMAT: 224  
text string

## **G81 (ESSI 225) CHARACTER HEIGHT**

G81 defines the size of the characters to be printed. The format is as follows, where nn is the character height.

EIA FORMAT: G81 Dnn

ESSI FORMAT: 225+nn

## **G82 (ESSI 226) CHARACTER ORIENTATION**

G82 defines the orientation of the text string on the plate. The format is as shown below, where nnn is rotation in degrees counter-clockwise from the -Y direction.

EIA FORMAT: G82 Dnnn

ESSI FORMAT: 226+nnn

### **EXAMPLE**

.	
.	
G81D1.	Define character height 1 inch.
G82D270	Define character orientation at 270 degrees.
G80	Define character string.
PART 223A28	Character string
D4	Comments OFF (end character string)
.	
.	

### **EXAMPLE (ESSI)**

.	
.	
225+10	Define character height 1 inch.
226+27000	Define character orientation at 270 degrees.
224	Define character string.
PART 223A28	Character string
4	Comments OFF (end character string)
.	
.	

---

## Section 2: Programming Codes

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<b>G83</b>	<b>(ESSI 31)</b>	<b>STATION SELECT 1-9</b>
<b>G87</b>	<b>(ESSI 33)</b>	<b>STATION SELECT 10 AND ABOVE</b>
<b>G84</b>	<b>(ESSI 32)</b>	<b>DE-SELECT STATIONS 1-9</b>
<b>G88</b>	<b>(ESSI 34)</b>	<b>DE-SELECT STATIONS 10 AND ABOVE</b>

The codes G83, G84, G87, and G88 are assigned slightly different functions depending on the configuration of the machine.

For machines equipped with one motorized Y axis carriage and multiple slave carriages with automatic band clamping, these codes are used for Station Selection and Spacing, as described in section 2.3.3.

For machines equipped with two plasma cutting torches on the same carriage (such as high current plasma and precision plasma), these codes are used for Multi-Process Programming, as described in section 0.

For machines with two or more motor driven Y axis carriages, these codes are used for Programming Station Motion, as described in section 2.3.6.

<b>G86</b>	<b>(ESSI 61)</b>	<b>PROGRAMMED MOVE TO FIXED POINT</b>
------------	------------------	---------------------------------------

This code allows the part program to direct the machine to move to one of the fixed points. All machines have at least one fixed point. Optionally, the Divided Working Areas option allows 4 fixed points. The actual position of those fixed points is defined in the Machine Constants.

When used, the G86 must be followed by an "I" parameter and the fixed point number to which the machine should be moved.

EIA FORMAT: G86In

ESSI FORMAT: 61+n

### EXAMPLE

G86I3                      Sends the machine to Fixpoint 3.

**G90 (ESSI 81) ABSOLUTE PROGRAMMING MODE**

Informs the control that all programmed dimensions are absolute coordinates, referenced from an absolute zero point. When used, this code must appear at the beginning of the program. This is the default mode. If neither a G90 (81) nor a G91 (82) is programmed, the control will assume absolute mode.

**G91 (ESSI 82) INCREMENTAL PROGRAMMING MODE**

Informs the control that all programmed dimensions are relative distances, referenced from the start of each block. When used, this code must appear at the beginning of the program.

**G92 (ESSI 86) ABSOLUTE ZERO POINT**

Defines the position of the absolute zero point for absolute programming mode. The format of this code allows the user to define the zero point anywhere in the coordinate system. If no X or Y value is included, then the control assumes that the current machine position is the absolute zero point. Otherwise, the value programmed for X and Y is taken as the distance that the machine is currently offset from the absolute zero point. Those values are loaded into the control's Program Coordinates register, and all absolute programming movements are referenced to the new zero point.

EIA FORMAT: G92 Xn Yn

ESSI FORMAT: 86+n+n

---

## Section 2: Programming Codes

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### 2.3.3 Programmed Station Selection

#### 2.3.3.1 Applications

Programmed Station Selection is available on all Vision CNC controlled machines. This feature allows the cutting or marking stations to be turned on and off via codes in the part program.

#### 2.3.3.2 Introduction

A set of G codes has been assigned for programming this feature for the Vision Control system. These codes are described with regard to function and operation.

#### 2.3.3.3 Station Selection

**G83 (ESSI 31)**

**STATION SELECT 1-9**

**G87 (ESSI 33)**

**STATION SELECT 10 AND ABOVE**

These codes are used to specify which stations to activate or deactivate. G83 selects a station or multiple stations in the group of stations 1-9, G87 selects stations 10 and above. Follow the G code with an "I" parameter and the station number (s) to be selected.

EIA FORMAT: G83InJm

EIA FORMAT: G87InJm

ESSI FORMAT: 31+n+m

ESSI FORMAT: 33+n+m

**EXAMPLE**

G83I357

Selects station numbers 3, 5 and 7

Stations 10 and above are selected by using G87. In this group of stations, station 10 is 1, station 11 is 2, station 12 is 3, etc.

**EXAMPLE**

G87I135

Selects station numbers 10, 12 and 14

## 2.3.3.4 Station De-Selection

**G84 (ESSI 32)**

**DE-SELECT STATIONS 1-9**

**G88 (ESSI 34)**

**DE-SELECT STATIONS 10 AND ABOVE**

These two G-Codes are used to de-select stations. G84 de-selects stations 1-9, G88 de-selects station 10 and up. An "I" parameter can be included to specify which stations to de-select.

### **EXAMPLE**

G84I2468

De-selects station numbers 2, 4, 6 and 8

G88I2

De-selects station number 11

If no station(s) are specified "All" will be assumed.

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## Section 2: Programming Codes

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### 2.3.4 Programmed Station Clamping and Spacing

#### 2.3.4.1 Applications

Programmed Station Clamping and Spacing is an optional feature of the Vision CNC. This feature is only available on machines equipped with more than one Y-axis carriage, and with automatic band clamps on each carriage. For machines equipped with two motor driven Y-axis carriages, see section, 2.3.6, Programmed Station Motion.

#### 2.3.4.2 Introduction

A set of G codes has been assigned for programming this optional feature for the Vision Control system. These codes are described with regard to function and operation.

#### 2.3.4.3 Station Clamping

**G83 (ESSI 31)**

**CLAMPING STATIONS 1-9**

**G87 (ESSI 33)**

**CLAMPING STATIONS 10 AND ABOVE**

The same codes are used for Station Selection and Station Clamping. G83 sets the clamping mode for stations 1-9, G87 sets stations 10 and above.

Follow the G code with an "I" parameter and the station number (s) to be clamped.

The clamping mode of the selected stations is specified by including a "J" parameter. A data block with a "J" parameter will only cause the station to be clamped as specified, it does not select the station for cutting. The clamp mode can be one of four (4) choices.

J0 Free stations (unclamped)

J1 Clamp station(s) to beam

J2 Clamp station(s) in "like" image

J3 Clamp station(s) in "mirror" image

## EXAMPLES

G83I1234J1	Clamp stations 1, 2, 3 and 4 to the beam
G83I257J3	Clamp stations 2, 5 and 7 in "mirror" image
G87I12J2	Clamp stations 10 and 11 in "like" image mode
31+23+2	Sets stations 2 and 3 to "Like" mode.
31+4+3	Sets station 4 to "Mirror" mode.

### 2.3.4.4 Programming Sequence

Since a G83 or G87 with a "J" parameter does not activate a station, all clamping must be done prior to selecting which stations will be used for the cutting process. If station spacing is changed during a program, it resets the station selection. Thus, after re-spacing the stations, the appropriate stations must be selected prior to starting the cutting process.

To have the control do an automatic movement back to the part program after station spacing is set, the program should be written in absolute mode, with all spacing movements written in incremental mode. Specify Absolute Mode at the beginning of the program with a G90, then establish an Absolute Zero Point with a G92. Following the Mash code, M89, the spacing motion should be preceded by an Incremental Mode code, G91. When all incremental spacing motion is finished, use a G90 to resume Absolute Mode, and return to programming of the desired part.

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## Section 2: Programming Codes

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A sample program using station selection and spacing would look like this:

### EXAMPLE

G90	Select Absolute Mode
G92X0Y0	Set Absolute Zero Point at current position
M89	MASH, releases all clamps and mashes stations
G91	Select Incremental Mode
G1Y60.0	Separate the Master carriage by 60 inches.
G83I2J2	Clamp station #2 in the "Like" mode.
G90	Select Absolute Mode
G0X0Y0	Rapid motion back to the Absolute Zero Point
G83I1J2	Select stations 1 and 2 for cutting.
M67	Begin cutting process.
M65	
.	
.	

To change the station spacing in the middle of a program, start by de selecting all stations using the G84 and G87. Next, clamp the slave stations to the beam as required by using the G83 with a "J" parameter. Then, while the slave stations are clamped to the beam, move the master carriage to the desired position relative to the slaves. The actual minimum separation of the cutting torches will be different on each machine and will have to be determined by measurement. Once the torches are at the correct separation, clamp the slave stations as required using the G83 with a "J" parameter. Finally, select the stations to be used for cutting by using a G83 code.

## 2.3.5 Multi-Process Programming

### 2.3.5.1 Applications

Multi-Process Programming is an optional feature of the Vision CNC. This feature is only available on machines equipped with two or more different cutting process tools which will be used within the same part program. This requires fixed offsets between the process tools, meaning either that the tools are mounted on the same carriage, or that the tool carriages are attached at a fixed distance.

### 2.3.5.2 Introduction

A set of G codes has been assigned for programming this optional feature for the Vision Control system. These codes are described with regard to function and operation.

### 2.3.5.3 Tool Selection

When multi-process stations are installed, each cutting tool is programmed as a separate station, even if they are physically mounted to the same carriage. The standard Station Selection codes are used to turn each process on and off. If a machine is equipped with two different plasma torches mounted on the same carriage, each torch is assigned a different station number, and each must be turned on and off individually. Furthermore, the Vision CNC software prevents turning two different cutting processes on simultaneously.

**G83 (ESSI 31)**

**STATION TOOL SELECT 1-9**

**G87 (ESSI 33)**

**STATION TOOL SELECT 10 AND ABOVE**

These codes are used to select the desired cutting tool. G83 selects a tool station or multiple tool stations of the same type in the group of stations 1-9, G87 turns on tool stations 10 and above. Follow the G code with an "I" parameter and the station number (s) to be selected.

EIA FORMAT: G83In

EIA FORMAT: G87In

ESSI FORMAT: 31+n

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ESSI FORMAT: 33+n

### EXAMPLE

G83I13

Selects tool stations 1 and 3

Tool stations 10 and above are selected by using G87. In this group of stations, station 10 is 1, station 11 is 2, station 12 is 3, etc.

### EXAMPLE

G87I15

Selects tool stations 10, and 14

### 2.3.5.4 Tool De-Selection

**G84 (ESSI 32)**

**DE-SELECT TOOL STATIONS 1-9**

**G88 (ESSI 34)**

**DE-SELECT TOOL STATIONS 10 AND ABOVE**

These two G-Codes are used to de-select tool stations. After cutting processing is finished with one tool, that tool station must be deselected before a different cutting tool may be selected. G84 de-selects tool stations in the group 1-9, G88 de-selects station 10 and up. An "I" parameter can be included to specify which stations to de-select.

### EXAMPLE

G84I24

De-selects tool stations 2 and 4

G88I2

De-selects tool station 11

If no station(s) are specified "All" will be assumed.

## 2.3.5.5 Programming Sequence

The tool station selection codes must be used in conjunction with tool offset codes in order to place the desired tool into position. The general sequence of programming requires the following sequence:

1. Tool Offset ON
2. Tool Select
3. Motion to first process start point.\*
4. Process ON
5. Programmed motion with selected tool.
6. Process OFF
7. Tool De-Select
8. Tool Offset OFF
9. Second Tool Offset ON
10. Second Tool Select
11. Motion to next process start point.\*
12. Process ON
13. Programmed motion with selected tool.
14. Process OFF
15. Second Tool Deselect
16. Second Tool Offset OFF

There must be either a programmed motion or a programmed delay time (G04) between the tool selection code and the process on code in order to allow for purge cycles or internal processing.

The example below is for a multi-process station with a high current plasma torch (Tool Station #1) as the primary tool (no offset required), and a precision plasma torch (Tool Station #2).

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### EXAMPLE

M45	Tool Offset #1 ON.
G83I2	Select Tool Station #2.
G00X10.0	Rapid motion to pierce point.
M67	Kerf ON.
M65	Precision Plasma Process ON.
.	Programmed Cutting Motion.
.	.
.	.
M66	Precision Plasma Process OFF.
M67	Kerf OFF.
G84I2	De-Select Tool Station #2.
M46	Tool Offset OFF.
G83I1	Select Tool Station #1.
G00X-10.0	Rapid motion to second pierce point.
M67	Kerf ON.
M65	High Current Plasma Process ON.
.	Programmed Cutting Motion.
.	.
.	.
M66	Precision Plasma Process OFF.
M67	Kerf OFF.
G84I1	De-Select Tool Station #1.

## 2.3.6 Programmed Station Motion

### 2.3.6.1 Application

Programmed Station Motion is an optional feature of the Vision CNC. This feature is only available on machines equipped with two or more motor driven Y-Axis carriages. For machines equipped with a Y-Axis band and automatic band clamps, see section 2.3.3, Programmed Station Selection.

### 2.3.6.2 Introduction

A set of G codes has been assigned for programming this optional feature for the Vision Control system. This feature is of great importance on machines equipped with two plasma bevel stations, each mounted on a motorized Y-Axis carriage. On such machines, the motion mode also affects the rotation and tilt axes of the bevel head. This feature allows the machines to automatically cut two mirror image bevel parts simultaneously, including mirrored bevel angles and rotation.

### 2.3.6.3 Codes

#### **G83 (ESSI 31)**

#### **SELECT MOTION MODE**

G83 selects the Y-Axis motion mode for each cutting station.

Each cutting station is mounted to a motorized carriage. The carriage will be driven in the Y-Axis according to the movements programmed into the part program. However, with this code it is possible to change the mode of each carriage's Y-Axis movement to one of the following: like mode, mirror mode, or free mode. In like mode, the carriage will move in the direction defined in the part program. In mirror mode, the carriage will move in the direction opposite of the programmed movement. In free mode, the carriage will not move in the Y-Axis. Each carriage can be programmed independently, and the mode can be changed at any time by the program.

When used, this code must be followed by an I parameter and a J parameter. The I parameter precedes the number of each station being set. The J parameter precedes the code number for the motion mode to apply to those stations. The

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motion mode may be set for one station at a time, or for multiple stations at one time. The motion mode may be changed multiple times during the program. The format is as follows:

**EIA FORMAT:** G83 Ixy Jw

**ESSI FORMAT:** 31+xy+w

where:

x and y are the numbers of the stations whose motion mode is being changed.

w is the code number for the motion mode to apply to those stations.

The motion modes are as follows:

- 1 = Free : station will not move during program.
- 2 = Like Mode : station will move according to actual programmed motion. Rotation mode is normal. Tilt mode is normal.
- 3 = Mirror Mode : station will move opposite of actual programmed motion in the Y axis. Rotation will be mirrored. Tilt angle is also mirrored.

The motion mode for each station may also be set manually in the Process Window at the Vision CNC. The G83 code overrides the manually set clamping mode. If there is no G83 in a program, the manually set clamping mode will apply throughout the program.

### **EXAMPLES:**

G83 I12 J2	Sets stations 1 and 2 to "Like" mode.
G83 I2 J1	Sets station 2 to "Free" mode.
G83 I1 J3	Sets station 1 to "Mirror" mode.
31+2+2	Sets station 2 to "Like" mode.
31+1+3	Sets station 1 to "Mirror" mode.

## **G85 (ESSI 37)**

### **STATION SPACING**

Machines with two or more motor driven Y-axis carriages are set up such that the Vision CNC monitors and controls the spacing between adjacent carriages.

The G85 code may be used to set a specific spacing between carriages.

**EIA FORMAT:** G85 Inm Jxxx

**ESSI FORMAT:** 37+nm+xxx

Where n is the number of the station to remain fixed, m is the number of the station to be moved, and xxx is the new distance between stations. The distance xxx must be greater than or equal to the minimum distance between two carriages.

### **EXAMPLES**

G85 I12 J120.0

This code will fix Station 1 in its present location and move Station 2 until it is 120.0 inches or mm away from Station 1.

G85 I21 J120.0

This code will fix Station 2 in its present location and move Station 1 until it is 120.0 inches or mm away from Station 2.

### **MISC. CODES**

#### **G89**

#### **MARKING TOOL IDENTIFICATION**

G89D1

Select Image Tool

G89D2

Select X-Y Marking Table

#### **G140D**

#### **FEEDRATE % OVERRIDE**

Used for waterjet to change speed without having to call out a different SDP file.

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### 2.4 M-Codes

**M0 (ESSI 0)**

#### **PROGRAM STOP**

This code may be used to stop program execution at a specific point in the program, such as at the start of cutting operations. To continue program execution, the operator must press START.

**M1 (ESSI 102)**

#### **OPTIONAL STOP**

An optional stop will only be recognized if the Optional Stop feature is turned on by the machine operator. If the Optional Stop feature is turned on, this code causes machine motion to stop at this point. This can be useful to stop program execution at a specific point in the program, such as at the start of cutting operations, if the operator deems necessary. To continue program execution, the operator must press START.

**M21-M28**

#### **SHAPE ORIENTATION**

These codes interchange or rotate the coordinate axis in 90 degree intervals or mirror image positions. These codes can be useful for orientation or nesting of parts.

**M21 (ESSI 21)**

#### **NORMAL MODE**

This is the default mode. This code only needs to be programmed if returning to normal orientation after using M22 through M28.

**M22 (ESSI 24)**

#### **MIRROR X AXIS**

$(X=-X, Y=+Y)$

**M23 (ESSI 26)**

#### **ROTATE 90° CCW FROM NORMAL**

$(X=+Y, Y=-X)$

**M24 (ESSI 25)**

#### **MIRROR IMAGE OF M23**

$(X=-Y, Y=-X)$

**M25 (ESSI 28) ROTATE 90° CW FROM NORMAL**

(X=-Y, Y=+X)

**M26 (ESSI 27) MIRROR IMAGE OF M25**

(X=+Y, Y=+X)

**M27 (ESSI 23) ROTATE 180° FROM NORMAL**

(X=-X, Y=-Y)

**M28 (ESSI 22) MIRROR IMAGE OF M27**

(X=+X, Y=-Y)

**M29 (ESSI 184) INCREMENTAL ROTATION**

This function allows part programming to be rotated by any number of degrees. All programmed motion after this code is rotated by the amount specified with this code.

EIA FORMAT: M29 Tnnn

ESSI FORMAT: 184+nnn

**M34 (ESSI 117) ROTATION SKIP BLOCK**

This function turns rotation OFF for one motion block. This can be used to avoid unnecessary bevel head movement, or to maintain a fixed bevel angle over a contour. The same results can be achieved by using M62 and M63 to turn rotation OFF then back ON before and after a motion block.

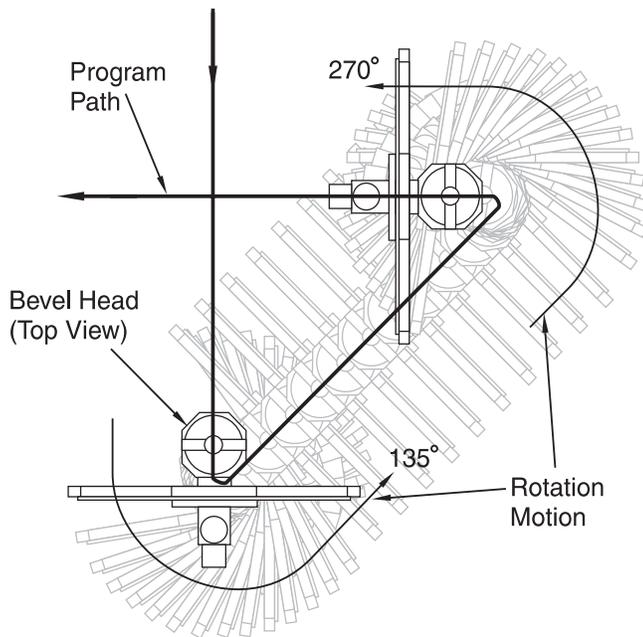
G72 also provides the same function.

**M35 (ESSI 118) ROTATION LOOK AHEAD ONE BLOCK**

This is an important part of bevel cutting rotation control. When the controller receives this code, it does not rotate the bevel head according to the next block, but instead looks ahead to the following block. With this code, head wrap is avoided since the head can do a corner loop while rotating only 90 degrees, in the opposite direction of the loop.

G73 also provides the same function.

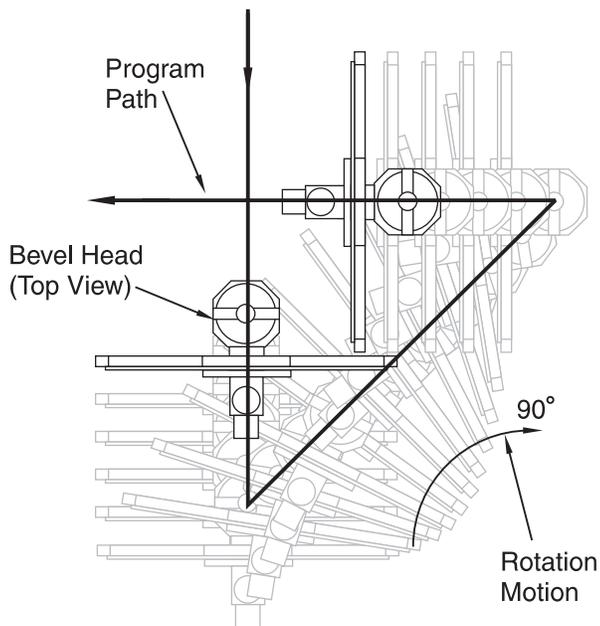
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To execute a corner loop without M35, the bevel head rotates to follow machine motion. This results in two turns of 135 degrees each, for a total of 270 degrees of counter-clockwise rotation.

This top view illustrates the motion resulting from the following lines of code.

```
.  
. G1 X-10.0  
X1.0 Y-1.0  
Y10.0  
.
```



A corner loop with M35 results in only 90 degrees of clockwise rotation. After executing the movement in the positive X direction (G1 X10.0) the head will slowly turn until it is rotated in the correct position to execute the Y axis motion (Y-10.0).

This top view illustrates the motion resulting from the following lines of code.

```
.  
. G1 X-10.0  
M35  
X1.0 Y-1.0  
Y10.0  
.
```

**M38 (ESSI 108) LASER POINTER ON**

For machines equipped with the programmable laser pointer option, this code turns the laser pointer ON.

**M39 (ESSI 109) LASER POINTER OFF**

Turns the laser pointer off.

**M45 (ESSI 11) TOOL OFFSET #1 ON**

Moves the marker to the location previously occupied by the torch. Direction and amount of offset are determined by the Machine Constants. Either this code or an M47 must precede any marking or scribing. After one of these offset codes has been programmed, actual marking is done by programming an M60, scribing is done with the M74 and M75.

**M46 (ESSI 12) TOOL OFFSET OFF**

Cancels the offset initiated by M45. The marker offset off codes M46 and M48 should only be used after all marking and scribing in the program is completed.

**M47 (ESSI 114) TOOL OFFSET #2 ON**

Moves the marker to the location previously occupied by the torch. Direction and amount of offset are determined by the Machine Constants.

**M48 (ESSI 12) TOOL OFFSET OFF**

Cancels the offset initiated by M47.

**M49 (ESSI 114) TOOL OFFSET #3 ON**

Moves tool #3 to the location previously occupied by the main tool. Direction and amount of offset are determined by the Machine Constants.

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<b>M50</b>	<b>(ESSI 12)</b>	<b>TOOL OFFSET OFF</b>
		Cancels the offset initiated by M49, turns off AHC and raises the marker unit.
<b>M56</b>	<b>(ESSI 49)</b>	<b>DISABLE TOUCH. USE PREVIOUS HEIGHT.</b>
		Only for machines shipped after August 2002. After first height sample with encoder this code will skip touch plate sequence. Must be used before M65. M66 cancels this code
		<b>EXAMPLE:</b>
		M56
		M65
<b>M57</b>	<b>(ESSI 48)</b>	<b>AUTOMATIC HEIGHT CONTROL BLOCK</b>
		This code freezes the Plasma AHC until an M58 code is received.
<b>M58</b>	<b>(ESSI 47)</b>	<b>AUTO HEIGHT CONTROL RELEASE</b>
		This command re-enables Plasma AHC after having been disabled by an M57.
<b>M59</b>	<b>(ESSI 48)</b>	<b>ENCODER HEIGHT CONTROL</b>
		This code is used for slide with encoder. If this code is placed directly before M65 it sets the cutting AHC mode to encoder height.
		<b>EXAMPLE:</b>
		M59
		M65
<b>M60</b>	<b>(ESSI 9)</b>	<b>PUNCH/MARK</b>
		This code momentarily energizes the marking unit to make a mark on the plate. Marker Offset On must be programmed first to enable height control and to properly offset the marker unit, either M45 or M47. All punching or marking should be done prior to cutting the part, since parts may shift or drop away after being cut, and the vibration from the marker can cause cut parts to move.

## **M62 (ESSI 52)**

### **ROTATION STOP**

This code freezes the rotation axis at its current location. This can be used to hold the bevel head from turning over several movements. Note:

1. If rotation needs to be turned on again, an M63 must be programmed.
2. If no more rotation is going to be done in the program, then an M64 should be used instead of M62.
3. If rotation only needs to be disabled for one block, a single M34 may be used instead of using M62 followed by M63.

## **M63 (ESSI 51)**

### **ROTATION ON**

This code turns on the rotation axis, also known as the tangential follower. The bevel head will begin to rotate according to the programmed motion.

When rotation is on, the bevel head will rotate so that the protractor is oriented perpendicular to the cut path, with the protractor and tilt carriage leading the plasma torch.

Some things to note when programming rotation on:

1. Turn rotation on, then make a short move in the cut direction to orient the head properly before piercing for a bevel cut.
2. Turn rotation off whenever possible to avoid head-wrap. Use M34 and M35 whenever possible to minimize head rotation.
3. Turn rotation off when making rapid moves or when cutting with no bevel.

If programmed in correct sequence it will pre-rotate head before process starts. When programmed like the following example head will pre-rotate to line 5 not 4.

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### EXAMPLE:

1. M63
2. G91
3. G0 X\_ Y\_
4. M65
5. G01 X\_ Y\_
6. M66

### **M64 (ESSI 98)**

#### **ROTATION OFF/HOME**

This code turns off the tangential follower, and sends the bevel head back to its home position. This code should be used at the end of a program, or when bevel cutting is finished.

### **M65 (ESSI 53)**

#### **PLASMA ON**

This code causes the following sequence of events:

1. Automatic Height Control is initiated, torches find initial height.
2. The Plasma process is initiated.
3. When all arcs are established, the Travel Delay and Pierce Timers begin.
4. After the Travel Delay Timer ends travel is initiated.
5. During the Pierce Timer, the Master Up output is on.

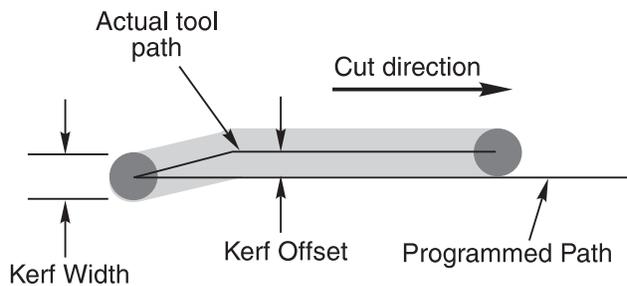
### **M66 (ESSI 54)**

#### **PLASMA OFF**

This code stops all arcs and raises the torches for the amount of time in the MASTER UP TIMER.

## M67 (ESSI 29)

## KERF LEFT



This code turns on kerf compensation offsetting to the left of the path. To determine the desired direction of kerf offset, it is necessary to envision the cut direction. Kerf Left will offset the cut path to the left, when facing the cut direction. The programmer need only consider the kerf direction. The machine operator will enter the kerf amount, which needs to be determined by measurement of the actual cut width, and will change with every thickness of material and type of cutting. The controller will automatically offset the cut path by 1/2 of the entered amount. This puts the edge of the cut along the actual programmed path.

G41 is also supported for KERF LEFT.

Both M67 and G41 may also be used to program the actual kerf value, as shown in the following examples.

EIA FORMAT: M67 Knnn

EIA FORMAT: G41Dnnn

ESSI FORMAT: 29+nnn

### EXAMPLES:

M67

Turns on KERF LEFT

M67 K270

Turns on KERF LEFT with a kerf width of .270 inches.

G41D270

Turns on KERF LEFT with a kerf width of .270 inches.

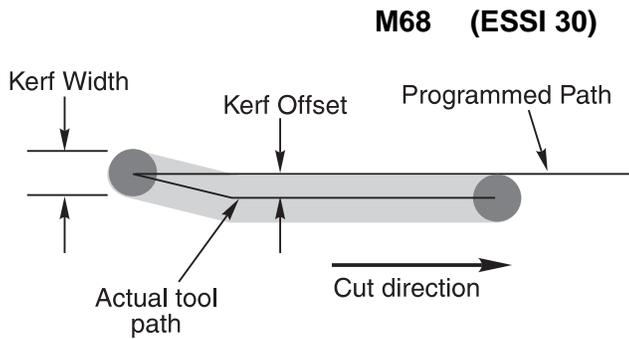
29+270

Turns on KERF LEFT with a kerf width of .270 inches. (ESSI Format)

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### **KERF RIGHT**

This code turns on kerf compensation to the right of the programmed path. See M67 above for other details.

G42 is also supported for KERF RIGHT.

Both M68 and G42 may also be used to program the actual kerf value, as shown in the following examples.

EIA FORMAT: M68 Knnn

EIA FORMAT: G42Dnnn

ESSI FORMAT: 30+nnn

### **EXAMPLES:**

M68

Turns on KERF RIGHT

M68 K270

Turns on KERF RIGHT with a kerf width of .270 inches.

G42D270

Turns on KERF RIGHT with a kerf width of .270 inches.

30+270

Turns on KERF RIGHT with a kerf width of .270 inches. (ESSI Format)

### **M69 (ESSI 38)**

### **KERF OFF**

This code turns off the kerf compensation after being turned on by an M67 or M68. It is not necessary to program M69 before changing from kerf offset on one side to the other, however, this should not be done when the torch is lit.

G40 is also supported for KERF OFF.

## **M70 (ESSI 7)**

### **OXY FUEL CUTTING CYCLE START**

This code causes the following sequence of events to occur:

1. The Automatic Height Control is initiated and selected torches lower to the plate. The ignitors on all torches turn on.
2. The ignitors turn off automatically after five seconds of operation.
3. High preheat gases turn on and PREHEAT timer starts.
4. When the preheat timer has completed its timing, the cutting oxygen is turned on, and the preheat gases are switched to "low preheat".
5. Machine travel is initiated.
6. If a Plasma station is selected, the M70 is the same as an M65.

## **M71 (ESSI 8)**

### **CUTTING CYCLE STOP**

This code shuts off all gases and causes the torches to raise for the amount of time in the MASTER UP TIMER. The machine will be in feedhold while the torches are being raised. If a Plasma station is selected, the M71 functions the same as an M66.

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### **M73 (ESSI 59) CUT STOP**

This code shuts off the cutting oxygen, but leaves preheat oxygen/fuel gas on, and raises the torches for the amount of time in the MASTER UP TIMER. This function is used primarily to end the cutting process between multiple oxy-fuel cuts. If a plasma station is selected, the M73 function is the same as the M66.

**NOTE:** Manual Edge Prep Oxyfuel with rotation or Oxyfuel VBA (7-axis head) require M71 as process off code to perform pre-rotation correctly. The M73 code should not be used.

### **M74 (ESSI 110) SCRIBE ON**

This code turns on Automatic Height Control and energizes the marking unit in order to mark a scribed path. The markers remain energized until an M75 is programmed. This code should be followed immediately with a motion block.

The M74 should only be used after a marker offset code has been programmed, either M45 or M47. The scribe on code begins marking, and assumes that the marker has already been moved into the correct position.

### **M75 (ESSI 111) SCRIBE OFF**

This code de-energizes the marking units and turns off Automatic Height Control to end a scribed path. After all marking or scribing has been finished, a marker offset off code should be issued to turn off the marker offset, either M46 or M48.

**M77 (ESSI 73) CENTER TORCH CUT OXYGEN OFF**

For Triple Torch Oxy-Fuel Contour Bevel Units, this code shuts off the center torch cutting oxygen stream.

**M78 (ESSI 14) LEFT TORCH CUT OXYGEN OFF**

For Triple Torch Oxy-Fuel Contour Bevel Units, this code shuts off the left torch cutting oxygen stream.

**M79 (ESSI 16) RIGHT TORCH CUT OXYGEN OFF**

For Triple Torch Oxy-Fuel Contour Bevel Units, this code shuts off the right torch cutting oxygen stream.

**M81 (ESSI 13) LEFT TORCH CUT OXYGEN ON**

For Triple Torch Oxy-Fuel Contour Bevel Units, this code turns on the left torch cutting oxygen stream.

**M82 (ESSI 15) RIGHT TORCH CUT OXYGEN ON**

For Triple Torch Oxy-Fuel Contour Bevel Units, this code turns on the right torch cutting oxygen stream.

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<b>M91</b>	<b>(ESSI 31+1)</b>	<b>SELECT STATION 1</b>	Selects cutting station number 1. Duplicates the function of G83, but only for station 1.
<b>M92</b>	<b>(ESSI 31+2)</b>	<b>SELECT STATION 2</b>	Selects cutting station number 2. Duplicates the function of G83, but only for station 2.
<b>M93</b>	<b>(ESSI 31+3)</b>	<b>SELECT STATION 3</b>	Selects cutting station number 3. Duplicates the function of G83, but only for station 3.
<b>M94</b>	<b>(ESSI 31+4)</b>	<b>SELECT STATION 4</b>	Selects cutting station number 4. Duplicates the function of G83, but only for station 4.
<b>M95</b>	<b>(ESSI 31+5)</b>	<b>SELECT STATION 5</b>	Selects cutting station number 5. Duplicates the function of G83, but only for station 5.
<b>M96</b>	<b>(ESSI 31+6)</b>	<b>SELECT STATION 6</b>	Selects cutting station number 6. Duplicates the function of G83, but only for station 6.
<b>M97</b>	<b>(ESSI 31+7)</b>	<b>SELECT STATION 7</b>	Selects cutting station number 7. Duplicates the function of G83, but only for station 7.
<b>M98</b>	<b>(ESSI 31+8)</b>	<b>SELECT STATION 8</b>	Selects cutting station number 8. Duplicates the function of G83, but only for station 8.
<b>M83</b>	<b>(ESSI 31+9)</b>	<b>SELECT STATION 9</b>	Selects cutting station number 9. Duplicates the function of G83, but only for station 9.
<b>M84</b>	<b>(ESSI 33+1)</b>	<b>SELECT STATION 10</b>	Selects cutting station number 10. Duplicates the function of G83, but only for station 10.

**M85 (ESSI 33+2) SELECT STATION 11**

Selects cutting station number 11. Duplicates the function of G83, but only for station 11.

**M86 (ESSI 33+3) SELECT STATION 12**

Selects cutting station number 12. Duplicates the function of G83, but only for station 12.

**M89 (ESSI 199) MASH**

The Mash function is used in conjunction with the Programmed Station Selection feature (see section 2.3.3).

The Mash function moves all stations to one end of the beam, and clamps them to the beam.

The Mash function is executed in the following sequence:

1. All slave carriage band and beam clamps are released.
2. The master carriage drives toward the end of the beam, “mashing” all slave carriages to the end of the beam. The actual direction of mash and the position to which the master carriage travels are set in the machine constants.
3. All slave carriages are clamped to the beam.
4. All previous station selection is canceled.

Following the M89, stations must be first be clamped at the desired spacing. See section 2.3.3 for additional information and programming examples.

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### M CODES FOR TRIPLE TORCH CUTTING

**M61**

#### **CBU CUTTING OXYGEN ON**

This code simultaneously turns on cutting oxygen to the left, right and center torches of an optional 3-torch gas contour bevel unit.

**M70**

#### **CUTTING CYCLE START**

This information causes the following sequence of events to occur:

- a. The automatic height control is initiated and selected torches lower to the plate. Then ignitors on all torches turn on.
- b. The ignitors turn off automatically after five seconds of operation.
- c. High preheat gases come on and preheat timer starts.
- d. When the preheat timer has completed its timing, the piercing valve opens, and the gases are switched to "low preheat".
- e. Machine travel is initiated when the cutting machine oxygen pressure switch closes. (nominally 0 - 20 psi).
- f. For Contour Bevel applications M70 is CENTER TORCH CUTTING OXYGEN ON.

**M71**

#### **CUTTING CYCLE STOP**

This information shuts off all gases and causes the torches to raise approximately 2". With bevel heads, the machine will be in feedhold while the torches are being raised. Resets all Port/Starboard selections.

**M73**

#### **TORCHES UP**

This information shuts off the cutting oxygen, but leaves preheat oxygen/fuel gas on, and raises the torches approximately 2" above the plate. This function is used primarily to retract torches during high speed positioning between multiple cuts.

**M77****CENTER BEVEL CUTTING OXYGEN OFF**

This function is used in conjunction with a triple torch bevel head when the machine is so equipped. It will turn the center torch cutting oxygen off.

**M78****LEFT BEVEL CUTTING OXYGEN OFF**

This function is identical to M77, except it shuts off cutting oxygen to the left bevel torch.

**M79****RIGHT BEVEL CUTTING OXYGEN OFF**

Same as M78, except it is for the right bevel torch.

**M81****LEFT BEVEL CUTTING OXYGEN ON**

This function turns on the cutting oxygen to the left torch of a triple torch bevel head.

**M82****RIGHT BEVEL CUTTING OXYGEN**

This function is the same as M81 except it turns cutting oxygen on to the right bevel torch.

**NOTE**

In bevel cutting operation M70 converts to CENTER BEVEL CUTTING OXYGEN ON. The first M-code (M70, 81, or 82) encountered will function to turn AHC on, Ignite, and High Preheat in addition to the normal function. The last M-code (M77, 78 or 79) encountered will do an AHC off and raise torches in addition to the normal function of shutting off cutting oxygen.

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### IMAJE PROGRAMMING CODES

<b>G89D2</b>	Select Imaje device
<b>G00XY</b>	Rapid move
<b>G04F0.1</b>	Delay 0.1 second
<b>G81D4</b>	Select font type
<b>G82D2270.0</b>	Select character angle
<b>G1</b>	Use marking speed
<b>G80</b>	Start of text string
<b>4001</b>	Text to be printed
<b>D4</b>	End of text

## 2.5 Auxiliary Codes

The Vision has added capabilities that allow for special functions. These special capabilities are not critical to the function of the CNC but allow for easier more convenient programming.

**R**

### **RAPID FEED RATE**

When placed at the end of a G01, G02, or G03 motion code, that line will be executed at Rapid speed. The "R" is not modal, the speed will return to normal after this line is executed.

EIA FORMAT: G01 Xn Yn R

**K (ESSI 40)**

### **KERF OFFSET**

Programmed Kerf Offset allows for changes in Kerf settings within the part program. A programmed kerf value overrides any kerf value entered by the machine operator. "K" followed by the kerf value in thousandths of an inch will load the kerf value into the control's kerf register.

EIA FORMAT: Knnn

ESSI FORMAT: 40+nnn

### **EXAMPLE**

.	
.	
K.250	Set kerf width to .250 inch
G1X10.0Y1.0R	Rapid motion to start point
M67	Kerf Left
M65	Plasma On
G1X-1.0Y-1.0	Linear Move
.	
.	

---

## Section 2: Programming Codes

---

### **F (ESSI 39) FEED RATE**

Programmed Feedrate provides feedrate changes during automatic program execution. "F" followed by the feedrate in inches per minute will cause a feedrate change upon execution of this block. Operator override of feedrate is still functional.

**EIA FORMAT:** Fnnn

**ESSI FORMAT:** 39+nnn

The following program cuts a 10 x 10 inch square with a 4 inch hole in the center. The hole is cut at 75 inches per minute, the square is cut at 100 inches per minute.

### **EXAMPLE**

G91	Incremental Mode
G00 X5.0 Y-6.5	Rapid move to 1st pierce point
F75	Set Feed rate at 75 IPM
M65	Plasma On
G03 J-.25	Lead In
G03 J2.0	Cut Circle
G03 J.25	Lead Out
M66	Plasma Off
G00 X-5.5 Y6.5	Rapid move to 2nd pierce point
F100	Set Feed rate at 100 IPM
M65	Plasma On
G01 X10.5	Cut Square
Y-10.0	.
X-10.0	.
Y10.5	.
M66	Plasma Off

### **D3 (ESSI 3) COMMENTS ON**

This code signals the beginning of comments, which are ignored by the controller during program processing. Comments must be ended by a code D4 (ESSI 4).

### **D4 (ESSI 4) COMMENTS OFF**

This code signals the end of comments.

**D100 (ESSI 100) OMIT BLOCK ON**

This code marks the beginning of a block which may be optionally omitted. The end of the block must be marked by a code D101 (ESSI 101). Using these codes, a group of program lines may be optionally omitted, or skipped, depending on whether the machine operator enables the Optional Block Skipping Feature. When Optional Block Skipping is turned on, all program lines between code D100 (ESSI 100) and code D101 (ESSI 101) are skipped. When Optional Block Skipping is turned off, those program lines are executed normally.

**D101 (ESSI 101) OMIT BLOCK OFF**

This code marks the end of an optional block.

**Q (ESSI 10) SELECT CUTTING DATA FILE**

The Q code is used to select a Cutting Data File (SDP file) which contains cutting parameters for the desired plate material and thickness. The ability to use SDP Files is an optional feature of the Vision CNC, and is used extensively with Plasma Bevel Systems. SDP files allow storage of a complete set of process parameters, which can then be recalled manually, or by the part program. This information must appear on a line by itself.

EIA FORMAT: Qnnn

ESSI FORMAT: 10+nnn

**EXAMPLE**

G91  
Q375  
G00 X5.0 Y-6.5  
M65

Incremental Mode  
Call SDP file "375.SDP"  
Rapid move to 1st pierce point  
Plasma On

**P160n**

(n = process #)  
n = 1 Plasma  
n = 2 Oxy/Fuel  
n = 6 Pr. Plasma  
n = 11 Waterjet

**PRESET PROCESS**

Pre-select process to insure correct kerf.

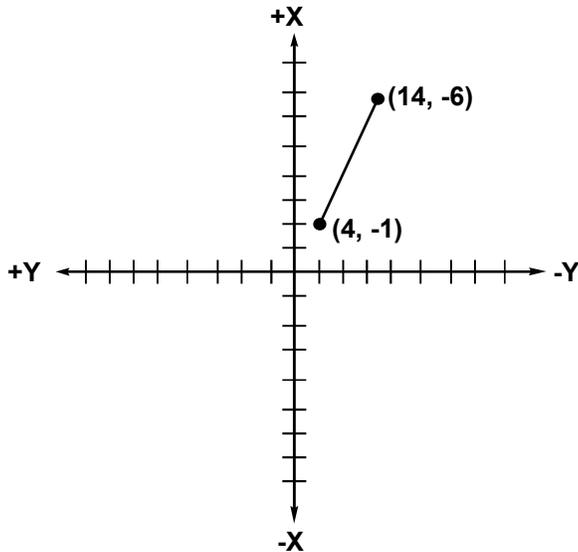
---

## Section 4: Programming Techniques

---

### 3 Programming Techniques

#### 3.1 Programming A Straight Line



A straight line is programmed by specifying the endpoint of the line. Normally, a straight line is programmed with a G01. However, if the movement is to be at rapid speed, then a G00 is used.

##### 3.1.1 Incremental

In incremental, the dimension specified is the displacement from the start point of the line. If there is motion only in one axis, then other axis dimension need not be programmed.

###### EXAMPLE

```
G01 X+10.0 Y-5.0
```

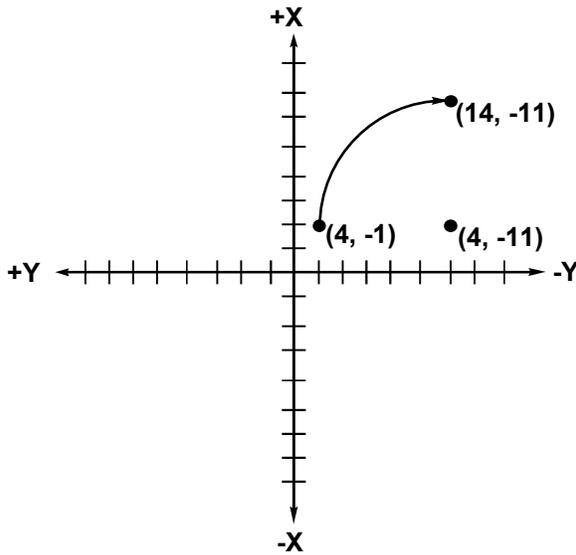
##### 3.1.2 Absolute

In absolute, the dimension specified is the absolute coordinate of the endpoint. If a dimension is omitted, it is assumed that the endpoint in that axis is a the same absolute dimension as the start point.

###### EXAMPLE

```
G01 X+14.0 Y-6.0
```

## 3.2 Programming An Arc



An arc is programmed by specifying the endpoint and center point of the arc.

### 3.2.1 Incremental

In incremental, both the endpoint and center point dimensions are specified as the displacement from the start point.

**EXAMPLE**

```
G02 X10.0 Y-10.0 I0 J-10.0
```

### 3.2.2 Absolute

In absolute, both the endpoint and center point dimensions are specified as the absolute coordinates of those points. If a dimension is omitted, then it is assumed that the absolute position of that point is the same as the start point.

**EXAMPLE**

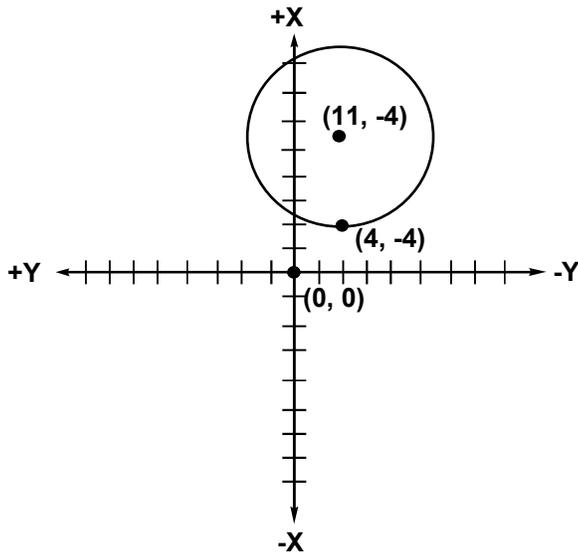
```
G02 X14.0 Y-11.0 I4.0 J-11.0
```

---

## Section 4: Programming Techniques

---

### 3.3 Programming A Circle



A complete circle is programmed by specifying the center point of the circle.

#### 3.3.1 Incremental

In incremental, center point dimensions are specified as the displacement from the start point. The endpoint need not be specified, since the displacement is zero.

**EXAMPLE**

```
G02 I7.0
```

#### 3.3.2 Absolute

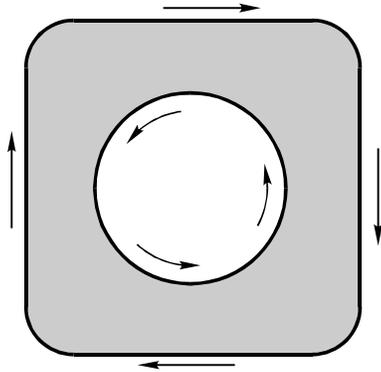
In absolute, the center point dimensions are specified as the absolute coordinates of that point. The endpoint need not be specified, since the control will assume the X and Y dimension to be unchanged from the current position.

**EXAMPLE**

```
G02 I11.0
```

## 4 General Rules Of Programming

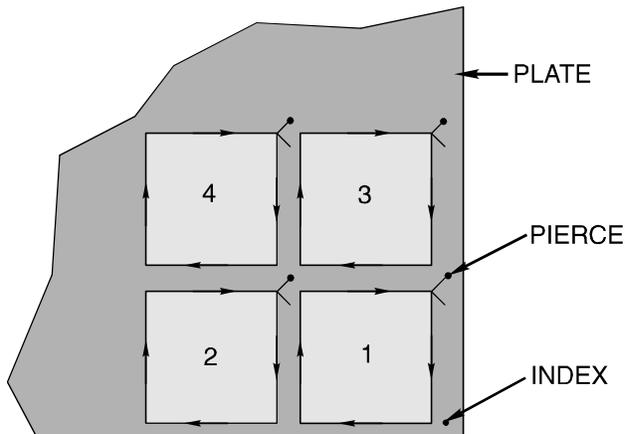
Below are some general rules of programming as demonstrated in the example programs.



**Cut direction:**

**Clockwise on outer perimeter.**

**Counter-clockwise on inner perimeters.**



**Cut order:**

**Last cut attached to the largest part of the plate.**

- Cut direction should generally be clockwise on the outside perimeter of a part, counter clockwise on any inner perimeter. This is due to the assumption that any part program may be used for plasma cutting. When plasma cutting, the physics of the arc result in a straighter part edge on the right side of the cut then on the left. Therefore, the good part should always be kept to the right of the cut, the scrap to the left. This also allows the use of Kerf Left (M67) for both the ID and OD.

- Parts should generally have their index point in the lower right corner, with the pierce point and lead-in point at the upper right corner. This is due to the general principle that when oxy-fuel cutting, the last side of the part to be cut should be attached to the largest part of the plate. Therefore, when cutting clockwise around the perimeter of a square, the first cut would be down the right side, and the last cut would be from left to right across the top. This assumes that the part is being cut near the end of the plate closest to the operator.

- M-Codes may be on the same line as a programmed movement, but for clarity should be placed on a separate line. If an M-Code is included on a line with a programmed movement, the M-Code is always executed first.
- Kerf On and Kerf Off M-Codes must always be done while the cutting process is turned off.

---

## Section 4: General Rules Of Programming

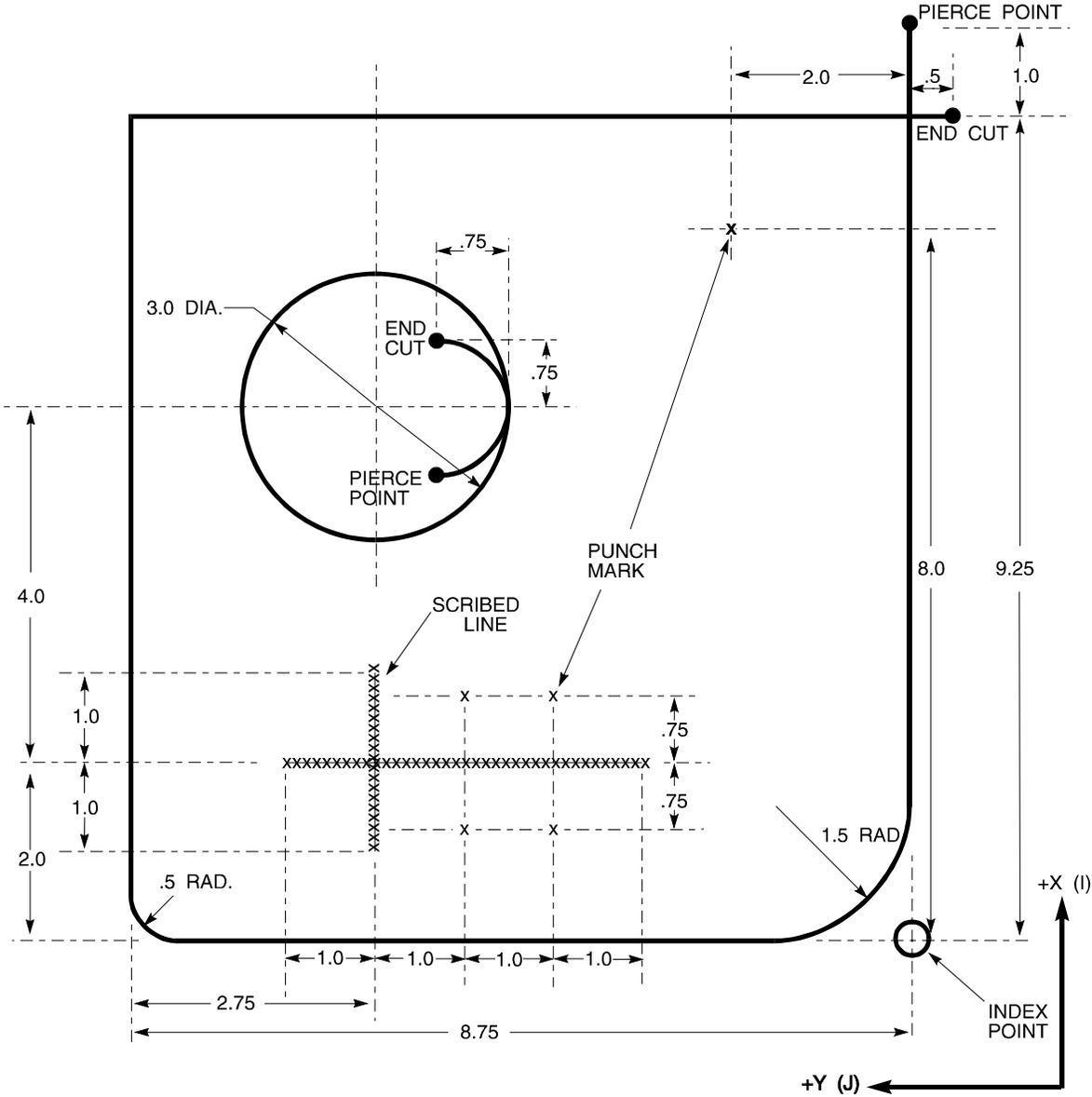
---

This means that you should program Kerf On before the process on code, and program Kerf Off after the process off code. Failure to do so will cause the machine to execute the kerf compensation movement while the process is on, possibly damaging the part which is being cut

- An M71 code should only be used when you are sure that all cutting is finished. If a part is going to be cut repeatedly, or used in a nest, the M73 code should be used instead. Doing so will save time and gas by avoiding the unnecessary ignite cycle for each pierce.
- The Vision control interprets process M-Codes differently depending upon which stations are turned on. For example; on a machine with both plasma and oxy-fuel process, if the plasma station is turned on, either an M65 or an M70 will start the plasma pierce cycle. Because of this capability, the Vision control will only allow the operator to turn on one type of station at a time.
- If a program is going to be cut repeatedly, or in a nest, the return to index point may be omitted. When nesting or doing repetitions on the Vision, the control will automatically move the machine from the end point of one program to the start point of the next program, regardless of where those points are located. Therefore, eliminating the return to index point may save time in the cutting operation.
- If machine motion needs to be stopped at a specific point during the program execution, an M0 may be programmed. This command halts machine motion. Continuation of the program does not resume until the START button is pressed.

5 Programming Examples

5.1 Program Example 1



---

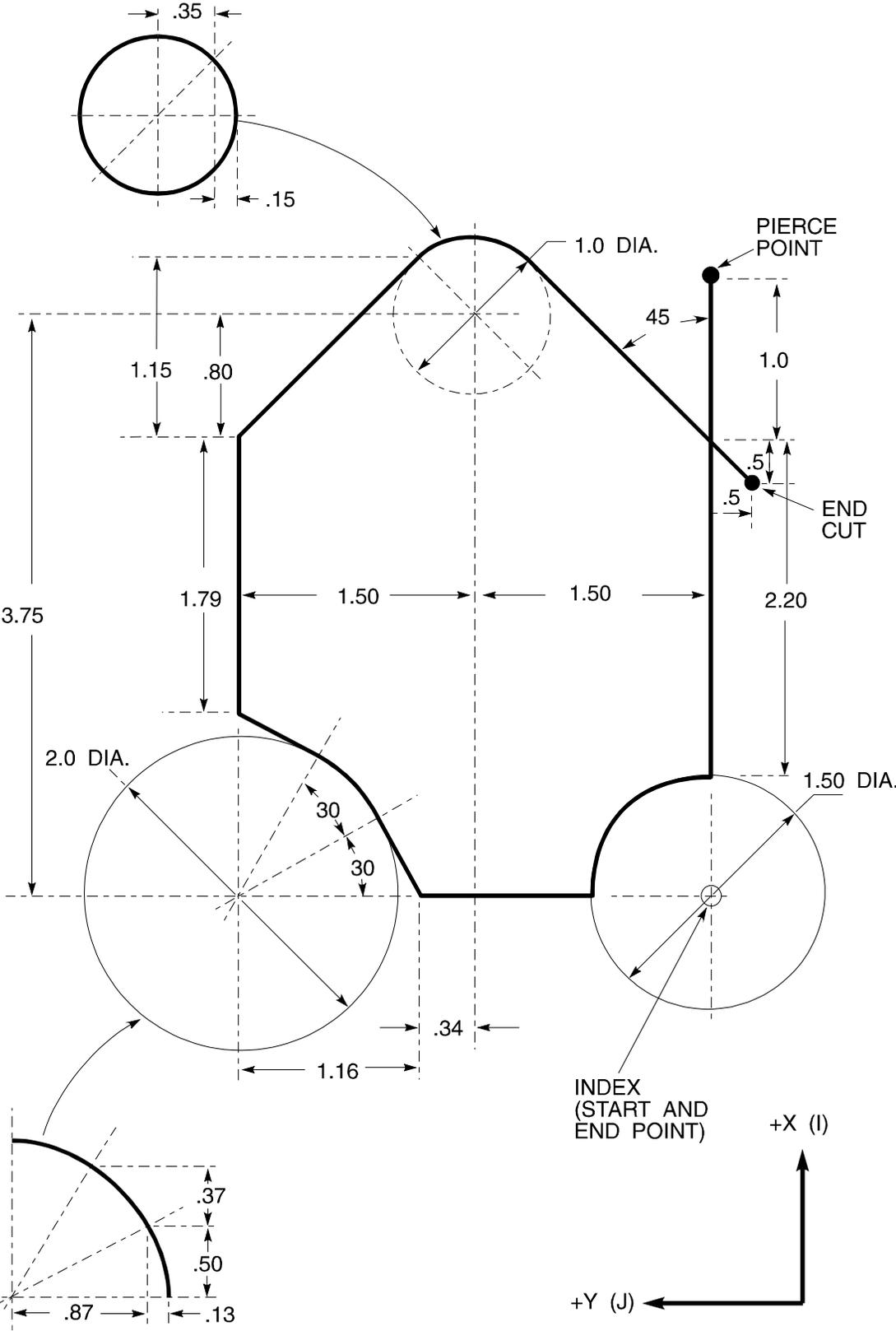
## Section 6: Programming Examples

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The following programs illustrate the use of common M-Codes and programming techniques. Here is how it would be programmed:

1: G91	INCREMENTAL MODE
2: M47	PUNCH MARKER OFFSET ON
3: G00 X8.0 Y2.0	RAPID MOVE TO 1ST PUNCH POINT
4: M60	PUNCH MARK
5: X-5.25 Y2.0	RAPID MOVE TO 2ND PUNCH POINT
6: M60	PUNCH MARK
7: X-1.5	RAPID MOVE TO 3RD PUNCH POINT
8: M60	PUNCH MARK
9: Y1.0	RAPID MOVE TO 4TH PUNCH POINT
10: M60	PUNCH MARK
11: X1.5	RAPID MOVE TO 5TH PUNCH POINT
12: M60	PUNCH MARK
13: X-.75 Y-2.0	RAPID MOVE TO BEGINNING OF SCRIBE
14: M74	SCRIBE ON
15: Y4.0	SCRIBE LINE
16: M75	SCRIBE OFF
17: X1.0 Y-1.0	RAPID MOVE TO NEXT SCRIBE LINE
18: M74	SCRIBE ON
19: X-2.0	SCRIBE LINE
20: M75	SCRIBE OFF
21: M48	PUNCH MARKER OFFSET OFF
22: X4.25 Y-.75	RAPID MOVE TO PIERCE POINT
23: M0	PROGRAM STOP AFTER PUNCH MARKING
24: F25	SET FEED RATE AT 25 INCH PER MINUTE
25: M67	KERF ON LEFT
26: M70	PIERCE CYCLE
27: G03 X.75 Y-.75 I.75	LEAD IN
28: G03 J1.5	CUT CIRCLE
29: G03 X.75 Y.75 J.75	LEAD OUT
30: M73	CUTTING OXYGEN OFF, TORCHES STAY ON
31: M69	KERF OFF
32: G00 X3.5 Y-5.25	RAPID MOVE TO NEXT PIERCE POINT
33: M67	KERF ON LEFT
34: M70	PIERCE CYCLE START
35: G01 X-8.75	LEAD IN
36: G02 X-1.5 Y1.5 J+1.5	CUT DESIRED SHAPE
37: G01 Y6.75	"
38: G02 X.50 Y.50 I+.50	"
39: G01 X8.75	"
40: Y-9.25	"
41: M71	PROCESS OFF
42: M69	KERF OFF
43: G00 X-9.25 Y.50	RAPID MOVE BACK TO INDEX POINT

5.2 Program Example 2



---

## Section 6: Programming Examples

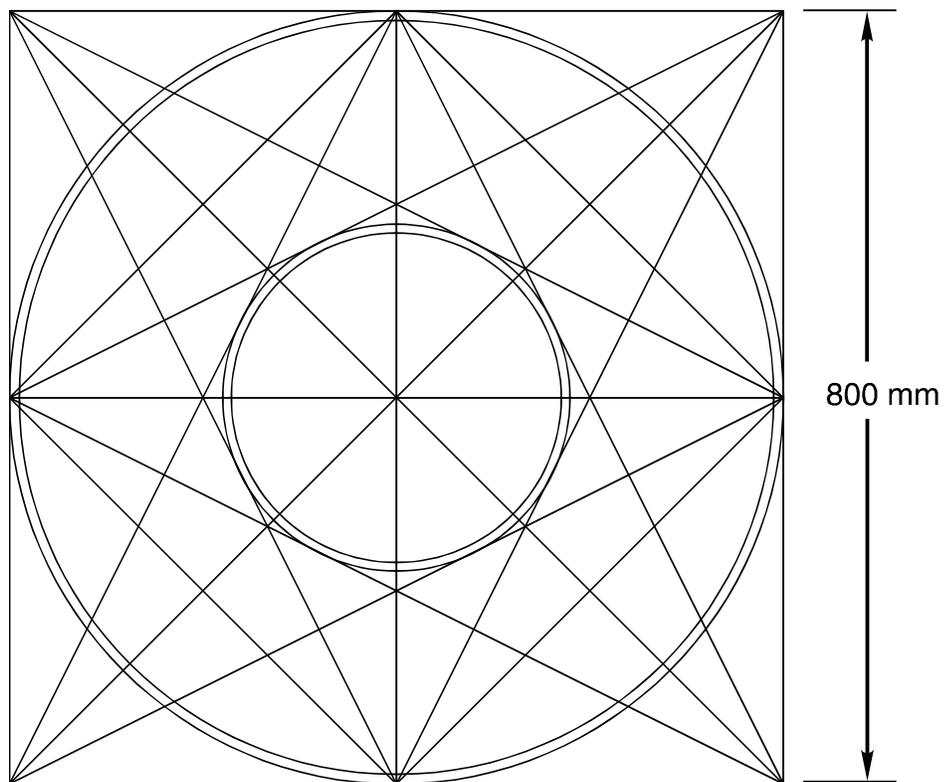
---

This program example, illustrates the difference between Incremental and Absolute programming of the same shape.

Incremental Program	Absolute Program
1: G91	1: G90
2: G00 X3.95	2: G00 X3.95
3: M67	3: M67
4: M70	4: M70
5: G01 X-3.2	5: G01 X.75
6: G03 X-.75 Y.75 I-.75	6: G03 X.75 Y0 I0 J0
7: G01 Y1.09	7: G01 Y1.84
8: X.5 Y.29	8: X50 Y2.13
9: G03 X.37 Y.37 I-.5 J+.87	9: G03 X.87 Y2.50 J3.0
10: G01 X.29 Y.5	10: G01 X1.16 Y3.0
11: X1.79	11: X2.95 Y3.0
12: X1.15 Y-1.15	12: G01 X4.1 Y1.85
13: G02 Y-.7 I-.35 J-.35	13: G02 X4.1 Y1.15 I3.75 J1.5
14: G01 X-1.65 Y-1.65	14: G01 X2.45 Y-.5
15: M73	15: M73
16: M69	16: M69
17: G00 X-2.45 Y.5	17: G00 X0 Y0

## 5.3 Program Example 3

The WES Test pattern (per WES 6601-1980) is used to check machine accuracy. This program can be run while using a tracing pen mounted to one of the carriages in order to trace the machine's movements on paper. The pattern produced is ideal for checking machine squareness, positioning accuracy, and repeatability. This sample also illustrates the difference between Inch and metric programming.



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## Section 6: Programming Examples

---

### Program: Inch

```
1: G91
2: G70
3: G01 Y-31.496
4: X31.496
5: Y31.496
6: X-31.496 Y-15.748
7: X15.748 Y-15.748
8: X15.748 Y15.748
9: X-15.748 Y15.748
10: X-15.748 Y-15.748
11: X31.496 Y-15.748
12: X-15.748 Y31.496
13: X-15.748 Y-31.496
14: X31.496 Y15.748
15: X-31.496 Y15.748
16: X15.748 Y-31.496
17: X15.748 Y31.496
18: X-31.496
19: X31.496 Y-31.496
20: Y31.496
21: X-31.496 Y-31.496
22: X15.748
23: Y31.496
24: X15.748 Y-15.748
25: X-31.496
26: G02 I15.748
27: G01 X.079
28: G03 I15.669
29: G01 X8.7
30: G03 I6.968
31: G01 X-.079
32: G02 I7.047
```

### Metric

```
G91
G71
G01 Y-800.0
X800.0
Y800.0
X-800.0 Y-400.0
X400.0 Y-400.0
X400.0 Y400.0
X-400.0 Y400.0
X-400.0 Y-400.0
X800.0 Y-400.0
X-400.0 Y800.0
X-400.0 Y-800.0
X800.0 Y400.0
X-800.0 Y400.0
X400.0 Y-800.0
X400.0 Y800.0
X-800.0
X800.0 Y-800.0
Y800.0
X-800.0 Y-800.0
X400.0
Y800.0
X400.0 Y-400.0
X-800.0
G02 I400.0
G01 X2.0
G03 I398.0
G01 X221.0
G03 I177.0
G01 X-2.0
G02 I179.0
```

## 6 Programming SDP Files

### 6.1 Introduction to SDP Files

SDP Files, also known as Process Parameter Files, are an optional feature of the Vision CNC system.

The Vision CNC allows the user to store multiple process parameter files. These files, called SDP files, (SchneidDatenPaket = Cutting Data Package), contain all of the same information that can be manually adjusted on the process parameter screen. When an SDP file is loaded into memory, it overwrites the values that were previously set on the process parameter screen. Therefore, instead of having to manually readjust the parameters for each type of material or thickness, the operator can simply load the SDP file which contains the parameters for that material.

### 6.2 Creating SDP Files

An SDP file can be created using any ASCII text editor, such as Microsoft Windows Notepad, or the MS-DOS EDIT program. An SDP file may have any filename, up to 8 characters long\*, but it must have the filename extension “.SDP”. The “.SDP” extension allows the Vision CNC to recognize the file as an SDP file. The filename should be chosen so that it indicates the material, nozzle, and/or plate thickness, and should not include any symbols or characters other than letters, numbers, the underline (\_), and the hyphen (-).

*\* The Vision NT and Vision PC allow long file names.*

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## Section 6: Programming SDP Files

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### 6.3 SDP File Format

An SDP file contains:

- Up to eight cutting records.

A cutting record contains the following information:

- Process number
- Organization program call (optional)
- Cutting record name (optional)
- Kerf width parameter (optional)
- Feed rate parameter (optional)
- up to 20 cutting parameters\*.

Each cutting parameter contains the following information:

- Parameter Code
- Default value
- Lower editing limit (optional)
- Upper editing limit (optional)

*\* The Vision NT and Vision PC allow up to 40 parameters.*

#### 6.3.1 Process Number (Nx)

Each cutting record must be identified by a specific process number. To determine the process number, refer to the PARAM.CUT file. For this example, N1 is the process number for Plasma Process.

#### 6.3.2 Designation Lines ((..))

The Designation Lines are used strictly for display purposes, to give the operator information about the SDP file that has been loaded. The text of the Designation Line will appear at the top of the process screen after the SDP file is loaded.

A Designation Line must be on one line, and enclosed in parenthesis. There may be up to two Designation Lines lines. The Designation Line must be all capital letters, with no special characters allowed. A message should be chosen which indicates the purpose of the SDP file.

On the Vision 500 and Vision 1000, a single line of up to 38 characters can be displayed.

On the Vision 2000, Vision 2000C, Vision 3000, Vision NT and Vision PC, two lines of up to 40 characters can be displayed.

Some example Designation Lines:

**EXAMPLE**

(ALUMINUM-N2-N2CH4, PT24, 30 AMP)  
(.062 INCH - 1.575 MILLIMETERS)

### 6.3.3 Organization Program Call (M=FILENAME)

Organization Programs are used in conjunction with the ESAB Programmable Plasma Bevel System. They contain correction data for a range of thicknesses of a specific type of material. Multiple Organization Programs may be required for different applications. In order to automate the selection of the Organization Program, the name of the Organization Program can be called from the SDP file.

The format is **(M=FILENAME)**, where FILENAME is the name of the Organization Program. This must be written in all capital letters, and the filename extension “.ORG” is not included. This call must appear on the first line after the Process Number (N1).

Since one Organization Program can contain data for many different thicknesses, it is also necessary to select the desired thickness setting. This can be done manually by the operator, or it can also be included in the SDP file. To specify the thickness from the SDP file, include the thickness setting in the Organization Program Call, according to the format: **(M=FILENAME S=XXXX)**, where XXXX is the plate thickness in 1/1000 inch or 1/10 mm. One space must be included between the Organization Program filename and the “S” code for plate strength.

The Organization Program Call takes the place of the Designation Line, and is also displayed in the Parameter Window.

---

## Section 6: Programming SDP Files

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### 6.3.4 Cutting Record Flags (Mb)

Some processes may require use of the Cutting Record Flags. This is a list of 16 binary flags, meaning that they are either 1 or 0. The list is preceded by the code letter M. In an SDP file, the Cutting Record Flag might appear as shown below:

```
M0000000000100000
```

The Cutting Record Flag, when present, is used by the Machine Interface Program (MIP) to select specific process handling. Each of the 16 binary flags can have a specific meaning when read by MIP. If the Cutting Record Flag is present in SDP files for a specific process, then it must be present in all SDP files created for that process. Since the use of the flag is dependent on the MIP, contact ESAB for specific information on a particular machine.

### 6.3.5 Kerf Width Parameter (Kx)

A Kerf Width parameter may be included in each cutting record. The format is the letter K followed by the kerf value. A decimal point may be programmed. The kerf value entered here is activated when the cutting record is read into memory. It becomes the default value displayed on the Automatic Setup Screen.

### 6.3.6 Feed Rate Parameter (Fx)

A Feed Rate parameter may be included in each cutting record. The format is the capital letter F followed by the feed rate value. A decimal point can not be included. The feed rate entered here is activated when the cutting record is read into memory. It will become the default value displayed on the program preparation screen. A feed rate value in the cutting record overrides any previously set feedrate, and will be overridden by any subsequent feedrate parameters in the part program.

## 6.3.7 Cutting Parameters (Px, Tx)

Each cutting parameter contains a Parameter Code, a Default Value, a Lower Editing Limit, and an Upper Editing Limit. Parameter codes have the format Px or Tx, representing either an analog Process parameter or a Time parameter. Therefore, the format for a cutting parameter is one of these:

Px	Wx	Ux	Qx
Tx	Wx	Ux	Qx

Wx

x is the default value

Ux

x is the lower editing limit

Qx

x is the upper editing limit

When these parameters are read, they will override the previous set of parameter in the process parameter window. The upper and lower editing limit set the range of adjustment in which the machine operator can change that parameter using the Handwheel in the process parameter window.

The default value for time parameters must be specified in seconds. One decimal place is always used. The maximum range is from 0.0 to 600.0 seconds.

To find out the actual parameter codes available on a specific machine, refer to that machine's PARAM.CUT file. Located in the system directory (\ANC or \WINANC) on the Vision CNC's system disk drive, the PARAM.CUT file contains the text descriptions of each process and time parameter available on that machine, and the default parameter settings.

The sample PARAM.CUT file listed below contains two processes, plasma and oxy-fuel.

```
@>T
;PARAM.CUT
;TIMER TEXT
;TEXT FOR ANALOG CHANNEL

P100 E" "      X"STANDOFF"
P101 E" "      X"INITIAL HEIGHT"
```

Header information

Parameter codes and text descriptions of all available Process Parameters for this machine.

## Section 6: Programming SDP Files

```
P102 E"PSI"      X"START GAS FLOW"
P103 E"PSI"      X"CUT GAS FLOW"
P104 E"PSI"      X"START SHIELD GAS"
P106 E"PSI"      X"SHIELD GAS"
P105 E"AMP"      X"REMOTE CURRENT"
```

```
T8      E"SEC" X"COOLING WATER DELAY"
T12     E"SEC" X"PLASMA PREFLOW TIME"
T21     E"SEC" X"PRE SWITCH CUT GAS"
T13     E"SEC" X"HIGH VOLT DELAY"
T10     E"SEC" X"PLASMA FIRING TIME"
T1      E"SEC" X"PLASMA RISE ON PIERCE"
T14     E"SEC" X"PLASMA PIERCE TIME"
T2      E"SEC" X"PLASMA TRAVEL DELAY"
T9      E"SEC" X"SHIELD GAS DELAY"
T5      E"SEC" X"MASTER UP"
T15     E"SEC" X"PLASMA POSTFLOW"
```

```
T18     E"SEC" X"ALL DOWN TIME"
T16     E"SEC" X"GAS IGNITE TIME"
T6      E"SEC" X"PREHEAT TIME"
T3      E"SEC" X"GAS PIERCE TIME"
T4      E"SEC" X"GAS TRAVEL DELAY"
```

@>D

N1 ; Plasma Process

```
P100    W140    U66    Q200
P101    W28     U0     Q100
P102    W28.6  U0.0  Q100.0
P103    W60.0  U0.0  Q100.0
P104    W00.0  U0.0  Q100.0
P106    W50.5  U0.0  Q100.0
P105    W260.0 U100.0 Q600.0
```

```
T8      W2.0     U2.0  Q50.0
T12     W2.0     U2.0  Q50.0
T21     W0.1    U0.0  Q50.0
T13     W0.5    U0.5  Q50.0
T10     W4.0    U4.0  Q4.0
T1      W0.0    U0.0  Q50.0
T14     W0.0    U0.0  Q50.0
T2      W0.0    U0.0  Q50.0
T9      W0.3    U0.0  Q50.0
T5      W2.0    U0.0  Q50.0
T15     W1.0    U1.0  Q50.0
```

N2 ; Oxy fuel Process

```
P100    W120    U66    Q200
```

```
T3      W0.8     U0.0  Q50.0
T4      W1.0     U0.0  Q50.0
T5      W2.0     U0.3  Q50.0
T6      W5.0     U0.3  Q300.0
T16     W5.0     U0.3  Q50.0
T18     W0.5     U0.3  Q50.0
```

Parameter codes and text descriptions of all available Time Parameters for this machine.

Process Number for Plasma Process (N1)

Listing of Process Parameters used with Plasma Process, and their default settings.

Listing of Time Parameters used with Plasma Process, and their default settings.

Process Number for Oxy-Fuel Process (N2)

Listing of Process Parameters used with Oxy-Fuel Process.

Listing of Time Parameters used with Oxy-Fuel Process.

In this sample PARAM.CUT file, the Parameter Code for “START GAS FLOW” is P102. The Parameter Code for “PLASMA PIERCE TIME” is T14. For the actual parameter codes used on a specific machine, refer to that machine’s PARAM.CUT file.

## 6.3.8 Special Formatting

The SDP files must be included between code words, which mark the beginning and end of the file. The beginning of the file is marked with the code word **SP\_BEGINN**; the end of the file is marked with the code word **SP\_ENDE**. These code words must be written in capital letters.

In order for the SDP file to be called from within a part program, it must be enclosed by the comment function D3 and D4 in EIA code, 3 and 4 in ESS1. This allows it to be read as comments at run-time.

## 6.3.9 Comments

Comments should be used as much as possible in your SDP files, in order to document the purpose and function of the file itself, as well as each statement in the file.

A comment is signaled by the semicolon ( ; ) and is legal on any line of the SDP file. It may be on a line by itself, or at the end of a line containing another statement. Everything on a line after the semicolon is ignored.

Examples of comments in an SDP file:

### EXAMPLE

```
; THE FOLLOWING LINE SETS THE KERF  
K0.200 ; KERF SET TO 200 MIL
```

## Section 6: Programming SDP Files

### 6.4 Example SDP files

For a particular application, most SDP files will contain all the same information, with different values for the various parameters. The following sample SDP file uses many of the available parameters for the plasma process, as defined in the sample PARAM.CUT file above. The right column below gives an explanation of each line.

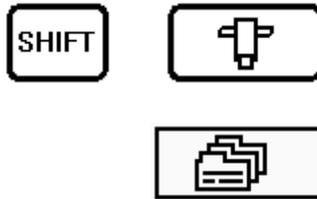
SDP File	Explanations
D3	EIA Code for Begin Comments.
SP_BEGINN	Code word for start of file.
; PLASMA - PT15	Comments
; CUTTING AMPERAGE 260 AMPS	Comments
N1 ; PLASMA PROCESS	Process Number for plasma cutting.
(PT-15XL OXYGEN PLASMA)	Select Organization Program and plate thickness.
(1/2 INCH CARBON STEEL)	Designation Line
K.2	Kerf width parameter.
F150	Feed rate parameter.
P100 W160 U66 Q200	Standoff Parameter.
P101 W50 U0 Q100	Initial Height Parameter.
P102 W28.6 U0.0 Q100.0	Start Gas Flow Parameter.
P103 W60.0 U0.0 Q100.0	Cut Gas Flow Parameter.
P104 W26.0 U0.0 Q100.0	Start Shield Gas Parameter.
P106 W50.5 U0.0 Q100.0	Shield Gas Parameter.
P105 W260.0 U100.0 Q600.0	Remote Current Parameter.
T10 W4.0 U4.0 Q4.0	Plasma Firing Time Parameter.
T1 W1.0 U0.0 Q50.0	Plasma Rise On Pierce Parameter.
T14 W0.0 U0.0 Q50.0	Plasma Pierce Time Parameter.
T2 W1.0 U0.0 Q50.0	Plasma Travel Delay Parameter.
SP_ENDE	Code word for end of file.
D4	EIA Code for End Comments.

## 6.5 Using SDP Files

SDP files can be used in two different ways. They can be manually selected and loaded by the operator, or they can be called from within a part program as a macro call.

### 6.5.1 Manually Loading SDP Files

To manually load an SDP file at the controller, press F3 in the parameter window.



To access the parameters window, press Shift-Process Window button.

Press F3, Select SDP File.

A selection box will appear listing all of the SDP files which are found on the disk. Use the Handwheel to scroll through the list, and press F1 to select the desired file. The file will be loaded, and the parameter values from the file will overwrite any previously changed values on screen.

### 6.5.2 Loading SDP Files Via Part Program

To call an SDP file from within a part program, the code letter "Q" is used to prefix the SDP file name. If used, this call must appear on a line by itself.

EIA FORMAT: Q<filename>.SDP

ESSI FORMAT: 10+<filename>.SDP

#### EXAMPLE

```
G91
Q5C260375.SDP
G00 X5.0 Y-6.5
M65
.
.
.
```

Incremental Mode  
Call SDP file "5C260375.SDP"  
Rapid move to 1st pierce point  
Plasma On

The parameters from the file will be loaded at run time, and will be used during program execution. However, any Feedrate value or Kerf value in an SDP file that is loaded by a program will not overwrite the values displayed in the Automatic Setup Screen.

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**CUTTING SYSTEMS**