HEIDENHAIN

iTNC 530
Service Manual

July 2002

Contents

1 Using the Service Manual

1.1 General

About this manual

This service manual will assist service personnel in the diagnosis and correction of errors on TNC-controlled machine tools.

This manual refers to:

- iTNC 530 with NC software 340420 / 421

Udpate service

This service manual is regularly updated.
You will find a current - printable - version on the internet:
www.heidenhain\Service\Download Area\FileBase-Public\Documentation Service.

Printed copies of the manual are only distributed to the participants of our service training courses.

Other service manuals

Other service manuals:

- Inverter Systems and Motors

Note

Service personnel must possess a comprehensive knowledge about drives, inverters, NC controls and measuring systems for correct evaluation of the malfunction of an NC controlled machine.

Improper operation of the control, incorrect NC programming or incorrect (non-optimized) machine parameter values can lead to faulty machine performance.

Caution

HEIDENHAIN can accept no responsibility for direct or indirect damage or injury caused to property or persons through improper use or incorrect operation of the machine.

Other documentation

You will find more important information in the following documents:

- OEM documentation
- Operation Manual (HEIDENHAIN)
- CD-ROM TNCguide (HEIDENHAIN)

The machine tool builder must be contacted for error diagnosis.

However, support will also be provided by the service department of HEIDENHAIN Traunreut or by the nearest HEIDENHAIN agent.

You will find the necessary telephone and fax numbers, as well as relevant e-mail addresses, on the back cover of the Service Manual, or on the HEIDENHAIN home page at http://www.heidenhain.de.

Note

It is extremely important to read also the general safety precautions on the following page, see page 1- 6.

1.2 Safety Precautions

DANGER

Ensure that the main electrical disconnect switch of the machine and the measuring system are switched off before connecting or disconnecting any plugs or terminals.

DANGER

Ensure that the grounding conductor is connected.
Any interruption of the protective ground can result in serious injury to persons and damage to equipment.

DANGER

Incorrect or non-optimized input values can lead to faulty machine performance and therefore to serious injury to persons and damage to equipment.
Machine parameters may be altered only by the machine manufacturer or after consultation with the machine manufacturer.

Caution

Service personnel must possess a comprehensive knowledge about drives, inverters, NC controls and measuring systems for correct evaluation of the malfunction of an NC controlled machine.

Improper treatment or use may cause considerable damage or injury to property or persons.

HEIDENHAIN can accept no responsibility for direct or indirect damage or injury caused to property or persons through improper use or incorrect operation of the machine.

DANGER

The interfaces for PLC inputs and outputs, machine operating panel and PL connection comply with the regulations for basic insulation according to **IEC 742 EN 50 178**.
All connected devices must comply with the regulations for basic insulation in **IEC 742 EN 50 178** . Failure to follow this instruction can result in serious injury to persons and damage to equipment.
The **maximum** mean dc voltage for PLC inputs is 31 V.

2 Integral Monitoring System

2.1 Introduction

iTNC 530 features a comprehensive integral monitoring system for the prevention of input or operation errors, as well as for identification and diagnosis of technical errors on the control and the connected units. The monitoring system is an integral component of the iTNC hardware and software and is active as long as the control is switched on. The presence of a technical fault or an operation error is made known through a plain-language message.

During operation, the iTNC monitors the following positions:

- Amplitude of encoder signals
- Edge separation of encoder signals
- Absolute position for encoders with distance-coded reference marks
- Current position (servo lag monitoring)
- Actual path traversed (movement monitoring)
- Position deviation at standstill
- Nominal speed value
- CRC sum of EPROM, RAM and Flash memory
- Power supply
- Buffer battery voltage
- Operating temperature of MC 422 and CPU
- Run time of PLC program

With digital axes, the iTNC also monitors:

- Motor current
- Motor temperature
- Temperature of power module
- DC-link voltage
- Actual utilization of drive motors
- Status of HEIDENHAIN inverters
- I^2t of power module and motor

If the "Control is ready" signal output and the "Control is ready" signal acknowledgment input are correctly connected to the emergency-stop loop, the control interrupts the loop via the "Control is ready" signal output as soon as a dangerous error occurs.

2.2 Monitoring Functions

The NC monitors the axis positions and the dynamic response of the machine. If the fixed values are exceeded, it displays an error message and stops the machine.

Caution

Do NOT deactivate the monitoring functions!
Safe machine operation is not possible if the monitoring functions are switched off.
Uncontrolled axis movements are not detected.

2.2.1 Position monitoring

The axis positions are monitored by the iTNC as long as the control loop is closed.

The input values for position monitoring depend on the maximum possible following error (servo lag). Therefore the input ranges for operation with following error and velocity feedforward are separate.

For both modes of operation there are two range limits for position monitoring.

If the first limit is exceeded, the error message **EXCESSIVE SERVO LAG IN <AXIS>** appears. The machine stops.
You can clear this message with the CE key. An actual-to-nominal value transfer is then executed for the respective axes. I.e. the control restarts calculation at the actual value.

If the second limit is exceeded, the error message **EXCESSIVE SERVO LAG IN <AXIS>** appears. The control-is-ready signal output is reset.
You cannot clear this message. You must restart the control to correct the error.

If blocked axes are the cause of the erasable error message **EXCESSIVE SERVO LAG IN <AXIS>,** a nominal velocity value may freeze, since the machine axes can no longer be moved:

- In MP1150.0, specify the time after which the nominal velocity value is to be deleted. After this time has expired, the actual position value is assumed as nominal position value. Before this time has expired, the error message cannot be cleared with the CE key. At this time the actual position value is assumed as nominal value, and the nominal velocity value is deleted.

MP1410.x **Position monitoring in operation with velocity feedforward control (erasable)**

MP1420.x **Position monitoring in operation with velocity feedforward control (EMERGENCY STOP)**

MP1710.x **Position monitoring for operation with following error (erasable)**

MP1720.x **Position monitoring for operation with following error (EMERGENCY STOP)**

2.2.2 Nominal speed value monitoring

For the axes, the nominal speed value monitoring is effective only in operation with velocity feedforward.

For the spindle, it is effective in operation with following error as long as the position control loop is closed (orientation).

If the nominal speed value calculated by the position controller is greater than the maximum possible nominal value, the blinking error message **NOMINAL SPEED VALUE TOO HIGH <AXIS>** appears and the control-is-ready output is reset.

Analog axes: Maximum nominal value = 10 V

Analog spindle: Maximum nominal value = 20 V

Digital axes and spindle: Maximum nominal value = maximum motor speed from motor table

Caution

Never make any changes to the motor table!

2.2.3 Movement monitoring

Movement monitoring is possible during operation both with velocity feedforward and with following error.

During movement monitoring, the actual path traveled is compared at short intervals (several servo cycles) with the nominal path calculated by the NC. If during this period the actual path traveled differs from the calculated path, the blinking error message **MOVEMENT MONITORING IN <AXIS>** appears.

Analog axes:
An existing offset during a standstill may cause a potential at the analog output without any resulting positioning movement:

- In MP1140.x, enter a threshold from which the movement monitoring should go into effect.

Digital axes:
There is no offset.

- In MP1140.x, enter a speed from which the movement monitoring should go into effect.

For digital axes, in addition to the comparison of actual and nominal values, the calculated position from the pulses of the position encoder are compared with the pulses of the speed encoder:

- Enter in MP332.x the number of signal periods and in MP331.x the path for the number of signal periods.
- MP1054.x contains the displacement per motor revolution. A formula can also be entered here.
- MP1144.x contains the value for this position difference. If no position encoder is used, the value 0 must be entered as position difference.

If the difference is greater than the input value from MP1144.x, the error message **MOVEMENT MONITORING IN <AXIS> B** appears.

Caution

If you enter the maximum value in MP1140.x or MP1144.x, no movement monitoring is active.
Safe machine operation is not possible without the movement monitoring function.

MP1140.x Threshold at which the movement monitoring goes into effect.

MP1054.x Traverse distance per motor revolution (for digital axes only).

MP1144.x Motion monitor for position and speed (for digital axes only).

2.2.4 Standstill monitoring

Standstill monitoring is effective during operation both with velocity feedforward and with following error, as soon as the axes have reached the positioning window.

If the position difference is greater than the value defined in MP2800.x, the blinking error message **STANDSTILL MONITORING IN <AXIS>** appears. The message also appears if, while moving to a position, an overshoot occurs that is larger than the input value in MP1110.x, or if the axis moves in the opposite direction when beginning a positioning movement:

▶ In MP1110.x, enter a threshold from which the standstill monitoring should go into effect.

MP1110.x Standstill monitoring

2.2.5 Positioning window

The positioning window defines the limits within which the control considers a position to have been reached. After the position has been reached, the control begins running the next block. The position controller can correct a disturbance inside this window without activating the "Return to the Contour" function.

▶ The size of the positioning window is defined in MP1030.x.

MP1030.x Positioning window

Axes in position

Once the axes have moved into the positioning window, the corresponding bits are set in W1026. This also applies to the status after the machine control voltage is switched on. Axes that are not used are considered to be in position.

The NC resets the bits as soon as you start a positioning movement or traverse the reference marks.

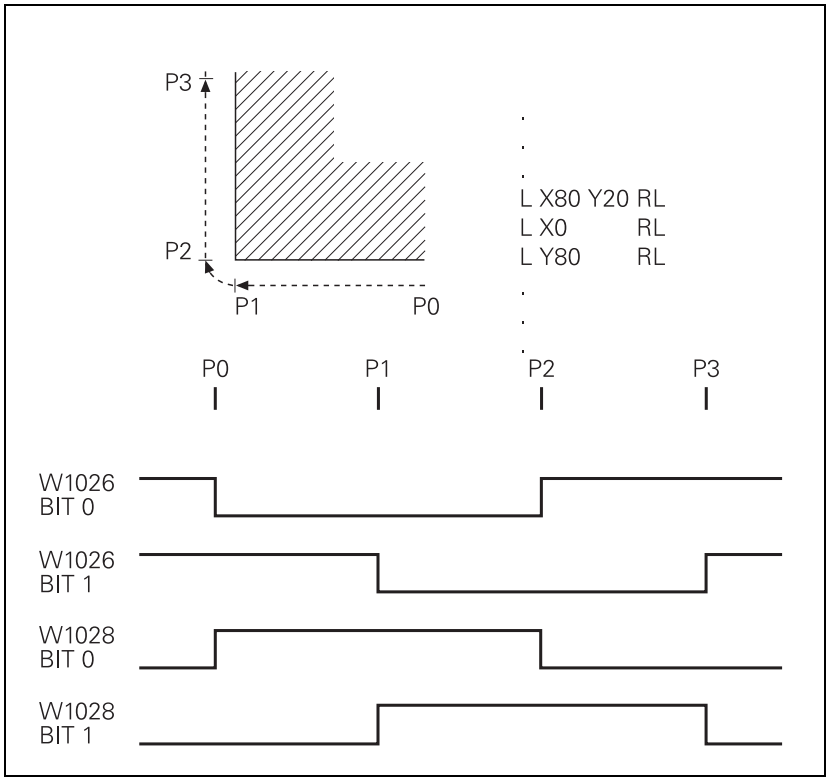
In the ELECTRONIC HANDWHEEL mode of operation the bit for the current handwheel axis is reset.

On contours that can be machined with constant surface speed, W1026 is not set.

		Set	Reset
W1026	**Axes in position** Bits 0 to 8 correspond to axes 1 to 9 0: Axis not in positioning window 1: Axis in positioning window	NC	NC

Axes in motion During axis movement, the NC sets the corresponding bits in W1028.

		Set	Reset
W1028	**Axes in motion** Bits 0 to 8 correspond to axes 1 to 9 0: Axis not in motion 1: Axis in motion	NC	NC



2.2.6 Monitoring of the power supply unit

Regenerative systems:
The rectified supply voltage of the power supply unit is monitored. The supply voltage must lie within a defined range –> (400 V +/– 10%).
If this is not the case the power supply unit reports an AC fail ($\overline{\text{PF.PS.AC}}$).

Regenerative and non-regenerative systems:

At the same time, the dc-link voltage is monitored:

- If approx. 760 Vdc (UV 120, UV 140, UV 150, UR 2xx: approx. 800 V) is exceeded, the NC revokes the pulse release (reset) for the IGBT of the power module. The motors coast out of loop to a stop. No energy is returned to the dc link.
- If the dc-link voltage falls below approx. 385 Vdc (UV 120, UV 140, UV 150, UR 2xx: approx. 410 V), the power supply unit **reports a power fail** (signal $\overline{\text{PF.PS.ZK}}$)
- If the dc-link voltage falls below approx. 155 Vdc (UV 120, UV 140, UV 150, UR 2xx, UV 105: approx. 200 V), the control is reset (signal $\overline{\text{RES.PS}}$).
- Below approx. 135 Vdc (UV 120, UV 140, UV 150, UR 2xx, UV 105: approx. 180 V) the power supply unit switches off.

The UV 105 power supply unit reports a **power fail** if the dc-link voltage is < approx. 385 V and the supply voltage is < approx. 330 V.

▶ With MP2150, you define which inverter signal is to trigger the **`Power fail`** on the control.

Inverter signal	Explanation
AC fail ($\overline{\text{PF.PS.AC}}$)	Failure of supply voltage for inverter
Power fail ($\overline{\text{PF.PS.ZK}}$)	DC-link voltage failure

Since the AC fail is reported to the control before the power fail, the control has more time to react to the subsequent dc-link voltage failure.

Note

Only the regenerative HEIDENHAIN inverter units provide the AC-fail signal.

If a power fail is triggered on the control, all drives are brought to a controlled stop.
The PLC outputs are switched off and the control displays the error message **`POWERFAIL`**.
The control must be turned off and on again.

MP2150 Power-fail signals on the control

Input: 0: AC fail

1: Power fail and AC fail
2: Neither power fail nor AC fail
3: Power fail

2.2.7 Temperature monitoring

Temperature of the MC 422

The internal temperature of the MC 422 is continuously being monitored. At approx. 55 °C the message **TNC temperature warning** is displayed. If the temperature does not fall below 55 °C any more, the warning is reactivated after two minutes. As of approx. 60 °C the error message **TNC temperature too high <temperature> °C** is displayed and an emergency stop generated. If the temperature does not fall below 60 °C when the machine is switched on again, the error message reappears after 10 to 20 seconds.

Motor temperature

To measure the motor temperature, a KTY 84 must be connected at pins 13 and 25 of X15 to X20, X80 to X83. The temperature value is ascertained at least once per second. The maximum permissible motor temperature is taken from the motor table.

As soon as the given temperature is exceeded, the blinking error message **MOTOR TEMPERATURE <AXIS> TOO HIGH** appears and the drives are automatically switched off.

Caution

Never make any changes to the motor table!

Temperature of the power module's heat sink

At X51 to X60 the temperature warning signal is available at pin 13.

If the permissible temperature of the heat sink on the power module is exceeded, this signal is reset.

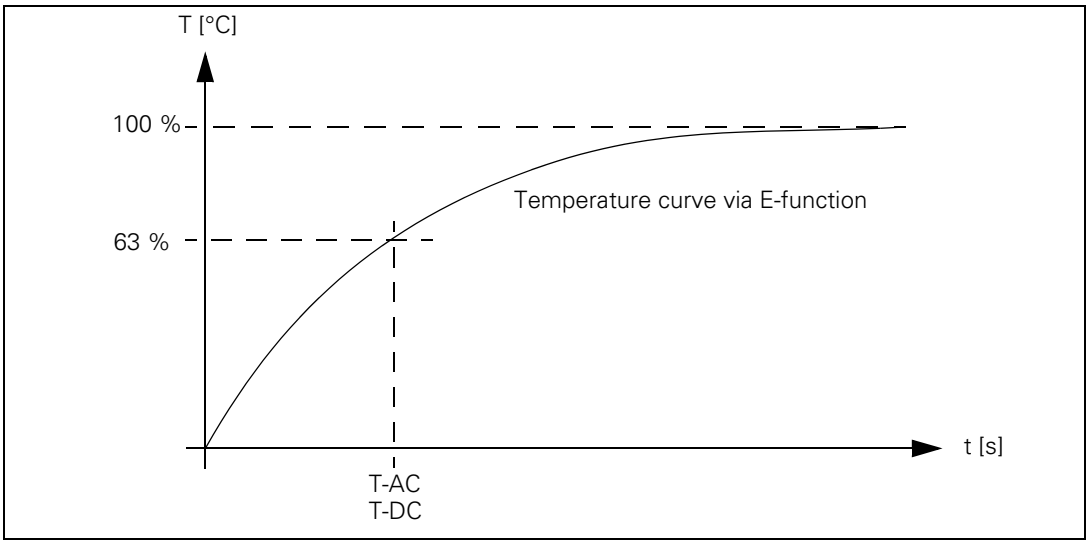
The temperature warning signal is not evaluated in the NC:

- When a temperature warning is generated, the PLC program of the machine tool builder immediately must bring the drives to standstill; otherwise the power modules would be destroyed.

2.2.8 I^2t monitoring

The instantaneous motor current is limited to either the maximum current of the power module, or the maximum motor current, whichever is lower. The values result from the type of power module and type of motor, and are saved in the motor or power module table.

In addition the I^2t monitoring for the power module and for the motor is executed individually. The temperature rise of motor and power module is proportinal to the square of the current consumed. Since heat removal may be non-uniformly during standstill or slow movement of the motor, the monitoring distinguishes two different ranges. For this purpose the value F-AC (**crossover frequency to T-AC [Hz]** has been added to the motor and power-module table. Above this frequency the T-AC entry (**Thermal time constant AC [s]** applies; below this frequency the T-DC entry **Thermal time constant DC [s]**) takes effect. The T-AC and T-DC input values mark that point of the temperature curve at which 63 % of the maximum temperature are reached. This defines a temperature model of motor or power module.



This temperature model serves to continuously calculate a mean current value. If the result exceeds the nominal current (for motors MP2302.x is added) the I^2-t monitoring responds (module 9160). In this case the PLC program should reduce the machining feed rate. If the calculated mean current is higher than 1.1 times the nominal current (for motors MP2302.x is added), an error message is generated; the drives are not switched off.

- MP2302.x contains a reference value for I^2t monitoring. The input value is a factor of the rated current of the motor (1 = rated current of the motor). If you enter zero, the I^2t monitoring for the motor (not for the power supply unit) is switched off.

Note

Never make any changes to the motor table!

Note

In the oscilloscope you can display the current values of the I^2-t monitoring of motor and power module as well as the current utilization of the drive.

MP2302.x Reference value for I^2t monitoring

2.2.9 Read actual utilization of drive motors

The PLC module 9166 provides the momentary utilization of the given drive motor as a percentage value.

Ask your machine tool builder, how he evaluates this PLC module and how this information is displayed.

2.2.10 Status of HEIDENHAIN inverters

Status information of the HEIDENHAIN inverters can be read with PLC module 9066:

- DC-link voltage too high ($\overline{\text{ERR.UZ.GR}}$)
- Heat sink temperature too high ($\overline{\text{ERR.TEMP}}$)
- Short-circuit of a motor phase with U_Z ($\overline{\text{AXISFAULT}}$)
- DC-link current too high ($\overline{\text{ERR.IZ.GR}}$)
- Power supply unit not ready (RDY.PS)
- Leakage current too high ($\overline{\text{ERR.ILEAK}}$)

Ask your machine tool builder, how he evaluates this PLC module and how this information is displayed.

2.2.11 EMERGENCY STOP monitoring

On the control there is a PLC input (X42/4) designated ""Control-is-ready signal acknowledgment" and a PLC output (X41/34) designated "Control-is-ready" for the EMERGENCY STOP routine.

If a functional error is detected, the iTNC switches the control-is-ready output off. A blinking error messages appears and the PLC program is stopped. You **cannot** clear this error message with CE:

▶ Correct the error and restart the switch-on routine.

Connection diagram

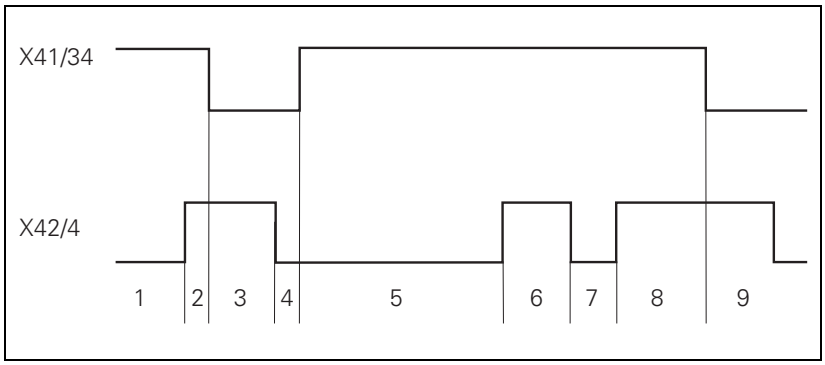
In the event of an error, the control-is-ready output must trigger an emergency stop. The control therefore checks this output every time that line power is switched on.

Note

The circuitry recommended by HEIDENHAIN is illustrated in the Basic Circuit Diagram.

Ensure that the control-is-ready acknowledgment occurs within 1s.

Flowchart



Step	Function	Screen display
1	Waiting for machine control voltage	**RELAY EXTERNAL DC VOLTAGE MISSING**
2	Recognition of the machine control voltage on X42/4 and switch-off of the control-is-ready signal on X41/34 by host computer (t < 66 ms)	
3	Maximum time within which the control-is-ready acknowledgment on X42/4 must go to zero (t < 1 s)	If exceeded, **EMERGENCY STOP defective**
4	Recognition of the acknowledgment and setting of X41/34 (t < 20 ms)	
5	Waiting for machine control voltage	**RELAY EXTERNAL DC VOLTAGE MISSING**
6	Normal control operation. Control-is-ready output and acknowledgment are high.	
7	Control voltage is switched off externally.	**EMERGENCY STOP**
8	After switching on again, the machine control voltage can be switched off, and then the control operates normally.	
9	After detecting a fault, the control switches off the control-is-ready output (X41/34).	Blinking error message

2.3 Error Messages

Classification of error messages

Depending on the gravity and the priority of the error message, the iTNC may trigger different reactions following the error message acknowledgment.

Different iTNC reactions

Display only

- No reaction of iTNC/drives
- Error message can be reset with CE key
- iTNC operation still possible
- Additional information via HELP key

NC stop

- iTNC carries out an NC stop
- Axes are braked at the nominal value characteristic
- Error message can be reset with CE key
- iTNC operation still possible
- Additional information via HELP key

EMERGENCY STOP (Emergency-stop button or hardware limit switch)

- Deceleration of axes at current limit
- Error message can be reset with CE key
- iTNC operation still possible
- Additional information via HELP key

Output "Control is ready" is reset

- Deceleration of axes at current limit
- Error message can be reset with CE key
- Some errors necessitate another reference-mark traverse for the problem axis
- iTNC operation still possible
- Additional information via HELP key

Blinking error message (red window) with Reset

- iTNC keyboard disabled
- Deceleration of axes at current limit
- Reset error message with END BLOCK key or main On/Off switch
- All axes must be referenced

Operating-system error message (white letters on black background) with Reset

- Error message: HEIDENHAIN OPERATING SYSTEM - FATAL ERROR MESSAGE
- Deceleration of axes at current limit
- iTNC keyboard disabled
- Reset error message with END BLOCK key or main On/Off switch
- All axes must be referenced

Context sensitive help

In the event of errors that do not affect the function of the iTNC keyboard the service engineer has the possibility of pressing the HELP key to obtain context sensitive help.
I.e. the iTNC displays error cause and possiblecorrective action together with the error message.
This type of support may also be realized for PLC error messages by the machine tool builder.

List of error messages

The error messages are listed in alphabetical order:

Error message	Error number	Cause of error	Corrective action
3-D CORR: Plane wrongly defined	314	■ LN block:Calculation of the plane direction resulted in an error.	■ Have the components NX, NY and NZ of the surface normals checked.
3-D ROT active: Useaxis buttons	1178	■ You have attempted to traverse the reference marks with NC start, although the function "Rotate working plane" is active.	■ Traverse reference marksusing the axis direction keys.
3DROT not permitted	2526	■ The tilted working plane function is active during execution of a digitizing cycle.	■ Deactivate the tilted working plane function and restart the program.
3DROT: No description found	3063	■ An incorrect path or file name of a kinematic description is saved in the assignment table for kinematic descriptions.	■ Correct the path or file name in the assignment table. Copy the kinematic description to the correct directory.
3DROT: Description incomplete	3064	■ Not all of the required machine parameters are defined in a kinematic description.	■ Ensure that kinematic tables are complete.
3DROT: No assignment table found	3062	■ An incorrect path or file name for the assignment table for kinematic descriptions is saved in the OEM.SYS under the code word KINEMATIC=.	■ Correct the path or file name in OEM.SYS. ■ Remove the code word KINEMATIC= from OEM.SYS. Machine parameters MP7500 and following become active in the currect machine parameter file.
8B00 Zn track axis error		■ Contamination of motor encoder (Zn track). ■ Motor encoder cable is defective. ■ Drive control board defective.	■ Inform your service agency. ■ Exchange the motor. ■ Check the motor encoder cable. ■ Exchange drive control board.
8B30 Motor temp. too high		■ Measured motor temperature is too high. ■ No temperature sensor. ■ Motor encoder cable is defective. ■ Entry in motor table is incorrect. ■ Incorrect or defective temperature sensor was installed.	■ Let the motor cool down. ■ Inform your service agency. ■ Check the motor encoder cable. ■ Check the entry in the motor table.
8B50 Axis module not ready		■ Inverter is not ready for operation. ■ No pulse release for the power supply unit. ■ Uz too high. ■ Power-fail signal is active. ■ If M control: NE2 input is active. ■ If P control: drive release at X50 is inactive. ■ Motor control board defective. ■ PWM cable defective. ■ Noise signals.	■ Inform your service agency. ■ Check the control and cabling of the pulse release. ■ Check Uz. ■ Check the emergency stop circuit. ■ If the power supply is not regenerative: Is the braking resistor connected? ■ If the power supply is regenerative: Is the energy recovery activated? ■ Check the grounding and shielding of the cable. ■ Exchange the power module. ■ For P controls: Exchange the interface card. ■ Exchange the motor drive control board.
Dist value too small	1590	■ The value entered for 'DIST' in the digitizing cycle 16.0 MEANDER or 18.0 LINE is smaller than the minimum permissible distance that the TNC calculates from the machine data.	■ Press <NO ENT> to delete value for 'DIST'. The TNC enters a value automatically.

Error message	Error number	Cause of error	Corrective action
Current to axis %.1s not equal 0	2657	■ The axis motor is receiving current, although its inverter was switched off.	■ Inform your service agency.
Axis %.1.s: MP112/ MP113 incorrect	2200	■ MP112 / MP113 for the displayed axis is incorrect.	■ Inform your service agency.
Axis %.1.s: MP120 / MP121 incorrect	2201	■ MP120 / MP121 for the displayed axis is incorrect.	■ Inform your service agency.
Axis %.1.s: MP2190 incorrect	2199	■ MP2190 for the displayed axis is incorrect.	■ Inform your service agency.
Axis %.1.s: MP2340 / MP2350 incorrect	2198	■ MP2340 / MP2350 for the displayed axis is incorrect.	■ Inform your service agency.
Axis %.1.s: MP2540 / MP2550 incorrect	2202	■ MP2540 / MP2550 for the displayed axis is incorrect.	■ Inform your service agency.
Axis double programmed	307	■ In the Contour Lines cycles (TCH PROBE 7) you programmed the starting position in one axis twice.	■ Edit the part program.
Axis double programmed	308	■ You programmed an axis twice in a single positioning block.	■ Edit the part program.
Axis double programmed	309	■ You programmed an axis twice in the Mirror Image cycle.	■ Edit the part program.
Axis double programmed	310	■ You called a Slot Milling or Rectangular Pocket cycle in which the same axis is programmed for length and width.	■ Edit the part program.
Axis double programmed	311	■ While defining Cycle 26 (axis-specific scaling factor), you programmed the scaling factor or the scaling datum twice in one axis.	■ Edit the part program.
Axis locked	2285	■ The datum point for this axis is disabled in machine parameter MP7295.	■ Edit machine parameter MP7295: Input value 0 allows the datum to be set in all axes.
Axis not at test position	3219	■ Safety-oriented function: The axis moved from the test position before you pressed the permissive button.	■ Reapproach the test position.
Axis cannot be shown	860	■ Simulation of a movement in the axes A, B, C, U, V, W is not possible in the graphics.	■ xxxx
Axis geometry not defined	336	■ You programmed Cycle 27 (Cylinder Surface, ISO:G127), although in machine parameter MP7510 and following no rotary axis is programmed, or the programmed rotary axis, is not configured.	■ Define the correct rotary axis in the contour subprogram. ■ Have the machine manufacturer check parameter MP7510 and following.
Axis configuration not equal 0	2696	■ The safe inputs for the axis configurations are not equal to 0 V.	■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
Axis module %.2s not ready	2874	■ No pulse release for the power supply unit. ■ Uz too high. ■ 5-V power supply too weak. ■ Inverter is not ready for operation. ■ Motor control board defective. ■ PWM cable defective. ■ Noise pulses.	■ Inform your service agency. ■ Check the control and cabling of the pulse release. ■ Check Uz. ■ If the power supply is not regenerative: Is the braking resistor connected? ■ If the power supply is regenerative: Is the energy recovery activated? ■ Check the grounding and shielding of the cable. ■ Exchange the power module. ■ For P controls: Exchange the interface card. ■ Exchange the motor drive control board.
Axis module %.2s not ready	2918	■ No pulse release for the power axis module. ■ Uz too high. ■ 5-V power supply too weak. ■ Inverter is not ready for operation. ■ Motor control board defective. ■ PWM cable defective. ■ Noise pulses.	■ Inform your service agency. ■ Check the control and cabling of the pulse release. ■ Check Uz. ■ If the power supply is not regenerative: Is the braking resistor connected? ■ If the power supply is regenerative: Is the energy recovery activated? ■ Check the grounding and shielding of the cable. ■ Exchange the power module. ■ For P controls: Exchange the interface card. ■ Exchange the motor drive control board.
Address letter already assigned	954	■ You used an address letter incorrectly in an ISO block.	■ Edit the highlighted block.
Selected block not addressed	183	■ After an interruption of the program run, the TNC can no longer resume the program run from the cursor's current location.	■ Press GOTO and enter a block number to select the desired location for returning to the program, or select the mid-program startup function.
Mot. enc. ampl. too high %.2s	2940	■ Noise on motor encoder signal. ■ Short-circuit in motor encoder cable. ■ Motor encoder signal amplitude too high.	■ Inform your service agency. ■ Check connection of motor encoder (ground connection). ■ Check the motor encoder.
Analog output already assigned %.1s	1123	■ An analog output is being used by several axes.	■ Inform your service agency.
Analog voltage not defined	1147	■ Function definition for laser power control missing in machine parameter 3013/3014.	■ Edit the machine parameter list.
Analog voltage ambiguous	1148	■ Function definition for laser power control ambiguous in machine parameter 3013/3014.	■ Edit the machine parameter list.
The calling program was changed	202	■ During start-up of a subprogram, the control found that the calling program had been changed. ■ During a return jump from a subprogram, the control found that the calling program had been changed.	■ Select the point of interruption with GOTO + block number, then continue the run.

Error message	Error number	Cause of error	Corrective action
Start position incorrect	445	■ Digitizing with contour lines: Incorrect starting position selected.	■ Check the axes defined in the Contour Lines cycle.
Radius comp. entry is missing	1142	■ M120 with LA greater than 0 permitted only during active tool radius compensation.	■ Edit the part program.
ANGLE in TOOL.T too small	2243	■ Cycle 22 (DIN/ISO:G122) ROUGH-OUT: The plunge angle of the active tool is too small.	■ Change the plunge angle in the tool table TOOL.T (column ANGLE). ■ Enter a smaller plunging angle in the rough-out cycle. ■ Use a tool which permits a greater plunging angle.
Probing already active	2870	■ Internal software error	■ Inform your service agency. ■ Check the software version.
Touch point inaccessible	50	■ In the TCH-PROBE 0 (ISO: G55) cycle or during use of the manual probe cycles, no touch point was reached within the traverse defined in machine parameter MP6130.	■ Pre-position the touch probe to the workpiece. ■ Increase the value in MP6130.
OEM cycle not permitted	271	■ An OEM cycle has been called in a program being run blockwise from an external data medium.	■ Delete the OEM cycle.
OEM cycle does not exist	264	■ You attempted to call an OEM cycle that is not stored in TNC memory.	■ Delete the cycle definition. ■ Read-in the OEM cycle.
APPR LCT before HELIX not permtd	286	■ You programmed the APPR LCT block or the APPR PLCT block for approaching a contour immediately before a helix.	■ Edit the part program.
APPR not permitted	296	■ You programmed an APPR block in the definition of a contour or a contour pocket.	■ Edit the part program.
APPR not first block	297	■ You programmed an APPR block in a position other than first in the definition of a contour or a contour train.	■ Edit the part program.
Too little main memory	2888	■ Internal software error	■ Inform your service agency. ■ Check software version
Arithmetical error	213	■ Internal calculations have resulted in a non-representable numerical value.	■ Check the input values.
Arithmetical error	214	■ Internal calculations have resulted in a non-representable numerical value.	■ Check the input values.
Arithmetical error	215	■ Internal calculations have resulted in a non-representable numerical value.	■ Check the input values.
Arithmetical error	226	Error in internal calculations, e.g. due to: ■ Division by 0 ■ Extracting the root of a negative value, etc.	■ Check the input values.
Arithmetical error in APPR/DEP	227	■ Calculation of an APPR or DEP block in a part-program resulted in an arithmetic error.	■ Check the input values. If necessary change the starting point.
Arithmetical error in APPR/DEP	228	■ Calculation of an APPR or DEP block in a part-program resulted in an arithmetic error.	■ Check the input values. If necessary change the starting point.
Arithmetical error in APPR/DEP	229	■ Calculation of an APPR or DEP block in a part-program resulted in an arithmetic error.	■ Check the input values. If necessary change the starting point.

Error message	Error number	Cause of error	Corrective action
Arithmetical error in APPR/DEP	230	■ Calculation of an APPR or DEP block before or after a helix resulted in an arithmetic error.	■ Check the input values. If necessary change the starting point.
Arithmetical error in APPR/DEP	238	■ Calculation of the approaching or departing path with APPR LCT or DEP LCT in the Contour Train cycle resulted in an arithmetical error.	■ Check the input values. ■ If necessary, use another tool radius.
Arithmetical error in CR	232	■ Calculation of the circle center of a "circle with radius" block in a contour pocket resulted in an arithmetical error.	■ Check the coordinates in the CR block (ISO: G2, G3 with R).
Arithmetical error in CT	233	■ Calculation of a "circle with tangent" block in a contour pocket resulted in an arithmetical error.	■ Check the coordinates in the CT block (ISO: G6, G16 with R).
Arithmetical error during M112	250	■ Calculation of automatically inserted rounding arcs (M function M112) resulted in an arithmetic error.	■ Check input values for M112 .
Arithmetical error in RND/CHF	234	■ Calculation of a rounding arc or chamfer in a contour pocket resulted in an arithmetic error.	■ Check the input values in the chamfer or rounding block. ■ If necessary, use another tool radius.
Arithmetical error in rough-out	231	■ Calculation of a rounding arc for contour-parallel rough-out resulted in an arithmetic error.	■ Change the starting point. ■ If necessary, use another tool radius.
Oversize greater than depth	448	■ SLII contour cycles: Allowance for floor is greater than milling depth.	■ Check Q4 in cycle 20 (ISO: G120).
Autostart not enabled	3205	■ You have attempted to activate the autostart function even though it was not enabled by the machine tool builder.	■ Contact your machine tool builder.
Contouring disabled by PLC	3056	■ In your NC program you have programmed a movement to be executed in more than one axis. However, contouring operation has been disabled by the PLC.	■ Edit the NC program so that it contains only paraxial line blocks.
Path comp wrongly ended	253	■ You attempted to cancel radius compensation in a circle block (with R0, ISO: G40).	■ Radius compensation can only be cancelled with a line block (L, DIN/ISO: G0, G1, G10, G11).
Path comp wrongly started	254	■ You attempted to program a chamfer before tool radius compensation was started.	■ A chamfer may only be programmed if tool radius compensation is active.
Path comp wrongly started	255	■ You attempted to program a corner radius before tool radius compensation was started.	■ A corner radius may only be programmed if tool radius compensation is active.
Path comp wrongly started	256	■ You attempted to activate tool radius compensation in a circle block (with RL or RR, ISO: G41 or G42).	■ Tool radius compensation can only be activated with a line block (L, DIN/ISO: G0, G1, G10, G11) .
Path comp wrongly started	257	■ You attempted to program a corner radius between a part-program block without radius compensation and a line block with tool radius compensation.	■ Program a corner radius only with active tool radius compensation.
Path comp wrongly started	258	■ You attempted to take over a pole (or circle center) after the first block with tool radius compensation (empty CC block, ISO: G29).	■ The pole can be taken over no earlier than in the second block with tool radius compensation.
Path comp wrongly started	259	■ You tried to program an APPR block with tool radius compensation active.	■ APPR block is permitted only when no tool radius compensation is active.

Error message	Error number	Cause of error	Corrective action
Path comp incorrectly begun: NC block must be a line	515	■ You attempted to begin a tool radius compensation on a circular path.	■ Tool radius compensation can only be activated with a line.
Path comp wrongly ended:NC block must be a line	516	■ You attempted to end a tool radius compensation on a circular path.	■ Tool radius compensation can only be canceled with a line block.
Band-pass parameter %.2s	2913	■ Incorrect entry in MP2540, MP2541, MP2550 or MP2551 ■ Internal software error	■ Inform your service agency. ■ Check entry in MP2540, MP2541, MP2550 and MP2551 ■ Check software version
Baud rate not possible	197	■ The baud rates set at the two data interfaces do not permit simultaneous transmission over both interfaces.	■ Select another baud rate.
Calculated rpm too large	218	■ Calculation of a spindle speed from a Q parameter resulted in a value that was outside the permissible range of 0 to +99 999.9999.	■ Edit the part program.
Calculated error no. too large	222	■ Calculation of an error number for the function FN14 (ISO: D14) from a Q parameter resulted in a value that was outside the permissible range of 0 to 499.	■ Edit the part program.
Calculated coordinate too large	217	■ Calculation of a coordinate from a Q parameter resulted in a value that was outside the permissible range of -99 999.9999 to +99 999.9999.	■ Edit the part program.
Calculated label no. too large	221	■ Calculation of a label number from a Q parameter resulted in a value that was outside the permissible range of 1 to 255.	■ Edit the part program.
Calculated tool number too large	220	■ Calculation of a tool number from a Q parameter resulted in a value that was outside the permissible range of 0 to 32767. ■ You have called a tool number which is greater than the number of tools defined in the tool table.	■ Edit the part program.
Calc. scaling factor too large	223	■ Calculation of a scaling factor from a Q parameter resulted in a value that was outside the permissible range of 0.0001 to 100.007936.	■ Edit the part program.
Calculated Q-parameter too large	216	■ The TNC tried to display a Q parameter, whose value was outside the permissible range of –99 999.9999 to +99 999.9999.	■ Edit the part program.
Calculated feed rate too large	219	■ Calculation of a feed rate from a Q parameter resulted in a value that was outside the permissible range of 0 to 300 000.	■ Edit the part program.
Range exceeded	443	■ During digitizing the stylus went outside the defined digitizing range.	■ Check the data in the Range cycle, in particular the entry for the touch probe axis.
Trav. range shift not permitted	2996	■ During a return to the contour, the PLC commanded an illegal traverse range shift.	■ If the error recurs: Have the machine manufacturer change the PLC program.
Enter Q247 greater than 5	2830	■ In a measuring cycle, you entered in parameter Q247 an angular step smaller than 5 degrees.	■ To ensure sufficient measuring accuracy, enter in Q247 an angular step greater than 5 degrees.

Error message	Error number	Cause of error	Corrective action
Operating parameters erased	947	■ The machine parameters have been erased and the PLC program is missing.	■ Enter new operating parameters.
Op. state MCU not equal CCU	2877	■ The operating states Automatic, SRG, SBH, and SH of the MCU and CCU are compared cyclically. If the values remain unequal for longer than 200 ms, a Stop 1 is released.	■ Press CE to acknowledge the error message. ■ Switch on the machine. ■ Inform your service agency. ■ Check software version.
Movement monitoring %.1s A	40	■ The axis is moving at least 4 times slower or faster than commanded by the nominal speed command output.	■ Check machine parameter 1140.x . ■ Inform your service agency.
Movement monitoring %.1s B	43	■ The motor is moving while the axis slides are stationary or vice versa.	■ Check MP2800.x. ■ Inform your service agency.
Reference to specific block not permitted	522	FK programming: Relative references are possible only to the last 64 positioning blocks: ■ A reference is made to a more distant block. ■ A reference is made to a block, which at that point in the program, would lead to more than one FK solution.	■ Change the relative reference.
Reference to CC block not permitted	523	■ FK programming: You programmed a relative reference to a CC block.	■ Change the relative reference.
Reference to block %.6s : no DEL	1125	■ FK programming: You have attempted to delete a part-program block to which another block refers.	■ First edit the referring block, then delete the reference.
BLK FORM cannot be shown	863	The workpiece blank cannot be displayed: ■ The workpiece blank is not fully defined. ■ One edge has a negative length. ■ The longest edge is too large or too small. ■ Ratio of edge lengths is excessive.	■ Edit the part program.
Hole diameter too large	2509	■ Probing cycle for workpiece measurement: Tolerance for hole diameter exceeded. ■ Cycle 208: The programmed hole diameter (Q335) cannot be machined with the active tool.	■ Check the workpiece, and if necessary the measuring log. ■ Cycle 208: Use larger tool: Hole diameter must not be larger than twice tool diameter.
Hole diameter too small	2508	■ Probing cycle for workpiece measurement: Hole diameter too small for tolerance.	■ Check the workpiece, and if necessary the measuring log.
C330 Motor temp. too high		■ Measured motor temperature is too high. ■ No temperature sensor. ■ Motor encoder cable is defective. ■ Entry in motor table is incorrect. ■ Incorrect or defective temperature sensor was installed.	■ Let the motor cool down. ■ Inform your service agency. ■ Check the motor encoder cable. ■ Check the entry in the motor table. ■ Measure the temperature sensor (2000[Ohm] at 25[°C])
C340 Unknown counter compnt		■ Hardware defective. ■ Incorrect software version.	■ Inform your service agency. ■ Check software version. ■ Exchange drive control board.

Error message	Error number	Cause of error	Corrective action
C350 Axis module not ready		■ No pulse release for the power supply unit. ■ Uz too high. ■ 5-V power supply too weak. ■ Inverter is not ready for operation. ■ Motor control board defective. ■ PWM cable defective. ■ Noise pulses.	■ Inform your service agency. ■ Check the control and cabling of the pulse release. ■ Check Uz. ■ If the power supply is not regenerative: Is the braking resistor connected? ■ If the power supply is regenerative: Is the energy recovery activated? ■ Check the grounding and shielding of the cable. ■ Exchange the power module. ■ For P controls: Exchange the interface card. ■ Exchange the motor drive control board.
C370 Angle error motor encdr.		■ Motor encoder defective. ■ Motor encoder cable is defective. ■ Drive control board defective.	■ Inform your service agency. ■ Check the motor encoder and leads. ■ Exchange drive control board.
C380 Motor not controllable		■ Motor cables were crossed (e.g. X with Y). ■ Motor encoder cables crossed. ■ Phases connected incorrectly to motor. ■ Motor encoder cable is defective. ■ Incorrect entry in motor table (rotation direction, no. pole pairs). ■ Motor defective. ■ Check the motor cabling. ■ Current or speed controller not optimized (values too high).	■ Inform your service agency. ■ Check motor and motor cables. ■ Check the entry in the motor table.
C3B0 Motor does not rotate		■ Inverter is not ready for operation. ■ Disturbance on RDY input of PWM output connector. ■ Motor jammed. ■ Inverter defective. ■ Motor defective. ■ Incorrect motor selected (MP2200). ■ Assignment of PWM outputs entered incorrectly in MP120. ■ Assignment of PWM inputs entered incorrectly in MP112. ■ Motor power cables crossed. ■ Motor encoder cables crossed. ■ Motor connection defective.	■ Inform your service agency. ■ Check the inverter. ■ Check the motor and cabling. ■ Check the machine parameters.
CCU +5V iTNC outside tolerance	2688	■ The 5V power supply of the iTNC is outside the permissible tolerance range.	■ Inform your service agency.
CCU amplitude too high %.2s	2720	■ The amplitude of the encoder signal is too large or the signal for contamination is active.	■ Check the amplitude of the encoder signal.
CCU amplitude too small %.2s	44	■ The amplitude of the encoder signal is too small or the signal for contamination is active.	■ Check the amplitude of the encoder signal.

Error message	Error number	Cause of error	Corrective action
Op. state of CCU not equal MCU	2710	■ The operating states Automatic, SRG, SBH, and SH of the MCU and CCU are compared cyclically. If the values remain unequal for longer than 200 ms, a Stop 1 is released.	■ Switch on the machine and press CE to acknowledge error message.
CCU speed greater than SRG %.2s	3213	■ Rotational speed for safety-oriented operation too high.	■ Inform your service agency.
CCU limit switch %.1s-	57	■ The calculated path of the tool exceeds the traversing range (software limit switch) of the machine.	■ Check the programmed coordinates, and if necessary edit the program. ■ Check the datum, and if necessary reset the datum.
CCU limit switch %.1s+	55	■ The calculated path of the tool exceeds the traversing range (software limit switch) of the machine.	■ Check the programmed coordinates, and if necessary edit the program. ■ Check the datum, and if necessary reset the datum.
CCU frequency too high %.2s	45	■ The maximum input frequency was exceeded at an encoder input.	■ Check input frequency of the encoder signal.
CCU NC temperature outside tol.	2687	■ The temperature inside the iTNC is outside the permissible tolerance range.	■ Ensure adequate ventilation in the electrical cabinet.
CCU S input signals %d not equal	2336	■ In a safe circuit, each machine operating keystroke sends a signal through separate inputs to two microprocessors. In this case, one of the inputs was not set. The machine function cannot be executed.	■ Inform your service agency.
CCU S input signals %d not equal 0	2612	■ The safety-oriented inputs for key switch, door contact and axis configuration were not correctly set during the cyclical test.	■ Inform your service agency.
CCU standstill monitoring %.2s	41	■ The position deviation at standstill is greater than the value entered in machine parameter MP1110.x.	■ Inform your service agency.
CCU feed rate greater SRG %.2s	2376	■ Feed rate for safety-oriented operation too high.	■ Inform your service agency.
CDT path not found	2320	■ The path entered in OEM.SYS for the display of cutting data (CDT files) was not found.	■ Check the entry in OEM.SYS and change if necessary.
CHF after APPR not permitted	277	■ You programmed a chamfer (CHF) immediately after an APPR block.	■ Edit the part program.
CMA file: No active line	497	■ Error in compensation value conversion: In the *.CMA file either there is no active line selected or the selected line does not exist.	■ Activate a line.
C block: Circle end pos. incorrect	358	■ The difference between the radius at the end point of a C block (ISO: G2, G3) and the radius at the starting point is larger than defined in MP7431.	■ Check the circle end-point coordinates. ■ If necessary, increase the value in MP 7431.
CT after APPR not permitted	276	■ You programmed a tangentially connecting circle (CT) immediately after an APPR block.	■ Edit the part program.
CYCL 210 not permitted	2045	■ Cycle 210 cannot be run in the CIRCULAR PATTERN or LINEAR PATTERN cycles.	■ Use another fixed cycle.

Error message	Error number	Cause of error	Corrective action
CYCL 211 not permitted	2046	■ Cycle 211 cannot be run in the CIRCULAR PATTERN or LINEAR PATTERN cycles.	■ Use another fixed cycle.
CYCL CALL PAT not permitted	3189	■ You have used Cycle 12 (ISO: G39) to declare a program containing CYCL CALL PAT to be a cycle.	■ CYCL CALL PAT in connection with cycle 12 (ISO: G39) is not permitted.
CYCL DEF not defined	261	■ You have programmed a cycle call without having first defined a fixed cycle. ■ You attempted to call a cycle that automatically becomes active upon definition.	■ Define the cycle call after definiton of a fixed cycle. ■ Delete the cycle call.
CYCL DEF incomplete	260	■ You deleted part of a cycle. ■ You have inserted other part-program blocks within a cycle.	■ Redefine complete cycle again. ■ Delete NC blocks within cycle.
CYCL parameter incorrect	447	For digitizing cycles: ■ Probe point interval greater than 65 535 (with Q parameter) ■ Incorrect line-by-line digitizing axis	■ Check the entries in the digitizing cycle.
File %.16s is missing	498	■ Error in compensation value conversion: The *.COM file selected in the *.CMA file does not exist.	■ Load the file.
File %.16s is missing	499	■ "PGM not found" error message during Include in ASCII file.	■ Load the file.
File %s%s already exists	2498	■ You have already used the entered file name for another file type.	■ Select a new file name or delete the existing file.
File empty	2225	■ You attempted to select a tool material or a cutting material although the corresponding table has no entries.	■ Enter the missing workpiece material in the file MAT.TAB or the missing cutting material in the file CUT.TAB.
File not found.	2382	■ In your program you called a file or a table that does not exist in your TNC.	■ Enter the name of an existing table.
File not found in OEM.SYS	2222	■ You attempted to use a workpiece-material table or a tool-material table, although your machine manufacturer has not made the required entries in OEM.SYS.	■ The OEM.SYS must be changed. Contact your machine tool builder.
File format has changed	1186	■ This error message will be displayed when opening a binary file (*.H,*.T...) if the binary format has changed since the last output version.	■ Delete the file.
File name on data medium assigned	1035	■ The file name already exists on the external data medium.	■ Select with the YES/NO key whether to overwrite the file.
Program name already exists	186	■ You attempted to create a file that already exists.	■ Use another file name.
Program name already exists	944	■ This file name already exists.	■ Select another file name.
File system error 1	1160	■ Incorrect cluster number in the "get_cluster" routine, caused by a software error.	■ Inform your service agency.
File system error 2	1161	■ Incorrect cluster number in the "put_cluster" routine, caused by a software error.	■ Inform your service agency.
File system error 3	1162	■ Incorrect cluster number in the "next_cluster" routine, caused by a software error.	■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
File system error 4	1163	■ Incorrect cluster number in the "update_cluster" routine, caused by a software error.	■ Inform your service agency.
File system error 5	1164	■ Incorrect cluster number in the "get_free_cluster" routine, caused by a software error.	■ Inform your service agency.
File system error 6	1165	■ Incorrect cluster number in the "get_last_cluster" routine, caused by a software error.	■ Inform your service agency.
File system error 7	1166	■ Incorrect cluster number in the "get_cluster_befor" routine, caused by a software error.	■ Inform your service agency.
File system error 8	1167	■ Incorrect cluster number in the "read_dos_data" routine, caused by a software error.	■ Inform your service agency.
File system error 9	1168	■ Incorrect cluster number in the "write_dos_data" routine, caused by a software error.	■ Inform your service agency.
File system error A	1155	■ Semaphore or queue could not be created.	■ Inform your service agency.
File system error B	1156	■ Partition faulty or cannot be read.	■ Inform your service agency.
File system error C	1157	■ Disk has been incorrectly partitioned.	■ Inform your service agency.
File system error D	1158	■ Sector number is incorrect in the hard-disk server task.	■ Inform your service agency.
File system error E	1159	■ Timeout while waiting for the interrupt from the hard disk.	■ Inform your service agency.
File system error F	1185	■ Write or read error on the hard disk.	■ Inform your service agency.
File system error L	1702	■ No data request from the hard disk, though expected.	■ Inform your service agency.
File system error 10	1169	■ Undefined software error in the "test_file" routine.	■ Inform your service agency.
File system error 11	1207	■ Reserved	■ xxxx
File system error 12	1208	■ Reserved	■ xxxx
File system error 13	1209	■ Reserved	■ xxxx
File system error 14	1210	■ Reserved	■ xxxx
File system error 15	1211	■ Reserved	■ xxxx
File system error G	1212	■ Reserved	■ xxxx
File system error H	1213	■ Reserved	■ xxxx
File system error I	1214	■ Reserved	■ xxxx
File system error J	1215	■ Reserved	■ xxxx
File system error K	1216	■ Reserved	■ xxxx
Faulty range data	444	■ Range cycle: Max. value is smaller than min. value. ■ Range extends past software limit switch. ■ No Range cycle defined.	■ Check the data in the Range cycle.

Error message	Error number	Cause of error	Corrective action
DEP LCT after HELIX not permitted	285	■ You programmed a DEP LCT block for departing a contour immediately after a helix.	■ Edit the part program.
DEP not permitted	295	■ You programmed a DEP block in the definition of a contour or a contour pocket.	■ Edit the part program.
DEP not last block	291	■ You programmed a DEP block in a position other than last in the definition of a contour or a contour train.	■ Edit the part program.
DEP interruption not permitted	440	■ You interrupted the part program during a DEP block and then attempted to restart.	■ Begin machining before or after DEP block (if necessary select with GOTO).
DEP interruption not permitted	441	■ You interrupted the part program during a DEP block, then moved the axes and attempted to restart.	■ Begin machining before or after DEP block (if necessary select with GOTO).
The contour is resolved: FSELECT block is not permitted	508	FK programming: ■ FSELECT block follows an already resolved contour. ■ FSELECT block follows an as yet unresolvable FK contour (shown in red).	■ Delete FSELECT block.
Digitized data incomplete	2337	■ Digitizing with touch trigger probe: Digitizing was interrupted, because the sensor could no longer record realistic data, e.g. with grinding probe.	■ Select digitizing direction, so that probe can be as vertical as possible. ■ Range of digitizing cycle = Enter half probe point interval ■ Enter smaller value in machine parameter 6230 (approximate value: 50).
DP RAM areaoverlap	2927	■ Internal software error	■ Inform your service agency. ■ Check software version.
Rotary axis not permitted here	329	■ You programmed a rotary axis as tool axis.	■ In the TOOL CALL block (ISO: T..) program only linear axes.
Rotary axis not programmed	335	■ In cycle 27, Cylinder Surface (ISO: G127) you did not program the rotary axis corresponding to the linear axis in the first NC block of the description of a contour.	■ Edit the contour subprogram.
Direction of rotation missing	502	■ You programmed an FK arc without a direction of rotation.	■ Always program the direction of rotation (DR).
Rotary-table coordinates missing	1121	■ Coordinates for rotary table center are missing in machine parameters MP75xx.	■ Inform your service agency.
Rotation not permitted	449	■ Rotation not permitted during digitizing ■ Rotation not permitted during automatic measuring (measuring cycles 400 to 418) together with 3-D rotation.	■ Delete Rotation cycle. ■ Reset rotation (Manual mode).
0 rpm not permitted	345	■ You called a Rigid Tapping or a Tapping cycle with a programmed spindle speed of 0.	■ Program a spindle speed greater than 0.
Rpm too high for this cycle	344	■ The programmed spindle speed results in an excessively high feed rate in the tool axis during execution of a Rigid Tapping or Tapping cycle.	■ Reduce spindle speed.

Error message	Error number	Cause of error	Corrective action
Nominal speed value too high %.2s	39	■ An excessively high nomial speed value was calculated. Analog axes: Max. nominal speed value –10 V Analog spindle: Max. nominal speed value –10 V Digital axes and spindle: Max. nominal speed value = max. motor speed	■ Inform your service agency.
PWM triangular signal error	2887	■ Hardware error: Triangular signal does not oscillate or it oscillates at the wrong frequency	■ Inform your service agency. ■ Exchange drive control board.
DSP error %c	1122	■ Error in the power stage of the displayed axis. FF01 .. F240 ..	■ Inform your service agency.
DSP error in axis %.2s	2187	■ Error in the power stage of the displayed axis.	■ Inform your service agency.
Plane wrongly defined	313	■ The two axes of the circle end point in a circle block (C, ISO: G2, G3, G12, G13) differ from the axes in the circle center block (CC, ISO: I,J,K).	■ Edit the part program.
Plane wrongly defined	315	■ The tool axis is not perpendicular to the plane in which the basic rotation is active.	■ Edit the part program.
Plane wrongly defined	316	■ In a probing operation, the tool axis active in the NC program is not identical or parallel to the touch probe axis, and the machine parameter 7411 has the value 1 (current tool data remain in the part-program block TCH PROBE, ISO: G55).	■ Edit the part program.
Plane wrongly defined	317	■ In a circular block you programmed the coordinates for the end point in a main axis and its associated parallel axis.	■ Edit the part program.
Plane wrongly defined	318	■ You programmed only one axis for the arc end-point in a "Circle with Radius" block (CR, ISO: G2, G3 with R). You also either did not define a tool axis or the programmed axis is the tool axis.	■ Edit the part program.
Plane wrongly defined	319	■ In a CT block -(ISO: G6, G16) you defined an axis that is not included in the working plane.	■ Edit the part program.
Plane wrongly defined	320	■ Radius compensation in a circle block is not possible if the circle lies in a plane parallel to the tool axis and a basic rotation or a programmed rotation is active.	■ Edit the part program.
Plane wrongly defined	321	■ Radius compensation in a circle block is not possible C (ISO: G2, G3) if the starting point and end point do not have the same two axes or those axes are not parallel to the axes of the circle center (CC, ISO: I,J;K).	■ Edit the part program.

Error message	Error number	Cause of error	Corrective action
Plane wrongly defined	322	■ Radius compensation in a rounding block is not possible (RND, ISO: G25) if two mutually parallel linear axes are programmed in the preceding positioning block (e.g. X and U).	■ Edit the part program.
Plane wrongly defined	323	■ Radius compensation in a chamfer block is not possible (CHF, ISO: G24) if two mutually parallel linear axes are programmed in the preceding positioning block (e.g. X and U).	■ Edit the part program.
Plane wrongly defined	324	■ You programmed a radius-compensated circle block that does not lie in the compensation plane.	■ Check the programmed axes in the circle block.
Plane wrongly defined	325	■ You programmed only one axis in a circle center or pole takeover block (CC, ISO: I,J,K) and this axis does not lie in the plane that was previously defined in a CC block, or there is no preceding CC block.	■ Edit the part program.
Plane wrongly defined	326	■ You programmed a circle center or pole takeover block (CC, ISO: I,J,K) without entering coordinates (pole assumption) and without explicitly programming two linear axes in the preceding positioning block.	■ In the block before the pole-takeover block, program two linear axes of the working plane.
Plane wrongly defined	327	■ The calculated positioning operation requires movement in more than 5 axes.	■ Edit the part program.
Plane wrongly defined	328	■ You programmed a helix for which the axis of linear motion is identical or parallel to one of the axes of circular motion.	■ Edit the part program.
Insertion not possible here	2663	■ You attempted to insert a copied block behind the END block (ISO: block N 999999).	■ Select another block before inserting.
Input as context not permitted	2776	■ You entered a function that cannot initiate a context.	■ Only enter permissible functions.
Input of further programs is not possible			
Contradictory input	504	■ FK programming: You have entered contradictory values.	■ Check the input values.
Input error	1073	■ You entered a value that exceeds the permissible input range.	■ Check the input values.
Input value incorrect	171	■ In an APPR or DEP block in a part program the use of a Q parameter leads to an illegal intermediate result: The length of the tangential line for approaching or departing the contour becomes negative.	■ Edit the part program.
Input value incorrect	172	■ In an APPR or DEP block in a part program the use of a Q parameter leads to an illegal intermediate result: The center angle of the tangential arc for approaching or departing the contour becomes negative.	■ Edit the part program.

Error message	Error number	Cause of error	Corrective action
Input value incorrect	173	■ In a Contour Train cycle the use of a Q parameter leads to an illegal intermediate result: The length of the tangential line for approaching or departing the contour becomes negative.	■ Edit the part program.
Input value incorrect	174	■ In a Contour Train cycle the use of a Q parameter leads to an illegal intermediate result: The center angle of the tangential arc for approaching or departing the contour becomes negative.	■ Edit the part program.
Input value incorrect	175	■ You have entered a negative value as tolerance for the automatic insertion of a rounding arc (M function M112).	■ Enter a positive tolerance.
Input value incorrect	176	■ In the programmed positioning of a rotary axis with feed rate in mm/min (M116) an excessively high velocity results for the rotary table.	■ Reduce the feed rate.
Input value incorrect	178	■ In the execution of a "Cylinder Surface" cycle, the programmed radius of the cylinder surface is less than or equal to 0.	■ Edit the part program.
Input value incorrect	179	■ In the superimposition of a handwheel movement (M function M118) the programmed maximum permissible superimposition is less than 0.	■ Enter only positive values after M118.
Input value incorrect	942	■ The value you entered is out-of-range. ■ Cycle 209 (ISO: G209): You entered the value 0 as infeed depth for chip breaking (Q257).	■ Enter the correct value. ■ Enter a value other than 0 in Q257.
Input value incorrect	943	■ You pressed a sequence of keys so quickly that you filled up the keyboard buffer.	■ Repeat entry.
Input (NE2) not equal to 0	2697	■ During the dynamic test, the voltage at NE2 is expected to be 0 V. If the input has voltage 24 V, an error message appears.	■ Inform your service agency.
Enter the element.	2344	■ You forgot to enter an element required to complete the block or cycle.	■ Enter the element.
EnDat defective %d %.1s	2834	■ The encoder with EnDat interface is defective. The error codes have the following meanings: 001 Light source defective 010 Signal amplitude too low 100 Position value incorrect	■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
EnDat defective xxxxx axis		When you were downloading the current position value from the EnDat encoder (only following switch-on of machine), an error was detected in the encoder. If the speed encoder is used for reading the position value, the evaluation is the same. The cause of the error is transferred as a status bit and displayed on the TNC with 5 status bits: xxxxx = xx001 Light source defective xx010 Signal amplitude too low xx100 Position value incorrect ■ Encoder cable defective. ■ Encoder defective. ■ Encoder input on TNC defective.	■ Exchange the encoder cable. ■ Exchange the encoder. ■ Use another encoder input on the TNC.
End of closed contour — no incr. coordinates permitted	509	■ FK programming: An FK block in which CLSD (contour end) is programmed contains incremental axis coordinates.	■ Use CLSD only with absolute axis coordinates.
Limit switch %.1s-traversed	58	■ The calculated path of the tool exceeds the traversing range (software limit switch) of the machine.	■ Check the programmed coordinates, and if necessary edit the program. ■ Check the datum, and if necessary reset the datum.
Limit switch %.1s+	56	■ The calculated path of the tool exceeds the traversing range (software limit switch) of the machine.	■ Check the programmed coordinates, and if necessary edit the program. ■ Check the datum, and if necessary reset the datum.
Limit switch <axis>			
Range beyond limit switch	1798	■ The digitizing range exceeds the traversing range (limit switch).	■ Check the values in the Range cycle. ■ If necessary, reset the datum.
Correct the error block	2232	■ In the active part program there are ERROR blocks that cannot be run by the iTNC (e.g. TOOL DEF block —ISO: G99 block — with active tool file).	■ If necessary, delete the entire ERROR block. ■ In the Programming and Editing mode, select the ERROR block and, with the rightward arrow key, go into the block. Edit the block and exit it with END. When the error is eliminated, the TNC automatically cancels the word ERROR.
Ext. in-/output not ready	200	■ The interface is not connected. ■ The external unit is not switched on or not ready. ■ The transmission cable is defective or incorrect.	■ Check the data transfer line.
External EMERGENCY STOP	182	■ The "control-is-ready" input is not active.	■ Check the emergency-stop circuit.

Error message	Error number	Cause of error	Corrective action
Incorrect axis in Range cycle	1795	■ A rotary axis is active in the range during the start of a contour line cycle. ■ Digitizing with measuring touch probe: A rotary axis is defined in the range during the start of a meander cycle. ■ Touch probe axis in the Range cycle is not the same as the calibrated touch probe axis in the Manual mode.	■ Check the axis definitions in the Range cycle. ■ Check the calibrated touch-probe axis (Manual mode, probing functions).
Wrong axis programmed	331	■ You called a Slot Milling or a Pocket Milling cycle in which the programmed axes for length and width do not lie in the working plane.	■ Change cycle parameters.
Wrong axis programmed	332	■ You called a Slot Milling or a Pocket Milling cycle in which one of the axes for length or width is a rotary axis.	■ Change cycle parameters.
Wrong axis programmed	333	■ You called a Slot Milling or a Pocket Milling cycle, in which one of the axes programmed for length or width is a secondary axis, even though a programmed rotation or basic rotation is active.	■ Reset basic rotation. ■ Use a principal axis for this cycle.
Wrong axis programmed	334	■ In the Thread Cutting cycle (18, ISO: G86) you programmed as target point a coordinate that does not agree with the current tool axis.	■ Edit the part program.
Wrong axis programmed	950	■ An incorrect axis is programmed in the highlighted block.	■ Check whether you have programmed an axis twice.
Wrong axis programmed	951	■ An incorrect axis is programmed in the highlighted block.	■ Check whether you have programmed an axis twice.
Wrong axis in .PNT file	1568	■ In the selected point file, which limits the digitizing range, no coordinates have been saved for the working plane.	■ In the point file, use only the coordinates of the working plane as limits.
Wrong rpm	340	■ The spindle speed you programmed is greater than the maximum spindle speed defined in machine parameter MP3020.	■ Enter a permissible speed. Refer to your machine manual.
Wrong rpm	341	■ The spindle speed you programmed is smaller than the minimum spindle speed defined in machine parameter MP3020.	■ Enter a permissible speed. Refer to your machine manual.
Wrong rpm	342	■ The spindle speed you programmed is greater than the maximum analog spindle speed defined in machine parameter MP3515.	■ Enter a permissible speed. Refer to your machine manual.
Wrong rpm	343	■ The spindle speed that you programmed results in an excessively low analog voltage (MP3240.1).	■ Enter a permissible speed. Refer to your machine manual.
Wrong rpm	346	■ The programmed spindle speed does not lie in the pattern of spindle speed ranges defined in MP3020.	■ Enter the correct spindle speed.
Wrong rpm	952	■ You entered an invalid spindle speed.	■ Enter the correct speed. Refer to your machine manual.
Incorrect entry in MP%.4u	1149	■ The permissible input range of a machine parameter was exceeded.	■ Check the input range of the marked machine parameter.

Error message	Error number	Cause of error	Corrective action
Incorrect entry in MP%.4u.%u	1182	■ An incorrect value was entered in a machine parameter.	■ Edit your entry.
Incorrect entry in MP%u	2746	■ Input value of the machine parameter MP2180 (PWM frequency) is incorrect.	■ Edit MP2180: PWM frequency.
Incorrect gear range	2934	■ Software error	■ Inform your service agency. ■ Check software version.
Incorrect datum number	2039	■ You have called a datum number that does not exist in the active datum table.	■ Call another datum number or activate another datum table.
Incorrect number for FN17/FN18	1749	■ The number combination of the system datum (FN17/FN18, ISO: D17/D18) is not allowed.	■ Check the number and index of the system datum.
Wrong pocket number	160	■ The input number of the pocket number in the tool table is greater than machine parameter MP7261. ■ MP7261 = 0, pocket output is activated through MP7480 and no pocket has been assigned to the called tool.	■ Check the tool pocket table. ■ Inform your service agency.
Wrong pocket number	937	■ The input number of the pocket number in the tool table is greater than machine parameter MP7261. ■ MP7261 = 0, pocket output is activated through MP7480 and no pocket has been assigned to the called tool.	■ Check the tool pocket table. ■ Inform your service agency.
Incorrect reference position %.1s	2745	■ 1) Signal of the reference pulse is disturbed (ground shield). 2) Position determination via Z1-track is defective. 3) Incorrect encoder line count.	■ 1) Take measures for noise suppression. 2) Inform your service agency. 3) Inform your service agency; take measures for noise suppression; check motor table.
Incorret reference position %.2s	2922	■ Incorrect motor selected (MP2200). ■ Grounding error on motor encoder cable (disturbance on reference signal line). ■ Motor encoder defective.	■ Inform your service agency. ■ Check the motor selection (MP2200). ■ Check cabling of the motor encoder (grounding). ■ Exchange the motor.
Wrong axis for column	1793	■ Digitizing with measuring touch probe: In the Meander or Contour Lines cycle you defined a rotary axis as column axis.	■ In the Meander or Contour Lines cycle, define a linear axis as column axis.
Wrong angular axis	1794	■ During digitizing with rotary axes, the rotary axis is not parallel to the line axis or the column axis.	■ Check the axis definitions in the Range, Meander, Contour Lines and Line cycles.
Wrong axis for line	1792	■ During a Meander or Contour Line cycle, the line axis is the same as the probe axis ■ There is no line axis in the range definition (RANGE cycle).	■ Check the axes defined in the RANGE cycle.
Wrong Range cycle	1790	■ Cycle 15 RANGE is active at the start of a Contour Line cycle.	■ Use the Contour Lines cycle only in connection with Cycle 5 RANGE.
Incorrect file type	2223	■ You searched for a table that does not have the file extension .TAB.	■ Search only for tables with extension .TAB.
Incorrect NC block in cycle	273	■ A part program stored in an EPROM contains a jump to a label (LBL CALL) indicating a jump counter.	■ Edit the user cycle.

Error message	Error number	Cause of error	Corrective action
Wrong RDY status of axes	2932	■ Cabling to inverter defective. ■ No axis connected (axis release relay). ■ Inverter defective.	■ Inform your service agency. ■ Check the inverter and cabling.
Wrong RDY status of spindle	2931	■ Cabling to inverter defective. ■ Spindle not connected (spindle release relay). ■ Inverter defective.	■ Inform your service agency. ■ Check the inverter and cabling.
Incorrect block syntax	272	■ An NC block contains a syntax error.	■ Edit the part program.
Incorrect intersection line/ line	237	■ Calculation of the intersection of two lines in the contour pocket resulted in an arithmetical error.	■ Check the input values. ■ If necessary, use another tool radius.
Incorrect intersection arc/line	236	■ Calculation of the intersection of an arc with a line in the contour pocket resulted in an arithmetical error.	■ Check the input values. ■ If necessary, use another tool radius.
Incorrect intersection arc/arc	235	■ Calculation of the intersection of two arcs in the contour pocket resulted in an arithmetical error.	■ Check the coordinates in the circle blocks. ■ If necessary, use another tool radius.
Correct the block format	2668	■ The program contains blocks (indicated with ERROR), with incorrect block format.	■ Correct the blocks. ■ Delete the blocks and enter them again.
Chamfer length = 0 not permitted	280	■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer (CHF, ISO: G24) with length 0.	■ Edit the part program.
Chamfer not permitted with M120	1146	■ When M120 is active, chamfer is permitted only in the compensation plane.	■ Edit the part program.
Chamfer is possible only between two straight lines	513	■ The CHF block is not located between two line blocks.	■ Edit the part program.
Chamfer after RND not permitted	283	■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer (CHF, ISO: G24) immediately behind a rounding arc (RND, ISO: G25) block in the definition.	■ Edit the part program.
Chamfer not permitted	290	■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer (CHF, ISO: G24) as first NC block.	■ Edit the part program.
Chamfer not permitted	347	■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer between two elements, of which at least one is an arc.	■ Enter a chamfer only between straight lines.
Chamfer not permitted	348	■ The positioning block preceding a chamfer block (CHF, ISO: G24) is not a straight line.	■ Enter a chamfer only between straight lines.
Chamfer not permitted	349	■ The positioning block following a chamfer block (CHF, ISO: G24) is not a straight line.	■ Enter a chamfer only between straight lines.
Chamfer not permitted	350	■ You programmed in sequence a positioning block without radius compensation, a positioning block with radius compensation and a chamfer (CHF, ISO: G24).	■ Enter a chamfer no earlier than after two compensated part-program blocks.

Error message	Error number	Cause of error	Corrective action
Chamfer not permitted	351	■ You programmed in sequence a positioning block without radius compensation, a chamfer (CHF, ISO: G24) and a positioning block with radius compensation.	■ Enter a chamfer only between radius-compensated blocks.
Chamfer not permitted	352	■ You programmed in sequence a positioning block with radius compensation, a chamfer (CHF, ISO: G24) and a positioning block without radius compensation.	■ Enter a chamfer only between radius-compensated blocks.
Chamfer not permitted	353	■ You programmed a chamfer (CHF, DIN/ISO: G24) in a plane perpendicular to the working plane followed by a movement only in the tool axis.	■ Execute a chamfer only in the working plane.
Chamfer too large	354	■ You programmed a chamfer (CHF, DIN/ISO: G24) that cannot be inserted because the preceding line is too short.	■ Enter a smaller chamfer length.
Chamfer too large	355	■ You programmed a chamfer (CHF, DIN/ISO: G24) that cannot be inserted because the line following the chamfer is too short.	■ Enter a smaller chamfer length.
Chamfer too large	356	■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer (CHF, ISO: G24) whose starting and end points no longer lie on one of the adjoining contour elements.	■ Enter a smaller chamfer length.
Chamfer too large	514	■ The programmed chamfer length is too large.	■ Edit the part program.
FCT or FLT block not permitted at this point	520	■ FK programming: A tangential FK block (FLT, FCT) can follow a conventional positioning block only if the approach direction is unambiguously defined.	■ Program at least two positioning blocks with the gray function keys before the tangential FK block.
Error	168	■ This message indicates that there is an error message on the screen now in the background.	■ Switch to the background mode and acknowledge the error message.
ERROR	859	■ General indication of a previous error in the graphic simulation.	■ Press CE to acknowledge the error message.
Error in 3-D touch probe %.2s	2921	■ Software error. ■ Hardware error in drive control board.	■ Inform your service agency. ■ Exchange the motor drive control board. ■ Check the software version.
Error in axis module %.2s	3011	■ Undervoltage, temperature, or short-circuit monitor of an IGBT in the inverter has responded.	■ Let the inverter cool down. ■ Inform your service agency. ■ Examine the motor for short circuit in the windings. ■ Exchange the power module.
Error while testing limit switch	249	■ Checking the software limit switch for a circle or a helix in space resulted in an arithmetic error.	■ Check the input values.
Error while testing limit switch	252	■ Checking the software limit switches resulted in an arithmetic error.	■ Check the input values.
LSV2 transmission error	2871	■ Interrupted LSV2 connection. ■ Internal software error.	■ Check the LSV2 connection. ■ Inform your service agency. ■ Check the software version.

Error message	Error number	Cause of error	Corrective action
Error in MP transfer	2937	■ MP3210 or MP3510 incorrect. ■ Software error MCU.	■ Inform your service agency. ■ Check MP3210 and MP3510. ■ Check software version.
Parameter calculation error	251	■ Calculation of an arithmetic expression in the Q-parameter calculation resulted in an arithmetical error.	■ Check the input values.
Error in radius compensation	239	■ Calculation of the radius compensation in the Contour Train cycle resulted in an arithmetical error.	■ Check the input values. ■ If necessary, use another tool radius.
Error in radius compensation	244	■ Calculation of the radius compensation in the Contour Pocket cycle resulted in an arithmetical error.	■ Check the input values. ■ If necessary, use another tool radius.
Error in radius compensation	245	■ Calculation of the radius compensation in the Contour Pocket cycle resulted in an arithmetical error.	■ Check the input values. ■ If necessary, use another tool radius.
Error during conversion!	2387	You changed the structure of a freely defined table. During conversion of an element, one of the following errors occurred: ■ Incorrect number range defined. ■ Permissible column width was exceeded. ■ An element contains illegal characters.	■ In your table, examine all the elements marked with # for the described errors.
Error in PLC program	979	■ Collective error message for all errors in the compilation or execution of the PLC program. The explanatory text is inserted in the context of the program.	■ Refer to the Technical Manual for the respective control.
Error in software timer	2891	■ Internal software error.	■ Inform your service agency. ■ Check software version.
Error in contour pocket	240	■ Calculation of the intersection of the contour with the tool path in the contour pocket resulted in an arithmetical error.	■ Check the input values. ■ If necessary, use another tool radius.
Error in contour pocket	242	■ Calculation of the contour-parallel paths for clearing out a contour pocket resulted in an arithmetical error.	■ Check the input values. ■ If necessary, use another tool radius.
Error in contour pocket	243	■ Calculation of the contour elements of a contour pocket resulted in an arithmetical error.	■ Check the input values.
Error in contour pocket	246	■ Calculation of the normal from a given point on a contour element for contour-parallel rough-out resulted in an arithmetical error.	■ Check the input values.
Error in contour pocket	247	■ Calculation of the intersections in the contour pocket resulted in an arithmetical error.	■ Check the input values.
Error in contour pocket/train	241	■ The length of the path to be traversed in the contour pocket or Contour Train cycle is too large to be represented as a number.	■ Check the input values.

Error message	Error number	Cause of error	Corrective action
Pos. control cyc. time err.	2893	■ MCU is outputting erroneous cycle time for CCU position controller. ■ Hardware error.	■ Inform your service agency. ■ Check machine parameter 7600.0. ■ Exchange drive control board.
Cutout channels test error	2936	■ Machine key depressed (ZT.HR, ZT.MB, MT signal).	■ Inform your service agency. ■ Check the wiring X65, X66, (X67). ■ Check the machine keys.
Faulty data from CCU	2819	■ Faulty software.	■ Inform your service agency.
Processor check error	977	■ Collective error message for all software errors. Here the explanatory texts are not yet shown individually, but are inserted where the error occurs in the programs.	■ Refer to the Technical Manual for the respective control.
Processor check error 0	1	■ The CRC sum for the control's data (datum point, etc.) is incorrect.	■ Inform your service agency.
Processor check error 0	2	■ The CRC sum for the control's data (datum point, etc.) is incorrect.	■ Inform your service agency.
Processor check error 1	1077	■ The CRC sum for the machine's parameters is incorrect.	■ Inform your service agency.
Processor check error 2	3	■ The CRC sum of a file in the block memory is incorrect.	■ Inform your service agency.
Processor check error 3	4	■ Not all tests were run completely.	■ Inform your service agency.
Processor check error 4	5	■ There is crosstalk of data in the RAM.	■ Inform your service agency.
Processor check error 5	6	■ There is crosstalk of addresses in the RAM.	■ Inform your service agency.
Processor check error 6	7	■ Internal error: Stack overflow or stack underflow.	■ Inform your service agency.
Processor check error 7	8	■ The CRC sum of a PLC file is incorrect.	■ Inform your service agency.
Processor check error 8	9	■ The CRC sum of a PLC file is incorrect.	■ Inform your service agency.
Processor check error 9	10	■ The CRC sum of the test programs is incorrect.	■ Inform your service agency.
Processor check error A	11	■ General file management error.	■ Inform your service agency.
Processor check error A	12	■ General software error in the main processor task.	■ Inform your service agency.
Processor check error A	13	■ General software error in the Sync task.	■ Inform your service agency.
Processor check error A	14	■ There is no free NC memory space available for opening a machine-parameter file.	■ Delete NC programs that are no longer required to increase memory space.
Processor check error A	15	■ Error in file management: In the Program Run or Program Test operating modes, an NC program was selected although no status flag M or S is set.	■ Inform your service agency.
Processor check error B	16	■ Internal error: Incorrect interrupt.	■ Inform your service agency.
Processor check error C	17	■ Overrun of the internal time slice: Control loop, PLC and interrupts need all the processing time, or the timer interrupt interrupts itself.	■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
Processor check error D	18	■ Internal error: More commands are given to the control loop than have space in the transfer buffer.	■ Inform your service agency.
Processor check error E	19	■ Internal error: A task was given an unknown command or a command with illegal parameters.	■ Inform your service agency.
Processor check error F	21	■ Internal calculations have resulted in a non-representable numerical value.	■ Inform your service agency.
Processor check error F	1078	■ Incorrect display mode in the main processor.	■ Inform your service agency.
Processor check error G	22	■ Internal error: A CPU was given an unknown command to load the program (boot).	■ Inform your service agency.
Processor check error H	23	■ Internal error: The program was incorrectly loaded (booted) by a CPU.	■ Switch the control off and on again.
Processor check error I	24	■ Internal error: While a program was being loaded (booted) an incorrect auxiliary instruction was given together with the "test" command.	■ Inform your service agency.
Processor check error J	25	■ Internal error: The memory for transferring commands for loading the program cannot be written or read properly.	■ Inform your service agency.
Processor check error K	26	■ Internal error: The program loaded in the RAM of a CPU does not match the code stored in the EPROM.	■ Inform your service agency.
Processor check error L	1079	■ Incorrect command in control loop.	■ Inform your service agency.
Processor check error M	27	■ The operating voltage lies outside the permissible tolerance.	■ Have the operating voltage at the iTNC checked by trained personnel.
Processor check error N	28	■ There are no files stored in the PLC EPROM with PLC dialogs or PLC error messages.	■ Have the machine manufacturer exchange the PLC EPROM.
Processor check error O	29	■ You have attempted to simultaneously move more axes than is possible with the export version of a control.	■ Reset the basic rotation. ■ Reset 3-D rotation.
Processor check error P	30	■ You have tried to activate a protected function, without activating the appropriate software protection module.	■ Order the software protection module from HEIDENHAIN.
Processor check error Q	31	■ A required CPU (control loop, geometry) is not ready for operation.	■ Switch control Off and On again.
Processor check error R	32	■ During output of a miscellaneous function M or the spindle speed S the PLC commanded a PLC positioning, a datum shift or a range shift, although machine parameter MP7440 or MP3330 commanded constant speed with M or S output.	■ Inform your service agency.
Processor check error S	20	■ Internal error: More dynamically managed memory was requested than is available.	■ Inform your service agency.
Incorrect include file version	2831	■ An include file was called that has differing version numbers in the MCU and CCU. ■ Software error.	■ Check the software version. ■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
Incorrect compensation values	2373	■ Erroneous data in compensation table.	■ Inform your service agency.
Program data erroneous	945	■ This is a general error message which informs that there is some error in the program data (e.g. ERROR block).	■ Edit the part program.
Program data erroneous	946	■ A syntax error occurred during downloading via the data interface. The TNC marks the erroneous block with ERROR.	■ Edit the part program.
Incorrect tool data	2374	■ Erroneous data in tool table.	■ Inform your service agency.
Faulty braking process %.2s	2827	■ The braking process was not started or it was started after a delay.	■ Switch the control voltage off and on again, or inform your service agency.
Field name not found	2224	■ In the definition of a freely definable table you used a field name that is not an element of the table.	■ The table definition must be changed. Contact your machine tool builder.
Field current error %.2s	2897	■ Incorrect entry in motor table.	■ Inform your service agency. ■ Check the motor table.
Field angle error %.2s	2909	■ Incorrect entry in MP2340 or MP2350.	■ Inform your service agency. ■ Check entry in MP2340 / MP2350
Window cannot be shifted further	530	■ In a programming graphic simulation you moved the selection frame to the edge of the window which calls for a reduction of scale beyond the capability of the graphics controller.	■ Keep the selection frame within the window.
Window too large	528	■ Programming graphics: During reduction of a programming graphic simulation the window section exceeds the limits of the graphics processor.	■ Enlarge the programming graphic.
Window too small	529	■ During enlargement of a programming graphic simulation the window section does not reach the limits of the graphics processor.	■ Reduce the programming graphic.
FK: Arithmetical error	518	■ FK programming: Arithmetical error in calculation of a FK contour (e.g. division by 0, root of a negative number).	■ Check the input in the FK section.
FK reference to current block	212	■ You attempted in an FK program to delete a block to which another part of the program makes a reference.	■ Change FK reference.
Parallel operation of FK graphics not possible	526	■ FK programming: You attempted to start an FK graphic while the iTNC was already running a part program.	■ Start FK graphic after part program has been run.
FK block not permitted at this point	519	FK programming: An FK positioning block (FL,FC,FLT, FCT) can follow a conventional positioning block only if the end point of the conventional positioning block is unambiguously defined, i.e.: ■ The conventional positioning block must not contain any Q parameters. ■ The first FK block must not follow a label.	■ Edit the part program.

Error message	Error number	Cause of error	Corrective action
FK blk not selectable with GOTO	2233	■ You attempted to resume the program at an FK block which contains Q parameters.	■ Use the mid-program startup function to resume the program.
FK block was not converted	2837	■ Automatic FK conversion at NC start not possible. FK section may be located at end of the program.	■ First run the program in the Programming and Editing mode ■ Increase the input value in MP 7229.1 (maximum value: 9 999).
FK translation is erroneous	1870	■ The FK translation is erroneous.	■ Convert from FK to H again.
FN 14: Error code %-3u	59	■ Forced error through function FN14 (ISO: D14). With this function the TNC calls the pre-programmed messages of the machine manufacturer (e.g. from an OEM cycle). If during a program run or test run, the TNC comes to a block with FN14 (D14), it stops operation and displays a message. You must then restart the program.	■ Refer to the User's Manual for a description of the error. Correct the error and restart the program.
FN 17: Assignment value illegal	2342	■ In the function "Write system data" you entered an assignment value that lies outside the permitted input range.	■ Check the assignment value.
FN20/D20: Incorrect condition	1892	■ Condition in FN20 (ISO: F20): Wait is not permitted.	■ Correct FN20/D20 block. Permissible comparisons are: =, <, >, <=, >=
Format error in date or time	2618	■ While creating a log you entered an illegal format for the date or the time.	■ Enter the permissible format: Format for date: 25.10.97 (day.month.year) Format for time: 10:25:00 (hours:minutes:seconds)
FPOL missing	506	■ FK programming: You programmed with polar coordinates without first defining an FPOL.	■ Program FPOL at some location before the block in which you first use polar coordinates.
Enter direction Q351 unequal 0	3055	■ In a fixed cycle you did not define the cutting direction (climb/up-cut).	■ Define cutting direction as climb milling (= 1) or upcut milling (= –1).
For FPOL give both coordinates	524	■ FK programming: In FPOL you did not program both coordinates of the working plane.	■ Add a coordinate to the FPOL block
Auxiliary point requires both coordinates	525	■ FK programming: You did not program both coordinates of an auxiliary point.	■ Add an auxiliary point to FK block.
Slave axis of gantry programmed	339	■ You programmed the slave axis of a gantry axis in a part-program block.	■ Do not program any slave axes.
MCU/CCU checked axes unequal	2823	■ Contradictory status of checked position values in the MCU and CCU.	■ Switch the control off and on again. ■ Inform your service agency.
Straight line before or after rounding/ chamfer has length 0	512	■ A straight line before or after a RND or CHF block has length 0.	■ Edit the part program.
Device busy	1900	■ You attempted to interrupt the connection to a device (e.g. network), although the TNC is still accessing the device.	■ Wait to end the connection until the TNC is no longer accessing the device.
Protected file!	948	■ You cannot edit or erase this program until the protection has been removed.	■ Cancel file protection.

Error message	Error number	Cause of error	Corrective action
Locked axis was programmed	330	■ You programmed a locked axis in a part program block. ■ A traverse was calculated for a locked axis (e.g. due to an active rotation). ■ A programmed axis is a freely traversing rotary axis.	■ If necessary, activate the axis. ■ Delete the axis from the part-program block.
Thread diameter not found	3183	■ In the technology table for threads, the TNC could not find the thread diameter defined in the cycle.	■ Check the thread diameter and, if required, add it to the corresponding technology table.
Thread depth too large	3081	■ The programmed thread depth plus 1/3 of the pitch is greater than the drilling or sinking depth.	■ Program the total hole depth to be at least 1/3 of a thread pitch smaller that the total hole depth.
G-code group already assigned	955	■ In a part program block you use G codes from the same group (e.g. G01 and G02).	■ Check the highlighted block for G codes that influence each other.
Synchronization monitoring %.1s	2853	■ The positions of two synchronized axes differ by a value greater than that defined in machine parameter MP855.	■ Reduce the feed rate and increase the spindle speed. ■ Remove potential sources of vibration. ■ If this occurs frequently: Inform your service agency.
Gross positioning error %.1s F	1080	■ Central drive configuration.	■ Inform your service agency.
Handwheel not ready	1096	■ Handwheel not ready.	■ Check handwheel connections.
Handwheel?	63	■ Electronic handwheel is not connected. ■ Incorrect handwheel selected in machine parameter MP7640. ■ The transmission line is defective or incorrect.	■ Connect the handwheel via cable adapter. ■ Check machine parameter MP7640. ■ Inspect the data transfer line for damage.
Unknown hardware identifier	2884	■ Software does not fit the hardware. ■ Hardware defective.	■ Inform your service agency. ■ Check the software version. ■ Exchange drive control board.
Imax of power module %.2s	2902	■ Incorrect entry in power module table.	■ Inform your service agency. ■ Check the power module table.
Imax of motor %.2s error	2907	■ Incorrect entry in motor table.	■ Inform your service agency. ■ Check the motor table.
Rated I of power module %.2s	2905	■ Incorrect entry in power module table.	■ Inform your service agency. ■ Check the power module table.
Rated I of motor %.2s error	2906	■ Incorrect entry in motor table.	■ Inform your service agency. ■ Check the motor table.
Incr. polar angle too large	224	■ In an NC block you have programmed an incremental polar angle (IPA, ISO: G91 H..) greater than or equal to 5760 degrees (16 full circles).	■ Edit the part program.
Incremental angle reference not permitted here	521	■ FK programming: You programmed a relative angle reference to a part program block whose slope angle is not constant.	■ Change the relative reference.

Error message	Error number	Cause of error	Corrective action
Internet address error	2993	■ When the service support ON/OFF soft key was pressed there was no valid Internet address entered under the code word SERVICE.REQUEST.HOST or SUPPORT.REQUEST.HOST in the OEM.SYS file.	■ Check with the machine manufacturer about the Internet address.
Missing calibration data	3192	■ You have attempted to perform a measurement with Cycle 440 without first performing a calibration.	■ Repeat Cycle 440, but with Q363 = 0 (calibrate).
No fixed cycle defined	1855	■ There is no fixed cycle defined before Cycle 220/221 (circular/linear point pattern).	■ Define a fixed cycle before Cycle 220/221.
Nothing is marked	2665	■ You attempted to fill the intermediate memory using the DELETE BLOCK, COPY BLOCK soft keys, although you have not yet marked a block.	■ Mark the block that you wish to delete/copy.
No appropriate tool found	3181	■ Automatic tool search: The TNC could not find an appropriate tool in the tool table.	■ Check the tool table.
No sign permitted	1812	■ You attempted to enter an algebraic sign in a cycle parameter for which a sign is not permitted.	■ Press CE to acknowledge the error message.
No material selected	2228	■ You attempted to have the TNC automatically calculate the spindle speed or the feed rate without first selecting a workpiece material in the workpiece blank definition.	■ Enter the workpiece material in the workpiece blank definition.
Range cycle not yet defined	1797	■ There was no range cycle defined before the start of a digitizing cycle.	■ Program the Range cycle before the Digitizing cycle.
No .TAB file open?	2736	■ You attempted to use FN27 to write to a table, or FN28 to read from a table, although no table was open.	■ Use FN26 to open the desired table.
No axis column selected	2734	■ While editing a pallet table, you pressed the actual-position-capture key and the PRESENT VALUE soft key, although the highlight was not on an axis column.	■ Use the rightward/leftward cursor keys to select the desired axis column.
No editing of running program	949	■ You cannot edit the program while it is being transferred or executed.	■ Stop the program or edit it after it is finished.
No drive release %.2s	2994	■ Inverter is not ready for operation. ■ No pulse release for the power supply unit. ■ Uz too high. ■ Power-fail signal is active. ■ If M control: NE2 input is active. ■ If P control: drive release at X50 is inactive. ■ Motor control board defective. ■ PWM cable defective. ■ Noise pulses.	■ Inform your service agency. ■ Check the control and cabling of the pulse release. ■ Check Uz. ■ Check the emergency stop circuit. ■ If the power supply is not regenerative: Is the braking resistor connected? ■ If the power supply is regenerative: Is the energy recovery activated? ■ Exchange the power module. ■ For P controls: Exchange the interface card. ■ Exchange the motor drive control board.
No rotary axis was programmed	337	■ The axis recognized as main axis in Cycle 27 (Cylinder Surface, ISO: G127) is not a rotary axis.	■ Edit the contour subprogram.

Error message	Error number	Cause of error	Corrective action
All elements deleted!	2384	■ While editing the structure of a freely definable table you erased all the elements.	■ Insert at least one element.
No chamfer as last block	293	■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer (CHF, ISO: G24) as last NC block.	■ Edit the part program.
No principal axis was programmed	338	■ The linear axis programmed in Cycle 27 (Cylinder Surface, ISO: G127) or the tool axis selected for machining is none of the axes X, Y or Z.	■ Edit the contour subprogram.
Coordinates after APPR missing	442	■ You did not give any coordinates in the NC block after APPR.	■ Add coordinate data to the part program block after APPR.
No position values from the CCU	2821	■ For a certain time the CCU has not sent any position values to the MCU.	■ Switch control Off and On again. ■ Inform your service agency.
No position values from the MCU	2822	■ The MCU must not send any position values to the CCU.	■ Switch control Off and On again. ■ Inform your service agency.
No measuring axis defined	2617	■ You failed to define the measuring axis in one of the measuring cycles 400, 402, 420, 425, 426 or 427.	■ Check Q272 in the corresponding cycle. Permitted input values: 1 or 2; for cycle 427 1, 2 or 3.
No connection to network	2339	■ The connection to the NFS server was interrupted.	■ Check whether the NFS server is available ■ If necessary, inspect the connections, the cables and the Ethernet card.
No new axis during rotatn	162	■ In a tool call a programmed rotation is active and at the same time the new tool axis is not the same as or parallel to the previous tool axis.	■ Cancel the programmed rotation in the part program before changing the tool axis.
No datum table active	2505	■ Probing cycle for datum setting: You want the TNC to write the measured point into a datum table, but you have not activated a datum table in a program run mode (status M).	■ In the single block or full sequence program run mode, activate the datum table into which you want the measured point to be entered.
No PNT file selected	3187	■ You have called a fixed cycle with CYCL CALL PAT without having activated a point table.	■ Use SEL PATTERN to select a point table before CYCL CALL PAT.
No polar coordinates possible	2774	■ You pressed the P key to enter polar coordinates. Polar coordinates are not programmable for the active function.	■ Enter Cartesian coordinates to program the active function, or use a function that permits polar coordinate input.
No testing rights	2858	■ The detachable-key switch does not permit axis testing. The "untested" status remains in effect.	■ Turn the key switch to the proper position and restart the testing procedure.
No rounding arc as last block	292	■ In the definition of a contour, a contour pocket or a contour train, you programmed a rounding arc (RND, ISO: G25) as last NC block.	■ Edit the part program.
No cutting data table selected	2230	■ You attempted to call a tool without first assigning it a cutting data table.	■ Edit the tool table.
No permission to write	2771	■ You have selected a write-protected file for editing.	■ Before editing, enter the code number 86357 to cancel the write protection.
Further enlargement not possible	862	■ The selected section cannot be enlarged any further.	■ Enter the section at its current size.

Error message	Error number	Cause of error	Corrective action
Further reduction not possible	861	■ The selected section cannot be reduced any further.	■ Enter the section at its current size.
Further file entry impossible	185	■ The TNC cannot save any more files.	■ Delete any files that you no longer need.
Check parentheses for pairs	2777	■ You attempted to end a Q-parameter block containing an odd number of parentheses. Parentheses can be programmed only in pairs.	■ Enter the missing parentheses.
Command not acknowledged	2759	■ Command was not acknowledged by the Computer Control Unit (CCU) within 200 ms.	■ Inform your service agency.
Commands do not agree	2758	■ The command returned by the CCU as echo is not the command it received.	■ Inform your service agency.
Command buffer overflow	2757	■ Too many commands were not returned by the Control Computer Unit (CCU) to the Main Computer Unit (MCU) as an echo.	■ Inform your service agency.
Impermissible change of context	2773	■ You attempted to open another context within a context dialog sequence.	■ Continue the dialog, or completely erase the block and enter a new context.
Press ENT to change the context.	2775	■ You attempted to change a context initiator to which other elements in the current block belong.	■ First delete the elements, then change the context initiator.
Press NO ENT to delete entire context.	2772	■ During editing you attempted to delete a word that is a required element of a function.	■ Press NO ENT to delete the entire function, or press END to cancel.
Contour too complex	484	■ Contour cannot be resolved.	■ Try to split the contour subprograms.
Contour too complex	485	■ Contour cannot be resolved.	■ Try to split the contour subprogram.
Contour too complex	486	■ Contour cannot be resolved.	■ Try to split the contour subprograms.
Contour too complex	487	■ Contour cannot be resolved.	■ Try to split the contour subprograms.
Contour too complex	488	■ Contour cannot be resolved.	■ Try to split the contour subprograms.
Contour too complex	489	■ Contour cannot be resolved.	■ Try to split the contour subprograms.
Contour too complex	490	■ Contour cannot be resolved.	■ Try to split the contour subprograms.
Contour too complex	491	■ Contour cannot be resolved.	■ Try to split the contour subprograms.
Contour too complex	492	■ Contour cannot be resolved.	■ Try to split the contour subprograms.
Contour too complex	493	■ Contour cannot be resolved.	■ Try to split the contour subprograms.
Contour too complex More data needed	517	■ FK programming: The information does not suffice for the calculation of an FK contour.	■ Enter more geometrical information.
Insufficient contour definition	505	■ FK programming: The contour was not resolved by the end of the program.	■ Resolve the FK section by entering more information.
Contour programming error	475	■ A contour starting point lies on a contour intersection: The TNC cannot recognize how you wish to combine the contours.	■ Change the contour starting point in a contour subprogram.

Error message	Error number	Cause of error	Corrective action
Contour programming error	476	■ Two successive contour elements are circles with the same center but different radii.	■ Check the arc end-point coordinates.
Contour programming error	477	■ A contour subprogram contains only one point.	■ Add data to the contour subprogram. At least two points are required.
Contour programming error	479	■ Programmed contour is not continuous.	■ Check the contour subprogram.
Contour programming error	480	■ Contour is too complex.	■ Try to split the contour subprograms.
Contour programming error	481	■ On a self-intersecting contour the starting point lies on an intersection.	■ Change the starting point in the contour subprogram.
Contour programming error	482	■ At the starting point of the contour is an intersection that cannot be resolved by the TNC.	■ Change the starting point in the contour subprogram.
Contour programming error	483	■ Incorrect entry in MP810.	■ Inform your service agency.
Contour programming error	1076	■ Error in the contour subprogram during contour cycle run.	■ xxx
Contour programming error	478	■ The TNC cannot determine the rotational direction of the programmed contour.	■ In the contour subprogram, clearly define the rotational direction.
Contour pocket not permitted	262	■ You attempted to run a contour pocket cycle in a program being run blockwise from an external data medium.	■ Delete contour pocket cycle.
Circle end pos. incorrect	357	■ The difference between the radius at the end point of a C block (ISO: G2, G3) and the radius at the starting point is larger than defined in MP7431.	■ Check the circle end-point coordinates. ■ If necessary, increase the value in MP 7431.
Circle end pos. incorrect	359	■ The distance between the circle starting point and the circle end point in the CR block (ISO: G2, G3 with R) is less than 0.2 µm.	■ Check coordinates in CR block.
Circle end pos. incorrect	360	■ You programmed a "circle with radius" block (CR, ISO: G2, G3 with R) such that the distance between the starting point and the end point is greater than the diameter.	■ Check the coordinates of the starting and end points.
Circle end pos. incorrect	361	■ After an interruption in a circle block a program run was restarted although the starting position deviates from the arc by a distance greater than the tolerance defined in machine parameter MP7431. This can happen, for example, after you move an axis in a manual mode.	■ Use a mid-program startup to return to the interrupted block.
Circular interpolation illegal	3013	■ Peripheral milling is permitted only for straight line blocks L (ISO: G00, G01) or LP (SO: G10, G11).	■ Edit the part program.
Circle center missing	367	■ You programmed a circle block (C, ISO: G2/G3) without first defining a circle center (CC, ISO: I/J/K).	■ Define a circle center before the circle block.
Radius too small	437	■ You programmed a circular movement in which the radius is less than 1.6 µm. ■ In the thread milling cycle 263, 264 or 265 you entered 0 for the countersinking offset at front.	■ Check the circle block. ■ For thread milling cycles: Program Q359 greater than 0.

Error message	Error number	Cause of error	Corrective action
Label 0 is missing	363	■ A contour subprogram defined in Cycle 14 (Contour Geometry, ISO: G37) is not concluded with LBL 0 (ISO: G98).	■ Conclude the contour subprogram with LBL 0 (ISO: G98).
Label number not found	362	■ In Cycle 14 (contour geometry, ISO: G37) you defined a subprogram number that does not exist.	■ Correct the subprogram number in Cycle 14. ■ Enter the missing subprogram.
Label number not found	364	■ You attempted to use LBL CALL (ISO: L x,x) to call a subprogram or a program section repeat that does not exist.	■ Change the number in the LBL CALL block. ■ Insert a subprogram or program section repeat.
Label number %-3u already assigned	188	■ During a program start or a subprogram call, several LBL SET (ISO: G98 Lxx) blocks with the same label number were found.	■ Edit the part program.
Label number already assigned	187	■ You attempted to program the same label number in several LBL SET (ISO: G98 Lxx) blocks in a part program.	■ Edit the part program.
Pos. deviation too large %.1s	2944	■ MP640 too small. ■ Incorrect mounting of position encoder. ■ Incorrect temperature compensation, linear or nonlinear compensation, or reversal error.	■ Inform your service agency. ■ Correct MP640. ■ Check the encoder mounting. ■ Check the compensation.
Position error: Center in axis 1	2506	■ Probing cycle for workpiece measurement: Center of 1st axis outside of position tolerance.	■ Check the workpiece, and if necessary the measuring log.
Position error: Center in axis 2	2507	■ Probing cycle for workpiece measurement: Center of 2nd axis outside of position tolerance.	■ Check the workpiece, and if necessary the measuring log.
Pos. contr. cyc. time error	2854	■ MCU is outputting erroneous cycle time for CCU position controller. ■ Hardware error.	■ Inform your service agency. ■ Check machine parameter 7600.x. ■ Exchange drive control board.
Position control time too short	2828	■ The time frame for the position controller is too small. It can be increased in MP7600.0.	■ Increase the input value in MP7600.0 by 1. ■ Inform your service agency.
Language load error XX			
Interrupt running transmission?	2210	■ You attempted to start a data transfer, although the interface is already occupied.	■ Reply with YES to interrupt the transmission now running. Reply with NO to allow it to continue.
Drive not found	1901	■ The NFS server cannot find the drive that you selected.	■ Check whether your network is active.
LBL CALL not permitted	269	■ A subprogram call (LBL CALL, ISO: Lx,x) has been programmed in a program being run blockwise from an external data medium.	■ Delete the sub program call.
Power supply unit %.1s is not ready	2318	■ The readiness signal for the power supply module was switched off during operation.	■ Inform your service agency.
Power stage %.1s: I max incorrect	2193	■ IMAX of the power stage for the displayed axis is incorrect IMAX = peak current	■ Inform your service agency.
Power stage %.1s: U-Imax incorrect	2192	■ U-IMAX of the power stage for the displayed axis is incorrect U-IMAX = voltage of the current sensor	■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
Power stage in axis %.1s too weak	2188	■ Power stage for displayed axis is too weak.	■ Inform your service agency.
LN: Oriented stop not possible	2691	■ The tool direction given in the LN block (TX, TY, TZ) cannot be realized with the active swivel head.	■ Have the CAD system recalculate the tool direction.
LSV2	198	■ There was an erroneous transmission in LSV2 mode.	■ Data transfer line must be checked.
LSV2 transfer not possible	199	■ LSV2 mode in the control is not possible with the present combination of data transfer rates.	■ Change the data transfer rates (MOD, RS 232 SETUP)
Deactivate M112	1126	■ M112 is active during a cycle call.	■ Deactivate M112 with M113 prior to the cycle call.
M112 not permitted with M128	2375	■ You must not program M112 together with M128.	■ Delete M112 in the NC program.
M114 with 3DROT not permitted	303	■ You attempted to activate the Tilted Working Plane functions and M114 simultaneously.	■ Edit the part program.
No M114 with radius compensation	305	■ You programmed the M function M114 in a block with tool radius compensation.	■ Edit the part program.
M114 not permitted with M116	1809	■ The M functions M114 and M116 cannot be used together.	■ Correct the part program.
M114 not permitted with M128	2610	■ You attempted to activate M114 and M128 simultaneously.	■ Edit the part program.
M114 without machine geometry	304	■ You programmed the M function M114 without entering a corresponding description of the machine geometry in the machine parameters MP7510 and following.	■ Define the machine geometry in machine parameters MP7510 and following.
Reset M114, M128 or CYCL19.	3065	■ You attempted to activate a kinematic description, although one of the functions M114, M128 or the tilted-working-plane is active.	■ Before selecting a new kinematic description, reset all active 3DROT functions.
M114, M128, 3DROT not permitted	2750	■ You attempted to run the funtion M138, although one of the functions M114, M128, or tilted working plane was active.	Before running M138, either: ■ Deactivate M114 with M115 ■ Deactiavte M128 with M129, or ■ Reset Cycle 19.
M120 LA not permitted	3012	■ You used the M120 function during peripheral milling with active tool radius compensation.	■ M120 is not permitted with this function. Delete M120 from the NC program.
M120: LOOK AHEAD not possible	2644	■ You attempted to cancel radius compensation immediately behind a positioning block with M120. In order to be able to check for potential collisions, however, the TNC requires several radius-compensated positions.	■ Delete M120 in the NC program. ■ Activate M120 earlier.
M128 not permitted with 3DROT	2609	■ You attempted to activate the Tilted Working Plane functions and M128 simultaneously.	■ Edit the part program.
M128 with LN block not possible	2692	■ The rotary-axis coordinate resulting from M128 and from the tool direction given in the LN block (TX, TY, TZ) cannot be realized with this swivel head configuration.	■ There is no solution with your swivel head configuration.

Error message	Error number	Cause of error	Corrective action
M128 not permitted with RR/RL	2611	■ You attempted to activate M128 while radius compensation was active (RL/RR, ISO: G41/G42).	■ Edit the part program.
M128 not permitted	2735	■ You attempted a mid-program startup in a program that contains the miscellaneous function M128.	■ Delete M128 from the program.
M128: DATUM setting not allowed	2621	■ You attempted to set a new datum while M128 was active.	■ Deactivate M128 and M129 before setting the datum.
M130 not permitted with comp.	1854	■ The function M130 is not permitted together with radius compensation.	■ Correct the part program.
M130 not permitted M114	1852	■ The function M130 is not permitted together with M114.	■ Correct the part program.
M130 not permitted	1851	■ The function M130 is only permitted for a tilted working plane.	■ Correct the part program.
M130 not permitted	1853	■ The function M130 is only permitted for line interpolation.	■ Correct the part program.
M89 not permitted	1187	■ M89 is not allowed during Cycle 9 PGM CALL.	■ Edit the part program.
M91/M92 with 3DROT not permitted	302	■ You have programmed a positioning operation with M91 or M92 with a tilted working plane.	■ Edit the part program.
M91/M92 not permitted with M128	2212	■ M91 or M92 were programmed with M128 active.	■ Do not program any machine-referenced coordinates while M128 is active.
M91/M92 not permitted	2945	■ In an active tilted working plane and during an active Sie radius compensation you attempted to use M91 or M92 to move to a machine-based position.	■ Use only linear interpolation and inactive radius compensation to move to a machine-based position in an active working plane.
No macro %.20s	3206	■ During a program abort the TNC was not able to run a macro defined by your machine tool builder.	■ Contact your machine tool builder.
Begin/end block not markable	2662	■ You attempted to mark the BEGIN block (ISO: first block with %) or the END block (ISO: block N 999999).	■ The marked block must not include the first or last block of a program.
Machine key depressed	2646	■ Contact of a machine key does not open!	■ Release the key if pressed, otherwise Inform your service agency.
Scaling factor not permitted	450	■ You programmed a scaling factor before the TCH PROBE 0 cycle (ISO: G55) or before the digitizing cycles.	■ Delete the Scaling Factor or the axis-specific scaling cycles.
Scaling factors not equal	451	■ You attempted to scale a circular contour element with differing axis-specific scaling factors.	■ Scale the axes of circular contour elements with the same scaling factors.
Max. line length exceeded!	2386	■ In a freely definable table, the sum of the column widths of all elements exceeds the maximum permissible line length of 200 characters.	■ Decrease the column width of the individual elements.
MCU pos. deviation too large %.1s	2820	■ The calculated position deviation between speed encoder and position encoder is greater than the value from MP640.x.	■ Switch the control off and on again. ■ Inform your service agency.
MCU command invalid	2880	■ Internal software error.	■ Inform your service agency. ■ Check the software version.

Error message	Error number	Cause of error	Corrective action
MCU command unknown	2869	■ Internal software error.	■ Inform your service agency. ■ Check the software version.
ME: Tape end	195	■ The cassette in the ME magnetic tape unit has reached the end of the tape.	■ Turn the cassette over or insert a new one.
ME: Incorrect operating mode	192	■ The operating mode set at the ME magnetic tape unit (transmit/ receive) does not match the transmission direction set at the TNC.	■ Correct the transmission direction (transmit/receive) set on the ME.
ME: Cassette is empty	193	■ The cassette loaded in the ME magnetic tape unit is empty.	■ Insert the correct cassette.
ME: Cassette is write-protected	191	■ The cassette loaded in the ME magnetic tape unit is write-protected.	■ Cancel the write-protection on the cassette.
ME: Cassette is missing	190	■ No cassette was loaded in the ME magnetic tape unit.	■ Insert a cassette into the ME.
Only one DEP block permitted	294	■ You programmed more than one DEP block in the definition of a contour or a contour train.	■ Edit the part program.
Measuring touch probe selected	1170	■ You have attempted to start a digitizing cycle for a triggering probe, although a measuring probe is defined in machine parameter MP6200.	■ Edit machine parameter MP6200.
%.2s measuring system defective	46	■ Contradiction apparent from comparison of the absolute and incremental positions.	■ Inform your service agency.
Axis encoder defective		■ Error on coded scales.	■ Glass scale tape contaminated or damaged. ■ Scanning head contaminated or defective. ■ Cable damaged. ■ Encoder input on iTNC defective.
Axis encoder: amplitude too low		■ Amplitude error.	■ Glass scale tape contaminated or damaged. ■ Scanning head contaminated or defective. ■ Cable damaged. ■ Encoder input on iTNC defective.
Axis encoder: frequency too high		■ Signal frequency error (edge separation).	■ Glass scale tape contaminated or damaged. ■ Scanning head contaminated or defective. ■ Cable damaged. ■ Encoder input on iTNC defective.
Encoder input %.2s	2911	■ Incorrect entry in MP112 or MP113 (speed encoder). ■ Internal software error.	■ Inform your service agency. ■ Check entry in MP112 / MP113. ■ Check software version.
Measuring cycle: Length exceeds max.	2520	■ Probing cycle 425 or 427: The measured length exceeds the max. permissible value.	■ Check the workpiece, and if necessary the measuring log.
Measuring cycle: Length below min.	2521	■ Probing cycle 425 or 427: The measured length is below the min. permissible value.	■ Check the workpiece, and if necessary the measuring log.
Measuring cycle: M114 not permitted.	2748	■ You attempted to run a measuring cycle while M114 was active.	■ Use M115 to cancel M114 before running the measuring cycle.

Error message	Error number	Cause of error	Corrective action
Measuring cycle: M128 not permitted.	2749	■ You attempted to run a measuring cycle while M128 was active.	■ Use M129 to cancel M128 before running the measuring cycle.
RL/RR not permitted if M120 = 0	1141	■ M120 with LA = 0 during active tool radius compensation not permitted.	■ Cancel tool radius compensation. ■ Enter a value other than 0 for LA.
Motor %.1s: is not turning	2209	■ The motor of the displayed axis is not rotating.	■ Inform your service agency.
Motor %.1s: speed not equal to Imax	2207	■ The current speed of the motor does not correspond to the expected speed at Imax. Perhaps direction of rotation is incorrect.	■ Inform your service agency.
Motor %.1s: I max incorrect	2196	■ I max. of the motor for the displayed axis is incorrect. I-MAX = peak current	■ Inform your service agency.
Motor %.1s: I-n incorrect	2195	■ Rated current of the motor for the displayed axis is incorrect. I-N = rated current	■ Inform your service agency.
Motor %.1s: n max incorrect	2197	■ N max. of the motor for the displayed axis is incorrect. N-MAX = maximum rotational speed	■ Inform your service agency.
Motor %.1s: n-n; f-n incorrect	2191	■ One of the following motor data for the displayed axis is incorrect: N-N = rated speed F-N = rated frequency	■ Inform your service agency.
Motor %.1s: temperature too high	2205	■ Temperature of the motor for the displayed axis is too high.	■ If the error recurs, contact your service agency.
Motor %.1s: T max incorrect	2194	■ T max. of the motor for the displayed axis is incorrect. T-MAX = maximum temperature	■ Inform your service agency.
Motor %.1s: Xh; X2; f-n; R2 incorrect	2190	■ One of the following motor data for the displayed axis is incorrect: XH = Magnetizing reactance X2 = Rotor leakage reactance F-N = rated frequency R2 = Rotor resistance cold	■ Inform your service agency.
Motor %.2s: is not turning	2923	■ Inverter is not ready for operation. ■ Disturbance on RDY input of PWM output connector. ■ Motor jammed. ■ Inverter defective. ■ Motor defective. ■ Incorrect motor selected (MP2200). ■ Assignment of PWM outputs entered incorrectly in MP120. ■ Assignment of encoder inputs entered incorrectly in MP112. ■ Motor power cables crossed. ■ Motor encoder cables crossed. ■ Motor connection defective.	■ Inform your service agency. ■ Check the inverter. ■ Check the motor and cabling. ■ Check the machine parameters.

Error message	Error number	Cause of error	Corrective action
Motor %.2s not controllable	2920	■ Motor cables were crossed (e.g. X with Y). ■ Motor encoder cables crossed. ■ Phases connected incorrectly to motor. ■ Motor encoder cable is defective. ■ Incorrect motor table entry (direction of rotation). ■ Motor defective.	■ Check the motor cabling. ■ Inform your service agency. ■ Check motor and motor encoder cabling. ■ Check motor table entry.
Motor temperature too high %.1s	1217	■ Temperature of motor is too high.	■ Switch off machine. Allow motor cool down.
Motor encoder %.1s defective	2206	■ The motor encoder of the displayed axis is defective.	■ Inform your service agency.
Motor encoder %.1s Frequency too high	2208	■ The input frequency of the motor encoder for the displayed axis is incorrect.	■ Check input frequency of the encoder signal.
Motor encoder %.1s Line count too high	2189	■ Line count of the motor encoder for the displayed axis too high.	■ Inform your service agency.
%.1s z1 motor enc. ampl. too small	2204	■ Z1 amplitude of the motor encoder (ERN 1381) for the displayed axis is too low.	■ Inform your service agency.
%.1s motor enc. zn ampl.. too low	2203	■ ZN amplitude of the motor encoder (ERN 1381) for the displayed axis is too low.	■ Inform your service agency.
Motor encoder %.1s: Amplitude too small	47	■ During digital speed control the signal amplitude from one motor encoder is too small for the motor speed.	■ Check the amplitude of the encoder signal.
Motor encoder %.1s: Frequency too high	48	■ The input frequency of the motor encoder for the displayed axis is incorrect.	■ Check input frequency of the encoder signal.
Motor encoder axis: Amplitude too small		■ Amplitude error	■ Motor encoder cable damaged. ■ Graduated disk of encoder contaminated or damaged. ■ Speed encoder input on iTNC defective.
Motor encoder axis: frequency too high		■ Signal frequency error (edge separation)	■ Motor encoder cable damaged. ■ Graduated disk of encoder contaminated or damaged. ■ Speed encoder input on iTNC defective.
Mot. current %.2s not equal to 0	2941	■ Motor current was determined during cutout channel test (24-h test).	■ Inform your service agency. ■ Check the inverter
Motor current %.2s too high	2876	■ Incorrect current controller parameters. ■ Incorrect parameters in the motor table. ■ Power module defective. ■ Motor cable defective. ■ Motor defective. ■ Motor control board defective.	■ Inform your service agency. ■ Is the correct motor and power module selected? ■ Check the current control adjustment. ■ Check the motor and motor cable for a short circuit. ■ Exchange the power module or drive control board.

Error message	Error number	Cause of error	Corrective action
Motor current %.2s too high	2924	■ Incorrect current controller parameters. ■ Incorrect parameters in the motor table. ■ Power module defective. ■ Motor cable defective. ■ Motor defective. ■ Motor control board defective.	■ Inform your service agency. ■ Is the correct motor and power module selected? ■ Check the current control adjustment. ■ Check the motor and motor cable for a short circuit. ■ Exchange the power module or drive control board.
Motor temp. too high %.2s	2916	■ Measured motor temperature is too high. ■ No temperature sensor. ■ Motor encoder cable is defective. ■ Entry in motor table is incorrect. ■ Incorrect or defective temperature sensor was installed.	■ Let the motor cool down. ■ Inform your service agency. ■ Check the motor encoder cable. ■ Check the entry in the motor table. ■ Measure the temperature sensor (2000 [Ohms] at 25 [°C]).
Motor temp. %.2s too high	2873	■ Measured motor temperature is too high. ■ No temperature sensor. ■ Motor encoder cable is defective. ■ Entry in motor table is incorrect. ■ Incorrect or defective temperature sensor was installed.	■ Let the motor cool down. ■ Inform your service agency. ■ Check the motor encoder cable. ■ Check the entry in the motor table. ■ Measure the temperature sensor (2000 [Ohms] at 25 [°C]).
Unknown motor type %.2s	2895	■ Error in MP file or in motor table. ■ Internal software error.	■ Inform your service agency. ■ Check the MP file and motor table. ■ Check software version.
MP not yet confirmed with ENT	2764	■ The value of a new MP was not yet confirmed by pressing the ENT key.	■ Re-enter the MP value and confirm it by pressing ENT, or simply press ENT to confirm the default value.
MP locked by PLC	1748	■ The machine parameter is disabled. It is occupied by the PLC.	■ Edit the PLC program.
MP: defined twice	155	■ Machine paremeter input error: A machine parameter has been defined twice.	■ Edit machine parameter list.
MP: Contradictory input	158	■ Machine parameter input error: The entered values for the machine parameters are contradictory, which results in a conversion error.	■ Inform your service agency.
MP: Contradictory input	2752	■ You entered a machine parameter that does not match the default value set by your machine tool builder.	■ To accept the default setting: Press ENT. To confirm the value you entered: Press NO ENT.
MP: Input value incorrect	154	■ Machine parameter input error: Input value of the machine parameter is incorrect.	■ Edit machine parameter list.
MP: Incorrect number	152	■ Machine parameter input error: The given machine parameter does not exist (incorrect number).	■ Edit machine parameter list.
MP: No separator found	153	■ Machine parameter input error: No separator (":") was found between the number and value of the machine parameter.	■ Edit machine parameter list.
MP: not defined	156	■ Machine parameter input error: A machine parameter has not been defined. The line is generated automatically.	■ Edit machine parameter list.
MP: Saving not possible	157	■ Machine parameter input error: A machine parameter cannot be stored.	■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
MP: Line w/o number	151	■ Machine parameter input error: A line was found without a machine parameter number (not an empty line or comment).	■ Edit machine parameter list.
MP75XX not defined	2213	■ M128 without machine geometry description MP 7500 and following.	■ Inform your service agency.
MP file from EPROM defective	2637	■ A machine parameter file that was to be copied from the EPROM to the TNC main memory is defective.	■ Inform your service agency.
Error in MP transfer	3061	■ While copying a machine parameter file into the working memory, the TNC determined that the file to be copied is defective.	■ Inform your service agency.
N-code missing	496	■ In the NC block,block number N is missing.	■ Enter the block number.
NC: Pprogram memory erased	201	■ After the control was switched on, a file in NC memory was found faulty and deleted.	■ Create the file again.
Rated speed error %.2s	2900	■ Incorrect entry in motor table.	■ Inform your service agency. ■ Check the motor table.
Illegal name for path or file	1154	■ File name/path is not allowed.	■ Select another file/path name.
Illegal NC block	268	A program being executed blockwise contains the following part program blocks: ■ CALL LBL x REP y (ISO: L x,y) ■ LBL SET x (ISO: G98 Lx) ■ FN15:PRINT (ISO: D15)	■ Delete impermissible part program blocks from the externally stored program.
Illegal NC block	287	You programmed one of the following (non-permissible) blocks within the definition of a contour, a contour pocket or a contour train: ■ TCH PROBE (ISO: G55) ■ TOOL DEF (ISO: G99) ■ TOOL CALL (ISO: T..) ■ BEGIN PGM (ISO: %..)	■ Edit the part program.
Nmax of motor %.2s error	2908	■ Incorrect entry in motor table.	■ Inform your service agency. ■ Check the motor table.
EMERGENCY STOP defective	203	■ The internal or external EMERGENCY STOP circuit is found by the system CPU to be defective.	■ Check the emergency-stop circuit.
EMERGENCY STOP PLC	205	■ Error message from the PLC (see machine documentation).	■ Inform your service agency.
Datum table?	167	■ A datum table is required to machine a part program. Either there is no table in the control's NC memory, or several tables have be saved and none activated.	■ Activate the datum table in the Program Run, Full Sequence mode (status "M").
Insufficient slot width	2040	■ The width defined in the slot cycle cannot be machined with the active tool.	■ Use a smaller tool.
Excessive offset in %.1s	42	■ During offset adjustment (with code number or cyclic) an offset voltage of more than 100 mV was determined.	■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
Oriented spindle stop inactive	165	■ You attempted to call either the Rigid Tapping cyle or the Tapping cycle, although your machine does not have a controlled analog spindle.	■ Contact your machine tool builder.
Oscilloscope error %1s	2904	■ Internal software error.	■ Inform your service agency. ■ Check software version.
'PALETT' in NCMACRO.SYS missing	2102	■ Pallet changer: A pallet change was started although there is no NCMACRO.SYS file.	■ Inform your service agency.
Wrong pallet	2100	■ Pallet changer: The part program that was started belongs to another pallet.	■ Change to the proper pallet.
Pallet data missing	2103	■ Pallet changer: You started a part program that does not belong to any pallet.	■ Add the PALLET entry to the pallet file. The PALLET entry assigns a pallet to the part program.
Pallet line locked	3025	■ You attempted to run a locked pallet line.	■ To resume program run, unlock the line or continue with the next line. If necessary, refer to your machine manual.
Parallel operation not possible	208	■ You attempted to start a program at the same time in the Program Run and Program Test operating modes, or to start a program in the Program Test mode during execution of a PLC positioning command.	■ Start the part program only in one of the operating modes.
Parallel operation not possible	209	■ You edited the machine or user parameter list and tried to exit the editor with END. This is not permitted if the part program or a PLC positioning operation is running.	■ Wait until the part program run is ended, or interrupt it.
Parallel operation not possible	210	■ You attempted to compile an FK program or generate an FK graphic simulation during a running NC program or PLC positioning operation.	■ Stop the part program.
Parallel operation not possible	2284	■ The window for the help text could not be displayed. It could be that a help window is already open in another operating mode.	■ Close the window that is open in parallel.
Mandatory field deleted!	2385	■ While editing the structure of a freely definable table you deleted an element that is always required by the TNC (mandatory element).	■ Reinsert the mandatory element.
PGM %.16s is missing	206	■ The program that you have selected contains a program call into a program that does not exist in TNC memory.	■ If necessary, modify the program name. ■ Modify the program call so than the TNC can call an externally stored program.
PGM CALL not permitted	270	■ A program call (PGM CALL, ISO: %..) has been programmed in a program being run blockwise from an external data medium.	■ Delete the program call.
PGM not found	207	■ During execution of a blockwise transferred part program (DNC mode) the control found that a called subprogram does not exist in NC memory.	■ Load the part program.

Error message	Error number	Cause of error	Corrective action
PGM section cannot be shown	49	During graphic simulation of a positioning block one of the following errors occurred: ■ In the positioning block to be simulated one of the axes A, B, C, U, V, W was moved. ■ Starting point or target point of the positioning block lies in at least one axis farther away than approx. 128 times the maximum edge length of the programmed BLK FORM. ■ The center of a circle lies in at least one axis farther away than approx. 128 times the maximum edge length of the programmed BLK FORM. ■ The circle radius is larger than approx. 128 times the longest side of the programmed BLK FORM. ■ The arc length of a circle is greater than approx. 128 times the longest side of the programmed BLK FORM.	■ The TNC cannot graphically simulate traverse in the A, B, C, U, V, and W axes. ■ Enlarge the BLK FORM.
Pocket 0 undefined	159	■ You attempted to assign a tool to a locked pocket in the tool-pocket table.	■ Check the tool pocket table. ■ Inform your service agency.
PLC: CASE/KFIELD is empty	92	■ PLC syntax error: You programmed a CASE instruction followed immediately by an ENDC instruction, or you programmed a KFIELD label followed immediately by an ENDK instruction.	■ Edit the PLC program.
PLC: File not found	98	■ PLC syntax error: A file linked with the USES command cannot be found, or you attempted to include a file from the RAM memory in a PLC program from the EPROM (machine parameter MP4010 = 0).	■ Edit the PLC program.
PLC: File too long	99	■ PLC syntax error: The program code of a single file would be larger than 64 KB and therefore cannot be compiled. Split the file into several smaller files and link them with the USES command.	■ Edit the PLC program.
PLC: ENDC/ENDK without beginning	89	■ PLC syntax error: You programmed an ENDC command without a preceding CASE statement, or an ENDK command without a preceding KFIELD label.	■ Edit the PLC program.
PLC: Event file not found	2316	■ In the system file OEM.SYS the file defined with PLCEVENTS= was not found.	■ Inform your service agency.
PLC: External label in CASE	103	■ PLC syntax error: A label declared with EXTERN has been inserted in the CM list of a CASE command. Define a local module, which in the simplest case calls only the global module via CM.	■ Edit the PLC program.
PLC: External label in JP	104	■ PLC syntax error: You attempted to jump to a label defined with EXTERN using a JP/JPF/JPT statement.	■ Edit the PLC program.

Error message	Error number	Cause of error	Corrective action
PLC: External label not defined	102	■ PLC syntax error: A label declared with EXTERN has not been defined with GLOBAL in any of the associated modules.	■ Edit the PLC program.
PLC: Incorrect program structure	106	PLC syntax error: ■ You programmed an ELSE/ENDI/ ENDW/UNTIL statement without a previous IF/ELSE/WHILE/REPEAT statement. ■ Differently structured statements have been interlinked instead of nested within each other. The structures must always be closed in the order opposite to that in which they are opened!	■ Edit the PLC program.
PLC: Error in text after command	68	■ PLC syntax error: The PLC command is followed by further characters that cannot be interpreted.	■ Edit the PLC program.
PLC: Incorrect type in parenth.	87	■ PLC syntax error: Depending on the logic operation formed before a parenthesis and the parenthesis command used, it is expected that the sequence in parentheses supplies a result of the same type (word/logic). If the types differ, the logic operation requested in the open-parenthesis command cannot be formed.	■ Edit the PLC program.
PLC: Error in module call	1750	■ Fatal error during PLC module call (e.g. module 9031: error converting MP).	■ Edit the PLC program.
PLC: Error in CASE/ KFIELD	90	■ PLC syntax error: You programmed a command other than CM behind a CASE instruction and before the associated ENDC instruction, or you programmed a command other than K behind a KFIELD and before the associated ENDK label.	■ Edit the PLC program.
PLC: Error table format incorrect	1528	■ PLC error table: The error table selected in the OEM.SYS file does not have an up-to-date binary format (e.g. after a software exchange).	■ Delete the PLC error table and download a new PLC error table through the data interface.
PLC: Error table not .PET	1525	■ The PLC error table selected in OEM.SYS is not a PET file.	■ Check the format of the PLC error table.
PLC: Error table not found	1527	■ The PLC error table selected in OEM.SYS could not be found.	■ Check the file name or the path name.
PLC: Error table not yet compiled	1521	■ A PLC error table selected in the OEM.SYS file has not been recompiled after a change.	■ Compile PLC error table.
PLC: Global in the main file	108	■ PLC syntax error: You defined a module from the main file as GLOBAL. Only modules from files that are linked with the USES statement can be made accessible for other files through the GLOBAL statement.	■ Edit the PLC program.

Error message	Error number	Cause of error	Corrective action
PLC: Global/ external incorrect	96	■ PLC syntax error: You wrote the GLOBAL or EXTERN commands behind other program code in the file. These commands must always appear before the program code.	■ Edit the PLC program.
PLC: Global label defined twice	105	■ PLC syntax error: You defined the same label more than once with GLOBAL in the same or in several files.	■ Edit the PLC program.
PLC: Index range incorrect	115	PLC runtime error: ■ The address for writing access to data types B/W/D/M/I/O/T/C is, through the inclusion of the index register, in an invalid region for these operand types. ■ During access to a constant field, the index register contains a value that is not possible for this field (less than 0, or greater than or equal to field length). ■ Due to the inclusion of the index register, the address of a string leads to an illegal value. ■ The number of a dialog (S#Dn[X]) or an error message (S#En[X]) leads to a prohibited value owing to inclusion of the index register (less than 0 or greater than 999). ■ During the addressing of a component string.	■ Edit the PLC program.
PLC: End of block not found	71	■ PLC syntax error — block end not found: At the end of the program file there are PLC commands that are not concluded by an EM or JP command. The danger therefore exists that an undefined program area is executed at run time.	■ Edit the PLC program.
PLC: Invalid command	64	■ PLC syntax error: The TNC cannot interpret the line it has read as a PLC command.	■ Edit the PLC program.
PLC: Error table missing	1524	There is no PLC error table. ■ A PLC error module 9085/9086 was called although no error table was compiled, or there were no entries in the table. ■ A PLC error module 9085/9086 was called or an error marker was set, although the error table was edited or deleted after compilation.	■ Compile PLC error table. ■ Check the entries in the PLC error table.
PLC: Opening parenth. incorrect	86	■ PLC syntax error: You programmed an opening parenthesis command without first beginning a logic or a word sequence.	■ Edit the PLC program.
PLC: Parentheses not closed	80	■ PLC syntax error: You have programmed an EM instruction in a parenthetical expression.	■ Edit the PLC program.
PLC: Closing parenthesis w/o opening	76	■ PLC syntax error: There were more closing than opening parentheses.	■ Edit the PLC program.

Error message	Error number	Cause of error	Corrective action
PLC: Label defined twice	81	PLC syntax error: ■ The same label name was used twice for a LBL or KFIELD instruction. ■ A label name that was imported with EXTERN from another module was used again with a LBL or KFIELD instruction. ■ A name reserved for internal modules (9000–9255) was used with an LBL, KFIELD or EXTERN instruction.	■ Edit the PLC program.
PLC: Label incorrectly programmed	77	■ PLC syntax error: A label was set within a parenthetical calculation. This is illegal because closing parenthesis commands cannot be executed without the associated opening parenthesis commands.	■ Edit the PLC program.
PLC: Label incorrectly programmed	78	■ PLC syntax error: A label was programmed in a connective operation that was already started. This is illegal because the first command behind the label would then have to be interpreted, depending on the program, once as a logical connection and once as a load command.	■ Edit the PLC program.
PLC: Label not defined	70	■ PLC syntax error: A reference was made to a label that has not been defined with BL, KFIELD or EXTERN.	■ Edit the PLC program.
PLC: Logic accumulator not loaded	85	■ Syntax error: A command was programmed that gates, assigns or manipulates the already loaded logic accumulator even though the accumulator was not previously loaded.	■ Edit the PLC program.
PLC: Logic assignment missing	83	■ PLC syntax error: A logic operation was conducted. However, the result was not assigned to an operand, but to a new logic operation.	■ Edit the PLC program.
PLC: M4005, M4006, M4007 incorrect	133	■ PLC runtime error: More than one of the markers M4005 (M03), M4006, (M04), M4007 (M05) is set.	■ Edit the PLC program.
PLC: Module 9008 not called	1124	■ Compatibility module 9008 has not been called at the start of the PLC program. The module is required by the TNC 426 in order to be able to process the interface markers of the TNC 425/407.	■ Edit the PLC program.
PLC: Operand incorrect	67	■ PLC syntax error: An operand number was specified that lies outside the value range for this operand.	■ Edit the PLC program.
PLC: Operand not found	66	■ PLC syntax error: Operand not found. A type was indicated for the operand, but no value.	■ Edit the PLC program.
PLC: Program too long	72	■ PLC syntax error: The complete length of the program code to be generated exceeds the storage space available in the control.	■ Edit the PLC program.

Error message	Error number	Cause of error	Corrective action
PLC: Jump incorrectly programmed	75	■ PLC syntax error: An unconditional jump was programmed although the assignment chain begun beforehand had not yet been assigned.	■ Edit the PLC program.
PLC: Jump incorrectly programmed	79	■ PLC syntax error: A jump statement was programmed within parentheses. This is not possible because, due to the internal implementation, opening parentheses must be closed again. This could not happen in the event of a jump.	■ Edit the PLC program.
PLC: Jump incorrectly programmed	88	■ PLC syntax error: You programmed a conditional jump (CMT/CMF/JPT/JPF/EMT/EMF) without first starting a logic operations sequence in the logic accumulator.	■ Edit the PLC program.
PLC: Stack overflow	111	■ PLC runtime error: You attempted to write more than 128 bytes of data to the stack. Word operands (B/W/D/K) occupy 4 bytes each. Logic operands (M/I/O/T/C) occupy 2 bytes.	■ Edit the PLC program.
PLC: Stack underflow	110	■ PLC runtime error: You attempted to retrieve data from the stack although it had not yet been written there.	■ Edit the PLC program.
PLC: String within parentheses	94	■ PLC syntax error: You programmed a string statement within parentheses. String operands cannot be nested with parentheses.	■ Edit the PLC program.
PLC: String accumulator not loaded	93	■ PLC syntax error: A command was programmed that logically connects, assigns or manipulates the loaded string accumulator, although the string accumulator was not previously loaded.	■ Edit the PLC program.
PLC: String assignment missing	95	■ PLC syntax error: You started a new logic operations sequence without first assigning the logic operation formed in the string accumulator.	■ Edit the PLC program.
PLC: More than one strobe active	134	■ PLC runtime error: More than one of the functions "PLC positioning," "datum shift," or "spindle orientation" has been activated.	■ Edit the PLC program.
PLC: Structure open at file end	107	■ PLC syntax error: A structured command has been opened and not closed again prior to the end of the file.	■ Edit the PLC program.

Error message	Error number	Cause of error	Corrective action
PLC: Timeout	112	PLC runtime error: ■ The processing of the cyclically executed program section takes too long. Check the program substructure for very compute-intensive sections that you can start as submit jobs. ■ The displayed processing time might increase during data transfer and in handwheel mode. In case of doubt, select handwheel mode and simultaneously start data transfer with max. baud rate, then check "MAXIMUM PROCESSING TIME" in the PLC programming environment. Values should not exceed 150% (safety reserve in the event of unfavorable operating conditions).	■ Edit the PLC program.
PLC: CASE out of range	113	■ PLC runtime error: The operand for the CASE statement contains a value that cannot be interpreted as an offset in the CM table (smaller than 0, or greater than or equal to the table length).	■ Edit the PLC program.
PLC: Invalid operand type	65	■ PLC syntax error - invalid operand type: An unkown operand type was given, or the command cannot be used for the given operand type.	■ Edit the PLC program.
PLC: Subprogram not defined	114	■ PLC runtime error — subprogram was not defined.	■ Edit the PLC program.
PLC: Word accumulator not loaded	84	■ PLC syntax error: A command was programmed that logically connects, assigns or manipulates the loaded word accumulator, although the word accumulator was not previously loaded.	■ Edit the PLC program.
PLC: Word assignment missing	82	■ PLC syntax error: A word gate was executed but the result had not been assigned to any operand, and a new gate had begun instead.	■ Edit the PLC program.
PLC: Line too long	69	■ PLC syntax error: The line is longer than 128 characters.	■ Edit the PLC program.
PLC: Excessive nesting	109	PLC runtime error: ■ You attempted to nest more than 32 module calls. ■ You programmed a recursive module call that exceeds the limit of 32 levels.	■ Edit the PLC program.
PLC: Too many entries in CASE	91	■ PLC syntax error: A CASE table was programmed with more than 128 entries.	■ Edit the PLC program.
PLC: Too many events	2317	■ More than 15 events were defined for the current SPAWN process (cooperative multitasking).	■ Inform your service agency.
PLC: Too many global labels	101	■ PLC syntax error: A total of more than 1,000 global labels were defined within the associated files.	■ Edit the PLC program.
PLC: Too many parentheses	74	■ An attempt was made to nest more than 16 parenthetical expressions in each other.	■ Edit the PLC program.

Error message	Error number	Cause of error	Corrective action
PLC: Too many local labels	100	■ PLC syntax error: More than 1,000 labels assigned in one file. All LBL, KFIELD and EXTERN statements are added together along with the (hidden) labels created through structured commands. Split the file into several smaller files and link them with the USES command.	■ Edit the PLC program.
PLC: Too many modules	97	■ PLC syntax error: You attempted to link more than 64 files into one program using the USES instruction.	■ Edit the PLC program.
PLC: assignment in 1 parenthesis	73	■ PLC syntax error: An attempt was made to assign the result of a gated operand, although not all opening parentheses were closed.	■ Edit the PLC program.
PLC:\NCMACRO.SYS missing	2101	■ Pallet changer: A pallet change was started although there is no NCMACRO.SYS file.	■ Inform your service agency.
PLC: No error table selected	1523	■ After an interruption in power, the PLC error table cannot be automatically compiled because there is no table selected in OEM.SYS.	■ Enter PLC error table in OEM.SYS.
PLC function not permitted	3218	■ During mid-program startup, the PLC function programmed in the displayed block cannot be properly executed.	■ Inform your service agency.
PLC module 9169 illegal	2930	■ PLC Module 9169 in safety-oriented software (illegal). ■ Software error	■ Inform your service agency. ■ Check the PLC program. ■ Check software version.
Illegal PLC datum shift	2995	■ During a return to the contour, the PLC commanded an illegal datum shift.	■ If the error recurs: Have the machine manufacturer change the PLC program.
PLC program not translated	211	■ The PLC program was not compiled after switch-on, or it has been edited since it was last compiled. ■ You attempted to activate the In Code Tracer, although the PLC program was not compiled after switch-on or was edited since it was last compiled.	■ Compile the PLC program.
PNT: Clearance height too low	3188	■ You have called a fixed cycle with CYCL CALL PAT, and the coordinate you have entered in the tool axis (clearance height) is too small.	■ The clearance height entered in the point table is greater than the clearance height in a cycle.
Pole is missing	366	■ You attempted to traverse with polar coordinates (LP/CP/CTP, ISO: G10/G11/G12/G13/G15/G16) without first programming a pole (CC, ISO: I/J/K).	■ Program a pole before the first block with polar coordinates.
Pole pair no. too large %.2s	2896	■ Incorrect entry in motor table	■ Inform your service agency. ■ Check the motor table.
Positioning error	51	■ The servo lag of a moving axis is greater than the value given in machine parameter MP1710 (in lag mode) or MP 1410 (feedforward mode).	■ Reduce the feed rate and increase the spindle speed. ■ Remove potential sources of vibration. ■ Inform your service agency.
Program incomplete	194	■ Data transmission was interrupted with the <END> key.	■ Transfer the program again.

Error message	Error number	Cause of error	Corrective action
Program not found	184	■ You attempted to call a program that is not stored in TNC memory.	■ Edit the part program.
Program checksum error	2889	■ Internal software or hardware error	■ Inform your service agency. ■ Check software version ■ Exchange drive control board.
Program memory exceeded	939	■ The NC program memory no longer suffices for part programs.	■ Delete any programs that you no longer need.
Checksum error	978	■ Collective error message for all checksum errors. The explanatory texts are inserted in the context of the programs.	■ Refer to the Technical Manual for the respective control.
Checksum error A	33	■ The CRC sum of the EPROMs IC-P1 and IC-P2 is incorrect.	■ Inform your service agency.
Checksum error B	34	■ The CRC sum of the EPROMs IC-P3 and IC-P4 is incorrect.	■ Inform your service agency.
Checksum error C	35	■ The CRC sum of the EPROMs IC-P5 and IC-P6 is incorrect.	■ Inform your service agency.
Checksum error D	36	■ The CRC sum of the PLC EPROM is incorrect.	■ Inform your service agency.
Checksum error E	37	■ The CRC sum of PLC EPROM IC-P7 is incorrect.	■ Inform your service agency.
Checksum error R	2239	■ EPROMS defective	■ Inform your service agency.
Exchange buffer battery	164	■ The voltage of the buffer battery in the power supply unit is too low.	■ Exchange the buffer battery (see User's Manual).
Point spacing too large	1791	■ The point spacing in a digitizing cycle was programmed by Q parameter as a value greater than 6.5535 mm.	■ Check the data for the probe point interval in the digitizing cycle.
PWM output %.2s	2912	■ Incorrect entry in MP120 or MP121 (nominal speed command signal output). ■ Internal software error.	■ Inform your service agency. ■ Check entry in MP120 / MP121. ■ Check software version.
PWM component defective %.2s	2925	■ Internal hardware error.	■ Inform your service agency. ■ Exchange drive control board.
PWM frequency error	2894	■ Entered PWM frequency in MP2180 lies outside the permissible input range.	■ Inform your service agency. ■ Check MP2180.
Q202 not defined	2042	■ There is no plunging depth (Q202) defined in the fixed cycles 200 to 215.	■ Enter a plunging depth in the fixed cycle.
Q205 not defined	2043	■ In the Universal Drilling cycle, you have not defined the minimum plunging depth.	■ Enter a minimum plunging depth in the fixed cycle.
Q124: 0 not permitted	2315	■ In the definition of cycle 204 you have entered the disengaging direction 0.	■ In Q214, enter a value from 1 to 4.
Q218 must be greater than Q219	2044	■ Pocket finishing cycle: Q218 must be greater than Q219.	■ Correct the values in the fixed cycle.
Q220 too large	2047	■ Pocket or stud finishing cycle: Rounding radius Q220 too large.	■ Correct the rounding radius in the fixed cycle.
Q222 must be greater than Q223	2048	■ Stud finishing cycle: Workpiece blank diameter Q222 must be greater than the finished part diameter Q223.	■ Correct the workpiece blank diameter in the fixed cycle.

Error message	Error number	Cause of error	Corrective action
Q223 must be greater than Q222	2238	■ In the Circular Pocket Finishing cycle (Cycle 212, ISO: G212), you entered a finished-part diameter (Q223) smaller than the workpiece-blank diameter (Q222).	■ Edit Q222 in the cycle definition.
Q244 must be greater than 0	2049	■ Circular pattern cycle: You entered a pitch circle diameter of zero.	■ Correct the pitch circle diameter in the cycle.
Q245 must not equal Q246	2050	■ Circular pattern cycle: Enter a stopping angle equal to the starting angle.	■ Correct the starting or stopping angle in the cycle.
Enter Q247 unequal 0.	2829	■ In a measuring cycle you entered in parameter Q247 an angular step of 0.	■ Enter an angular step (Q247) other than 0.
R+/R- not permitted with M120	1144	■ Paraxial radius compensation (R+/R-, ISO: G43/G44) is not permitted when M120 is active.	■ Edit the part program.
Cancel comp. before PLC positng	425	■ During resumption of a part program a tool radius compensation is active RL/RR (ISO: G41, G42) although a PLC datum shift must be executed.	■ Cancel tool radius compensation before resuming the program.
Cancel radius comp. before M128	2636	■ You activated M128 while a tool radius compensation RL/RR (DIN/ISO: G41/G42) was still active. The TNC cannot switch from 2-D to 3-D radius compensation.	■ If you wish to run a 3-D radius compensation, you must first program M128 and then the tool radius compensation with RL/RR (ISO:G41/G42).
Radius compensation not defined	267	■ You programmed four axes and a tool radius compensation in an L block, but the TNC can move no more than three axes with radius compensation. ■ M112 not permitted for circular movement.	■ Remove one of the four axes or the radius compensation. ■ Deactivate M112 with M113.
Impermissible radius comp.	1143	■ You cannot change the tool radius compensation while M120 is active. ■ You programmed a tool radius compensation RR/RL in an LN block, but the TNC will calculate the compensation from the normal vector NX, NY, NZ.	■ Edit the part program. ■ Delete RR/RL from the LN block.
Radius compensation not possible!	3026	■ The TNC cannot execute radius compensation on the programmed contour. Possible cause: You programmed two tangentially connecting straight lines in sequence.	■ Correct the contour.
Radius comp. undefined	370	■ You programmed a radius-compensated single-axis positioning block which without the radius compensation does not result in tool movement (e.g. IX+0 R+, ISO: G7).	■ Edit the part program.
Radius comp. undefined	371	■ You programmed a radius-compensated single-axis positioning block whose path would take a direction opposite to that of the non-compensated path.	■ Edit the part program.
Radius comp. undefined	372	■ You attempted to run a part program block with tool radius compensation after inserting a spherical or toroidal cutter.	■ Set R2 to equal 0 in the tool table = 0.

Error message	Error number	Cause of error	Corrective action
Radius comp. undefined	373	■ In the definition of a contour, a contour pocket or a contour train you neglected to program radius compensation.	■ Set a tool radius compensation in the contour subprogram to define whether the contour is for a pocket or island.
Radius comp. undefined	374	■ You called cycle 22 (Contour-Parallel Roughing, ISO: G122) or Cycle 21 (Pilot Drilling, ISO: G121) although the product of the tool radius and the overlap factor is 0.	■ Edit the part program.
Cross over reference points	375	■ In a part program block you attempted to move an axis that has not yet traversed the reference point.	■ Move the axis over the reference point.
Ref mark %.1s: Incorrect spacing	62	■ During a reference run on an encoder with distance-coded reference marks a distance of more than 1000 grating periods was covered without passing over a reference mark.	■ Correct machine parameter MP1350.
Reaming diameter not found	3184	■ In the technology table for reaming, the TNC could not find the reaming diameter defined in the cycle.	■ Check the reaming diameter and, if required, add it to the corresponding technology table.
Relay: n.c. contact closed?	2647	■ In the relay chain, the normally closed contact of one or more relays is closed.	■ Check the relay for proper function. If necessary, Inform your service agency.
Relay: n.c. contact open?	2254	■ In the relay chain, the normally closed contact of one or more relays is open.	■ Check the relay for proper function. If necessary, inform your service agency.
RND not permitted with M120	1145	■ When M120 is active, rounding is permitted only in the compensation plane.	■ Edit the part program.
RND after APPR not permitted	278	■ You programmed a rounding arc (RND) immediately after an APPR block.	■ Edit the part program.
Blank form too large	527	■ The blank form is so large that the graphic elements cannot be displayed by the graphics processor.	■ Reduce the size of the blank form.
Blank form definition incorrect	180	Error in the conversion of the programmed workpiece blank in the graphic: ■ The programmed spindle axis was not X, Y or Z. ■ An edge length is negative (the minimum and limits were switched). ■ One edge length is smaller than 0.1 mm. ■ The length of the shortest edge is less than approx. 1% of the longest edge.	■ Edit the part program.
Blank form definition incorrect	181	■ Error in the conversion of the programmed workpiece blank in the graphic: An edge length is negative (the minimum and limits were switched).	■ Edit the part program.
Rotor time constant err. %.2s	2899	■ The rotor time constant calculated from the rotor table is invalid.	■ Inform your service agency. ■ Check the motor table.

Error message	Error number	Cause of error	Corrective action
RND radius = 0 not permitted	279	■ In the definition of a contour, a contour pocket or a contour train, you programmed a rounding arc (RND, ISO: G25) with radius 0.	■ Edit the part program.
RND after chamfer not permitted	282	■ In the definition of a contour, a contour pocket or a contour train, you programmed a rounding arc (RND, ISO: G25) immediately behind a chamfer (CHF, ISO: G24) block in the definition.	■ Edit the part program.
Rounding-off undefined	376	■ You programmed in sequence a positioning block without radius compensation, a rounding arc (RND, ISO: G25), and a circle block with radius compensation.	■ Edit the part program.
Rounding-off undefined	377	■ You programmed a corner radius perpendicular to the working plane, followed only by a movement in the tool axis.	■ Edit the part program.
Rounding arc not permitted	288	■ In the definition of a contour, a contour pocket or a contour train, you programmed a rounding arc immediately before a CT (ISO: G6) or CTP (ISO: G16) block in the definition.	■ Edit the part program.
Rounding arc not permitted	289	■ In the definition of a contour, a contour pocket or a contour train, you programmed a rounding arc (RND, ISO: G25) as first NC block.	■ Edit the part program.
Rounding arc not permitted	378	■ In the positioning block before a rounding arc (RND, ISO: G25) either you programmed a movement only in the tool axis or you used the M function M98 to cancel compensation.	■ Edit the part program.
Rounding arc or chamfer not permitted at this point	510	■ You programmed a rounding arc or chamfer that does not immediately follow a positioning block.	■ Edit the part program.
Rounding/chmafer with tangential transition is not permitted	511	■ You programmed a rounding arc or chamfer between tangential contour transitions.	■ Edit the part program.
Rounding radius too large	379	■ In the definition of a contour, a contour pocket or a contour train, you programmed a rounding arc (RND, ISO: G25) with so large a radius that it does not fit between the adjoining elements.	■ Define a smaller rounding radius in the contour subprogram.
Rounding radius too large	380	■ In a rounding block approaching a contour, the starting point of the block lies inside the circle of the arc.	■ Use a smaller rounding radius. ■ Program the starting point of the approaching block farther away from the contour.
Rounding radius too large	381	■ In a rounding block approaching a contour the starting point of the block lies too close to the center of the rounding circle (less than 1.6 µm).	■ Program the starting point of the approaching block farther away from the center of the rounding circle.
Rounding radius too large	382	■ In a rounding block departing a contour, the end point of the departing block lies within the rounding circle.	■ Use a smaller rounding radius. ■ Program the end point of the departing block farther away from the contour.

Error message	Error number	Cause of error	Corrective action
Rounding radius too large	383	■ In a rounding block departing a contour, the end point of the departing block lies too close to the center of the rounding circle (less than 1.6 µm).	■ Program the end point of the departing block farther away from the center of the rounding circle.
Rounding radius too large	384	■ You programmed a rounding arc (RND) whose starting point does not lie on the contour or on the compensated contour.	■ Edit the part program.
Rounding radius too large	385	■ You programmed a rounding arc (RND) whose end point does not lie on the contour or on the compensated contour.	■ Edit the part program.
Rounding radius too large	386	■ You defined a pocket (cycle 4) in which the sum of twice the corner radius plus the stepover factor is greater than the width of the pocket.	■ Edit the part program.
Rounding radius too large	387	■ In the Contour Train cycle, you programmed the approach to or departure from a contour with a rounding block whose starting position or target position lies within the arc.	■ Edit the part program.
Rounding radius too large	503	■ Tool radius 0 is active. ■ A rounding radius does not fit between two contour elements.	■ Program a tool radius other than 0. ■ Program a smaller rounding radius.
Limit switch %.1s-	2377	■ You have traversed the hardware limit switch.	■ Inform your service agency.
S: Gross positioning error L %.1s	2378	■ During acceleration or deceleration the machine did not behave as instructed by the software.	■ Inform your service agency.
Block not permitted with M112	2231	■ The highlighted block is not permitted with M112 active.	■ Edit the part program.
Block in cycle not allowed!	1107	■ HEIDENHAIN cycles usually consist of several component blocks. You have attempted to write another part program block in between these component blocks.	■ Insert the new part program block before or after the cycle.
Block in cycle not allowed!	1107	■ HEIDENHAIN cycles usually consist of several component blocks. You have attempted to write another part program block in between these component blocks.	■ Insert the new part program block before or after the cycle.
Block too long	494	■ The maximum block length has been exceeded.	■ Shorten the highlighted block.
Block format incorrect	427	■ The radius is missing for a Circle with Radius block (G02, G03).	■ Edit the part program.
Block format incorrect	953	■ Incorrect block format in the highlighted block.	■ Edit the part program.
Block format incorrect	1266	■ Binary format of a plain language block is incorrect.	■ Delete the block and enter again.
Block number already assigned	956	■ You attempted to save a block number that already exists.	■ Use a block number that is not already being used.
Contradictory block scan %s	3217	■ At the end of a block scan for a mid-program startup, the control detected a disagreement between the geometry and the machine in the data of the active spindle (S), the traverse range (R), or the PLC datum shift (P).	■ Acknowledge the error message by pressing the END key. The TNC will restart.

Error message	Error number	Cause of error	Corrective action
Triggering touch probe selected	1171	■ You have attempted to start a digitizing cycle for a measuring touch probe, although a triggering touch probe is defined in machine parameter 6200.	■ Edit machine parameters 6200.
Excessive servo lag in %.1s	38	■ The servo lag of a moving axis is greater than the value given in machine parameter MP1720 (in lag mode) or MP 1420 (feedforward mode).	■ Reduce the feed rate and increase the spindle speed. ■ Remove potential sources of vibration. ■ If this occurs frequently: Inform your service agency.
Cutting-material table not found	2227	■ The cutting material table integrated in OEM.SYS was not found.	■ Check the entry in the OEM.SYS file and, if necessary, regenerate the CUT.TAB file.
Check the cutting data!	2300	■ You have altered the entries for automatic cutting data calculation in the part program block WMAT or in the TOOL CALL block (ISO: G99 block).	■ Check whether the changed entries have any effects on the spindle speed automatically calculated by the TNC or on the automatically calculated feed rate.
Interface already assigned	196	■ You attempted to assign an already occupied data interface.	■ End the data transmission and restart it.
Tilting not possible	301	■ The existing machine geometry does not allow the definition of the angle entered in cycle 19 for tilting the working plane.	■ Check the angle in the Tilted Working Plane cycle.
Tilt plane, tool axis is missing	2186	■ Tilting the working plane: Tool axis for the setup clearance in cycle 19 is missing.	■ Before the cycle definition, define a tool call with the tool axis.
Safe inputs %.2s not equal	2938	■ Wiring error X65, X66, (X67). ■ Safety module defective.	■ Inform your service agency. ■ Check the wiring X65, X66, (X67). ■ Exchange the safety module.
Countersinking dia. not found	3185	■ In the technology table for countersinking, the TNC could not find the countersinking diameter defined in the cycle.	■ Check the countersinking diameter and, if required, add it to the corresponding technology table.
S function not performed	2760	■ One or more S functions within a cycle were not performed.	■ Inform your service agency.
Safe function call error	2939	■ Software error	■ Inform your service agency. ■ Check the software version.
Clear hgt. Q260 < Meas. hgt. Q261	2645	■ In a touch probe cycle you defined a clearance height (Q260) below the measuring height (Q261). Risk of collision!	■ Check the entry in the touch probe cycle last defined, and enter a value for Q260 that is greater than Q261.
Clearance height too small	1799	■ The clearance height entered in cycle 8 orcycle 18 was less than the MIN point of the touch probe axis in the Range cycle.	■ Enter a larger value for the clearance height in cycle 8 or cycle 18.
Safe stop (SH2) is active	2695	■ Error in program run.	■ Inform your service agency.
Safe machine parameter error	2935	■ CRC checksum does not fit the entered safe MPs.	■ Inform your service agency. ■ Check the safe machine parameters.
Safe machine parameter error	2704	■ The input value for the safety-oriented machine parameter is not permitted!	■ Enter correct input value. ■ Inform your service agency.
Softw. synchronization err.	2892	■ Internal software error	■ Inform your service agency. ■ Check the software version.
Software error	2883	■ Internal software error	■ Inform your service agency. ■ Check the software version.

Error message	Error number	Cause of error	Corrective action
Special spindle mode not permitted	3002	■ The code number 561320 is non-functional because the servicing mode for the spindle was not enabled by the machine tool manufacturer.	■ Check MP560. ■ Inform your service agency.
Plane wrongly defined	312	■ While defining the Contour Lines cycle (TCH PROBE 7) you programmed a height axis in the starting point.	■ Edit the part program.
Voltage monitoring not active	2698	■ Cyclic voltage monitoring could not be carried out.	■ Inform your service agency.
Memory test	869	■ Memory is tested whenever the control is switched on.	■ Wait until the message disappears, or acknowledge the message with CE.
Mirroring not permitted	452	■ You programmed a mirror image before the TCH PROBE 0 cycle (ISO: G55) or before the digitizing cycles.	■ Delete the Mirror Image cycle.
Rotate spindle by 180 degrees!	248	■ During measurement of the stylus center offset the spindle was not rotated by 180 degrees.	■ Rotate the spindle by 180 degrees.
Spindle must be turning	388	■ You called a fixed cycle without first switching on the spindle.	■ Edit the part program.
Current to spindle not equal to 0	2655	■ The spindle motor is receiving current, although its inverter was switched off!	■ Inform your service agency.
Spindle switching not permitted	3199	■ During a mid-program startup, the active gear range did not match the gear range at the restore position. ■ During a mid-program startup, the active spindle did not match the spindle required at the restore position.	■ Restart the mid-program startup. ■ Before the mid-program startup, activate the gear range and/or the spindle that is needed at the restore position. ■ If the error recurs, contact your service agency.
Safe checksum erroneous	2711	■ Checksum was not yet entered, or it is incorrect.	■ Inform your service agency.
S checksum error	2743	■ Checksum error due to faulty data.	■ Inform your service agency.
Jump to label 0 not permitted	170	■ In a LBL CALL (ISO: L 0,0) block of a part program or in a jump instruction (parametric calculation) you attempted to program a jump to the label 0.	■ Edit the part program.
SRG speed too high	2933	■ Safe reduced rotational velocity (SRG) was exceeded. ■ No standstill in safe controlled stop (SBH) operating mode.	■ Inform your service agency.
Safe speed SRG exceeded %.2s	2879	■ The safe reduced speed SRG was exceeded while the protective door was open.	■ Inform your service agency.
Stack overflow	2886	■ Internal software error	■ Inform your service agency. ■ Check the software version.
Status NE1/NE2 not equal	2929	■ NE2 input incorrectly connected. ■ Software error	■ Inform your service agency. ■ Check the wiring. ■ Check the software version.
Status NR1/NR2 not equal	2928	■ NR2 input incorrectly connected. ■ Software error	■ Inform your service agency. ■ Check the wiring. ■ Check the software version.
0 pitch not permitted	225	■ You have programmed a thread pitch of 0 in the Rigid Tapping cycle or Tapping cycle.	■ Edit the part program.

Error message	Error number	Cause of error	Corrective action
Pitch not found	3186	■ In the technology table for threads, the TNC could not find the pitch defined in the cycle.	■ Check the pitch and, if required, add it to the corresponding technology table.
Switch off external dc voltage!	2253	■ The machine control voltage is still switched on.	■ Switch off the machine control voltage.
Switch on the machine control voltage.	2255	■ The machine control voltage is switched off.	■ Switch on the machine control voltage.
Relay external DC voltage missing	958	■ Error message after power interruption.	■ Switch on the control voltage separately.
Standstill monitoring %.2s	2878	■ The rotational speed limit SBH was exceeded while the protective door was open and the key switch was turned to "automatic".	■ Inform your service agency.
Incorrect line count %.2s	2875	■ Incorrect entry in motor table. ■ Faulty reference signal. ■ Noise pulses. ■ Encoder cable is defective.	■ Inform your service agency. ■ Check the entry in the motor table. ■ Check the motor encoder cable. ■ Exchange the motor encoder cable. ■ Exchange the motor.
Current sensor voltage %.2s	2901	■ Incorrect entry in power module table.	■ Inform your service agency. ■ Check the power module table.
Power interruption			
Search address missing	940	■ In the NC program the original search address no longer exists.	■ Interrupt search.
Update the system data!	1845	■ The system files on your hard disk are no longer up-to-date.	■ Ask your machine tool builder or HEIDENHAIN for a SETUP disk for your present software.
System memory overflow	1810	■ This error occurs when the TNC does not have enough buffer memory for calculations, e.g. for generating complex FK graphics while machining a complex part.	■ Acknowledge the error message by pressing CE and repeat the function.
System clock MCU not equal to CCU	2881	■ Hardware error (quartz generator) ■ Software error	■ Inform your service agency. ■ Exchange the drive control board or processor board. ■ Check the software version.
MCU/CCU system clock mismatch	2818	■ Hardware error	■ Inform your service agency.
TAB: Field not numerical	2738	■ You attempted to use an FN27 or FN28 function to write to or read from a non-numerical field.	■ Write and read operations are possible only with numerical fields.
TAB: Field name too long	2737	■ You entered an excessively long field name in an FN27 or FN28 function.	■ Enter field names with no more than 8 characters.
TAB: Too many field names	2739	■ You entered more than 8 field names in an FN27 or FN28 function.	■ Enter no more than 8 field names.
Table values were changed	3214	■ During a program run, you changed a value in a datum table or point table while in the Programming and Editing operating mode. The TNC was no longer able to include the new value in its geometry look-ahead calculation.	■ Start the program again.
Pocket too large: Scrap axis 1.A.	2514	■ Probing cycle for workpiece measurement: Pocket length in 1st axis too large for tolerance.	■ Check the workpiece, and if necessary the measuring log.

Error message	Error number	Cause of error	Corrective action
Pocket too large: Scrap axis 2.A.	2515	■ Probing cycle for workpiece measurement: Pocket length in 2nd axis too large for tolerance.	■ Check the workpiece, and if necessary the measuring log.
Pocket too small	2041	■ The side lengths defined in the Pocket Milling cycle are too small.	■ Use a smaller tool.
Pocket too small: Rework axis 1.A.	2512	■ Probing cycle for workpiece measurement: Pocket length in 1st axis too small for tolerance.	■ Check the workpiece, and if necessary the measuring log.
Pocket too small: Rework axis 2.A.	2513	■ Probing cycle for workpiece measurement: Pocket length in 2nd axis too small for tolerance.	■ Check the workpiece, and if necessary the measuring log.
Key non-functional	938	■ In this context the key has no function.	■ xxxx
Stylus deflection exceeds max.	454	■ Digitizing with measuring touch probe: Maximum stylus deflection exceeded.	■ Reduce the digitizing feed rate. ■ If necessary, increase the maximum stylus deflection (machine parameter 6330).
Stylus already in contact	52	■ The stylus is already deflected at the start of a probing movement.	■ Get the touch probe clear and repeat the probe. ■ If the error frequently recurs, inspect the probe for damage. ■ If necessary, Inform your service agency.
Calibrate touch probe	1172	■ You have attempted to automatically measure a tool, although the table probe is not yet calibrated.	■ Calibrate table probe with cycle 30 TCH PROBE.
Touch probe not ready	54	■ Touch probe is not connected. ■ Battery in touch probe is dead. ■ No connection between infrared probe system and receiver unit.	■ Connect touch probe. ■ Replace battery. ■ Clean receiver unit.
Touch probe not ready %.3s	1150	■ The touch probe is not ready	■ Check connecting cable.
Exchange touch probe battery	53	■ Battery in touch probe is dead.	■ Replace battery.
TCHPROBE 426: Length exceeds max.	2522	■ Probe cycle 426: The measured length exceeds the max. permissible value.	■ Check the workpiece, and if necessary the measuring log.
TCHPROBE 426: Length below min.	2523	■ Probe cycle 426: The measured length is below the min. permissible value.	■ Check the workpiece, and if necessary the measuring log.
TCHPROBE 430: Diameter too large	2524	■ Probe cycle 430: The measured bolt-hole-circle diameter exceeds the maximum permissible value.	■ Check the workpiece, and if necessary the measuring log.
TCHPROBE 430: Diameter too small	2525	■ Probe cycle 430: The measured bolt-hole-circle diameter is below the minimum permissible value.	■ Check the workpiece, and if necessary the measuring log.
Grating per. motor enc. %.2s	2898	■ Measured grating period does not agree with entry in the motor table.	■ Inform your service agency. ■ Check the motor table (line count). ■ Check the motor.
Temperature monitoring not active	2699	■ Cyclic temperature monitoring could not be carried out.	■ Inform your service agency.
Test of cutout channels inactive	2700	■ The MCU (Main Computer Unit) failed to test the cutoff channels.	■ Inform your service agency.
Text not found	888	■ The ASCII editor could not find the desired text in a file.	■ Search for another text (note upper and lower case).

Error message	Error number	Cause of error	Corrective action
Tmax of motor table %.2s	2903	■ Incorrect temperature entry in motor table.	■ Inform your service agency. ■ Check the motor table.
TNC program block not permitted until contour is resolved	507	■ FK programming: Conventional blocks may follow an FK block only if the FK block led to a complete resolution of the contour. Exceptions: ■ RND block ■ CHF block ■ L block containing only motion in the tool axis or auxiliary axis.	■ Resolve the FK contour completely.
TNC operating temp. exceeded	204	■ The temperature sensor in the iTNC has detected an excessively high temperature inside the control housing.	■ Check for adequate heat transfer in the electrical cabinet.
Tolerance exceeded	3193	■ Cycle 440: The maximum permissible tolerance for thermal expansion was exceeded in one axis.	■ Increase permissible tolerance: Change LTOL/RTOL of calibration tool. ■ Allow machine to cool down.
Tolerance value too great	1097	■ Geometry error message: The tolerance value entered with M124 is greater than half the tolerance value in M112.	■ Reduce tolerance value in M124.
No TOOL CALL permitted with M128	2211	■ A TOOL CALL is not permitted with M128 active.	■ Enter M129 to cancel M128 and then run the TOOL CALL.
TOOL.T: LCUTS or ANGLE missing!	1682	Cycle 22 needs informaion on the tooth length and the plunge angle of the active tool. ■ The data for LCUTS and ANGLE are missing in the tool table. ■ The tool table is not active.	■ In the tool table, enter LCUTS and ANGLE for the current tool. ■ Activate the tool table via machine parameter 7260 or 7224.
TOOL.T: Enter number of teeth	1193	■ Automatic tool measurement: Number of teeth not entered into tool table.	■ Transfer number of teeth (CUT.) into TOOL.T.
TOOL.T: Too many tools	1075	■ More than 99 tools are defined in the tool table.	■ Delete some lines out of the tool table so that no more than 99 tools are stored.
TS: Inadequate consistency	2273	■ During multiple measurement with the automatic probe cycle the variance of the individual measured values is greater than the value defined in machine parameter MP6171.	■ Check whether the probe point and the stylus are clean. ■ Expand the tolerance in machine parameter MP6171.
Calibrate TT in tilted plane	2824	■ You attempted to run a cycle for tool measurement while the tilted-plane function was active, although the touch probe was not calibrated in the tilted working plane.	■ Run the calibration cycle 30 while the working plane is tilted.
TT not parallel to tool axis	2826	■ You attempted to run a cycle for tool measurement although the touch probe is not parallel to the tool axis.	■ Position the axes so that the touch probe axis and the tool axis are parallel.
Calibrate TT in non-tilted plane	2825	■ You attempted to run a cycle for tool measurement, although the touch probe was last calibrated in a tilted working plane.	■ Run the calibration cycle 30 when the working plane is not tilted.

Error message	Error number	Cause of error	Corrective action
TT: Pre-position the axes	2868	■ You tried to start tool measurement although the REF coordinates of one or more rotary axes (or parallel axes) do not agree with the coordinates defined in machine parameters MP6586.x.	■ In the Manual operating mode, position the rotary or parallel axes so that the REF coordinates of the axes agree with the machine parameter values. Then restart the measuring program.
Data transfer erroneous	189	■ E: During data transfer with BCC, the <NAK> signal was received 15 times in succession. ■ A to H w/o E: error code of the receiver module with one of the following causes: ■ The baud rate setting of the TNC and peripheral device do not match. ■ Parity bit wrong. ■ Erroneous data frame (e.g.: no stop bit). ■ The receiver module of the interface is faulty. ■ K: During transmission of an error to the TNC, the <1> character was not transmitted after the <ESC> character. ■ L: After the error sequence <ESC<1>< an incorrect error number was received (error numbers 0 to 7 are permitted). ■ M: During data transfer with BCC, the <NAK< signal was transmitted 15 times in succession. ■ N: An expected acknowledgment >ACK< or <NAK< was not transmitted by a certain time.	■ Data transfer channel must be checked.
Inverter %.2s ready	2942	■ RDY status of the inverter is LOW instead of HIGH.	■ Inform your service agency. ■ Check the inverter. ■ Check the cabling of the cutout channels.
Inverter %.2s not ready	2943	■ RDY status of the inverter is LOW instead of HIGH.	■ Inform your service agency. ■ Check the inverter. ■ Check the cabling of the cutout channels.
Inverter for axes RDY=0	2653	■ The power supply of an axis could not be switched to ready condition.	■ Check the wiring and Inform your service agency.
Inverter for axes RDY=1	2656	■ The power supply for a spindle or for an axis is ready for operation although it ought to be switched off.	■ Inform your service agency.
Inverter is not ready for operation	2642	■ After a "safe stop" the inverter did not return to the ready state.	■ Inform your service agency.
Inverter still in operation	2289	■ The inverter is still ready for operation, although it is supposed to be switched off.	■ Inform your service agency.
Inverter for spindle RDY=0	2652	■ The power supply of the spindle could not be switched to ready condition.	■ Check the wiring and Inform your service agency.
Inverter for spindle RDY=1	2654	■ The power supply for a spindle is ready for operation although it ought to be switched off.	■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
Unknown computer compnt. %.2s	2917	■ Hardware defective. ■ Incorrect software version.	■ Inform your service agency. ■ Check the software version. ■ Exchange drive control board.
Unknown G code	495	■ You have programmed an unknown G code.	■ Check the highlighted block. Permissible G functions: See Overview in the User's Manual.
Undefined interrupt	2882	■ Software error. ■ Hardware error: Disturbance results in internal interrupt.	■ Switch off the machine. ■ Switch on the machine. ■ Inform your service agency. ■ Check the software version. ■ Check the grounding.
Program start undefined	413	■ Type of interpolation undefined.	■ Restart NC program.
Program start undefined	414	■ Type of dimensions undefined.	■ Before the first positioning block in the ISO program, use G90 or G91 to define whether you are entering absolute or incremental coordinates.
Program start undefined	415	■ A direction of rotation is required to start a circular movement.	■ Define the direction of rotation in the first circle block.
Program start undefined	416	■ The TNC cannot exactly calculate the geometry from the present position (e.g., the programmed coordinates of the first positioning block are the same as the compensated actual position).	■ Restart NC program. ■ Use mid-program startup to return to the point of interruption.
Program start undefined	417	■ Error after an interruption in program run (with change of operating mode or PLC positioning): A pole cannot be taken over if a CT block was programmed before the interruption.	■ Restart NC program.
Program start undefined	418	■ Error after an interruption in program run (with change of operating mode or PLC positioning): After an interruption you attempted to start the program with a cycle call or with the TOUCH PROBE measuring cycle.	■ Press GOTO select a cycle definition block.
Program start undefined	419	■ The first block in the part program is a block with automatic pole assumption (CC without coordinates, ISO: G29). ■ After a program interruption you pressed GOTO to select a block with automatic pole assumption.	■ Automatic pole assumption must not be the first coordinate block. ■ To return to the program, use a positioning block with all coordinates.
Program start undefined	420	■ The first positioning block in the part program is a CT block (ISO: G6, G16). ■ After a program interruption you pressed GOTO to select a CT block (ISO: G6, G16).	■ Program at least two positioning blocks before the CT block. ■ After a program interruption, restart at least two positioning blocks before the CT block.
Program start undefined	421	■ The first positioning block in the part program is a RND block (ISO: G25). ■ After a program interruption you pressed GOTO to select a RND block (ISO: G25).	■ Program at least two positioning blocks before the RND block. ■ After a program interruption, restart at least two positioning blocks before the RND block.

Error message	Error number	Cause of error	Corrective action
Program start undefined	422	■ The first positioning block in the part program is a CHF block (ISO: G24). ■ After a program interruption you pressed GOTO to select a CHF block (ISO: G24).	■ Program at least two positioning blocks before the CHF block. ■ After a program interruption, restart at least two positioning blocks before the CHF block.
Program start undefined	423	■ After a program interruption you attempted to select a departing block with GOTO.	■ After a program interruption, do not resume the program at a departing block.
Program start undefined	424	■ At the beginning of the program you activated a tilted working plane and M114 at the same time.	■ M114 cannot be run while the working plane is tilted.
Program start undefined	426	■ When resuming a part program you selected a CT block (ISO: G6, G16) although a PLC positioning or a PLC datum shift must be executed.	■ Resume the program several blocks before the CT block.
Err. in rated U of motor %.2s	2926	■ Motor rated voltage outside of permitted input range.	■ Inform your service agency. ■ Check entry in motor table.
Subprogram does not exist	265	■ You defined a subprogram number in Cycle 14 Contour Geometry (ISO: G37) that does not exist in your program.	■ Correct the subprogram number in the cycle. ■ Program a subprogram with the correct number.
Subprogram does not exist	266	■ You called a user cycle or a subprogram in the definition of a contour, a contour pocket or a cycle contour train. However, the corresponding file could not be opened for reading.	■ Load the file again.
Incomplete cycle was deleted	2769	■ Informational message that the TNC has erased an incomplete cycle.	■ xxxx
Illegal file name	1807	■ Syntax error during file-name input.	■ Use no more than 16 characters for file names.
Illegal file type	1867	■ The function cannot be used for this type of file.	■ Select another file type.
Uz %.2s error	2910	■ Incorrect entry in MP2190 (dc-link voltage Uz).	■ Inform your service agency. ■ Check entry in MP2190.
Traverse definition not defined	2504	■ In a probing cycle you entered 0 for the traverse direction Q267.	■ For Q267, enter either +1 (for positive traverse direction) or -1 (for negative traverse direction).
Datum shift not permitted	453	■ Digitizing with contour lines: Datum shift is active.	■ Delete the datum shift.
Directory not empty	1848	■ You attempted to erase a directory that still contains files.	■ First delete all files and subdirectories stored in the directory that you wish to delete. ■ Use the DELETE ALL function to delete directories at once together with their contents.
Move to target before starting	2666	■ You pressed the NC start button before positioning manually (in distance-to-go) to the target.	■ Position to the zero display position, then press the NC start key again.
Use RESTORE POS AT N	2500	■ You attempted a mid-program startup by pressing GOTO block number, although it is defined in machine parameter 7680 that a spline be inserted as connecting element at radius-compensated outside corners.	■ Use the RESTORE POS. AT N function to resume the program.
Feed rate is missing	161	■ You did not program a feed rate.	■ Edit part program, FMAX only effective for block programming.

Error message	Error number	Cause of error	Corrective action
Reciprocation feed rate missing	1856	■ In the Rough-Out cycle, the reciprocation feed rate has not yet been defined.	■ Define the feed rate.
Feed rate too fast for graphics	866	■ The feed rate is too high for the program-run graphics to display tool movement.	■ Select another screen layout.
Wrong sign programmed	434	■ The programmed dwell time in the Dwell Time cycle, Peck Drilling cycle, or Tapping cycle is negative (through Q parameter).	■ Edit the cycle parameter.
Material table not found	2226	■ The workpiece material table in OEM.SYS was not found.	■ Check the entry in the OEM.SYS file and, if necessary, regenerate the MAT.TAB file.
Tool locked	1789	■ The tool was locked.(e.g. after breakage).	■ Check the tool and, if necessary, change it or unlock it in the tool table.
Tool not defined	2345	■ You have called a tool that is not defined in the tool table.	■ Add the missing tool to the tool table. ■ Use another tool.
Tool axis is missing	391	■ You programmed a positioning block with tool radius compensation without first calling a tool.	■ Edit the part program.
Tool axis is missing	392	■ You programmed a single-axis positioning block with tool radius compensation without first calling a tool.	■ Edit the part program.
Tool axis is missing	393	■ You called a fixed cycle without first activating a tool.	■ Edit the part program.
Tool axis is missing	394	■ You programmed cycle 10 (Rotation,ISO: G73) without first calling a tool. The tool call defines which working plane the TNC rotates.	■ Edit the part program.
Tool axis is missing	395	■ You attempted to approach a position using the positioning logic, but did not first define the working plain through a tool call.	■ Edit the part program.
Tool axis is missing	396	■ You programmed the M function for reducing the feed rate in the tool axis, but did not call a tool first.	■ Edit the part program.
Tool axis is missing	397	■ You called the TCH PROBE 0 cycle (ISO: G55) without first calling a tool.	■ Edit the part program.
Mirror image on tool axis	389	■ You ran a TOOL CALL block (ISO: T..) in which a mirrored axis is given as tool axis.	■ Cancel the mirror image before a tool change. ■ If necessarya, change the tool axis in the TOOL CALL block.
Mirror image on tool axis	390	■ In cycle 8 (Mirror Image, ISO: G28) you defined the tool axis as a mirrored axis.	■ Edit the part program.

Error message	Error number	Cause of error	Corrective action
Wrong tool axis in BLK FORM	864	■ The tool axis entered in a tool call does not match the tool axis entered in the BLK FORM block (ISO: G30/G31). ■ Programming graphics: In an APPR or DEP block you have programmed coordinates that do not lie in the drawing plane. The drawing plane is perpendicular to the tool axis, which is indicated in the BLK FORM. If no BLK FORM has been programmed, the drawing plane lies in the X/Y.	■ Change the tool axis for tool call, or in the blank form definition. ■ Check the APPR or DEP block.
Tool call not permitted	298	■ You programmed the M function for automatic tool call in a block with radius compensation.	■ Cancel the radius compensation before an automatic tool change.
Tool call not permitted	300	■ You attempted to execute an automatic tool call while a part program block with radius compensation was running.	■ Edit the part program.
Tool broken	1914	■ Automatic tool measurement: The breakage tolerance (LBREAK or RBREAK) from the tool table was exceeded.	■ Check the tool and, if necessary, replace it.
Tool breakage tolerance exceeded	2635	■ During workpiece inspection using a measuring cycle, the tool breakage tolerance RBREAK given in the tool table was exceeded.	■ Check whether the tool is damaged.
Tool number already assigned	169	■ You attempted to give a tool more than one definition.	■ Edit the part program.
Tool number missing	401	■ You programmed a tool axis in the TOOL CALL block (ISO: T..), but no tool number.	■ Edit the part program.
Tool radius 0 not permitted	369	■ You called the Slot Milling, Pocket Milling, Circular Pocket Milling, or Contour Pocket cycle although the active tool has a radius of 0.	■ Edit the part program.
Tool radius cannot be shown	865	■ The radius of the active tool cannot be displayed.	■ Verify without graphic simulation.
Tool radius too large	402	■ Contour milling: During inside compensation, the radius of an arc block is smaller than the cutter radius. ■ Thread milling: The core diameter of the thread is smaller than the tool diameter.	■ Use a smaller tool.
Tool radius too large	403	■ During inside compensation, the radius of a rounding block is smaller than the cutter radius.	■ Edit the part program.
Tool radius too large	404	■ The compensated path of the straight line or of the circle would take a direction opposite to that of the non-compensated path.	■ Edit the part program.
Tool radius too large	405	■ On inside corners the resulting intermediate angle would be smaller than 0.028 degrees.	■ Edit the part program.
Tool radius too large	406	■ Slot cycle: The slot width is less than the tool diameter	■ Edit the part program.
Tool radius too large	407	■ Rectangular pocket cycle: The pocket width is less than or equal to the tool diameter.	■ Edit the part program.

Error message	Error number	Cause of error	Corrective action
Tool radius too large	408	■ Rectangular pocket cycle: The corner rounding radius is smaller than the cutter radius.	■ Edit the part program.
Tool radius too large	409	■ Circular pocket cycle: The pocket radius is smaller than the cutter radius.	■ Edit the part program.
Tool radius too large	410	■ In cycle 24 (Side Finishing, ISO: G123) the sum of the finishing cutter radius and the finishing allowance is greater than or equal to the sum of the roughing cutter radius and the roughing allowance.	■ Reduce the finishing allowance in cycle 23. ■ Use a smaller finishing tool.
Tool radius too large	411	■ During cycle 21 (Pilot Drilling for Contour-Parallel Rough-Out, ISO: G121), the drilling tool radius is so large that it would gouge the workpiece.	■ Use a smaller drilling tool.
Tool radius too large	412	■ The tip edge radius of the toroidal cutter is greater than its shaft radius.	■ Enter in the tool table a value for R2 that is less than or equal to R.
Tool radius too large	1857	■ Rough-out cycle: The radius of the fine-roughing tool is too large.	■ Use a smaller tool.
Tool radius too small	368	■ In cycle 3 (Slot Milling) you defined a width that is greater than four times the tool radius.	■ Input limits for slot width: Greater than tool diameter, smaller than four times the tool radius. ■ If the slot width is greater than four times the tool radius, use the pocket milling cycle.
Tool holder defective!	2288	■ The tool holder does not open or close.	■ Check the tool holder. If necessary, Inform your service agency.
Max. tool age expired	163	■ The service life of the called tool has expired and you have not defined a replacement tool.	■ Check the tool and, if necessary, exchange it or define a replacement tool.
Tool table locked	61	■ The tool file (TOOL.T) cannot be edited while the TNC is executing a tool call. Pressing the EDIT ON/OFF soft key provokes this error message.	■ Wait until the TOOL CALL has been executed, the press the EDIT ON/OFF soft key again.
Tool file?	166	■ There are several tool tables in the NC memory and no table is activated in the Test Run operating mode.	■ Activate the tool table in the Test Run operating mode (status "S").
Tool type not found	3182	■ Automatic tool search: The TNC could not find an appropriate tool in the tool table.	■ Check the tool table.
Perform a tool change!	3006	■ You have tried to perform a probing function without an active touch probe. Machine parameter MP7411, bit 2 is set so that the calibration data is always taken from the tool table TOOL.T.	■ Call the touch probe with TOOL CALL (ISO: T) and the touch probe axis. Then try the touch probe function again.
Tool change is in process	2649	■ You attempted to save changes in the pocket table while a tool was being exchanged.	■ Wait until the tool change is completed, then try again.
Resumption with M120 not allowed	1151	■ Re-entry with GOTO during active M120 not permitted.	■ Re-entry possible only via mid-program startup.

Error message	Error number	Cause of error	Corrective action
Entered angle not permitted	1192	■ The solid angle programmed in Cycle 19 Working Plane (DIN/ISO: G80) cannot be realized with the current attachment (e.g. universal head where only one hemisphere is accessible).	■ Edit the solid angle entered.
Angle error motor enc. %.2s	2919	■ Motor encoder defective. ■ Motor encoder cable is defective. ■ Drive control board defective.	■ Inform your service agency. ■ Check the motor encoder and leads. ■ Exchange drive control board.
Angle cannot be calculated	2708	■ In the tilted working plane function you have spatial-angle input mode active, although the TNC does not support this mode for your machine configuration.	■ Set bit 1 in machine parameter MP7500 = 0.
You entered an angle range greater than 360°.	2051	■ Circular pattern cycle: You entered an angle range greater than 360°.	■ Correct the starting or stopping angle in the cycle.
Angle reference missing	435	In an LP/CP block (ISO: G10, G11, G12, G13) no polar angle or incremental polar angle is defined, i.e.: ■ The distance between the last programmed position and the pole is less than or equal to 0.1 µm. ■ No rotation is programmed between pole assumption and an LP/CP block.	■ Program the absolute polar angle. ■ Check the position of the pole. ■ If necessary, reset the rotation.
Angle reference missing	436	■ You programmed a CT block (ISO: G6, G16; tool compensation active) that only activates the tool axis.	■ In the CT block, program both coordinates of the circle plane.
Angle reference missing	438	■ Contour Pocket or Contour Train cycle: The TNC cannot determine the starting point of the contour.	■ Program the starting point in the contour subprogram with absolute coordinates.
Angle reference missing	439	■ Contour Pocket or Contour Train cycle: The first or second block in the contour subprogram is a CT block (ISO: G6, G16). The direction of the CT block is therefore undetermined.	■ Program at least two positioning blocks before the CT block.
TOOL Def. w/o length or radius	275	■ The definition of a tool (TOOL DEF, ISO: G99) has no value for tool length or tool radius.	■ Complete the TOOL DEF block (G99 block).
Tool definition is missing	398	■ In a TOOL CALL (ISO: T..) you entered a tool number for which there is no definition (TOOL DEF, ISO: G99) in the program.	■ Edit the part program.
Tool definition is missing	399	■ In a part program run in blockwise transfer (DNC mode) a TOOL CALL block (ISO: T..) was programmed with a number other than that programmed in the preceding TOOL DEF (ISO: G99) block.	■ Edit the part program.
Tool definition is missing	400	■ You programmed a TOOL CALL (ISO: T..) with a tool number that does not exist in the central tool file (TOOL.T).	■ Edit the part program.
Tool definition not permitted	274	■ You programmed a tool definition (TOOL DEF, ISO: G99), although the central tool file is active.	■ Delete the TOOL DEF block (G99 block). ■ Deactivate the tool table (machine parameter 7260).

Error message	Error number	Cause of error	Corrective action
Tool number 0 not permitted	941	■ A tool definition with the number "0" is not permitted.	■ Edit the part program.
Tool number defined twice	1099	■ The number used in the tool definition in the program is already defined in the tool file.	■ Use numbers greater than 99 for the tool definition in the program.
Tool type table not found	2319	■ The tool type table entered in OEM.SYS was not found.	■ Check entry in the OEM.SYS file.
WMAT-TMAT combination missing	2229	■ In the tool table you refer to a cutting-data table in which the workpiece-material/tool-material combination that you selected does not exist.	■ Select another cutting data table in the tool table. ■ Add the current workpiece/cutting material combination to the cutting data table that you selected.
Z1 track %.2s error	2915	■ Contamination of the motor encoder (Z1 track). ■ Motor encoder cable is defective. ■ Motor control board defective.	■ Inform your service agency. ■ Exchange the motor. ■ Check the motor encoder cable. ■ Exchange the motor drive control board.
Stud diameter too large	2511	■ Probing cycle for workpiece measurement: Tolerance for stud diameter exceeded.	■ Check the workpiece, and if necessary the measuring log.
Stud too large: Rework axis 1.A.	2518	■ Probing cycle for workpiece measurement: Stud length in 1st axis too large for tolerance.	■ Check the workpiece, and if necessary the measuring log.
Stud too large: Rework axis 2.A.	2519	■ Probing cycle for workpiece measurement: Stud length in 2nd axis too large for tolerance.	■ Check the workpiece, and if necessary the measuring log.
Stud diameter too small	2510	■ Probing cycle for workpiece measurement: Stud diameter too small for tolerance.	■ Check the workpiece, and if necessary the measuring log.
Stud too small: Scrap axis 1.A.	2516	■ Probing cycle for workpiece measurement: Stud length in 1st axis too small for tolerance.	■ Check the workpiece, and if necessary the measuring log.
Stud too small: Scrap axis 2.A.	2517	■ Probing cycle for workpiece measurement: Stud length in 2nd axis too small for tolerance.	■ Check the workpiece, and if necessary the measuring log.
Line is write-protected	2747	■ You attempted to edit or erase a write-protected line.	■ Write protection can be canceled only with a certain code number. If you wish to cancel write protection, contact your machine tool builder.
Incorrect line spacing	1796	■ The point spacing in a digitizing cycle was programmed by Q parameter as a value greater than 6.5535 mm. ■ The line spacing in a digitizing cyle was programmed by Q parameter as a negative value. ■ Digitizing with measuring touch probe: The minimum line spacing is greater than the line spacing, or it was entered as zero.	■ Enter a probe point interval that is positive and no larger than 6.5535 mm. ■ Enter a minimum line spacing greater than 0 and less than the line spacing.
Time limit exceeded	446	■ Digitizing with contour lines: Touch probe does not reach the starting point within the time set in the cycle.	■ It could be that the contour line cannot be closed. ■ Increase the time. ■ Increase the tolerance for the target window (machine parameter MP6390).
Controller software timeout	2890	■ Internal software or hardware error.	■ Inform your service agency. ■ Check software version. ■ Exchange drive control board.

Error message	Error number	Cause of error	Corrective action
Zn track %.2s error	2872	■ Contamination of the motor encoder (Zn track). ■ Motor encoder cable is defective. ■ Motor control board defective.	■ Inform your service agency. ■ Exchange the motor. ■ Check the motor encoder cable. ■ Exchange the motor drive control board.
Zn track %.2s error	2914	■ Contamination of the motor encoder (Zn track) ■ Motor encoder cable is defective ■ Motor control board defective	■ Inform your service agency. ■ Exchange the motor. ■ Check the motor encoder cable. ■ Exchange the motor drive control board.
Excessive subprogramming	428	In a Contour Pocket cycle or a Contour Train cycle you called more than 3 programs (PGM CALL, ISO: %..). A program call can also be: ■ Cycle 9 (PGM CALL, ISO: G39) ■ Calling an OEM cycle	■ Edit the part program.
Excessive subprogramming	429	■ You nested more than 8 subprogram calls (CALL LBL xx, ISO: Lx,0).	■ Check whether all your subprograms are concluded with LBL 0 (ISO:G98 L0).
Excessive subprogramming	430	■ You nested more than 10 program section repeats.	■ Edit the part program.
Excessive subprogramming	431	You programmed more than 3 program calls (PGM CALL, ISO: %.). A program call can also be: ■ Cycle 9 (PGM CALL, ISO: G39) ■ Calling an OEM cycle	■ Edit the part program.
Excessive subprogramming	432	■ Internal stack error in an arithmetical expression (FN20, ISO: D20), e.g. due to excessive nesting.	■ Check the condition in the FN20 block.
Too many *.CDT files	2321	■ There are more than 128 cutting data tables (*.CDT) in the specified directory.	■ Delete cutting data tables that are no longer required.
Too many compensation functions	501	■ Error in compensation value conversion: Permissible number of compensation functions exceeded.	■ Decrease the number of compensation value functions.
Too many compensation points	500	■ Error in compensation value conversion: Permissible number of compensation points exceeded.	■ Reduce size of compensation table.
Too many points	1086	■ Automatic establishment of points for the digitizing range in the Positioning with Manual Data Input operating mode: Number of stored points (max. 893) exceeded.	■ Re-record digitizing range after increasing the point spacing.
Too many columns	2733	■ While editing the structure of a configurable table, you attempted to enter more than the permissible 30 columns.	■ Erase the superfluous columns.
Too many subcontours	455	■ Contour pocket cycle: Internal calculations resulted in too many subcontours.	■ Use a smaller tool.
Too many subcontours	456	■ Contour intersects itself to produce too many subcontours.	■ Use a smaller tool.
Too many subcontours	457	■ The union of cycles results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	458	■ Calculation of the tool path results in more than 12 subcontours.	■ Use a smaller tool. ■ Decrease the number of programmed subcontours.

Error message	Error number	Cause of error	Corrective action
Too many subcontours	459	■ Calculation of the equidistant results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	460	■ Calculation of the equidistant results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	461	■ A contour subprogram contains more than 128 geometrical elements.	■ Split the subprogram.
Too many subcontours	462	■ A contour subprogram contains more than 128 geometrical elements.	■ Split the subprogram.
Too many subcontours	463	■ The union of cycles results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	464	■ The union of cycles results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	465	■ Calculation of the equidistant results in too many subcontours.	■ Edit the part program or set Q8 = 0.
Too many subcontours	466	■ Calculation of the equidistant results in too many subcontours.	■ Edit the part program or set Q8 = 0.
Too many subcontours	467	■ Calculation of the equidistant results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	468	■ Contour intersects itself to produce too many subcontours.	■ Use a smaller tool.
Too many subcontours	469	■ The union of cycles results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	470	■ Calculation of the equidistant results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	471	■ The contour to be machined in contour-parallel roughing has too many subcontours.	■ Edit the part program.
Too many subcontours	472	■ Calculation of the equidistant results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	473	■ Calculation of the equidistant results in too many subcontours.	■ Use a smaller tool.
Too many subcontours	474	■ While defining the range for a measuring touch probe you entered too many subcontours.	■ Redefine the range.
Access denied	1745	■ You attempted to open a file during a write access — e.g. through the data interface — or vice versa. ■ You attempted to open a locked file. ■ You attempted to erase or rename a protected file. ■ You attempted to erase the main directory (TNC:\)	■ Select the file again at a later time. ■ Cancel the file protection.
0 plunging depth not permitted	263	■ You programmed the plunging depth 0 in the definition of the called fixed cycle.	■ Enter a plunging depth other than 0.
Permissive button was pressed	2768	■ The permissive button of the handwheel was pressed. An incorrect handwheel was selected by MP7640.	■ Check the permissive buttons. ■ Correct the machine parameters. ■ Inform your service agency.
Two TOOL DEF %-3u with PGM CALL	60	■ The NC block TOOL DEF (ISO: G99), is used more than once to define a tool using the same tool number in programs that are nested to each other.	■ Delete the TOOL DEF block (G99 block) in one of the programs, or use another tool number.

Error message	Error number	Cause of error	Corrective action
2nd chamfer not permitted	284	■ In the definition of a contour, a contour pocket or a contour train, you programmed two chamfers (CHF, ISO: G24) in immediate succession.	■ Edit the part program.
2nd rounding arc not permitted	281	■ In the definition of a contour, a contour pocket or a contour train, you programmed two rounding arcs (RND, ISO: G25) in succession.	■ Edit the part program.
2nd rounding arc not permitted	281	■ In the definition of a contour, a contour pocket or a contour train, you programmed two rounding arcs (RND, ISO: G25) in succession.	■ Edit the part program.
DC-link voltage too low	2885	■ Line power interrupted. ■ Inverter defective.	■ Check your line power supply. ■ Inform your service agency. ■ Check the inverter.
Intermediate memory empty	2664	■ You attempted to insert blocks from intermediate memory, although you have not copied anything since power has been on.	■ Before you can insert anything from intermediate memory you must first fill it using the copy function.
Intermediate memory empty	2770	■ You attempted to insert a block from an empty intermediate memory.	Before trying to insert a block from intermediate memory, put the block into memory by: ■ Using the DEL key to delete the block to be copied, or ■ Editing the block to be copied.
Contradictory signs in cycle	433	■ The algebraic signs of the setup clearance, total hole depth and plunging depth do not match.	■ Enter identical signs.
Cycle 14 (G37) not permitted	299	■ During compilation of an FK program a part program "ERROR" block was read-in. ■ You defined a Cycle 14 in a contour subprogram (ISO: G37).	■ Delete ERROR block. ■ Delete Cycle 14 (G37) from the contour subprogram.
Cycle 14: LBL not found	365	■ In the Contour Geometry cycle you have listed a subprogram number that does not exist.	■ Correct the subprogram number in Cycle 14. ■ Insert the subprogram that you have defined in Cycle 14.
Cycle 27(G127): depth > radius	177	■ In the execution of a Cylindrical Surface cycle the entered milling depth is greater or equal to the radius of the cylindrical surface. ■ The ratio of the unit radius to the machining radius is too large.	■ Enter a smaller milling depth in the Cylinder Surface cycle. ■ Enter a smaller cylinder radius in the Cylinder Surface cycle.
Cycle 4(G75/G76): Incorrect axis	1850	■ The main axis and its associated parallel axis is not permitted in the rectangular pocket cycle.	■ Correct the axes in the Pocket Milling cycle. Possible combinations: X/Y, X/V, U/Y, U/V .....
Delete entire cycle: DEL.	1106	■ Warning before deleting an entire HEIDENHAIN cycle.	■ For complete deletion of the cycle, press DEL. To interrupt the delete sequence, press END.
Cylinder surface not tiltable	306	■ You called the Cylinder Surface cycle while the working plane was tilted.	■ Delete the cyclindrical interpolation cycle from the part program.

2.4 Log

General

The log serves as a troubleshooting aid. There are 4 MB of memory available for this purpose.

All entries in the log are marked with the current date and time.

Note

The following error messages are not entered in the log:

```
*** POWER FAIL ***
File system error x
```

Overview of log entries

Entry		Description
RESET		Booting the control
BERR		Blinking error message
BREG		Register contents with a blinking error message
ERR		Error message P: PLC error message with the line number in the PLC error text file N: NC error message with number
KEY		Key strokes
STIB[a]	ON	Control-in-operation on
	OFF	Control-in-operation off
	BLINK	Control-in-operation symbol blinking
INFO	MAIN START	Control model and NC software
INFO	MAIN FILE DEL	Faulty files on the hard disk, to be erased during booting
INFO	MAIN HDD	Hard disk designation
INFO	MAIN CYCLES	Test results for fixed cycles and touch probe cycles

a. STIB = control-in-operation symbol in the screen display

Entry			Description
INFO	MAIN PGM		Started NC program or NC macro
INFO	MAIN LINE		Line number of the running NC program or NC macro
INFO	MAIN PATH	PLCEDIT	File for PLC Editor
		NCEDIT	File for NC Editor
		RUNPGM	Main program for program run
		RUNPALET	Pallet table for program run
		RUNDATUM	Datum table for program run
		RUNTOOL	Tool table for program run
		RUNTCH	Pocket table for program run
		SIMPGM	Main program for program test
		SIMDATUM	Datum table for program test
		SIMTOOL	Tool table for program test
		RUNBRKPGM	Stopping point for block scan
		SIMBRKPGM	Stopping point for program test
		RUNPRINT	Path for FN15: PRINT for program run
		SIMPRINT	Path for FN15: PRINT for program test
		MDIPGM	File for positioning with manual data input
		NCFMASK	Mask for file management in the NC area
		PLCFMASK	Mask for file management in the PLC area
		EASYDIR	Paths for standard file management
		TCHPATH	Datum table for manual measurement
		SIMTAB	Freely definable table in program test
		RUNTAB	Freely definable table in program run
		KINTAB	Active kinematic table
		PGMEND	Information about the program end in program run Byte 0/1 00 01 Emergency stop 00 02 Positioning error 00 03 Programmed stop 00 04 Block end for single block 00 05 Geometry error 00 06 END PGM, M02 00 07 Internal stop key 00 08 Data transfer error (V.24/V.11) Byte 2/3 xx xx Internal error class Byte 4...7 xx xx xx xx Internal error code
INFO WARNING ERROR	PLC <log identifier>		Entries through PLC modules 9275 and 9276
INFO	REMO A_LG		Log in with LSV2 protocol
	REMO A_LO		Log out with LSV2 protocol
	REMO C_LK		LSV2 protocol: Locking and releasing the keyboard; the key codes between locking and releasing are sent via LSV2 protocol.

Example of a log entry

The following example shows possible entries in the log:

```
INFO:       MAIN   START                      21.11.2001 07:30:51
            iTNC 530
INFO:       MAIN   START                      21.11.2001 07:30:51
            NC SOFTWARE = 340420 01
INFO:       MAIN CYCLES                       21.11.2001 07:30:55
            CYCLE data are up to date
INFO:       MAIN CYCLES                       21.11.2001 07:30:55
            TCHPROBE data are up to date
ERR:        N-1 power interruption            21.11.2001 07:31:02
Key:        0x01AE -> CE                      21.11.2001 07:31:15
Error:      P88 88 MPs being read...          21.11.2001 07:31:19
Key:        0x01F0 -> NC Start                21.11.2001 07:31:22
Key:        0x01F0 -> NC Start                21.11.2001 07:31:23
Key:        0x01F0 -> NC Start                21.11.2001 07:31:24
Key:        0x01F0 -> NC Start                21.11.2001 07:31:24
Key:        0x01F0 -> NC Start                21.11.2001 07:31:24
Key:        0x01F0 -> NC Start                21.11.2001 07:31:25
Key:        0x01C3 -> Auto                    21.11.2001 07:31:27
Key:        0x01F0 -> NC Start                21.11.2001 07:31:30
STIB:       ON                                21.11.2001 07:31:30
INFO:       MAIN PGM                          21.11.2001 07:31:30
            TNC:\STEFAN\GRAVUR.H
INFO:       MAIN LINE                         21.11.2001 07:31:30
            0
STIB:       OFF                               21.11.2001 07:31:31
INFO:       MAIN PGMEND                       21.11.2001 07:31:31
            01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
            00 05 00 08 00 00 00 38
                      Byte 0          Byte 7

INFO:       MAIN PATH                         21.11.2001 07:31:32
            RUNBRKPGM = TNC:\STEFAN\GRAVUR.H
ERR:        N56 X+ limit switch               21.11.2001 07:31:32
Key:        0x01AE -> CE                      21.11.2001 07:31:43
```

Calling the log

▶ Press the following key combination to call the log:

▶ Select the Programming and Editing mode.

MOD

▶ Prepare for entry of code number.

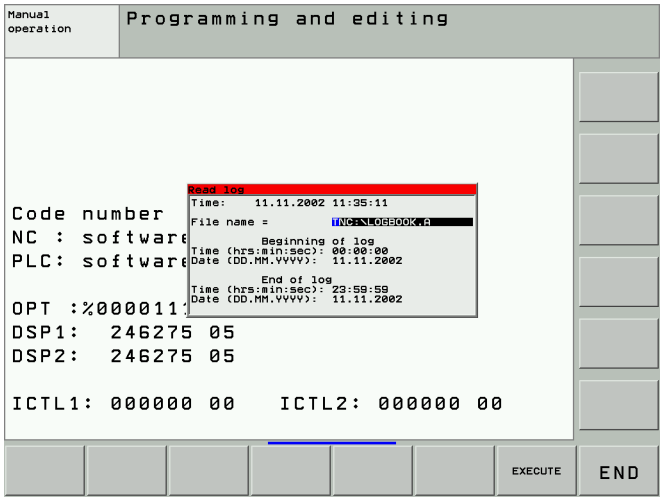
L O G B O O K

▶ Enter the code number.

ENT

▶ Confirm.

The following screen is displayed:



If you wish, you may change the path and the file name in this window.
Default setting: TNC:\LOGBOOK.A.

Here you also can define the starting point and the end point for reading out the log.

Note

Ensure correct spelling when making any changes in the log window.

Then start reading out the log by pressing the "EXECUTE" soft key.

A log file is now created and displayed on the screen.

3 Errors and Error Analysis on the Machine or Control

3.1 Overview

Note

The following table shows an overview of specific errors on the machine or control, possible causes of the errors as well as measures for correcting these errors.
The potential measures for correcting the errors are described in more detail in the corresponding chapters.

Error	Possible cause of error	Error diagnosis
The iTNC monitor remains dark after the machine has been switched on.	■ iTNC monitor defective. ■ Power supply to monitor defective. ■ Power supply to MC defective. ■ A major short-circuit generates a reset in the power supply unit of the iTNC.	■ Check the BC visual display unit, see page 199. ■ Check power supply to MC, see page 165. ■ Switch the power switch off, unplug all connectors except the VDU cable and switch the machine on again. If an image is displayed on the monitor, check all connectors for short-circuits.
STIB ("*" in status display) remains in place even though positioning appears to be completed. In the automatic modes the next NC block is not run.	■ Electrical offset. ■ Approach behavior of axis not optimized. ■ Axis did not reach the positioning window.	■ Carry out offset adjustment, see "Adjusting the Electrical Offset" on page 242. ■ Re-optimize axis (contact machine manufacturer for information).
Strong vibration of controller, already in current controller mode, accompanied by loud noises (initial operation).	■ Connectors on grounding terminal X131 of power supply module (Simodrive 611D) not properly wired. ■ Grounding terminal X131 of power supply module (Simodrive 611D) or grounding connection damaged.	■ Check the grounding of your machine according to the HEIDENHAIN grounding diagram after consultation with the machine tool builder, see page 154. ■ Ensure the grounding clamps are secure.
Servo lag is too high at standstill.	■ Electrical offset.	■ Carry out offset adjustment, see "Adjusting the Electrical Offset" on page 242.
The message "Ext. relay dc voltage missing" does not disappear although the "control voltage ON" button was pressed.	■ EMERGENCY STOP chain interrupted. ■ MC defective.	■ Check output "Control is ready" and acknowledgment I3, see page 227.
When the machine is switched on, the error message "EMERGENCY STOP defective" is generated.	■ MC defective. ■ Main contactor defective.	■ Check the related components, see page 228.

4 Reserved

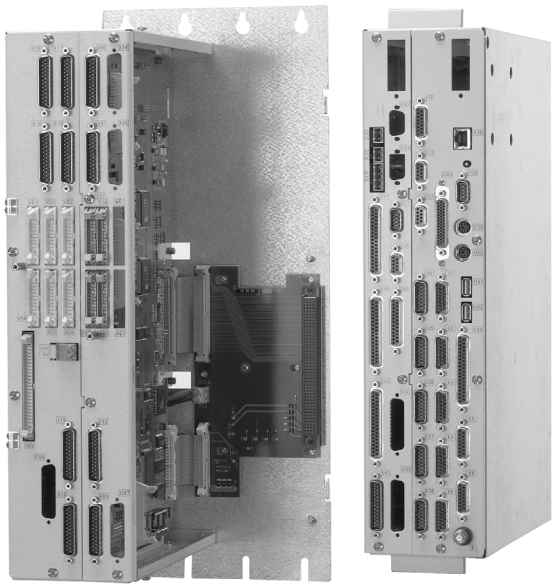
4.1

5 Overview of Components

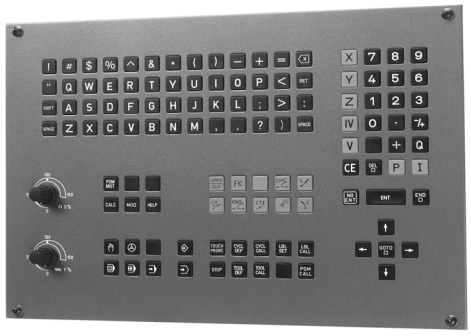
5.1 Standard Components

Controller unit CC 422 (CC = Controller Computer)

Main computer MC 422 (MC = Main Computer)



TE 420
Operating panel

TE 530
Operating panel

	Picture to be added

BF 120
Visual display unit

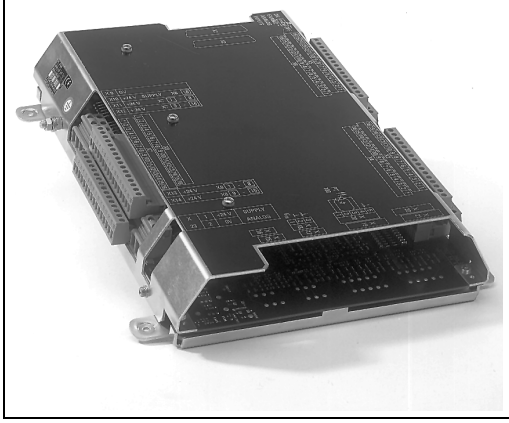
- Color VDU
- TFT interface (thin film transistor)
- Connection to iTNC:
  Female 62-pin D-sub connector X49

BF 150
Visual display unit

- Color VDU
- TFT interface (thin film transistor)
- Connection to iTNC:
  Female 44-pin D-sub connector X149

5.2 Accessories

PL 410 B
PL 405 B
PLC input/ output unit



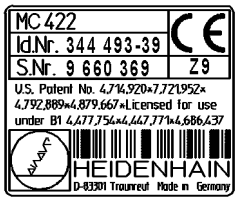
MB 420
Machine operating panel

HR 410
Handwheel

6 Important Features of HEIDENHAIN Components

6.1 Hardware Identification

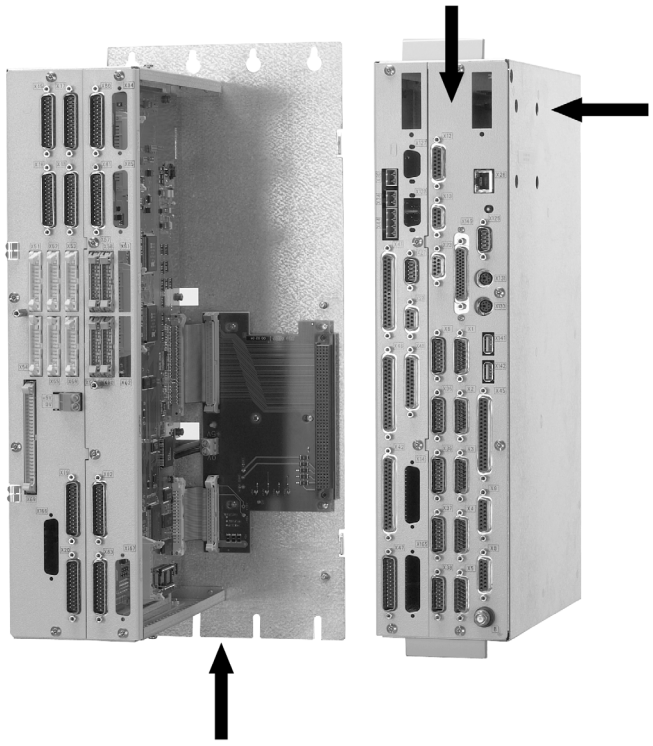
ID plate (example)



Note

The location of the ID plate with unit designation, ID number and series number is shown below.
Each unit can be identified through its own numbers.
For the service the most important number is the ID number.

MC 422
CC 422



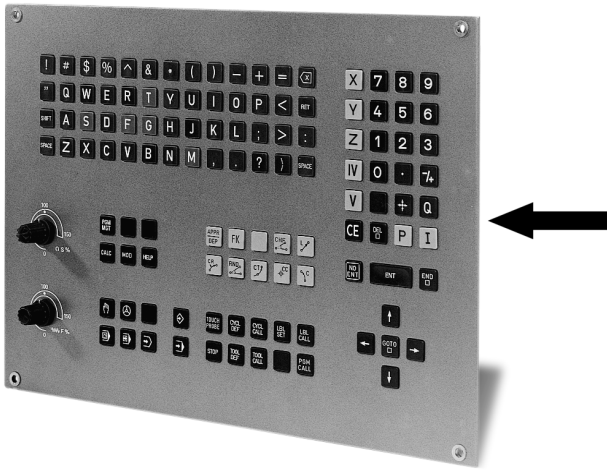
BF 120

(unit rear side)

BF 150

(unit rear side)

TE 420



(unit rear side)

TE 530

Picture to be added

6.2 Display of System Information

General

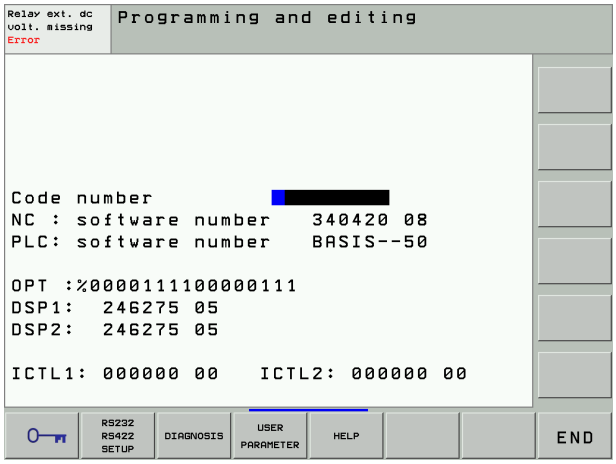
When consulting your machine manufacturer or HEIDENHAIN in case of error or malfunction of your machine, it is important to know which software is installed on the iTNC.

Display on iTNC

▶ Press the following keys to display the currently active NC software on the iTNC screen:

▶ Select Programming and Editing operating mode

▶ Press key



NC software

```
NC : Software Number   340420 08
```

340420 Program number of NC software
08 Version of NC software

PLC software

```
PLC: Software Number   BASIC-- 50
```

BASIC--35 Any character string that the machine manufacturer uses to identify his PLC software

Setup

```
SETUP:                 340433 03
```

340433 Program number of the SETUP
03 Version of the SETUP

Note

SETUP designates the part of the NC software data which is stored on the hard disk in the SYS partition.

Option

```
OPT  :%0000111100000111
```

% Identifier of binary format
0000111100000111 Options enabled in the SIK (e.g. auxiliary axes, tilting operation, HSC milling etc.)

DSP software

```
DSP1:   246275  05
```

246275 Program number of DSP software
05 Version of DSP software

Note

The DSP software designates the operating system for the **d**igital **s**ignal **p**rocessors (DSP). This is a part of the SETUP and is only active with digital axes/spindle.

Current controller software

```
ICTL1: 246276 17
```

246276 Program number of current controller software
17 Version of current controller software

Note

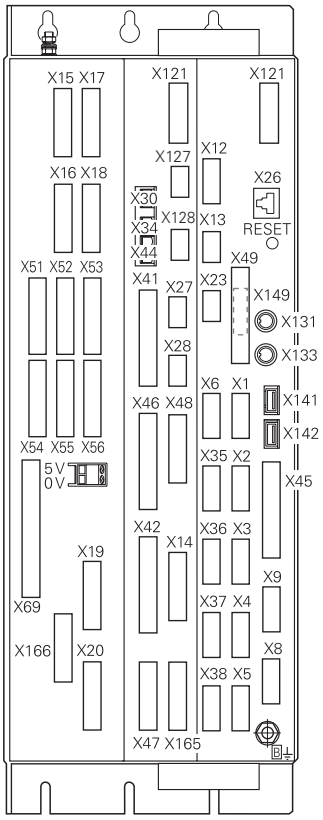
The digital current controller uses this software for the digital axes.

7 Connector Designation and Layout

7.1 MC and CC

7.1.1 Designation and position of connectors

MC 422 M with 5 position encoder inputs and CC 422 with 6 speed control loops



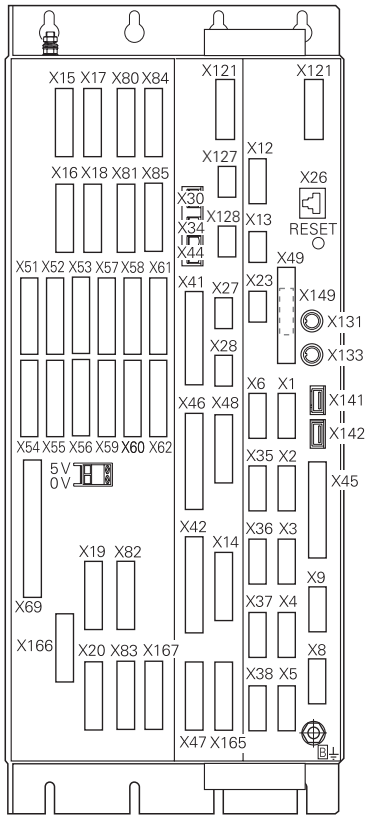
X150, X151 at bottom of housing

X1 to X5	Position encoder 1 V_{PP}
X35 to X38	Vacant
X15 to X20	Speed encoder 1 VPP
X51 to X60	PWM output (power stage of motor)
X8, X9	Nominal value output, analog
X12	TS touch trigger probe
X13	TT 130 touch trigger probe
X23	Handwheel
X26	Ethernet data interface
X27	RS-232-C/V.24 data interface
X28	RS-422/V.11 data interface
X30	24 V reference signal for spindle
X34	24 V for control-is-ready signal output
X41	PLC output
X42	PLC input
X44	24 V PLC supply voltage
X45	Keyboard unit (TE 4xx)
X46	Machine operating panel
X47	PLC expansion (PL 4xxB)
X48	PLC analog input
X149 (X49)	BF 150 (BF 120) visual display unit
X69	Power supply
X121, X125	Reserved
X127, X128	Reserved
X131, X133	Reserved
X141, X142	Reserved
X165, X166	Reserved
5V/0V	Power supply for processor
X150	Axis-specific drive release 1 to 6
B	Signal ground
⏚	Equipment ground (YL/GN)

Caution

Do not engage or disengage any connecting elements while the unit is under power!

MC 422 M with 10 position encoder inputs and CC 422 with 10 speed control loops



X150, X151 at bottom of housing

X1 to X6	Position encoder 1 V_{PP}
X35 to X38	Position encoder 1 V_{PP}
X15 to X20	Speed encoder 1 V_{PP}
X80 to X83	Speed encoder 1 V_{PP}
X84, X85	Vacant
X51 to X60	PWM output (power stage of motor)
X61, X62	Vacant
X8, X9	Nominal value output, analog
X12	TS touch trigger probe
X13	TT 130 touch trigger probe
X23	Handwheel
X26	Ethernet data interface
X27	RS-232-C/V.24 data interface
X28	RS-422/V.11 data interface
X30	24 V reference signal for spindle
X34	24 V for control-is-ready signal output
X41	PLC output
X42	PLC input
X44	24 V PLC supply voltage
X45	Keyboard unit (TE 4xx)
X46	Machine operating panel
X47	PLC expansion (PL 4xxB)
X48	PLC analog input
X149 (X49)	BF 150 (BF 120) visual display unit
X69	Power supply
X121, X125	Reserved
X127, X128	Reserved
X131, X133	Reserved
X141, X142	Reserved
X165, X166, X167	Reserved
5V/0V	Power supply for processor
X150	Axis-specific drive release 1 to 6
X151	Axis-specific drive release 7 to 10
B	Signal ground
⏚	Equipment ground (YL/GN)

Caution

Do not engage or disengage any connecting elements while the unit is under power!

7.1.2 Pin layouts

X1 to X6,
X35 to X38:
Position encoder
1 V_{PP}

MC 422		AK 309 783-xx AK 310 197-xx			Encoder	
Male	**Assignment**	**Female**	**Color**	**Female**	**Male**	**Color**
1	+5 V (U_P)	1	Brown/Green	12	12	Brown/Green
2	0 V (U_N)	2	White/Green	10	10	White/Green
3	A+	3	Brown	5	5	Brown
4	A–	4	Green	6	6	Green
5	Do not assign	5				
6	B+	6	Gray	8	8	Gray
7	B–	7	Pink	1	1	Pink
8	Do not assign	8				
9	+5 V (sensor line)	9	Blue	2	2	Blue
10	R+	10	Red	3	3	Red
11	0 V (sensor line)	11	White	11	11	White
12	R–	12	Black	4	4	Black
13	0 V	13				
14	Do not assign	14	Violet	7	7	Violet
15	Do not assign	15				
Hsg.	External shield	Hsg.	External shield	Hsg.	Hsg.	External shield

X1 to X6,
X35 to X38:
Position encoder with EnDat interface

MC 422		AK 332 115-xx			VB 323 897-xx				AK 313 791-xx		
Male	**Assignmt**	**Female**	**Color**	**Female**	**Male**	**Color**	**Fem.**		**Male**	**Color**	**Fem.**
1	+5 V (U_P)	1	Brown/ Green	7	7	Brown/ Green	7	Line drop compensator 336 697-02, if required	7	Brown/ Green	5b
2	0 V (U_N)	2	White/ Green	10	10	White/ Green	10		10	White/ Green	6a
3	A+	3	Green/ Black	15	15	Green/ Black	15		15	Green/ Black	2a
4	A–	4	Yellow/ Black	16	16	Yellow/ Black	16		16	Yellow/ Black	2b
5	Data	5	Gray	14	14	Gray	14		14	Gray	3b
6	B+	6	Blue/ Black	12	12	Blue/ Black	12		12	Blue/ Black	1a
7	B–	7	Red/ Black	13	13	Red/ Black	13		13	Red/ Black	1b
8	$\overline{\text{Data}}$	8	Pink	17	17	Pink	17		17	Pink	3a
9	+5 V (sensor line)	9	Blue	1	1	Blue	1		1	Blue	6a
10	Free	10		3	3	Red	3		3		
11	0 V (sensor line)	11	White	4	4	White	4		4	White	6b
12	Free	12		2	2	Black	2		2		
13	Internal shield	13	Internal shield	11	11	Internal shield	11		11	Internal shield	
14	Clock	14	Violet	8	8	Violet	8		8	Violet	4a
15	$\overline{\text{Clock}}$	15	Yellow	9	9	Yellow	9		9	Yellow	4b
Hsg.	Housing	Hsg.	External shield	Hsg.		External shield			Hsg.	External shield	

X8:
Analog outputs 1 to 6

MC 422		Connecting cable	
D-sub connctn. (female) 15-pin	**Assignment**	**D-sub connctr. (male) 15-pin**	**Color**
1	Analog output 1: ±10 V	1	Brown
2	Do not assign	2	Brown/Green
3	Analog output 2: ±10 V	3	Yellow
4	Analog output 5: ±10 V	4	Red/Blue
5	Analog output 3: ±10 V	5	Pink
6	Analog output 5: 0 V	6	Gray/Pink
7	Analog output 4: ±10 V	7	Red
8	Analog output 6: ±10 V	8	Violet
9	Analog output 1: 0 V	9	White
10	Do not assign	10	White/Gray
11	Analog output 2: 0 V	11	Green
12	Do not assign	12	
13	Analog output 3: 0 V	13	Gray
14	Analog output 4: 0 V	14	Blue
15	Analog output 6: 0 V	15	Black
Housing	External shield	Housing	External shield

X9:
Analog outputs 7 to 13

MC 422		Connecting cable	
D-sub connctn. (female) 15-pin	**Assignment**	**D-sub connctr. (male) 15-pin**	**Color**
1	Analog output 7: ±10 V	1	Brown
2	Do not assign	2	Brown/Green
3	Analog output 8: ±10 V	3	Yellow
4	Analog output 11: ±10 V	4	Red/Blue
5	Analog output 9: ±10 V	5	Pink
6	Analog output 11: 0 V	6	Gray/Pink
7	Analog output 10: ±10 V	7	Red
8	Analog output 12: ±10 V	8	Violet
9	Analog output 7: 0 V	9	White
10	Do not assign	10	White/Gray
11	Analog output 8: 0 V	11	Green
12	Do not assign	12	
13	Analog output 9: 0 V	13	Gray
14	Analog output 10: 0 V	14	Blue
15	Analog output 12: 0 V	15	Black
Housing	External shield	Housing	External shield

X12: Connection of touch probe for workpiece measurement

Pin layout for TS 220:

MC 422		AK 274 543-xx			TS 220	
Female	**Assignment**	**Male**	**Color**	**Pin**	**Pin**	**Color**
1	0 V (internal shield)	1				
2	Do not assign	2				
3	Ready	3	Pink	4	4	
4	Start	4				
5	+ 15 V ± 10% (U_P), max. 100 mA	5	Gray	3	3	
6	+5 V ± 5% (U_P), max. 100 mA	6	Brown/Green	2	2	Brown
7	$\overline{\text{Battery warning}}$	7	Gray			
8	0 V (U_N)	8	White/Green	1	1	White
9	Trigger signal	9	Green	5	5	Green
10	$\overline{\text{Trigger signal}}$[a]	10	Yellow	6	6	Yellow
11 to 15	Do not assign	11 to 15				
Hsg.	External shield	Hsg.	External shield	Hsg.		

a. Stylus at rest means logic level HIGH.

Pin layout for TS 632 with EA 632:

MC 422		AK 310 197-xx			EA 632 346, 22-xx		TS 632
Female	**Assignment**	**Male**	**Color**	**Female**	**Male**	**Color**	
1	0 V (internal shield)	1	White/ Brown	7	7	White/ Brown	
2	Do not assign						
3	Ready	3	Gray	5	5	Gray	
4	Start	4	Yellow	3	3		
5	+ 15 V ± 10% (U_P), max. 100 mA	5	Brown	2	2	Brown	
6	+5 V ± 5% (U_P), max. 100 mA						
7	$\overline{\text{Battery warning}}$	7	Blue	6	6	Blue	
8	0 V (U_N)	8	White	1	1	White	
9	Trigger signal						
10	$\overline{\text{Trigger signal}}$[a]	10	Green	4	4	Green	
11 to 15	Do not assign						
Hsg.	External shield	Hsg.	External shield	Hsg.	Hsg.		

a. Stylus at rest means logic level HIGH.

Two EA 652 can be connected to the MC 422 via the APE 652. This is necessary for example on large machines or on machines with swivel heads.

Pin layout for TS 632 with two EA 652 via the APE 652:

MC 422	Adapter cable 310 197-xx	APE 652 354 656-xx		VB 336 157-xx			EA 652 346 323-xx		TS 632
		Male	Female	Male	Color	Female	Male	Color	
For the layout see TS632 with EA632 on page 108		7	7	7	White/ Brown	7	7	White/ Brown	
		5	5	5	Gray	5	5	Gray	
		3	3	3	Yellow	3	3		
		2	2	2	Brown	2	2	Brown	
		6	6	6	Blue	6	6	Blue	
		1	1	1	White	1	1	White	
		4	4	4	Green	4	4	Green	
		Hsg.	Hsg.	Hsg.	External shield	Hsg.	Hsg.		

X13: Connection of touch probe for workpiece measurement

Pin layout on the MC 422:

Pin layout on adapter cable and touch probe:

MC 422		AK 335 332-xx			TT 130 296 537-xx	
Female	Assignment	Male	Color	Female	Male	Color
1	Ready	1	Pink	6	6	
2	0 V (U_N)	2	White/Green	1	1	White
3	Do not assign	3				
4	+15 V ± 5% (U_P)	4	Brown/Green	2	2	Brown
5	Do not assign	5		5	5	
6	Do not assign	6				
7	+5 V ± 5% (U_P)	7				
8	Trigger signal	8	Brown	3	3	Green
9	$\overline{\text{Trigger signal}}$[a]	9	Green	4	4	Yellow
–	–	–	–	7	7	
Hsg.	External shield	Hsg.	External shield	Hsg.	Hsg.	

a. Stylus at rest means logic level HIGH.

X15 to X20,
X80 to X85:
Speed encoder
1 V_{PP}

CC 422		AK 289 440-xx			VB 336 847-xx		
Male	**Assignment**	**Female**	**Color**	**Female**	**Male**	**Color**	**Female**
1	+5 V (U_P)	1	Brown/Green	10	10	Brown/Green	10
2	0 V (U_N)	2	White/Green	7	7	White/Green	7
3	A+	3	Green/Black	1	1	Green/Black	1
4	A–	4	Yellow/Black	2	2	Yellow/Black	2
5	0 V						
6	B+	6	Blue/Black	11	11	Blue/Black	11
7	B–	7	Red/Black	12	12	Red/Black	12
8	0 V	8	Internal shield	17	17	Internal shield	17
9	Do not assign						
10	Do not assign						
11	Do not assign						
12	Do not assign						
13	Temperature +	13	Yellow	8	8	Yellow	8
14	+5 V (U_P)	14	Blue	16	16	Blue	16
15	Do not assign						
16	0 V (U_N)	16	White	15	15	White	15
17	R+	17	Red	3	3	Red	3
18	R–	18	Black	13	13	Black	13
19	C+	19	Green	5	5	Green	5
20	C–	20	Brown	6	6	Brown	6
21	D+	21	Gray	14	14	Gray	14
22	D–	22	Pink	4	4	Pink	4
23	Do not assign						
24	0 V						
25	Temperature–	25	Violet	9	9	Violet	9
Hsg.	Housing	Hsg.	External shield	Hsg.	Hsg.	External shield	Hsg.

X15 to X20,
X80 to X85:
Speed encoder with
EnDat interface

CC 422		AK 336 376-xx				VB 340 302-xx		
Male	**Assignment**	**Female**	**Color**	**Female**		**Male**	**Color**	**Female**
1	+5 V (U_P)	1	Brown/Green	10	Line drop compensator 336 697-01, if required	10	Brown/Green	10
2	0 V (U_N)	2	White/Green	7		7	White/Green	7
3	A+	3	Green/Black	1		1	Green/Black	1
4	A–	4	Yellow/Black	2		2	Yellow/Black	2
5	0 V							
6	B+	6	Blue/Black	11		11	Blue/Black	11
7	B–	7	Red/Black	12		12	Red/Black	12
8	0 V	8	Internal shield	17		17	Internal shield	17
9	Do not assign							
10	Clock	10	Green	5		5	Green	5
11	Do not assign							
12	$\overline{\text{Clock}}$	12	Brown	14		14	Brown	14
13	Temperature +	13	Yellow	8		8	Yellow	8
14	+5 V (sensor line)	14	Blue	16		16	Blue	16
15	Data	15	Red	3		3	Red	3
16	0 V (sensor line)	16	White	15		15	White	15
17	Do not assign							
18	Do not assign							
19	Do not assign							
20	Do not assign							
21	Do not assign							
22	Do not assign							
23	$\overline{\text{Data}}$	23	Black	13		13	Black	13
24	0 V							
25	Temperature–	25	Violet	9		9	Violet	9
Hsg.	Housing	Hsg.	External shield	Hsg.		Hsg.	External shield	Hsg.

X23:
Handwheel input

D-sub connection (female) 9-pin	Assignment
1	CTS
2	0 V
3	RTS
4	+12 V
5	Do not assign
6	DTR
7	TxD
8	RxD
9	DSR
Housing	External shield

X26:
Ethernet interface
RJ45 port

Maximum data transfer rate:
Approx. 2 to 5 Mbps (depending on file type and network utilization)

Maximum cable length, shielded: 100 m

RJ45 connection (female) 8-pin	Assignment
1	TX+
2	TX–
3	REC+
4	Do not assign
5	Do not assign
6	REC –
7	Do not assign
8	Do not assign
Housing	External shield

X27:
RS-232-C/V.24
data interface

25-pin adapter block:

MC 422		VB 365 725-xx			Adapter block 310 085-01		VB 274 545-xx		
Male	**Assignment**	**Female**	**Color**	**Female**	**Male**	**Female**	**Male**	**Color**	**Female**
1	Do not assign	1		1	1	1	1	White/ Brown	1
2	RXD	2	Yellow	3	3	3	3	Yellow	2
3	TXD	3	Green	2	2	2	2	Green	3
4	DTR	4	Brown	20	20	20	20	Brown	8
5	Signal GND	5	Red	7	7	7	7	Red	7
6	DSR	6	Blue	6	6	6	6		6
7	RTS	7	Gray	4	4	4	4	Gray	5
8	CTR	8	Pink	5	5	5	5	Pink	4
9	Do not assign	9					8	Violet	20
Hsg.	Ext. shield	Hsg.	Ext. shield	Hsg.	Hsg.	Hsg.	Hsg.	Ext. shield	Hsg.

9-pin adapter block:

MC 422		VB 355 484-xx			Adapter block 363 987-02		VB 366 964-xx		
Male	**Assignment**	**Female**	**Color**	**Male**	**Female**	**Male**	**Female**	**Color**	**Female**
1	Do not assign	1	Red	1	1	1	1	Red	1
2	RXD	2	Yellow	2	2	2	2	Yellow	3
3	TXD	3	White	3	3	3	3	White	2
4	DTR	4	Brown	4	4	4	4	Brown	6
5	Signal GND	5	Black	5	5	5	5	Black	5
6	DSR	6	Violet	6	6	6	6	Violet	4
7	RTS	7	Gray	7	7	7	7	Gray	8
8	CTR	8	White/ Green	8	8	8	8	White/ Green	7
9	Do not assign	9	Green	9	9	9	9	Green	9
Hsg.	External shield	Hsg.	External shield	Hsg.	Hsg.	Hsg.	Hsg.	External shield	Hsg.

X28:
RS-422/V.11
Data Interface

MC 422		VB 355 484-xx			Adapter block 363 987-01	
Female	**Assignment**	**Male**	**Color**	**Female**	**Male**	**Female**
1	RTS	1	Red	1	1	1
2	DTR	2	Yellow	2	2	2
3	$\overline{\text{RXD}}$	3	White	3	3	3
4	$\overline{\text{TXD}}$	4	Brown	4	4	4
5	Signal GND	5	Black	5	5	5
6	CTS	6	Violet	6	6	6
7	DSR	7	Gray	7	7	7
8	RXD	8	White/ Green	8	8	8
9	TXD	9	Green	9	9	9
Hsg.	External shield	Hsg.	External shield	Hsg.	Hsg.	Hsg.

X30:
Reference signal for spindle

Connecting terminal	Assignment
1	+24 V
2	0 V

X34:
Power supply for control-is-ready signal

Connecting terminal X34	Assignment	Connection when using a HEIDENHAIN inverter
1	+24 V	X72/1
2	0 V	X72/2

X41:
PLC outputs on the MC 422

MC 422		**Connecting cable Id. Nr. 244 005-xx Id. Nr. 263 954-xx**	
D-sub connctn. (female) 37-pin	**Assignment**	**D-sub connctr. (male) 37-pin**	
Supply via X44, pin 3; can be switched off with EMERGENCY STOP			
1	O0	1	Gray/Red
2	O1	2	Brown/Black
3	O2	3	White/Black
4	O3	4	Green/Black
5	O4	5	Brown/Red
6	O5	6	White/Red
7	O6	7	White/Green
8	O7	8	Red/Blue
9	O8	9	Yellow/Red
10	O9	10	Gray/Pink
11	O10	11	Black
12	O11	12	Pink/Brown
13	O12	13	Yellow/Blue
14	O13	14	Green/Red
15	O14	15	Yellow
16	O15	16	Red
Supply via X44, pin 2; can be switched off by EMERGENCY STOP			
17	O16	17	Gray
18	O17	18	Blue
19	O18	19	Pink
20	O19	20	White/Gray
21	O20	21	Yellow/Gray
22	O21	22	Green/Red
23	O22	23	White/Pink
24	O23	24	Gray/Green
Supply via X44, pin 1; **cannot** be switched by EMERGENCY STOP			
25	O24	25	Yellow/Brown
26	O25	26	Gray/Brown
27	O26	27	Yellow/Brown
28	O27	28	White/Yellow
29	28	29	Gray/White
30	O29	30	Pink/Blue
31	O30	31	Pink/Red
32, 33	Do not assign	32	Brown/Blue, Pink/Green
34	Control is ready	34	Brown
35, 36, 37	Do not assign	35	Yellow/Pink, Violet, White
Housing	External shield	Housing	External shield

X42:
PLC inputs on the
MC 422

MC 422		**Connecting cable Id. Nr. 244 005-xx, Id. Nr. 263,954-xx**	
D-sub connctn. (female) 37-pin	**Assignment**	**D-sub connctn. (male) 37-pin**	
1	I0	1	Gray/Red
2	I1	2	Brown/Black
3	I2	3	White/Black
4	I3 Control-is-ready signal acknowledgement	4	Green/Black
5	I4	5	Brown/Red
6	I5	6	White/Red
7	I6	7	White/Green
8	I7	8	Red/Blue
9	I8	9	Yellow/Red
10	I9	10	Gray/Pink
11	I10	11	Black
12	I11	12	Pink/Brown
13	I12	13	Yellow/Blue
14	I13	14	Green/Blue
15	I14	15	Yellow
16	I15	16	Red
17	I16	17	Gray
18	I17	18	Blue
19	I18	19	Pink
20	I19	20	White/Gray
21	I20	21	Yellow/Gray
22	I21	22	Green/Red
23	I22	23	White/Pink
24	I23	24	Gray/Green
25	I24	25	Yellow/Brown
26	I25	26	Gray/Brown
27	I26	27	Yellow/Black
28	I27	28	White/Yellow
29	I28	29	Gray/Blue
30	I29	30	Pink/Blue
31	I30	31	Pink/Red
32	I31	32	Brown/Blue
33	I32 Drive enable	33	Pink/Green
34	Do not assign	34	Brown
35	0 V (PLC) Test output; do not assign	35	Yellow/Pink
36	0 V (PLC) Test output; do not assign	36	Violet
37	0 V (PLC) Test output; do not assign	37	White
Housing	External shield	Housing	External shield

X44:
PLC supply voltage

Pin layout on the MC 422:

Connection terminal	Assignment	PLC outputs
1	+24 V not disconnectable with EMERGENCY STOP	O24 to O30 control-is-ready signal
2	+24 V disconnectable with EMERGENCY STOP	O16 to O23
3		O0 to O15
4	0 V	

X45:
TNC Keyboard
(TE 420)

MC 422		Connecting cable Id. Nr. 263 954-xx			TE 420 313 038-xx
D-sub connctn. (female) 37-pin	Assignment	D-sub cnnctr. (male) 37-pin		D-sub cnnctr. (female) 37-pin	X2: D-sub connctn. (male) 37-pin
1	RL0	1	Gray/Red	1	1
2	RL1	2	Brown/Black	2	2
3	RL2	3	White/Black	3	3
4	RL3	4	Green/Black	4	4
5	RL4	5	Brown/Red	5	5
6	RL5	6	White/Red	6	6
7	RL6	7	White/Green	7	7
8	RL7	8	Red/Blue	8	8
9	RL8	9	Yellow/Red	9	9
10	RL9	10	Gray/Pink	10	10
11	RL10	11	Black	11	11
12	RL11	12	Pink/Brown	12	12
13	RL12	13	Yellow/Blue	13	13
14	RL13	14	Green/Blue	14	14
15	RL14	15	Yellow	15	15
16	RL15	16	Red	16	16
17	RL16	17	Gray	17	17
18	RL17	18	Blue	18	18
19	RL18	19	Pink	19	19
20	SL0	20	White/Gray	20	20
21	SL1	21	Yellow/Gray	21	21
22	SL2	22	Green/Red	22	22
23	SL3	23	White/Pink	23	23
24	SL4	24	Gray/Green	24	24
25	SL5	25	Yellow/ Brown	25	25
26	SL6	26	Gray/Brown	26	26
27	SL7	26	Yellow/Black	27	27
28	RL19	28	White/Yellow	28	28
29	RL20	29	Gray/Blue	29	29
30	Do not assign	30	Pink/Blue	30	30
31	RL21	31	Pink/Red	31	31
32	RL22	32	Brown/Blue	32	32

MC 422		Connecting cable Id. Nr. 263 954-xx			TE 420 313 038-xx
D-sub connctn. (female) 37-pin	**Assignment**	**D-sub cnnctr. (male) 37-pin**		**D-sub cnnctr. (female) 37-pin**	**X2: D-sub connctn. (male) 37-pin**
33	RL23	33	Pink/Green	33	33
34	Spindle override (wiper)	34	Brown	34	34
35	Feed-rate override (wiper)	35	Yellow/Pink	35	35
36	+5 V override potentiometer	36	Violet	36	36
37	0 V override potentiometer	37	White	37	37
Housing	External shield	Housing	External shield	Housing	Housing

X46: Machine operating panel

Pin layout on the MC 422, connecting cables and machine operating panel:

MC 422		Connecting cable Id. Nr. 263 954-xx			MB 420	
D-sub connection (female) 37-pin	**Assignment**	**D-sub connctr. (male) 37-pin**		**D-sub connctn. (female) 37-pin**	**D-sub connctn. (male) 37-pin**	**Key**
1	I128	1	Gray/Red	1	1	X –
2	I129	2	Brown/Black	2	2	Y –
3	I130	3	White/Black	3	3	Z –
4	I131	4	Green/Black	4	4	IV –
5	I132	5	Brown/Red	5	5	V –
6	I133	6	White/Red	6	6	X +
7	I134	7	White/Green	7	7	Y +
8	I135	8	Red/Blue	8	8	Z +
9	I136	9	Yellow/Red	9	9	IV +
10	I137	10	Gray/Pink	10	10	V +
11	I138	11	Black	11	11	Tool change
12	I139	12	Pink/Brown	12	12	Unlock tool
13	I140	13	Yellow/Blue	13	13	Menu selection
14	I141	14	Green/Blue	14	14	Unlock door
15	I142	15	Yellow	15	15	Chip removal
16	I143	16	Red	16	16	Spindle on
17	I144	17	Gray	17	17	Spindle off
18	I145	18	Blue	18	18	Coolant
19	I146	19	Pink	19	19	NC start
20	I147	20	White/Gray	20	20	NC stop
21	I148	21	Yellow/Gray	21	21	Rapid traverse
22	I149	22	Green/Red	22	22	Retract axis
23	I150	23	White/Pink	23	23	Rinse water jet
24	I151	24	Gray/Green	24	24	Via X3
25	I152	25	Yellow/Brown	25	25	Via X3
26	O0*	26	Gray/Brown	26	26	Via X4
27	O1*	26	Yellow/Black	27	27	Via X4
28	O2*	28	White/Yellow	28	28	Via X4
29	O3*	29	Gray/Blue	29	29	Via X4
30	O4*	30	Pink/Blue	30	30	Via X4
31	O5*	31	Pink/Red	31	31	Via X4
32	O6*	32	Brown/Blue	32	32	Via X4
33	O7*	33	Pink/Green	33	33	Via X4
34, 35	0 V (PLC)	34, 35	Brown, Yellow/Pink	34, 35	34, 35	
36, 37	+24 V (PLC)	36	Violet, white	36, 37	36,37	
Housing	Ext. shield	Housing	External shield	Housing	Housing	

X47:
PLC expansion on the MC 422

MC 422		Conn. cable Id. Nr. 289 111-xx / Id. Nr. 317 788-xx			1. PL 410 B/PL405 B	
D-sub connctn. (male) 25-pin	**Assignment**	**D-sub connector (female) 25-pin**		**D-sub connctr. (male) 25-pin**	**X1 D-sub connctn. (female) 25-pin**	**Assignment**
1	0 V	1	Brown, Yellow, Pink, Red, Violet	1	1	0 V
2	0 V	2	Red/Blue, Brown/Green, Yellow/Brown, Gray/ Brown, Pink/Brown	2	2	0 V
3	0 V	3	Brown/Blue, Brown/ Red, Brown/Black, Yellow/Gray, Yellow/ Pink	3	3	0 V
4	Do not assign	4	Gray/Green	4	4	Serial IN 2
5	$\overline{\text{Address 6}}$	5	White/Green	5	5	$\overline{\text{Address 6}}$
6	INTERRUPT	6	Pink/Green	6	6	INTERRUPT
7	$\overline{\text{RESET}}$	7	Green/Blue	7	7	$\overline{\text{RESET}}$
8	$\overline{\text{WRITE EXTERN}}$	8	White/Blue	8	8	$\overline{\text{WRITE EXTERN}}$
9	WRITE EXTERN	9	White/Red	9	9	WRITE EXTERN
10	$\overline{\text{Address 5}}$	10	Gray/Pink	10	10	$\overline{\text{Address 5}}$
11	$\overline{\text{Address 3}}$	11	Blue	11	11	$\overline{\text{Address 3}}$
12	$\overline{\text{Address 1}}$	12	Green	12	12	$\overline{\text{Address 1}}$
13	Do not assign	13		13	13	Do not assign
14	PCB identifier 3	14	Yellow/Blue, Pink/Blue, Yellow/Black	14	14	+12 V
15	PCB identifier 4	15	Yellow/Red, Gray/Red, Pink/Red	15	15	+12 V
16	Do not assign	16	Gray/Blue	16	16	PCB identifier 2
17	Do not assign	17	Green/Black	17	17	PCB identifier 1
18	$\overline{\text{Address 7}}$	18	White/Yellow	18	18	$\overline{\text{Address 7}}$
19	Serial IN 1	19	White/Black	19	19	Serial IN 1
20	EM. STOP	20	Green/Red	20	20	EM. STOP
21	$\overline{\text{Serial OUT}}$	21	White/Gray	21	21	$\overline{\text{Serial OUT}}$
22	Serial OUT	22	White/Pink	22	22	Serial OUT
23	$\overline{\text{Address 4}}$	23	Black	23	23	$\overline{\text{Address 4}}$
24	$\overline{\text{Address 2}}$	24	Gray	24	24	$\overline{\text{Address 2}}$
25	$\overline{\text{Address 0}}$	25	White	25	25	$\overline{\text{Address 0}}$
Housing	External shield	Housing	External shield	Housing	Housing	External shield

X48:
Analog input (PLC) on the MC 422

D-sub connection (female) 25-pin	Assignment
1	I_1+ Constant current for Pt 100
2	I_1– Constant current for Pt 100
3	U_1+ Measuring input for Pt 100
4	U_1– Measuring input for Pt 100
5	I_2+ Constant current for Pt 100
6	I_2– Constant current for Pt 100
7	U_2+ Measuring input for Pt 100
8	U_2– Measuring input for Pt 100
9	I_3+ Constant current for Pt 100
10	I_3– Constant current for Pt 100
11	U_3+ Measuring input for Pt 100
12	U_3– Measuring input for Pt 100
13	Do not assign
14	Analog input 1: -10 V to +10 V
15	Analog input 1: 0 V (reference potential)
16	Analog input 2: -10 V to +10 V
17	Analog input 2: 0 V (reference potential)
18	Analog input 3: -10 V to +10 V
19	Analog input 3: 0 V (reference potential)
20 to 25	Do not assign
Housing	External shield

X49:
BF 120 flat-panel display

MC 422, X49		Connecting cable Id. Nr. 340 300-xx			BF 120, X2
D-sub connctn. (female) 62-pin	Assignmt.	D-sub connctr. (male) 62-pin		D-sub connector (female) 62-pin	D-sub connctn. (male) 62-pin
1	0 V	1	Gray/Black	1	1
2	CLK.P	2	Brown/Black	2	2
3	HSYNC	3	Green/Black	3	3
4	$\overline{\text{BLANK}}$	4	Orange/Black	4	4
5	VSYNC	5	Blue/Black	5	5
6	0 V	6	Green/White	6	6
7	R0	7	Orange/White	7	7
8	R1	8	Brown/White	8	8
9	R2	9	Gray/White	9	9
10	R3	10	Blue/White	10	10
11	0 V	11	Violet/White	11	11
12	G0	12	Violet/Brown	12	12
13	G1	13	Violet/Green	13	13
14	G2	14	Violet/Orange	14	14
15	G3	15	Violet/Blue	15	15
16	0 V	16	Red/Gray	16	16
17	B0	17	Red/Brown	17	17
18	B1	18	Yellow/Gray	18	18
19	B2	19	Yellow/Brown	19	19
20	B3	20	Yellow/Green	20	20

MC 422, X49		Connecting cable Id. Nr. 340 300-xx			BF 120, X2
D-sub connctn. (female) 62-pin	**Assignmt.**	**D-sub connctr. (male) 62-pin**		**D-sub connector (female) 62-pin**	**D-sub connctn. (male) 62-pin**
21	0 V	21	Free	21	21
22	0 V	22	Black/Gray	22	22
23	$\overline{\text{CLP.P}}$	23	Black/Brown	23	23
24	$\overline{\text{HSYNC}}$	24	Black/Green	24	24
25	BLANK	25	Black/Orange	25	25
26	$\overline{\text{VSYNC}}$	26	Black/Blue	26	26
27	0 V	27	White/Green	27	27
28	$\overline{\text{R0}}$	28	White/Orange	28	28
29	$\overline{\text{R1}}$	29	White/Brown	29	29
30	$\overline{\text{R2}}$	30	White/Gray	30	30
31	$\overline{\text{R3}}$	31	White/Blue	31	31
32	0 V	32	Gray/Violet	32	32
33	$\overline{\text{G0}}$	33	Brown/Violet	33	33
34	$\overline{\text{G1}}$	34	Green/Violet	34	34
35	$\overline{\text{G2}}$	35	Orange/Violet	35	35
36	$\overline{\text{G3}}$	36	Blue/Violet	36	36
37	0 V	37	Gray/Red	37	37
38	$\overline{\text{B0}}$	38	Brown/Red	38	38
39	$\overline{\text{B1}}$	39	Gray/Yellow	39	39
40	$\overline{\text{B2}}$	40	Brown/Yellow	40	40
41	$\overline{\text{B3}}$	41	Green/Yellow	41	41
42	0 V	42	Free	42	42
43	$\overline{\text{DISP. LOW}}$	43	Red/Blue	43	43
44	DISP. LOW	44	Blue/Red	44	44
45	$\overline{\text{DISP.ON}}$	45	Red/Orange	45	45
46	DISP.ON	46	Orange/Red	46	46
47	C0	47	Green/Red	47	47
48	C1	48	Red/Green	48	48
49	C2	49	Orange/Yellow	49	49
50	C3	50	Yellow/Orange	50	50
51	C4	51	Yellow/Blue	51	51
52	C5	52	Blue/Yellow	52	52
53 to 56	Do not assign	53 to 56	Free	53 to 56	53 to 56
57 to 62	0 V	57 to 62	Free	57 to 62	57 to 62
Housing		Housing		Housing	Housing

X51 to X62:
PWM output

Pin layout:

Ribbon cable connector 20-pin	Assignment
1a	PWM U1
1b	0 V U1
2a	PWM U2
2b	0 V U2
3a	PWM U3
3b	0 V U3
4a	$\overline{SH2}$
4b	0 V (–SH2)
5a	$\overline{SH1B}$
5b	0 V ($\overline{SH1B}$)
6a	+Iactl 1
6b	–Iactl 1
7a	0 V (analog)
7b	+Iactl 2
8a	–Iactl 2
8b	0 V (analog)
9a	Do not assign
9b	Do not assign
10a	$\overline{\text{Temp. warning}}$
10b	Ready

X69:
NC supply voltage and control signals

Ribbon connector, 50-line	Assignment	Ribbon connector, 50-line	Assignment
1a to 5b	+5 V	16b	GND
6a to 7b	+12 V	17a	RDY.PS
8a	+5 V (low-voltage separation)	17b	GND
8b	0 V (low-voltage separation)	18a	ERR.ILEAK
9a	+15 V	18b	GND
9b	-15 V	19a	PF.PS.AC (only UV 120, UV 140, UV 150, UR 2xx)
10a	UZAN	19b	GND
10b	0 V	20a	Do not assign
11a	IZAN	20b	GND
11b	0 V	21a	Do not assign
12a	RES.PS	21b	GND
12b	0 V	22a	Do not assign
13a	$\overline{PF.PS.ZK}$	22b	GND
13b	GND	23a	Reserved (SDA)
14a	$\overline{ERR.UZ.GR}$	23b	GND
14b	GND	24a	Reserved (SLC)
15a	ERR.IZ.GR	24b	GND
15b	GND	25a	RES.LE
16a	$\overline{ERR.TMP}$	25b	GND

X149:
BF 150
flat-panel display

MC 422, X149		Connecting cable Id. Nr. 35 545-xx			BF 150, X2
D-sub (female) 44-pin	**Assignmt.**	**D-sub (male), 44-pin**		**D-sub (female), 44-pin**	**D-sub (male) 44-pin**
1	A7M	1		1	1
2	A6M	2	White/Brown	2	2
3	A5M	3	White/Green	3	3
4	A4M	4	Red/Gray	4	4
5	A3M			5	5
6	CLKM	6	Red/Blue	6	6
7	A2M	7	White/Orange	7	7
8	A1M	8	Red/Brown	8	8
9	A0M	9	Red/Green	9	9
10	LVDSGND	10	Red/Orange	10	10
11	HWK_GND	11	Orange/Red	11	11
12	HWK0	12	White/Blue	12	12
13	HWK1	13	Blue/White	13	13
14	HWK2	14	White/Gray	14	14
15	HWK3	15	Gray/White	15	15
16	A7P	16		16	16
17	A6P	17	Brown/White	17	17
18	A5P	18	Green/White	18	18
19	A4P	19	Gray/Red	19	19
20	A3P			20	20
21	CLKP	21	Blue/Red	21	21
22	A2P	22	Orange/White	22	22
23	A1P	23	Brown/Red	23	23
24	A0P	24	Green/Red	24	24
25	Not assigned			25	25
26	Not assigned			26	26
27	Not assigned			27	27
28	Not assigned			28	28
29	Not assigned			29	29
30	Not assigned			30	30
31	LVDSGND			31	31
32	LVDSGND			32	32
33	LVDSGND			33	33
34	LVDSGND			34	34
35	LVDSGND			35	35
36	LVDSGND			36	36
37	LVDSGND			37	37
38	LVDSGND			38	38
39	LVDSGND			39	39
40	Not assigned			40	40
41	Not assigned			41	41
42	Not assigned			42	42
43	Not assigned			43	43
44	Not assigned			44	44
Housing		Housing		Housing	Housing

X150, X151: Drive controller enabling for axis groups

The connecting terminals X150 and X151 are located on the bottom of the CC 422.

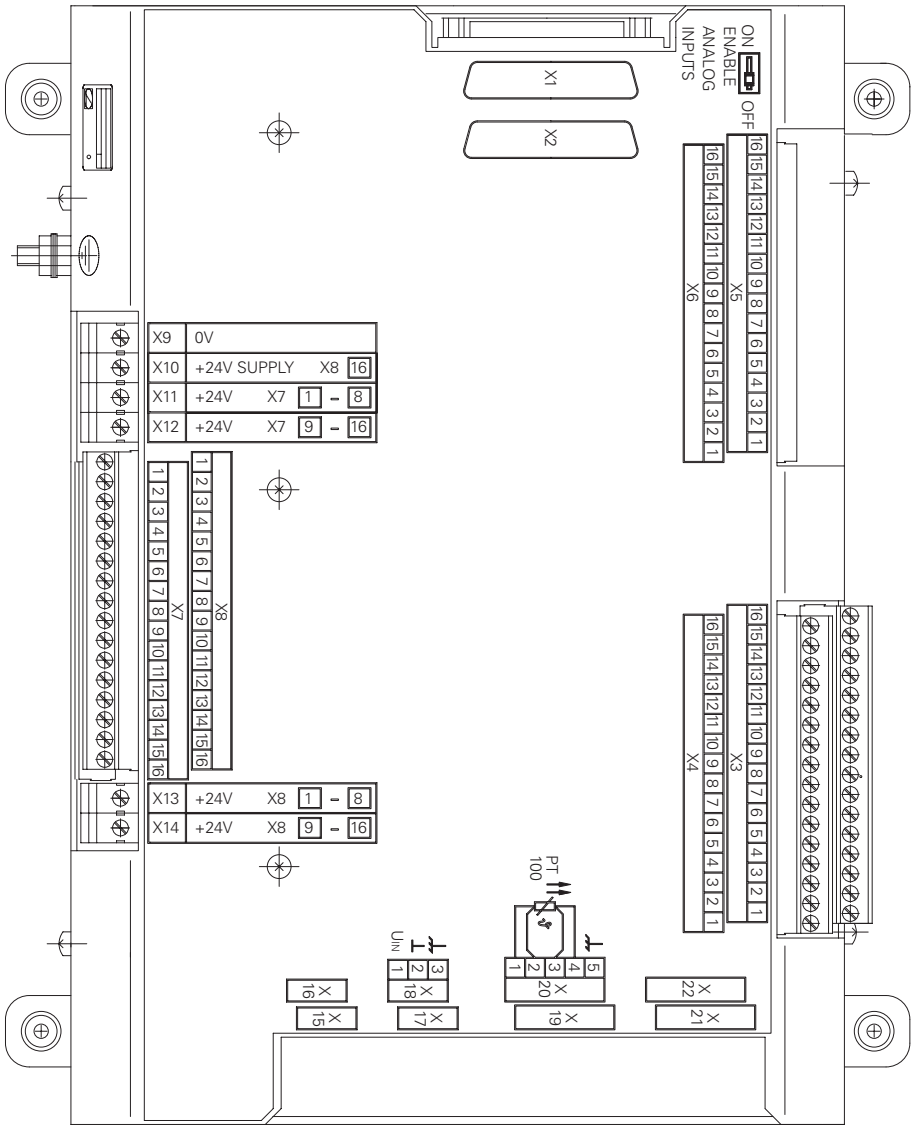
Terminal X150/X151	Assignment of X150	Assignment of X151
1	+24 V[a]; drive controller enabling for axis group 1	Reserved, do not assign
2	+24 V[a]; drive controller enabling for axis group 2	Reserved, do not assign
3	+24 V[a]; drive controller enabling for axis group 3	Reserved, do not assign
4	Reserved, do not assign	Reserved, do not assign
5	Reserved, do not assign	Reserved, do not assign
6	Reserved, do not assign	Reserved, do not assign
7	Reserved, do not assign	Reserved, do not assign
8	Reserved, do not assign	Reserved, do not assign
9	0 V	Reserved, do not assign

a. Maximum current consumption 10 mA.

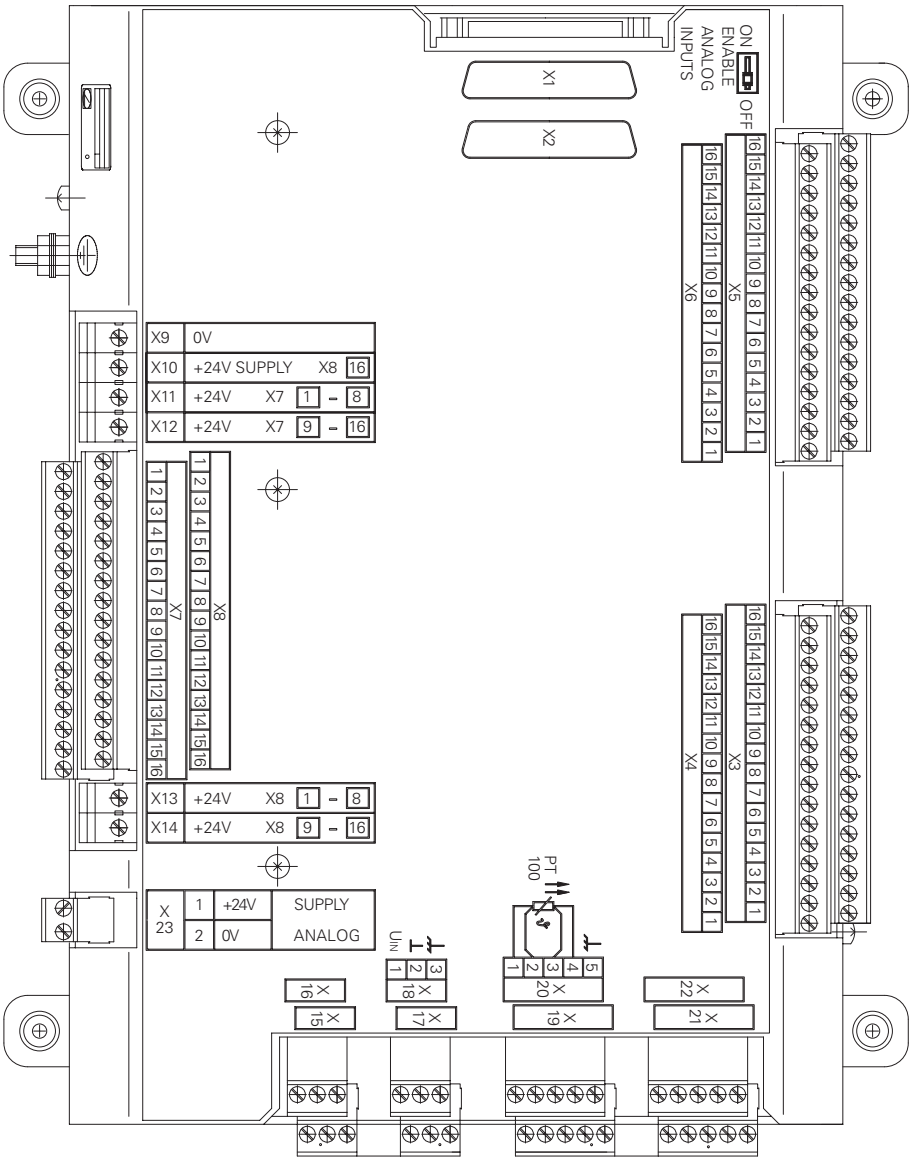
7.2 PLC Expansion Boards

7.2.1 Designation and position of connectors

PL 405 B



PL 410 B


X1
X2
ON
ENABLE
ANALOG
INPUTS
OFF
X5
X6
X9 0V
X10 +24V SUPPLY X8 16
X11 +24V X7 1 – 8
X12 +24V X7 9 – 16
X7
X8
X13 +24V X8 1 – 8
X14 +24V X8 9 – 16
X3
X4
X 23
1 +24V SUPPLY
2 0V ANALOG
PT 100
UIN
X15
X16
X17
X18
X19
X20
X21
X22

7.2.2 Pin layouts

X1:
PLC expansion on the MC

Pin layout of MC, connecting cable, and PL:

MC		Connecting cable Id. Nr. 289 111-xx			1. PL 4xx B	
D-sub (male) 25-pin, X47	**Assignment**	**D-sub cnnctr. (female) 25-pin**		**D-sub cnnctr. (male) 25-pin**	**D-sub cnnctn. (female) 25-pin**	**Assignment**
1	0 V	1	Brown, Yellow, Pink, Red, Violet	1	1	0 V
2	0 V	2	Red/Blue, Brown/ Green, Yellow/Brown, Gray/Brown, Pink/ Brown	2	2	0 V
3	0 V	3	Brown/blue, brown/red, brown/black, yellow/ gray, yellow/pink	3	3	0 V
4	Do not assign	4	Gray/Green	4	4	Serial IN 2
5	$\overline{\text{Address 6}}$	5	White/Green	5	5	$\overline{\text{Address 6}}$
6	INTERRUPT	6	Pink/Green	6	6	INTERRUPT
7	$\overline{\text{RESET}}$	7	Green/Blue	7	7	$\overline{\text{RESET}}$
8	$\overline{\text{WRITE EXTERN}}$	8	White/Blue	8	8	$\overline{\text{WRITE EXTERN}}$
9	WRITE EXTERN	9	White/Red	9	9	WRITE EXTERN
10	$\overline{\text{Address 5}}$	10	Gray/Pink	10	10	$\overline{\text{Address 5}}$
11	$\overline{\text{Address 3}}$	11	Blue	11	11	$\overline{\text{Address 3}}$
12	$\overline{\text{Address 1}}$	12	Green	12	12	$\overline{\text{Address 1}}$
13	Do not assign	13		13	13	Do not assign
14	PCB identifier 3	14	Yellow/Blue, Pink/Blue, Yellow/Black	14	14	+12 V
15	PCB identifier 4	15	Yellow/Red, Gray/Red, Pink/Red	15	15	+12 V
16	Do not assign	16	Gray/Blue	16	16	PCB identifier 2
17	Do not assign	17	Green/Black	17	17	PCB identifier 1
18	$\overline{\text{Address 7}}$	18	White/Yellow	18	18	$\overline{\text{Address 7}}$
19	Serial IN 1	19	White/Black	19	19	Serial IN 1
20	EM. STOP	20	Green/Red	20	20	EM. STOP
21	$\overline{\text{Serial OUT}}$	21	White/Gray	21	21	$\overline{\text{Serial OUT}}$
22	Serial OUT	22	White/Pink	22	22	Serial OUT
23	$\overline{\text{Address 4}}$	23	Black	23	23	$\overline{\text{Address 4}}$
24	$\overline{\text{Address 2}}$	24	Gray	24	24	$\overline{\text{Address 2}}$
25	$\overline{\text{Address 0}}$	25	White	25	25	$\overline{\text{Address 0}}$
Housing	External shield	Housing	External shield	Housing	Housing	External shield

X2: PLC expansion
PL 4xx B on PL 410B

Pin layout of MC, connecting cable, and PL:

PL 410B		Connecting cable Id. Nr. 289 111-xx			PL 4xx B	
D-sub cnnctr. (male) 25-pin	**Assignment**	**D-sub cnnctr. (female) 25-pin**		**D-sub connctr. (male) 25-pin**	**X1 D-sub (female) 25-pin**	**Assignment**
1	0 V	1	Brown, Yellow, Pink, Red, Violet	1	1	0 V
2	0 V	2	Red/Blue, Brown/Green, Yellow/Brown, Gray/Brown, Pink/Brown	2	2	0 V
3	0 V	3	Brown/blue, brown/red, brown/black, yellow/gray, yellow/pink	3	3	0 V
4	Do not assign	4	Gray/Green	4	4	Serial IN 2
5	$\overline{\text{Address 6}}$	5	White/Green	5	5	$\overline{\text{Address 6}}$
6	INTERRUPT	6	Pink/Green	6	6	INTERRUPT
7	$\overline{\text{RESET}}$	7	Green/Blue	7	7	$\overline{\text{RESET}}$
8	$\overline{\text{WRITE EXTERN}}$	8	White/Blue	8	8	$\overline{\text{WRITE EXTERN}}$
9	WRITE EXTERN	9	White/Red	9	9	WRITE EXTERN
10	$\overline{\text{Address 5}}$	10	Gray/Pink	10	10	$\overline{\text{Address 5}}$
11	$\overline{\text{Address 3}}$	11	Blue	11	11	$\overline{\text{Address 3}}$
12	$\overline{\text{Address 1}}$	12	Green	12	12	$\overline{\text{Address 1}}$
13	Do not assign	13		13	13	Do not assign
14	PCB identifier 4	14	Yellow/Blue, Pink/Blue, Yellow/Black	14	14	+12 V
15	PCB identifier 3	15	Yellow/Red, Gray/Red, Pink/Red	15	15	+12 V
16	PCB identifier 2	16	Gray/Blue	16	16	PCB identifier 2
17	PCB identifier 1	17	Green/Black	17	17	PCB identifier 1
18	$\overline{\text{Address 7}}$	18	White/Yellow	18	18	$\overline{\text{Address 7}}$
19	Serial IN 1	19	White/Black	19	19	Serial IN 1
20	EM. STOP	20	Green/Red	20	20	EM. STOP
21	$\overline{\text{Serial OUT}}$	21	White/Gray	21	21	$\overline{\text{Serial OUT}}$
22	Serial OUT	22	White/Pink	22	22	Serial OUT
23	$\overline{\text{Address 4}}$	23	Black	23	23	$\overline{\text{Address 4}}$
24	$\overline{\text{Address 2}}$	24	Gray	24	24	$\overline{\text{Address 2}}$
25	$\overline{\text{Address 0}}$	25	White	25	25	$\overline{\text{Address 0}}$
Housing	External shield	Housing	External shield	Housing	Housing	External shield

X3: PLC input

Terminal	Assignment			
	1. PL	2. PL	3. PL	4. PL
1	I64	I192	I256	I320
2	I65	I193	I257	I321
3	I66	I194	I258	I322
4	I67	I195	I259	I323
5	I68	I196	I260	I324
6	I69	I197	I261	I325
7	I70	I198	I262	I326
8	I71	I199	I263	I327
9	I72	I200	I264	I328
10	I73	I201	I265	I329
11	I74	I202	I266	I330
12	I75	I203	I267	I331
13	I76	I204	I268	I332
14	I77	I205	I269	I333
15	I78	I206	I270	I334
16	I79	I207	I271	I335

X4: PLC input

Terminal	Assignment			
	1. PL	2. PL	3. PL	4. PL
1	I80	I208	I272	I336
2	I81	I209	I273	I337
3	I82	I210	I274	I338
4	I83	I211	I275	I339
5	I84	I212	I276	I340
6	I85	I213	I277	I341
7	I86	I214	I278	I342
8	I87	I215	I279	I343
9	I88	I216	I280	I344
10	I89	I217	I281	I345
11	I90	I218	I282	I346
12	I91	I219	I283	I347
13	I92	I220	I284	I348
14	I93	I221	I285	I349
15	I94	I222	I286	I350
16	I95	I223	I287	I351

X5: PLC input

Terminal	Assignment			
	1. PL	2. PL	3. PL	4. PL
1	I96	I224	I288	I352
2	I97	I225	I289	I353
3	I98	I226	I290	I354
4	I99	I227	I291	I355
5	I100	I228	I292	I356
6	I101	I229	I293	I357
7	I102	I230	I294	I358
8	I103	I231	I295	I359
9	I104	I232	I296	I360
10	I105	I233	I297	I361
11	I106	I234	I298	I362
12	I107	I235	I299	I363
13	I108	I236	I300	I364
14	I109	I237	I301	I365
15	I110	I238	I302	I366
16	I111	I239	I303	I367

X6: PLC input

Terminal	Assignment			
	1. PL	2. PL	3. PL	4. PL
1	I112	I240	I304	I368
2	I113	I241	I305	I369
3	I114	I242	I306	I370
4	I115	I243	I307	I371
5	I116	I244	I308	I372
6	I117	I245	I309	I373
7	I118	I246	I310	I374
8	I119	I247	I311	I375
9	I120	I248	I312	I376
10	I121	I249	I313	I377
11	I122	I250	I314	I378
12	I123	I251	I315	I379
13	I124	I252	I316	I380
14	I125	I253	I317	I381
15	I126	I254	I318	I382
16	I127	I255	I319	I383

X7: PLC output

Terminal	Assignment			
	1. PL	2. PL	3. PL	4. PL
1	O32	O64	O128	O160
2	O33	O65	O129	O161
3	O34	O66	O130	O162
4	O35	O67	O131	O163
5	O36	O68	O132	O164
6	O37	O69	O133	O165
7	O38	O70	O134	O166
8	O39	O71	O135	O167
9	O40	O72	O136	O168
10	O41	O73	O137	O169
11	O42	O74	O138	O170
12	O43	O75	O139	O171
13	O44	O76	O140	O172
14	O45	O77	O141	O173
15	O46	O78	O142	O174
16	O47	O79	O143	O175

X8: PLC output

Terminal	Assignment			
	1. PL	2. PL	3. PL	4. PL
1	O48	O80	O144	O176
2	O49	O81	O145	O177
3	O50	O82	O146	O178
4	O51	O83	O147	O179
5	O52	O84	O148	O180
6	O53	O85	O149	O181
7	O54	O86	O150	O182
8	O55	O87	O151	O183
9	O56	O88	O152	O184
10	O57	O89	O153	O185
11	O58	O90	O154	O186
12	O59	O91	O155	O187
13	O60	O92	O156	O188
14	O61	O93	O157	O189
15	O62	O94	O158	O190
16	Control is ready			

X9 to X14: Power supply

Pin layout on the PL:

Terminal	Assignment	1. PL	2. PL	3. PL	4. PL
X9	0 V				
X10	+24 Vdc logic power supply and for control-is-ready signal				
X11	+24 Vdc Power supply for outputs	O32 – O39	O64 – O71	O128 – O135	O160 – O167
X12	+24 Vdc Power supply for outputs	O40 – O47	O72 – O79	O136 – O143	O168 – O175
X13	+24 Vdc Power supply for outputs	O48 – O55	O80 – O87	O144 – O151	O176 – O183
X14	+24 Vdc Power supply for outputs	O56 – O62	O88 – O94	O152 – O158	O184 – O190

X15 to X18: Analog input on the PL 410B

Connecting terminals	Assignment
1	-10 V to +10 V
2	0 V (reference potential)
3	Shield

X19 to X22: Connection for Pt 100 on the PL 410B

Connecting terminals	Assignment
1	I + Constant current for Pt 100
2	U + Measuring input for Pt 100
3	U – Measuring input for Pt 100
4	I – Constant current for Pt 100
5	Shield

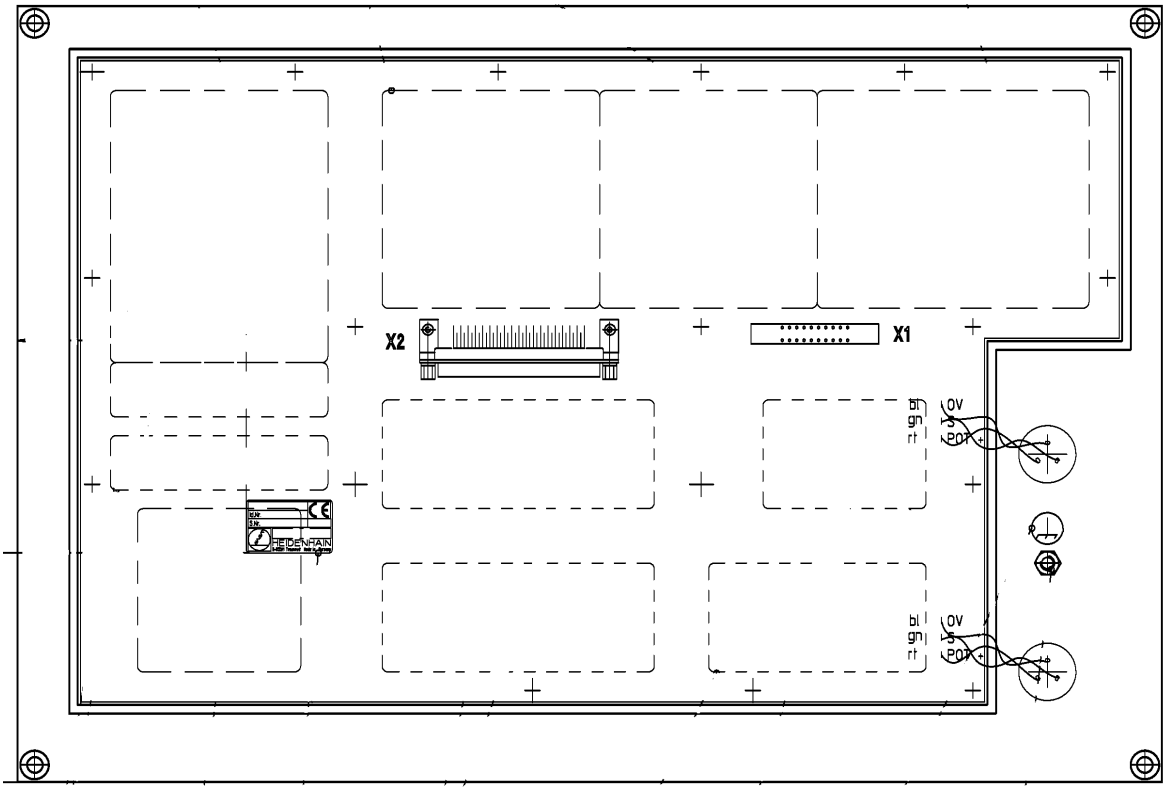
X23: Power supply for the analog inputs on the PL 410B

Terminal	Assignment
1	+24 V as per EN 50 178, 5.88
2	+0 V

7.3 iTNC Operating Panel

7.3.1 Designation and position of connectors

TE 420



7.3.2 Pin layouts

X1:
Connection of soft keys on the visual display unit with the iTNC operating panel

Pin layout of the iTNC operating panel:

Connecting element (male) 9-pin	Assignment
1	SL0
2	SL1
3	SL2
4	SL3
5	Do not assign
6	RL15
7	RL14
8	RL13
9	RL12

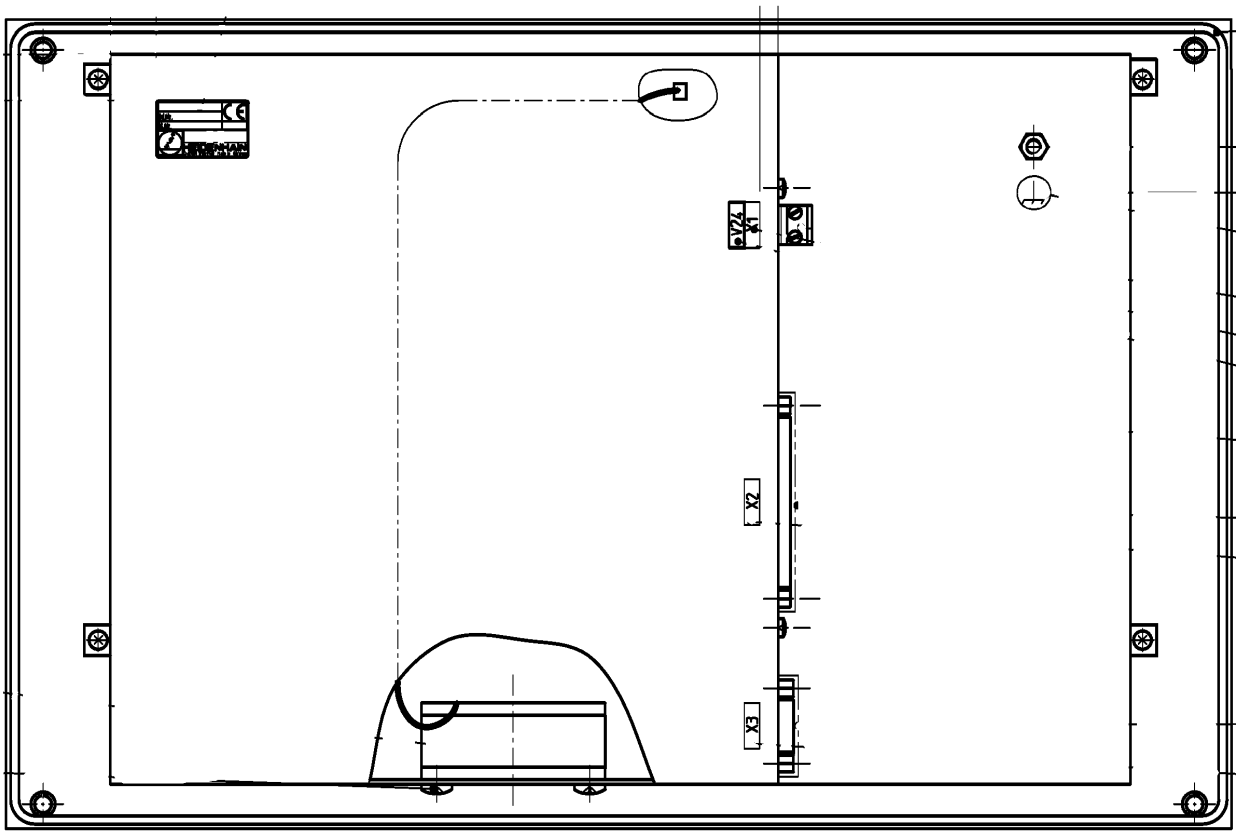
X2: iTNC operating panel

Pin layout of MC 422, connecting cable and iTNC operating panel:

MC 422		**Connecting cable Id. Nr. 263,954-xx**			**TE 420 313,038-xx**
D-sub connctn. (female) 37-pin	**Assignment**	**D-sub cnnctr. (male) 37-pin**		**D-sub cnnctr. (female) 37-pin**	**X2: D-sub connctn. (male) 37-pin**
1	RL0	1	Gray/Red	1	1
2	RL1	2	Brown/Black	2	2
3	RL2	3	White/Black	3	3
4	RL3	4	Green/Black	4	4
5	RL4	5	Brown/Red	5	5
6	RL5	6	White/Red	6	6
7	RL6	7	White/Green	7	7
8	RL7	8	Red/Blue	8	8
9	RL8	9	Yellow/Red	9	9
10	RL9	10	Gray/Pink	10	10
11	RL10	11	Black	11	11
12	RL11	12	Pink/Brown	12	12
13	RL12	13	Yellow/Blue	13	13
14	RL13	14	Green/Blue	14	14
15	RL14	15	Yellow	15	15
16	RL15	16	Red	16	16
17	RL16	17	Gray	17	17
18	RL17	18	Blue	18	18
19	RL18	19	Pink	19	19
20	SL0	20	White/Gray	20	20
21	SL1	21	Yellow/Gray	21	21
22	SL2	22	Green/Red	22	22
23	SL3	23	White/Pink	23	23
24	SL4	24	Gray/Green	24	24
25	SL5	25	Yellow/ Brown	25	25
26	SL6	26	Gray/Brown	26	26
27	SL7	26	Yellow/Black	27	27
28	RL19	28	White/Yellow	28	28
29	RL20	29	Gray/Blue	29	29
30	Do not assign	30	Pink/Blue	30	30
31	RL21	31	Pink/Red	31	31
32	RL22	32	Brown/Blue	32	32
33	RL23	33	Pink/Green	33	33
34	Spindle override (wiper)	34	Brown	34	34
35	Feed-rate override (wiper)	35	Yellow/Pink	35	35
36	+5 V override potentiometer	36	Violet	36	36
37	0 V override potentiometer	37	White	37	37
Housing	External shield	Housing	External shield	Housing	Housing

7.4 Visual Display Units

7.4.1 BF 120



Connection layouts

X1
Power supply

Connecting terminal X1	Assignment
1	+24 V
2	0 V

X2
Connection to MC

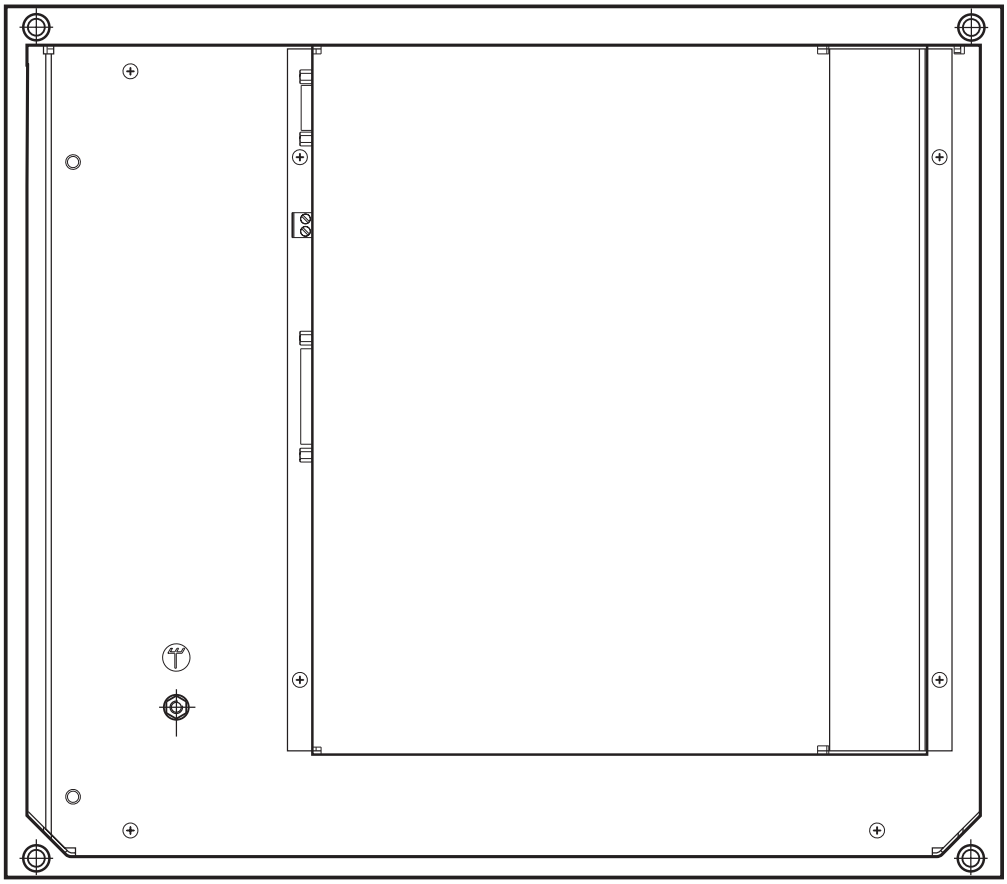
MC 422, X149		Connecting cable Id. Nr. 353 545-xx			BF 150, X2
D-sub connctn. (female) 44-pin	**Assignment**	**D-sub connctr. (male), 44-pin**		**D-sub connctr. (female), 44-pin**	**D-sub connctn. (male) 44-pin**
1	A7M	1		1	1
2	A6M	2	White/Brown	2	2
3	A5M	3	White/Green	3	3
4	A4M	4	Red/Gray	4	4
5	A3M			5	5
6	CLKM	6	Red/Blue	6	6
7	A2M	7	White/Orange	7	7
8	A1M	8	Red/Brown	8	8
9	A0M	9	Red/Green	9	9
10	LVDSGND	10	Red/Orange	10	10
11	HWK_GND	11	Orange/Red	11	11
12	HWK0	12	White/Blue	12	12
13	HWK1	13	Blue/White	13	13
14	HWK2	14	White/Gray	14	14
15	HWK3	15	Gray/White	15	15
16	A7P	16		16	16
17	A6P	17	Brown/White	17	17
18	A5P	18	Green/White	18	18
19	A4P	19	Gray/Red	19	19
20	A3P			20	20
21	CLKP	21	Blue/Red	21	21
22	A2P	22	Orange/White	22	22
23	A1P	23	Brown/Red	23	23
24	A0P	24	Green/Red	24	24
25	Not assigned			25	25
26	Not assigned			26	26
27	Not assigned			27	27
28	Not assigned			28	28
29	Not assigned			29	29
30	Not assigned			30	30
31	LVDSGND			31	31
32	LVDSGND			32	32
33	LVDSGND			33	33

MC 422, X149		Connecting cable Id. Nr. 353 545-xx			BF 150, X2
D-sub connctn. (female) 44-pin	**Assignment**	**D-sub connctr. (male), 44-pin**		**D-sub connctr. (female), 44-pin**	**D-sub connctn. (male) 44-pin**
34	LVDSGND			34	34
35	LVDSGND			35	35
36	LVDSGND			36	36
37	LVDSGND			37	37
38	LVDSGND			38	38
39	LVDSGND			39	39
40	Not assigned			40	40
41	Not assigned			41	41
42	Not assigned			42	42
43	Not assigned			43	43
44	Not assigned			44	44
Housing		Housing		Housing	Housing

X3
Connection of soft keys to keyboard unit

see "Pin layouts" on page 133

7.4.2 BF 150



Pin layouts

X1
Power supply

Connecting terminal X1	Assignment
1	+24 V
2	0 V

X2
Connection to MC

MC 422, X149		Connecting cable Id. Nr. 353 545-xx			BF 150, X2
D-sub connctn. (female) 44-pin	Assignment	D-sub connctr. (male), 44-pin		D-sub connctr. (female), 44-pin	D-sub connctn. (male) 44-pin
1	A7M	1		1	1
2	A6M	2	White/Brown	2	2
3	A5M	3	White/Green	3	3
4	A4M	4	Red/Gray	4	4
5	A3M			5	5
6	CLKM	6	Red/Blue	6	6
7	A2M	7	White/Orange	7	7
8	A1M	8	Red/Brown	8	8
9	A0M	9	Red/Green	9	9
10	LVDSGND	10	Red/Orange	10	10

MC 422, X149		Connecting cable Id. Nr. 353 545-xx			BF 150, X2
D-sub connctn. (female) 44-pin	**Assignment**	**D-sub connctr. (male), 44-pin**		**D-sub connctr. (female), 44-pin**	**D-sub connctn. (male) 44-pin**
11	HWK_GND	11	Orange/Red	11	11
12	HWK0	12	White/Blue	12	12
13	HWK1	13	Blue/White	13	13
14	HWK2	14	White/Gray	14	14
15	HWK3	15	Gray/White	15	15
16	A7P	16		16	16
17	A6P	17	Brown/White	17	17
18	A5P	18	Green/White	18	18
19	A4P	19	Gray/Red	19	19
20	A3P			20	20
21	CLKP	21	Blue/Red	21	21
22	A2P	22	Orange/White	22	22
23	A1P	23	Brown/Red	23	23
24	A0P	24	Green/Red	24	24
25	Not assigned			25	25
26	Not assigned			26	26
27	Not assigned			27	27
28	Not assigned			28	28
29	Not assigned			29	29
30	Not assigned			30	30
31	LVDSGND			31	31
32	LVDSGND			32	32
33	LVDSGND			33	33
34	LVDSGND			34	34
35	LVDSGND			35	35
36	LVDSGND			36	36
37	LVDSGND			37	37
38	LVDSGND			38	38
39	LVDSGND			39	39
40	Not assigned			40	40
41	Not assigned			41	41
42	Not assigned			42	42
43	Not assigned			43	43
44	Not assigned			44	44
Housing		Housing		Housing	Housing

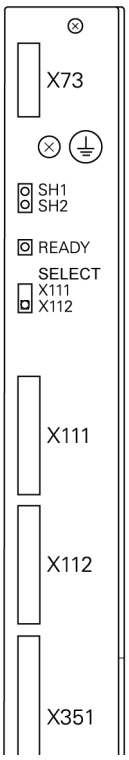
X3 Connection of soft keys to keyboard unit

see "Pin layouts" on page 133

7.5 Interface Card for Simodrive 611D

7.5.1 Interface card Id.Nr. 324 955-xx

Overview LEDs and connectors



Designation	Element
X73	Enabling connector
⏚	Equipment ground
SH1	Pulse release disabled
SH2	Pulse release disabled
READY	Ready for operation (green)
SELECT	Slide switch: X111 or X112
X111	PWM, axis/spindle
X112	PWM, axis/spindle
X351	SIMODRIVE unit bus

Pin layout X111, X112 Connection to iTNC

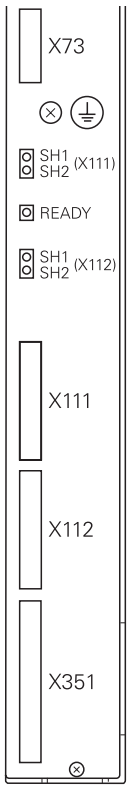
see "X51 to X62: PWM output" on page 122

Description of LEDs

LED	Condition	Meaning/possible causes of error
READY (green),	LED On (operating state)	Axis 1 and axis 2 are ready for operation MCU acknowledges readiness (both LED SH1 are Off)
	LED Off (error)	■ The safety relay did not respond (is 24 V power supply available at X73/3)? ■ RESET (+24 V) from unit bus? ■ Controller pulse inhibit (+15 V) from unit bus? ■ P5 (+5 V) does not exist?
SH1 (red)	LED On (error)	MCU acknowledges error in readiness (X111 or X112-SH1 Pin 5a low)
SH2 (red)	LED usually off	**No** controller enable for axis by iTNC. With PLC module 9161, the iTNC sets the axis-specific internal current and speed controller (X111 or X112 Pin 4a high). ■ Speed and current controller are not active? ■ Clamping axis clamped? ■ No M function active for spindle?

7.5.2 Interface card Id.Nr. 31 437-xx

Overview LEDs and connectors



Designation	Operating element
X73	Enabling connector
⏚	Equipment ground
SH1 SH2	Pulse release disabled (red) Pulse release disabled (red)
READY	Ready for operation (green)
SH1 SH2	Pulse release disabled (red) Pulse release disabled (red)
X111	PWM, axis/spindle
X112	PWM, axis/spindle
X351	SIMODRIVE unit bus

Pin layout X111, X112 Connection to iTNC

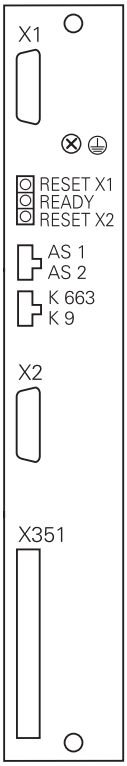
see "X51 to X62: PWM output" on page 122

Description of LEDs

LED	Condition	Meaning/Possible causes of error
READY (green)	LED On (operating state)	Axis 1 and axis 2 are ready for operation. MCU acknowledges readiness (both SH1 LEDs are Off)
	LED Off (error)	■ The safety relay did not respond. (Is 24 V power supply available at X73/3)? ■ RESET (+24 V) from unit bus? ■ Controller pulse inhibit (+15 V) from unit bus? ■ P5 (+5 V) does not exist?
SH1 (red) (X111/ X112)	LED On (error)	MCU acknowledges error in readiness. (X111/X112-SH1 pin 5a low)
SH2 (red) (X111/ X112)	LED usually off	**No** controller enable for axis by MC. With PLC module 9161, the iTNC sets the axis-specific internal current and speed controller (X111/X112 pin 4a high). ■ Speed and current controller are not active? ■ Clamping axis clamped? ■ No M function active for spindle?

7.5.3 Interface card Id.Nr. 324 952-1x

Overview LEDs and connectors



Designation	Element
X1	Connection of CC
⏚	Equipment ground
RESET X1	RESET axis 1
READY	Ready
RESET X2	RESET axis 2
AS1	Normally closed contact 1
AS2	Normally closed contact 2
K663	Safety relay for pulse release
K9	Power supply for safety relay (from SIMODRIVE unit bus)
X2	Connection of CC
X351	SIMODRIVE unit bus

Pin layout X1, X2 Connection to iTNC

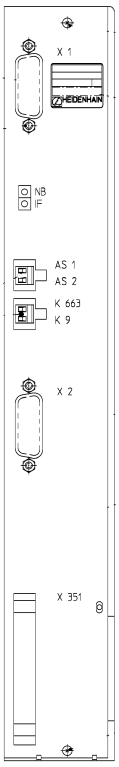
see "X51 to X62: PWM output" on page 122

Description of LEDs

LED	Condition	Meaning/Possible causes of error
READY (green)	LED On (operating state)	Pulse release for axis 1 and axis 2.
	LED Off (error)	■ The safety relay did not respond. (Is 24 V power supply available at contact K663)? ■ RESET (X1 or X2 Pin 5 +24 V) from unit bus? ■ Controller pulse inhibit (+15 V) from unit bus? ■ Is P5 (+5 V) from Siemens unit bus not available?
RESET X1 (red)	LED usually off	**No** controller enable for axis by iTNC. Path for PWM signals **not** enabled. With PLC module 9161, the iTNC sets the axis-specific internal current and speed controller (X1 pin 5 high).
RESET X2 (red)	LED usually off	**No** controller enable for axis by iTNC. Path for PWM signals **not** enabled. With PLC module 9161, the iTNC sets the axis-specific internal current and speed controller (X2 pin 5 high).

7.5.4 Interface card Id.Nr. 324 952-0x

Overview LEDs and connectors



Designation	Element
X1	Connection of CC
NB	Not ready: Monitoring of U_Z, temperature, Power supply
IF	Pulse release
AS1	Normally closed contact 1
AS2	Normally closed contact 2
K663	Safety relay for pulse release
K9	Power supply for safety relay (from SIMODRIVE unit bus)
X2	Connection of CC
X351	SIMODRIVE unit bus

Pin layout X1, X2 Connection to iTNC

see "X51 to X62: PWM output" on page 122

Description of LEDs

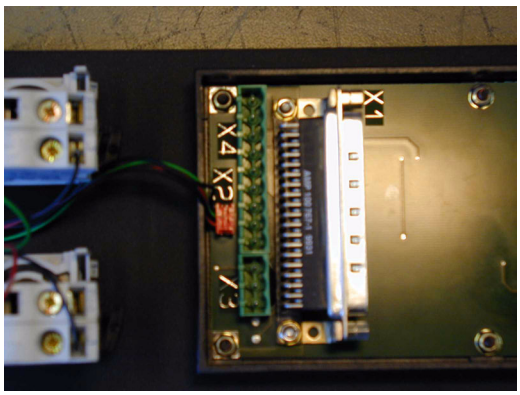
LED	Condition	Meaning/Possible causes of error
IF (green),	LED On (operating state)	Pulse enable
	LED Off (error)	■ The safety relay did **not respond**. (Is 24 V power supply available at contact K663)? ■ Is P5 (5 V) from Siemens unit bus not available?
NB (red), Not ready	LED On (error)	■ Inverter does not acknowledge readiness: X1, X2 pin 6 at low? ■ The safety relay did not respond (is 24 V power supply available at contact K663)? ■ Is P5 (+5 V) from Siemens unit bus not available? (level< 4.55 V)? ■ **RESET** (X1 or X2 pin 5 +24 V) from unit bus? ■ Controller pulse inhibit **RIMS** (+15 V) from unit bus? ■ Is the dc-link voltage greater than the critical threshold of 710 V (only version -01)?

Note

As soon as the inverter is in standby mode, the PLC can set axis-specific internal current and speed controllers via PLC module 9161. The **RESET** signal (X1 or X2 pin 5) is canceled and the path for the PWM signals is enabled.

7.6 Machine Operating Panel

7.6.1 MB 420



Pin layout

X1:
Connection to MC

MC 422		Connecting cable Id. Nr. 263 954-xx			MB 420	
D-sub connctn. (female) 37-pin	**Assignment**	**D-sub connctr. (male) 37-pin**		**D-sub connctn. (female) 37-pin**	**D-sub connctn. (male) 37-pin**	**Key**
1	I128	1	Gray/Red	1	1	X –
2	I129	2	Brown/Black	2	2	Y –
3	I130	3	White/Black	3	3	Z –
4	I131	4	Green/Black	4	4	IV –
5	I132	5	Brown/Red	5	5	V –
6	I133	6	White/Red	6	6	X +
7	I134	7	White/Green	7	7	Y +
8	I135	8	Red/Blue	8	8	Z +
9	I136	9	Yellow/Red	9	9	IV +
10	I137	10	Gray/Pink	10	10	V +
11	I138	11	Black	11	11	Tool change
12	I139	12	Pink/Brown	12	12	Unlock tool
13	I140	13	Yellow/Blue	13	13	Menu selection
14	I141	14	Green/Blue	14	14	Unlock door
15	I142	15	Yellow	15	15	Chip removal
16	I143	16	Red	16	16	Spindle on
17	I144	17	Gray	17	17	Spindle off
18	I145	18	Blue	18	18	Coolant
19	I146	19	Pink	19	19	NC start
20	I147	20	White/Gray	20	20	NC stop
21	I148	21	Yellow/Gray	21	21	Rapid trav.
22	I149	22	Green/Red	22	22	Retract axis
23	I150	23	White/Pink	23	23	Rinse water jet
24	I151	24	Gray/Green	24	24	Via X3
25	I152	25	Yellow/Brown	25	25	Via X3

MC 422		Connecting cable Id. Nr. 263 954-xx			MB 420	
D-sub connctn. (female) 37-pin	**Assignment**	**D-sub connctr. (male) 37-pin**		**D-sub connctn. (female) 37-pin**	**D-sub connctn. (male) 37-pin**	**Key**
26	O0*	26	Gray/Brown	26	26	Via X4
27	O1*	26	Yellow/Black	27	27	Via X4
28	O2*	28	White/Yellow	28	28	Via X4
29	O3*	29	Gray/Blue	29	29	Via X4
30	O4*	30	Pink/Blue	30	30	Via X4
31	O5*	31	Pink/Red	31	31	Via X4
32	O6*	32	Brown/Blue	32	32	Via X4
33	O7*	33	Pink/Green	33	33	Via X4
34, 35	0 V (PLC)	34, 35	Brown, Yellow/Pink	34, 35	34, 35	
36, 37	+24 V (PLC)	36	Violet, white	36, 37	36,37	
Housing	Ext. shield	Housing	External shield	Housing	Housing	

X3:
PLC inputs

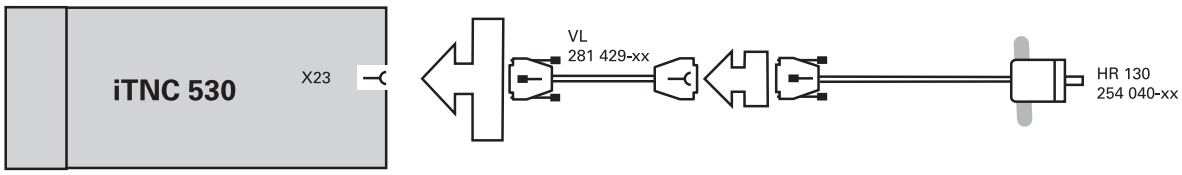
Terminal	Assignment
1	I151
2	I152
3	+24 V

X4:
PLC outputs

Terminal	Assignment
1	O0
2	O1
3	O2
4	O3
5	O4
6	O5
7	O6
8	O7
9	0 V

7.7 Handwheels

7.7.1 HR 130 (Panel-mounted handwheel)



Pin layouts

X23:
Handwheel input

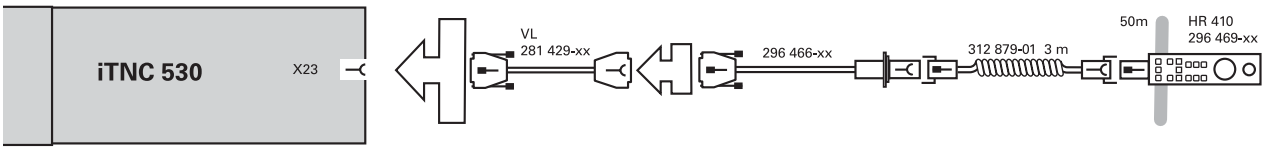
Pin layout of the logic unit:

D-sub connection (female) 9-pin	Assignment
1	CTS
2	0 V
3	RTS
4	+12 V
5	Do not assign
6	DTR
7	TxD
8	RxD
9	DSR
Housing	External shield

Pin layout for extension cable and handwheel:

Extension cable Id. Nr. 281 429-xx			HR 130 Id. Nr. 254 040-xx	
D-sub cnnctr. (male) 9-pin	Color	D-sub connctr. (female) 9-pin	D-sub cnnctr. (male) 9-pin	Color
Housing	Shield	Housing	Housing	Shield
2	White	2	2	White
4	Brown	4	4	Brown
6	Yellow	6	6	Yellow
8	Green	8	8	Green
7	Gray	7		

7.7.2 HR 410 (Portable handwheel)



Pin layouts

X23:
Handwheel input

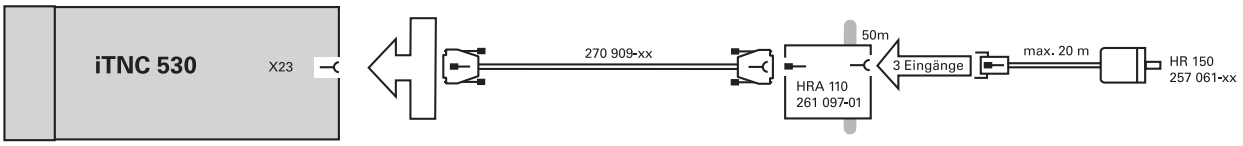
Pin layout of the logic unit:

D-sub connection (female) 9-pin	Assignment
1	CTS
2	0 V
3	RTS
4	+12 V
5	Do not assign
6	DTR
7	TxD
8	RxD
9	DSR
Housing	External shield

Pin layout for the various extension cables, adapter cables, connecting cables, and the handwheel:

Extension cable Id. Nr. 281 429-xx			**Adapter cable Id. Nr. 296 466-xx**			**VB**			**HR 410 Id. Nr. 296 469-xx**	
D-sub connctr. (male) 9-pin		**D-sub connctr. (female) 9-pin**	**D-sub connctr. (male) 9-pin**		**Cplng. on mntng. base (fem.) (5+7)-pin**	**Cnnctr. (male) (5+7)-pin**		**Cnnctr. (female) (5+7)-pin**	**Cnnctr. (male) (5+7)-pin**	
Housing	Shield	Housing	Housing	Shield	Housing	Housing	Shield	Housing	Housing	Shield
2	WH	2	2	WH	E	E	WH	E	E	
4	BN	4	4	BN	D	D	BN	D	D	
6	YE	6	6	YE	B	B	YE	B	B	
7	Gray	7	7	Gray	A	A	Gray	A	A	
8	Green	8	8	Green	C	C	Green	C	C	
					6	6	BK	6	6	
					7	7	RD/ BL	7	7	
					5	5	Red	5	5	
					4	4	Blue	4	4	
					2	2	WH/ GN	2	2	
					3	3	BN/ GN	3	3	
					1	1	GY/ PK	1	1	
				WH/ BN	3	Contact 1 + 2				
				WH/ YL	2	Contact 2 (left) permissive button				
				WH/ GN	1	Contact 1 (right)				
				WH/ BL	1	Contact 1				
				WH/ RD	2	Contact 1 EMERGENCY STOP				
				YL/BK	3	Contact 2				
				WH/ BK	4	Contact 2				

7.7.3 HRA 110 (Multi-axis handwheel)



Pin layout

X1, X2, X3: Inputs for HR 150 handwheels

Pin layout on the HRA 110 for the HR 150:

HRA 110 261 097-xx	
Connection (female) 9-pin	**Assignment**
1	I_1 +
2	I_1 –
5	I_2 +
6	I_2 –
7	I_0 –
8	I_0 +
3	+5 V
4	0 V
9	Internal shield
Housing	External shield

X23: Connection to MC

Pin layout on the HRA 110:

HRA 110 261 097-xx	
D-sub connection (female) 9-pin	**Assignment**
1	RTS
2	0 V
3	CTS
4	+ 12 V + 0.6 V (U_V)
5	Do not assign
6	DSR
7	RxD
8	TxD
9	DTR
Housing	External shield

X31: Supply voltage

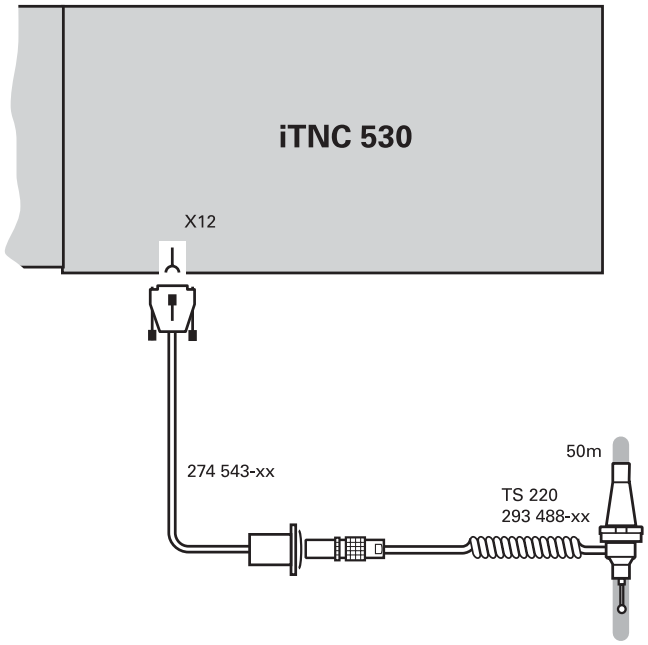
Pin layout on the HRA 110:

HRA 110 261 097-xx	
Connecting terminal	**Assignment**
1	+ 24 Vdc as per IEC 742 (VDE 551)
2	0 V

Maximum current consumption 200 mA.

7.8 Touch Probe Systems

7.8.1 TS 220

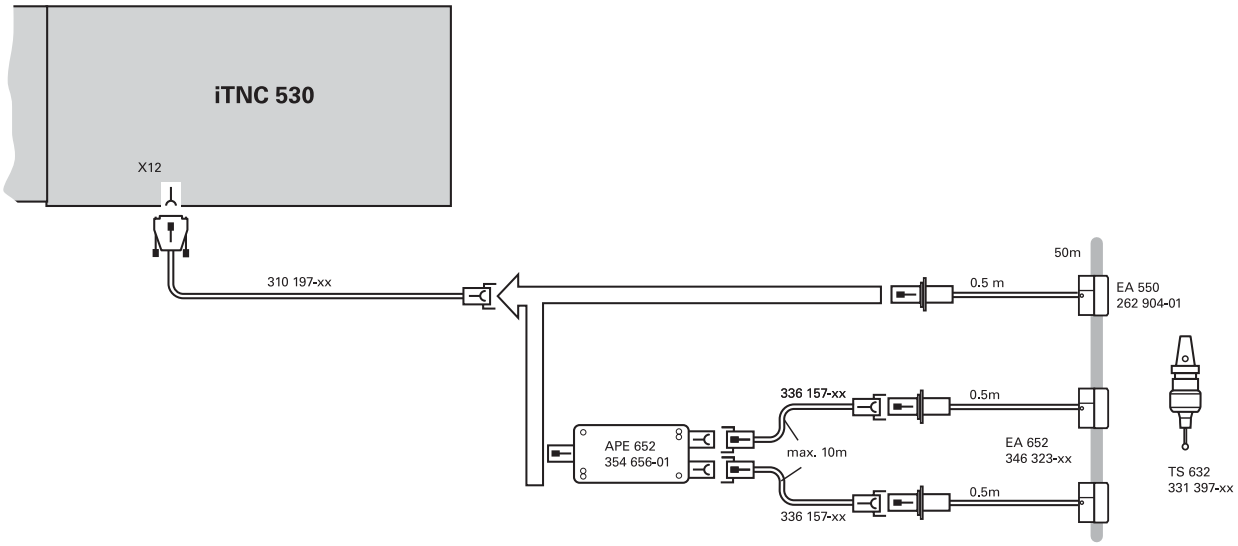


Pin layout

MC, X12		AK 274 543-xx			TS 220	
Female	**Assignment**	**Male**	**Color**	**Pin**	**Pin**	**Color**
1	0 V (internal shield)	1				
2	Do not assign	2				
3	Ready	3	Pink	4	4	
4	Start	4				
5	+ 15 V ± 10% (U_P), max. 100 mA	5	Gray	3	3	
6	+5 V ± 5% (U_P), max. 100 mA	6	Brown/ Green	2	2	Brown
7	$\overline{\text{Battery warning}}$	7	Gray			
8	0 V (U_N)	8	White/Green	1	1	White
9	Trigger signal	9	Green	5	5	Green
10	$\overline{\text{Trigger signal}}$[a]	10	Yellow	6	6	Yellow
11 to 15	Do not assign	11 to 15				
Hsg.	External shield	Hsg.	External shield	Hsg.		

a. Stylus at rest means logic level HIGH.

7.8.2 TS 632



Pin layout

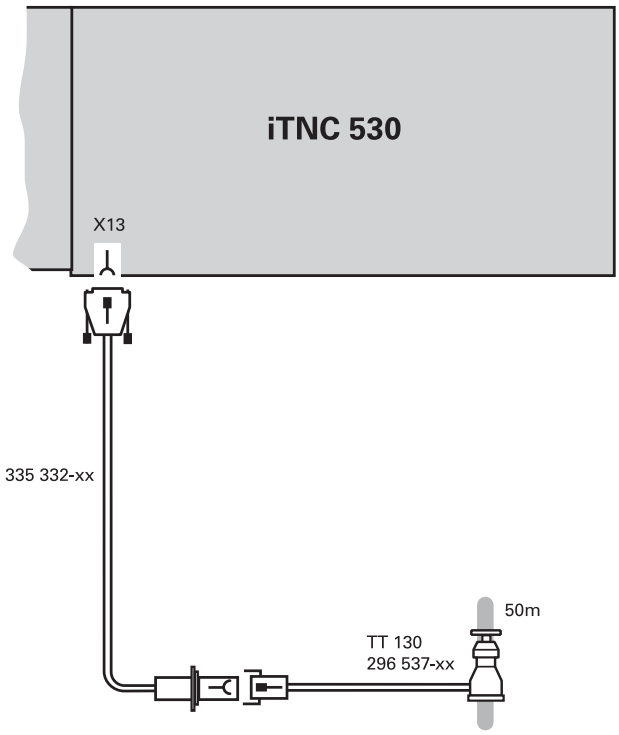
MC 422		AK 310 197-xx			EA 632 346 322-xx		TS 632
Female	**Assignment**	**Male**	**Color**	**Female**	**Male**	**Color**	
1	0 V (internal shield)	1	White/ Brown	7	7	White/ Brown	
2	Do not assign						
3	Ready	3	Gray	5	5	Gray	
4	Start	4	Yellow	3	3		
5	+ 15 V ± 10% (U_P), max. 100 mA	5	Brown	2	2	Brown	
6	+5 V ± 5% (U_P), max. 100 mA						
7	$\overline{\text{Battery warning}}$	7	Blue	6	6	Blue	
8	0 V (U_N)	8	White	1	1	White	
9	Trigger signal						
10	$\overline{\text{Trigger signal}}$[a]	10	Green	4	4	Green	
11 to 15	Do not assign						
Hsg.	External shield	Hsg.	External shield	Hsg.	Hsg.		

a. Stylus at rest means logic level HIGH.

Pin layout for TS 632 with two EA 652 via the APE 652:

MC 422	Adapter cable 310 197-xx	APE 652 354 656-xx		VB 336 157-xx			EA 652 346 323-xx		TS 632
		Male	Female	Male	Color	Female	Male	Color	
For the layout see TS632 with EA632 on page 108		7	7	7	White/ Brown	7	7	White/ Brown	
		5	5	5	Gray	5	5	Gray	
		3	3	3	Yellow	3	3		
		2	2	2	Brown	2	2	Brown	
		6	6	6	Blue	6	6	Blue	
		1	1	1	White	1	1	White	
		4	4	4	Green	4	4	Green	
		Hsg.	Hsg.	Hsg.	External shield	Hsg.	Hsg.		

7.8.3 TT 130



Pin layout Pin layout on adapter cable and touch probe:

MC 422		AK 335 332-xx			TT 130 296 537-xx	
Female	**Assignment**	**Male**	**Color**	**Female**	**Male**	**Color**
1	Ready	1	Pink	6	6	
2	0 V (U_N)	2	White/Green	1	1	White
3	Do not assign	3				
4	+15 V ± 5% (U_P)	4	Brown/Green	2	2	Brown
5	Do not assign	5		5	5	
6	Do not assign	6				
7	+5 V ± 5% (U_P)	7				
8	Trigger signal	8	Brown	3	3	Green
9	$\overline{\text{Trigger signal}}$[a]	9	Green	4	4	Yellow
–	–	–	–	7	7	
Hsg.	External shield	Hsg.	External shield	Hsg.	Hsg.	

a. Stylus at rest means logic level HIGH.

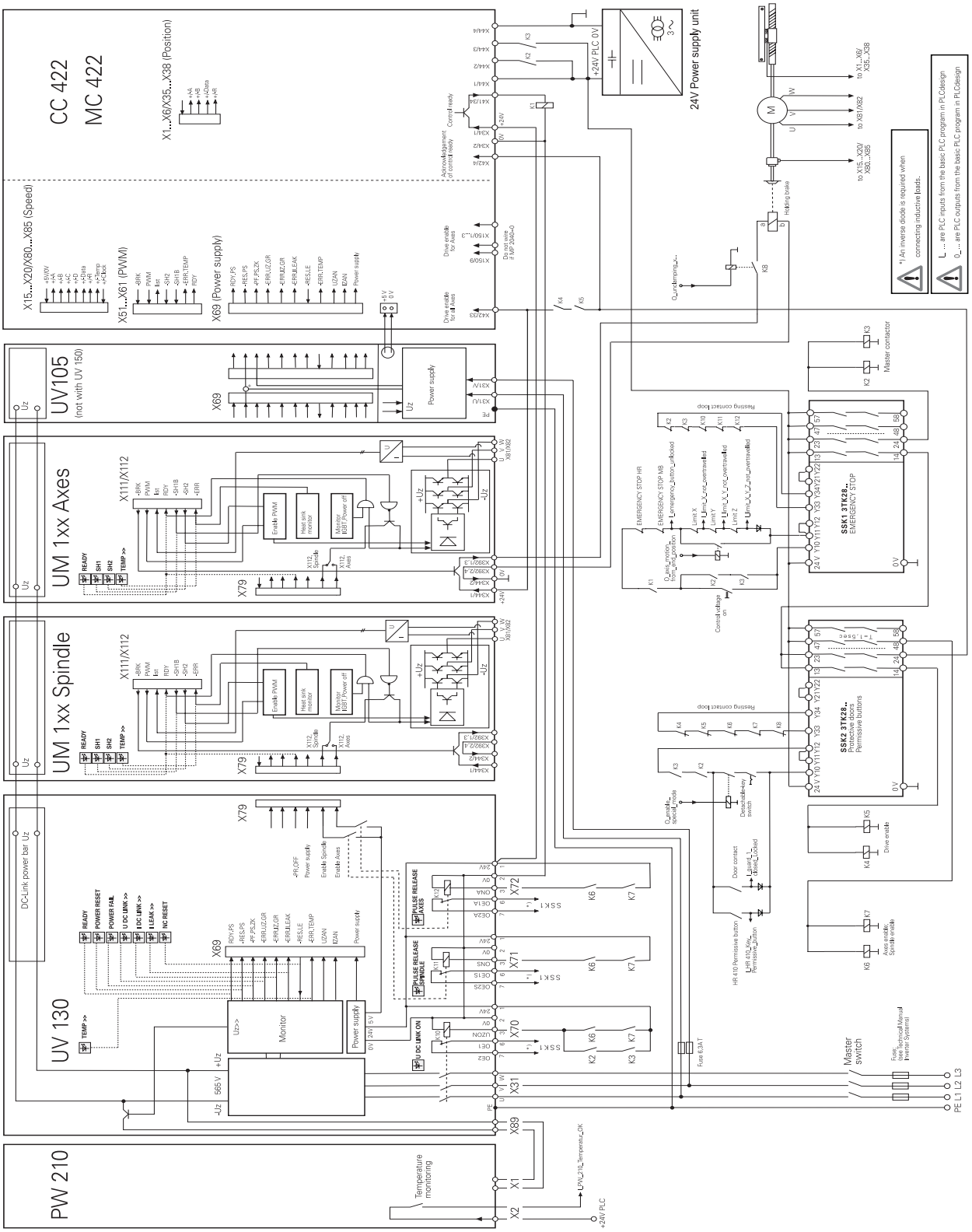
8 Grounding Diagrams and Block Diagrams

8.1 Grounding Diagram

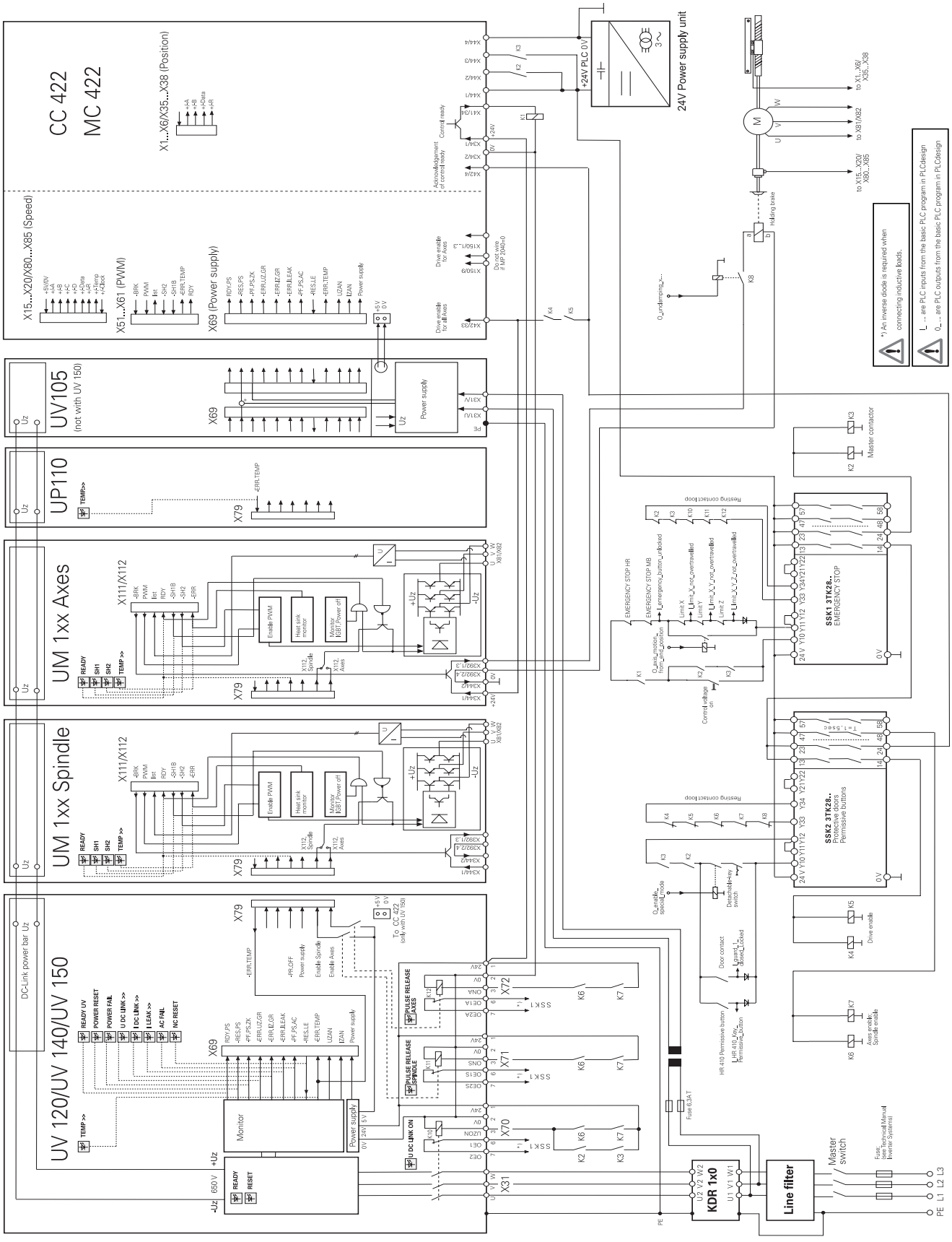
In preparation

8.2 Basic Circuit Diagrams

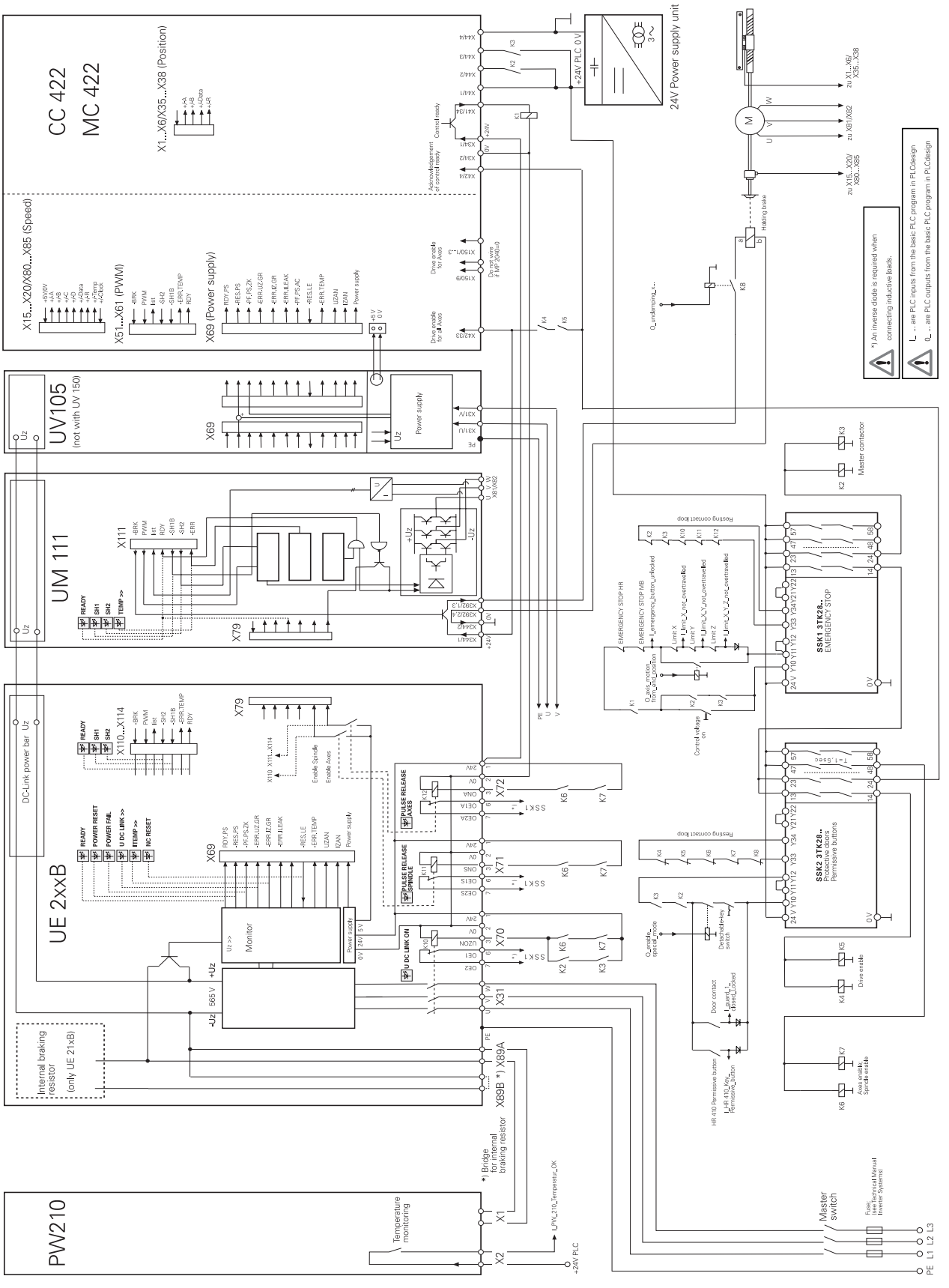
iTNC 530 with Modular Non-Regenerative HEIDENHAIN Inverter System



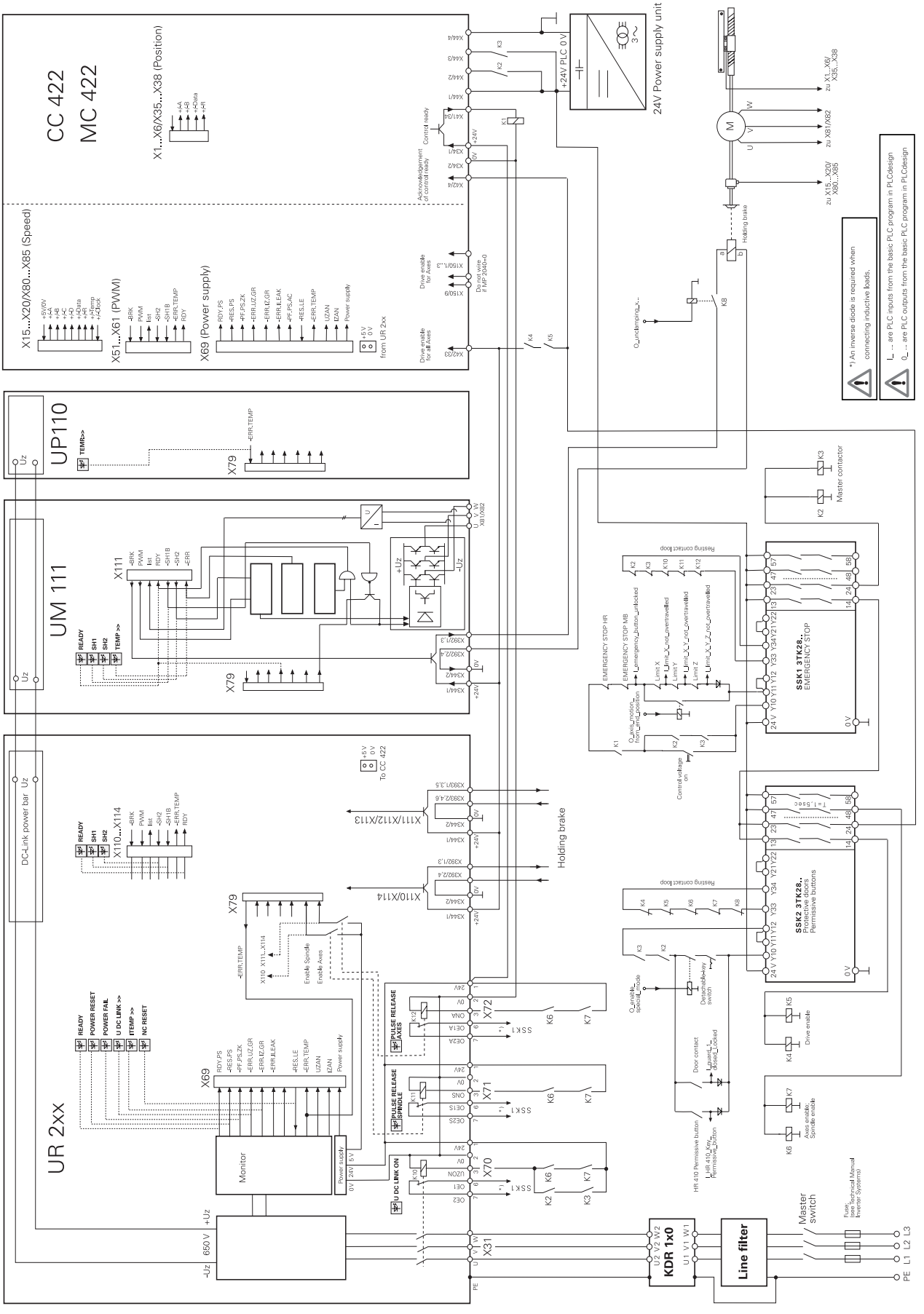
iTNC 530 with Modular Regenerative HEIDENHAIN Inverter System



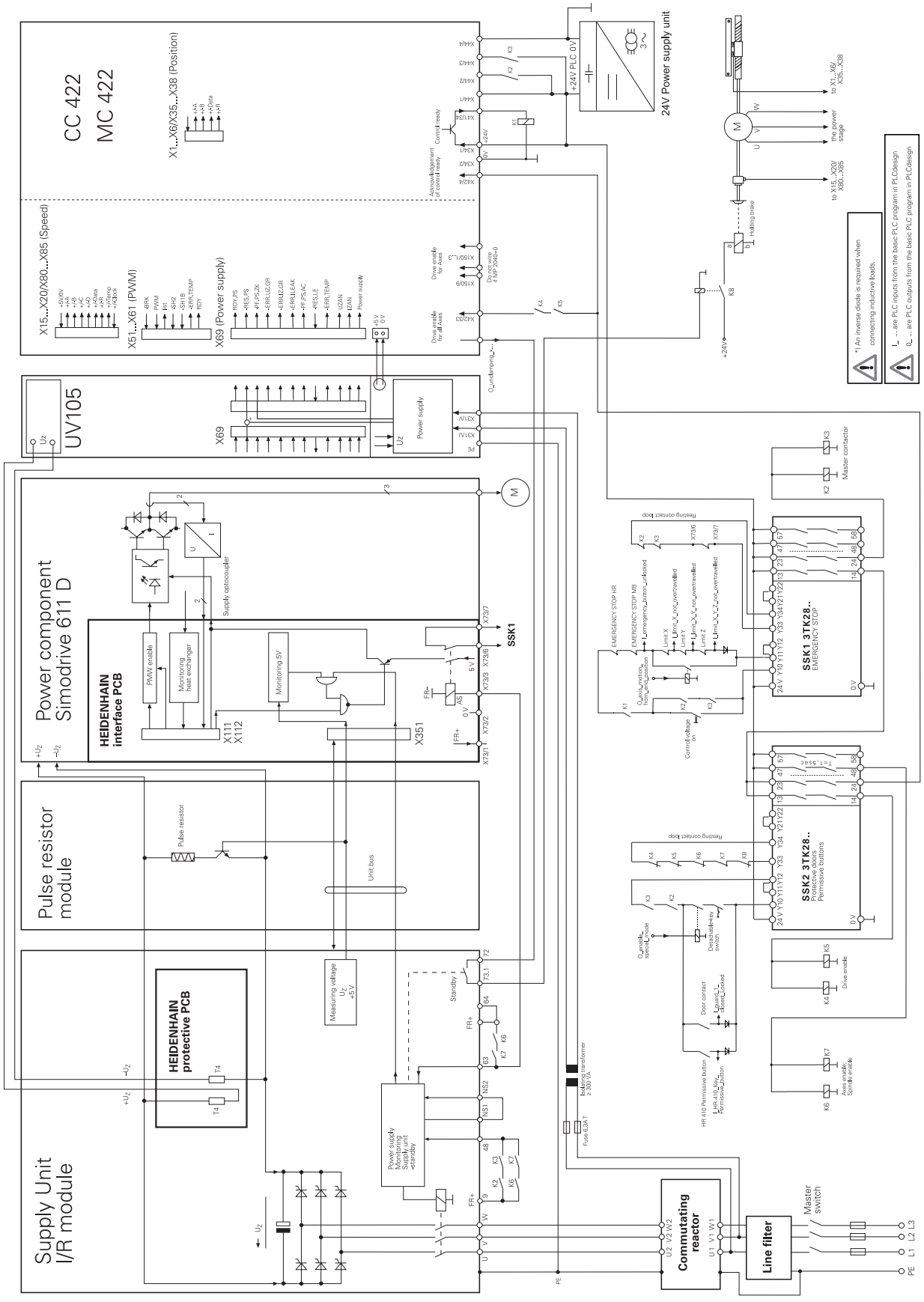
iTNC 530 with UE 2xxB Non-Regenerative HEIDENHAIN Compact Inverter



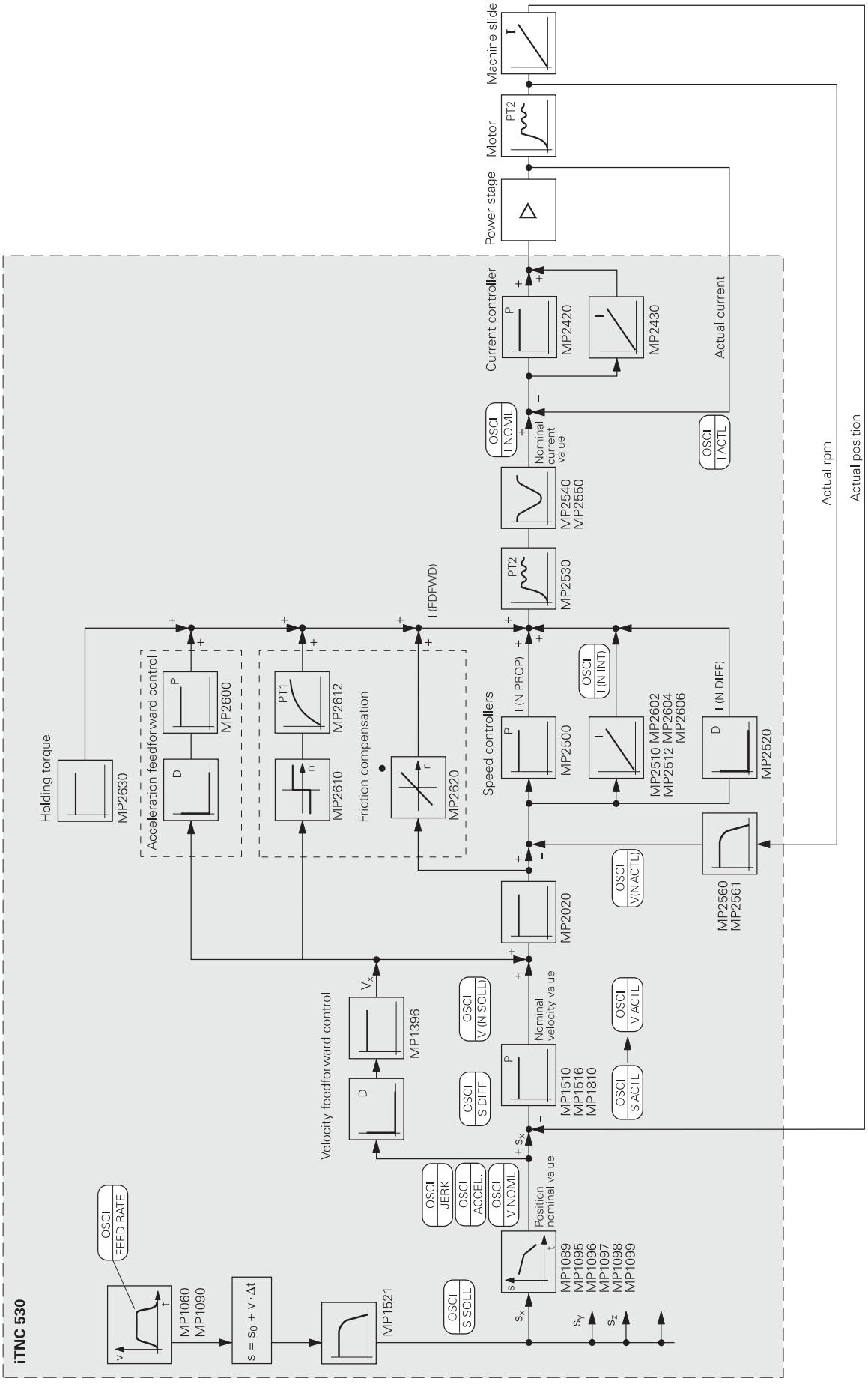
iTNC 530 with UR 2xx Regenerative HEIDENHAIN Compact Inverter



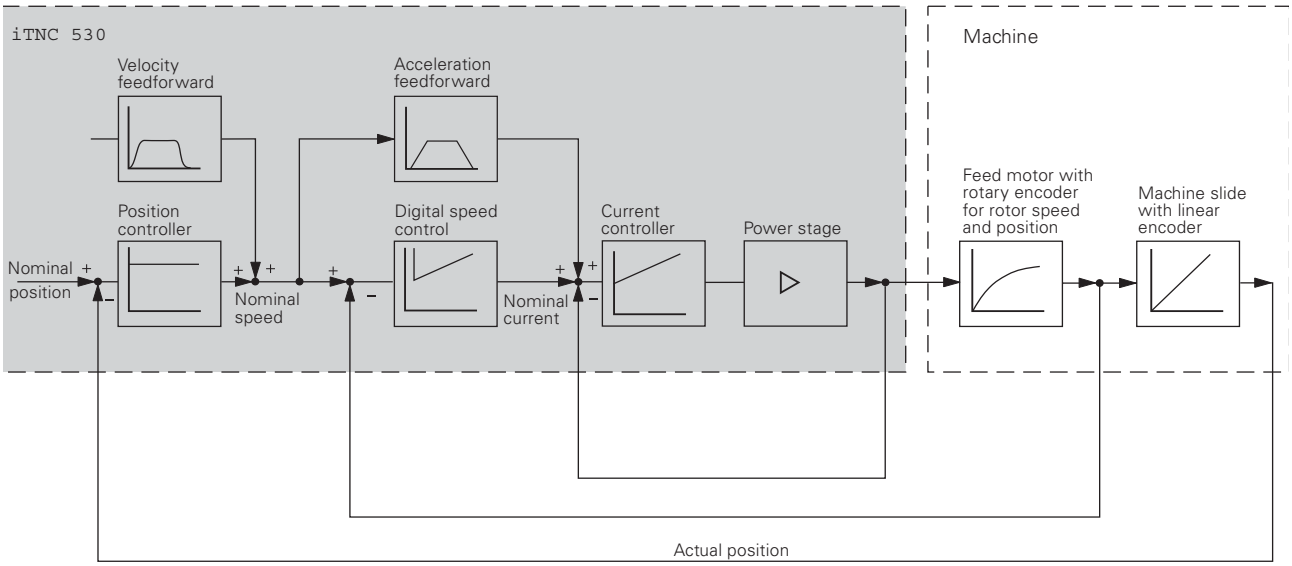
iTNC 530 with SIMODRIVE Inverter System



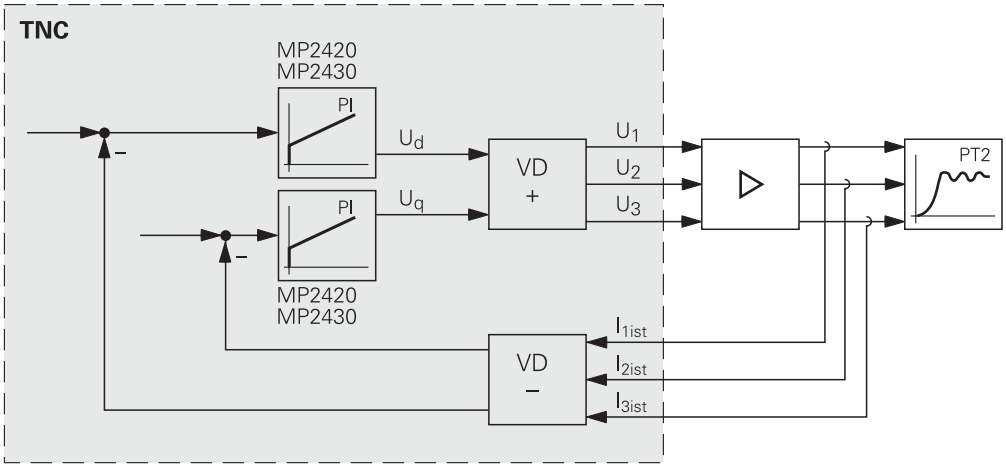
8.3 Block diagram



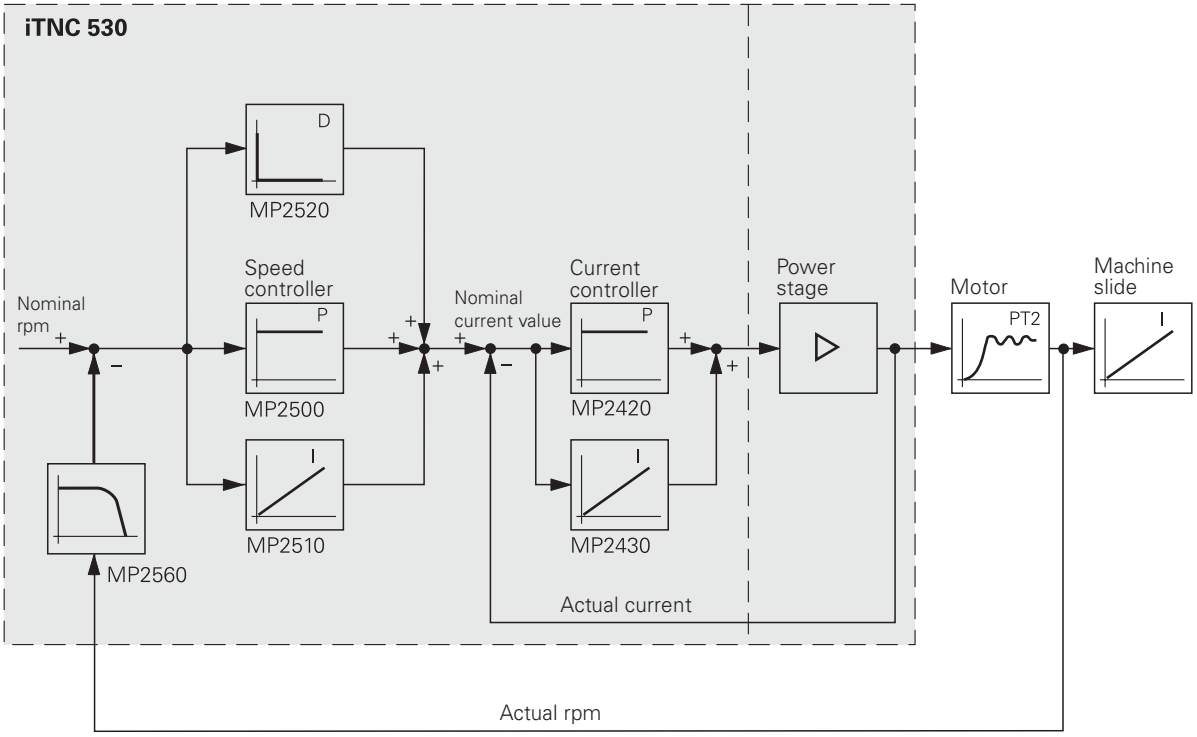
Digital axis/spindle



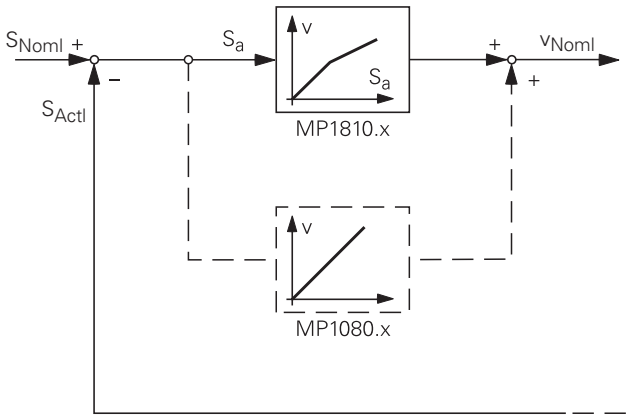
Block diagram of the current controller



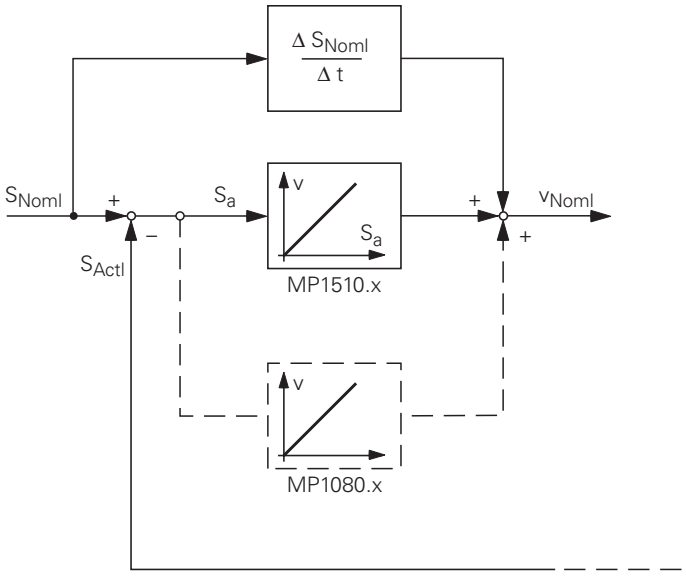
Block diagram of the speed controller



Block diagram of position feedback control with servo lag



Block diagram of position feedback control with velocity feedforward control



9 Power Supply

9.1 Power Supply for the iTNC 530

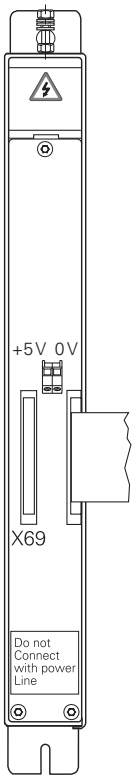
The iTNC 530 is powered via a compact inverter, via the UV 1x0 power supply units or via the UV 105 power supply unit.
Power is supplied through the 50-pin ribbon-cable connector X69 and in addition through a 5 V terminal on the CC 422.

For information on the HEIDENHAIN inverter units please refer to the service manual "Inverter Systems and Motors".

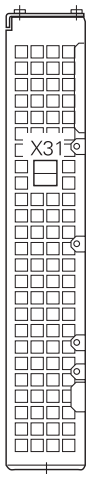
Note

Supply voltage and dc-link power are monitored.
See section "Integral Monitoring System" on page 7

Connection overview UV 105



Conductor bar	Power supply over U_Z
Free cable	5 V power supply for CC 422 (to 5 V terminal on CC 422)
Free ribbon cable	Power supply for CC 422 (to X69 on CC 422)
X69	Status signals from UV 1x0



X31	Power supply

Caution

Do not engage or disengage any connecting elements while the unit is under power!

X69:
NC supply voltage and control signals

Note

Operation with HEIDENHAIN inverters:
For the NC to be able to evaluate the status signals of the compact inverter or the UV 1x0 power supply units, connector X69 must be connected by ribbon cable with X69 of the UV 105.
Operation with non-HEIDENHAIN inverters:
Since non-HEIDENHAIN inverters do not send any status signals, an adapter connector (Id. Nr. 349 211-01) must be connected to X69 on the UV 105.

5-V connection of the UV 105

Pin layout:

Wire color of 5-V connection	5-V terminal on the CC 422
Black	0V
Red	+5V

X31:
Supply voltage of the UV 105

Supply voltage: 400 V ± 10 %

Pin layout:

Connecting terminal	Assignment
U	U[a]
V	V
⏚	Equipment ground (YL/GY)

a. Connecting cable: 1.5 mm^2, shielded

Note

The supply voltage at terminals U and V:

- Must be supplied via an isolating transformer (300 VA, basic isolation in accordance with EN 50 178 or VDE 0550) for non-HEIDENHAIN inverters and regenerative HEIDENHAIN inverter systems (UV 120, UV 140, UV 150, UR 2xx).
- There is no need for an isolating transformer if non-regenerative HEIDENHAIN inverter systems are used.

Supply of the UV 105 with U_Z

The UV 105 is powered with dc-link voltage U_Z through

- The conductor bars (for HEIDENHAIN inverter systems).
- A cable which is connected instead of the conductor bar (for non-HEIDENHAIN inverter systems).

The dc-link voltage is monitored by the control.

Service diagnosis UV 105

When checking the UV 105 power supply unit, proceed as follows:

DANGER

Danger of electrical shock!

High voltages and currents

Function of the fan

▶ First check, whether the fan of UV 105 is running.

Note

If it does not, the fan itself may be defective. However, this may also indicate that the UV 105 is defective.

Supply lines U / V and -Uz/+Uz

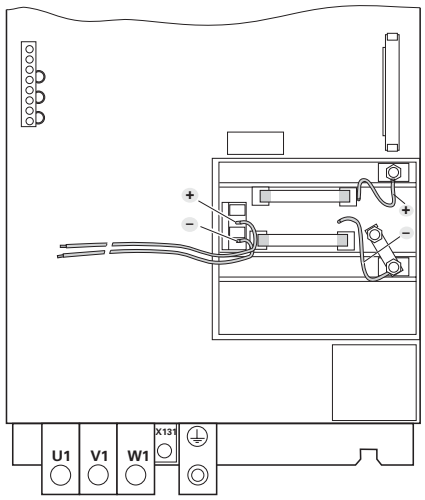
▶ Check the supply lines U and V at connection X31. This connection can be found on the underside of the power supply unit.

▶ Check the supply lines -Uz and +Uz at the conductor bar.

- Supply voltage available at ac voltage connector?
- Are the contacts on the connector / socket in order?
- Is connection fixed tightly?
- Dc link voltage available at -Uz / +Uz conductor bar?
  If not, check the fuses on the protective PCB (see below!).

Note

Operation with a non-HEIDENHAIN inverter (e.g. Simodrive 611):
The power supply from the dc link is usually lead via a protective PCB. This is secured to the conductor bar on the non-HEIDENHAIN inverter.



DANGER

Danger of electrical shock!

High voltages and currents

▶ Switch off the main switch of the machine.

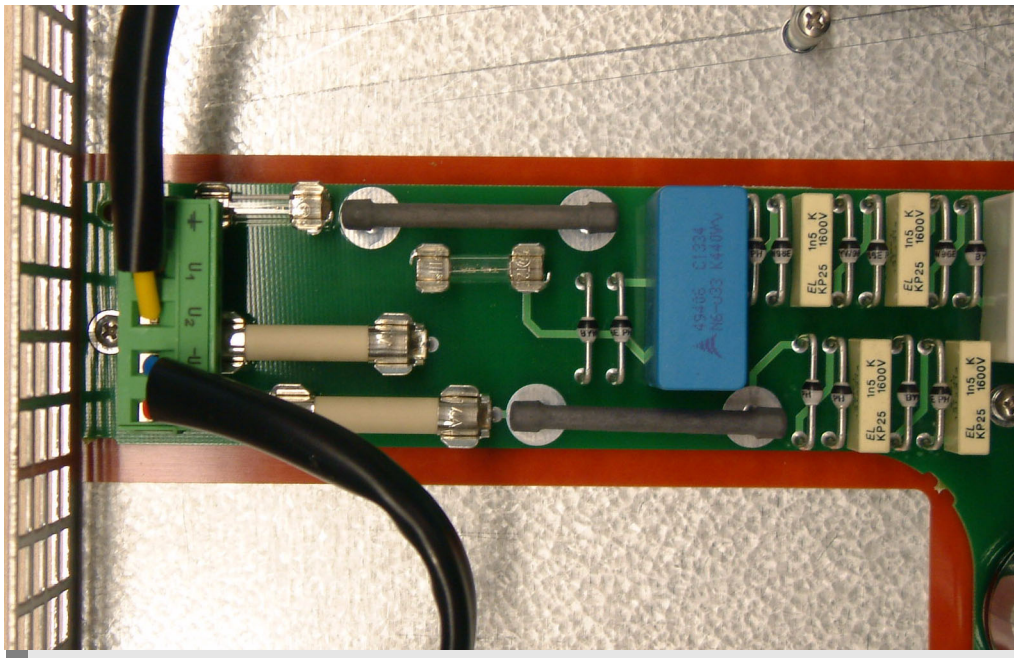
▶ Check whether there is zero potential at the conductor bars.

▶ Take precautions against resetting.

▶ Check the fuses on the power supply board.

Fuses in UV 105

- Switch off the main switch of the machine.
- Dismantle the UV 105 power supply unit.
- Ensure that the unit is not under power.
- Remove the side plate.
  Caution: One screw is located under the cover of the connector of the conductor bar.
- Check the fuses on the power supply board.



Note

If any of the fuses is defective, the UV 105 power supply unit must be replaced.
Replacing the fuses is not advised.

9.2 Power Supply for Control-Is-Ready Signal

X34: Power supply for control-is-ready signal

The control-is-ready signal output is powered by 24 Vdc provided by the UE 2xx B inverter or the UV1xx power supply unit. The voltage is connected to terminal X34.

Pin layout:

Connecting terminal X34	Assignment	Connection when using a HEIDENHAIN inverter
1	+24 V	X72/1
2	0 V	X72/2

Service diagnosis X34

When checking the power supply, proceed as follows:

DANGER

Danger of electrical shock!

High voltages and currents

- Check the supply lines at connection X34.
- Does +24 V power supply exist?
- Is connection fixed tightly?
- Are the contacts on the connector / socket in order?
- Switch off the main switch of the machine.
- Dismount the MC.
- Check the fine-wire fuses on the board in the area of connector X34 and replace these if necessary.

9.3 Buffer Battery

General

If the machine is switched off, the power for the RAM is supplied by the buffer battery. The rated voltage is 3 V.

For safeguarding the RAM, an additional capacitor (Gold cap) was integrated onto the PCB of the iTNC. This capacitor stores the RAM content for approx. one day without batteries.

Caution

If the voltage of the buffer battery falls below 2.6 V, the error message **Exchange buffer battery is displayed.**
If the voltage does not exceed 2.6 V any more, the error message is reactivated after 30 minutes.
Exchange the buffer battery within one week!

Note

The capacitor (Gold cap) is only loaded when the iTNC is switched on.

Exchanging the buffer battery

When replacing the buffer battery, proceed as follows:

- Check the load status of the capacitor in the Info menu

Note

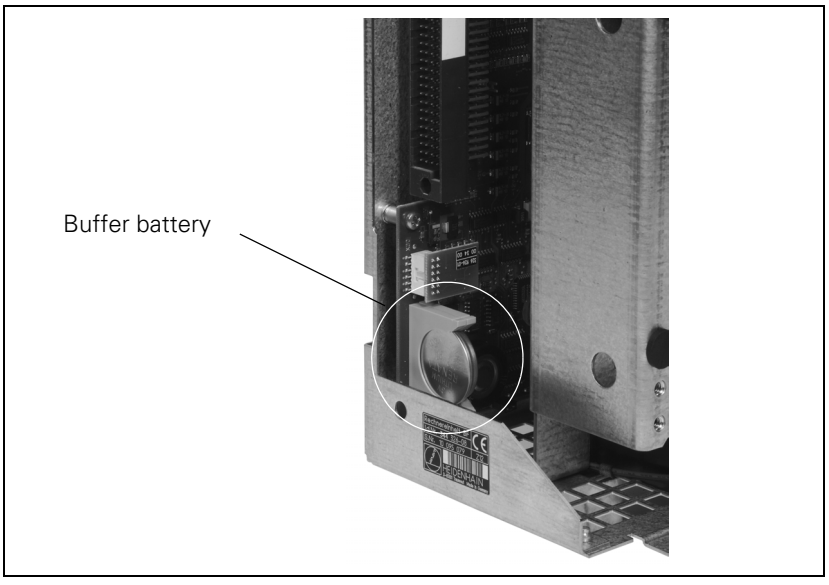
Voltage must be >= 3 V!

- Switch off the main switch of the machine.
- Dismount the MC 422.
- Exchange the battery.
  Due to the non-symmetric shape of the battery there is only one possibility of inserting.
  Battery type: 1 lithium battery, type CR 2450N (Renata), Id. Nr. 315878-01

Caution

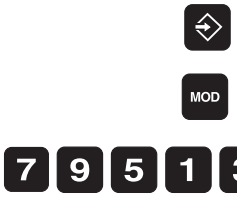
Be careful not to touch any components sensitive to electrostatic discharge or take the necessary preventive measures.

Location of buffer battery

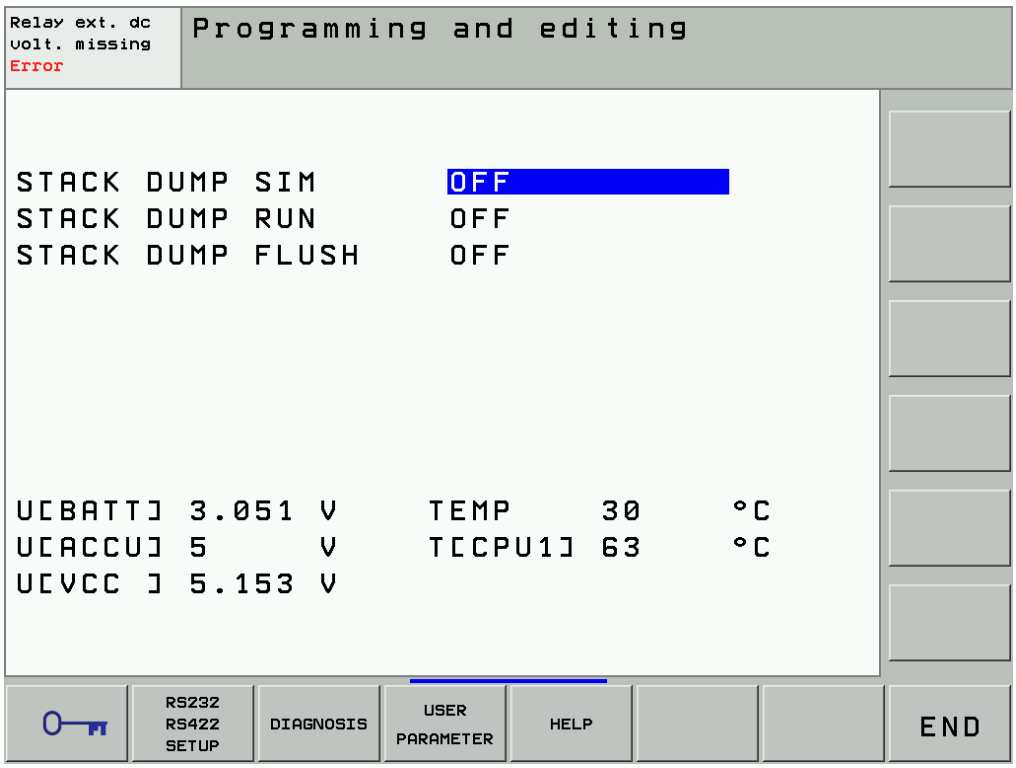


9.4 Info Menu

Activation



- PROGRAMMING AND EDITING mode (select operating mode)
- Call input field for code number
- Enter code number and acknowledge



Description

The following information is displayed on the screen:

U[BATT] 3.051 V		Voltage of buffer battery
U[ACCU] 5 V		Load status of capacitor (Gold cap)
U[VCC] 5.135 V		5 V supply voltage
TEMP 30	**°C**	Temperature inside the iTNC
T[CPU1] 63	**°C**	Temperature of CPU1

Note

The values are updated internally every minute;
the display is only updated each time the Info menu is called.

9.5 Power Supply for PLC Outputs

9.5.1 General

The PLC of the iTNC 530 as well as the PL 410 B/PL 405 B are powered by the 24 Vdc control voltage of the machine (in accordance with VDE 0551).

- Minimum absolute value 19.2 Vdc
- Maximum absolute value 30 Vdc

Nominal operating current per output

MC 422:0.125 A (with a simultaneity factor of 0.5)
PL 410 B: 2 A (with max. current consumption of 20 A)
PL 405 B: 2 A (with max. current consumption of 20 A)

9.5.2 Power supply for the PLC outputs of MC 422

X44: PLC supply voltage

Pin layout on the MC 422:

Connection terminal	Assignment	PLC outputs
1	+24 V not disconnectable with EMERGENCY STOP	O24 to O30 control-is-ready signal
2	+24 V disconnectable with EMERGENCY STOP	O16 to O23
3		O0 to O15
4	0 V	

Service diagnosis X44

When checking the power supply, proceed as follows:

DANGER

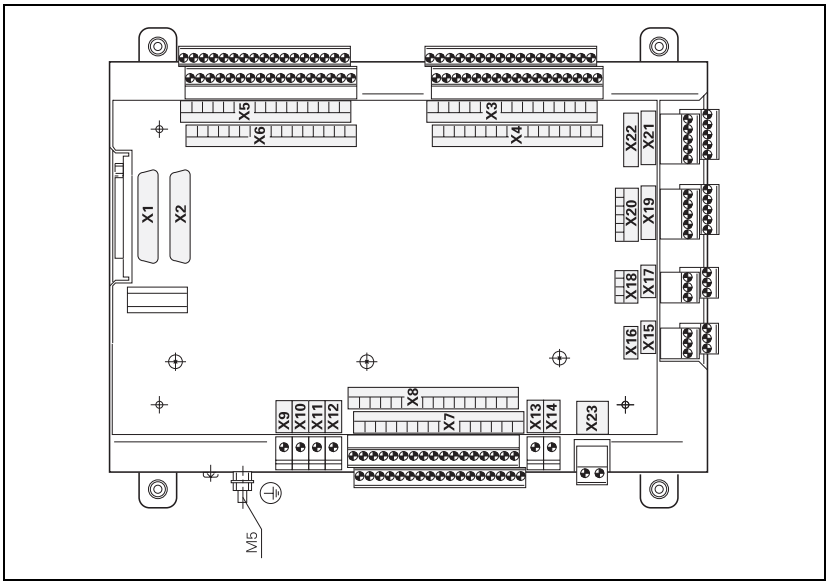
Danger of electrical shock!

High voltages and currents

- ▶ Check the supply lines at connection X44.
- Does +24 V power supply exist?
- Is connection fixed tightly?
- Are the contacts on the connector / socket in order?
- ▶ Switch off the main switch of the machine.
- ▶ Dismount the MC.
- ▶ Check the fine-wire fuses on the board in the area of connector X44 and replace these if necessary.

9.5.3 Supply voltage for PLC outputs on the PL 4xx B

Connection overview



X9 to X14: Supply voltage

Pin layout on the PL 410 B:

Terminal	Assignment	PL 1	PL 2	PL 3	PL 4
X9	0 V				
X10	+24 Vdc logic power supply and for control-is-ready signal				
X11	+24 Vdc Power supply for outputs	O32 – O39	O64 – O71	O128 – O135	O160 – O167
X12	+24 Vdc Power supply for outputs	O40 – O47	O72 – O79	O136 – O143	O168 – O175
X13	+24 Vdc Power supply for outputs	O48 – O55	O80 – O87	O144 – O151	O176 – O183
X14	+24 Vdc Power supply for outputs	O56 – O62	O88 – O94	O152 – O158	O184 – O190

Pin layout on the PL 405 B:

Terminal	Assignment	PL 1	PL 2	PL 3	PL 4
X9	0 V				
X10	+24 Vdc logic power supply and for control-is-ready signal				
X13	+24 Vdc Power supply for outputs	O48 – O55	O80 – O87	O144 – O151	O176 – O183
X14	+24 Vdc Power supply for outputs	O56 – O62	O88 – O94	O152 – O158	O184 – O190

X23: Power supply for the analog inputs on the PL 410 B

The PL 410 B input/output unit is also available with additional analog inputs and inputs for the Pt 100 thermistors. The power supply must comply with EN 50 178, 5.88 requirements for "low voltage electrical separation."

Terminal	Assignment
1	+24 Vdc as per EN 50 178, 5.88
2	+0 V

Service diagnosis

When checking the power supply, proceed as follows:

- ▶ Check the green LED on the PL in the area of connection X1/X2.
- ■ Is LED lit up?
- ▶ If LED is not lit up, check connections at X9/X10:
- ■ Is + 24 V available at X10?
- ■ Are the contacts Ok?

Note

If LED is not lit up, despite available power supply, the PL board is probably defective.

- ▶ If the LED is lit, check the other supply terminals.

9.6 Power Supply for the Display Units

Power supply with basic insulation in accordance with EN 50 178:

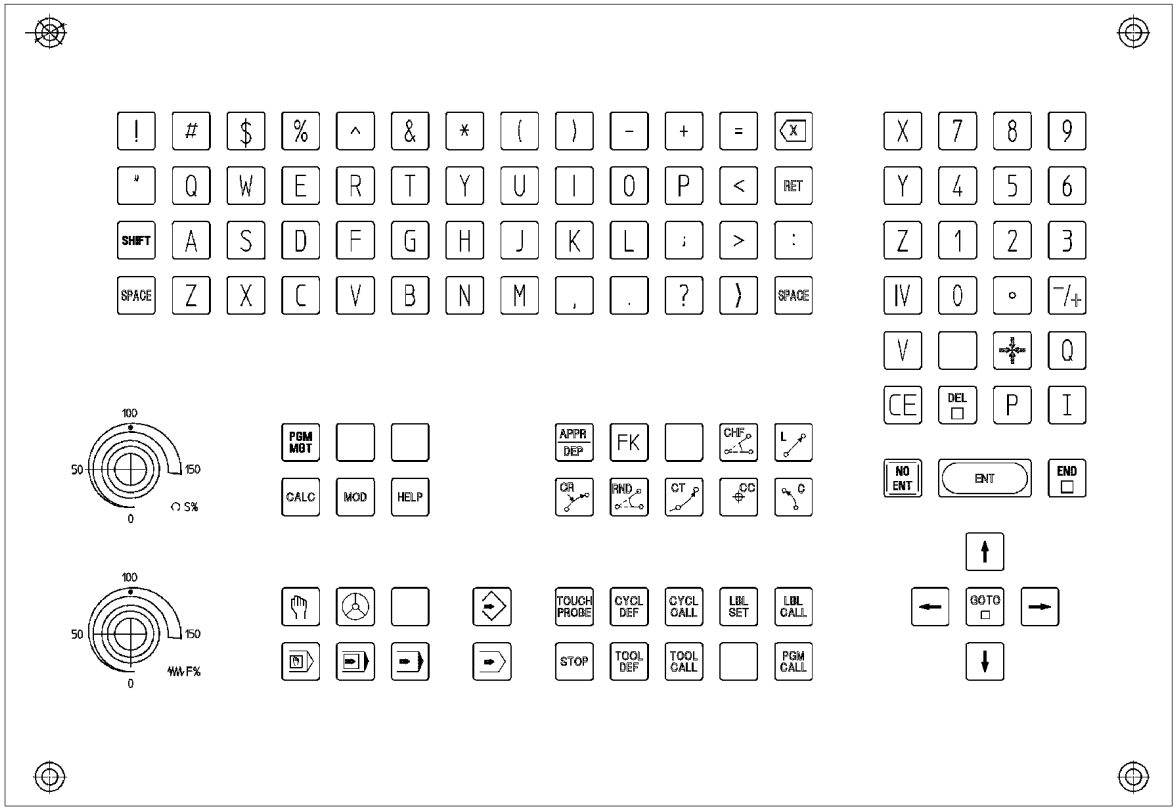
Connecting terminal X1	Assignment
1	+24 V
2	0 V

Power consumption:BF 120: 15 W
BF 150: 25 W

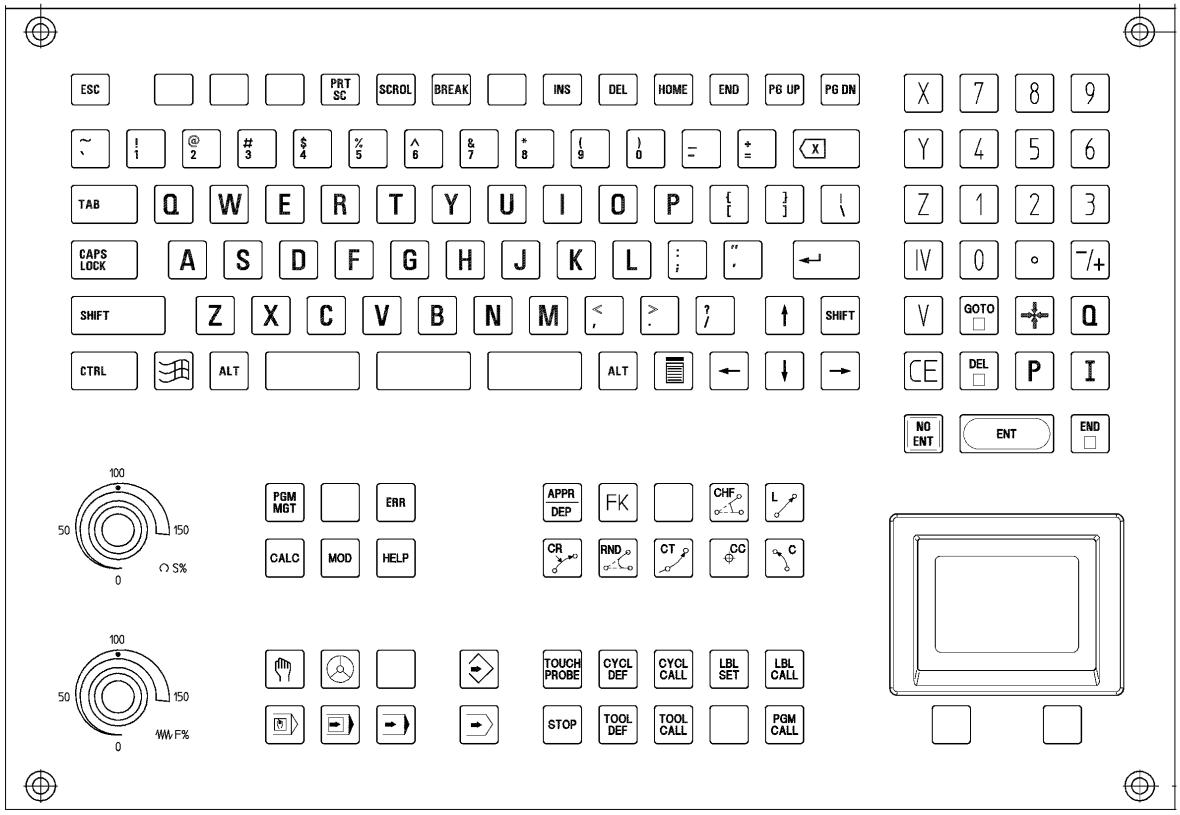
10 TE 420 and TE 530 Keyboard Units

10.1 Front View of the Keyboard Units

10.1.1 TE 420



10.1.2 TE 530


ESC
PRT SC
SCROL
BREAK
INS
DEL
HOME
END
PG UP
PG DN
TAB
CAPS LOCK
SHIFT
CTRL
ALT
SHIFT
ALT
GOTO
CE
DEL
NO ENT
ENT
END
PGM MGT
ERR
CALC
MOD
HELP
APPR DEP
FK
CHF
L
CR
RND
CT
CC
C
TOUCH PROBE
CYCL DEF
CYCL CALL
LBL SET
LBL CALL
STOP
TOOL DEF
TOOL CALL
PGM CALL
100
50
150
0
S%
F%

10.2 Checking the Keyboard Unit

Checking a defective key

When checking a defective key, proceed as follows:

- Activate a key which according to the key matrix has the same SL line as the defective key.
  - If this key does not react, the SL line is interrupted.
  - If the key reacts, proceed as follows:
- Activate a key which according to the key matrix has the same RL line as the defective key.
  - If this key does not react, the RL line is interrupted.
  - If the key reacts, the key element of the defective key is not functioning properly.

Note

The blue keys on the ASCII keypad are only active in the ASCII editor. Test these keys in an ASCII file (xxx.A) for example.

Checking the potentiometers

Procedure:

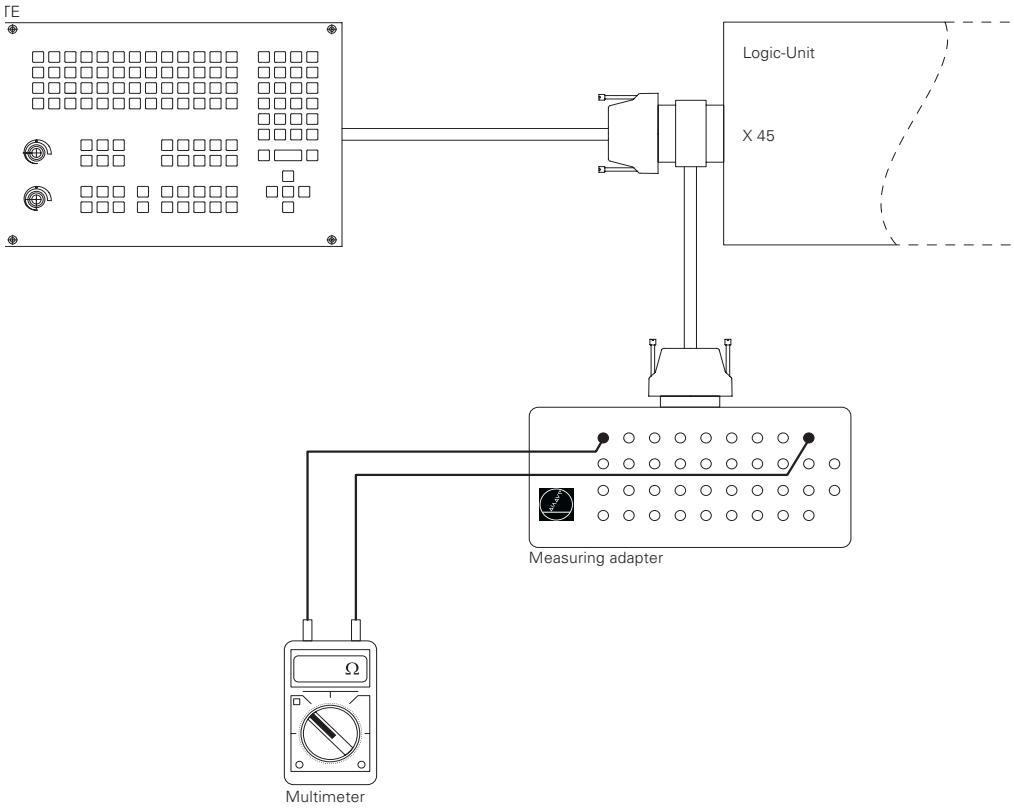
- Switch off the main switch of the machine.
- Insert the measuring adapter at connection X45 of the MC between the MC and the connection of the TE.
- Switch the main switch of the control back on again.
- Using a multimeter, check the collector voltages of the potentiometers.

Potentiometers	PIN	Voltage range
Feed rate override F%	37 = 0V / 35 = Wiper pot	(0 ... ca. + 4.95) V
Spindle Override S%	37 = 0V / 34 = Wiper pot	(0 ... ca. + 4.95) V

Note

You can also use the diagnosis program for checking the keys and potentiometers.

Measuring circuit



10.3 Key Matrix of the TE 420 Keyboard Unit

10.3.1 TE 420

X2 PIN	1	2	3	4	5	6	7	8	9	17	18	19	28	29	31	32	20	21	22	23	24	25	26	27
KEY	RL0	1	2	3	4	5	6	7	8	16	17	18	19	20	21	22	SL0	1	2	3	4	5	6	7
!										X							X							
#										X								X						
$											X						X							
%											X							X						
^												X					X							
&												X						X						
*													X				X							
(													X					X						
)														X			X							
−														X				X						
+															X		X							
=															X			X						
⌫																X	X							
"										X									X					
Q										X										X				
W											X								X					
											X									X				
R												X							X					
R												X								X				
Y													X						X					
U													X							X				
I														X					X					
O														X						X				
P															X				X					
<															X					X				

X2 PIN	1	2	3	4	5	6	7	8	9	17	18	19	28	29	31	32	20	21	22	23	24	25	26	27
KEY	RL0	1	2	3	4	5	6	7	8	16	17	18	19	20	21	22	SL0	1	2	3	4	5	6	7
RET																X			X					
SHIFT										X											X			
A										X												X		
S											X										X			
D											X											X		
F												X									X			
G												X										X		
H													X								X			
J													X									X		
K														X							X			
L														X								X		
;															X						X			
>															X							X		
:																X					X			
SPACE										X													X	
Z										X														X
X											X												X	
C											X													X
V												X											X	
B												X												X
N													X										X	
M													X											X
,														X									X	
.														X										X
?															X								X	
)															X									X
SPACE																X							X	

X2 PIN	1	2	3	4	5	6	7	8	9	17	18	19	28	29	31	32	20	21	22	23	24	25	26	27
KEY	RL0	1	2	3	4	5	6	7	8	16	17	18	19	20	21	22	SL0	1	2	3	4	5	6	7
PGM MGT								X													X			
							X														X			
						X															X			
CALC					X																X			
MOD						X													X					
HELP			X																					X
	X																						X	
		X															X							
			X																					X
					X																		X	
	X																							X
		X																					X	
			X																				X	
				X																			X	
APPR DEP									X								X							
									X									X						
									X										X					
CHF									X											X				
L								X												X				
CR							X													X				
RND							X												X					
CT								X											X					
CC						X														X				
C					X															X				
TOUCH PROBE				X													X							
CYCL DEF								X										X						
CYCL CALL							X											X						

X2 PIN KEY	1	2	3	4	5	6	7	8	9	17	18	19	28	29	31	32	20	21	22	23	24	25	26	27
	RL0	1	2	3	4	5	6	7	8	16	17	18	19	20	21	22	SL0	1	2	3	4	5	6	7
LBL SET						X												X						
LBL CALL					X													X						
STOP					X														X					
TOOL DEF								X									X							
TOOL CALL							X										X							
						X											X							
PGM CALL					X												X							
X				X																	X			
			X																		X			
8		X																			X			
9	X																				X			
Y				X																X				
4			X																	X				
5		X																		X				
6	X																			X				
Z				X															X					
1			X																X					
2		X																	X					
3	X																		X					
IV				X														X						
0		X																X						
.			X															X						
-/+	X																	X						
V									X												X			
									X													X		
			X																			X		
Q			X														X							

X2 PIN	1	2	3	4	5	6	7	8	9	17	18	19	28	29	31	32	20	21	22	23	24	25	26	27
KEY	RL0	1	2	3	4	5	6	7	8	16	17	18	19	20	21	22	SL0	1	2	3	4	5	6	7
CE					X																	X		
DEL □				X																		X		
P				X																				X
I					X																			X
NO ENT		X																				X		
ENT	X																					X		
END □	X																X							
↑								X														X		
←						X																X		
GOTO □							X															X		
→								X															X	
↓						X																	X	

10.3.2 TE 530

X2 PIN	KEY	ESC				PRT SC	SCROL	BREAK		INS	DEL	HOME	END	PG UP	PG DN	X
1	RL0															
2	1															
3	2															
4	3															X
5	4															
6	5															
7	6															
8	7															
9	8															
12	11		X	X												
13	12						X	X								
14	13					X										
15	14								X							
16	15															
17	16				X											
18	17															
19	18															
28	19															
29	20											X		X		
31	21															
32	22	X								X					X	
33	23										X		X			
20	SL0															
21	1															
22	2		X													
23	3	X		X									X			
24	4				X											X
25	5									X	X					
26	6							X	X			X				
27	7					X	X							X	X	

X2 PIN KEY		7	8	9	~ `	! 1	@ 2	# 3	$ 4	% 5	^ 6	& 7	* 8	(9	) 0	_ -
1	RL0			X												
2	1		X													
3	2	X														
4	3															
5	4															
6	5															
7	6															
8	7															
9	8															
12	11															
13	12															
14	13															
15	14															
16	15															
17	16					X		X								
18	17								X	X						
19	18										X	X				
28	19												X	X		
29	20														X	X
31	21						X									
32	22				X											
33	23															
20	SL0					X			X		X		X		X	
21	1				X		X	X		X		X		X		X
22	2															
23	3															
24	4	X	X	X												
25	5															
26	6															
27	7															

X2 PIN KEY		+ =	⌫	Y	4	5	6	TAB	Q	W	E	R	T	Y	U	I
1	RL0						X									
2	1					X										
3	2				X											
4	3			X												
5	4															
6	5															
7	6															
8	7															
9	8															
12	11															
13	12															
14	13															
15	14															
16	15															
17	16								X							
18	17									X	X					
19	18											X	X			
28	19													X	X	
29	20															X
31	21	X														
32	22		X					X								
33	23															
20	SL0	X	X													
21	1															
22	2									X		X		X		X
23	3			X	X	X	X		X		X		X		X	
24	4															
25	5															
26	6							X								
27	7															

X2 PIN	KEY	O	P	{ [	}]	| \	Z	1	2	3	CAPS LOCK	A	S	D	F	G
1	RL0									X						
2	1								X							
3	2							X								
4	3						X									
5	4															
6	5															
7	6															
8	7															
9	8															
12	11															
13	12															
14	13										X					
15	14															
16	15															
17	16											X				
18	17												X	X		
19	18														X	X
28	19															
29	20	X														
31	21		X			X										
32	22			X												
33	23				X											
20	SL0															
21	1															
22	2		X				X	X	X	X						
23	3	X														
24	4			X	X								X		X	
25	5											X		X		X
26	6										X					
27	7					X										

X2 PIN	KEY	H	J	K	L	: ;	" '	↵	IV	0	.	+/-	SHIFT links	Z	X	C
1	RL0											X				
2	1									X						
3	2										X					
4	3								X							
5	4															
6	5															
7	6															
8	7															
9	8															
12	11															
13	12															
14	13															
15	14															
16	15															
17	16						X							X		
18	17														X	X
19	18															
28	19	X	X													
29	20			X	X											
31	21					X										
32	22							X								
33	23												X			
20	SL0												X			
21	1								X	X	X	X				
22	2						X	X								
23	3															
24	4	X		X		X										
25	5		X		X											
26	6														X	
27	7													X		X

X2 PIN		V	B	N	M	< ,	> .	? /	↑	SHIFT rechts	V	GOTO □	✣	Q	CTRL links	WIN links
KEY																
1	RL0															
2	1															
3	2												X	X		
4	3															
5	4															
6	5															
7	6											X				
8	7								X							
9	8										X					
12	11															
13	12															
14	13															
15	14															X
16	15														X	
17	16															
18	17															
19	18	X	X													
28	19			X	X											
29	20															
31	21					X	X	X								
32	22															
33	23									X						
20	SL0													X		
21	1									X						
22	2															
23	3					X										
24	4										X					
25	5						X		X			X	X			
26	6	X		X				X							X	
27	7		X		X											X

X2 PIN	KEY	ALT links	SPACE	ALT rechts	WIN Kont	←	↓	→	CE	DEL □	P	I	NO ENT	ENT	END □
1	RL0													X	X
2	1												X		
3	2														
4	3									X	X				
5	4								X			X			
6	5					X	X								
7	6														
8	7							X							
9	8														
12	11	X		X											
13	12														
14	13														
15	14														
16	15														
17	16		X												
18	17														
19	18														
28	19														
29	20														
31	21														
32	22														
33	23				X										
20	SL0	X													X
21	1			X											
22	2				X										
23	3														
24	4														
25	5					X			X	X			X	X	
26	6		X				X	X							
27	7										X	X			

X2 PIN	KEY	PGM MGT		ERR	APPR DEP	FK		CHF	L	CALC	MOD	HELP	CR	RND	CT	CC
1	RL0															
2	1											X				
3	2															
4	3															
5	4									X						
6	5			X							X					X
7	6		X										X	X		
8	7	X							X						X	
9	8				X	X	X	X								
12	11															
13	12															
14	13															
15	14															
16	15															
17	16															
18	17															
19	18															
28	19															
29	20															
31	21															
32	22															
33	23															
20	SL0				X											
21	1					X										
22	2						X				X			X	X	
23	3							X	X				X			X
24	4	X	X	X						X						
25	5															
26	6															
27	7											X				

X2 PIN KEY		C					TOUCH PROBE	CYCL DEF	CYCL CALL	LBL SET	LBL CALL					STOP
1	RL0		X	X												
2	1				X							X				
3	2												X		X	
4	3						X							X		
5	4	X				X					X					X
6	5									X						
7	6								X							
8	7							X								
9	8															
12	11															
13	12															
14	13															
15	14															
16	15															
17	16															
18	17															
19	18															
28	19															
29	20															
31	21															
32	22															
33	23															
20	SL0				X		X									
21	1							X	X	X	X					
22	2															X
23	3	X														
24	4															
25	5															
26	6		X			X						X	X	X		
27	7			X											X	

X2 PIN KEY		TOOL DEF	TOOL CALL		PGM CALL											
1	RL0															
2	1															
3	2															
4	3															
5	4				X											
6	5			X												
7	6		X													
8	7	X														
9	8															
12	11															
13	12															
14	13															
15	14															
16	15															
17	16															
18	17															
19	18															
28	19															
29	20															
31	21															
32	22															
33	23															
20	SL0	X	X	X	X											
21	1															
22	2															
23	3															
24	4															
25	5															
26	6															
27	7															

Note

In the log the SK1 key is entered as soft key 0, the SK2 key as soft key 1 and so on.

BF 120

X1 pin[a]	**9**	**8**	**7**	**6**	**1**	**2**	**3**	**4**
X2 pin[a]	**13**	**14**	**15**	**16**	**20**	**21**	**22**	**23**
key[b]	**RL12**	**RL13**	**RL14**	**RL15**	**SL0**	**SL1**	**SL2**	**SL3**
		X			X			
	X				X			
				X		X		
SK1			X			X		
SK2		X				X		
SK3	X					X		
SK4				X			X	
SK5			X				X	
SK6		X					X	
SK7	X						X	
SK8				X				X
			X					X

a. Connector on the keyboard unit
b. Key on visual display unit

X1: Connection for ribbon cable display unit=> keyboard unit (plug-type connector)
X2: Connection for cable keyboard unit => MC (D-Sub 37-pin)
SK = Soft key (SK1..SK8 from left to right)

BF 150

X1 pin[a]	**9**	**8**	**7**	**6**	**1**	**2**	**3**	**4**	**5**
X2 pin[a]	**13**	**14**	**15**	**16**	**20**	**21**	**22**	**23**	**24**
key[b]	**RL12**	**RL13**	**RL14**	**RL15**	**SL0**	**SL1**	**SL2**	**SL3**	**SL4**
			X		X				
		X			X				
	X				X				
				X		X			
SK1			X			X			
SK2		X				X			

X1 pin[a]	9	8	7	6	1	2	3	4	5
X2 pin[a]	13	14	15	16	20	21	22	23	24
key[b]	RL12	RL13	RL14	RL15	SL0	SL1	SL2	SL3	SL4
SK3	X					X			
SK4				X			X		
SK5			X				X		
SK6		X					X		
SK7	X						X		
SK8				X				X	
▷			X					X	
MF1		X						X	
MF2	X							X	
MF3				X					X
MF4			X						X
MF5		X							X
MF6	X								X

a. Connector on the keyboard unit
b. Key on visual display unit

X1: Connection for ribbon cable display unit=> keyboard unit (plug-type connector)
X2: Connection for cable keyboard unit => MC (D-Sub 37-pin)
SK = Horizontal soft keys (SK1..SK8 from left to right)
MF = Vertical soft keys (MF1..MF6 from top to bottom)

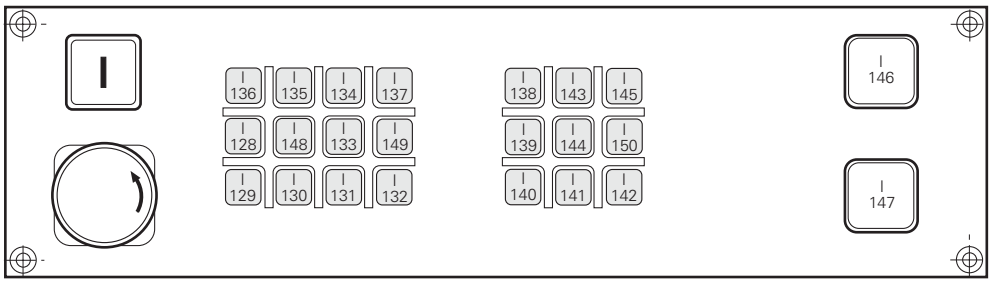
10.3.4 MB 420 machine operating panel

The PLC inputs of the MB 420 machine operating panel (I 128 - I 150) can be tested at the 37-pin D-sub connector of MB 420 or at the D-Sub connector X46 (connection of machine operating panel) of the iTNC.
For this purpose you require the universal test adapter (Id. Nr. 255480-01,See section “Inspection, Measuring and Test Equipment” on page 297.

Note

Use the TABLE function in the PLC mode for assistance.

Assignment of PLC inputs to the keys of the MB 420:



11 Visual Display Units

11.1 Checking the BC 120F Visual Display Unit

Fault diagnosis

If the machine is switched on, but the screen remains black:

- Is the fan running?
- Check the 24 V voltage at the 2-pin connector of the visual display unit.

Note

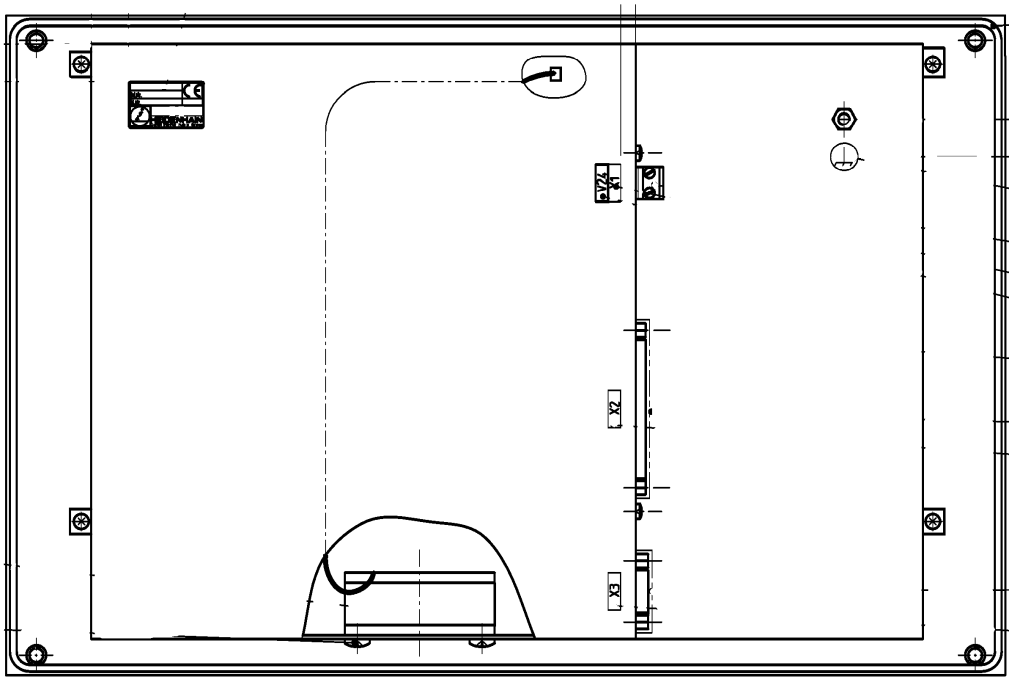
If the power supply is in order, then a further inspection of the flat-panel display is not possible without special test equipment.

If another BF 120 is available:

- Test the VDU output X49 with this monitor.

If you have a dimensionally identical control:

- Test the BF 120 with this control.



Note

If required you can display the control monitor by means of the programs TNCremo, TNCremoNT or TeleService.

11.2 Checking the BC 150 Visual Display Unit

Fault diagnosis

If the machine is switched on, but the screen remains black:

- Is the fan running?
- Check the 24 V voltage at the 2-pin connector of the visual display unit.

Note

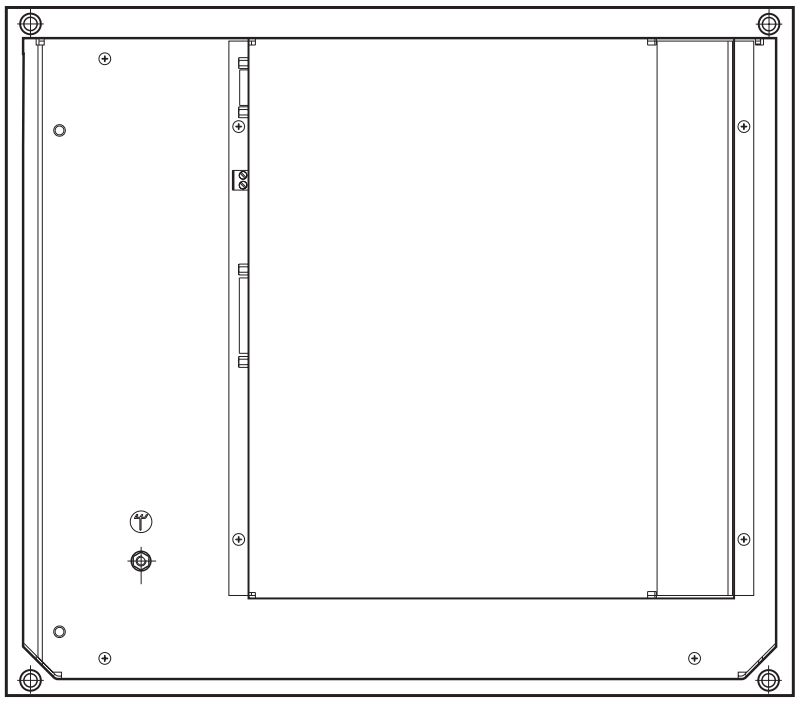
If the power supply is in order, then a further inspection of the flat-panel display is not possible without special test equipment.

If another BF 150 is available:

- Test the VDU output X19 with this monitor.

If you have a dimensionally identical control:

- Test the BF 150 with this control.



Note

If required you can display the control monitor by means of the programs TNCremo, TNCremoNT or TeleService.

12 File Management of iTNC

12.1 Code Numbers

Caution

Certain areas on the hard disk and certain file types are locked by code numbers. The code numbers may only be passed on to service personnel. Inexpert handling may result in the loss of important data, in a faulty machine performance and thus lead to damage or injury to property or persons.

Overview

Code number	Brief description
123	Editing of machine parameters that are accessible by the end user
DSP123	Screen display of internal DSP signals
NET123	Network settings (only if Ethernet board mounted)
NETMONI	Network status (only if Ethernet board mounted)
LOGBOOK	Calls the internal log of the iTNC , see page 88
95148	Calls the active machine parameter list, see page 207
807667	Calls the PLC mode , see page 205
75368	Offset adjustment for analog axes, see page 242
79513	Info menu (battery voltage, charge status of the capacitor etc.), see page 172
857282	Resets the operating hours counter
688379	Integrated Oscilloscope, see page 245
531210	Resets the non-volatile PLC markers/words and the control data in the RAM
SIK	Display of the number of the SIK system identification key
FAILTEST	Simulation of an internal emergency stop; Caution – take safety precautions!
0	Delete the code numbers entered so far.

12.2 Where are Which Data in the iTNC?

Different partitions

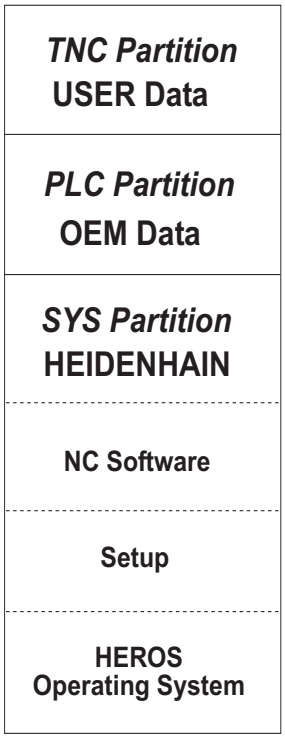
The hard disk of the iTNC is divided into three partitions:

TNC	User-specific data: NC programs, tool tables, datum tables and pallet tables are stored here.
PLC	OEM-specific data System files, PLC programs, machine parameters, Help files, PLC dialogs, PLC error tables, compensation value tables and OEM cycles are stored here. The PLC partition only becomes visible when you enter the code number 807667.
SYS	System-specific files (system files, NC dialogs, HEIDENHAIN cycles, etc.) A daily password is required to open the SYS partition.

Caution

Changes to the SYS partition can result in a malfunction of your TNC.

Structure of the iTNC hard disk



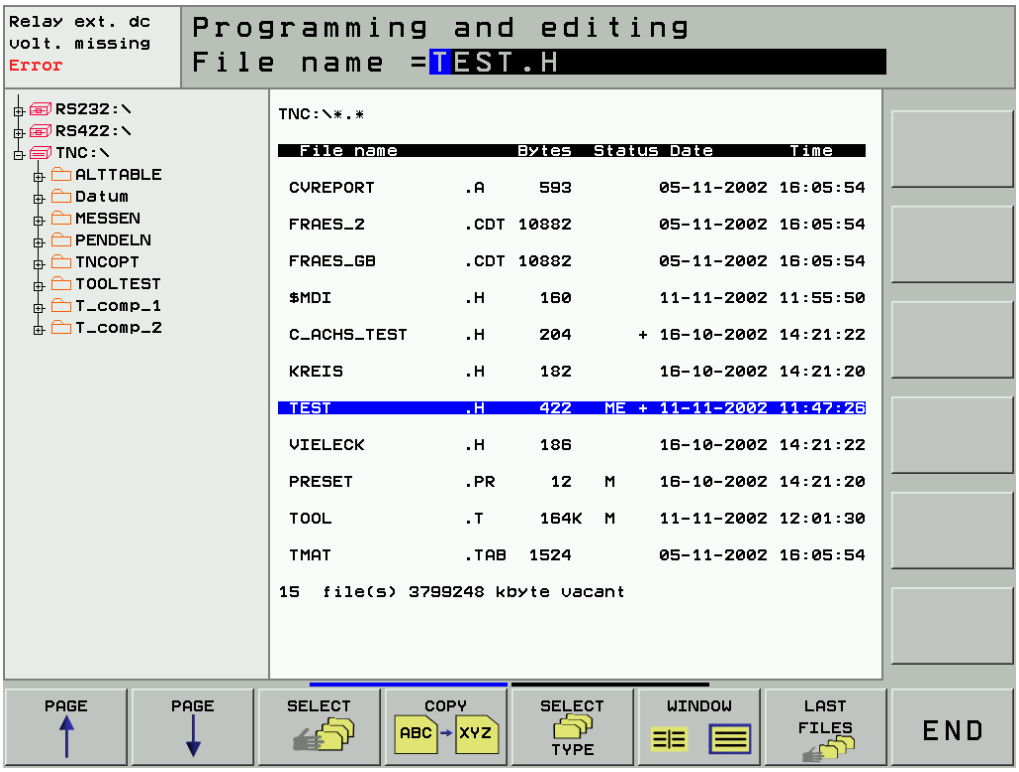
12.3 TNC Partition (TNC:\)

Calling the TNC partition

▶ Press the following key combination to call the TNC partition:

▶ Select Programming and Editing operating mode

▶ Call the program management



The directory structure is displayed on the left side of the screen.

You can move to the corresponding subdirectories using the UP and DOWN arrow keys. The selected directory is indicated in the header.

The right side of the screen shows all of the files contained in the selected directory. Use the LEFT and RIGHT arrow keys to move between the directory and file side of the screen.

Note

Under RS232/RS422 SETUP the user can switch between the standard display (without subdirectories, similar to TNC 415) and the enhanced display mode (with subdirectories) via the selection field PGM MGT.
The soft key RS232/RS422 SETUP is displayed after pressing the MOD key (while the program management is displayed).

Overview of the most important files

File type	TNC file extension
NC program HEIDENHAIN language	.H
Tool table	.T
NC program in ISO format	.I
Pallet table	.P
Datum table	.D
ASCII files	.A
Point table	.PNT
Pocket table	.TCH
Preset table	.PR
Cutting-data table	.CDT
Table of tool material and workpiece material	.TAB

Select file list for display

Use this key to switch between soft-key rows

File information

File name	Name consists of up to 16 characters plus file extension
Bytes	File size in bytes
Status	File properties:
	E The file is selected in Programming and Editing
	S The file is selected in Test Run
	M The file is selected in a Program Run mode
	P Protected file, i.e. cannot be deleted or edited
Date	Date on which file was last changed
Time	Time at which file was last changed

12.4 PLC Partition (PLC:\)

Calling the PLC partition

▶ Press the following key combination to call the PLC partition:

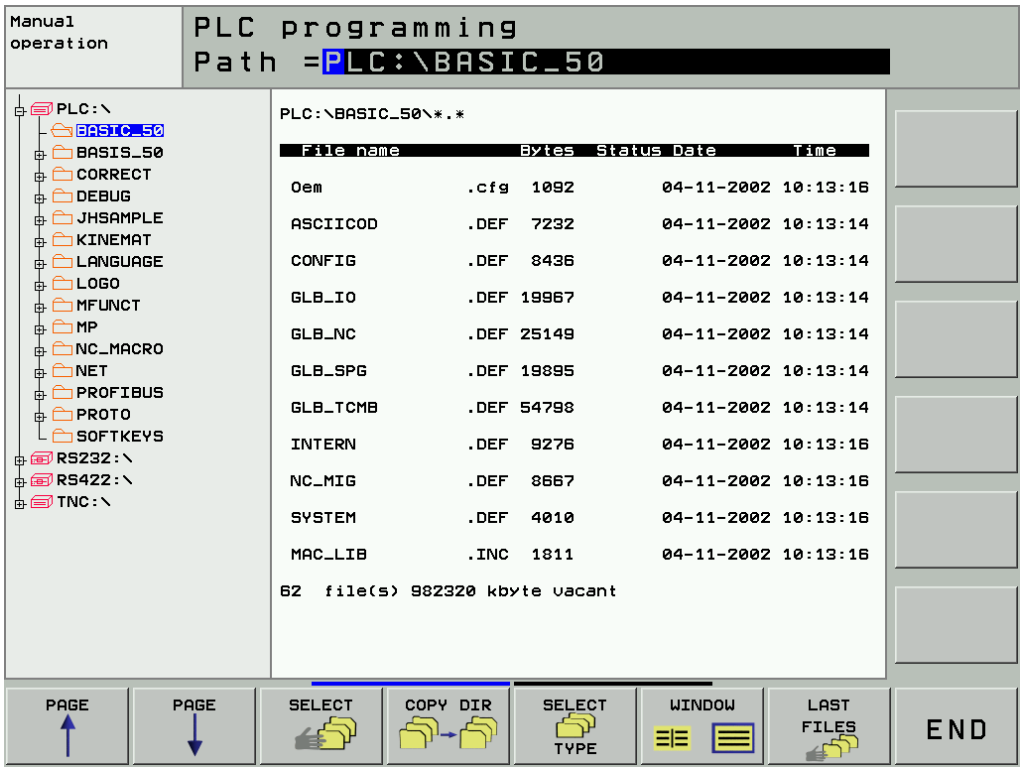
▶ Select Programming and Editing operating mode.

▶ Prepare iTNC for entry of code number.

▶ Enter code number and acknowledge.

After the code number has been entered, the PLC basic menu is displayed. If the dialog **READONLY**appears in the lower left screen, the machine manufacturer has protected the PLC partition with his own code number. In this case, only the soft keys EDIT, TABLE and TRACE can be activated.

▶ Call the program management.



The directory structure is displayed on the left side of the screen.

You can move to the corresponding subdirectories using the UP and DOWN arrow keys.

The selected directory is indicated in the header.

The right side of the screen shows all of the files contained in the selected directory.

Use the LEFT and RIGHT arrow keys to move between the directory and file side of the screen.

Overview of the most important files

File type	TNC file extension
Compiled PLC programs	.PLC
ASCII files (PLC dialogs and error messages)	.A
Help files	.HLP
Important system file	OEM.SYS
System files	.SYS
Compensation tables	.COM
Compensation tables	.CMA
Standard PLC error messages	.PET
Machine parameter lists	.MP
Source files	.SRC
Soft-key project files	.SPJ

Select file list for display

Use this key to switch between soft-key rows.

File information

File name	Name consists of up to 16 characters plus file extension
Bytes	File size in bytes
Status	File properties:
	E The file is selected in Programming and Editing
	S The file is selected in Test Run
	M The file is selected in a Program Run mode
	P Protected file, i.e. cannot be deleted or edited
Date	Date on which file was last changed
Time	Time at which file was last changed

12.5 Machine Parameter Editor

Call the active machine parameter list

▶ Press the following key combination to call the active machine parameter list:

▶ Select Programming and Editing operating mode.

▶ Call input field for code number.

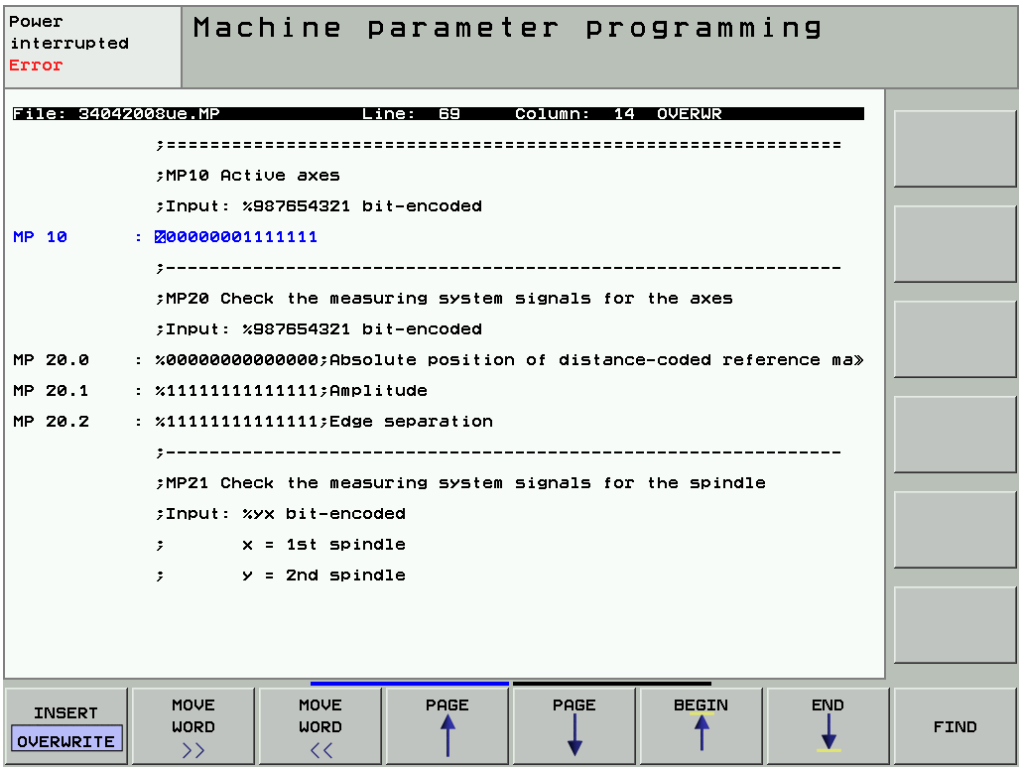
▶ Enter code number and acknowledge.

Caution

Machine parameters may only be changed after consultation with the machine manufacturer.

The active machine parameter list appears on the screen.

The iTNC automatically enters this parameter list into the OEM.SYS under MPFILE = xxxx.



▶ Exit the machine parameter mode.

Note

If the message "Line is write-protected" is displayed when trying to edit a machine-parameter value, the machine parameter list is protected against editing. Contact the machine manufacturer for more information.

Creating a backup copy

▶ Press the following key combination to create a backup copy of the machine parameter list:

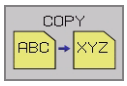
▶ Select Programming and Editing operating mode.

▶ Call input field for code number.

▶ Enter code number and acknowledge.

▶ Call Program Management.

▶ The program management system automatically calls the active machine parameter file (status M). If it does not, place the cursor on the active list.



▶ Press soft key.

▶ Enter the name of the target file.

▶ Start the copying process.

When the copying process is complete, the backup copy is stored in the same directory as the original machine parameter file.

Activating the backup copy for test purposes

▶ Press the following key combination to activate the backup copy of the machine parameter list:
(if you are already in the MP editor - see previous item - you can select the backup copy with the cursor)

▶ Select Programming and Editing operating mode.

▶ Call input field for code number.

▶ Enter code number and acknowledge.

▶ Call Program Management.

▶ Place the cursor on the backup copy.

▶ Download file into editor.

▶ When you press the END key, the iTNC carries out a reset and activates the backup copy of the machine parameter list file. The original file is activated in the same way.

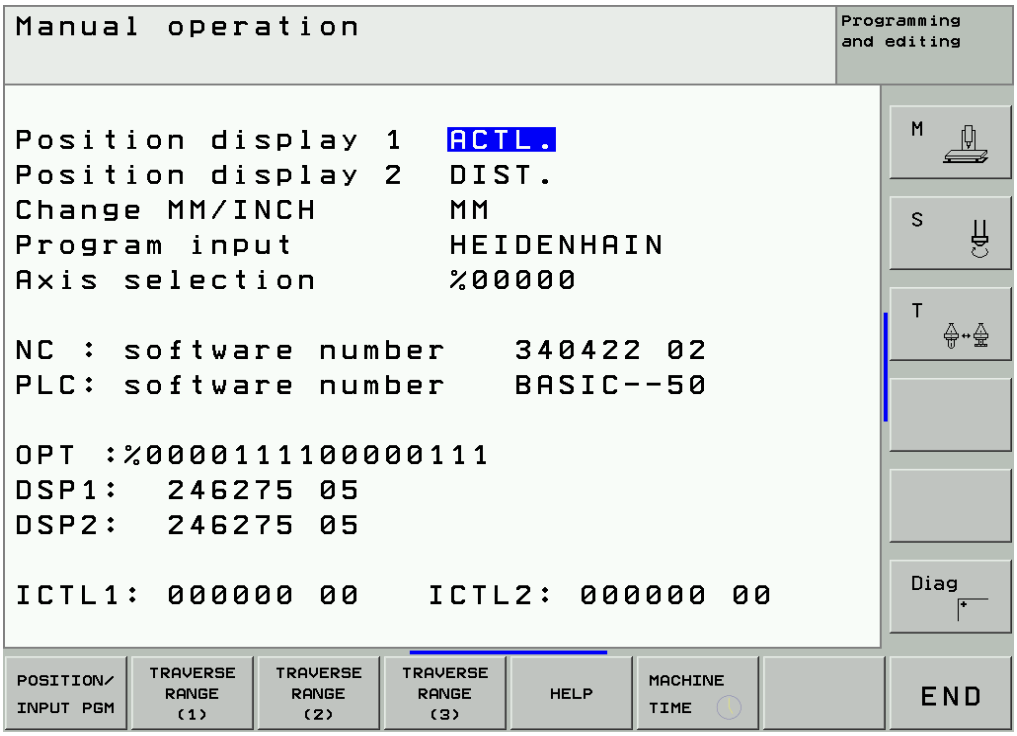
12.6 Switching the Position Display for Service Purposes

Activation

▶ Press the following key combination to switch the position display:

▶ Select MACHINE mode (manual, program run/full sequence, etc.).

▶ Activate MOD function.



▶ Press GOTO to open a list box.

Description of the settings

Possible position displays:

ACTL	Actual position
REF	Distance from machine datum
LAG	Current following error
NOML	Nominal position
DIST.	Distance to go

▶ Using the arrow keys, select the desired position display.

▶ Press ENT to activate the position display.

▶ Exit subordinate mode.

13 Encoder Interface

13.1 Position Encoders Circuit

Position encoder inputs

On the MC there are the following inputs:
X1 to X6 and - depending on the expansion stage - **X35 to X38.**

The monitoring functions for the position encoders are activated in **MP 20.x**.

MP 100 contains the information which axis is the first, the second, the third axis etc.

The allocation of position encoder inputs to the axes can be found in the machine parameters **MP 110.x**

The allocation of position encoder inputs to the spindle can be found in the machine parameters **MP 111.x**

The position encoder inputs can be switched from 1 Vpp to 11 µApp via **MP 115.0**.

MP 115.2 contains the input frequency of the position encoder inputs.

All position encoder inputs are **EnDat-compatible.**

Caution

MP 100 must not be edited!
The monitoring functions for the position encoders (MP 20.x) must always be active.
Exception: MP 20.0 is only active for position encoders with distance-coded reference marks.

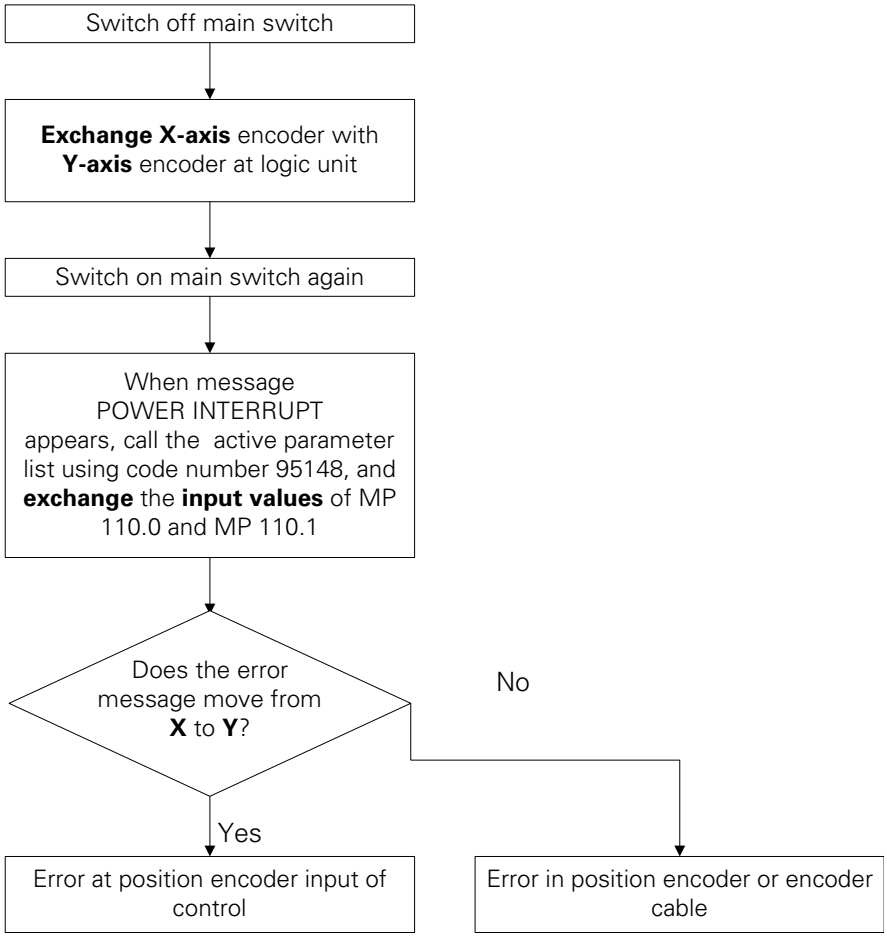
Example: Error in X-axis

For fault diagnosis, proceed as follows:

Machine parameters used in example

MP 100.x = CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 110.0 = 1 (X-axis at X1 input)
MP 110.1 = 2 (Y-axis at X2 input)
MP 110.2 = 3 (Z-axis at X3 input)
MP 110.3 = 4 (C-axis at X4 input)
MP 115.0 = %0000000000 (all inputs 1 Vpp)
MP 115.1 = %0000000000
MP 115.2 = %0000000000 (all inputs 50 kHz)

Flowchart for diagnosing an error in the position encoders circuit



a. If necessary, you may also exchange MP 115.0 and MP 115.2.

13.2 Speed Encoders Circuit

Speed encoder inputs

On the CC there are the following inputs:

X15 to X20 and - depending on the expansion stage of the auxiliary drive-control board - **X80 to X83.**

MP 100 contains the information which axis is the first, the second, the third axis etc.

The allocation of speed encoder inputs to the axes can be found in the machine parameters **MP 112.x**

The allocation of speed encoder inputs to the spindles can be found in the machine parameters **MP 113.x**

All speed encoder inputs operate with **1 Vpp** and are **EnDat-compatible**.

Speed encoders are always monitored.

Caution

MP 100 must not be edited!

Example: Error in X-axis

For fault diagnosis, proceed as follows:

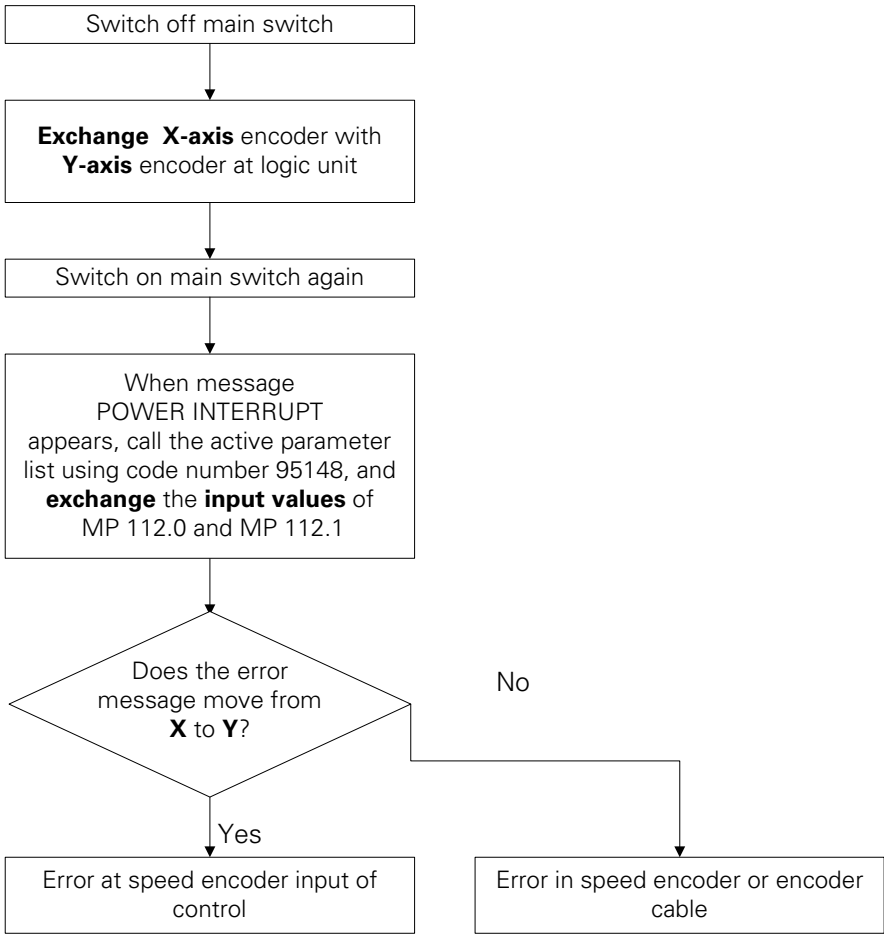
Machine parameters used in example

MP 100.x = CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 112.0 = 15 (X-axis at X15 input)
MP 112.1 = 16 (Y-axis at X16 input)
MP 112.2 = 17 (Z-axis at X17 input)
MP 112.3 = 18 (C-axis at X18 input)

Caution

Only encoders within the groups X15 to X20 (main controller board) and X80 to X83 (aux. controller board) may be exchanged.

Flowchart for diagnosing an error in the position encoders circuit



13.3 Checking Position and Speed Encoders

PWM 8

The electric functioning of an encoder is measured using a **phase angle measuring unit** (PWM), an oscilloscope and an impedance tester (see Operating Instructions, Encoder Diagnosis Set).

Adapter

Various adapters have been developed to permit PWM8 measurement of the different encoder signals(11 µApp, 1 VPP, TTL) at iTNC 530. You will find a **connection diagram** of the adapters and ID numbers in the PWM8 operating manual.

Internal oscilloscope

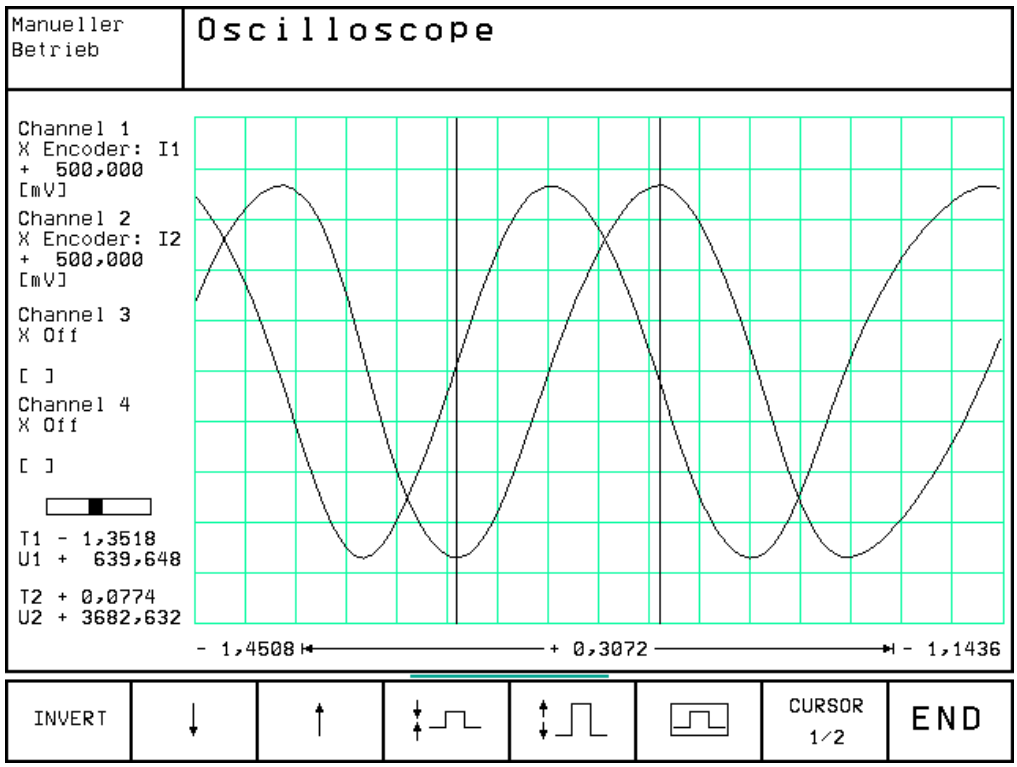
With the iTNC 530, the analog encoder signals of the **position encoder** can be recorded in the **internal oscilloscope** (see page 245) with pos. encoder: I1 (0° signal) and pos. encoder: I2 (90° signal). The reference signal cannot be recorded.

Caution

A phase angle measuring unit is required for an accurate tracing of the signals.

The signals are always displayed in the unit mV, irrespective of the connected encoder (1 Vpp or 11 µApp). The following relationship exists between the signals at the encoder input and the recorded signals:

Current signal 11 µApp:	Encoder signal at input [µA] * 284 = oscilloscope display [mV] e.g. 11 * 284 = 3124 mV
Voltage signal 1 Vpp:	Encoder signal at input [V] * 3480 = oscilloscope display [mV] e.g. 1 * 3480 = 3480 mV



13.4 Traverse with Indirect Distance Measurement (Emergency Operation)

If your machine tool is equipped with linear (direct) measuring systems **and** motor encoders, for service purposes indirect measurement can be used as well.

General

- Among other things entries in the machine parameters MP110 indicate that your machine tool is equipped with linear encoders.
  At the control the connectors of the "position encoder" group (X1 ... X6, X35 ... X38) must be assigned.
- If there are entries in the machine parameters MP112 and/or MP113 your machine operates with motor encoders.
  At the control the connectors of the "position encoder" group (X15 ... X20, X80 ... X83) must be assigned.

Note

Digital axes always require a motor encoder.

- Traversing without position encoder does not mean traversing without position control loop! In this case the position control loop requires the information from the motor encoder.

Proceeding

- Switch the machine on and enter the machine parameter list while the message "Power interrupted" is being displayed. (Do not confirm "Power interrupted"!)
- Deactivate the position encoder for the axis to be checked.
  Set MP 110.x = 0 !
- If the machine has trip dogs for reference end position that can be evaluated, the type of reference mark traverse in MP 1350.x can be set to "2" --> linear measurement through rotary encoder.
- If there are no such cams, reference mark traverse must be deactivated in MP 1340.x for the axis concerned --> MP 1340.x = 0

Note

Without reference mark traverse there is no defined reference of the axis to the machine datum! Therefore, increase the traverse range limits to the maximum (MP 910.x and following) for this axis.
Also set the traverse range limits defined by the operator to their maximum values (manual operation --> MOD key --> TRAVERSE RANGE soft key).

Caution

Restore the original values after having checked the axis!

- Enter the value from MP 1054 (traverse per motor revolution) into MP 331 (path for the number of signal periods from MP 332).
- Enter the line count of the motor encoder (e.g. taken from the motor table) in MP 332 (number of signal periods for the path in MP 331).

Note

In MP 331 the value may be entered in [mm] or [°].
For linear axes the value is considered to be in [mm], for rotary axes in [°].
From MP 100 you can see whether the axis to be traversed with indirect distance measurement is a linear or a rotary axis; linear axes are XYZ UVW, rotary axes ABC.

- Now you can traverse the axis with indirect distance measurement.

Note

If an error message is generated immediately (in most cases "Standstill monitoring" or "Movement monitoring" or similar), invert MP 210 (counting direction of position encoder).

14 Reference Marks

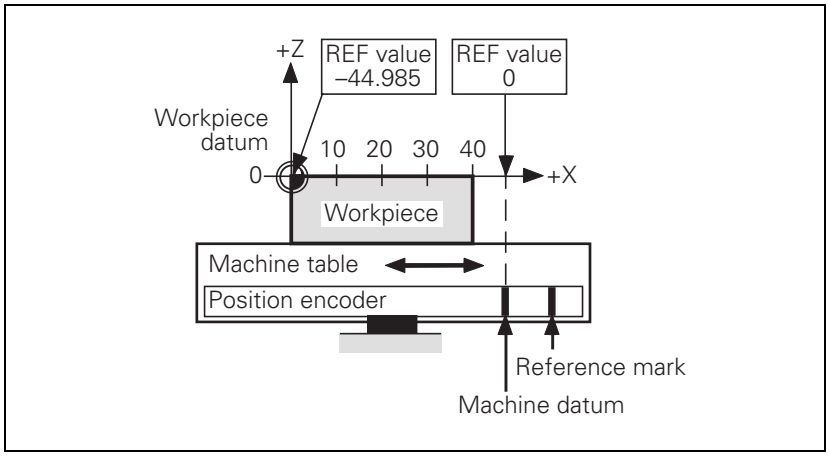
14.1 Definition

The position value (coordinates) of an axis position is defined with respect to a freely selectable datum. When the axes are moved, the ACTUAL position is calculated incrementally. If there is an interruption in power, the reference between the axis position and the position value is lost.

Reference marks

HEIDENHAIN linear encoders are designed with one or more reference marks. The reference marks identify an axis position at a known distance from the machine datum. The position of the freely selectable datum is defined with respect to the machine datum.

The datum and the actual position can be reproduced as soon as the reference marks are traversed.



14.2 Traversing the Reference Marks

The reference marks must be traversed after any interruption in power:

- Press the machine START button: The reference marks are automatically traversed. The sequence of axes is predetermined.

or:

- Press the machine axis-direction button. The user determines the sequence of the axes.

After the reference marks have been traversed:

- The software limit switches are activated.
- The most recently saved datum and machine datum are reproduced.
- PLC positioning and positioning with M91 and M92 become possible.
- The counter is set to zero for axes in an open loop.

Distance between the scale reference point and the machine datum

For distance-coded reference marks, the machine datum is defined with respect to the scale reference point, which is at the first reference mark after the beginning of the measuring length. On angle encoders, the scale reference point is marked:

- MP 960.x contains the distance between scale reference point and machine datum.

Note

After removing and remounting a measuring system MP 960.x may have to be altered.

External reference pulse

If the reference mark of the encoder cannot be used, e.g. owing to an unfavorable transmission of motor and rotary axis, an external reference pulse may be evaluated.

- In MP 4130.x a fast PLC input is defined for an external reference pulse.
- In MP 1360.x the number of the fast PLC input is entered for the axis concerned.
- MP 1350.x = 6 for the axis concerned.

Reference end position

To prevent the axes from violating their traverse limits when traversing the reference marks, each axis requires a trip dog (at the reference end position). The trip dogs must be installed by the machine tool builder at the ends of the traverse range. The switch signals from the trip dogs are sent to free PLC inputs. The PLC program must gate these PLC inputs with W1054 for "reference end position."

Encoders with EnDat interface

Encoders with EnDat interface can be connected to the position and speed inputs of the MC 422 and CC 422. With these encoders there is no need to traverse the reference marks. The position value is only read when the control is switched on. It cannot be read again.
When connecting a position encoder with an EnDat interface:

- MP1350.x = 5 for the axis concerned

When connecting a speed encoder with an EnDat interface:

- The iTNC automatically attempts to communicate with the encoder.

When connecting a speed encoder with an EnDat interface as a position encoder:

- MP1350.x = 5 for the axis concerned
- MP110.x = 0 for the axis concerned

If a position encoder without EnDat interface is used together with a speed encoder with EnDat interface, the absolute position of the speed encoder can be evaluated instead of traversing the reference mark of the position encoder.

- For this purpose the corresponding bit in MP1355 is set to 1 for those axes for which the absolute position is to be evaluated via the speed encoder.
- If MP1356.x contains a wrong distance of position and speed encoder, the message **`Set MP1356.x to <value>`** is displayed. Enter this value in MP1356.x.

Note

If use of multiturn encoders with EnDat interfaces results in overruns, the corresponding information is entered in the system file NCDATA.SYS. For a control exchange, this file must be transferred or MP960.x must be readjusted.

MP960.x **Machine Datum**

Input: -99,999.9999 to +99,999.999 [mm] or [°]

Values with respect to the scale reference point.

MP1320 **Direction for traversing the reference marks**

Format: %xxxxxxxxxxxxxx

Input: Bits 0 to 13 correspond to axes 1 to 14.

0: Positive
1: Negative

MP1330.x **Velocity for traversing the reference marks**

Input: 80 to 300,000 [mm/min]

MP1331.x **Velocity for leaving the reference mark end position for axes 1 to 9 (only for rotary encoders MP1350 = 2)**

Input: 10 to 300,000 [mm/min]

MP1340.x **Sequence for traversing the reference marks**

Input: 0: No evaluation of reference marks

1 to 14: Axes 1 to 14

MP1350.x **Type of reference mark traverse**

Input: 0: Linear encoder with distance-coded reference marks (old routine)

1: Position encoder with one reference mark
2: Special type (length measurement with ROD)
3: Linear encoder with distance-coded reference marks (new routine)
4: Same as 3 except that two reference marks are evaluated
5: Encoder with EnDat interface
6: Reference pulse via fast PLC input

MP1355 **Reference run**

Format: %xxxxxxxxxxxxxx

Input: Bits 0 to 13 correspond to axes 1 to 14

0: Reference run as defined in MP1350.x
1: Reference run via EnDat interface of speed encoder

MP1356.x Difference between speed and position encoder, if MP1355 = 1

Input: -99,999.999 to +99,999.999 [mm] or [°]

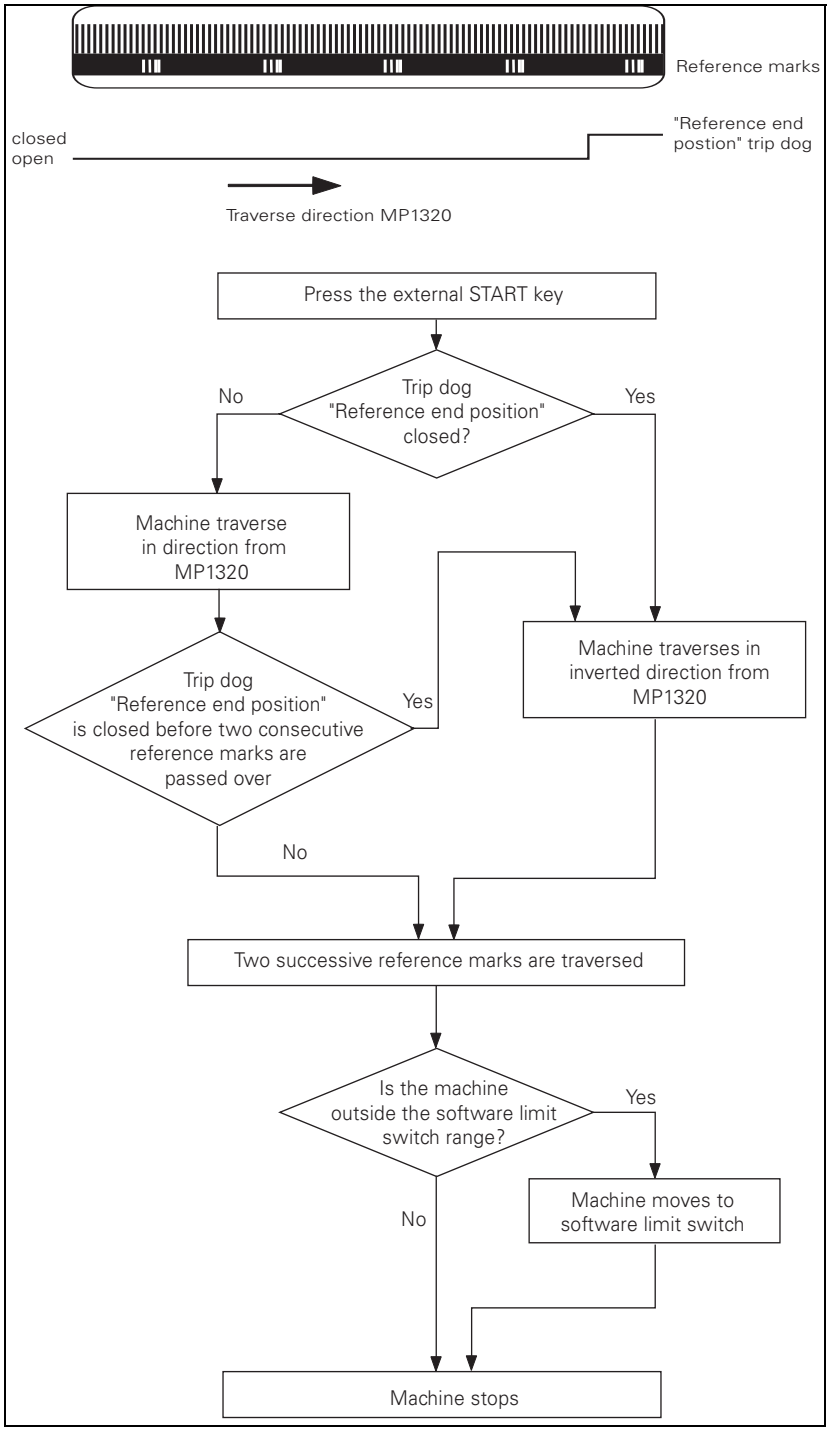
MP1360.x **Fast PLC input for reference pulse**

Input: 0: No fast PLC input for reference pulse

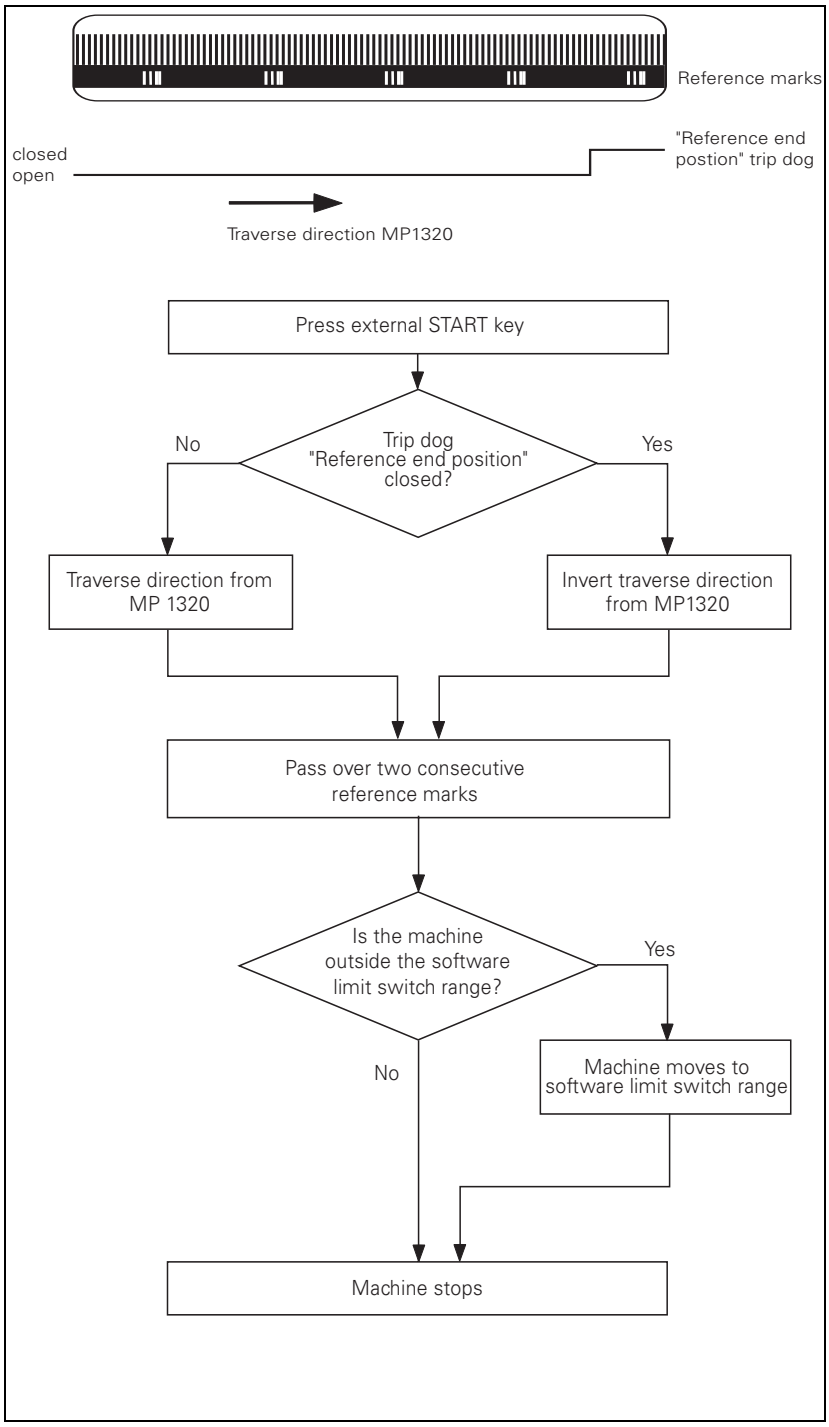
1 to 5: Fast PLC input for reference pulse

Position encoder with distance-coded reference marks

Function when MP1350.x = 3



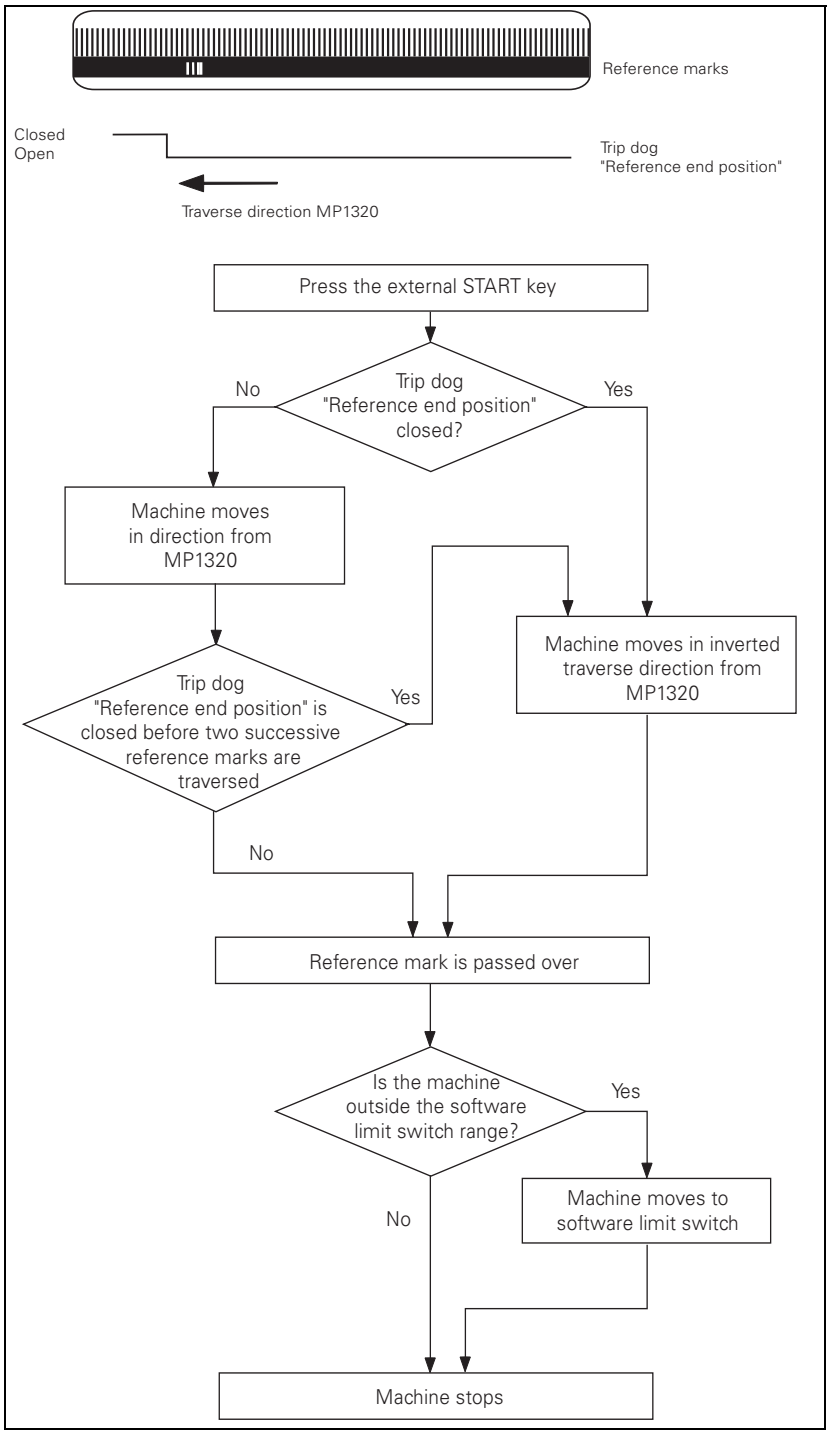
Function when MP1350.x = 0. This setting is used only to ensure compatibility. Do not use for new installations.



If during automatic referencing the trip dog is not closed until it is in the reference end position range, the contouring control will ignore this signal. It is therefore necessary that there be at least two reference marks in the range of the reference end position.

Position encoder with one reference mark

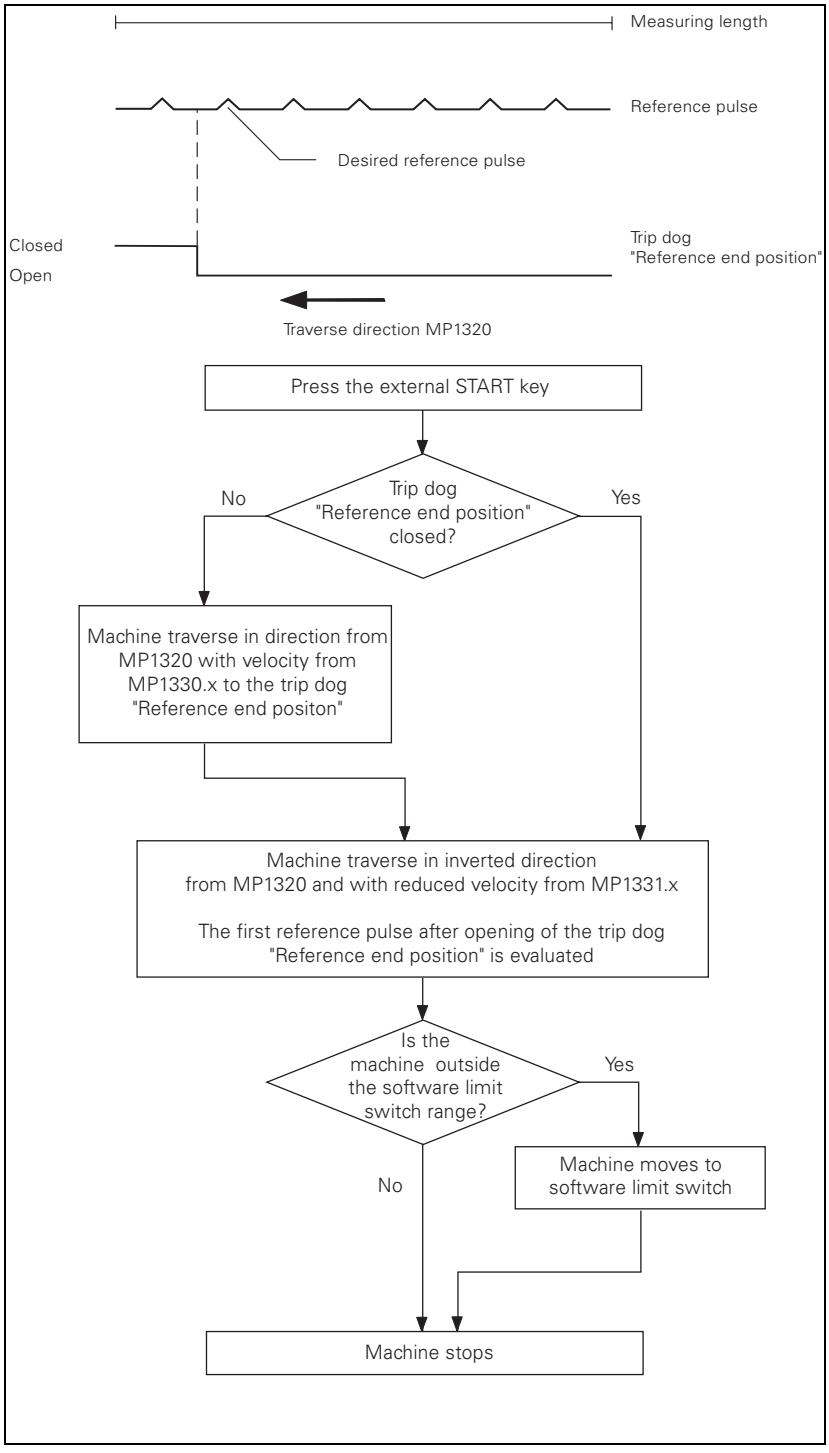
Function when MP1350.x = 1



Linear measurement through rotary encoder

Function when MP1350.x = 2

For linear measurement using a rotary encoder, a reference pulse is produced on each revolution of the encoder. Ensure that during referencing the same reference pulse is always evaluated. This can be realized with the trip dog for reference end position.



15 Checking the Enables on the iTNC

15.1 General

To move axes or spindles the appropriate enables are required.

If one or several enables are missing, an error message is output or the axes and/or the spindles cannot be operated.

The following conditions must be fulfilled to drive axes and spindles:

- **I 3** (X42/4, control-is-ready signal acknowledgment) is set.
- **I 32** (X42/33, "global" drive enabling) is set.
  - The functionality of the I 32 global drive enabling is defined in MP2050.
- **If X150 / X151 are wired**, in addition to I32, 24V must also be available at X150 / X151 for the respective axis group.
  - MP 2040 contains the information whether this drive enabling for axis groups is used and how the axis groups are assigned.
- HEIDENHAIN inverter system ready.
  - The green **READY LEDs** at the drive module (of a modular inverter system) or at the output stage (of a compact inverter) must be lit.
- **PLC module 9161** called.
  - This module serves to activate the current and speed controllers individually for each axis.

Note

The word W1024 contains the axes enabled by the NC.

The word W1060 contains the axes for which the feed rate was individually enabled by the PLC.

If the marker M4563 is set, the PLC enables the feed rate in all axes.

(Use either W1060 or M4563.)

The word W1040 contains the axes in which the control loop is opened by the PLC (e.g. clamped axes).

The PLC module 9169 serves to call those axes for which I32 does not switch off the drives.

Note

When I32 is set the axes and the spindles are enabled at the inverter system according to the basic circuit diagram.
For this purpose the corresponding relays must trigger.
The iTNC monitors the time between the setting of I32 and the READY signal of the drive modules via the PWM cable.
If the READY signal is missing after the waiting time has passed, the error message **8B40 No drive release <axis>** appears.
A connection may be interrupted, or the relays trigger too slowly.
The permissible waiting time is entered in **MP2170**.

MP2040	**Axis groups for drive enabling through X150**
Format:	%xxxxxxxxxxxxxx
Input:	0: Axis not assigned
	1: Axis assigned
MP2040.0-5	Groups 1 to 6
MP2040.6-7	Reserved, enter %00000000000000
MP2050	**Functionality of drive enabling I32 (X42/33)**
Input:	0: Emergency stop for all axes, Module 9169 not effective
	1: Emergency stop for all axes that are not excepted with Module 9169 2: I32 and Module 9169 are without functionality
MP2170	**Waiting time between the switch-on of the drive and the drive's standby signal**
Input:	0.001 to 4.999 [s]
	0: 2 [s]

15.2 Examination

15.2.1 Examination of the control-is-ready output (X41/pin 34) and the control-is-ready signal acknowledgment input I3 (X42/pin 4).

If the message "Relay external DC voltage missing" remains on the screen after the control has been switched on, carry out the following fault diagnosis:

- Confirm "Power interrupted" message and switch machine control voltage on.
- Check whether the "control-is-ready" output (X41/pin 34) is set (+24 V).
  If +24 V are not available, proceed as follows:
- Measure the power supply at the output "control-is-ready".
  - Connector X34 / pin 1 = 24V, pin 2 = 0V

If the power supply is in order, the control-is-ready output X41/34 of the MC is probably defective.

Note

As an emergency solution, you could use the control-is-ready output X8 / pin 16 of the PL board.

If the control-is-ready output is set, proceed as follows:

- Check PLC input I3 in the PLC table

If the level is low, proceed as follows:

- Measure the input voltage at connector X42 / pin 4.
  - If the input voltage is high (+24 V), the high level is not recognised by the PLC. Input I3 on the MCis probably defective.
  - If the input voltage is low, proceed as follows:
- Check whether there is an interruption in the Emergency Stop circuit.
  - Are the Emergency Stop keys on the operating panel functioning properly?
  - Are the Emergency Stop keys on the handwheel connected and functioning properly?
  - Are the axes not located on the hardware limit switches?

Error message "Emergency Stop Defective"

If the error message "Emergency stop defective" appears when the machine is switched on, carry out error diagnosis as follows:

- Switch off the main switch of the machine.
- Insert a bridge between X41/Pin34 and X42/Pin4 (unclamp wires).

Note

If 24 V is supplied to the control-is-ready output from the HEIDENHAIN inverter system via connector X34, potential differences between the 24 V machine voltage and the 24 V from the inverter can result in compensating currents.
Therefore it is preferable to supply X34 with machine voltage.

- Switch the main switch of the control and the machine back on again.
  - If the message appears again, the MC is defective.
  - If the error message does not appear any more, the fall time of the main contactor (K1, See "Basic Circuit Diagrams" on page 155.) is probably too long, or the main contactor is defective.
- Inspect the K1 main contactor.

Note

The course of the emergency stop (or booting) routine is described in the chapter "Integral Monitoring System".

15.2.2 Checking the global drive enable I32, connector X42 / pin 33

- Check in the PLC table, whether I32 is set.

If the level is low, proceed as follows:

- Measure the input voltage at connector X42 / pin33.
  - If the input voltage is high (+24 V), the high level is not recognised by the PLC. Input I32 on the MC is probably defective.
  - If the input voltage is low, proceed as follows:
- Check, whether the conditions for drive enabling are complied with.
  Conditions may be: permissive button, door contacts etc.
  Use the circuit diagram of the machine tool for this purpose.
  - Permissive buttons, door contacts etc. closed?
  - Relay and wiring in order?

15.2.3 Checking the drive enabling for the axis groups via connector X150 (if wired)

- Check, whether 24V are available for the axis group to be traversed.

The axis groups for the drive enabling via X150 are defined in MP2040.
The connector X151 is still reserved.

15.2.4 Checking the readiness of the inverter system

- Check, whether the green READY LED (at the compact inverter, at the UM axis module or at the HEIDENHAIN interface card for the SIMODRIVE system) of the axis to be traversed is lit.

Note

The **SH1** signal (safe stop 1) indicated by a red LED at the inverter, is generated by the computer of the iTNC. The signal is low-active, i.e. line-break proof.
If the computer is not ready for operation or if an error is pending, SH1 is output. The red SH1 LED and the green READY LED at the inverter can never be lit a the same time. They are mutually locked.The **SH2** signal (safe stop 2) indicated by a red LED at the inverter, is generated by the controller of the iTNC. The signal is low-active, i.e. line-break proof.
If an axis or spindle is not controlled, SH2 is pending and the red LED is on.
This is for example the case with clamped axes or if a spindle is not controlled.
SH2 and READY are on simultaneously.

Note

HEIDENHAIN interface cards for the SIMODRIVE system:
The cards for the plug-type connectors (ribbon cables) are equipped with the green **READY** LED and the red LEDs **SH1** and **SH2**.
The cards with D-Sub connectors are equipped with the green **READY** LED and the red LEDs **RESET X1** und **RESET X2** for the respective axis.
RESET X1, RESET X2 correspond to the SH2 signal.
The first generation of the cards with D-Sub connectors feature a green **IF** LED and a red **NB** LED.
IF stands for "pulse enable" (German: Impulsfreigabe) and means that the axis module is ready.
NB means that the axis module is "not ready" (German: nicht bereit).
For further information on the drives please refer to the service manual "Inverter Systems and Motors".

If the READY LED is not lit, proceed as follows:

- Check your electrical cabinet (relays, wiring).
- Check the ribbon cables and the plug-type connectors at the inverter system.
- For further inspection routines please refer to the service manual "Inverter Systems and Motors".

15.2.5 Checking PLC modules, markers and words

- Check whether the PLC module 9161 is called in the PLC program.
  For this purpose enter the PLC TRACE mode.
  This module serves to activate the current and speed controllers individually for each axis.
- Check the value in the word W1024.
  For this purpose enter the PLC table.
  The word W1024 contains the axes enabled by the NC.
- Check the value in the word W1060 or whether the marker 4563 is set.
  For this purpose enter the PLC table.
  The word W1060 contains the axes for which the feed rate was individually enabled by the PLC.
  If the marker M4563 is set, the PLC enables the feed rate in all axes.
  (Use either W1060 or M4563.)
- Check the value in the word W1040.
  For this purpose enter the PLC table.
  The word W1040 contains the axes in which the control loop is opened by the PLC (e.g. clamped axes).

Note

The value of the words is displayed in hexadecimal or decimal format.The hexadecimal format is distinguished by a leading $.A hexadecimal digit comprises 4 bits.
I.e. you can - for example - calculate for which axes the feed rate is enabled.
e.g. W1024 = $004F →
The first HEX digit has the value F, that is the first 4 axes are enabled ($2^0+2^1+2^2+2^3 = 1+2+4+8 = F$), the second HEX digit has the value 4, i.e. the 7th axis is enabled ($2^2 = 4$).
In binary format this would be: 0100 1111
And in decimal format: 79.

16 Interface to Servo Amplifier

16.1 Analog/Digital Nominal Value to Servo Amplifier

The machine manufacturer defines **analog** or **digital** nominal value via machine parameter MP120.x/121.x.
The assignment of channel or connection to axis is also defined in this machine parameter.

MP 120.0	Assignment nominal value output	**1. axis**
MP 120.1	Assignment nominal value output	**2. axis**
MP 120.2	Assignment nominal value output	**3. axis**
MP 120.3	Assignment nominal value output	**4. axis**
MP 120.4	Assignment nominal value output	**5. axis**
MP 120.5	Assignment nominal value output	**6. axis**
MP 120.6	Assignment nominal value output	**7. axis**
MP 120.7	Assignment nominal value output	**8. axis**
MP 120.8	Assignment nominal value output	**9. axis**
MP 120.9	Assignment nominal value output	**10. axis**
MP 120.10	Assignment nominal value output	**11. axis**
MP 120.11	Assignment nominal value output	**12. axis**
MP 120.12	Assignment nominal value output	**13. axis**
MP 120.13	Assignment nominal value output	**14. axis**
MP 121.0	Assignment nominal value output	**1. spindle**
MP 121.1	Assignment nominal value output	**2. spindle**

iTNC 530

Input values in machine parameter MP 120.x and 121.x:

0 = No nominal value output via control
1 = **Analog** nominal speed value (±10 V) at connection **X8** channel 1
2 = **Analog** nominal speed value (±10 V) at connection **X8** channel 2
3 = **Analog** nominal speed value (±10 V) at connection **X8** channel 3
4 = **Analog** nominal speed value (±10 V) at connection **X8** channel 4
5 = **Analog** nominal speed value (±10 V) at connection **X8** channel 5
6 = **Analog** nominal speed value (±10 V) at connection **X8** channel 6
7 = **Analog** nominal speed value (±10 V) at connection **X9** channel 7
8 = **Analog** nominal speed value (±10 V) at connection **X9** channel 8
9 = **Analog** nominal speed value (±10 V) at connection **X9** channel 9
10 = **Analog** nominal speed value (±10 V) at connection **X9** channel 10
11 = **Analog** nominal speed value (±10 V) at connection **X9** channel 11
12 = **Analog** nominal speed value (±10 V) at connection **X9** channel 12

51 = **Digital** nominal value (PWM signal) at connection **X51**
52 = **Digital** nominal value (PWM signal) at connection **X52**
53 = **Digital** nominal value (PWM signal) at connection **X53**
54 = **Digital** nominal value (PWM signal) at connection **X54**
55 = **Digital** nominal value (PWM signal) at connection **X55**
56 = **Digital** nominal value (PWM signal) at connection **X56**
57 = **Digital** nominal value (PWM signal) at connection **X57**
58 = **Digital** nominal value (PWM signal) at connection **X58**
59 = **Digital** nominal value (PWM signal) at connection **X59**
60 = **Digital** nominal value (PWM signal) at connection **X60**

Caution

The machine manufacturer is responsible for assignment of the axes (axis 1, axis 2, axis 3, etc.) to the axis designations (X, Y, Z, etc.) in machine parameter **MP 100.X**
See section "Machine Parameter List" on page 301.

Under no circumstances may machine parameter MP100.x be changed!

16.2 Overview of Test Routines for Error Diagnosis

Brief description of test routines for error diagnosis	Description
Analog nominal value interface of iTNC 530	
■ iTNC with analog non-HEIDENHAIN inverter	Test routine 1
Digital nominal value interfaceof iTNC 530	
■ Modular HEIDENHAIN inverter system	Test routine 2
■ Two-axis module UM 12x HEIDENHAIN and servo motors, if **no** error at the **iTNC**	Test routine 3
■ SIMODRIVE 611 D	Test routine 4
■ Two-axis module SIMODRIVE 611 D and servo motors, if **no** error at the **iTNC**	Test routine 5
■ HEIDENHAIN UE 2xxB compact inverters	Test routine 6

Note

Also use the HEIDENHAIN tool TNCdiag for error diagnosis.

16.2.1 Test routine 1, Checking the analog speed command interface

General

The control outputs an analog voltage of 0V to ±10V, in proportion to the traversing speed (See MP1050.x page 306, analog voltage for rapid traverse).
This voltage can be measured directly at the MC or at the connecting terminals of the servo amplifier with a multimeter via the universal measuring adapter.

Error: No axis traverse!

Procedure for error diagnosis:

- Switch off main switch of machine.
- Connect the universal measuring adapter to connector X8 or X9 of the MC.
  The multimeter must be connected to the pin sockets of the measuring adapter.
  Assignment of the analog nominal speed value interface See section "Connector Designation and Layout" on page 103.
  If no measuring adapter is available, connect the mulitmeter directly to the nominal value input of the servo amplifier.
- Switch on main switch and control voltage.
- Switch position display to LAG (following error).
- Check or set the following machine parameters (if you change any of the machine parameters, note down the original input values so these can be restored after the diagnosis has been completed).

MP	Input value	Function
1410.x	30 [mm]	Position monitoring for operation with velocity feedforward (erasable)
1420.x	30 [mm]	Position monitoring for operation with velocity feedforward (EMERGENCY STOP)
1140.x	9.99 [V]	Movement monitoring
1710.x	300 [mm]	Position monitoring for operation with following error (erasable)
1720.x	300 [mm]	Position monitoring for operation with following error (EMERGENCY STOP)

- Traverse the reference points that need to be traversed prior to those of the defective axis.
- Turn the override potentiometer on the KEYBOARD UNIT back completely and start reference-point traverse for the defective axis.
- Check axis enable for defective axis on servo amplifier.
- Check the screen dispaly for the following:
  - The yellow asterisk symbolizing "control in operation" must be displayed.
  - The **"F"** for display of the feed rate must not be highlighted.
  - The symbol for "axis not in position control loop" must not appear before the position display, (e.g. +X +100.276).
- Slowly turn up the override potentiometer, and then turn it back again before the servo lag display reaches the position monitoring limit.

As the override potentiometer is turned up, the TNC outputs an analog voltage. This is increased in proportion to the servo lag until the max. 10V is reached.

If the voltage at the measuring adapter reads 10V ± 0.1V, then the control is OK.

If no voltage is recorded, proceed as follows:

- Switch off main switch.
- Disconnect X8 or X9 from the MC.
- Disconnect the nominal value lead from the servo amplifier and check it for short-circuit.

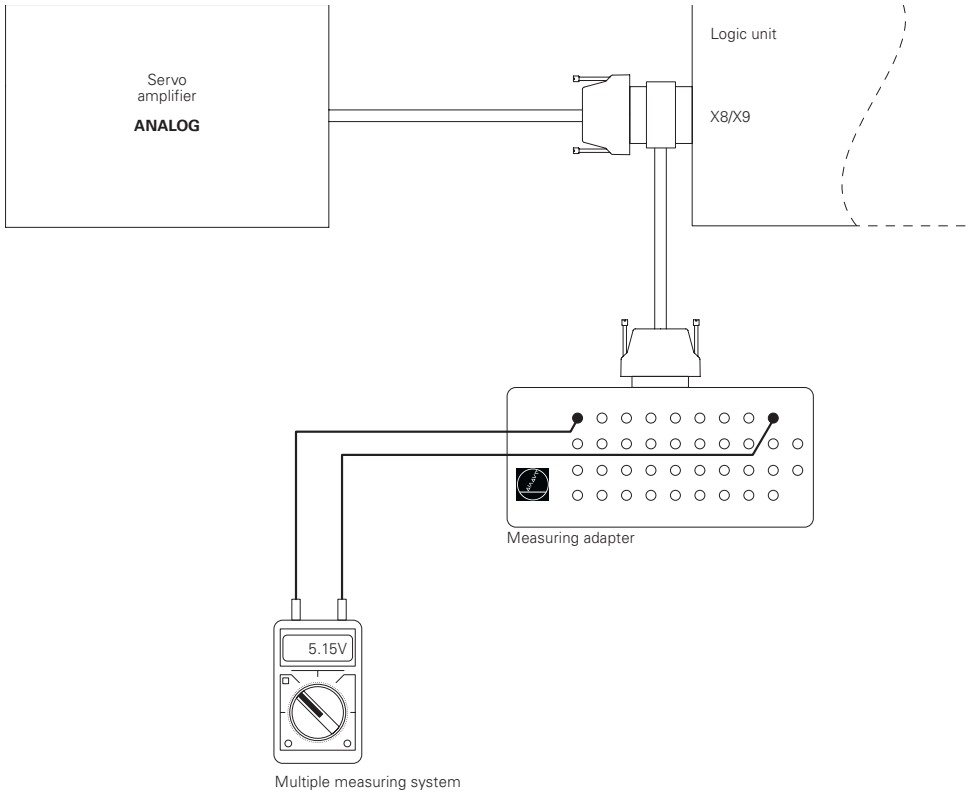
If the nominal value lead is OK, then:

- Reconnect X8 or X9 to MC (leave nominal value lead at servo amplifier open).
- Switch on main switch and repeat measurement with reference point traverse.

If an analog voltage is recorded now, then the control is OK.

If no analog voltage is recorded, then the analog output at the MC is defective.

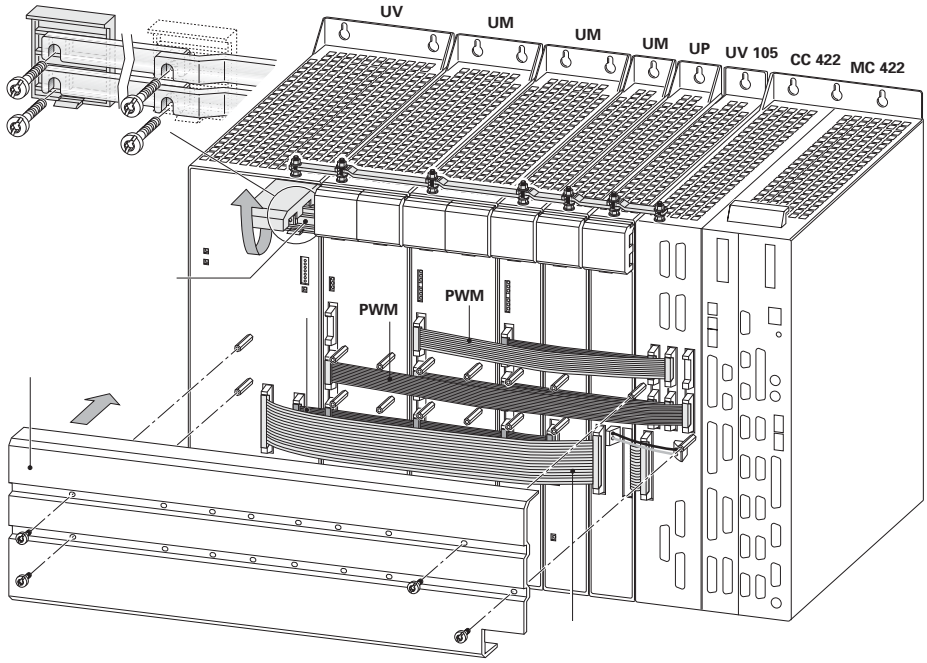
Test routine 1, Measuring setup for checking the analog nominal value interface



Specifications of the analog outputs

Load capacity:	$R_L \geq 5\ k\Omega$, $I \leq 2$ mA $C_L \leq 2$ nF
Short-circuit stability:	one output short-circuit proof at a time
Voltage range:	$U_{amax} = +10\ V \pm 100\ mV$ $U_{amin} = -10\ V \pm 100\ mV$
Resolution:	14 bit = 16.384 steps
Smallest step:	$\frac{10V}{16384} = 0{,}610\ mV$

16.2.2 Test routine 2



Machine parameters used in example

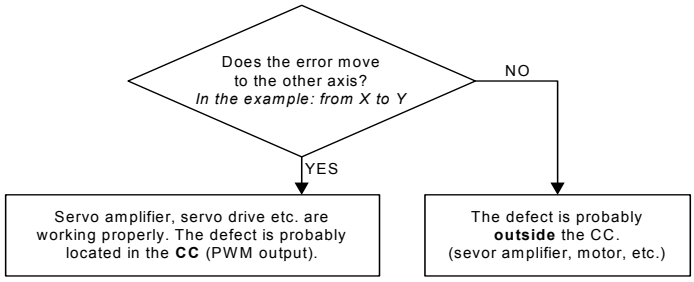
MP 100.x = - - - - -CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 2180.x = 0 (PWM frequency = 5 kHz for all axes)
MP 120.0 = 51 (X-axis at motor power stage connection **X51**)
MP 120.1 = 52 (Y-axis at motor power stage connection **X52**)
MP 120.2 = 53 (Z-axis at motor power stage connection **X53**)
MP 120.3 = 54 (C-axis at motor power stage connection **X54**)
MP 121.0 = 56 (1. spindle at motor power stage connection **X56**)
MP 121.1 = 0 (2. spindle not active)

Caution

Please contact your HEIDENHAIN agency, if you want to execute this routine and different values are entered in the parameters MP2180.x.
Only encoders within the groups X51 to X56 (main controller board) and X57 to X60 (aux. controller board) may be exchanged.

Example Error in X-axis

- Switch off main switch of machine.
- Remove the cover of the ribbon cables for the inverter modules.
- Exchange the motor power stage connection of the defective axis with that of a functional axis **at the CC**.
  In the example X51 (X-axis) with X52 (Y-axis).
  Caution: Be careful when reconnecting ribbon cables.
- Switch on main switch of machine.
- Do not acknowledge POWER INTERRUPT message. Call machine parameter list with code number 95148.
- Exchange the input values of MP 120.x for the defective axis with those of the other axis.
  In the example MP 120.0 (X-axis) = 52, MP 120.1 (Y-axis) = 51.
- Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- When the inverter system and the iTNC are ready See section "Checking the Enables on the iTNC" on page 225
- Start positioning of the axis.


Does the error move
to the other axis?
In the example: from X to Y
NO
YES
Servo amplifier, servo drive etc. are
working properly. The defect is probably
located in the **CC** (PWM output).
The defect is probably
outside the CC.
(sevor amplifier, motor, etc.)

16.2.3 Test routine 3

General

If the **iTNC is in order**, an error diagnosis of the inverter module UM / drive motor for UM 12x two-axis modules can be carried out by switching the channels.

Configuration and machine-parameter settings used in example

UM 12x: **X111** (motor power stage connection of channel 1) connected with **X51** (iTNC, X-axis)
X112 (motor power stage connection of channel 2) connected with **X54** (iTNC, Y-axis)
X81 (motor connection of channel 1) connected with motor **X-axis**
X82 (motor connection of channel 2) connected with **Y-axis**

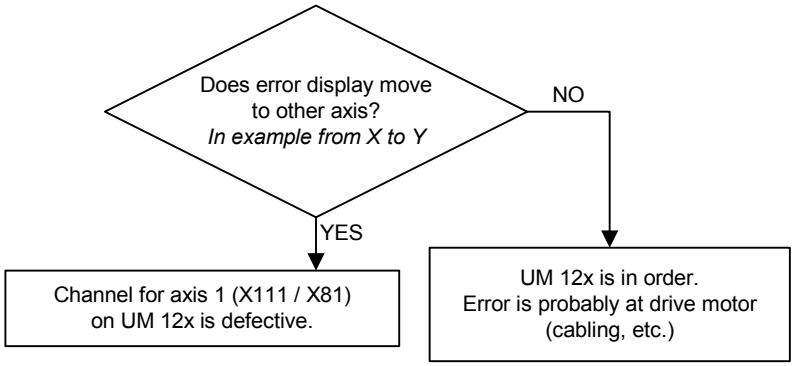
MP 100.x = - - - - -CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 2180.x = 0 (PWM frequency = 5 kHz for all axes)
MP 120.0 = 51 (X-axis at motor power stage connection **X51**)
MP 120.1 = 54 (Y-axis at motor power stage connection **X54**)
MP 120.2 = 52 (Z-axis at motor power stage connection **X52**)
MP 120.3 = 53 (C-axis at motor power stage connection **X53**)
MP 121.0 = 56 (1. spindle at motor power stage connection **X56**)
MP 121.1 = 0 (2. spindle not active)

Caution

Please contact your HEIDENHAIN agency, if you want to execute this routine and different values are entered in the parameters MP2180.x.
Only encoders within the groups X51 to X56 (main controller board) and X57 to X60 (aux. controller board) may be exchanged.

Example Error in X-axis

- Switch off main switch of machine.
- Remove the cover of the ribbon cables for the inverter modules.
- Switch the motor power stage connections **X111** and **X112** at the inverter module.
- Switch the motor connections **X81** and **X82** at the inverter module,
  in the example, the motor connections of the X and Y axis on the two-axis module UM 12x.
- Switch on main switch of machine.
- Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- When the inverter system and the iTNC are ready. See section "Checking the Enables on the iTNC" on page 225
- Start positioning of axis.



16.2.4 Test routine 4

Machine parameters used in example

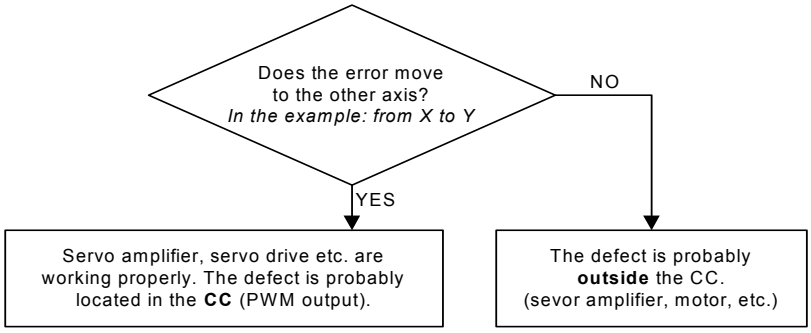
MP 100.x = - - - - -CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 2180.x = 0 (PWM frequency = 5 kHz for all axes)
MP 120.0 = 51 (X-axis at motor power stage connection **X51**)
MP 120.1 = 54 (Y-axis at motor power stage connection **X54**)
MP 120.2 = 52 (Z-axis at motor power stage connection **X52**)
MP 120.3 = 53 (C-axis at motor power stage connection **X53**)
MP 121.0 = 56 (1. spindle at motor power stage connection **X56**)
MP 121.1 = 0 (2. spindle not active)

Caution

Please contact your HEIDENHAIN agency, if you want to execute this routine and different values are entered in the parameters MP2180.x.
Only encoders within the groups X51 to X56 (main controller board) and X57 to X60 (aux. controller board) may be exchanged.

Example Error in X-axis

- Switch off main switch of machine.
- Remove cover from ribbon cables.
- Exchange the motor power stage connection of the defective axis with that of a functional axis **at the CC**.
  In the example X51 (X-axis) with X54 (Y-axis).
- Switch on main switch of machine.
- Do not acknowledge POWER INTERRUPT message. Call machine parameter list with code number 95148.
- Exchange the input values of MP 120.x for the defective axis with those of the other axis.
  In the example MP 120.0 (X-axis) = 54, MP 120.1 (Y-axis) = 51
- Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- When the inverter system and the iTNC are ready See section "Checking the Enables on the iTNC" on page 225.
- Start positioning of axis.



16.2.5 Test routine 5

General

If the **iTNC is in order**, an error diagnosis of the inverter / drive motor for two-axis modules can be carried out by switching the channels on the HEIDENHAIN interface card.

Configuration and machine parameters used in example

Interface card: **X111** (motor power stage connection of channel 1) connected with **X51** (iTNC, X-axis)
X112 (motor power stage connection of channel 2) connected with **X56** (iTNC, Y-axis)

At the output: Motor connection of channel 1 connected with motor **X-axis**
Motor connection of channel 2 connected with motor **Y-axis**

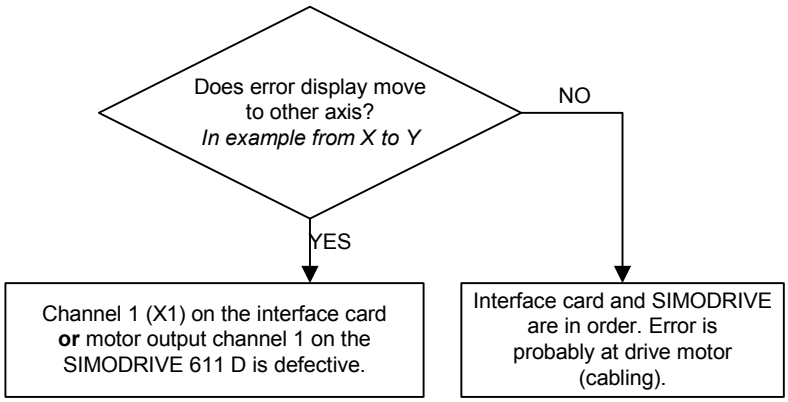
MP 100.x = - - - - -CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 2180.x = 0 (PWM frequency = 5 kHz for all axes)
MP 120.0 = 51 (X-axis at motor power stage connection **X51**)
MP 120.1 = 54 (Y-axis at motor power stage connection **X54**)
MP 120.2 = 52 (Z-axis at motor power stage connection **X52**)
MP 120.3 = 53 (C-axis at motor power stage connection **X53**)
MP 121.0 = 56 (1. spindle at motor power stage connection **X56**)
MP 121.1 = 0 (2. spindle not active)

Caution

Please contact your HEIDENHAIN agency, if you want to execute this routine and different values are entered in the parameters MP2180.x.
Only encoders within the groups X51 to X56 (main controller board) and X57 to X60 (aux. controller board) may be exchanged.

Example Error in X-axis

- Switch off main switch of machine.
- Remove cover from ribbon cables.
- Exchange motor power stage connections **X111** and **X112** on the **interface card**.
- **At the output** exchange the motor connections on the SIMODRIVE 611D
  in the example, the motor connections of the X and Y axis on the two-axis module.
- Switch on main switch of machine.
- Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- When the inverter system and the iTNC are ready See section "Checking the Enables on the iTNC" on page 225.
- Start positioning of axis.



16.2.6 Test routine 6

Machine parameters used in example

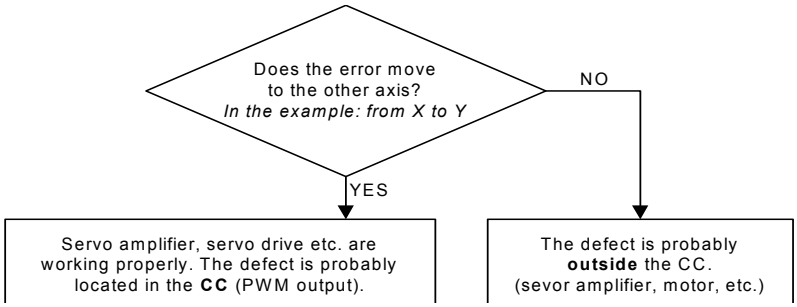
MP 100.x = - - - - -CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 2180.x = 0 (PWM frequency = 5 kHz for all axes)
MP 120.0 = 51 (X-axis at motor power stage connection **X51**)
MP 120.1 = 54 (Y-axis at motor power stage connection **X54**)
MP 120.2 = 55 (Z-axis at motor power stage connection **X55**)
MP 120.3 = 52 (C-axis at motor power stage connection **X52**)
MP 121.0 = 56 (1. spindle at motor power stage connection **X56**)
MP 121.1 = 0 (2. spindle not active)

Caution

Please contact your HEIDENHAIN agency, if you want to execute this routine and different values are entered in the parameters MP2180.x.
Only encoders within the groups X51 to X56 (main controller board) and X57 to X60 (aux. controller board) may be exchanged.

Example Error in X-axis

- Switch off main switch of machine.
- Unscrew the cover of the ribbon cables at the compact inverter.
- Exchange the motor power stage connection of the defective axis with that of a functional axis **at the CC**.
  In the example X51 (X-axis) with X54 (Y-axis).
  Caution: Be careful when reconnecting ribbon cables.
- Switch on main switch of machine.
- Do not acknowledge POWER INTERRUPT message. Call machine parameter list with code number 95148.
- Exchange the input values of MP 120.x for the defective axis with those of the other axis.
  In the example MP 120.0 (X-axis) = 54, MP 120.1 (Y-axis) = 51
- Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- When the compact inverter and the iTNC are ready See section "Checking the Enables on the iTNC" on page 225.
- Start positioning of the axis.



16.3 Speed Adjustment at Servo Amplifier

General

Speed adjustment at servo amplifier needs to be carried out if

- You have updated the mechanical design of an axis (e.g. guideway, bearing, drive spindle, etc.)
- You have exchanged the servo amplifier or the motor.
- Servo lag at constant traverse is impermissibly high.

Note

Adjusting only needs to be carried out with an analog axis.

Adjusting

- Check or set the following machine parameters (if you change the machine parameters, please take note of the original input values).
  - MP 7290.x (display step) = 6 (display step 0.01 µm)
- Switch position display to LAG (following error)
- Enter the following test program (e.g. for X axis)

```
0    BEGIN PGM X MM
1    LBL 1
2    X+ 0 F MAX
3    X + 100 F MAX (if possible select larger traverse range)
4    CALL LBL 1 REP 100/100
5    END PGM X MM
```

- Allow test program to run in the Program Run, Full Sequence mode
- Adjust tachometer generator at the servo amplifier using the servo lag display.

Note

- For operation with velocity feedforward control, adjust the servo lag display to 0 (ideally).
- For operation with servo lag, adjust the servo lag display as follows:

$$\text{LAG [mm]} = \frac{\text{Traverse rate}\left(\frac{\text{m}}{\text{min}}\right)}{\text{kv Factor}}$$

- Repeat the adjustment procedure for all axes.
- Reset the original values in machine parameter MP 7290.x.

16.4 Adjusting the Electrical Offset

General

Electrical offset adjusting is required if

- You have exchanged the MC.
- You have exchanged the servo amplifier.
- Servo lag of the axis at standstill is impermissibly high.
- You have replaced cables or electrical lines at the machine.

Note

Adjusting only needs to be carried out with analog axes.

Offset adjusting at servo amplifier

Procedure:

Note

Before you carry out an offset adjustment via code number, you must first adjust the offset at the servo amplifier.

- Check or set the following machine parameters (if you change the machine parameter, please take note of the original input values).
  - MP 1080.x (Integral factor for offset) **: 0** (switched off):
  - MP 7290.x (display step) **: 6** (display step 0.1 µm)

- Select the Manual operating mode.
- Switch position display to LAG.

- Select the Programming and Editing mode.

- Prepare iTNC for entry of code number.

- Enter the code number.

- Confirm.

- End compensation.
- Adjust the offset at the servo amplifier until the individual axes either display the value 0 or oscillate around 0 (approximate value ± 3-5 µm).
- Reset the original values in machine parameters and in the position display.

Offset adjusting via code number

Procedure:

▶ Select the Programming and Editing mode.

MOD

▶ Prepare iTNC for entry of code number.

7 5 3 6 8

▶ Enter the code number.

ENT

▶ Confirm.

▶ Press one of the following soft keys.

CONTINUE

Carry out an offset compensation. The values are stored in the nonvolatile memory.
Offset adjusting via code number compensates the current offset values. Later changes in offset are not compensated.

ABORT

Do not carry out an offset compensation, or end a previous compensation.

END

Exit the menu without making any changes.

17 Integrated Oscilloscope

The iTNC features an integrated oscilloscope.

The oscilloscope can be called via code number **688379**.

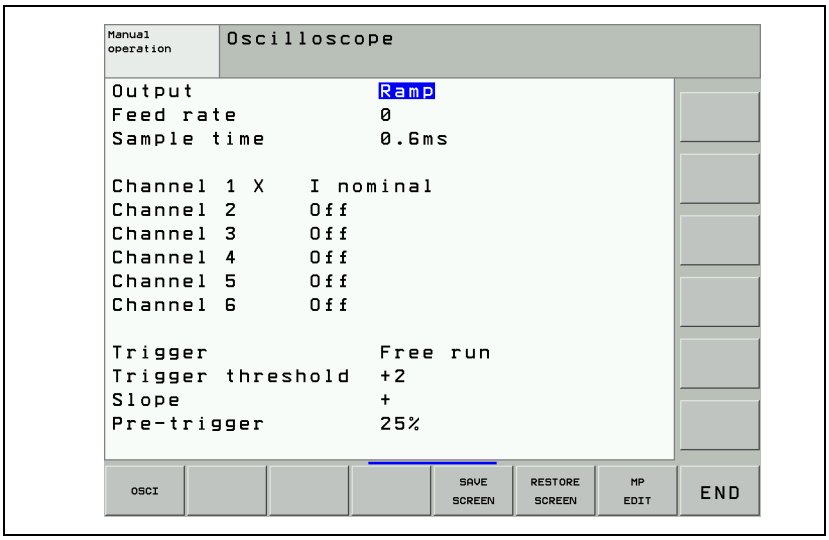
With this oscilloscope you can record the following signals in up to six channels:

Signal	Explanation
Off	No recording in this channel
Saved	The signal last recorded is saved
Actual pos	Actual position [mm]
Noml. pos	Nominal position [mm]
Lag	Following error of the position controller [µm]
Volt.analog	Analog axis/spindle: Analog voltage = nominal velocity value [mV]
V actl.	Actual value of the axis feed rate [mm/min]; Calculated from position encoder
V noml.	Nominal value of the axis feed rate [mm/min]; Axis feed rate calculated from the difference from the nominal position values. The following error is not included.
Feed rate	Contouring feed rate [mm/min]
Position: I1	Signal 1 of the position encoder
Position: I2	Signal 2 of the position encoder
V (ACT RPM)	Shaft speed actual value [mm/min]; Calculated from rotary speed encoder and standardized with MP1054
V (NOML RPM)	Nominal velocity value [mm/min]; Output quantity of the position controller.
I (INT RPM)	Integral-action component of the nominal current value [A]
I nominal	Nominal current value [A] that determines torque
PLC	The PLC operands (B, W, D, I, O, T, C) are recorded. Enter the operands in the input field next to the PLC.
Acceleration	Nominal value of the acceleration [m/s^2]
Jerk	Nominal value of the jerk [m/s^3]
Pos. Diff.	Difference between position and speed encoder [mm]
Current Accel.	Current acceleration value [m/s^2]; Calculated from position encoder
Current Jerk	Current jerk value [m/s^3]; Calculated from position encoder
I2-t (mot.)	Current value of I^2-t monitoring of the motor [%]
I2-t (pow. module)	Current value of I^2-t monitoring of the power module [%]
Utilization	Actual utilization of the drive [%]
Block no.	Block numbers of the NC program
Gantry Diff.	Difference between the synchronized axes [mm]

The recorded data remain stored until you start recording again or activate another graphic function.

Setup

- Activate the oscilloscipe by entering the code number 688379 –> the setup menu is displayed.
- Choose the parameters to be entered with the cursor keys.
- Press GOTO –> a popup window is displayed.



Output:

- Select whether the nominal speed value is to be issued as a step or ramp:
  - If you select **ramp** output, then the programmed feed rate, k_V factors, and acceleration values that you have specified with machine parameters go into effect.
  - If you select **step** output, a step will be output as nominal velocity value when you press the axis-direction buttons in the **Manual operating mode.** During output, the position control loop is open.
    With this recording mode you can e.g. find out, whether machine vibrations (after replacement of mechanical components) are already generated in the current or speed controller, or whether they derive from the position controller.

DANGER

- When operating the oscilloscope with step output (= traverse without position control loop) you may damage your machine or even cause injury to persons!
- The specified feed rate is the step height.
- Start recording with a small step which you can increase if necessary.
- Set the feed rate to zero before terminating the oscilloscope function.
  When the internal oscilloscope is activated again, "Ramp" output is automatically selected.

Feed rate:

- Enter the height of the step for the nominal velocity value (in mm/min).
  This entry has no effect for ramp output.

Sample time:

- Set the time interval for recording the signals.
  Entry: 0.6 ms; 1.8 ms and 3.6 ms
  4096 samples are stored. The signals are therefore stored for the following duration:
  - 0.6 ms · 4096 = 2.4576 s
  - 1.8 ms · 4096 = 7.3728 s
  - 3.6 ms · 4096 = 14.7456 s

Channel 1 to channel 6:

- Assign the channels of the recorded signals to the respective axes.

Trigger:

- Define the type of recording.
  You have the following possibilities:
  - **`Free run`**: The recording is started and ended by soft key. If you press the STOP soft key, the last 4096 events are stored.
  - **`Single shot`**: If you press the START soft key, the next 4096 events are stored.
  - **`Channel 1`** to **`6`**: Recording begins when the triggering threshold of the selected channel is exceeded.

Trigger threshold:

- Enter the trigger threshold in the following dimensions:
  - Velocity [mm/min]
  - Position [mm]
  - Shaft speed [mm/min]
  - Following error [µm]
  - Analog voltage [mV]
  - Current [A]
  - Acceleration [m/s^2]
  - Jerk [m/s^3]

Slope:

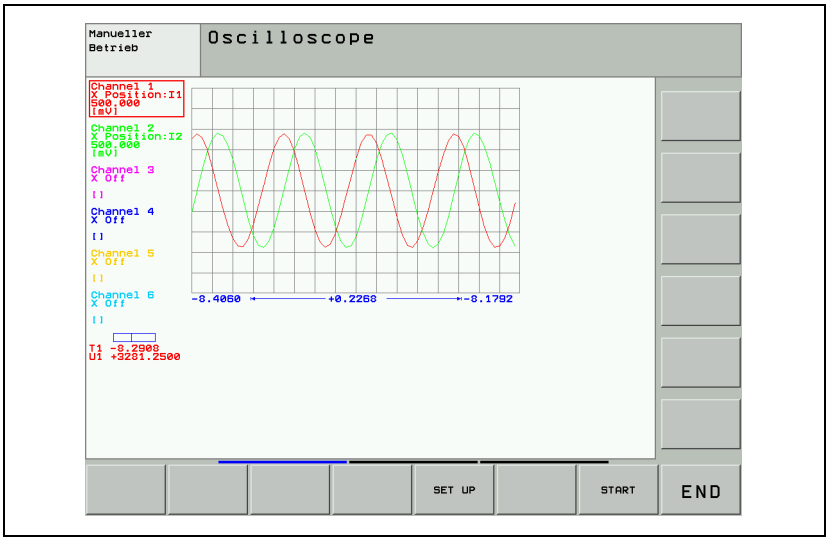
- Select whether the rising edge (positive slope) or falling edge (negative slope) of the signal acts as trigger.

Pre-trigger:
Recording begins at a time preceding the trigger time point by the value entered here

- Enter a value.

Oscilloscope display:

- Press the OSCI Soft key.



During recording, the selected signals are continuously displayed. After recording ends, the memory contents are displayed. For every channel, the manner of the signal and the resolution are also shown. The length of the recorded range, with respect to the entire memory content, is shown as a bar in the status field.

- Move the cursor with the arrow keys. The status field shows the amplitude of the selected channel and the time with respect to the beginning of recording.
- Activate a second cursor by pressing the CURSOR 1/2 soft key. The oscilloscope displays the amplitude and time of this cursor. The time [s] and the value of the second cursor is shown with respect to the time point of the first cursor. With this function you can measure the acceleration time of an axis, for example.

Meaning of the soft keys:

Meaning of the soft keys:	
Select one of the six channels using the cursor keys (arrow keys around the GOTO key). Press the arrow keys on the VDU to switch the soft-key row and display the following symbols:	
Soft-key row 1:	
	Back to setup menu.
	Start recording. The recording is ended either with a trigger condition or with the STOP soft key.
	Exit the oscilloscope function.
Soft-key row 2:	
	Move the signal down.
	Move the signal up.
	Decrease the vertical resolution.
	Increase the vertical resolution.
	Optimum vertical resolution. The signal is centered in the picture.
	Optimum display of the signal considering the zero line.
	Activating the second cursor.
	Exit the oscilloscope function.
Soft-key row 3:	
	Move the signals to the left.
	Move the signals to the right.
	Decrease the horizontal resolution.
	Increase the horizontal resolution.
	Invert the signal.
	Exit the oscilloscope function.

Saving the recording

You can display the signal last recorded for a channel again by selecting the Saved signal.

With the SAVE SCREEN soft key in the Setup menu you can save the recorded signals with all settings in a file on the hard disk. The file must have the extension *.DTA. This file can be called again with e.g. the TNCscope software.
The TNCscope software has been developed as external oscilloscope for TNC410.
With iTNC 530 it does not work online. You can use TNCscope to open and edit your oscilloscope files (*.DTA files) on your computer.

18 PLC Interface

18.1 Specifications

PLC inputs

Voltage ranges	MC 422	PL 4xx B
"1" signal: U_i	13 V to 30.2 V	
"0" signal: U_i	-20 V to 3.2 V	
Current ranges:		
"1" signal: I_i	3.8 mA to 8.9 mA	2.5 mA to 6 mA
"0" signal: I_i when U_i = 3.2 V	1.0 mA	0.65 mA

Address	Number	Device
I0 to I31	31 + Control-is-ready signal	MC 422, X42 (PLC input)
I128 to I152	25	MC 422, X46 (machine operating panel)
I64 to I127 I64 to I95	64 32	First PLC input/output board PL 410B First PLC input/output board PL 405B
I192 to I255 I192 to I223	64 32	Second PLC I/O board PL 410B Second PLC input/output board PL 405B
I256 to I319 I256 to I287	64 32	Third PLC input/output board PL 410B Third PLC input/output board PL 405B
I320 to I383 I320 to I351	64 32	Fourth PLC input/output board PL 410B Fourth PLC input/output board PL 405B

PLC outputs

The switching outputs are transistor outputs with current limitation.

Please note:

- Permissible load: Resistive load; Inductive load only with quenching diode parallel to inductance.
- Short circuiting of **one** output is **permissible**.
  No more than one output may be short-circuited at one time.
- No more than half the PLC outputs may be driven at the same time. (simultaneity factor 0.5).

	MC 422	PL 4xx B
Min. output voltage for "1" signal	3 V below supply voltage	
Nominal operating current per output	0.125 A (simultaneity factor 0.5)	2.0 A (at max. PL current consumption of 20 A)

Note

The switching outputs need a minimum load of 5 mA.

Address	Number	Device
O0 to O30	31	MC 422, X41 (PLC output)
O0 to O7	8	MC 422, X46 (machine operating panel)
O32 to O62	31	First PLC input/output unit
O64 to O94	31	Second PLC input/output unit
O128 to O158	31	Third PLC input/output unit
O160 to O190	31	Fourth PLC input/output unit

18.2 Monitoring the PLC Inputs and Outputs

PLC inputs

When checking the PLC inputs, proceed as follows:

- Switch off the main switch of the machine.
- Connect the universal measuring adapter to connector X42 or X46 between the MC and the connecting cable.

Note

The voltage levels for the PLC inputs or the output current for the PLC outputs on the PL 405B/410B must be measured directly at the corresponding terminal.

- Switch the machine On again.
- Press the following key combination:

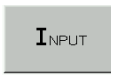
- Select the Programming and Editing mode.

- Prepare iTNC for entry of code number.

- Enter the code number.

- Confirm.

- Call TABLE function.



- Display table for inputs.

The logic states for the inputs are displayed on the screen. These must be in agreement with the voltage level for each input.

If, at correct input voltage, there is a difference between the logical condition and the voltage level of an input, then the corresponding input board of the logic unit or the PL 405B/510B I/O unit is defective.

- Press the END key twice to end the TABLE function and exit the Programming and Editing mode.

PLC outputs

When checking the PLC outputs, proceed as follows:

- Switch off the main switch of the machine.
- Connect the universal measuring adapter to connector X41 or X46 between the MC and the connecting cable.

Note

The voltage levels for the PLC inputs or the output current for the PLC outputs on the PL 405B/410B must be measured directly at the corresponding terminal.

- Press the following key combination:

- Select the Programming and Editing mode.

MOD

- Prepare iTNC for entry of code number.

8 0 7 6 6 7

- Enter the code number.

ENT

- Confirm.

TABLE

- Call TABLE function.

OUTPUT

- Display table for outputs.

The displayed logic states must be in agreement with the voltage levels for each output.

If you find a difference between them:

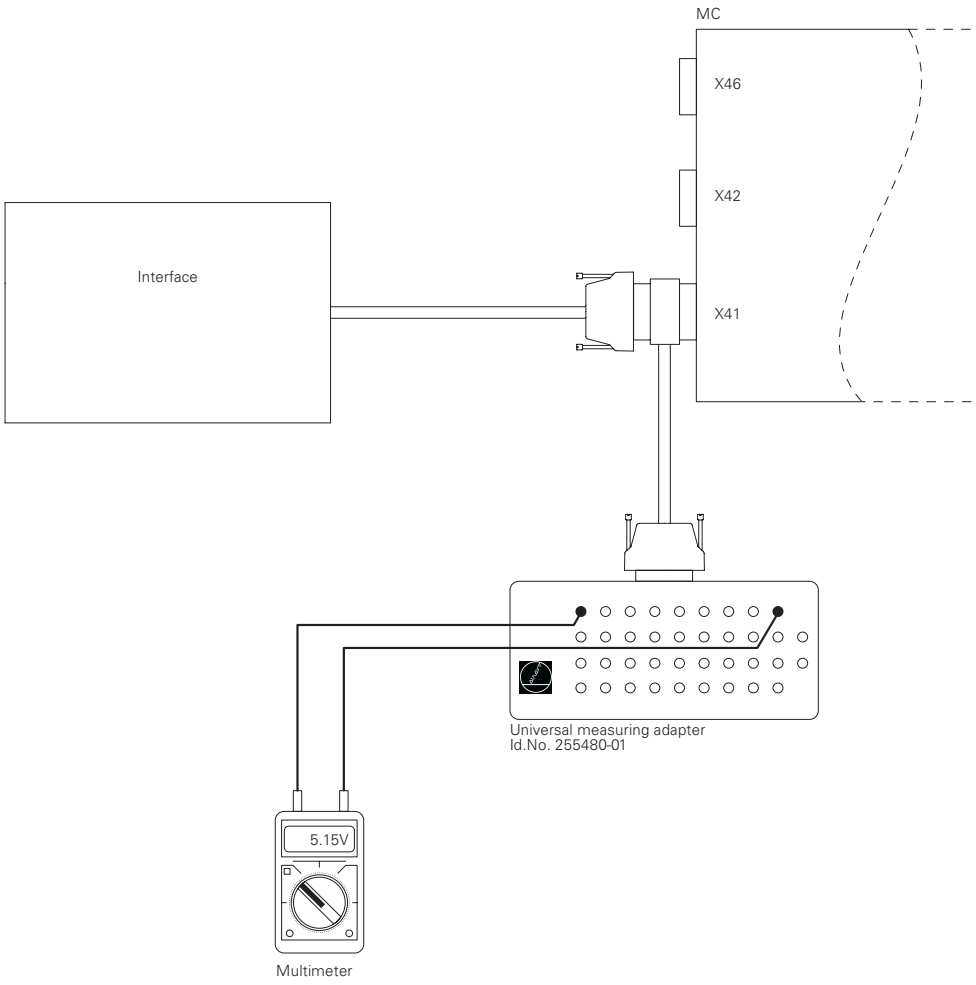
Check that there is no short circuit in the connecting cable and measure the output current for this output.See section “Specifications” on page 251 If the output current is not exceeded and the cable is Ok, then the output board of the MC or the PL 405B/410B I/O unit is defective.

END

- Press the END key twice to end the TABLE function and exit the Programming and Editing mode.

END

Measuring circuit for PLC inputs and outputs on MC



DANGER

Always switch off the main electrical disconnect switch of the machine before connecting or disconnecting any plugs or terminals. Otherwise damage or injury to property or persons may result.

X41: PLC output
X42: PLC input
X46: Machine operating panel

18.3 Service Diagnosis in PLC mode

18.3.1 TRACE function

The TRACE function allows the monitoring of logic states such as

- Markers
- Inputs
- Outputs
- Timers
- Counters

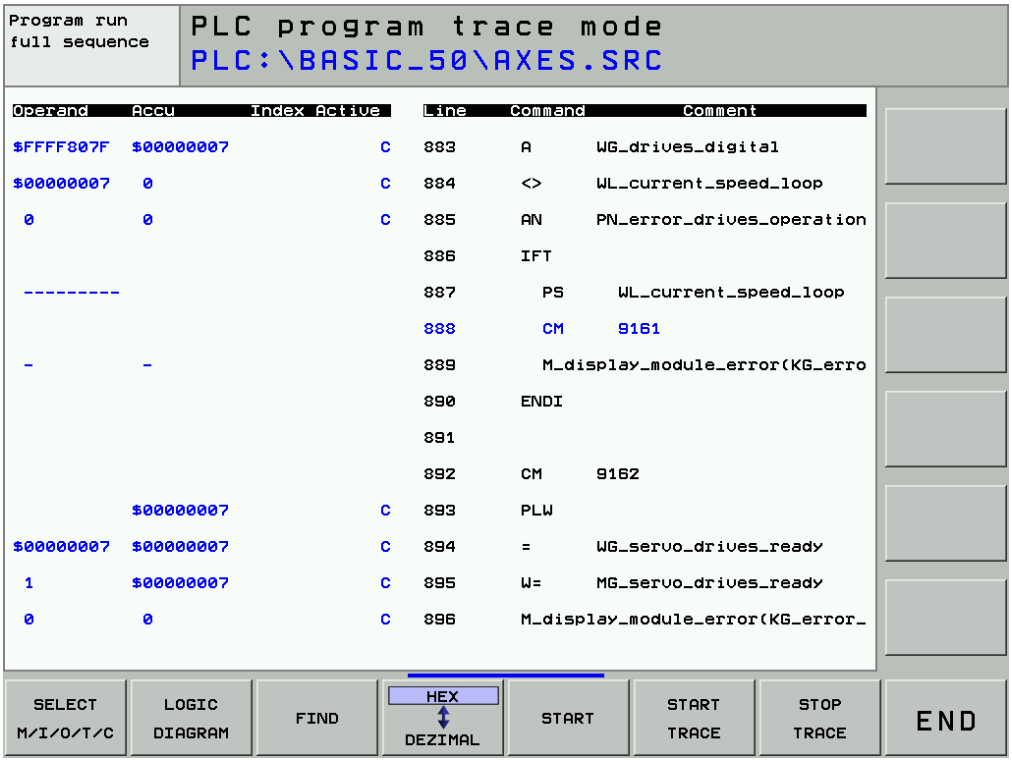
as well as the inspection of the contents of

- Bytes
- Words
- Double words

Call

TRACE

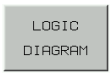
▶ The TRACE function is called via the TRACE soft key.



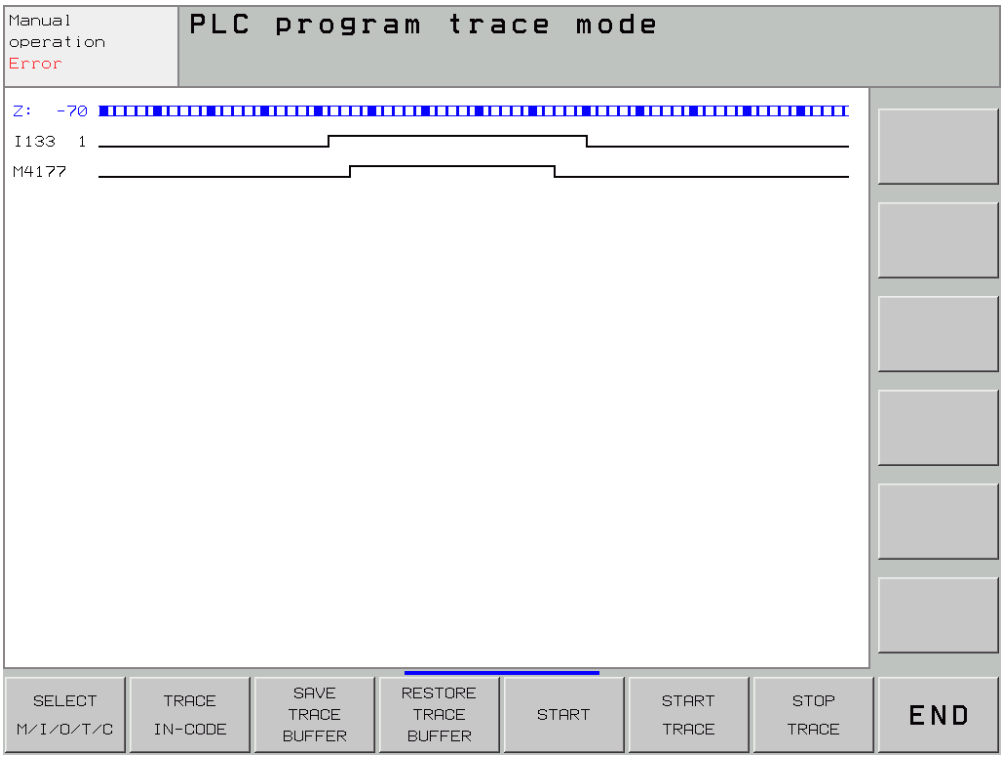
The statement list (STL) of the converted program is displayed. In addition, the contents of the operand and the accumulator is displayed in HEX or decimal code for every program line. Every active command of the STL is identified with a "C".

18.3.2 LOGIC diagram

Call



▶ Soft key for calling the logic diagram.



The logic states of up to 16 operands (M,I,O,T,C) can be displayed at the same time. Only a maximum 1024 PLC scans are traced.

▶ Soft key for storing a completed trace on the hard disk.

▶ Soft key for loading a saved trace into the logic diagram.

Selection of operands and start of recording

▶ Press the following key combination:

SELECT M/I/O/T/C

▶ Display selection table.

A table appears in which the desired operands can be selected. The individual positions in the table are interrogated using dialog. Incorrect entries can be deleted with DEL key.
A trigger condition can be set for each operand. 512 states are recorded each before and after a trigger event. The following are possible trigger conditions:

"1" Record when operand logical "1" (trigger on positive edge)
"0" Record when operand logical "0" (trigger on negative edge)
NO ENT No trigger:
If a trigger condition is not entered for any of the operands, the operand statesare recorded continuously and the last 1024 are always saved.

e.g.:

0	I5	1	Trigger on positive edge
1	O6	0	Trigger on negative edge
2	M2003		No trigger

START TRACE

▶ Start TRACE function.

▶ iTNC in Machine mode (key on visual display unit).

A recording begins with START TRACE and ends with STOP TRACE or with the arrival of a trigger event.

PCTR blinking: Trigger condition has not yet arrived.

PCTR not blinking: Trigger condition has arrived, buffer is written.

PCTR not lit: Buffer full, LOGIC DIAGRAM can be called.

▶ Switch to TRACE mode.

LOGIC DIAGRAM

▶ Call the logic diagram.

18.3.3 TABLE Function

▶ Press the following key combination:

▶ Call TABLE function.

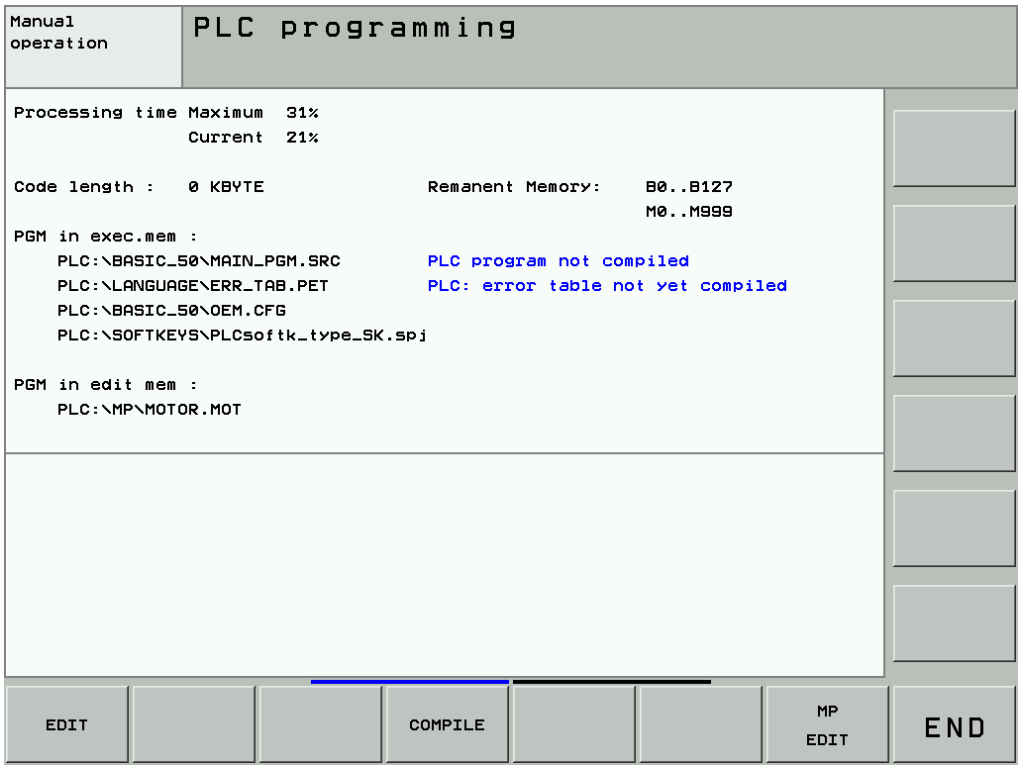
▶ Key on visual display unit.

The table is called after the corresponding soft key has been pressed.

The logic states of the markers, inputs, outputs, counters and timers are shown dynamically. The display mode for byte, word and doubleword tables can be switched between HEX and DECIMAL.
Positions can be selected within the tables using the cursor keys or the GOTO key.

18.4 Re-Compile the PLC program

Main screen



Compile PLC program

COMPILE

▶ Prepare compilation.

OEM.SYS: ALL

▶ Compilation of the main PLC program and the PLC error table.

OEM.SYS: PLC-MAIN PROGRAM

▶ Compilation of the main PLC program.

OEM.SYS: PLC-ERRORTAB.

▶ Compilation of the PLC error table.

SELECT

▶ After pressing this soft key, the program manager is opened.
Now a PLC program can be selected to be compiled as main PLC program.

Caution

Only the main program may be compiled.
If a subprogram was accidentally compiled as main PLC program, the error message "PLC program not translated" is generated. In this case the compiler has detected global modules in this file.
In a main PLC program there are no modules defined as "global".
For this reason there is another error message - PLC: Global in the main file - which indicates that a subprogram was compiled instead of the main PLC program.

18.5 Calling the PLC Error Table (<Name>.PET) for Diagnosis Purposes

Calling the PET table

Caution

The PET table may only be opened for the purpose of fault diagnosis.
Under no circumstances may the settings be changed, as this will alter the performance of the machine.

▶ Select the Programming and Editing mode.

▶ Call input field for code number.

▶ Enter the code number.

▶ Confirm.

▶ Call the program management.

▶ Using the arrow keys, select the PLC error table PLC:\<Name>.PET.

▶ Confirm.

Description of elements

Column	Description
NR	Line number in the table. The modules select the PLC error message by assigning the line number.
ERROR	Error text There are three ways to specify the error text: ■ Direct entry of the error text (max. 32 characters). ■ Line number of the PLC error text file. The PLC error text file is defined in the OEM.SYS by "PLCERROR = ..."(#< line no.>). ■ Number of the string memory, where the error text may be found (#S<string nr.>).
MARKER	The PLC error message can be activated without a module call by setting the marker defined here. Only markers in the range M4800 to M4899 can be entered. The marker is also set if the error message was activated through Module 9085. 0 means no error marker.
RESET	0 = No NC reset when error message is activated. Non-blinking error display. 1 = NC reset when error message is activated. Error display flashes.
NC STOP	0 = No NC stop when error message is activated. 1 = NC stop when error message is activated.
NC CANCEL	0 = No NC stop (iTNC stop) when error message is activated. 1 = NC stop (iTNC stop) when error message is activated.
F STOP	0 = Feed rate enable is not affected. 1 = Feed rate enable is reset when error message is activated.
EMER.STOP	0 = No EMER. STOP stop when error message is activated. 1 = EMER. STOP when error message is activated.
CE	0 = error message can be deleted with CE key. 1 = error message cannot be deleted with CE key.
PRIOR	A priority from 0 to 2 can be entered for the error message. 0 is the highest priority. The active PLC error messages are displayed in order of priority.
MType	Message type: E = Error, W = Warning, I = Info

▶ Exit PET table

18.6 Nonvolatile PLC Markers and Words

Saving on hard disk

For storing certain states of the PLC program, it is possible to save the nonvolatile PLC memory range on the hard disk and then load it again for testing purposes.

▶ Press the following key combination:

▶ Select the Programming and Editing mode.

MOD

▶ Prepare iTNC for entry of code number.

8 0 7 6 6 7

▶ Enter the code number.

ENT

▶ Confirm.

TABLE

▶ Call TABLE function.

▶ Switch soft-key row.

SAVE M/B/W/D

RANGE =

▶ The defined maximum range of the nonvolatile PLC markers and words (e.g. M0... M999, B0 ... B127) is automatically entered by iTNC. This range can be changed by the operator.
Note: Here the unit B (bytes) instead of W (words) is not an error.
-> A byte is the smallest subset of a word.

ENT

▶ Confirm setting.

File: PLC:\PLCMEM.A

▶ The default setting offered by the iTNC is PLC:\PLCMEM.A. If required, more than one file can be stored on the hard disk.

ENT

▶ The states or contents of the PLC markers / words are stored on the hard disk in the indicated file.

END END

▶ Exit PLC operating mode.

Restore data in RAM

▶ Press the following key combination:

▶ Select the Programming and Editing mode.

▶ Prepare iTNC for entry of code number.

▶ Enter the code number.

▶ Confirm.

▶ Call TABLE function.

▶ Switch soft-key row.

▶ Enter the target directory and the file name under which the states of the PLC markers and words are stored on the hard disk.
The default setting offered by the iTNC is PLC:\PLCMEM.A.

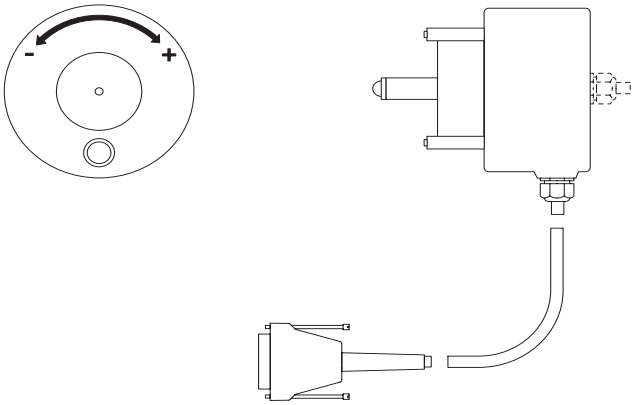
▶ The stored states of the PLC markers and words are restored in the RAM.

▶ Exit PLC operating mode.

19 Serial Handwheels

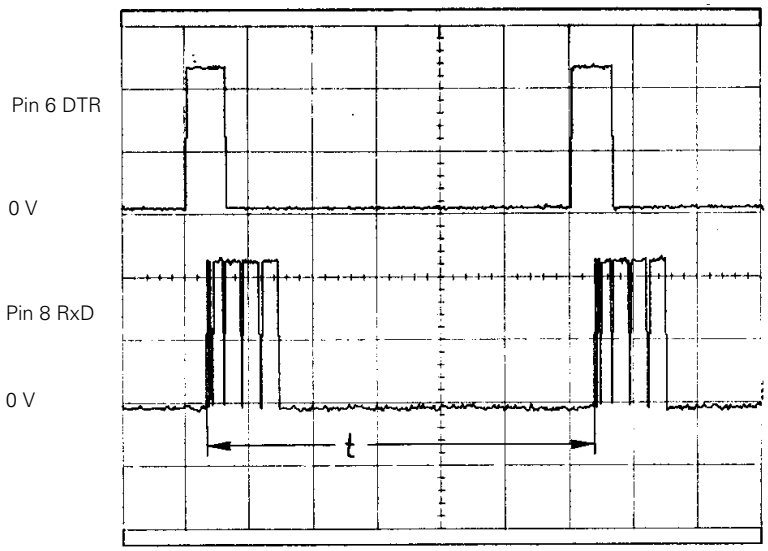
19.1 HR 130 Handwheel

HR130



Checking data transmission

The HR 332 serial handwheel with auxiliary keys can be checked using an oscilloscope. The following signals can be measured at handwheel input X23 of the MC. The signals must correspond to the following diagram:



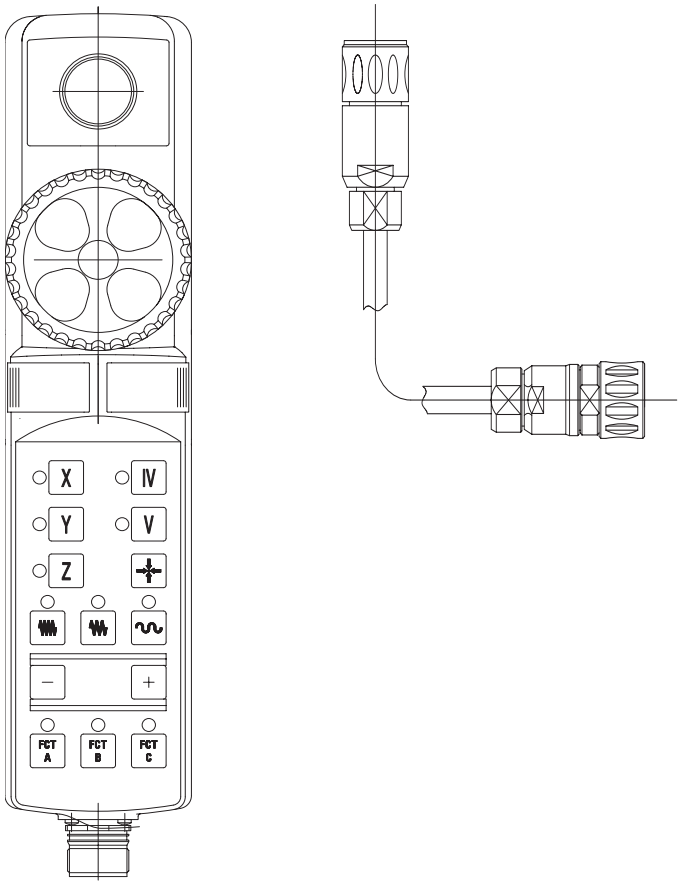
t = 6 ms

Note

Power is supplied to the handwheel via the MC.

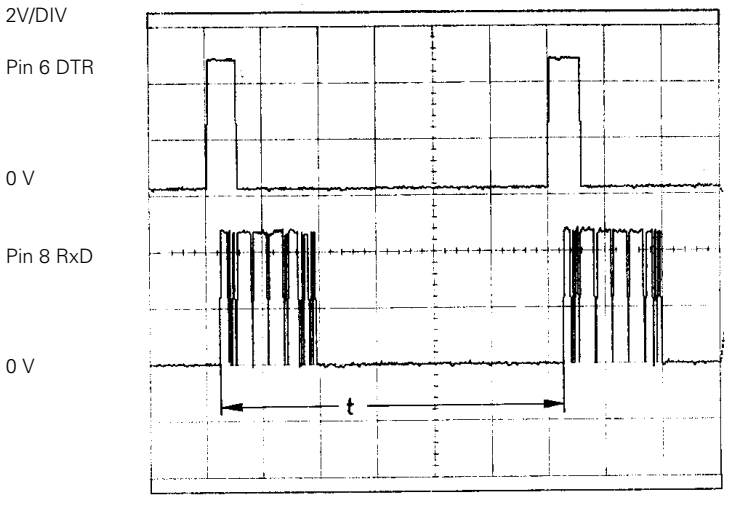
(X23, pin 2 = 0 V, pin 4 = + 12 V)

19.2 HR 410 Handwheel



Checking data transmission

The HR 410 serial handwheel can be checked using an oscilloscope. The following signals can be measured at handwheel input X23 of the MC. The signals must correspond to the following diagram:



t = 6 ms

Note

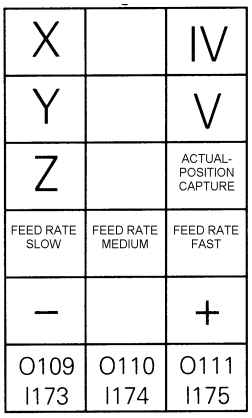
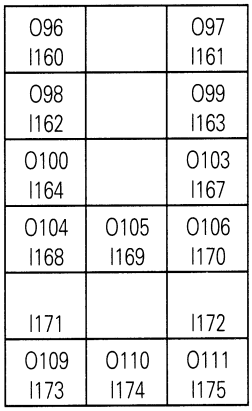
Power is supplied to the handwheel via the MC.

(X23 Pin 2 = 0 V, Pin 4 = + 12 V)

Checking the keys

Set machine parameter **MP7640 = 6**.

MP7645.0 determines whether the handwheel keys are evaluated by the NC or the PLC.

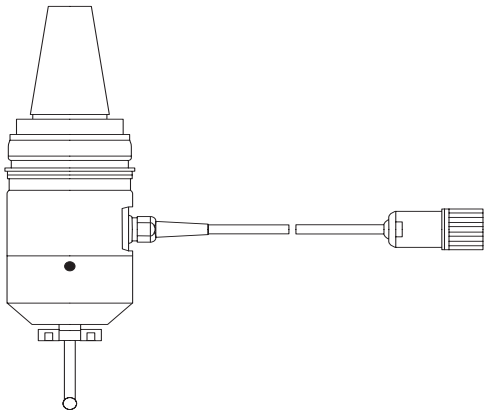
MP7645.0 = 0	**MP7645.0 = 1**
Evaluation of keys via NC	Evaluation of keys via PLC
	
With the exception of the function keys A, B and C, all keys are evaluated by the NC. MP7670.x determines the appropriate interpolation factors for low, medium and high speeds. MP7671.x defines the low, medium and high speeds. The speed is indicated as a % factor of the manual feed rate (MP1020.x).	All keys are evaluated by the PLC. Handwheel axis and handwheel interpolation are set with Module 9036. W766 allows the feed rate to be altered by pressing the axis-direction keys.

20 Touch Probe Systems

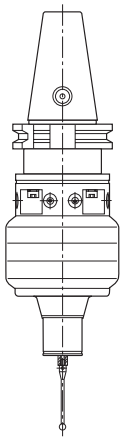
20.1 Overview

20.1.1 Touch probes for workpiece measurement

TS 220 With cable connection

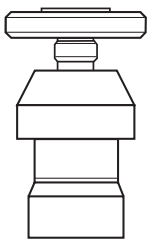


TS 632



20.1.2 Touch probe for tool measurement

TT 130



21 Data Interfaces

21.1 Cable Overview

Please note:

- Max. cable length with Ethernet is 400 m (shielded), 100 m (unshielded).
- Maximum cable length with RS-232-C/V.24 is 20 meters.
- Maximum cable length with RS-422-C/V.11 is 1000 meters.

21.1.1 Ethernet interface RJ45 port

- For the required peer-to-peer connection of your laptop and the iTNC you require a crossed Ethernet **cable.**
  "Peer-to-peer" means that you do not connect laptop and iTNC via the local computer network; instead the **laptop is directly** connected to the **iTNC**.

Note

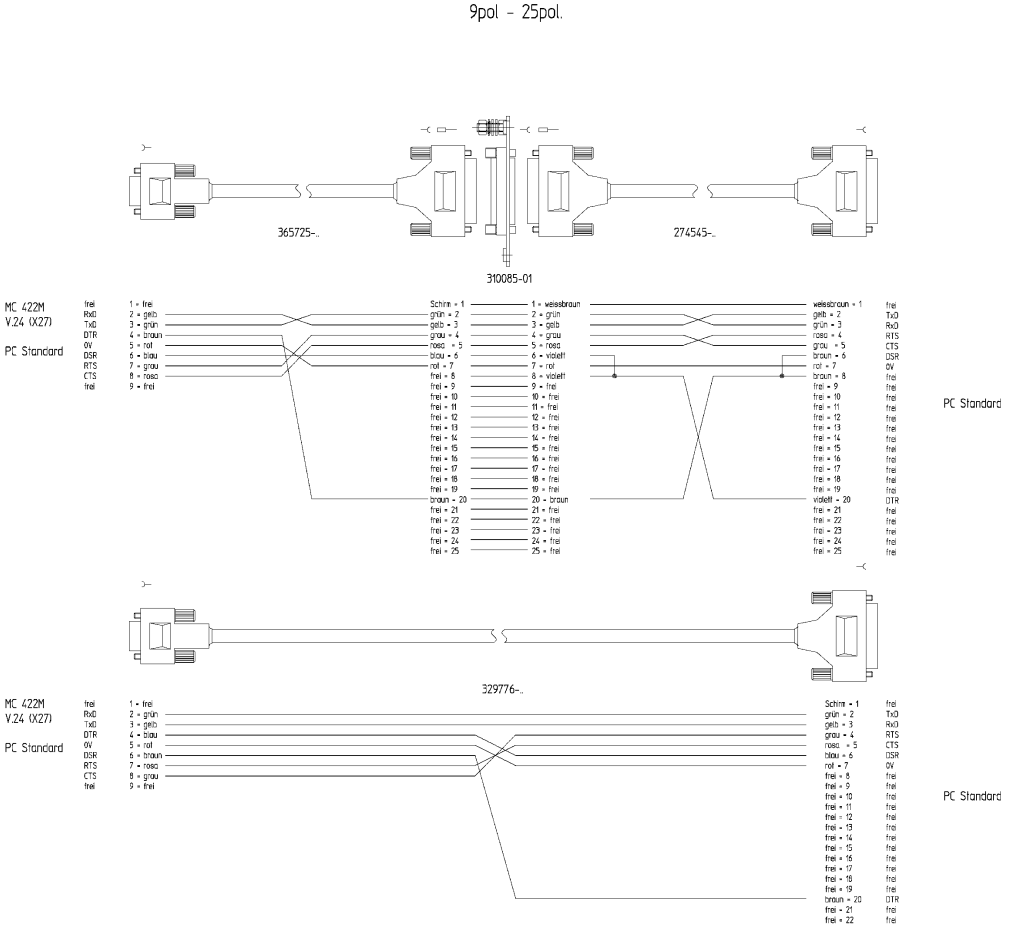
We recommend to mark the crossed Ethernet cable accordingly in order to avoid confusion.

- If you want to connect via your inhouse network, computer and control are normally connected with non-crossed Ethernet cables ("patched").

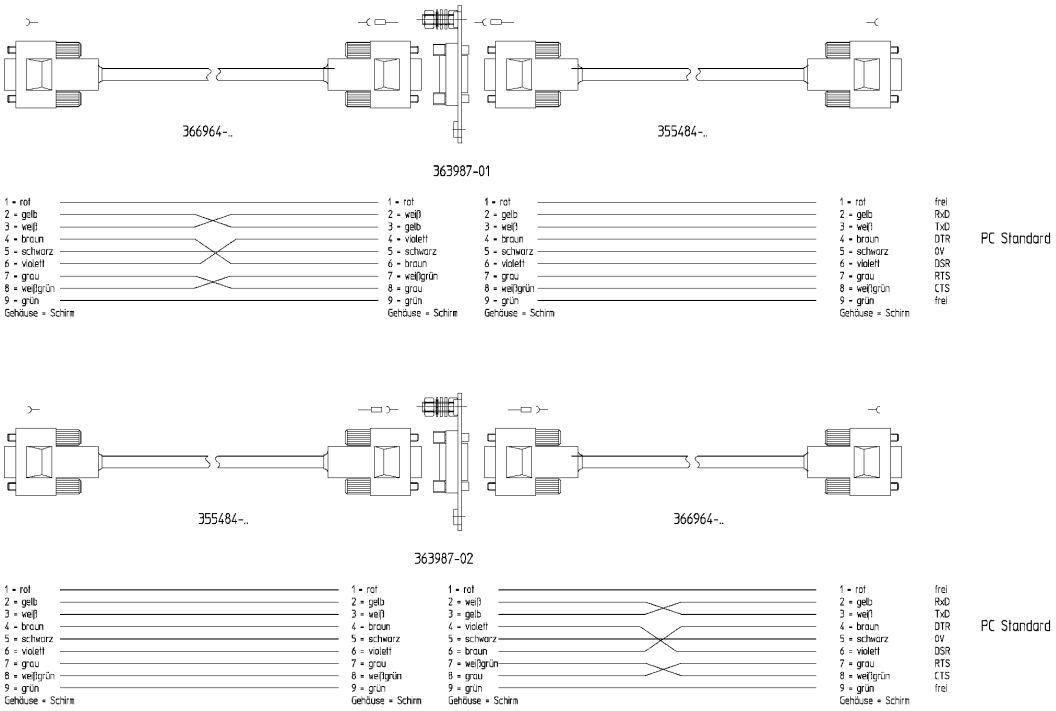
21.1.2 RS-232-C/V.24

Note

The RS-232-C-/V.24 data interface has different pin layouts at the iTNC (connector X27) and at the V.24 adapter block (connector on electrical cabinet).
Exception: The cable with the Id.No. 366964-xx may be connected to the 9-pin adapter block or directly to the control.



9pol - 9pol.



21.1.3 RS-422/V.11

Note

The RS-422-/V.11 data interface has the same pin layout at the iTNC (connector X28) and at the V.11 adapter block.

21.2 Data Interface Operating Modes

21.2.1 Overview of operating modes

The iTNC can be set for data transfer according to the following interface operating modes:

FE1

For connection of the HEIDENHAIN floppy-disk unit FE 401B or other peripheral units.
This operating mode is supported by TNCremo/TNCremoNT.

Protocol:	Blockwise transfer
Data format:	7 data bits, 1 stop bit, even parity
Baud rate:	110 - 115 200 baud
Interface parameters:	Adapted to mode
Transfer stop:	Software handshake with DC3

Data format and protocol adjusted to suit FE 401/B.

FE2

For connection of the HEIDENHAIN floppy-disk unit FE 401B or other peripheral units.
This operating mode is supported by TNCremo/TNCremoNT.

Protocol:	Blockwise transfer
Data format:	7 data bits, 1 stop bit, even parity
Baud rate:	110 - 115 200 baud
Interface parameters:	Adapted to mode
Transfer stop:	Software handshake with DC3

Data format and protocol adjusted to suit FE 401/B.

EXT 1, EXT 2

For adjusting data transfer to external peripheral units.

Protocol:	Standard data format or blockwise transfer Adaptation via machine parameters (from MP 5000)
Data format:	Adaptation via machine parameters (from MP 5000)
Baud rate:	110 - 115 200 baud
Interface parameters:	Adaptation via machine parameters (from MP 5000)
Transfer stop:	Software handshake with DC3 or hardware handshake with RTS, set via machine parameter from MP 5000

LSV-2:

The LSV2 protocol allows various functions such as file management and diagnosis of the iTNC to be executed from the PC.
This operating mode is supported by TNCremo/TNCremoNT.

Protocol:	Bidirectional data transfer in accordance with DIN 66019
Data format:	8 data bits, 1 stop bit, no parity
Baud rate:	110 - 115 200 baud
Interface parameters:	Adapted to mode
Transfer stop:	Software handshake via protocol

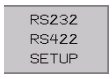
21.2.2 Interface configuration and assignment of mode

Calling the interface setup

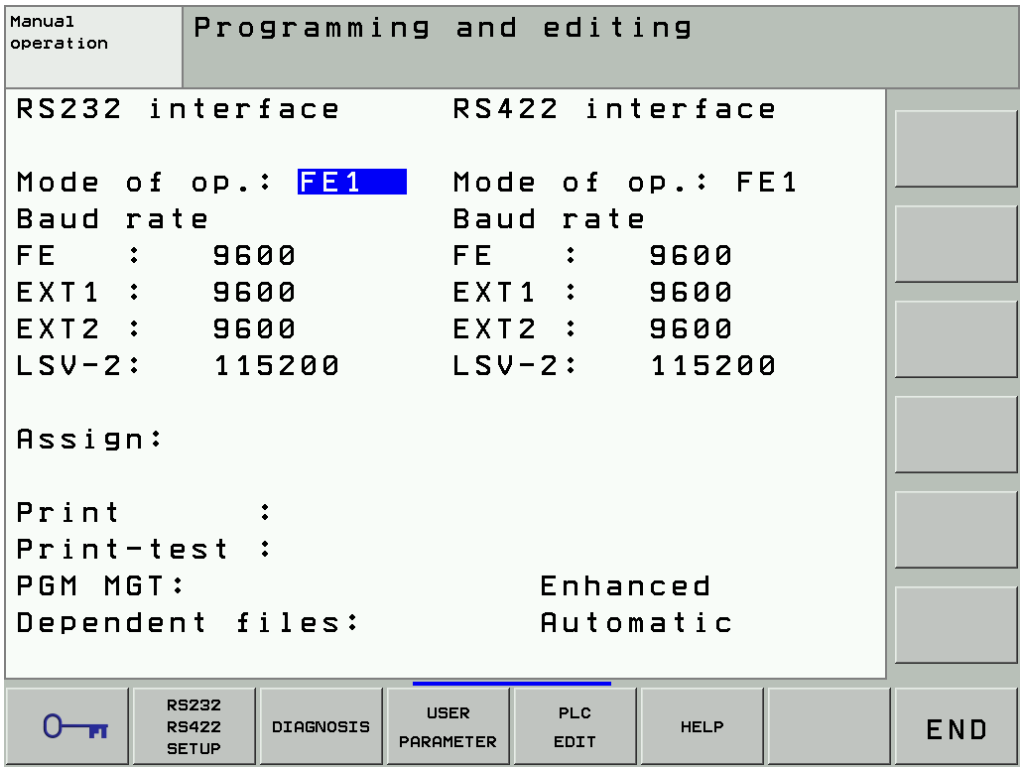
▶ Press the following key combination to call the main screen for interface configuration:

▶ Select the Programming and Editing mode.

▶ Prepare iTNC for entry of code number.



In the Programming and Editing, and Test Run modes, you can call the setup menu for the data interfaces by pressing the MOD key and the soft key RS232/RS422 SETUP.



Operating mode / baud rate

The data interface RS-232-C (V.24) is configured on the left side of the screen, and the data interface RS-422-C (V.11) on the right. The operating mode and the baud rate can be edited.

To edit the operating mode, baud rate and assignment of interfaces:

▶ Use the arrow keys to find the entry you wish to edit.

▶ Press the ENT key repeatedly until the value you require is displayed (or press MOD to call the menu).

▶ To exit MOD function RS 232/RS 422, press the END soft key.

22 Transfer of Files via Data Interface

22.1 The Data Transfer Menu

When you call program management in the Programming and Editing mode, the different drives are displayed.

RS 232:\ V.24 data interface (X27)
RS 422:\ V.11 data interface (X28)
TNC:\ TNC partition (user data)
PLC:\ PLC partition (machine data via code number)

Depending on the type of operating mode selected, a symbol appears beside the external drive.

Operating mode	Drive symbol with PGM MGT
FE1 FE2	
EXT1, EXT2	
Ethernet	

22.2 Downloading Files from the iTNC via Data Interface

Note

The following procedures describe the downloading and uploading of files using the HEIDENHAIN data transfer software **TNCremoNT 2.0 from revision 237**.

Connection setup via Ethernet

If your PC or laptop has a functioning ethernet card, proceed as follows:

- Establish a peer-to-peer connection between your laptop and the iTNC.
  "Peer-to-peer" means that you do not connect laptop and iTNC via the inhouse network; instead the **laptop is directly** connected to the **iTNC** using a crossed Ethernet cable.
- Now either adapt the IP address and the subnet mask of your laptop to the IP address and the subnet mask of the iTNC, or vice versa.

Note

You can read the IP address and the subnet mask of the control after entering the code number NET123 and pressing the DEFINE NET soft key.

If you want to adapt the settings of your laptop to those of the the iTNC:

- Assign your laptop an IP address that is one digit higher or lower than that of the control, and set the same subnet mask as in the control.
  Normally the settings can be changed in My Computer\Control Panel\Network.
  The laptop usually reboots after changes were made to these settings.

If you want to adapt the settings of your iTNC to those of the laptop:

- First back up the original DEFINE NET settings of the iTNC.
  For this purpose copy the file **ip4.n00** (in PLC:\NET) as **ip4-n00.txt** (or similar) or write down the information in this file.
- Determine IP address and subnet mask of our laptop.
  For this purpose enter "winipcfg" or "ipconfig" in the DOS-box. You can also find this information in My Computer\Control Panel\Network.
- Enter the code number NET123 and press the DEFINE NET soft key.
- Enter an internet address that is one digit higher or lower than the address of your laptop.
- Enter the same subnet mask as that of your laptop.
- Press END twice.
- The control now reboots.

Note

To check whether the ethernet connection is correct, you can "ping" the iTNC from your laptop.
In the DOS-box enter **ping** followed by the IP address of the iTNC (for example ping 160.1.180.9).
After having pressed ENT to confirm the command, the control must send a reply.

- Now start the HEIDENHAIN data transfer program TNCremoNT.
- In the configuration window (called by clicking the corresponding icon or via "Options/ Configuration…") click the TCP/IP connection and enter the IP address of your control. Confirm with "Apply" and "OK".

- Establish the connection by clicking the corresponding icon.
- If this does not work, please check the connecting cable and the settings.

Caution

Do not forget to reactivate the original settings after having finished your operation with the changed values.
If you have changed control settings, you can restore the backed up file ip4-n00.txt as ip4.n00.

Meaning of the LEDs of Ethernet interface X26:

LED	Condition	Explanation
Green	Blinks	Interface is active
	Off	Interface is inactive
Yellow	On	100-Mb network
	Off	10-Mb network

Connection setup via RS 232/V.24 or RS 422/V.11 serial interface

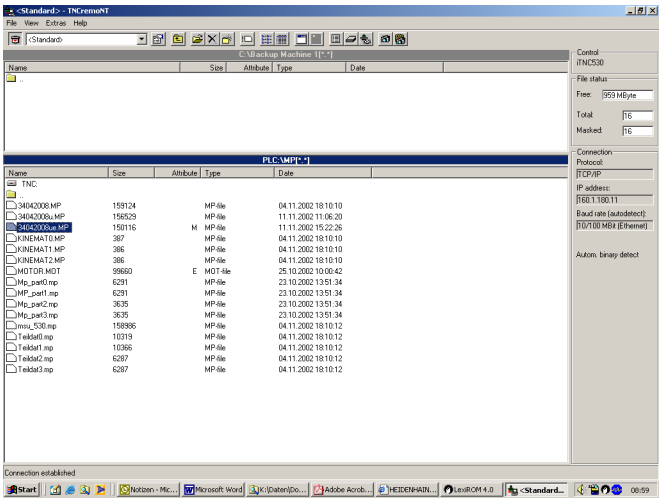
If you want to establish the connection via the serial interface, proceed as follows:

- Connect a crossed serial connecting cable (RS232 or RS422) to your laptop and to the D-Sub connector of the electrical cabinet (HEIDENHAIN adapter block).
  For possible configurations - also for direct connection of the laptop to the iTNC - please refer to the chapter “Data Interfaces” on page 269.
- At the iTNC select the LSV2 baud rate for the selected interface (RS 232 or RS 422).
- Now start the HEIDENHAIN data transfer program TNCremoNT.
- In the configuration window (called by clicking the corresponding icon or via "Options/ Configuration…") click theLSV2 connection and the serial interface of your control (in most cases COM 1).
  The data transfer rate is automatically determined when the connection is established.
  Confirm with "Apply" and "OK".

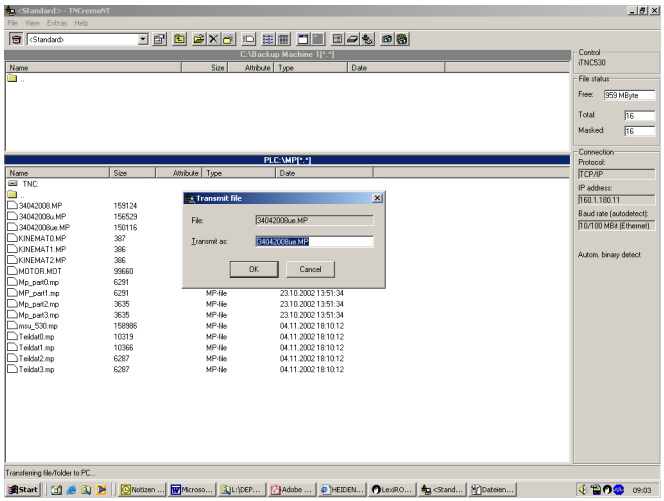
- Establish the connection by clicking the corresponding icon.
- If this does not work, please check the connecting cable and the settings.

Download files

- Select the target directory from the upper half of the screen display (contents of PC).
- In the lower screen window (contents of PLC partition of the iTNC), select the directory containing the file you wish to download. In the example PLC:\MP.



- Using the mouse, mark the file you wish to download.
- Start data transfer with "File/Transfer as…"



Note

You may also transfer the file with "drag & drop".
For this purpose click the file to be transferred and hold the right mouse button.
Now you can drag the file to its destination.

22.3 Uploading Files onto the iTNC via Data Interface

Note

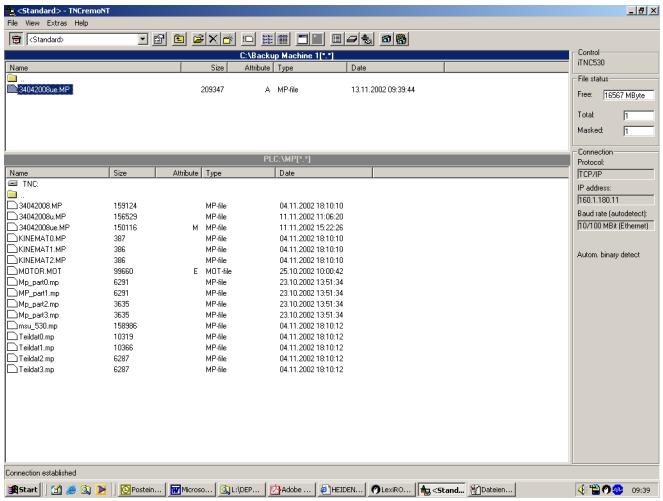
The following procedures describe the downloading and uploading of files using the HEIDENHAIN data transfer software **TNCremoNT 2.0 from revision 237**.

Connection setup

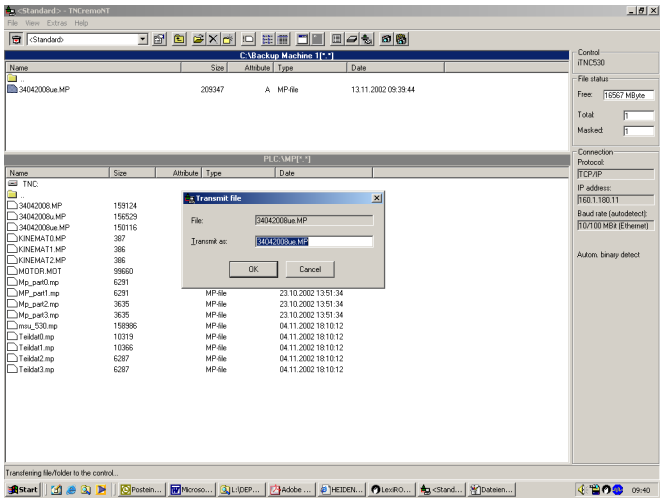
See previous pages.

Uploading files onto iTNC

- Select the target directory from the lower screen window (contents of iTNC)
- In the upper screen window (PC contents), select the directory containing the file you wish to upload onto iTNC. In the example C:\Backup



- Using the mouse, mark the file you wish to upload in the upper screen window (PC contents).
- Start data transfer with "File/Transfer as…".



Note

You may also transfer the file with "drag & drop".
For this purpose click the file to be transferred and hold the right mouse button. Now you can drag the file to its destination.

23 Replacing Instructions

23.1 Important Information

Note

Always comply with the safety precautions!
Normally the NC software or the MC are only exchanged by or upon consultation with the machine tool manufacturer.
Never press any key on your control while data transfer is running!

Which items can be exchanged?

- **MC** (Main Computer = housing part with the computer):
  Replacement MCs are equipped with the latest iTNC software.
- **CC** (Controller Computer = housing part with the controller)
- **Hard disk**:
  Replacement hard-disk drives are partitioned and the HEIDENHAIN HeROS operating system and the most recent iTNC software are installed.
- **NC software**
  The NC software is normally updated by the machine tool manufacturer.

SIK

Caution

- The SIK (System Identification Key) will remain with the machine.
  It must be inserted into the new or replacement MC; i.e. all enabled options are still available.
- Only defective SIKs are exchanged.
  If options were enabled on the defective SIK, you will receive the code numbers to enable these on your new SIK after giving us the number of your defective SIK.
  The SIK number is displayed after entering the code "SIK". It can also be found on the SIK housing or on a sticker below the ID label of the MC.
  The defective SIK has to be returned.

ID numbers

Caution

Since the iTNC consists of two components (MC 422 und CC 422) you can exchange each component individually or both together.
When sending us both components, do not forget to state both ID numbers.
The ID number of the MC can be found on the right side of the housing.
The ID number of the CC can be found on the underside of the base plate of the housing.

Required equipment

- PC or laptop with serial interface and/or Ethernet adapter and HEIDENHAIN data transfer software TNCremoNT, version 2.0, from revision 237.
- Ethernet cable:
  With peer-to-peer connection, i.e. direct connection of laptop and control, a crossed cable must be used.
  When connecting via the inhouse network a standard patch cable is required.
- Internet access for the NC software update.

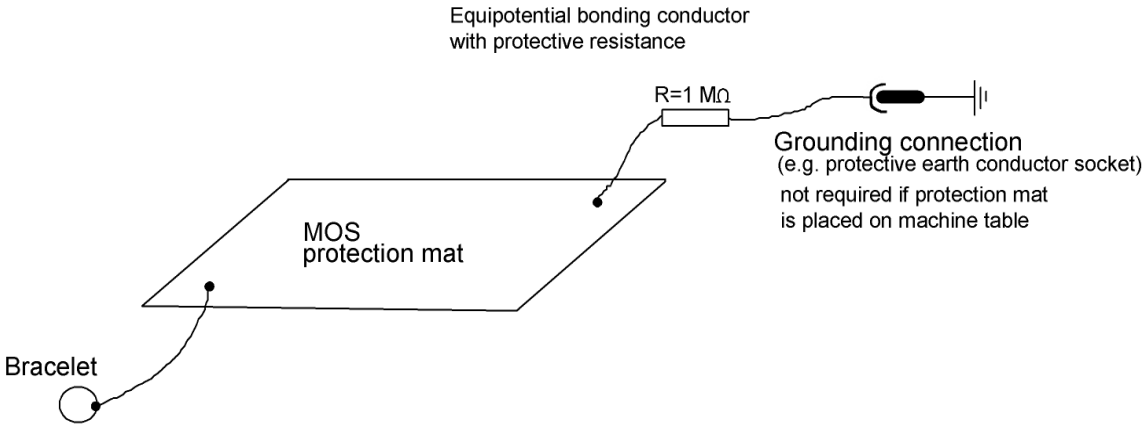
MP_NAME.MP

- If the PLC data are missing (data loss, loan or exchange control, new control) the control opens the file MP_NAME.MP.
- The axes cannot be traversed, and the control is set to Programming Station.
- In the MP_NAME.MP file there are no comments.
- Now the machine tool builder could commission his machine parameter by parameter.
- The service engineer in this case restores the backup of his machine data –> afterwards the machine performs as usual.

MOS protection

Caution

- When exchanging MC, CC or hard disk take the necessary preventive measures (EMC).
- There should be no contact between EMC-sensitive components with a statically loaded object (packaging, storing, warehousing).



23.2 NC Software Update for PGM no. 340420/421

Note

Always comply with the safety precautions!
Press the emergency stop button before you update the NC software or activate an already installed NC software.

Normally the NC software is only exchanged by or upon consultation with the **machine tool manufacturer**.
The new software can only be downloaded from the HEIDENHAIN website after entering a **user name** and a **password**.

Information about the cycles

Transform the OEM cycles into binary format before reconversion, otherwise the iTNC will not recognize these cycles, and will add ERROR blocks to the NC programs. These ERROR blocks must be deleted manually.

Downloading the new NC software to your laptop or PC

▶ Load the required NC software from the HEIDENHAIN website onto your laptop and decompress the ZIP file to a folder to be specified by you.
For this purpose proceed as follows:

- On the internet go to www.heidenhain.de.
- Click "Service".
- Click "Download Area".
- Click "File Base - Usergroup".
- Enter your user name and your password.

Note

User name and password for the download area "File Base - Usergroup" can be obtained from the HEIDENHAIN sales department.This access authorization is reserved to machine tool builders and selected customers.
Contact your HEIDENHAIN sales partner.

- Click "NC Software TNC" or "NC Software TNC Export".
- Select the required iTNC software.
- Download the software onto your laptop, PC, etc.
  For this purpose select a folder and start the procedure.
- Decompress the ZIP file into this folder.

Note

To update the software the three files with the software number (ending _bin.zip, _heros.zip and _setup.zip) are required. (_heros.zip may no longer be required in the future.)

Transfer of the new NC software to the control

▶ The procedure described below applies for the HEIDENHAIN data transfer software TNCremoNT V2.0 from R237 and a peer-to-peer connection via Ethernet (direct connection of laptop and control).
Proceed as follows:

- Connect laptop and iTNC 530 by means of a crossed Ethernet cable.
- Start TNCremoNT.
- Establish the connection.
- Select the PLC partition of the iTNC and create a new folder (e.g. SWUPDATE).
- Open the folder.
- Transfer the three zip files with the new NC software number and the endings _bin.zip, _heros.zip and _setup.zip from your laptop to the iTNC.
- Now the zipped files are on your iTNC hard disk.
  Disconnect TNCremoNT.

Note

Your data medium can also be connected to the control via CIMCO-NFS. For this purpose the CIMCO-NFS software must be installed. The connection setup is described in the iTNC 530 Technical Manual.
When using CIMCO-NFS the control directly accesses the data in the folder of the data medium. Therefore, the zipped NC software files do not have to be transferred with TNCremoNT.

Data in RAM

When the iNC is being prepared for a software update, then all of the important information in the RAM is stored **automatically** on the hard disk .

This includes:

- MODE settings (position display, etc.)
- AXIS LIMIT (traverse range limits, datums)
- RS 232/422 SETUP (assignment, baud rate, etc.)
- Touch probe calibration data
- Nonvolatile PLC memory range (markers and words from a specific group)

Once the NC software has been updated successfully, the saved data is restored **automatically**.

Preparing machine

- Move the swivel head to a defined position or basic position.
  Contact your machine manufacturer for more information.
- Move the tool changer to a defined position.
  Contact your machine manufacturer for more information.
- Move the axes away from the hardware limit switches, to the middle of the traverse range.

Converting data from binary to ASCII

Many file types (e.g. all NC programs with the extension *.H) are stored on the iTNC hard disk in binary format (the essential advantage is the fast access time). However, the binary format of the different software versions may not be the same (older software uses binary format A, newer software binary format B). Therefore the current binary format must be converted into the neutral ASCII format before updating an NC software. After the update the ASCII format is reconverted into the binary format of the software version. This ensures that the new NC software can operate with files in the correct binary format.

Caution

Conversion of the data is required for each software update!
Reason:
Different binary formats of the different software versions.
Non-volatile PLC markers and words in the RAM may have been moved during a software update. By means of the data conversion these PLC markers and words are automatically cached and restored.

- Check whether you have enough free space available on the hard disk for the files to be converted (at least 0.5 times the already occupied memory). If not, read out several large files with TNCremoNT and delete them from the iTNC hard disk.
- To accelerate the converting process delete any NC programs in the TNC partition that you no longer require. Contact the machine operator for information.
- Press the EMERGENCY STOP button of your machine.
- Press the following key combination:

▶ Select Programming and Editing operating mode.

MOD

▶ Prepare iTNC for entry of code number.

9 5 1 4 8

▶ Enter the code number.

ENT

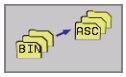
▶ Confirm.

MOD

▶ Call submenu.

UPDATE DATA

▶ Call further submenu.
Note: It is not necessary to enter the directory that is shown on the iTNC screen.



▶ The files on the hard disk are converted in turn into ASCII format.
During the conversion a progress window is displayed.

The following type assignment exists between the binary files and the converted ASCII files:

Binary file extension	Extension of converted file (ASCII)
.H	.H%
.TCH	.TC%
.PNT	.PN%
.I	.I%
.D	.D%
.COM	.CO%
.T	.T%
.P	.P%
.CMA	.CM%

Note

A log for the conversion process is stored in the file TNC:\CVREPORT.A.

Activating the new NC software

- ▶ Press the "NCV --> iTNC" soft key.
- ▶ "NC Software to Load" window appears.
- ▶ In the upper part of the window (where there is the path) place the cursor on the partition in which the zipped files of the new software are stored. Press the SELECT soft key.
- ▶ Subsequently place the cursor on the folder where you have stored the zipped files of the new software. Press the SELECT soft key.
- ▶ Now the number of the new software (e.g. 340420.04 (+Setup+HeROS)) is displayed in the lower part of the window (files area).
- ▶ To switch to the lower part of the window, press the FILES soft key (files area).
- ▶ The text - e.g. 340420.04 (+Setup+HeROS) - is now highlighted. Press the SELECT soft key.
- ▶ Now the three zip files are copied from the directory where they were stored to SYS:\zip\ ... During the copy process a progress window is displayed.
- ▶ A pop-up window is displayed containing all NC software versions stored in the control. The currently active software version is distinguished by an asterisk.
- ▶ Place the cursor on the desired software version and press the "SELECT" soft key.
"Select software 340420 04?" is displayed.
- ▶ Press the YES soft key. The new NC software is decompressed and activated.

Note

When the new NC software is activated, the zipped files are decompressed in a TEMP directory This TEMP directory is renamed in a fraction of a second; afterwards the new software is active. Only in this short time can a power failure cause the control not to boot properly any more.

▶ The control now reboots.

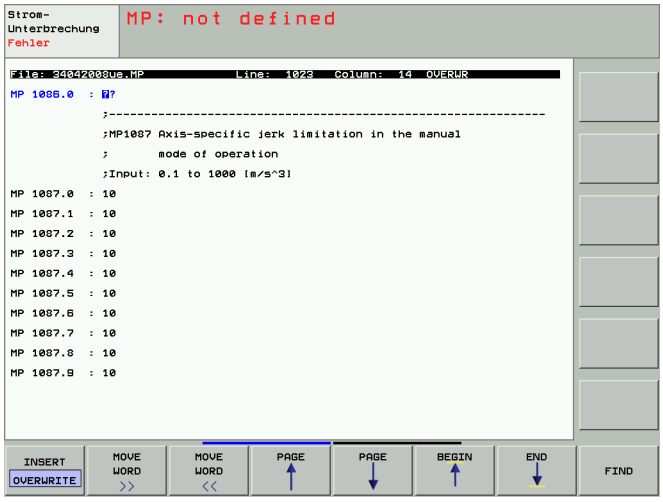
Updating the machine parameter list

▶ Update and activate the machine parameter file.
Proposal:
Enter the NC software version and the date in the corresponding machine parameter list.

- The last active machine-parameter file can be found in the OEM.SYS file (status M in file management). Once the software update has been completed, this file becomes active again.
- If machine parameters have been added or removed with the new software version, then the control opens the machine-parameter editor after booting.

END ▶ Try to activate the machine parameter list.
The iTNC carries out a reset.

Cancel the error message "MP: Not defined"



▶ Enter a value for the new machine parameter.

Note

Contact the machine manufacturer for more information.
See also **"iTNC 530 READ_MP.A"** in NC Info on the HEIDENHAIN file base on the internet.
If required you can add comments on the function of the new parameters in the MP list.

For error message "MP: Incorrect number".

▶ The parameter has been removed.
Mark the parameter as a comment so it remains in the machine-parameter list.

END ▶ After each change, try to activate the machine parameter list.
The iTNC carries out a reset.

Reconverting data from ASCII to binary format

- **Do not confirm** error messages that may be displayed on the iTNC.
- Press the following key combination:

- Select Programming and Editing operating mode.

MOD

- Prepare iTNC for entry of code number.

9 5 1 4 8 ENT

- Enter the code number.

ENT

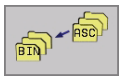
- Confirm.

MOD

- Call submenu.

UPDATE DATA

- Call submenu.
  Note: It is not necessary to enter the directory that is shown on the iTNC screen.



- The files on the hard disk are converted back into binary format. During the conversion a progress window is displayed.

END

- Exit the subordinate mode once conversion has been completed.

Note

A log for the conversion process is stored in the file TNC:\CVREPORT.A.

Copy sample files

- With the COPY SAMPLE FILES soft key, the HEIDENHAIN standard tables for cutting data, the tables for tilting-axis geometry, and the table of M-function macros can be copied into the corresponding directories.
  Tables already edited in a previous software version must have a different name or be stored in another directory; otherwise they will be overwritten.

Caution

The three files with the endings _bin.zip, _heros.zip and _setup.zip required to update the NC software are automatically stored in SYS:\zip\ ... by the iTNC.
Therefore, you should delete the directory (e.g. PLC:\SWUPDATE\ ...) into which you have transferred the zip files from you laptop to the control to free the memory.

Restoring the default settings on the machine

- If necessary, read in previously moved files.
- Recalibrate touch probes.
- Initialize swivel head again.
  Contact the machine manufacturer for more information.
- Initialize tool changer again.
  Contact the machine manufacturer for more information.

23.3 Activating an Existing NC Software in the Control

Note

All NC software versions downloaded into the iTNC are stored on the hard disk in SYS:\zip\ ... in compressed format.
Each of the versions can be activated in the control.

Information about the cycles

Change the OEM cycles into binary format before reconversion, otherwise the TNC will not recognize these cycles, and will add ERROR blocks to the NC programs. These ERROR blocks must be deleted manually.

Proceeding

- Make the same arrangements as for an NC software update.
  Press the emergency stop button.
- Enter the machine parameter list and press MOD.
- Press the UPDATE DATA soft key.
- Execute BIN –> ASC conversion.
- Press the NCVer soft key.
- A popup window is displayed that contains all NC software versions stored in the control. The currently active software version is distinguished by an asterisk.
- Place the cursor on the desired software version and press the "SELECT" soft key.
- "Select software 340420 xxx?" is displayed.
- Press the YES soft key.
- Now the three zip files belonging to the selected software are decompressed.
- The selected NC software is now active.
- The control now reboots.
- After booting the control automatically opens the machine parameter list, if machine parameters were added or removed.

Note

If required, activate the machine parameter list already available for the selected software version.
Otherwise enter values for the new parameters into the active machine parameter list.
Contact the machine manufacturer for more information.
See also **"iTNC 530 READ_MP.A"** in NC Info on the HEIDENHAIN file base on the internet.
Deactive non-required parameters by leading semicolons.
If necessary, edit the NC software version and the date in the machine parameter list.

- The control boots when closing the machine parameter list after editing or when an already available list is activated (belonging to the selected NC software version).
- Execute ASC –> BIN conversion.
- With the COPY SAMPLE FILES soft key, the HEIDENHAIN standard tables for cutting data, the tables for tilting-axis geometry, and the table of M-function macros can be copied into the corresponding directories.
  Tables already edited in a previous software version must have a different name or be stored in another directory; otherwise they will be overwritten.
- Establish the original status of the machine. See section "NC Software Update for PGM no. 340420/421" on page 281.

23.4 Backup/Restoring Hard-Disk Data

Note

The following procedures describe the downloading and uploading of files using the HEIDENHAIN data transfer software **TNCremoNT 2.0 from revision 237**.
The machine must not work while the hard disk data are being backed up or restored.
We recommend to leave the control at the "Power interrupted" message.
Never press any key on your control while data transfer is running!

23.4.1 Data backup

Preparation

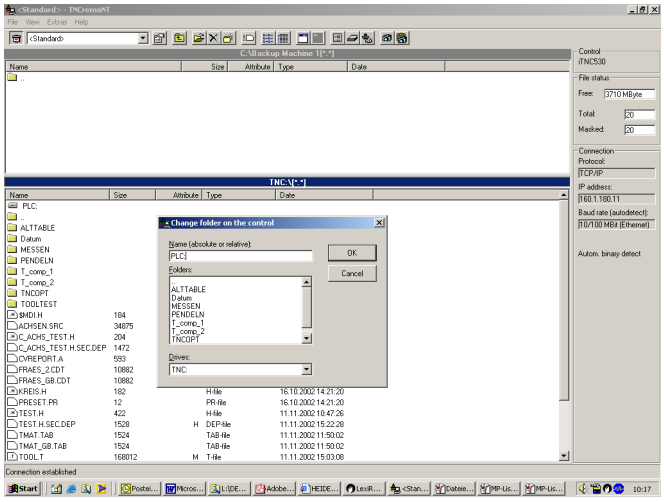
Carry out the following steps:

- Connect the data transfer cable (serial or Ethernet) to your laptop and to the machine. Configurations (see NC software update in chapter 23.2 , page 281)
- Start the data transfer software TNCremoNT on your laptop.
- For serial data transfer select the appropriate baud rate for the interface at the iTNC.
- In Extras/Configuration/Connection (or using the corresponding icon) set TNCremoNT to LSV2 (for serial data transfer) or to TCP/IP (for Ethernet transfer).
- In Extras/Configuration/Connection (or using the corresponding icon)of TNCremoNT select the COM interface and the baud drate for serial data tranfser. For ethernet data transfer enter the IP address of the iTNC.

Connection setup and selection of partition

- Establish connection with iTNC.
  If this does not work, please check the connecting cable and the settings.

- In the upper screen half (laptop contents), select the directory where you want to store the backup files.
  You can also create a new folder using TNCremotNT (File/File/New folder…).
- In the lower screen half (iTNC contents), select the partition that you want to save.
  To change the directory click on the blue bar containing the path.
  To change to the PLC partition you have to enter the PLC code number.
  - TNC: for backup of TNC partition
  - PNC: for backup of PLC partition
- Go to the root directory for the selected partition (in the example PLC:).



Selecting a backup

- Activate the backup menu via Extras/Backup (or by clicking the corresponding icon).
- Select files to be saved using menu item File/Scan a file list (or by clicking the correcsponding icon).
  - Scan folder:
    Only the files in the directory without subdirectories are scanned.
  - Scan folder tree:
    The selected directory is scanned including all subdirectories and all files stored there.
  - Machine data:
    The entire PLC partition and the three files in the SYS partition (NCPATH.SYS, NCDATA.SYS, TIMES.SYS) are scanned.
  - All control files:
    In addition to the machine data, also the TNC partition is scanned.

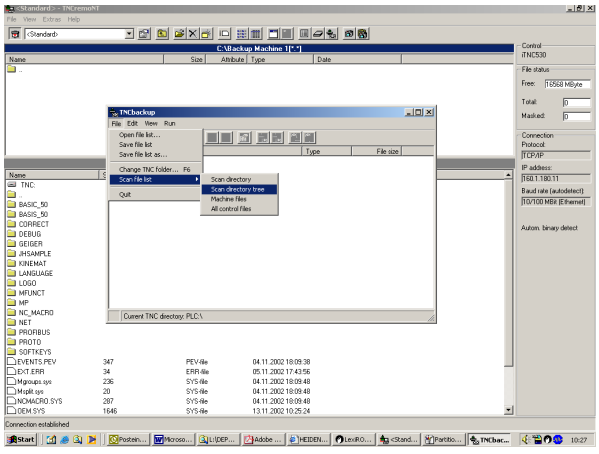
Note

Select the backup type according to the following criteria:
If you want to create a **backup archive** for your TNC and PLC data, select **"Scan directory"**. Archives can be created for the TNC partition and for the PLC partition. The backup should have an identifying name (for example the machine number, etc.).

If you want to replace the **entire control** or the **hard disk**, select **"All control data" ("full backup") or "Machine data"** (if the TNC files were already backed up). The machine time (TIMES.SYS), the calibration data of the touch probe, possible overflows of multiturn EnDat encoders, traverse range settings, etc. (NCDATA.SYS) are included in this backup and transferred to the new control or hard disk.
These backup types are not intended for an archive, since machine time, calibration data, overflows of multiturn EnDat encoders etc. continue to change.

Note

Scanning in this context means creating a reference list for the directory tree. A file with the extension *.LST is generated. This file serves to restore the original directory tree on the new hard disk.



Starting the backup

- Open the file window via Run/Backup.
- Enter the name of the backup file (extension BCK).
- Start the data transfer with Save.

Note

If the data transfer has been completed successfully, there should now be two files on your laptop:
*.BCK backup file with the original files in compressed format
*.LST reference list containing the directories and the files

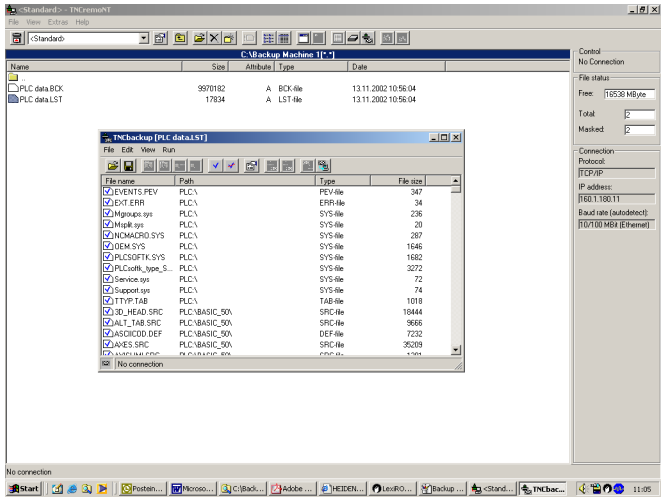
23.4.2 Extracting files from the backup file

General

If you want to create a backup e.g. of the PLC partition, all related files are stored in one *.bck file using a compression algorithm.
To view individual files (MP list, OEM.SYS, etc.) you can **extract** them from the *.bck file by means of TNCremoNT.

Extracting a file

- Start TNCremoNT.
- Enter the backup directory concerned.
- Click the *.lst file --> the TNCbackup window is displayed.
- Sort the files listed there by clicking "path".



- Click "Edit/Select All".
- Remove the blue tick by clicking the corresponding icon (blue tick crossed out).
- Double-click to mark the files you want to extract --> the blue tick appears before the file name.
- Click "Run/Extract".
- You can extract the selected files either directly or together with the corresponding directory structure into your backup directory.
- Now the extracted files can be read, transferred individually etc.

Caution

- After the extraction restore all marks in your *.bck file.
  (Otherwise only the marked files of this backup will be restored in a full restoration.)

23.4.3 Restoring the data

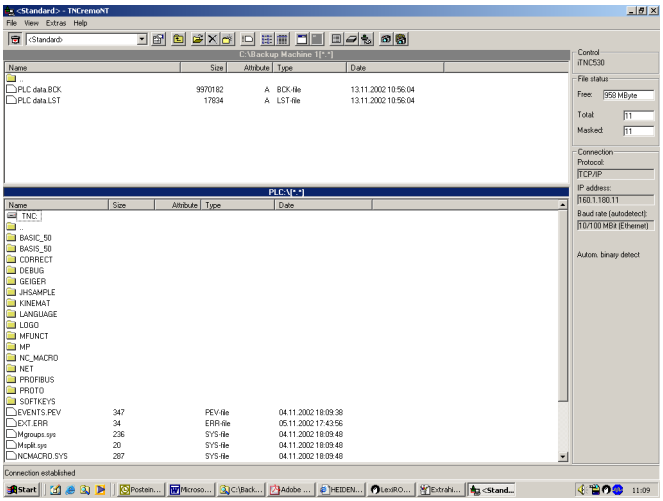
Preparation

Carry out the following steps:

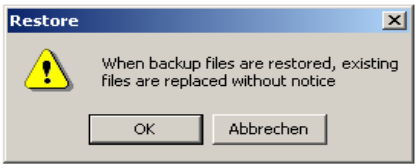
- Connect the data transfer cable (serial or Ethernet) to your laptop and to the machine. Configurations: See section “Data Interfaces” on page 269.
- Start the data transfer software TNCremoNT on your laptop.
- For serial data transfer select the appropriate baud rate for the interface at the iTNC.
- In Extras/Configuration/Connection (or using the corresponding icon) set TNCremoNT to LSV/2 (for serial data transfer) or to TCP/IP (for Ethernet transfer).
- In Extras/Configuration/Connection (or using the corresponding icon)of TNCremoNT select the COM interface and the baud drate for serial data tranfser. For Ethernet data transfer enter the IP address of the iTNC.

Connection setup and data restoration

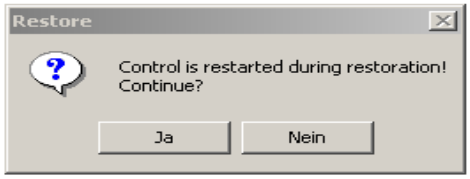
- Establish connection with iTNC.
  If this does not work, please check the connecting cable and the settings.
- In the upper screen half (laptop contents), select the directory where you have stored the backup file.
  In this example C:\Backup Machine 1



- Doubleclick on the LST file to open it.
- Start the data transfer with menu item Run/Restore.
- Confirm the following warning with Ok.



- Confirm the message regarding automatic reset of control with Yes and continue data transfer.



- After restoring the machine backup the control needs to be rebooted.
  Now the machine operates as usual.

Note

The following **problem** may arise **after restoring** the machine backup and subsequent rebooting of the control:
In the original MP list the control requires additional parameters (e.g. as of index xxx.5).

Background:
In the OEM.SYS there may be the entry AXISNUMBER.
This serves to specify the number of axes for which indices are to be created in the MP file (e.g. indices xxx.0 to xxx.8 for 9 axes).
If a control boots without PLC data, the MP list is added to the hardware configuration (i.e. on controls with 5 axes only up to parameter xxx.4).
The same is true if the PLC data of a control were lost and for new or exchange controls.
The number of axis indices exceeds the hardware configuration for example if the spindle drives more than one axis (C-axis mode, etc.).
I.e. when booting the first time during data restoration the original MP list is truncated and therefore no longer useful.

Solution:

1. Load the MP_NAME.MP file in the editor (as long as the original MP list is open for editing, it cannot be replaced).
2.Delete MP_NAME.MP –>
The control generates an adapted MP_NAME.MP (additional axis indices included).
3.Now download the original OEM.SYS and the original MP list a second time to the control (extract from backup file).
4. Load the original MP list into the editor and press the END key –>
The control reboots and operates as usual.

If you already know that for this machine more axes are defined than provided in the hardware configuration, you can proceed as follows:

1.Load the original OEM.SYS (extract from backup file).
2.Reboot the control –>
The control opens MP_NAME.MP (this file now would require the additional axis indices).
3. Delete this MP_NAME.MP –>
The control generates an adapted MP_NAME.MP (additional axis indices are included).
4. Now restore the machine backup.
5. Reboot the control again.
6. Control status as normal.

23.5 Exchanging the MC

Note

MCs received from the loan and exchange service and new MCs are normally equipped with the most recent NC software.
For this reason an MC may only be exchanged in consultation with the machine tool builder.
Ask your machine tool builder whether the latest NC software has been released for operation on your machine.
Moreover, you need to know from the machine tool builder whether there may be conflicts related to the cycles.

Preparing the machine

- Move the swivel head to a defined position or basic position.
  Contact your machine manufacturer for more information.
- Move the tool changer to a defined position.
  Contact your machine manufacturer for more information.
- Move the axes away from the hardware limit switches, to the middle of the traverse range.

Data backup

- Run an "All control data" backup ("scan all" icon) See section "Backup/Restoring Hard-Disk Data" on page 287.

Removing the defective MC

- Switch off the main switch of machine.
- Label and remove all of the connections on the MC.
- Loosen two torx screws at the top and two at the bottom of the MC housing (do not screw off completely).
- Remove the defective MC by drawing it towards you by the handles until the MC disengages from the CC.
  Now you can pull out the MC at a slight angle to the right.

Caution

Observe the ESD precautions.

- Remove the SIK from the defective MC and insert it into the new MC.

Caution

Secure the hard disk with the transportation lock before shipping MC or hard disk.

Integrating the new MC

- Remove the transportation lock of the hard disk before mounting the new MC.
- Insert the new MC and screw it into place.
- Reestablish all of the connections.

Caution

Do not confuse any of the connectors!

- Switch on main switch of machine.
- On the hard disk of the new MC there is the operating system and the current NC software. If you require an older software version, you will have to install it now.
- Restore your backup.

Note

The following problem may arise after restoring the machine backup and subsequent rebooting of the control:
In the original MP list the control requires additional parameters (e.g. as of index xxx.5).

Background:
In the OEM.SYS there may be the entry AXISNUMBER.
This serves to specify the number of axes for which indices are to be created in the MP file (e.g. indices xxx.0 to xxx.8 for 9 axes).
If a control boots without PLC data, the MP list is added to the hardware configuration (i.e. on controls with 5 axes only up to parameter xxx.4).
The same is true if the PLC data of a control were lost, and for new or exchange controls.
The number of axis indices exceeds the hardware configuration for example if the spindle drives more than one axis (C-axis mode, etc.).
I.e. when booting the first time during data restoration the original MP list is truncated and therefore no longer useful.

Solution:

1. Load the MP_NAME.MP file in the editor. (As long as the original MP list is open for editing, it cannot be replaced.)
2. Delete MP_NAME.MP -->
The control generates an adapted MP_NAME.MP (additional axis indices are included).
3.Now download the original OEM.SYS and the original MP list a second time to the control (extract from backup file).
4. Load the original MP list into the editor and press the END key –>
The control reboots and operates as usual.

If you already know that for this machine more axes are defined than provided in the hardware configuration, you can proceed as follows:

1.Load the original OEM.SYS (extract from backup file).
2.Reboot the control --> The control opens MP_NAME.MP. (This file now would require the additional axis indices.)
3. Delete MP_NAME.MP -->
The control generates an adapted MP_NAME.MP (additional axis indices are included).
4. Now restore the machine backup.
5. Reboot the control again.
6. Control status as normal.

Restoring the original settings on the machine

- If required, adapt the MP list.
- Adjust the offset of analog axes.
- The new MC is delivered with the most recent NC software version.
  If you want to run the original software version, you will have to load it
  (see NC software update in chapter 23.2 , page 281).
- Recalibrate the touch probes, if required.
- Initialize swivel head again.
  Contact the machine manufacturer for more information.
- Initialize tool changer again.
  Contact the machine manufacturer for more information.

23.6 Exchanging the CC

Preparing the machine

- Move the swivel head to a defined position or basic position.
  Contact your machine manufacturer for more information.
- Move the tool changer to a defined position.
  Contact your machine manufacturer for more information.
- Move the axes away from the hardware limit switches, to the middle of the traverse range.

Removing the defective CC

- Switch off the main switch of the machine.
- Label and remove all of the connections on the CC and the MC.
- Dismount the CC component together with the MC from the electrical cabinet.
- Separate the MC from the defective CC.

Caution

Observe the ESD precautions.

Integrating the new CC

- Connect the MC with the new CC.
- Mount the new CC together with the MC in the electrical cabinet.
- Re-establish all of the connections on the CC and the MC.

Caution

Do not confuse any of the connectors!

23.7 Exchanging the Hard Disk

Preparing the machine

Note

Carry out the preparations described, if the hard disk is still functional.

- Move the swivel head to a defined position or basic position.
  Contact your machine manufacturer for more information.
- Move the tool changer to a defined position.
  Contact your machine manufacturer for more information.
- Move the axes away from the hardware limit switches, to the middle of the traverse range.

Data backup

- Run an "All control data" backup. (See section "Backup/Restoring Hard-Disk Data" on page 287)

Note

If this is not possible owing to defective hard disk, you will have to fall back on already available data archives.
"The best backup is that you made before the hard disk failed."

Removing the defective hard disk

- Switch off main switch of machine.
- Dismount the MC. (See section "Exchanging the MC" on page 292.)
- Dismount the hard disk together with the holding plate (drive assembly).

Caution

Observe the ESD precautions.

- Insert the new drive assembly.

Note

The new iTNC hard disk is partioned and formatted.
The HeROS operating mode and the latest NC software are installed.
The control boots with this software.
If you require an older NC software version, you will have to install it now.

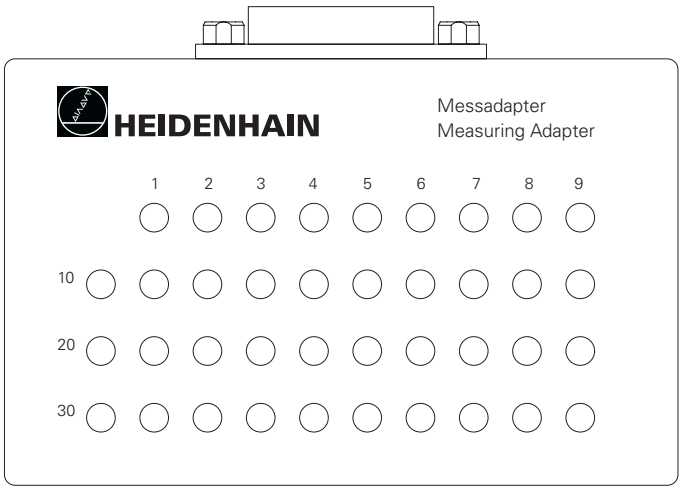
- Restore your "full backup" ("all control data") for this machine. (See section "Backup/Restoring Hard-Disk Data" on page 287).
  If no full backup is available, restore the backup files from the TNC and the PLC archives and recalibrate and re-initialize your machine tool.
  The data for the machine time are stored in RAM; i.e. the machine time in TIMES.SYS is restored.

24 Inspection, Measuring and Test Equipment

24.1 Universal Measuring Adapter (Id.Nr. 255 480 01)

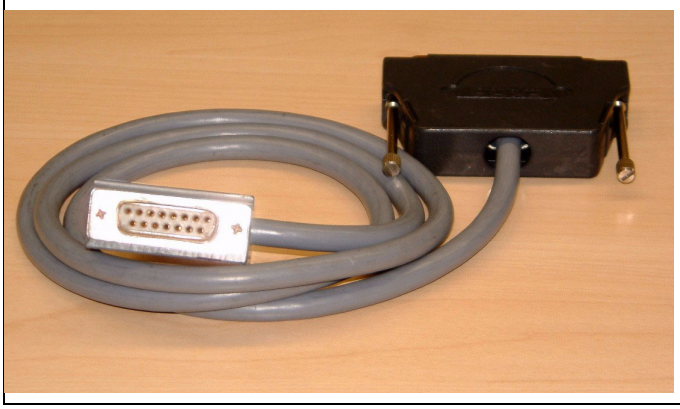
Measuring adapter

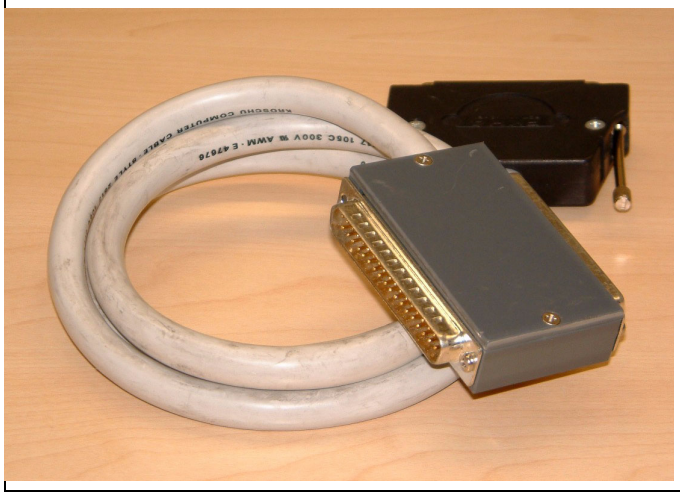
The measuring adapter is used for checking the inputs or outputs on 9 - 37-pin D-sub connections.



Accessories

Each connector size requires its own cable adapter.

	Adapter cable, 9-pin Id.Nr. 255 481 01
	Adapter cable, 15-pin Id.Nr. 255 482 01

	Adapter cable, 25-pin. Id.Nr. 255 483 01
	Adapter cable, 37-pin Id.Nr. 255 484 01

24.2 Encoder Diagnostic Set PWM 8 (Id.Nr. 309 956-xx)

General

The PWM 8 phase angle measuring unit is a universal encoder for inspecting and setting HEIDENHAIN linear and angle encoders.

Main functions

The main functions of the PWM 8 are:

- Display of phase angle and on-off ratio
- Display of scanning frequency
- Measurement of signal amplitude, current consumption and supply voltage of measuring system
- Display of internal universal counter or encoder signal period (pulse count)
- Display for reference signal, interference signal and count direction
- Output of amplified scanning signals (interface board: 11 µApp, 1 Vpp) or of original scanning signals (interface board TTL, HTL) via 3 BNC sockets, e.g. on an oscilloscope

Note

Each PWM8 is delivered together with detailed operating instructions.
These instructions you will also find in German and English on the internet for download:
www.heidenhain.de\Service\Download Area\FileBase-Public\Info-Documentation.
A detailed explanation of the PWM is part of our training courses on measuring systems.

25 Machine Parameter List

25.1 Excerpt from the iTNC 530 Technical Manual

25.1.1 Encoders and machines

MP	Function and input	Software version and behavior
MP10	Active axes Format: %xxxxxxxxxxxxxx Input: Bits 0 to 13 correspond to axes 1 to 14 0: Axis not active 1: Axis active	
MP20	Monitoring functions for the axes Format: %xxxxxxxxxxxxxx Input:Bits 0 to 13 correspond to axes 1 to 14 0: Monitoring not active 1: Monitoring active	PLC RUN
MP20.0	Absolute position of the distance-coded reference marks	
MP20.1	Amplitude of encoder signals	
MP20.2	Edge separation of encoder signals	
MP21	Monitoring functions for the spindle Format: %xx Input: Bit 0 – Spindle 1 0: Monitoring not active 1: Monitoring active Bit 1 – Spindle 2 0: Monitoring not active 1: Monitoring active	PLC RUN
MP21.0	No function	
MP21.1	Amplitude of encoder signals	
MP21.2	Edge separation of encoder signals	
MP100	Designation of axes Format: XYZABCUVWxyzabcuvw- Input: Characters 1 to 9 correspond to axes 1 to 9	PLC RUN
MP100.0	Traverse range 1	
MP100.1	Traverse range 2	
MP100.2	Traverse range 3	
MP110.x	Assignment of position encoder inputs to the axes Input: 0: No position encoder input 1 to 6: Position encoder inputs X1 to X6 35 to 38: Position encoder inputs X35 to X38	RESET

MP	Function and input	Software version and behavior
MP111	Position encoder input for the spindle/spindles Input: 0: No position encoder input 1 to 6: Position encoder inputs X1 to X6 35 to 38: Position encoder inputs X35 to X38	REF
MP111.0	Position encoder input for the first spindle	
MP111.1	Position encoder input for the second spindle	
MP112.x	Assignment of speed encoder inputs to the axes Input: 0: No speed encoder input 15 to 20: Speed encoder inputs X15 to X20 80 to 83: Speed encoder inputs X80 to X83	RESET
MP113	Speed encoder for the spindle/spindles Input: 0: No speed encoder input 15 to 20: Speed encoder inputs X15 to X20 80 to 83: Speed encoder inputs X80 to X83	REF
MP113.0	Speed encoder for the first spindle	
MP113.1	Speed encoder for the second spindle	
MP115.0	Position encoder input 1 V_{PP} or 11 μA_{PP} Format: %xxxxxxxxxxx Input: Bit 0 to bit 5: Position encoder inputs X1 to X6 Bit 6 to bit 9: Position encoder inputs X35 to X38 Bit 10: Nonfunctional 0: 1 V_{PP} 1: 11 μA_{PP}	RESET
MP115.1	Reserved Format: %xxxxxxxxxxx Input: Enter %00000000000	
MP115.2	Input frequency of the position encoder inputs Format: %xxxxxxxxxxx Input: Bit 0 to bit 5: Position encoder inputs X1 to X6 Bit 6 to bit 9: Position encoder inputs X35 to X38 Bit 10: Nonfunctional With 1 V_{PP}: 0: 50 kHz; 1: 350 kHz With 11 μA_{PP}: 0: 50 kHz; 1: 150 kHz	

MP	Function and input	Software version and behavior
MP120.x	Nominal speed command outputs of the axes Input: 0: No servo-controlled axis 1 to 6: Analog outputs 1 to 6 at terminal X8 7 to 12: Analog outputs 7 to 13 at terminal X9 51 to 60: Digital output X51 to X60	PLC RUN
MP121.0	Nominal speed command output of the first spindle Input: 0: No servo-controlled axis 1 to 6: Analog outputs 1 to 6 at terminal X8 7 to 12: Analog outputs 7 to 13 at terminal X9 51 to 60: Digital output X51 to X60	PLC RUN
MP121.1	Nominal speed command output of the second spindle Input: 0: No servo-controlled axis 1 to 6: Analog outputs 1 to 6 at terminal X8 7 to 12: Analog outputs 7 to 13 at terminal X9 51 to 60: Digital output X51 to X60	PLC RUN
MP130.x	Y index of the machine parameters MP2xxx.y for the axes Input: 0 to 9	PLC RUN
MP131	Y index of the machine parameters MP2xxx.y for the spindle in operating mode 0 Input: 0 to 9	PLC RUN
MP131.0	Index for the first spindle	
MP131.1	Index for the second spindle	
MP132	Y index of the machine parameters MP2xxx.y for the spindle in operating mode 1 Input: 0 to 9	PLC RUN
MP132.0	Index for the first spindle	
MP132.1	Index for the second spindle	
MP210	Counting direction of position encoder output signals Format: %xxxxxxxxxxxxxx Input: Bits 0 to 13 correspond to axes 1 to 14 0: Positive 1: Negative	RESET

MP	Function and input	Software version and behavior
MP331.x	Distance for the number of signal periods in MP332 Input: 0.0001 to 99.999 999 9 [mm] or [°]	PLC RUN REF
MP332.x	Number of signal periods for the distance in MP331 Input: 1 to 16,777,215	PLC RUN REF
MP334.x	Nominal increment between two fixed reference marks on encoders with distance-coded reference marks Input: 1 to 65,535 0: 1 000	PLC RUN REF
MP340.x	Interpolation factor for external interpolation Input: 0 to 99 0 = 1: No external interpolation	RESET
MP410 MP410.3 MP410.4	Assignment of axis keys IV and V Input: Axis designation XYZABCUVWxyzabcuvw– Axis key IV Axis key V	PLC RUN
MP420.x	Hirth coupling Input: 0: No Hirth coupling 1: Hirth coupling	PLC RUN
MP430.x	Prescribed increment for Hirth coupling Input: 0.0000 to 30.0000 [°]	PLC RUN
MP710.x	Backlash compensation Input: -1.0000 to +1.0000 [mm] or [°]	PLC RUN
MP711.x	Height of peaks during circular movement (analog only) Input: -1.0000 000 to +1.0000 999 [mm] (digital: 0)	PLC RUN
MP712.x	Compensation value per control loop cycle time Input: 0.000 000 to 99.999 999 [mm] (digital: 0)	PLC RUN
MP715.x	Height of peaks during circular movement (analog only) with M105 Input: -1.0000 000 to +1.0000 999 [mm] (digital: 0)	PLC RUN
MP716.x	Compensation value per control loop cycle time with M105 Input: 0.000 000 to 99.999 999 [mm] (digital: 0)	PLC RUN
MP720.x	Linear axis error compensation Input: -1 000 to +1.000 [mm/m]	PLC RUN
MP730	Selection of linear/nonlinear axis error compensation Format: %xxxxxxxxxxxxxx Input: Bits 0 to 3 correspond to axes 1 to 14: 0: Linear axis error compensation 1: Nonlinear axis error compensation	PLC RUN
MP750.x	Backlash Input: -1.0000 to +1.0000 [mm] or [°]	PLC RUN
MP752.x	Backlash compensation time Input: 0 to 1000 [ms]	PLC RUN
MP810.x	Display mode for rotary axes and PLC auxiliary axes Input: 0.0000 to 99,999.9999 [°] 0: Display +/–99 999.9999 1: Modulo value for display	PLC RUN REF

MP	Function and input	Software version and behavior
MP812	Activate software limit switches for tilting axes with modulo display, M94 and encoders with EnDat interface Format: %xxxxxxxxxxxxxx Input: Bits 0 to 3 correspond to axes 1 to 14: 0: Software limit switch not active 1: Software limit switch active	RESET
MP850.x	Synchronized axes Input: 0: Master axis 1: Slave axis to axis 1 2: Slave axis to axis 2 3: Slave axis to axis 3 4: Slave axis to axis 4 5: Slave axis to axis 5 6: Slave axis to axis 6 7: Slave axis to axis 7 8: Slave axis to axis 8 9: Slave axis to axis 9	PLC RUN
MP855.x	Sychronization monitoring Input: 0 to 100.0000 [mm] 0: Monitoring not active	PLC RUN
MP860.x	Datum for synchronous control Input: 0: Datum at position after switch-on 1: Datum at reference marks 2: Axis is torque slave axis	PLC RUN
MP910.x	Positive software limit switches, traverse range 1 (default setting after power on) Input: -99,999.9999 to +99,999 [mm] or [°]	PLC RUN
MP911.x	Positive software limit switches, traverse range 2 Input: -99,999.9999 to +99,999 [mm] or [°]	PLC RUN
MP912.x	Positive software limit switches, traverse range 3 Input: -99,999.9999 to +99,999 [mm] or [°]	PLC RUN
MP920.x	Negative software limit switches, traverse range 1 (default setting after power on) Input: -99,999.9999 to +99,999 [mm] or [°]	PLC RUN
MP921.x	Negative software limit switches, traverse range 2 Input: -99,999.9999 to +99,999 [mm] or [°]	PLC RUN
MP922.x	Negative software limit switches, traverse range 3 Input: -99,999.9999 to +99,999 [mm] or [°]	PLC RUN
MP950.x	Datum for positioning blocks with M92 for axes 1 to 9 Input: -99,999.9999 to +99,999.9999 [mm] or [°] Values with respect to the machine datum	PLC RUN
MP951.x	Simulated tool-change position for TOOL CALL during mid-program startup (block scan) Input: -99,999.9999 to +99,999.9999 [mm] or [°]	PLC RUN
MP960.x	Machine Datum Input: -99,999.9999 to +99 999.999 [mm] or [°] Values with respect to the scale reference point	PLC RUN REF

25.1.2 Positioning

MP	Function and input	Software version and behavior
MP1010.x	Rapid traverse Input: 10 to 300,000 [mm/min]	PLC RUN
MP1020.x	Manual feed Input: 10 to 300,000 [mm/min]	PLC RUN
MP1030.x	Positioning window Input: 0.0001 to 2.0000 [mm]	PLC RUN
MP1040	Analog axes: Polarity of nominal value voltage Digital axes: Algebraic sign of the nominal speed value Format: %xxxxxxxxxxxxxx Input: Bits 0 to 13 correspond to axes 1 to 14 0: Positive 1: Negative	
MP1050.x	Analog axes: Analog voltage at rapid traverse Input: 1,000 to 9,000 [V] Digital axes: without function Input: 1	PLC RUN
MP1054.x	Linear distance of one motor revolution Input: Analog axes: without function Digital axes: 0 to 100.000 [mm] or [°]	
MP1060.x	Acceleration Input: 0.001 to 100.000 [m/s or 1000°/s^2]	PLC RUN
MP1070	Radial acceleration Input: 0.001 to 100.000 [m/s or 1000°/s^2]	PLC RUN
MP1080.x	Analog axes: Integral factor for offset adjustment Input: Enter 0 to 65 535 Digital axes: nonfunctional Input: 0	PLC RUN
MP1086.x	Maximum permissible jerk during single-axis movements at rapid traverse for the operating modes "Program Run / Full Sequence", "Program Run / Single Block" and "Positioning with Manual Data Input" Input: 0: Function inactive 0.1 to 1000.0 [m/s or 1000°/s]	PLC RUN
MP1087.x	Max. permissible axis-specific jerk for Manual mode Input: 0.1 to 1000.0 [m/s or 1000°/s]	PLC RUN
MP1089.x	Max. permissible axis-specific jerk for Pass Over Reference Point mode Input: 0.1 to 1000.0 [m/s or 1000°/s]	PLC RUN
MP1090 MP1090.0 MP1090.1	Maximum permissible jerk on the tool path Input: 0.1 to 1000.0 [m/s or 1000°/s] With machining feed rate Beginning with feed rate from MP1092	PLC RUN
MP1092	Feed rate threshold from which MP1090.1 becomes effective Input: 10 to 300,000 [mm/min]	PLC RUN

MP	Function and input	Software version and behavior
MP1094	HSC filter Input: 0: HSC filter inactive 0.1 to 166.0: Cutoff frequency for HSC filter	280 474-07
MP1095	Nominal position value filter Input: 0: Single filter 1: Double filter	PLC RUN
MP1095.0	In the Program Run, Full Sequence; Program Run, Single Block; and Positioning With Manual Data Input operating modes	
MP1095.1	In the Manual, Handwheel, Jog Increment and Pass Over Reference Point operating modes	
MP1096	Tolerance for contour transitions Input: 0: No nominal position value filter 0.001 to 3.000 [mm]	PLC RUN
MP1097.x	Max. permissible axis-specific jerk (single/HSC filter) Input: 0.1 to 1000.0 [m/s or 1000°/s]	PLC RUN
MP1098.x	Max. permissible axis-specific jerk (double/HSC filter) Input: 0.1 to 1000.0 [m/s or 1000°/s]	PLC RUN
MP1099	Minimum filter order Input: 0 to 20	PLC RUN
MP1099.0	Minimum filter configuration for single filter (MP1095 = 0)	
MP1099.1	Minimum filter configuration for double filter (MP1095 = 1)	
MP1110.x	Standstill monitoring Input: 0.0010 to 30.0000 [mm]	PLC RUN
MP1140.x	Threshold at which the movement monitoring goes into effect. Input: Analog axes: 0.030 to 10.000 [V] Digital axes: 0.030 to 10.000 [1000 min] Recommended: 0.030 [1000 min]	PLC RUN
MP1144.x	Motion monitor for position and speed Input: Analog axes: without function Digital axes: 0 to 99 999.999 [mm] 0: No monitoring	PLC RUN
MP1150.0	Delay time for deleting the nominal velocity value with the erasable error message **EXCESSIVE SERVO LAG IN <AXIS.>** Input: 0 to 65.535 [s] Recommended: 0	PLC RUN
MP1150.1	Time period for which the monitoring function is to remain off after the fast PLC input defined in MP4130.0 is set. Input: 0 to 65.535 [s] 0: Monitoring functions on Recommended: 0.2 to 0.5	
MP1150.2	Minimum time period for which the monitoring functions are to remain effective after expiration of the time from MP1150.1. Input: 0 to 65.535 [s]	
MP1320	Direction for traversing the reference marks Format: %xxxxxxxxxxxxxx Input: Bits 0 to 13 correspond to axes 1 to 14 0: Positive 1: Negative	PLC RUN

MP	Function and input	Software version and behavior
MP1330.x	Velocity for traversing the reference marks Input: 80 to 300,000 [mm/min]	PLC RUN
MP1331.x	Velocity for leaving the reference mark end position for axes 1 to 9 (only for rotary encoders MP1350 = 2) Input: 10 to 300,000 [mm/min]	PLC RUN
MP1340.x	Sequence for traversing the reference marks Input: 0: No evaluation of reference marks 1 to 14: Axes 1 to 14	PLC RUN REF
MP1350.x	Type of reference mark traverse Input: 0: Linear encoder with distance-coded reference marks (old routine) 1: Position encoder with one reference mark 2: Special type (length measurement with ROD) 3: Linear encoder with distance-coded reference marks (new routine) 4: Same as 3 except that two reference marks are evaluated 5: Encoder with EnDat interface 6: Reference pulse via fast PLC input	PLC RUN REF
MP1355	Reference run Format: %xxxxxxxxxxxxxx Input: Bits 0 to 13 correspond to axes 1 to 14 0: Reference run as defined in MP1350.x 1: Ref. run via EnDat interface of speed encoder	PLC RUN REF 340 420-02
MP1356.x	Difference between speed and position encoder, if MP1355= 1 Input: -99,999.999 to +99 999.999 [mm] or [°]	PLC RUN REF 340 420-02
MP1360.x	Fast PLC input for reference pulse Input: 0: No fast PLC input for reference pulse 1 to 5: Fast PLC input 1 to 5 (MP4130.x)	PLC RUN REF
MP1391	Velocity feedforward control in the MANUAL and HANDWHEEL operating modes Format: %xxxxxxxxxxxxxx Input: Bits 0 to 13 correspond to axes 1 to 14 0: Operation with following error (lag) 1: Operation with velocity feedforward control	PLC RUN
MP1392	Velocity feedforward in the POSITIONING WITH MANUAL DATA INPUT, PROGRAM RUN SINGLE BLOCK and PROGRAM RUN FULL SEQUENCE operating modes Format: %xxxxxxxxxxxxxx Input: Bits 0 to 13 correspond to axes 1 to 14 0: Operation with following error (lag) 1: Operation with velocity feedforward control	PLC RUN
MP1396.x	Feedback control with velocity semifeedforward Input: 0.001 to 0.999 1: Velocity feedforward control	PLC RUN

25.1.3 Operation with velocity feedforward control

MP	Function and input	Software version and behavior
MP1410.x	Position monitoring for operation with velocity feedforward control (erasable) Input: 0.0010 to 30.0000 [mm] Recommended: 0.5 mm	PLC RUN
MP1420.x	Position monitoring for operation with velocity feedforward control (EMERGENCY STOP) Input: 0.0010 to 30.0000 [mm] Recommended: 2 mm	PLC RUN
MP1510.x	k_V factor for velocity feedforward control Input: 0.100 to 1,000.000 [(m/min)/mm]	PLC RUN
MP1511.x	Factor for static friction compensation Input: 0 to 16,777,215 [s]	PLC RUN
MP1512.x	Limitation of the amount of the static friction compensation Input: 0 to 16 777 215 [counting steps]	PLC RUN
MP1513.x	Feed-rate limitation for static friction compensation Input: 0 to 300,000 [mm/min]	PLC RUN
MP1515.x	k_V factor for velocity feedforward control effective after M105 Input: 0.100 to 20.000 [(m/min)/mm]	PLC RUN
MP1516.x	k_V factor for velocity semifeedforward control Input: 0.100 to 20.000 [(m/min)/mm]	PLC RUN
MP1521	Transient response during acceleration and deceleration Input: 1 to 255 [ms] 0: Function inactive	PLC RUN

25.1.4 Operation with following error (servo lag)

MP	Function and input	Software version and behavior
MP1710.x	Position monitoring for operation with following error (erasable) Input: 0.0000 to 300.0000 [mm] Recommended: 1.2 · following error	PLC RUN
MP1720.x	Position monitoring for operation with following error (EMERGENCY STOP) Input: 0.0000 to 300.0000 [mm] Recommended: 1.4 · following error	PLC RUN
MP1810.x	k_V factor for control with following error Input: 0.100 to 20.000 [(m/min)/mm]	PLC RUN
MP1815.x	k_V factor for control with following error effective after M105 Input: 0.100 to 20.000 [(m/min)/mm]	PLC RUN
MP1820.x	Multiplier for the k_V factor Input: 0.001 to 1.00000	PLC RUN
MP1830.x	Characteristic curve kink point Input: 0.000 to 100.000 [%]	PLC RUN

25.1.5 Integrated speed and current control

MP	Function and input	Software version and behavior
MP2040	Groups for drive enabling through X150 Format: %xxxxxxxxx Input: 0: Axis not assigned 1: Axis assigned	PLC RUN
MP2040.0-5	Groups 1 to 6	
MP2040.6-7	Reserved, enter %000000000	
MP2050	Functionality of drive enabling I32 (X42/33) Input: 0: Emergency stop for all axes, Module 9169 not effective 1: Emergency stop for all axes that are not excepted with Module 9169 2: I32 and Module 9169 are without functionality	
MP2100.x	Power stage model Input: Name of the selected power module (entered by the iTNC)	RESET
MP2150	Signal for power fail Input: 0: AC fail 1: Power fail and AC fail 2: Neither power fail nor AC fail 3: Power fail	
MP2160	Protection against failure of power supply for synchronous motor in field-weakening range Input: 0: Do not protect 1: Protect	
MP2170	Waiting time between the switch-on of the drive and the drive's standby signal Input: 0.001 to 4.999 [s] 0: 2 [s]	
MP2180.x	PWM frequency Input: 0: f_{PWM} = 5000 Hz (for HEIDENHAIN inverters) 3200 to 4000: f_{PWM} = 3330 Hz 4001 to 4999: f_{PWM} = 4166 Hz 5000 to 6000: f_{PWM} = 5000 Hz 6001 to 8000: f_{PWM} = 6666 Hz 8001 to 9999: f_{PWM} = 8000 Hz 10000: f_{PWM} = 10000 Hz	RESET
MP2190	dc link voltage U_Z Input: 0 to 10,000 [V] HEIDENHAIN inverters: UE 2xx, UE 2xxB, UV 130: 565 V UR 2xx, UV 120, UV 140, UV 150: 650 V	
MP2200.x	Motor model Input: Name of the selected motor (entered by the iTNC)	RESET

MP	Function and input	Software version and behavior
MP2220.x	Monitoring functions Format: %xxx Input: Bit 0 – Monitoring the reference mark 0: Monitoring active 1: Monitoring inactive Bit 1 – Monitoring the direction of rotation 0: Monitoring active 1: Monitoring inactive Bit 2 – Monitoring the ERR-IZ signal 0: Monitoring inactive (Non-HEIDENHAIN inverters, UE 2xx) 1: Monitoring active (All HEIDENHAIN inverters except UE 2xx)	PLC RUN
MP2302.x	Reference value for I^2t monitoring Input: 0 to 1 000.000 [· rated current of motor] 0: I^2t monitoring of feed motors switched off 1: Rated current of motor as reference value	
MP2312.x	Reference value for utilization of feed motors for axes 1 to 9 Input: 0 to 1 000.000 [· rated current of motor] 0 or 1: Reference value is rated current of motor	
MP2390.x	Max. braking performance in an emergency stop Input: 0.1 to 3,000.000 [kW] 0: Braking power is not limited	
MP2392.x	Power limit Input: 0: No power limit 0.1 to 3 000.000 [kW]	
MP2394.x	Maximum braking power during a power fail Input: 0.1 to 3,000.000 [kW] 0: Braking power is not limited	
MP2396.x	Maximum torque Input: 0.1 to 30,000.0 [Nm] 0: Torque is not limited	PLC
MP2420.x	Proportional factor of the current controller Input: 0.00 to 9999.99 [VA]	
MP2430.x	Integral factor of the current controller Input: 0.00 to 9999.99 [V/As]	
MP2500.x	Proportional factor of the shaft speed controller Input: 0 to 1 000 000.000 [As]	PLC RUN
MP2510.x	Integral factor of the shaft speed controller Input: 0 to 100,000,000 [A]	PLC RUN
MP2512.x	Limiting the integral factor of the speed controller Input: 0.000 to 30.000 [s] (realistically: 0.1 to 2.0)	PLC RUN
MP2520.x	Differential factor of the shaft speed controller Input: 0 to 1.0000 [As]	PLC RUN
MP2530.x	PT_2 element of the shaft speed controller (2nd-order delay) Input: 0 to 1.0000 [s]	PLC RUN
MP2540.x	Band-rejection filter damping Input: 0.0 to 18.0 [dB]	PLC RUN

MP	Function and input	Software version and behavior
MP2550.x	Band-rejection filter for center frequency Input: 0.0 to 999.9 [Hz]	PLC RUN
MP2560.x	Low-pass filter Input: 0: No low-pass filter 1: 1st-order low-pass filter 2: 2nd-order low-pass filter	PLC RUN
MP2590.x	Braking ramp in an emergency stop Input: 0.1 to 999.9 [rpm/ms] 0: Function inactive	PLC RUN
MP2600.x	Acceleration feedforward Input: 0 to 100.0000 [A/(rev/s)]	PLC
MP2602.x	IPC time constant T_1 Input: 0.0001 to 1.0000 [s] 0: IPC inactive	PLC RUN
MP2604.x	IPC time constant T_2 Input: 0.0001 to 1.0000 [s] 0: IPC inactive	PLC RUN
MP2606.x	Following error in the jerk phase Input: 0.000 to 10,000	PLC RUN
MP2610.x	Friction compensation at low speeds (effective only with velocity feedforward control) Input: 0 to 30.0000 [A] 0: No friction compensation (or axis is analog)	PLC RUN
MP2612.x	Delay of the friction compensation (effective only with velocity feedforward control) Input: 0.0000 to 1.0000 [s] (typically: 0.015 s) 0: No friction compensation (or axis is analog)	PLC RUN
MP2620.x	Friction compensation Input: 0 to 30.0000 [A] 0: No friction compensation (or axis is analog)	PLC RUN
MP2630.x	Holding current Input: -30,000 to +30.000 [A]	PLC RUN
MP2700	Reserved, enter 0	
MP2900.x	Tensioning torque between master and slave for master-slave torque control (entry for the slave axis) Input: -100.00 to +100.00 [Nm]	PLC
MP2910.x	P factor of the torque controller for master-slave torque control (entry for the slave axis) Input: 0.00 to 999.99 [1/(Nm · min)]	PLC
MP2920.x	Factor for variable torque distribution of the torque-master-slave control (entry for the slave axis) Input: 0.000 to 100.000 1: Master and slave axes have identical motors	PLC
MP2930.x	Speed compensation ratio for master-slave torque control (entry for the slave axis) Input: -100.00 to +100.00 [%]	PLC

25.1.6 Spindle

MP	Function and input	Software version and behavior
MP3010	Output of speed, gear range Input: 0: No output of spindle speed 1: Speed code if the speed changes 2: Speed code at every TOOL CALL 3: Nominal speed value always, G code if the gear range shifts 4: Nominal speed value always, G code at every TOOL CALL 5: Nominal speed value always, no G code 6: Same as 3, but with controlled spindle for orientation 7: Same as 4, but with controlled spindle for orientation 8: Same as 5, but with controlled spindle for orientation	PLC RUN
MP3011	Function of analog output S, if MP3010 < 3 Input: 0: No special function 1: Voltage is proportional to the current contouring feed rate, depending on MP3012 2: Voltage is defined as through Module 9130 3: Voltage is defined through M functions (M200 to M204)	
MP3012	Feed rate from output of an analog voltage of 10 V, MP3011 = 1 Input: 0 to 300,000 [mm/min]	
MP3013.x	Characteristic curve kink points (velocity) for output of the analog voltage with M202 Input: 10 to 300,000 [mm/min]	PLC RUN
MP3014.x	Characteristic curve kink points (voltage) for output of the analog voltage with M202 Input: 0.000 to 9.999 [V]	PLC RUN
MP3020	Speed range for S code output Format: xxyyz xx: S code for minimum speed yy: S code for maximum speed z: speed increment Input: 0 to 99,999	PLC RUN
MP3030	Behavior of the spindle Input: Bit 0 – 0: Axis stop for TOOL CALL S 1: No axis stop for TOOL CALL S Bit 1: Zero spindle speed when switching to another gear range 0: Reduce speed to 0 1: Do not reduce speed to 0	PLC RUN
MP3120	Zero speed permitted Input: 0: S = 0 allowed 1: S = 0 not allowed	PLC RUN

MP	Function and input	Software version and behavior
MP3130	Polarity of the nominal spindle speed Input: 0: M03 positive, M04 negative 1: M03 negative, M04 positive 2: M03 and M04 positive 4: M03 and M04 negative	PLC RUN
MP3140	Counting direction of spindle position encoder output signals Input: 0: Positive counting direction with M03 1: Negative counting direction with M03	PLC RUN
MP3142	Line count of the spindle position encoder Input: 100 to 9 999 [lines]	PLC RUN
MP3143	Mounting configuration of the spindle position encoder Input: 0: Position encoder directly on the first spindle 1: Position encoder via transmission (ratio in MP3450.x and MP3451.x); X30 pin 1: reference pulse 2: Position encoder via transmission (ratio in MP3450 and MP3451); X30 pin 1: reference pulse release 3: Same as input value 1, except that the second reference pulse is evaluated.	PLC RUN
MP3210.0-7	Analog nominal spindle voltage at rated speed for the gear ranges 1 to 8 Input: 0 to 100,000 [V] Digital spindle motor revolutions at rated speed for the gear ranges 1 to 8 Input: 0 to 100.000 [1000 rpm]	PLC RUN
MP3240.1	Analog spindle: Minimum nominal value voltage Input: 0 to 9.999 [V] Digital spindle: Minimum motor speed Input: 0 to 9.999 [1000 rpm]	PLC RUN
MP3240.2	Analog spindle: Spindle jog voltage for gear shifting (M4009/M4010) Input: 0 to 9.999 [V] Digital spindle: Motor speed for gear shifting (M4009/M4010) Input: 0 to 9.999 [1000 rpm]	
MP3310 MP3310.0 MP3310.1	Limitation for spindle speed override Input: 0 to 150 [%] Upper limit Lower limit	PLC RUN
MP3411.0-7	Ramp gradient of the spindle with M03 and M04 for gear ranges 1 to 8 Input: Analog axes: 0 to 1.999 [V/ms] Digital axes: 0 to 1.999 [(1000 min/min) · ms]	PLC RUN

MP	Function and input	Software version and behavior
MP3412	Multiplication factor for MP3411.x	PLC
	Input: 0.000 to 1.999	RUN
MP3412.0	With M05	
MP3412.1	With oriented spindle stop	
MP3412.2	With tapping with floating tap holder	
MP3412.3	With rigid tapping	
MP3415	Overshoot behavior of the spindle with M03, M04 and M05	PLC
	Input: 0 to 1000 [ms]	RUN
MP3415.0	With M03, M04 and M05	
MP3415.1	For oriented spindle stop	
MP3415.2	With tapping	
MP3415.3	With rigid tapping	
MP3420	Spindle positioning window	PLC
	Input: 0 to 360.0000 [°]	RUN
MP3430	Deviation of the reference mark from the desired position (spindle preset)	PLC RUN
	Input: 0 to 360 [°]	
MP3440.0-7	k_V factor for spindle orientation for gear ranges 1 to 8	PLC
	Input: 0.1 to 10 [(1000°/ min) /°]	RUN
MP3450.0-7	Number of spindle position-encoder revolutions for gear ranges 1 to 8	PLC RUN
	Input: 0 to 65,535 0: No transmission	
MP3451.0-7	Number of spindle revolutions for gear ranges 1 to 8	PLC
	Input: 0 to 65,535 0: No transmission	RUN
MP3510.0-7	Rated speed for the gear ranges 1 to 8	PLC
	Input: 0 to 99 999.999 [rpm]	RUN
MP3515.0-7	Maximum spindle speed for gear ranges 1 to 8	PLC
	Input: 0 to 99 999.999 [rpm]	RUN
MP3520.0	Speed activation through marker M4011	PLC
	Input: 0 to 99 999.999 [rpm]	RUN
MP3520.1	Spindle speed for oriented stop	
	Input: 0 to 99 999.999 [rpm]	

25.1.7 Integral PLC

MP	Function and input	Software version and behavior
MP4000.0-15	Options for the conditional compilation of the PLC program	
MP4020	PLC Functions Format: %xxxxxxxxxxxxx Input: Bit 0 to bit 4: Reserved Bit 5: Single or double spindle operation 0: Single-spindle operation 1: Double-spindle operation Bit 6 - Reserved Bit 7 - Transfer the values of the Pt 100 inputs 0: Accept values at a change rate of 1 K/s. 1: Accept results immediately Bit 8 - Behavior after an ext. emergency stop 0: "Approach position" is not automatically activated 1: "Approach position" is automatically activated Bit 9 - Behavior of a simulated key 0: Simulated key is transferred immediately to the NC 1: Simulated key is processed first by an active PLC window before being transferred to the NC Bit 10 - Behavior of a locked key 0: Locked key only works on the active PLC window 1: Locked key works on neither the active PLC window nor on the NC Bit 11 – PLC counter in MP4120.x 0: Input in PLC cycles 1: Input in seconds Bit 12 - Font size in PLC window 0: Automatic adaptation of font size to screen 1: Font size for BF 120	RESET
MP4030	Assignment of physical to logical PL Input: 0: First logical PL 1: Second logical PL 2: Third logical PL 3: Fourth logical PL	PLC RUN
MP4030.0	First physical PL	
MP4030.1	Second physical PL	
MP4030.2	Third physical PL	
MP4030.3	Fourth physical PL	
MP4050.0-8	Traverse distance for lubrication of axes 1 to 9 Input: 0 to 99 999.999 [m/s]	PLC RUN
MP4070	Compensation amount per PLC cycle for lagged-tracking axis error compensation Input: 0.0001 to 0.005 [mm]	PLC RUN
MP4110.0-47	Run time PLC timer T0 to T47 Input: 0 to 1,000,000.000 [s]	PLC RUN
MP4111.96-x	Run time PLC timer T96 to x (defined in OEM.SYS) Input: 0 to 1,000,000.000 [s]	PLC RUN

MP	Function and input	Software version and behavior
MP4120.0-47	PLC counter preset value Input: 0 to 1 000 000.000 [s or PLC cycles, depending on MP4020, bit 11]	PLC RUN
MP4130.0 MP4130.1 MP4130.2-5	Number of the high-speed PLC input for switching off the monitoring functions Reserved Numerical designation for fast PLC inputs Input: 0 to 255 [no. of the PLC input]	
MP4131.0 MP4131.1 MP4131.2-5	Activation criterion for fast PLC input for switching off the monitoring functions Reserved Activation criterion for fast PLC inputs Input: 0: Activation at low level 1: Activation at high level	
MP4210.0-47	Setting a number in the PLC (D768 to D956) Input: -99,999.9999 to +99,999.9999	
MP4220.0-4	Setting a number in the PLC (W960 to W968) Input: 10 to 30,000	
MP4230.0-31	Setting a number in the PLC (Module 9032) Input: -99,999.9999 to +99,999.9999	
MP4231.0-31	Setting a number in the PLC (Module 9032) Input: -99,999.9999 to +99,999.9999	
MP4310.0-6	Setting a number in the PLC (W976 to W988, M4300 to M4411) Input: 10 to 30,000	

25.1.8 Configuration of the data interface

MP	Function and input	Software version and behavior
MP5000	Disable data interfaces Input: 0: No interface disabled 1: RS-232-C/V.24 interface disabled 2: RS-422/V.11 interface disabled	PLC RUN
MP5020	Configuration of the data interface Format: %xxxxxxxx Input: Bit 0 – 0: 7 data bits 1: 8 data bits Bit 1 - 0 = Any BCC character 1 = BCC not control character Bit 2 - 0: Transmission stop by RTS not active 1: Active Bit 3 - 0: Transmission stop by DC3 not active 1: Active Bit 4 - 0: Character parity even 1: Odd Bit 5 - 0: Character parity not desired 1: Desired Bit 6 = 0, Bit 7 = 0: 1 stop bit Bit 6 = 1, Bit 7 = 0: 2 stop bits Bit 6 = 0, Bit 7 = 1: 1 stop bit Bit 6 = 1, Bit 7 = 1: 1 stop bit	PLC RUN CN123
MP5020.0	Operating mode EXT1	
MP5020.1	Operating mode EXT2	
MP5020.2	Operating mode EXT3 (PLC)	
MP5030	Data transfer protocol Input: 0 = Standard data transfer protocol 1 = blockwise transfer 2 = without protocol (only for MP5030.2)	PLC RUN CN123
MP5030.0	Operating mode EXT1	
MP5030.1	Operating mode EXT2	
MP5030.2	Operating mode EXT3 (PLC)	
MP5040	Data transfer rate in operating mode EXT3 (data transfer through PLC) Input: 0: 110 bps 1: 150 bps 2: 300 bps 3: 600 bps 4: 1200 bps 5: 2400 bps 6: 4800 bps 7: 9600 bps 8: 19200 bps 9: 38400 bps 10: 57600 bps 11: 115 200 bps	PLC RUN

25.1.9 3-D touch probe

MP	Function and input	Software version and behavior
MP6010	Selection of the touch probe Input: 0: Touch probe with cable transmission 1: Touch probe with infrared transmission	PLC CN123
MP6120	Probing feed rate (triggering touch probe) Input: 1 to 3000 [mm/min]	PLC RUN CN123
MP6130	Maximum measuring range Input: 0.001 to 99,999.9999 [mm]	PLC RUN CN123
MP6140	Setup clearance over measuring point Input: 0.001 to 99,999.9999 [mm]	PLC RUN CN123
MP6150	Rapid traverse in probing cycle (triggering touch probe) Input: 10 to 20,000 [mm/min]	PLC RUN CN123
MP6160	M function for probing from opposite directions Input: -1: Spindle orientation directly by NC 0: Function inactive 1 to 999: Number of the M function for spindle orientation through PLC	PLC RUN CN123
MP6161	M function for orienting the touch probe before every measuring process Input: -1: Spindle orientation directly by the NC 0: Function inactive 1 to 999: Number of the M function	PLC RUN CN123
MP6162	Orientation angle Input: 0 to 359.9999 [°]	PLC RUN CN123
MP6163	Minimum difference between the current spindle angle and MP6162 before executing an oriented spindle stop Input: 0 to 3.0000 [°]	PLC RUN CN123
MP6165	Orient the probe before approaching with Cycle 0 or 1, or with manual probing Input: 0: Probe is not oriented before each probing 1: Probe is oriented and always deflected in the same direction	PLC RUN CN123
MP6170	Number of measurements in a programmed measurement (touch probe block) Input: 1 to 3	PLC RUN CN123
MP6171	Confidence range for programmed measurement (MP6170 > 1) Input: 0.002 to 0.999 [mm]	PLC RUN CN123

MP	Function and input	Software version and behavior
MP6180	Coordinates of the ring gauge center for Probing Cycle 2 with respect to the machine datum (traverse range 1) Input: 0 to +99,999.9999 [mm]	PLC CN123
MP6180.0	X coordinate	
MP6180.1	Y coordinate	
MP6180.2	Z coordinate	
MP6181	Coordinates of the ring gauge center for Probing Cycle 2 with respect to the machine datum (traverse range 2) Input: 0 to +99,999.9999 [mm]	PLC CN123
MP6181.0	X coordinate	
MP6181.1	Y coordinate	
MP6181.2	Z coordinate	
MP6182	Coordinate of the ring gauge center for Probing Cycle 2 with respect to the machine datum (traverse range 3) Input: 0 to +99,999.9999 [mm]	PLC CN123
MP6182.0	X coordinate	
MP6182.1	Y coordinate	
MP6182.2	Z coordinate	
MP6185	Distance of probing point below ring top surface during calibration Input: +0.001 to +99,999.9999 [mm]	PLC CN123

25.1.10 Tool measurement with TT

MP	Function and input	Software version and behavior
MP6500	Tool measurement with TT 130 Format: %xxxxxxxxxxxxxxx Input: Bit 0 – Cycles for tool measurement 0: Locked 1: Not locked Bit 1 – 0: Tool radius measurement allowed. Tool length measurement with rotating spindle 1: Tool radius measurement and individual tooth measurement disabled Bit 2 – 0: Tool length measurement with rotating spindle (bit 1=1) 1: Tool length measurement with rotating spindle, only if a tool radius offset (TT:R-OFFS) has been entered in the tool table Bit 3 – 0: Tool measurement with spindle orientation 1: Tool measurement without spindle orientation. Individual tooth measurement not possible. Tool radius measurement possibly faulty. Bit 4 – 0: Automatically determine speed 1: Always use minimum spindle speed Bit 5 – NC stop during **Tool checking** 0: The NC program is not stopped when the breakage tolerance is exceeded 1: If the breakage tolerance is exceeded, the NC program is stopped and the error message **Tool broken** is displayed. Bit 6 – NC stop during **tool measurement** 0: The NC program is not stopped when the breakage tolerance is exceeded 1: If the breakage tolerance is exceeded, the NC program is stopped and the error message **Touch point inaccessible** is displayed.	PLC RUN

MP	Function and input	Software version and behavior
MP6500	Tool measurement with TT 130 Format: %xxxxxxxxxxxxxxx Input: Bit 7 – Reserved Bit 8 – Probing routine 0: Probe contact is probed from several directions 1: Probe contact is probed from one direction Bit 9 – Automatic measurement of the direction of the probe contact basic rotation (bit 8 = 1) 0: Basic rotation is not measured 1: Basic rotation of the probe element is automatically measured Bit 10 – Probing routine (bit 8 = 1) 0: Pre-positioning to starting point in all three principal axes 1: Pre-positioning to starting point in the tool axis and in the axis of the probing direction (MP6505) (bit 9 = 0) Bit 11 – **`Tool checking`** and changing in the tool routine 0: After **`Tool checking`** the tool table is changed 1: After **`Tool checking`** the tool table is not changed Bit 12 – PLC datum shift 0: Do not include 1: Include Bit 13 – 0: Tool is measured in the tilt position in which the tool touch probe was also calibrated 1: Tool is measured in another tilt position Bit 14 – Tool measurement with number of teeth = 0 0: Tool measurement with rotating spindle 1: Tool measurement with stationary spindle	PLC RUN
MP6505 MP6505.0 MP6505.1 MP6505.2	Probing direction for tool radius measurement for 3 traverse ranges Input: 0: Positive probing direction of the angle reference axis (0° axis) 1: Positive probing direction in the +90° axis 2: Negative probing direction of the angle reference axis (0° axis) 3: Negative probing direction in the +90° axis Traverse range 1 Traverse range 2 Traverse range 3	PLC RUN CN123
MP6507	Calculation of the probing feed rate Input: 0: Calculation of the probing feed rate with constant tolerance 1: Calculation of the probing feed rate with variable tolerance 2: Constant probing feed rate	PLC RUN CN123
MP6510 MP6510.0 MP6510.1	Permissible measuring error for tool measurement with rotating tool Input: 0.002 to 0.999 [mm] First measurement error Second measurement error	PLC RUN CN123

MP	Function and input	Software version and behavior
MP6520	Probing feed rate for tool measurement with non-rotating tool Input: 1 to 3000 [mm/min]	PLC RUN CN123
MP6530	Distance from the tool end to the top of the probe contact during tool radius measurement for 3 traverse ranges Input: 0.001 to 99.9999 [mm]	PLC RUN CN123
MP6530.0	Traverse range 1	
MP6530.1	Traverse range 2	
MP6530.2	Traverse range 3	
MP6531	Diameter or edge length of the TT 130 probe contact for 3 traverse ranges Input: 0.001 to 99.9999 [mm]	PLC RUN
MP6531.0	Traverse range 1	
MP6531.1	Traverse range 2	
MP6531.2	Traverse range 3	
MP6540	Safety zone around the probe contact of the TT 130 for pre-positioning Input: 0.001 to 99,999.9999 [mm]	PLC RUN CN123
MP6540.0	Safety clearance in tool axis direction	
MP6540.1	Safety clearance in the plane perpendicular to the tool axis	
MP6550	Rapid traverse in probing cycle for TT 130 Input: 10 to 20,000 [mm/min]	PLC RUN CN123
MP6560	M function for spindle orientation during individual tooth measurement Input: -1: Spindle orientation directly by NC 0: Function inactive 1 to 999: Number of the M function for spindle orientation by PLC	PLC RUN CN123

MP	Function and input	Software version and behavior
MP6570	Max. permissible surface cutting speed at the tooth edge Input: 1.0000 to 129.0000 [m/min]	PLC RUN CN123
MP6572	Maximum permissible speed during tool measurement Input: 1 to 1000 [rpm] 0: 1000 [rpm]	PLC RUN CN123
MP6580.0-2	Coordinates of the TT 130 probe contact center with respect to the machine datum (traverse range 1) Input: -99,999.9999 to +99,999.9999 [mm]	PLC RUN CN123
MP6581.0-2	Coordinates of the TT 130 probe contact center with respect to the machine datum (traverse range 2) Input: -99,999.9999 to +99,999.9999 [mm]	PLC RUN CN123
MP6582.0-2	Coordinates of the TT 130 probe contact center with respect to the machine datum (traverse range 3) Input: -99,999.9999 to +99,999.9999 [mm]	PLC RUN CN123
MP6585	Monitoring the position of the rotary and additional linear axes during the tool measurement cycles Format: %xxxxxx Input: 0: Axis is not monitored 1: Axis is monitored Bit 0 – A axis Bit 1 – B axis Bit 2 – C axis Bit 3 – U axis Bit 4 – V axis Bit 5 – W axis	PLC RUN CN123
MP6586 MP6586.0-5	Ref. coordinate for monitoring the position of the rotary and additional linear axes during the tool measurement cycles Input: -99,999.9999 to +99 999.9999 [mm or °] Axes A to W	PLC RUN CN123

25.1.11 Tapping

MP	Function and input	Software version and behavior
MP7110.0	Minimum for feed rate override during tapping Input: 0 to 150 [%]	PLC RUN
MP7110.1	Maximum for feed rate override during tapping Input: 0 to 150 [%]	
MP7120.0	Dwell time for reversal of spindle rotational direction Input: 0 to 65.535 [s]	PLC RUN
MP7120.1	Advanced switching time of the spindle during tapping with coded spindle-speed output Input: 0 to 65.535 [s]	
MP7120.2	Spindle slow-down time after reaching the hole depth Input: 0 to 65.535 [s]	
MP7130	Run-in behavior of the spindle during rigid tapping Input: 0.001 to 10 [°/min]	PLC RUN
MP7150	Positioning window of the tool axis during rigid tapping Input: 0.0001 to 2 [mm]	PLC RUN
MP7160	Spindle response during Cycle 17, 207 and 18 Format: %xxx Input: Bit 0 – Oriented spindle stop with Cycles 17 and 207 0: Oriented spindle stop before execution of the cycle 1: No oriented spindle stop before execution of the cycle Bit 1 – Spindle speed 0: Spindle speed is not limited 1: Spindle speed is limited so that it runs with constant speed approx. 1/3 of the time Bit 2 – Spindle in position feedback control 0: Spindle operated without position feedback control 1: Spindle operated with position feedback control Bit 3 – IPC and acceleration feedforward control 0: Active 1: Not active	PLC RUN CN123

25.1.12 Display and operation

MP	Function and input	Software version and behavior
MP7210	Programming station Input: 0: Controlling and programming 1: Programming station with PLC active 2: Programming station with PLC inactive	CN123
MP7212	Power interrupted message Input: 0: Acknowledge message **Power interrupted** with CE key 1: **Power Interrupted** message does not appear	PLC RUN CN123
MP7220	Block number increment for ISO programs Input: 0 to 250	PLC RUN CN123
MP7224.0	Disabling soft keys for file types Format: %xxxxxxxx Input: 0: Do not disable 1: Disable Bit 0 - HEIDENHAIN programs .H Bit 1 — ISO programs .I Bit 2 – Tool tables .T Bit 3 – Datum tables .D Bit 4 – Pallet tables .P Bit 5 – Text files .A Bit 6 – HELP files .HLP Bit 7 – Point tables .PNT	PLC RUN CN123
MP7224.1	Protecting file types Format: %xxxxxxxx Input: 0: Do not protect 1: Protect Bit 0 - HEIDENHAIN programs .H Bit 1 — ISO programs .I Bit 2 – Tool tables .T Bit 3 – Datum tables .D Bit 4 – Pallet tables .P Bit 5 – Text files .A Bit 6 – HELP files .HLP Bit 7 – Point tables .PNT	
MP7226.0	Size of the pallet table Input: 0 to 255 [lines]	PLC RUN CN123
MP7226.1	Size of the datum table Input: 0 to 255 [lines]	
MP7229	Depiction of the NC program	PLC
MP7229.0	Line number for program testing Input: 100 to 9999	RUN CN123
MP7229.1	Program length to which FK blocks are allowed Input: 100 to 9999	

MP	Function and input	Software version and behavior
MP7230	Switching the conversational language Input: 0: English 1: German 2: Czech 3: French 4: Italian 5: Spanish 6: Portuguese 7: Swedish 8: Danish 9: Finnish 10: Dutch 11: Polish 12: Hungarian 13: Reserved 14: Russian	PLC RUN CN123
MP7230.0	NC conversational language, soft keys for OEM cycles	
MP7230.1	PLC conversational language (user parameters)	
MP7230.2	PLC error messages	
MP7230.3	Help files	
MP7235	Time difference to time set in BIOS Input: -23 to +23 [hours]	PLC RUN CN123

MP	Function and input	Software version and behavior
MP7237	Displaying and resetting the operating times	PLC
MP7237.0	Display PLC operating times Input: Bits 0 to 7 represent PLC operating times 1 to 8 0: Do not display 1: Display	RUN
MP7237.1	Resetting PLC operating times with the code number 857282 Input: Bits 0 to 7 represent PLC operating times 1 to 8 0: Do not reset 1: Reset	
MP7237.2	Resetting NC operating times with the code number 857282 Input: Bit 0 – No function Bit 1 – "Machine on" operating time Bit 2 – "Program run" operating time 0: Do not reset 1: Reset	
MP7238.0-7	Dialog messages for PLC operating times 1 to 8 Input: 0 to 4095 Dialog no. from the file (OEM.SYS)	PLC RUN
MP7245	Disabling auxiliary cycles Input: 0: Auxiliary cycles disabled 1: Auxiliary cycles permitted	PLC RUN
MP7246	Disabling paraxial positioning blocks Input: 0: Paraxial positioning block enabled 1: Paraxial positioning block disabled	PLC RUN
MP7251	Number of global Q parameters that are transferred from the OEM cycle to the calling program Input: 0 to 100	PLC RUN
MP7260	Number of tools in the tool table Input: 0 to 30,000	CN123
MP7261.0-3	Number of pockets in the tool magazine 1 to 4 Input: 0 to 254	CN123
MP7262	Maximum tool index number for indexed tools Input: 0 to 9	CN123
MP7263	Hiding/showing the POCKET TABLE soft key Format: %x Input: Bit 0 – 0: POCKET TABLE soft key is shown 1: POCKET TABLE soft key is hidden	CN123

MP	Function and input	Software version and behavior
MP7266	Elements of the tool table Input: 0: No display 1 to 99: Position in the tool table	CN123
MP7266.0	16-character alphanumeric tool name (NAME)	
MP7266.1	Tool length L	
MP7266.2	Tool radius R	
MP7266.3	Tool radius 2 for toroidal cutter (R2)	
MP7266.4	Oversize in tool length (DL)	
MP7266.5	Oversize in tool radius (DR)	
MP7266.6	Oversize in tool radius 2 (DR2)	
MP7266.7	Locked tool? (TL)	
MP7266.8	Replacement tool (RT)	
MP7266.9	Maximum tool age , M4543 (TIME1)	
MP7266.10	Maximum tool age TOOL CALL (TIME2)	
MP7266.11	Current tool age (CUR.TIME)	
MP7266.12	Comment on the tool (DOC)	
MP7266.13	Number of tool teeth (CUT)	
MP7266.14	Wear tolerance for tool length (LTOL)	
MP7266.15	Wear tolerance for tool radius (RTOL)	
MP7266.16	Cutting direction of the tool (DIRECT)	
MP7266.17	Additional information for PLC, module 9093 (PLC)	
MP7266.18	Tool offset for tool length (TT:LOFFS)	
MP7266.19	Tool offset for tool radius (TT: ROFFS)	
MP7266.20	Breakage tolerance for tool length (LBREAK)	
MP7266.21	Breakage tolerance for tool radius (RBREAK)	
MP7266.22	Tooth length (LCUTS)	
MP7266.23	Plunge angle (ANGLE)	
MP7266.24	Tool type (TYP)	
MP7266.25	Tool material (TMA)	
MP7266.26	Cutting-data table (CDT)	
MP7266.27	PLC value (PLC-VAL)	
MP7266.28	Probe center offset in reference axis (CAL-OF1)	
MP7266.29	Probe center offset in minor axis (CAL-OF2)	
MP7266.30	Spindle angle during calibration (CAL-ANG)	
MP7266.31	Tool type for pocket table (PTYP)	340 420-02
MP7267	Elements of the pocket table Input: 0: No display 1 to 99: Position in the pocket table	CN123
MP7267.0	Tool number (T)	
MP7267.1	Special tool (ST)	
MP7267.2	Fixed pocket (F)	
MP7267.3	Locked pocket (L)	
MP7267.4	PLC status (PLC)	
MP7267.5	Tool name (TNAME)	
MP7267.6	Comment on the tool (DOC)	

MP	Function and input	Software version and behavior
MP7267.7 MP7267.8 MP7267.9 MP7267.10 MP7267.11 MP7267.12 MP7267.13 MP7267.14 MP7267.15 MP7267.16 MP7267.17	Tool type for pocket table (PTYP) Value 1 (P1) Value 2 (P2) Value 3 (P3) Value 4 (P4) Value 5 (P5) Reserve pocket (RSV) Pocket above locked (LOCKED_ABOVE) Pocket below locked (LOCKED_BELOW) Pocket at left locked (LOCKED_LEFT) Pocket at right locked (LOCKED_RIGHT)	340 420-02
MP7270	Feed rate display in the operating modes MANUAL OPERATION and ELECTRICAL HANDWHEEL Input: 0: Display of feed rate by pressing an axis direction key (axis-specific feed rate from MP1020) 1: Display of axis feed rate also before an axis direction key is pressed (smallest value from MP1020 for all axes)	PLC RUN CN123
MP7280	Decimal character Input: 0: Decimal comma 1: Decimal period	PLC RUN CN123
MP7281	Depiction of the NC program Input: 0: All blocks completely 1: Current block completely, others line by line 2: All blocks line by line; complete block when editing	PLC RUN CN123
MP7285	Tool length offset in the tool-axis position display Input: 0: Tool length is not offset 1: Tool length is offset	PLC RUN CN123
MP7289	Position display step for the spindle Input: 0: 0.1° 1: 0,05° 2: 0,01° 3: 0,005° 4: 0,001° 5: 0,0005° 6: 0,0001°	PLC RUN CN123
MP7290.0-8	Position display step for axes 1 to 9 0: 0.1 mm or 0.1° 1: 0.05 mm or 0.05° 2: 0.01 mm or 0.01° 3: 0.005 mm or 0.005° 4: 0.001 mm or 0.001° 5: 0.0005 mm or 0.0005° 6: 0.0001 mm or 0.0001°	PLC RUN CN123

MP	Function and input	Software version and behavior
MP7291	Display of axes on the screen Format: SXYZABCUVWxyzabcuvw- Input: Characters 1 to 9 from the right represent lines 1 to 9. Character 10 is spindle S which is always output in line 9.	PLC RUN
MP7291.0	Display in traverse range 1	
MP7291.1	Display in traverse range 2	
MP7291.2	Display in traverse range 3	
MP7295	Disabling "datum setting" Format: %xxxxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Not disabled 1: Disabled	PLC RUN CN123
MP7296	"Datum setting" through axis keys Input: 0: Datum can be set by axis keys and soft key 1: Datum can be set only by soft key	PLC RUN CN123
MP7300	Erasing the status display and Q parameters Input: 0: Erase the status display, Q parameters and tool data when a program is selected. 1: Erase the status display, Q parameters and tool data if a program is selected and M02, M30, and END PGM occur. 2: Erase the status display and tool data when a program is selected. 3: Erase the status display and tool data when a program is selected and in the event of M02, M30, END PGM. 4: Erase the status display and Q parameters when a program is selected. 5: Erase the status display and Q parameters when a program is selected and in the event of M02, M30, END PGM. 6: Erase the status display when a program is selected and in the event of M02, M30, END PGM. 7: Erase the status display when a program is selected and in the event of M02, M30, END PGM.	PLC RUN CN123

MP	Function and input	Software version and behavior
MP7310	Graphic display mode Format: %xxxxxxxx Input: Bit 0 – Projection in three planes: 0: German-preferred projection 1: US-preferred projection Bit 1 - Rotating the coordinate system in the working plane by 90°: 0: No rotation 1: Rotation by +90° Bit 2 – BLK form after datum shift: 0: Shifted 1: Not shifted Bit 3 – Display of the cursor position: 0: No display 1: Display Bit 4 - Reserved Bit 5 - Graphics during program test 0: 2.5-D 1: 3D Bit 6 - Graphics during program run 0: 2.5-D 1: 3D Bit 7 – Reserved	PLC RUN CN123
MP7315	Tool radius for graphic simulation without TOOL CALL Input: 0.0000 to 99,999.9999 [mm]	PLC RUN CN123
MP7316	Penetration depth of the tool Input: 0.0000 to 99,999.9999 [mm]	PLC RUN CN123
MP7317 MP7317.0 MP7317.1	M function for graphic simulation Beginning of graphic simulation Input: 0 to 88 Interruption of the graphic simulation Input: 0 to 88	PLC RUN CN123
MP7330.0-15	Specifying the user parameters 1 to 16 Input: 0 to 9999.00 (no. of the user parameter)	PLC RUN
MP7340.0-15	Dialog messages for user parameters 1 to 16 Input: 0 to 4095 (line number of the PLC dialog message file)	PLC RUN

25.1.13 Colors

MP	Function and input	Software version and behavior
MP7350	Window frames	PLC RUN
MP7351	Error Messages	PLC RUN
MP7352 MP7352.0 MP7352.1 MP7352.2	"Machine" operating mode display Background Text for operating mode Dialog	PLC RUN
MP7353 MP7353.0 MP7353.1 MP7353.2	"Programming" operating mode display Background Text for operating mode Dialog	PLC RUN
MP7354 MP7354.0 MP7354.1 MP7354.2 MP7354.3	"Machine" program text display Background General program text Active block Background of inactive window	PLC RUN
MP7355 MP7355.0 MP7355.1 MP7355.2 MP7355.3	"Programming" program text display Background General program text Active block Background of inactive window	PLC RUN
MP7356 MP7356.0 MP7356.1 MP7356.2	Status window and PLC window Background Axis positions in the status display Status display other than axis positions	PLC RUN
MP7357 MP7357.0 MP7357.1	"Machine" soft-key display Background Symbols	PLC RUN
MP7358 MP7358.0 MP7358.1	"Programming" soft-key display Background Symbols	PLC RUN
MP7360 MP7360.0 MP7360.1 MP7360.2 MP7360.3 MP7360.4 MP7360.5 MP7360.6	Graphics: 3-D view and plan view Background Top surface 3-D: Front face Text display in the graphics window 3-D: Lateral face Lowest point of blank form Highest point of blank form (below surface)	PLC RUN

MP	Function and input	Software version and behavior
MP7361	Graphics: Projection in three planes	PLC
MP7361.0	Background	RUN
MP7361.1	Top view	
MP7361.2	Front and side view	
MP7361.3	Axis cross and text in the graphic display	
MP7361.4	Cursor	
MP7362	Additional status display in the graphics window	PLC
MP7362.0	Background of graphic window	RUN
MP7362.1	Background of status display	
MP7362.2	Status symbols	
MP7362.3	Status values	
MP7363	Programming graphics	PLC
MP7363.0	Background	RUN
MP7363.1	Resolved contour	
MP7363.2	Subprograms and frame for zooming	
MP7363.3	Alternative solutions	
MP7363.4	Unresolved contour	
MP7364	Color of the help illustrations for cycles	PLC
MP7364.0-6	Colors 1 to 7 of the graphic program used	RUN
MP7364.7	Line color (color 8 of the graphic program)	
MP7364.8	Color for highlighted graphic elements if defined in the help illustration	
MP7364.9	Background	
MP7365	Oscilloscope	PLC
MP7365.0	Background	RUN
MP7365.1	Channel 1	
MP7365.2	Channel 2	
MP7365.3	Channel 3	
MP7365.4	Channel 4	
MP7365.5	Selected channel	
MP7365.6	Grid	
MP7365.7	Cursor and text	
MP7366	Pop-up window (HELP key, pop-up menus etc.)	PLC
MP7366.0	Background	RUN
MP7366.1	Text or foreground	
MP7366.2	Active line	
MP7366.3	Title bar	
MP7366.4	Scroll-bar field	
MP7366.5	Scroll bar	
MP7366.6-14	Reserved	
MP7367	Large PLC window	PLC
MP7367.0	Background	RUN
MP7367.1	Color 1	
MP7367.2	Color 2	
MP7367.3	Color 3	
MP7367.4	Color 4	
MP7367.5	Color 5	
MP7367.6-14	Colors 6 to 14	

MP	Function and input	Software version and behavior
MP7368	Pocket calculator	PLC
MP7368.0	Background	RUN
MP7368.1	Background of displays and keys	
MP7368.2	Key texts ("os" in "cos")	
MP7368.3	Key symbols	
MP7369	Directory tree in PGM MGT	PLC
MP7369.0	Text background	RUN
MP7369.1	Text	
MP7369.2	Text background of the active folder	
MP7369.3	Line color of the tree structure	
MP7369.4	Folders	
MP7369.5	Drives	
MP7369.6	Text background of the heading in the browser window	
MP7392	Screen saver Input: 1 to 99 [min] 0: No screen saver	PLC RUN CN123

25.1.14 Machining and program run

MP	Function and input	Software version and behavior
MP7410	Scaling cycle in two or three axes Input: 0: Scaling cycle is effective in all three principle axes 1: Scaling cycle is effective only in the working plane	PLC RUN CN123
MP7411	Tool data in the touch probe block Format: %xx Input: Bit 0 – 0: Use the calibrated data of the touch probe 1: Use the current tool data from the last TOOL CALL Bit 1 – 0: Only one set of touch probe calibration data 1: Manage several blocks of touch probe calibration data in the tool table	PLC RUN CN123
MP7420	Cycles for milling pockets with combined contours Format: %xxxxx Input: Bit 0 – Milling direction for channel milling: 0: Counterclockwise for pockets, clockwise for islands 1: Clockwise for pockets, counterclockwise for islands Bit 1 — Sequence for rough-out and channel milling: 0: First channel milling, then pocket rough-out 1: First pocket rough-out, then channel milling Bit 2 – Merging of listed contours: 0: Contours are merged only if the tool-center paths intersect 1: Contours are merged if the programmed contours intersect Bit 3 — Rough-out and channel milling to pocket depth or for every infeed 0: Each process uninterrupted to pocket depth 1: Both processes for each pecking depth before proceeding to the next depth Bit 4 – Position after completion of the cycle: 0: Tool moves to the same position as before the cycle was called 1: Tool only moves in the tool axis to the "clearance height"	PLC RUN CN123
MP7430	Overlap factor for pocket milling Input: 0.001 to 1.414	PLC RUN CN123

MP	Function and input	Software version and behavior
MP7431	Arc end-point tolerance Input: 0.0001 to 0.016 [mm]	PLC RUN CN123
MP7440	Output of M functions Format: %xxxxxxx Input: Bit 0 – Program stop with M06 0: Program stop with M06 1: No program stop with M06 Bit 1 – Modal cycle call M89 0: Normal code transfer of M89 at beginning of block 1: Modal cycle call M89 at end of block Bit 2 – Program stop with M functions: 0: Program stop until acknowledgment of the M function 1: No program stop: No waiting for acknowledgment. Bit 3 – Switching of k_V factors with M105/M106: 0: Function is not in effect 1: Function is effective Bit 4 — Reduced feed rate in the tool axis with M103: 0: Function is not in effect 1: Function is effective Bit 5 – Reserved Bit 6 – Automatic activation of M134 0: M134 must be activated in the NC program 1: M134 is automatically activated when an NC program is selected.	PLC RUN CN123
MP7441	Error message during cycle call Format: %xxx Input: Bit 0 – 0: Error message **Spindle ?** is not suppressed 1: Error message **Spindle ?** is suppressed Bit 1: Reserved, enter 0 Bit 2 – 0: Error message **Enter depth as negative** is suppressed 1: Error message **Enter depth as negative** is not suppressed	PLC RUN CN123
MP7442	Number of the M function for spindle orientation in the cycles Input: 1 to 999: Number of the M function 0: No oriented spindle stop –1: Oriented spindle stop by the NC	PLC RUN CN123
MP7450	Offsetting the tool change position from MP951.x in block scan Format: %xxxxxxxxxxxxxx Input: Bits 0 to 3 correspond to axes 1 to 14: 0: Do not offset 1: Offset	PLC RUN
MP7451.0-8	Feed rate for returning to the contour for axes 1 to 9 Input: 10 to 300,000 [mm/min]	PLC RUN

MP	Function and input	Software version and behavior
MP7470	Maximum contouring tool feed rate at 100% override Input: 0 to 300,000 [mm/min] 0: No limitation	PLC RUN CN123
MP7471	Maximum velocity of the principle axes during compensating movements through M128 Input: 0 to 300,000 [mm/min]	PLC RUN CN123
MP7475	Reference for datum table Input: 0: Reference is workpiece datum 1: Reference is machine datum (MP960.x)	PLC RUN CN123
MP7480 MP7480.0	Output of the tool or pocket number With TOOL CALL block Input: 0: No output 1: Tool number output only when tool number changes 2: Tool number output for every TOOL CALL block 3: Output of the pocket number and tool number only when tool number changes 4: Output of the pocket number and tool number for every TOOL CALL block 5: Output of the pocket number and tool number only when tool number changes. Pocket table is not changed. 6: Output of the pocket number and tool number for every TOOL CALL block. Pocket table is not changed.	PLC RUN
MP7480.1	With TOOL DEF block Input: 0: No output 1: Tool number output only when tool number changes 2: Tool number output for every TOOL DEF block 3: Output of the pocket number and tool number only when tool number changes 4: Output of the pocket number and tool number for every TOOL DEF block	

MP	Function and input	Software version and behavior
MP7490	Functions for traverse ranges Format: %xxxx Input: Bit 0 – 0: Display one traverse range via MOD 1: Display three traverse ranges via MOD Bit 1 - 0: Each traverse range has its own datum (and 3 memories for the positions of the swivel head) 1: One datum for all traverse ranges Bit 2 – Calibration data: touch probe for workpiece measurement: 0: One set of calibration data for all traverse ranges 1: Every traverse range has its own set of calibration data Bit 3 – Calibration data: touch probe for tool measurement: 0: One set of calibration data for all traverse ranges 1: Every traverse range has its own set of calibration data	PLC RUN
MP7500	Tilting working plane Format: %xxxxxxxxx Input: Bit 0 – "Tilted working plane" 0: Off 1: On Bit 1 – 0: Angles correspond to the position of the tilting axes of the head/table 1: Angles correspond to the spatial angle (the iTNC calculates the position of the tilted axes of the head/table) Bit 2 – 0: The tilting axes are not positioned with Cycle 19 1: The tilting axes are positioned with Cycle 19 Bit 3 – 0: The current tilting-axis position is taken into account with respect to the machine datum 1: The 0° position is assumed for the first rotary axis Bit 4 – 0: Compensate mechanical offset during exchange of the spindle head when calling M128, M114 or "tilted working plane" 1: Compensate mechanical offset during PLC datum shift	PLC RUN

MP	Function and input	Software version and behavior
MP7500	Tilting working plane Format: %xxxxxxxxx Bit 5 – 0: The current tilting-axis position is taken into account with respect to the machine datum 1: The tilting-axis position that was entered with the 3-D ROT soft key applies. Bit 6 – 0: Spatial angle C is realized through a rotation of the coordinate system. 1: Spatial angle C is realized through a rotation of the table. Bit 7 – 0: The current tilting-axis position is taken into account with respect to the machine datum 1: The active tilting-axis position is a) Manual tilting is active, derived from the tilting angles in the 3D ROT window. b) derived from the reference coordinates of the rotary axes if tilting is inactive. Bit 8 – non-functional	PLC RUN
MP7502	Functionality of M144/M145 Input: %xxx Bit 0 - 0: M144/M145 not active 1: M144/M145 active Bit 1 – M144/M145 in the automatic modes 0: M144/M145 active 1: M144 is activated automatically at the start of an NC program. It can only be deactivated with M145 during an NC program. Bit 2 – M144/M145 in the manual modes 0: M144/M145 not active 1: M144/M145 active	PLC RUN
MP7510 MP7510.0-14	Transformed axis Format: %xxxxxx Input: 0: End of the transformation sequence Bit 0 corresponds to axis X Bit 1 corresponds to axis Y Bit 2 corresponds to axis Z Bit 3 corresponds to axis A Bit 4 corresponds to axis B Bit 5 corresponds to axis C Transformation 1 to transformation 15	PLC RUN
MP7520 MP7520.0-14	Additional code for transformation Format: %xx Input: Bit 0 – Tilting axis 0: Swivel head 1: Tilting table Bit 1 – Type of dimension in MP7530 0: Incremental dimension for swivel head 1: Absolute with respect to the machine datum for tilting table Transformation 1 to transformation 15	PLC RUN

MP	Function and input	Software version and behavior
MP7530	Type of dimension for transformation	PLC
	Input: -99,999.9999 to +99,999.9999 0: Free tilting axis	RUN
MP7530.0-14	Transformation 1 to transformation 15	
MP7550	Home position of the tilting element	PLC
	Input: -99,999.9999 to +99,999.9999	RUN
MP7550.0	A Axis	
MP7550.1	B Axis	
MP7550.2	C Axis	

25.1.15 Hardware

MP	Function and input	Software version and behavior
MP7600.0	Position controller cycle time = MP7600.0 · 0.6 ms Input: 1 to 20 Proposed input value: 3 (= 1.8 ms)	RESET
MP7600.1	PLC cycle time = position controller cycle time · MP7600.1 Input: 1 to 20 Proposed input value: 7 (= 12.5 ms)	
MP7620	Feed-rate override and spindle speed override Format: %xxxxxxx Input: Bit 0 - Feed-rate override if rapid traverse key is pressed in **Program Run** mode. 0: Override not effective 1: Override effective Bit 1 – Non-functional Bit 2 - Feed-rate override if rapid traverse key and machine direction button are pressed in **Manual mode.** 0: Override not effective 1: Override effective Bit 3 – Feed rate override and spindle speed override in 1% increments or according to a nonlinear characteristic curve 0: 1% steps 1: Nonlinear characteristic curve Bit 4 – Non-functional Bit 5 – Reserved Bit 6 – Feed-rate smoothing 0: Not active 1: Active	PLC RUN
MP7640	Handwheel Input: 0: No handwheel 1: Reserved 2: HR 130 3: Reserved 4: Reserved 5: Up to three HR 150 via HRA 110 6: HR 410 7 to 10: Reserved	PLC RUN
MP7641	Entry of the interpolation factor Input: 0: Through iTNC keyboard 1: Through PLC Module 9036	PLC RUN

MP	Function and input	Software version and behavior
MP7645	Initializing parameter for handwheel	PLC
MP7645.0	Layout of the handwheel keypad for HR 410 Input: 0: Evaluation of the keys by NC, including LEDs 1: Evaluation of the keys by PLC	RUN
MP7645.0	Assignment of a third handwheel via axis selector switch S2, when MP7645.2 = 0 Input: 0: Switch position 1 (at the left stop) 3rd handwheel axis Z Switch position 2 3rd handwheel axis IV Switch position 3 3rd handwheel axis V 1: Switch position 1 3rd handwheel axis X Switch position 2 3rd handwheel axis Y Switch position 3 3rd handwheel axis Z Switch position 4 3rd handwheel axis IV Switch position 5 3rd handwheel axis V 2: Switch position 3 3rd handwheel axis Z Switch position 4 3rd handwheel axis IV Switch position 5 3rd handwheel axis V	
MP7645.1	Fixed assignment of third handwheel if MP7645.2 = 1 Input: 4: Axis Z 8: Axis IV (MP410.3) 16: Axis V (MP410.4)	
MP7645.2	Assignment of a third handwheel via axis selector switch or MP7645.1 Input: 0: Assignment by axis selection switch according to MP7645.0 1: Assignment by MP7645.1	
MP7645.3-7	No function	
MP7650	Counting direction for handwheel Format: %xxxxxxxxx Input: 0: Negative counting direction 1: Positive counting direction	PLC RUN
MP7660	Threshold sensitivity for electronic handwheel Input: 0 to 65 535 [increments]	PLC RUN
MP7670	Interpolation factor for handwheel Input: 0 to 10	PLC RUN
MP7670.0	Interpolation factor for low speed	
MP7670.1	Interpolation factor for medium speed (only HR 410)	
MP7670.2	Interpolation factor for high speed (only HR 410)	

MP	Function and input	Software version and behavior
MP7671	Handwheel feed rate in the Handwheel operating mode with HR 410 Input: 0 to 1000 [% of MP1020]	PLC RUN
MP7671.0	Low speed	
MP7671.1	Medium speed (only HR 410)	
MP7671.2	High speed (only HR 410)	
MP7680	Machine parameter with multiple function Format: %xxxxxxxxxxxxxx Input: Bit 0 – Memory function for axis-direction keys with M4562: 0: Not saved 1: Saved if M4562 is set Bit 1 – Returning to the contour 0: Not active 1: Active Bit 2 – Block scan 0: Not active 1: Active Bit 3 – Interruption of block scan for STOP or M06: 0: Interruption 1: No interruption Bit 4 — Inclusion of programmed dwell time during the block scan: 0: Include the dwell time 1: Do not include the dwell time Bit 5 – Start of calculation for block scan 0: Start from block with cursor 1: Start from beginning of program Bit 6 – Tool length in blocks with normal vectors: 0: Without R2 from tool table (south pole) 1: With R2 from tool table (center of sphere) Bit 7 – Inserting a defined rounding arc or spline: 0: Defined rounding arcs are always inserted 1: Defined rounding arcs are always inserted if the acceleration from MP1060.x or MP1070 was exceeded.	PLC RUN

MP	Function and input	Software version and behavior
MP7680	Machine parameter with multiple function Bit 8 – Insertion of rounding arc or cubic spline 0: Rounding arc is inserted. 1: A cubic spline is inserted instead of a rounding arc. Bit 9 – Constant jerk on spline (bit 8 = 1) 0: No constant jerk 1: Constant jerk Bit 10 – Cutter-radius-compensated outside corners 0: Insertion of a circular arc 1: Insertion of a spline curve Bit 11 - Behavior of M116 0: Rotary axis is parallel to linear axis 1: Any position of rotary axis to linear axis Bit 12 – Behavior of Cycle 28 0: Standard behavior 1: The slot wall is approached and departed tangentially; at the beginning and end of the slot a rounding arc with a diameter equal to the slot width is cut Bit 13 - Behavior during program interruption with axis movement 0: Automatic activation of **APPROACH POSITION** 1: Do not activate **APPROACH POSITION**	PLC RUN
MP7681	M/S/T/Q transfer to the PLC during block scan Format: %xxxx Input: Bit 0 – 0: Transfer M functions to the PLC during block scan. 1: Collect M functions and transfer them to the PLC after block scan. Bit 1 – 0: Transfer T code to the PLC during block scan. 1: Transfer last T code to the PLC after block scan. Bit 2 – 0: Transfer S or G code to the PLC during block scan. 1: Transfer S or G code to the PLC after block scan. Bit 3 – 0: Transfer FN19 outputs to the PLC during block scan. 1: Transfer last FN19 outputs to the PLC after block scan.	PLC RUN

MP	Function and input	Software version and behavior
MP7682	Machine parameter with multiple function Format: %xxxxx Input: Bit 0 – Incremental block after TOOL CALL 0: with length compensation 1: without length compensation Bit 1 – Reference value for calculating the preset during datum setting 0: Actual value is calculated 1: Nominal value is calculated Bit 2 – Traverse path of rotary axes with modulo display 0: Positioning without passing over zero 1: Positioning on the shortest path Bit 3 - Reserved, enter 0 Bit 4 - Tolerance of rotary axes with M128 0: With consideration of head dimensions 1: Without consideration of head dimensions	PLC RUN
MP7683	Executing pallet tables and NC programs Format: %xxxxx Input: Bit 0 - Nonfunctional Bit 1 - **Program Run, Full Sequence** mode 0: During the start, a complete NC program is run. 1: At the start all NC programs are executed up to next pallet. Bit 2 - **Program Run, Full Sequence** mode 0: As defined in bit 1 1: All NC programs and pallets up to the end of the table are executed . Bit 3 – When the end of the table is reached, the process begins again with the first line. 0: Function is not in effect 1: Function is effective (bit 2 = 1) Bit 4 – Editing the active pallet table 0: Active pallet table cannot be edited. 1: In the **Program Run, Full Sequence** and **Program Run, Single Block** modes, the current pallet table can be edited. Bit 5 – AUTOSTART soft key 0: Do not display soft key 1: Display soft key Bit 6 – Display of pallet table and NC program 0: Both simultaneously in a split screen 1: Pallet table or NC program individually Bit 7 - AUTOSTART function 0: AUTOSTART function by NC 1: AUTOSTART function by PLC	PLC RUN

MP	Function and input	Software version and behavior
MP7684	Nominal position value filter and path control with M128 Format: %xxxxxxx Input: Bit 0 - Nominal position value filter 0: Include acceleration 1: Do not include the acceleration Bit 1 - Nominal position value filter 0: Include the jerk 1: Do not include the jerk Bit 2 - Nominal position value filter 0: Include the tolerance 1: Do not include the tolerance Bit 2 - Nominal position value filter 0: Include the radial acceleration 1: Do not include the radial acceleration Bit 4 - Nominal position value filter 0: Include curvature changes 1: Do not include curvature changes Bit 5 - Feed-rate reduction at corners with M128 0: Include only maximum compensatory path 1: Do not include compensatory paths Bit 5 - Feed-rate reduction at corners with M128 0: Include compensatory paths depending on the entry in bit 5 1: Include all compensatory paths	PLC RUN
MP7690	MEMORY TEST during switch-on Format: %xxx Input: 1: No MEMORY TEST during switch-on 0: MEMORY TEST during switch-on Bit 0 – Test the RAM Bit 1 — Test the EPROM Bit 2 – Test the hard disk	

25.1.16 Second spindle

MP	Function and input	Software version and behavior
MP13010 to MP13520	Machine parameter block for the second spindle Input: Function and input range are identical with MP3010 to MP3520.	

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