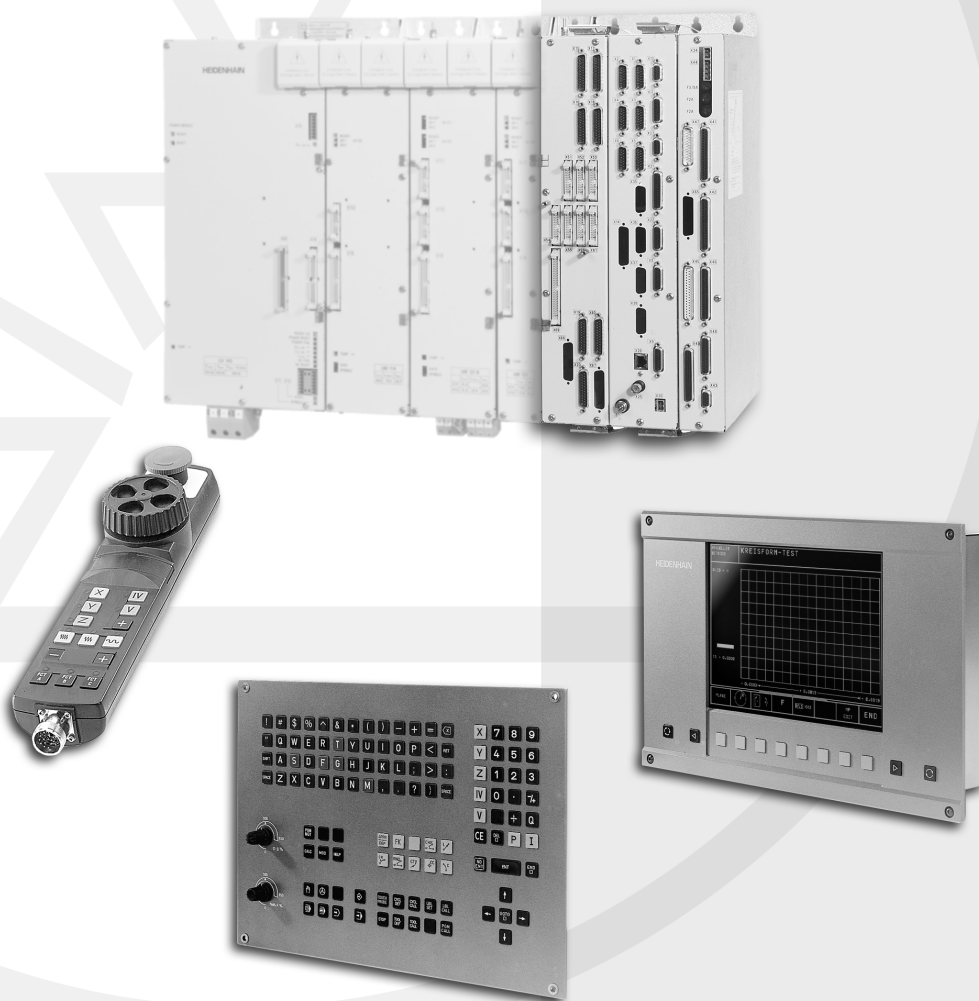




HEIDENHAIN

Service Manual

TNC 426 CB / PB / M
TNC 430 CA / PA / M



Contents

1 Using the Service Manual	5
1.1 General	5
1.2 Safety Precautions.....	6
2 Integral Monitoring System.....	7
2.1 Introduction	7
2.2 Error Messages	8
2.3 Log.....	77
2.4 Integrated Diagnosis Program	81
3 Errors and Error Analysis on the Machine or Control	85
3.1 Overview	85
4 Overview of Components	87
4.1 Standard Components.....	87
4.2 Accessories	90
5 Important Features of HEIDENHAIN Components	91
5.1 Hardware Identification	91
5.2 Display of System Information	94
6 Connector Designation and Layout.....	97
6.1 Logic Units.....	97
6.1.1 Designation and position of connections	97
6.1.2 Pin layouts	106
6.2 PLC Expansion Boards	122
6.2.1 Designation and position of connectors	122
6.2.2 Pin layouts	124
6.3 TNC Operating Panel.....	130
6.3.1 Designation and position of connectors	130
6.3.2 Pin layouts	130
6.4 Visual Display Units	132
6.4.1 BC 110B	132
6.4.2 BC 120	135
6.4.3 BF 120	138
6.5 Interface Card for Simodrive 611D	142
6.5.1 Interface card Id.Nr. 324 955-xx	142
6.5.2 Interface card Id.Nr. 313.437-xx	143
6.5.3 Interface card Id.Nr. 324 952-1x	144
6.5.4 Interface card Id.Nr. 324 952-0x	145
6.6 Machine Operating Panel	146
6.6.1 MB 420	146
6.7 Handwheels.....	148
6.7.1 HR 130 (Panel-mounted handwheel)	148
6.7.2 HR 410 (Portable handwheel)	149
6.7.3 HRA 110 (Multi-axis handwheel)	151
6.8 Touch Probe Systems	152
6.8.1 TS 220	152
6.8.2 TT 130	153
6.8.3 TS 630 / TS 632	154
7 Grounding Diagrams and Block Diagrams	155
7.1 Grounding Diagrams.....	155
7.2 Basic Circuit Diagrams.....	161
7.3 Block Diagrams.....	168

8 Power Supply	171
8.1 LE 426 CB/430 CA.....	171
8.1.1 Dc-link power supply	171
8.2 LE 426 PB / 430 PA	173
8.2.1 Dc-link power supply	173
8.3 LE 426M / 430M with Simodrive 611D.....	176
8.3.1 Power supply unit UV 101/B or UV 111	176
8.4 LE 426M/430M with HEIDENHAIN Inverter	178
8.5 Power Supply to PLC	179
8.5.1 Logic unit LE 426.B/430.A	179
8.5.2 Logic unit LE 426M/430M	179
8.5.3 PLC expansion board PL 405B/410B	180
8.6 Buffer Battery.....	181
8.6.1 LE 426 CB/PB and LE 430 CA/PA	181
8.6.2 LE 426 M and LE 430 M	182
8.7 Info Menu.....	183
9 Keyboard Unit TE 401 B/420.....	185
9.1 Front View of the Keyboard Unit	185
9.2 Checking the Keyboard Unit.....	186
9.3 Key Matrix of the Keyboard Unit	188
10 Visual Display Units.....	197
10.1 Checking the BC 110 B Visual Display Unit.....	197
10.2 Checking the BC 120 Visual Display Unit	198
10.3 Checking the BC 120F Visual Display Unit	200
11 File Management of the TNC.....	201
11.1 Code Numbers	201
11.2 Where are Which Data in the TNC?	201
11.3 TNC Partition (TNC:\)	204
11.4 PLC Partition (PLC:\)	206
11.5 Machine Parameter Editor.....	208
11.6 Switching the Position Display for Service Purposes	210
11.7 Command Shell	211
12 Encoder Interface	213
12.1 Position Encoders Circuit	213
12.2 Speed Encoders Circuit	216
12.3 Inspecting a Position Encoder	218
13 Checking the Enables on the TNC	219
13.1 General	219
13.2 "Control-is-Ready" Output (X41 / Pin 34) and Acknowledgement I3 (X41 / Pin 4).....	219
13.2.1 Checking the output (X41/34) and acknowledgement I3	219
13.2.2 Flowcharts of the TNC booting routine	220

14 Interface to Servo Amplifier.....	225
14.1 Analog/Digital Nominal Value to Servo Amplifier.....	225
14.2 Overview of Test Routines for Error Diagnosis	226
14.2.1 Test routine 1, Checking the analog speed command interface	227
14.2.2 Test routine 2	229
14.2.3 Test routine 3	232
14.2.4 Test routine 4	233
14.2.5 Test routine 5	235
14.2.6 Test routine 6	238
14.2.7 Test routine 7	239
14.2.8 Test routine 8	241
14.2.9 Test routine 9	244
14.2.10 Test routine 10	245
14.2.11 Test routine 11	247
14.3 Speed Adjustment at Servo Amplifier	250
14.4 Adjusting the Electrical Offset.....	251
14.5 Integrated Oscilloscope.....	253
15 PLC Interface	257
15.1 Specifications	257
15.2 Monitoring the PLC Inputs and Outputs.....	258
15.3 Service Diagnosis in PLC mode.....	261
15.3.1 TRACE function	261
15.3.2 LOGIC diagram	262
15.3.3 TABLE Function	264
15.4 Re-compile PLC program.....	265
15.5 Calling the PLC Error Table (<Name>.PET) for Diagnosis Purposes	266
15.6 Creating a Cross Reference List for Diagnosis Purposes.....	267
15.7 Nonvolatile PLC Markers and Words.....	268
16 Serial Handwheels	271
16.1 Handwheel HR 130/130.001/330	271
16.2 HR 332 Handwheel	273
16.3 HR 410 Handwheel	276
17 3-D Touch Probes	279
17.1 Overview	279
17.1.1 Touch probes for workpiece setup and measurement	279
17.1.2 Touch probe for digitizing	279
18 Data Interfaces	281
18.1 Wiring Diagram for Data Interfaces	281
18.1.1 RS-232-C/V.24	281
18.1.2 RS-422/V.11	284
18.2 Data Interface Operating Modes	285
18.2.1 Overview of operating modes	285
18.2.2 Interface configuration and assignment of mode	286
19 Transfer of Files via Data Interface.....	287
19.1 The Data Transfer Menu.....	287
19.2 Downloading Files from the TNC via Data Interface	288
19.3 Uploading Files onto the TNC via Data Interface.....	289

20 Replacing Instructions.....	291
20.1 Important Information	291
20.2 NC Software Update for PGM Nr. 280 474/475.....	292
20.3 NC Software Update for PGM Nr. 280 476/477, EPROM Hardware	297
20.4 NC Software Update for PGM Nr. 280 476/477, Flash Hardware	302
20.5 Backup/Restoring Hard-Disk Data	307
20.5.1 Data backup	307
20.5.2 Restoring the data	309
20.6 Exchanging the Complete LOGIC UNIT	310
21 Inspection, Measuring and Test Equipment	311
21.1 Universal Test Adapter (Id.Nr. 255 480 01)	311
21.2 Encoder Diagnostic Set PWM 8 (Id.Nr. 309 956-xx)	313
21.3 Drive Control Generator DCG (Id.Nr. 296 737-01)	314
21.3.1 Functional description of DCG controls and displays	314
21.3.2 Accessories DCG	316
22 Machine Parameter List	319

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:

- TNC 426 / TNC 430 with NC software 280.474/475
- TNC 426 / TNC 430 with NC software 280.476/477

Update service

This service manual is regularly updated. You find the current - printable - version in the service section of our website (www.heidenhain.de): Choose 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:

- TNC 426 CA/PA for NC software 280 460/461/462/463
- TNC 426 CB/PB / TNC430 CA/PA for NC software 280 470/471/472/473
- 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 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 further important information in the following documents:

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

The machine tool builder must be contacted in case of error diagnosis.

However, support will also be provided by the Service Department at 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 use can result in serious injury to persons and damage to equipment.
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

The TNC has a comprehensive integral monitoring system for prevention of input or operation errors, as well as for identification and diagnosis of technical errors on the TNC and the connected units. The monitoring system is an integral component of the TNC 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 TNC monitors the following positions:

- Amplitude of encoder signals
- Edge separation of encoder signals
- Absolute positions 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 logic unit
- Run time of PLC program

With digital axes, the TNC also monitors:

- Motor current
- Motor temperature
- Temperature of power module
- DC-link voltage
- Supply voltage of power module
- I^2t of power module and motor

2.2 Error Messages

Classification of error messages

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

Different TNC reactions

Display only

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

NC stop

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

EMERGENCY STOP (Emergency-stop button or hardware limit switch), see page 219

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

Output "Control is ready" is reset, see page 219

- 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
- TNC operation still possible
- Additional information via HELP key

Blinking error message (red window) with Reset

- TNC 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 type: HEIDENHAIN FATAL ERROR ...
- Deceleration of axes at current limit
- TNC keyboard disabled
- Reset error message with END BLOCK key or main On/Off switch
- All axes must be referenced

List of error messages

The error messages are listed in alphabetical order:

Error message	Error number	Cause of error	Corrective action
3-D comp.: 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.
3DROT active: use axis buttons	1178	■ You have attempted to traverse the reference marks with NC start, although the function "Rotate working plane" is active.	■ Traverse reference marks using 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 current 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. ■ On M controls: NE2 input active. ■ On P controls: drive enable at X50 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. ■ With non-energy recovery power module: Braking resistor connected? ■ With energy-recovery power module: Energy recovery active? ■ Check the grounding and shielding of the cable. ■ Exchange the power module. ■ on P controls: Exchange the interface card. ■ Exchange the motor drive control board.

Error message	Error number	Cause of error	Corrective action
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.
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 %.1s: MP112 / MP113 incorrect	2200	■ MP112 / MP113 for the displayed axis is incorrect	■ Inform your service agency.
Axis %.1s: MP120 / MP121 incorrect	2201	■ MP120 / MP121 for the displayed axis is incorrect	■ Inform your service agency.
Axis %.1s: MP2190 incorrect	2199	■ MP2190 for the displayed axis is incorrect	■ Inform your service agency.
Axis %.1s: MP2340 / MP2350 incorrect	2198	■ MP2340 / MP2350 for the displayed axis is incorrect	■ Inform your service agency.
Axis %.1s: 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 7295.	■ Edit machine parameter 7295: 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 parameters 7510 and following no rotary axis, or the programmed rotary axis, is not configured.	■ Define the correct rotary axis in the contour subprogram. ■ Have the machine manufacturer check parameter 7510 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	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the control and cabling of the pulse release. ■ Check Uz ■ With non-energy recovery power module: Braking resistor connected? ■ With energy-recovery power module: Energy recovery active? ■ Check the grounding and shielding of the cable. ■ Exchange the power module. ■ on P controls: Exchange the interface card. ■ Exchange the motor drive control board.
Axis module %.2s not ready	2918	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the control and cabling of the pulse release. ■ Check Uz ■ With non-energy recovery power module: Braking resistor connected? ■ With energy-recovery power module: Energy recovery active? ■ Check the grounding and shielding of the cable. ■ Exchange the power module. ■ on P controls: Exchange the interface card. ■ Exchange the motor drive control board.
Address letter already assigned	954	<ul style="list-style-type: none"> ■ You used an address letter incorrectly in an ISO block. 	<ul style="list-style-type: none"> ■ Edit the highlighted block.
Selected block not addressed	183	<ul style="list-style-type: none"> ■ After an interruption of the program run, the TNC can no longer resume the program run from the cursor's current location. 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Noise on motor encoder signal ■ Short-circuit in motor encoder cable ■ Motor encoder signal amplitude too high 	<ul style="list-style-type: none"> ■ Inform your service agency ■ Check connection of motor encoder (ground connection) ■ Check the motor encoder
Analog output already assigned %.1s	1123	<ul style="list-style-type: none"> ■ An analog output is being used by several axes. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Analog voltage not defined	1147	<ul style="list-style-type: none"> ■ Function definition for laser power control missing in machine parameter 3013/3014. 	<ul style="list-style-type: none"> ■ Edit the machine parameter list.
Analog voltage ambiguous	1148	<ul style="list-style-type: none"> ■ Function definition for laser power control ambiguous in machine parameter 3013/3014. 	<ul style="list-style-type: none"> ■ Edit the machine parameter list.
The calling program was changed	202	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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.
User cycle not permitted	271	■ An OEM cycle has been called in a program being run blockwise from an external data medium.	■ Delete the user cycle.
User cycle does not exist	264	■ You attempted to call a user cycle that is not stored in TNC memory.	■ Delete the cycle definition. ■ Read-in the user cycle.
APPR LCT before HELIX not permted	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).
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	■ SL cycles II: 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).	■ The tool radius compensation can be activated only with a line block (L, 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).	■ The tool radius compensation can be activated only with a line block (L, 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 incorrectly started: 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: from a Q parameter resulted in a value that was outside the permissible range 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	<ul style="list-style-type: none"> ■ The machine parameters have been erased and the PLC program is missing. 	<ul style="list-style-type: none"> ■ Enter new operating parameters.
Op. state MCU not equal CCU	2877	<ul style="list-style-type: none"> ■ The automatic SRG, SBH, and SH operating states of the MCU and CCU are compared cyclically. If the values remain unequal for longer than 200 ms, a Stop 1 is released. 	<ul style="list-style-type: none"> ■ Press CE to acknowledge the error message. ■ Switch on the machine. ■ Inform your service agency. ■ Check software version.
Movement monitoring error in % .1s A	40	<ul style="list-style-type: none"> ■ The axis is moving at least 4 times slower or faster than commanded by the nominal speed command output. 	<ul style="list-style-type: none"> ■ Check machine parameter 1140.x . ■ Inform your service agency.
Movement monitoring error in % .1s B	43	<ul style="list-style-type: none"> ■ The motor is moving while the axis slides are stationary or vice versa. 	<ul style="list-style-type: none"> ■ Check MP2800.x. ■ Inform your service agency.
Reference to specific block not permitted	522	<p>FK programming: Relative references are possible only to the last 64 positioning blocks:</p> <ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Change the relative reference.
Reference to CC block not permitted	523	<ul style="list-style-type: none"> ■ FK programming: You programmed a relative reference to a CC block. 	<ul style="list-style-type: none"> ■ Change the relative reference.
Reference to block % .6s : No DEL	1125	<ul style="list-style-type: none"> ■ FK programming: You have attempted to delete a part-program block to which another block refers. 	<ul style="list-style-type: none"> ■ First edit the referring block, then delete the reference.
BLK FORM cannot be shown	863	<p>The workpiece blank cannot be displayed:</p> <ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Edit the part program.
Hole diameter too large	2509	<ul style="list-style-type: none"> ■ Probing cycle for workpiece measurement: Tolerance for hole diameter exceeded. ■ Cycle 208: The programmed hole diameter (Q335) cannot be machined with the active tool. 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Probing cycle for workpiece measurement: Hole diameter too small for tolerance. 	<ul style="list-style-type: none"> ■ Check the workpiece, and if necessary the measuring log.
C330 Motor temp. too high		<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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		<ul style="list-style-type: none"> ■ Hardware defective. ■ Incorrect software version. 	<ul style="list-style-type: none"> ■ 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		<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the control and cabling of the pulse release. ■ Check Uz. ■ With non-energy recovery power module: Braking resistor connected? ■ With energy-recovery power module: Energy recovery active? ■ Check the grounding and shielding of the cable. ■ Exchange the power module. ■ On P controls: Exchange the interface card. ■ Exchange the motor drive control board.
C370 Angle error motor encdr.		<ul style="list-style-type: none"> ■ Motor encoder defective. ■ Motor encoder cable is defective. ■ Drive control board defective. 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the motor encoder and leads. ■ Exchange drive control board.
C380 Motor not controllable		<ul style="list-style-type: none"> ■ 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). 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check motor and motor cables. ■ Check the entry in the motor table.
C3B0 Motor does not rotate		<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the inverter. ■ Check the motor and cabling. ■ Check the machine parameters.
CCU +5V LE outside tolerance	2688	<ul style="list-style-type: none"> ■ The 5V power supply of the LE is outside the permissible tolerance range. 	<ul style="list-style-type: none"> ■ Inform your service agency.
CCU amplitude too high %.2s	2720	<ul style="list-style-type: none"> ■ The amplitude of the encoder signal is too large or the signal for contamination is active. 	<ul style="list-style-type: none"> ■ Check the amplitude of the encoder signal.
CCU amplitude too small %.2s	44	<ul style="list-style-type: none"> ■ The amplitude of the encoder signal is too small or the signal for contamination is active. 	<ul style="list-style-type: none"> ■ 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 automatic SRG, SBH, and SH operating states 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 LE 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 line.
C block: Circle end pos. incorrect	358	■ The difference between the radius at the end point of a C block (ISO: The difference between the radius at the end point of a C block (ISO:	■ 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.
CYCL 211 not permitted	2046	■ Cycle 211 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 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 definition 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.
File system error 4	1163	■ Incorrect cluster number in the "update_cluster" routine, caused by a software error.	■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
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
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.

Error message	Error number	Cause of error	Corrective action
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 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 75xx.	■ 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 nominal speed value was calculated. Analog axes: Max. nominal speed value –10V Analog spindle: Max. nominal speed value –10 V Digital axes and spindle: Max. nominal speed value = maximum 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 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 that 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 block 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 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		<p>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.</p> <p>The cause of the error is transferred as a status bit and displayed on the TNC with 5 status bits:</p> <p>xxxxx =</p> <p>xx001 Light source defective xx010 Signal amplitude too low xx100 Position value incorrect</p> <ul style="list-style-type: none"> ■ Encoder cable defective. ■ Encoder defective. ■ Encoder input on TNC defective. 	<ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ 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).	<ul style="list-style-type: none"> ■ 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 TNC (e.g. TOOL DEF block - ISO: G99 block with active tool memory).	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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.
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	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Check the axis definitions in the Range cycle ■ Check the calibrated touch-probe axis (Manual mode, probing functions)
Wrong axis programmed	331	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Change cycle parameters.
Wrong axis programmed	332	<ul style="list-style-type: none"> ■ You called a Slot Milling or a Pocket Milling cycle in which one of the axes for length or width is a rotary axis. 	<ul style="list-style-type: none"> ■ Change cycle parameters.
Wrong axis programmed	333	<ul style="list-style-type: none"> ■ 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 basicrotation is active. 	<ul style="list-style-type: none"> ■ Reset basic rotation. ■ Use a principal axis for this cycle
Wrong axis programmed	334	<ul style="list-style-type: none"> ■ In the Thread Cutting cycle (18, ISO: G86) you programmed as target point a coordinate that does not agree with the current tool axis. 	<ul style="list-style-type: none"> ■ Edit the part program.
Wrong axis programmed	950	<ul style="list-style-type: none"> ■ An incorrect axis is programmed in the highlighted block. 	<ul style="list-style-type: none"> ■ Check whether you have programmed an axis twice.
Wrong axis programmed	951	<ul style="list-style-type: none"> ■ An incorrect axis is programmed in the highlighted block. 	<ul style="list-style-type: none"> ■ Check whether you have programmed an axis twice.
Wrong axis in .PNT file	1568	<ul style="list-style-type: none"> ■ In the selected point file, which limits the digitizing range, no coordinated have been saved for the working plane. 	<ul style="list-style-type: none"> ■ In the point file, use only the coordinates of the working plane as limits.
Wrong rpm	340	<ul style="list-style-type: none"> ■ The spindle speed you programmed is greater than the maximum spindle speed defined in Machine Parameter MP3020. 	<ul style="list-style-type: none"> ■ Enter a permissible speed. Refer to your machine manual.
Wrong rpm	341	<ul style="list-style-type: none"> ■ The spindle speed you programmed is smaller than the minimum spindle speed defined in Machine Parameter MP3020. 	<ul style="list-style-type: none"> ■ Enter a permissible speed. Refer to your machine manual.
Wrong rpm	342	<ul style="list-style-type: none"> ■ The spindle speed you programmed is greater than the maximum analog spindle speed defined in Machine Parameter MP3515. 	<ul style="list-style-type: none"> ■ Enter a permissible speed. Refer to your machine manual.
Wrong rpm	343	<ul style="list-style-type: none"> ■ The spindle speed that you programmed results in an excessively low analog voltage (MP3240.1). 	<ul style="list-style-type: none"> ■ Enter a permissible speed. Refer to your machine manual.
Wrong rpm	346	<ul style="list-style-type: none"> ■ The programmed spindle speed does not lie in the pattern of spindle speed ranges defined in MP3020. 	<ul style="list-style-type: none"> ■ Enter the correct spindle speed.
Wrong rpm	952	<ul style="list-style-type: none"> ■ You entered an invalid spindle speed. 	<ul style="list-style-type: none"> ■ Enter the correct speed. Refer to your machine manual.
Incorrect entry in MP%.4u	1149	<ul style="list-style-type: none"> ■ The permissible input range of a machine parameter was exceeded. 	<ul style="list-style-type: none"> ■ 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, DIN/ISO: D17/D18) is incorrect.	■ 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 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.
Incorrect 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 trigger probe: In the meander or contour line cycle you defined a rotary axis as column axis.	■ In the meander or contour line 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	<ul style="list-style-type: none"> ■ Cabling to inverter defective. ■ No axis connected (axis release relay). ■ Inverter defective. 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the inverter and cabling.
Wrong RDY status of spindle	2931	<ul style="list-style-type: none"> ■ Cabling to inverter defective. ■ Spindle not connected (spindle release relay). ■ Inverter defective. 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the inverter and cabling.
Incorrect block syntax	272	<ul style="list-style-type: none"> ■ An NC block contains a syntax error. 	<ul style="list-style-type: none"> ■ Edit the part program.
Incorrect intersection line/line	237	<ul style="list-style-type: none"> ■ Calculation of the intersection of two lines in the contour pocket resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values. ■ If necessary, use another tool radius.
Incorrect intersection arc/line	236	<ul style="list-style-type: none"> ■ Calculation of the intersection of an arc with a line in the contour pocket resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values. ■ If necessary, use another tool radius.
Incorrect intersection arc/arc	235	<ul style="list-style-type: none"> ■ Calculation of the intersection of two arcs in the contour pocket resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the coordinates in the circle blocks. ■ If necessary, use another tool radius.
Correct the block format	2668	<ul style="list-style-type: none"> ■ The program contains blocks (indicated with ERROR), with incorrect block format. 	<ul style="list-style-type: none"> ■ Correct the blocks. ■ Delete the blocks and enter them again.
Chamfer length = 0 not permitted	280	<ul style="list-style-type: none"> ■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer (CHF, ISO: G24) with length 0. 	<ul style="list-style-type: none"> ■ Edit the part program.
Chamfer not permitted with M120	1146	<ul style="list-style-type: none"> ■ When M120 is active, chamfer is permitted only in the compensation plane. 	<ul style="list-style-type: none"> ■ Edit the part program.
Chamfer is possible only between two straight lines	513	<ul style="list-style-type: none"> ■ The CHF block is not located between two line blocks. 	<ul style="list-style-type: none"> ■ Edit the part program.
Chamfer after RND not permitted	283	<ul style="list-style-type: none"> ■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer (CHF, ISO: G24) immediately after a rounding arc (RND, ISO: G25). 	<ul style="list-style-type: none"> ■ Edit the part program.
Chamfer not permitted	290	<ul style="list-style-type: none"> ■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer (CHF, ISO: G24) as first block. 	<ul style="list-style-type: none"> ■ Edit the part program.
Chamfer not permitted	347	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Enter a chamfer only between straight lines.
Chamfer not permitted	348	<ul style="list-style-type: none"> ■ The positioning block preceding a chamfer block (CHF, ISO: G24) is not a straight line. 	<ul style="list-style-type: none"> ■ Enter a chamfer only between straight lines.
Chamfer not permitted	349	<ul style="list-style-type: none"> ■ The positioning block following a chamfer block (CHF, ISO: G24) is not a straight line. 	<ul style="list-style-type: none"> ■ Enter a chamfer only between straight lines.
Chamfer not permitted	350	<ul style="list-style-type: none"> ■ You programmed in sequence a positioning block without radius compensation, a positioning block with radius compensation and a chamfer (CHF, ISO: G24). 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ MP3210 or MP3510 incorrect ■ Software error MCU 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check MP3210 and MP3510. ■ Check software version.
Parameter calculation error	251	<ul style="list-style-type: none"> ■ Calculation of an arithmetic expression in the Q-parameter calculation resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values.
Error in radius compensation	239	<ul style="list-style-type: none"> ■ Calculation of the radius compensation in the Contour Train cycle resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values. ■ If necessary, use another tool radius.
Error in radius compensation	244	<ul style="list-style-type: none"> ■ Calculation of the radius compensation in the Contour Pocket cycle resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values. ■ If necessary, use another tool radius.
Error in radius compensation	245	<ul style="list-style-type: none"> ■ Calculation of the radius compensation in the Contour Pocket cycle resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values. ■ If necessary, use another tool radius.
Error during conversion!	2387	<p>You changed the structure of a freely defined table. During conversion of an element, one of the following errors occurred:</p> <ul style="list-style-type: none"> ■ Incorrect number range defined ■ Permissible column width was exceeded ■ An element contains illegal characters 	<ul style="list-style-type: none"> ■ In your table, examine all the elements marked with # for the described errors!
Error in PLC program	979	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Refer to the Technical Manual for the respective control.
Error in software timer	2891	<ul style="list-style-type: none"> ■ Internal software error 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check software version.
Error in contour pocket	240	<ul style="list-style-type: none"> ■ Calculation of the intersection of the contour with the tool path in the contour pocket resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values. ■ If necessary, use another tool radius.
Error in contour pocket	242	<ul style="list-style-type: none"> ■ Calculation of the contour-parallel paths for clearing out a contour pocket resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values. ■ If necessary, use another tool radius.
Error in contour pocket	243	<ul style="list-style-type: none"> ■ Calculation of the contour elements of a contour pocket resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values.
Error in contour pocket	246	<ul style="list-style-type: none"> ■ Calculation of the normal from a given point on a contour element for contour-parallel rough-out resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values.
Error in contour pocket	247	<ul style="list-style-type: none"> ■ Calculation of the intersections in the contour pocket resulted in an arithmetical error. 	<ul style="list-style-type: none"> ■ Check the input values.
Error in contour pocket/train	241	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Check the input values.

Error message	Error number	Cause of error	Corrective action
Pos. control cyc. time err.	2893	<ul style="list-style-type: none"> ■ MCU is outputting erroneous cycle time for CCU position controller. ■ Hardware error 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check machine parameter 7600.0. ■ Exchange drive control board.
Cutout channels test error	2936	<ul style="list-style-type: none"> ■ Machine key depressed (ZT.HR, ZT.MB, MT signal). 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the wiring X65, X66, (X67). ■ Check the machine keys.
Faulty data from CCU	2819	<ul style="list-style-type: none"> ■ Faulty software 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error	977	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Refer to the Technical Manual for the respective control.
Processor check error 0	1	<ul style="list-style-type: none"> ■ The CRC sum for the control's data (datum point, etc.) is incorrect. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 0	2	<ul style="list-style-type: none"> ■ The CRC sum for the control's data (datum point, etc.) is incorrect. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 1	1077	<ul style="list-style-type: none"> ■ The CRC sum for the machine's parameters is incorrect. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 2	3	<ul style="list-style-type: none"> ■ The CRC sum of a file in the block memory is incorrect. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 3	4	<ul style="list-style-type: none"> ■ Not all tests were run completely. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 4	5	<ul style="list-style-type: none"> ■ There is crosstalk of data in the RAM. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 5	6	<ul style="list-style-type: none"> ■ There is crosstalk of addresses in the RAM. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 6	7	<ul style="list-style-type: none"> ■ Internal error: stack overflow or stack underflow. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 7	8	<ul style="list-style-type: none"> ■ The CRC sum of a PLC file is incorrect. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 8	9	<ul style="list-style-type: none"> ■ The CRC sum of a PLC file is incorrect. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error 9	10	<ul style="list-style-type: none"> ■ The CRC sum of the test programs is incorrect. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error A	11	<ul style="list-style-type: none"> ■ General file management error. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error A	12	<ul style="list-style-type: none"> ■ General software error in the main processor task. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error A	13	<ul style="list-style-type: none"> ■ General software error in the Sync task. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error A	14	<ul style="list-style-type: none"> ■ There is no free NC memory space available for opening a machine-parameter file. 	<ul style="list-style-type: none"> ■ Delete NC programs that are no longer required to increase memory space.
Processor check error A	15	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error B	16	<ul style="list-style-type: none"> ■ Internal error: Incorrect Interrupt 	<ul style="list-style-type: none"> ■ Inform your service agency.
Processor check error C	17	<ul style="list-style-type: none"> ■ Overrun of the internal time slice: Control loop, PLC and interrupts need all the processing time, or the timer interrupt interrupts itself. 	<ul style="list-style-type: none"> ■ 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 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 memory 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 logic unit 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-enabling module.	■ Order the software-enabling 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.

Error message	Error number	Cause of error	Corrective action
Incorrect include file version	2831	<ul style="list-style-type: none"> ■ An include file was called that has differing version numbers in the MCU and CCU ■ Software error 	<ul style="list-style-type: none"> ■ Check the software version. ■ Inform your service agency.
Incorrect compensation values	2373	<ul style="list-style-type: none"> ■ Erroneous data in compensation table 	<ul style="list-style-type: none"> ■ Inform your service agency.
Program data erroneous	945	<ul style="list-style-type: none"> ■ This is a general error message which informs that there is some error in the program data (e.g. ERROR block). 	<ul style="list-style-type: none"> ■ Edit the part program.
Program data erroneous	946	<ul style="list-style-type: none"> ■ A syntax error occurred during downloading via the data interface. The TNC marks the erroneous block with ERROR. 	<ul style="list-style-type: none"> ■ Edit the part program.
Incorrect tool data	2374	<ul style="list-style-type: none"> ■ Erroneous data in tool table 	<ul style="list-style-type: none"> ■ Inform your service agency.
Faulty braking process %.2s	2827	<ul style="list-style-type: none"> ■ The braking process was not started or it was started after a delay. 	<ul style="list-style-type: none"> ■ Switch the control voltage Off and On again, or inform your Service Agency.
Field name not found	2224	<ul style="list-style-type: none"> ■ In the definition of a freely definable table you used a field name that is not an element of the table. 	<ul style="list-style-type: none"> ■ The table definition must be changed. Contact your machine tool builder.
Field current error %.2s	2897	<ul style="list-style-type: none"> ■ Incorrect entry in motor table 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the motor table
Field angle error %.2s	2909	<ul style="list-style-type: none"> ■ Incorrect entry in MP2340 or MP2350 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check entry in MP2340 / MP2350
Window cannot be shifted further	530	<ul style="list-style-type: none"> ■ In a programming graphics 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. 	<ul style="list-style-type: none"> ■ Keep the selection frame within the window.
Window too large	528	<ul style="list-style-type: none"> ■ Programming graphics: During reduction of a programming graphics simulation the window section exceeds the limits of the graphics processor. 	<ul style="list-style-type: none"> ■ Enlarge the programming graphics
Window too small	529	<ul style="list-style-type: none"> ■ During enlargement of a programming graphics simulation the window section does not reach the limits of the graphics processor. 	<ul style="list-style-type: none"> ■ Reduce programming graphics.
FK: arithmetical error	518	<ul style="list-style-type: none"> ■ FK programming: Arithmetical error in calculation of a FK contour (e.g. division by 0, root of a negative number). 	<ul style="list-style-type: none"> ■ Check the input in the FK section.
FK reference to current block	212	<ul style="list-style-type: none"> ■ You attempted in an FK program to delete a block to which another part of the program makes a reference. 	<ul style="list-style-type: none"> ■ Change FK reference.
Parallel operation of FK graphics not possible	526	<ul style="list-style-type: none"> ■ FK programming: You attempted to start an FK graphics while the TNC was already running a part program. 	<ul style="list-style-type: none"> ■ Start FK graphics after part program has been run.

Error message	Error number	Cause of error	Corrective action
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.
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.
FN17: 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: D20): 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 control off and on again; ■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
Straight line before or after rounding/chamfer has length 0	512	■ A straight line before or after an 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.
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 than 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 the problem 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.
I _{max} of power module %.2s	2902	■ Incorrect entry in power module table	■ Inform your service agency. ■ Check the power module table.
I _{max} 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.

Error message	Error number	Cause of error	Corrective action
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.
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.

Error message	Error number	Cause of error	Corrective action
No drive release %.2s	2994	<ul style="list-style-type: none"> ■ Inverter is not ready for operation ■ No pulse release for the power supply unit ■ Uz too high ■ Power-fail signal is active ■ On M controls: NE2 input active ■ On P controls: drive enable at X50 inactive ■ Motor control board defective ■ PWM cable defective ■ Noise pulses 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the control and cabling of the pulse release. ■ Check Uz. ■ Check the emergency stop circuit. ■ With non-energy recovery power module: Braking resistor connected? ■ With energy-recovery power module: Energy recovery active? ■ Exchange the power module ■ On P controls: Exchange the interface card. ■ Exchange the motor drive control board.
No rotary axis was programmed	337	<ul style="list-style-type: none"> ■ The axis recognized as main axis in Cycle 27 (Cylinder Surface, ISO: G127) is not a rotary axis. 	<ul style="list-style-type: none"> ■ Edit the contour subprogram.
All elements deleted!	2384	<ul style="list-style-type: none"> ■ While editing the structure of a freely definable table you erased all the elements. 	<ul style="list-style-type: none"> ■ Insert at least one element!
No chamfer as last block	293	<ul style="list-style-type: none"> ■ In the definition of a contour, a contour pocket or a contour train, you programmed a chamfer (CHF, ISO: G24) as last block. 	<ul style="list-style-type: none"> ■ Edit the part program.
No principal axis was programmed	338	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Edit the contour subprogram.
Coordinates after APPR missing	442	<ul style="list-style-type: none"> ■ You did not give any coordinates in the NC block after APPR. 	<ul style="list-style-type: none"> ■ Add coordinate data to the part program block after APPR.
No position values from the CCU	2821	<ul style="list-style-type: none"> ■ For a certain time the CCU has not sent any position values to the MCU. 	<ul style="list-style-type: none"> ■ Switch control off and on again. ■ Inform your service agency.
No position values from the MCU	2822	<ul style="list-style-type: none"> ■ The MCU must not send any position values to the CCU. 	<ul style="list-style-type: none"> ■ Switch control off and on again. ■ Inform your service agency.
No measuring axis defined	2617	<ul style="list-style-type: none"> ■ You failed to define the measuring axis in one of the measuring cycles 400, 402, 420, 425, 426 or 427. 	<ul style="list-style-type: none"> ■ Check Q272 in the corresponding cycle. Permissible input values: 1 or 2; for Cycle 427: 1, 2 or 3.
No connection to network	2339	<ul style="list-style-type: none"> ■ The connection to the NFS server was interrupted. 	<ul style="list-style-type: none"> ■ Check whether the NFS server is available ■ If necessary inspect the connections, the cables and the Ethernet card
No new axis during rotatn	162	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Cancel the programmed rotation in the part program before changing the tool axis.
No datum table active	2505	<ul style="list-style-type: none"> ■ 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). 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ You have called a fixed cycle with CYCL CALL PAT without having activated a point table. 	<ul style="list-style-type: none"> ■ Use SEL PATTERN to select a point table before CYCL CALL PAT.

Error message	Error number	Cause of error	Corrective action
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 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.
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.
To change context: press ENT	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.
To delete entire context: NO ENT	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 subprogram.
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 subprogram.
Contour too complex	487	■ Contour cannot be resolved.	■ Try to split the contour subprogram.
Contour too complex	488	■ Contour cannot be resolved.	■ Try to split the contour subprogram.
Contour too complex	489	■ Contour cannot be resolved.	■ Try to split the contour subprogram.

Error message	Error number	Cause of error	Corrective action
Contour too complex	490	■ Contour cannot be resolved.	■ Try to split the contour subprogram.
Contour too complex	491	■ Contour cannot be resolved.	■ Try to split the contour subprogram.
Contour too complex	492	■ Contour cannot be resolved.	■ Try to split the contour subprogram.
Contour too complex	493	■ Contour cannot be resolved.	■ Try to split the contour subprogram.
Contour too complex More data needed	517	■ FK programming: the information does not suffice for 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.	■ Put the contour starting point in a contour subprogram.
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 subprogram.
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 at the starting point is larger than permitted in machine parameter 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.

Error message	Error number	Cause of error	Corrective action
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.
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.

Error message	Error number	Cause of error	Corrective action
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 subprogram 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-I max 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.
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.

Error message	Error number	Cause of error	Corrective action
M114, M128, 3DROT not permitted	2750	■ You attempted to run the function M138, although one of the functions M114, M128, or tilted working plane was active.	Before running M138: ■ deactivate M114 with M115 ■ deactivate M128 with M129 ■ 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.
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 tool 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.

Error message	Error number	Cause of error	Corrective action
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 control off and on again. ■ Inform your service agency.
MCU command invalid	2880	■ Internal software error	■ Inform your service agency. ■ Check software version.
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 6200.	■ Edit machine parameters 6200.
%.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 logic unit (LE) defective.

Error message	Error number	Cause of error	Corrective action
Encoder axis: amplitude too small		■ Amplitude error	■ Glass scale tape contaminated or damaged. ■ Scanning head contaminated or defective. ■ Cable damaged. ■ Encoder input on logic unit (LE) defective.
Encoder axis: Frequency too high		■ Signal frequency error (edge separation)	■ Glass scale tape contaminated or damaged. ■ Scanning head contaminated or defective. ■ Cable damaged. ■ Encoder input on logic unit (LE) 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.
Meas 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.
Meas 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.
Meas 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.
Meas 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 lmax	2207	■ The current speed of the motor does not correspond to the expected speed at lmax. Perhaps direction of rotation is incorrect.	■ Inform your service agency.
Motor %.1s: l max incorrect	2196	■ l max. of the motor for the displayed axis is incorrect. l-MAX = peak current	■ Inform your service agency.
Motor %.1s: l-n incorrect	2195	■ Rated current of the motor for the displayed axis is incorrect. l-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.

Error message	Error number	Cause of error	Corrective action
Motor %.1s: Xh; X2; f-n; R2 incorrect	2190	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Inform your service agency.
Motor %.2s: is not turning	2923	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the inverter. ■ Check the motor and cabling. ■ Check the machine parameters.
Motor %.2s not controllable	2920	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Check the motor cabling. ■ Inform your service agency. ■ Check motor and motor encoder cabling. ■ Check motor table entry.
Motor temperature too high %.1s	1217	<ul style="list-style-type: none"> ■ Temperature of motor is too high. 	<ul style="list-style-type: none"> ■ Switch off machine. Allow motor cool down.
Motor encoder %.1s defective	2206	<ul style="list-style-type: none"> ■ The motor encoder of the displayed axis is defective. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Motor encoder %.1s Frequency too high	2208	<ul style="list-style-type: none"> ■ The input frequency of the motor encoder for the displayed axis is incorrect. 	<ul style="list-style-type: none"> ■ Check input frequency of the encoder signal.
Motor encoder %.1s Line count too high	2189	<ul style="list-style-type: none"> ■ Line count of the motor encoder for the displayed axis too high. 	<ul style="list-style-type: none"> ■ Inform your service agency.
%.1s z1 motor enc. ampl. too small	2204	<ul style="list-style-type: none"> ■ Z1 amplitude of the motor encoder (ERN 1381) for the displayed axis is too low. 	<ul style="list-style-type: none"> ■ Inform your service agency.
%.1s motor enc. zn ampl.. too low	2203	<ul style="list-style-type: none"> ■ ZN amplitude of the motor encoder (ERN 1381) for the displayed axis is too low. 	<ul style="list-style-type: none"> ■ Inform your service agency.
Motor encoder %.1s: amplitude too small	47	<ul style="list-style-type: none"> ■ During digital speed control the signal amplitude from one motor encoder is too small for the motor speed. 	<ul style="list-style-type: none"> ■ Check the amplitude of the encoder signal.
Motor encoder %.1s: Frequency too high	48	<ul style="list-style-type: none"> ■ The input frequency of the motor encoder for the displayed axis is incorrect. 	<ul style="list-style-type: none"> ■ Check input frequency of the encoder signal.
Motor encoder axis: amplitude too small		<ul style="list-style-type: none"> ■ Amplitude error 	<ul style="list-style-type: none"> ■ Motor encoder cable damaged. ■ Graduated disk of encoder contaminated or damaged. ■ Speed encoder input on logic unit (LE) defective.

Error message	Error number	Cause of error	Corrective action
Motor encoder axis: Frequency too high		<ul style="list-style-type: none"> ■ Signal frequency error (edge separation). 	<ul style="list-style-type: none"> ■ Motor encoder cable damaged. ■ Graduated disk of encoder contaminated or damaged. ■ Speed encoder input on logic unit (LE) defective.
Mot. current %.2s not equal to 0	2941	<ul style="list-style-type: none"> ■ Motor current was determined during cutout channel test (24-h test). 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the inverter.
Motor current %.2s too high	2876	<ul style="list-style-type: none"> ■ Incorrect current controller parameters. ■ Incorrect parameters in the motor table. ■ Power module defective. ■ Motor cable defective. ■ Motor defective. ■ Motor control board defective. 	<ul style="list-style-type: none"> ■ 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 current %.2s too high	2924	<ul style="list-style-type: none"> ■ Incorrect current controller parameters. ■ Incorrect parameters in the motor table. ■ Power module defective. ■ Motor cable defective. ■ Motor defective. ■ Motor control board defective. 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Error in MP file or in motor table. ■ Internal software error. 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check the MP file and motor table. ■ Check software version.
MP not yet confirmed with ENT	2764	<ul style="list-style-type: none"> ■ The value of a new MP was not yet confirmed by pressing the ENT key. 	<ul style="list-style-type: none"> ■ Reenter the MP value and confirm it by pressing ENT, or simply press ENT to confirm the default value.
MP locked by PLC	1748	<ul style="list-style-type: none"> ■ The machine parameter is disabled. It is occupied by the PLC. 	<ul style="list-style-type: none"> ■ Edit the PLC program.
MP: defined twice	155	<ul style="list-style-type: none"> ■ Machine parameter input error: A machine parameter has been defined twice. 	<ul style="list-style-type: none"> ■ Edit machine parameters list.
MP: contradictory input	158	<ul style="list-style-type: none"> ■ Machine parameter input error: The entered values for the machine parameters are contradictory, which results in a conversion error. 	<ul style="list-style-type: none"> ■ Inform your service agency.

Error message	Error number	Cause of error	Corrective action
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: The input value for 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	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: Machine parameter cannot be saved.	■ Inform your service agency.
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: NC program 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.

Error message	Error number	Cause of error	Corrective action
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.
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 Test Run 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 graphics 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.

Error message	Error number	Cause of error	Corrective action
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.
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.

Error message	Error number	Cause of error	Corrective action
PLC: ENDC/ENDK without CASE/KFIELD	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.
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.

Error message	Error number	Cause of error	Corrective action
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.
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	<p>PLC runtime error:</p> <ul style="list-style-type: none"> ■ 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.

Error message	Error number	Cause of error	Corrective action
PLC: error table missing	1524	<p>There is no PLC error table.</p> <ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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.
PLC: Label defined twice	81	<p>PLC syntax error:</p> <ul style="list-style-type: none"> ■ 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.

Error message	Error number	Cause of error	Corrective action
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: The operand type was specified without a 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.
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.

Error message	Error number	Cause of error	Corrective action
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.
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 unknown 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 operation was conducted. However, the result was not assigned to an operand, but to a new logic operation.	■ 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.

Error message	Error number	Cause of error	Corrective action
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	■ PLC syntax error: You attempted to nest more than 16 parentheses.	■ Edit the PLC program.
PLC: Too many local labels	100	■ PLC syntax error: More than 1000 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 has been edited since it was last compiled.	■ Compile 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 must be 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.

Error message	Error number	Cause of error	Corrective action
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.
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.
Q214: 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 milling cycle: Q218 must be greater than Q219.	■ Correct the values in the fixed cycle.

Error message	Error number	Cause of error	Corrective action
Q220 too large	2047	■ Pocket finishing or stud finishing cycle: Rounding radius Q220 is 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.
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 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.

Error message	Error number	Cause of error	Corrective action
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.
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	<p>Error in the conversion of the programmed workpiece blank in the graphics:</p> <ul style="list-style-type: none"> ■ 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.

Error message	Error number	Cause of error	Corrective action
Blank form definition incorrect	181	■ Error in the conversion of the programmed workpiece blank in the graphics: 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.
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 after a chamfer (CHF, ISO: G24).	■ 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 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.

Error message	Error number	Cause of error	Corrective action
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.
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.
S: Limit switch %.1s- traversed	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

Error message	Error number	Cause of error	Corrective action
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.
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 the problem 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 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 or Cycle 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.

Error message	Error number	Cause of error	Corrective action
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 software version.
Software error	2883	■ Internal software error	■ Inform your service agency. ■ Check software version.
Special spindle mode not permitted	3002	■ The code number 561320 is nonfunctional because the servicing mode for the spindle was not enabled by the machine tool manufacturer.	■ Check MP560. ■ Inform your service agency.
Height axis not permitted here	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 problem recurs: Inform 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.

Error message	Error number	Cause of error	Corrective action
Stack overflow	2886	■ Internal software error	■ Inform your service agency. ■ Check software version.
Status NE1/NE2 not equal	2929	■ NE2 input incorrectly connected. ■ Software error	■ Inform your service agency. ■ Check the wiring. ■ Check software version
Status NR1/NR2 not equal	2928	■ NR2 input incorrectly connected. ■ Software error	■ Inform your service agency. ■ Check the wiring. ■ Check 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.
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 or 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.

Error message	Error number	Cause of error	Corrective action
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.
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 trigger probe: Maximum permissible stylus deflection was 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	■ Probing 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	■ Probing 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	■ Probing 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	■ Probing cycle 430: The measured bolt-hole-circle diameter is below the minimum permissible value.	■ Check the workpiece, and if necessary the measuring log.

Error message	Error number	Cause of error	Corrective action
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 letter).
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 LE 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 6171.

Error message	Error number	Cause of error	Corrective action
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 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.
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	<ul style="list-style-type: none"> ■ E: During data transfer with BCC, the <NAK> signal was received 15 times in succession. ■ A to H error code of the receiver module with one w/o E of the following causes: <ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ 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.	<ul style="list-style-type: none"> ■ 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.

Error message	Error number	Cause of error	Corrective action
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.
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.

Error message	Error number	Cause of error	Corrective action
Program start undefined	419	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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). 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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). 	<ul style="list-style-type: none"> ■ Program at least two positioning blocks before the RND block. ■ After a program interruption, restart at least two positioning blocks before the RND block.
Program start undefined	422	<ul style="list-style-type: none"> ■ 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). 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ After a program interruption you attempted to select a departing block with GOTO. 	<ul style="list-style-type: none"> ■ After a program interruption, do not resume the program at a departing block.
Program start undefined	424	<ul style="list-style-type: none"> ■ At the beginning of the program you activated a tilted working plane and M114 at the same time. 	<ul style="list-style-type: none"> ■ M114 cannot be run while the working plane is tilted.
Program start undefined	426	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Resume the program several blocks before the CT block.
Err. in rated U of motor %.2s	2926	<ul style="list-style-type: none"> ■ Motor rated voltage outside of permitted input range 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check entry in motor table.
Subprogram does not exist	265	<ul style="list-style-type: none"> ■ You defined a subprogram number in Cycle 14 Contour Geometry (ISO: G37) that does not exist in your program. 	<ul style="list-style-type: none"> ■ Correct the subprogram number in the cycle. ■ Program a subprogram with the correct number.
Subprogram does not exist	266	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Load the file again.
Incomplete cycle was deleted	2769	<ul style="list-style-type: none"> ■ Informational message that the TNC has erased an incomplete cycle. 	<ul style="list-style-type: none"> ■ xxxx
Illegal file name	1807	<ul style="list-style-type: none"> ■ Syntax error during file-name input. 	<ul style="list-style-type: none"> ■ Use no more than 16 characters for file names.
Illegal file type	1867	<ul style="list-style-type: none"> ■ The function cannot be used for this type of file. 	<ul style="list-style-type: none"> ■ Select another file type.
Uz %.2s error	2910	<ul style="list-style-type: none"> ■ Incorrect entry in MP2190 (dc-link voltage Uz) 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check entry in MP2190
Traverse definition not defined	2504	<ul style="list-style-type: none"> ■ In a probing cycle you entered 0 for the traverse direction Q267. 	<ul style="list-style-type: none"> ■ For Q267, enter either +1 (for positive traverse direction) or -1 (for negative traverse direction).

Error message	Error number	Cause of error	Corrective action
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.
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.

Error message	Error number	Cause of error	Corrective action
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 necessary 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.
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.

Error message	Error number	Cause of error	Corrective action
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 milling cycle: The slot width is less than the tool diameter	■ Edit the part program.
Tool radius too large	407	■ Pocket Milling cycle: The pocket width is less than or equal to the tool diameter.	■ Edit the part program.
Tool radius too large	408	■ Pocket Milling cycle: The corner rounding radius is smaller than the cutter radius.	■ Edit the part program.
Tool radius too large	409	■ Circular Pocket Milling 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.

Error message	Error number	Cause of error	Corrective action
Perform a tool change!	3006	■ You have tried to perform a probing function without an active touch probe. Machine parameter 7411, bit 2 is set so that the calibration data are 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.
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 7500 = 0.
Angle range must be under 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.

Error message	Error number	Cause of error	Corrective action
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).
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 is 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: Stud diameter too large for tolerance.	■ Check the workpiece, and if necessary the measuring log.
Stud diameter 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 diameter 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 diameter 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 diameter 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.

Error message	Error number	Cause of error	Corrective action
Incorrect line spacing	1796	<ul style="list-style-type: none"> ■ 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 cycle was programmed by Q parameter as a negative value. ■ Digitizing with measuring trigger probe: The minimum line spacing is greater than the line spacing, or it was entered as zero. 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Digitizing with contour lines: Touch probe does not reach the starting point within the time set in the cycle. 	<ul style="list-style-type: none"> ■ It could be that the contour line cannot be closed. ■ Increase the time. ■ Increase the tolerance for the target window (machine parameter 6390).
Controller software timeout	2890	<ul style="list-style-type: none"> ■ Internal software or hardware error 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Check software version. ■ Exchange drive control board.
Zn track %.2s error	2872	<ul style="list-style-type: none"> ■ Contamination of the motor encoder (Zn track). ■ Motor encoder cable is defective. ■ Motor control board is defective. 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Exchange the motor. ■ Check the motor encoder cable. ■ Exchange the motor drive control board.
Zn track %.2s error	2914	<ul style="list-style-type: none"> ■ Contamination of the motor encoder (Zn track). ■ Motor encoder cable is defective. ■ Motor control board is defective. 	<ul style="list-style-type: none"> ■ Inform your service agency. ■ Exchange the motor. ■ Check the motor encoder cable. ■ Exchange the motor drive control board.
Excessive subprogramming	428	<p>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:</p> <ul style="list-style-type: none"> ■ Cycle 9 (PGM CALL, ISO: G39) ■ Calling an OEM cycle 	<ul style="list-style-type: none"> ■ Edit the part program.
Excessive subprogramming	429	<ul style="list-style-type: none"> ■ You nested more than 8 subprogram calls (CALL LBL xx, ISO: Lx,0). 	<ul style="list-style-type: none"> ■ Check whether all your subprograms are concluded with LBL 0 (ISO:G98 L0).
Excessive subprogramming	430	<ul style="list-style-type: none"> ■ You nested more than 10 program section repeats. 	<ul style="list-style-type: none"> ■ Edit the part program.
Excessive subprogramming	431	<p>You programmed more than 3 program calls (PGM CALL, ISO: %..). A program call can also be:</p> <ul style="list-style-type: none"> ■ Cycle9(PGMCALL, ISO: G39) ■ Calling an OEM cycle 	<ul style="list-style-type: none"> ■ Edit the part program.
Excessive subprogramming	432	<ul style="list-style-type: none"> ■ Internal stack error in an arithmetical expression (FN20, ISO: D20), e.g. due to excessive nesting. 	<ul style="list-style-type: none"> ■ Check the condition in the FN20 block.
Too many *.CDT files	2321	<ul style="list-style-type: none"> ■ There are more than 128 cutting data tables (*.CDT) in the specified directory. 	<ul style="list-style-type: none"> ■ Delete cutting data tables that are no longer required.
Too many compensation functions	501	<ul style="list-style-type: none"> ■ Error in compensation value conversion: Permissible number of compensation functions exceeded. 	<ul style="list-style-type: none"> ■ Decrease the number of compensation value functions.
Too many compensation points	500	<ul style="list-style-type: none"> ■ Error in compensation value conversion: Permissible number of compensation points exceeded. 	<ul style="list-style-type: none"> ■ Reduce size of compensation table.

Error message	Error number	Cause of error	Corrective action
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.
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 NC program or set Q8 = 0.
Too many subcontours	466	■ Calculation of the equidistant results in too many subcontours.	■ Edit the NC 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.

Error message	Error number	Cause of error	Corrective action
Access denied	1745	<ul style="list-style-type: none"> ■ 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:\) 	<ul style="list-style-type: none"> ■ Select the file again at a later time. ■ Cancel the file protection.
0 plunging depth not permitted	263	<ul style="list-style-type: none"> ■ You programmed the plunging depth 0 in the definition of the called fixed cycle. 	<ul style="list-style-type: none"> ■ Enter a plunging depth other than 0.
Permissive button was pressed	2768	<ul style="list-style-type: none"> ■ The permissive button of the handwheel was pressed. An incorrect handwheel was selected by MP7640. 	<ul style="list-style-type: none"> ■ Check the permissive buttons. ■ Correct the machine parameters. ■ Inform your service agency.
Two TOOL DEF %-3u with PGM CALL	60	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ Delete the TOOL DEF block (G99 block) in one of the programs, or use another tool number.
2nd chamfer not permitted	284	<ul style="list-style-type: none"> ■ In the definition of a contour, a contour pocket or a contour train, you programmed two chamfers (CHF, ISO: G24) in immediate succession. 	<ul style="list-style-type: none"> ■ Edit the part program.
2nd rounding arc not permitted	281	<ul style="list-style-type: none"> ■ In the definition of a contour, a contour pocket or a contour train, you programmed two rounding arcs (RND, ISO: G25) in succession. 	<ul style="list-style-type: none"> ■ Edit the part program.
2nd rounding arc not permitted	281	<ul style="list-style-type: none"> ■ In the definition of a contour, a contour pocket or a contour train, you programmed two rounding arcs (RND, ISO: G25) in succession. 	<ul style="list-style-type: none"> ■ Edit the part program.
DC-link voltage too low	2885	<ul style="list-style-type: none"> ■ Line power interrupted ■ Inverter defective 	<ul style="list-style-type: none"> ■ Check your line power supply. ■ Inform your service agency. ■ Check the inverter.
Intermediate memory empty	2664	<ul style="list-style-type: none"> ■ You attempted to insert blocks from intermediate memory, although you have not copied anything since power has been on. 	<ul style="list-style-type: none"> ■ Before you can insert anything from intermediate memory you must first fill it using the copy function.
Intermediate memory empty	2770	<ul style="list-style-type: none"> ■ You attempted to insert a block from an empty intermediate memory. 	<p>Before trying to insert a block from intermediate memory, put the block into memory by:</p> <ul style="list-style-type: none"> ■ using the DEL key to delete the block to be copied, or ■ editing the block to be copied.
Contradictory signs in cycle	433	<ul style="list-style-type: none"> ■ The algebraic signs of the setup clearance, total hole depth and plunging depth do not match. 	<ul style="list-style-type: none"> ■ Enter identical signs.
Cycle 14 (G37) not permitted	299	<ul style="list-style-type: none"> ■ 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). 	<ul style="list-style-type: none"> ■ Delete ERROR block. ■ Delete Cycle 14 (G37) from the contour subprogram.
Cycle 14: LBL not found	365	<ul style="list-style-type: none"> ■ In the Contour Geometry cycle you have listed a subprogram number that does not exist. 	<ul style="list-style-type: none"> ■ Correct the subprogram number in Cycle 14. ■ Insert the subprogram that you have defined in Cycle 14.

Error message	Error number	Cause of error	Corrective action
Cycle 27(G127): depth > radius	177	<ul style="list-style-type: none"> ■ 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. 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ The main axis and its associated parallel axis is not permitted in the rectangular pocket cycle. 	<ul style="list-style-type: none"> ■ Correct the axes in the Pocket Milling cycle. Some possible combinations are: X/Y, X/V, U/Y, U/V
Delete entire cycle: DEL!	1106	<ul style="list-style-type: none"> ■ Warning before deleting an entire HEIDENHAIN cycle. 	<ul style="list-style-type: none"> ■ For complete deletion of the cycle, press DEL. To interrupt the delete sequence, press END.
Cylinder surface not tiltable	306	<ul style="list-style-type: none"> ■ You called the Cylinder Surface cycle while the working plane was tilted. 	<ul style="list-style-type: none"> ■ Delete the cylindrical interpolation cycle from the part program.

2.3 Log

General

The log serves as a troubleshooting aid. The memory available is approx. 2 MB.

All of the entries in the log show the date and the time. The log is updated according to the FIFO principle, whereby the last entry in the list is at the very bottom.



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" 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

- a. STIB = "*" symbol in the screen display

Entry			Description
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 0/100 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 2/3xx xx Internal error class Byte 4...7xx 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                      09:18:19 Mon Oct 09 2000
      TNC 426/430 M
Info:      MAIN    START                      09:18:19 Mon Oct 09 2000
      NC SOFTWARE = 280476 10
Error:                                           09:18:29 Mon Oct 09 2000
      N-1 Power interruption
Key: 0x01AE -> CE                             09:41:37 Mon Oct 09 2000
Error:                                           09:41:40 Mon Oct 09 2000
      P88 88 MPs being read
Key: 0x01F0 -> NC Start                       09:41:46 Mon Oct 09 2000
Error:                                           09:41:46 Mon Oct 09 2000
      P93 93 Feed rate override Poti = 0 !
Key: 0x01F0 -> NC Start                       09:41:48 Mon Oct 09 2000
Stib: ON                                       09:41:57 Mon Oct 09 2000
Error:                                           09:41:57 Mon Oct 09 2000
      P93 93 Feed rate override Poti = 0 !
Info:      MAIN    PATH                      09:41:57 Mon Oct 09 2000
      RUNTAB =
Stib: OFF                                    09:41:57 Mon Oct 09 2000
Info:      MAIN    PGMEND                    09:41:57 Mon Oct 09 2000
      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                      09:41:57 Mon Oct 09 2000
      RUNBRKPGM = TNC:\STEFAN\NC\TEST.H
Error:                                           09:41:58 Mon Oct 09 2000
      N56 Limit switch X+
Key: 0x01EC -> Screen Change                 09:42:08 Mon Oct 09 2000

```

Calling the log

▶ Press the following key combination to call the log:



▶ Select the Programming and Editing mode



▶ Prepare for entry of code number



▶ Enter the code number



▶ Confirm



Note

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



▶ Confirm path and file name



Note

You may also change the starting date.
Default setting: Current day 00:00:00



▶ Confirm starting date and begin downloading log

2.4 Integrated Diagnosis Program

General

The TNC 426/430 control models feature an integrated diagnosis program for the pass/fail evaluation of important parts of the control hardware (RAM, EPROM etc.).

The diagnosis program can be activated at the machine tool.

Important preparations

- ▶ Switch on main switch of machine
- ▶ Confirm "Power interrupted" message and switch machine on
- ▶ Back up the non-volatile PLC markers and words, see page 268
- ▶ Switch off main switch of machine
- ▶ Disconnect the following connectors from the logic unit:
 - X21, V-24 data interface
 - X22, V-11 data interface
 - X23, handwheel interface
 - X25, Ethernet interface (option)
 - X26, Ethernet interface (option)
 - X41, PLC outputs
 - X42, PLC inputs
 - X46, machine operating panel
 - X47, PLC expansion interface
- ▶ Connect the adapter connector to test the interfaces X21 (V-24), X22 (V-11) and X23 (handwheel input).



Note

If the serial interfaces (X21, X22, X23) are to be tested, an adapter connector is required that must be wired by the customer. The wirings of the adapter connectors are shown below and on the next page.

Pin layouts of adapter connectors for interface test

X21 RS-232-C/V.24 data interface

Flange socket with female insert (25-pin)

Logic unit	
D-sub connctn. (female) 25-pin	Assignment
1	GND
2	RXD
3	TXD
4	CTS
5	RTS
6	DTR
7	Signal GND
11	
20	DSR
Housing	External shield

X22 RS-422/V.11 data interface

Flange socket with female insert (15-pin)

Logic unit	
D-sub connctr. (female) 15-pin	Assignment
1	Chassis GND
2	
3	
4	
5	
6	DSR
7	DTR
8	Signal GND
9	
10	
11	
12	
13	DSR
14	DTR
15	Do not assign
Housing	External shield

X23 Serial handwheel

Flange socket with female insert (9-pin)

Logic unit	
D-sub connctn. (female) 9-pin	Assignment
1	
2	
3	
4	+ 12 V \pm 0.6 V (Uv)
6	
7	
8	
9	
Housing	External shield

Calling the diagnosis program



- ▶ Press the EMERGENCY STOP button of your machine
- ▶ Load the diagnosis program from the BOOT MODE

Note

Please contact your HEIDENHAIN service agency for information on activating the BOOT MODE.

After the loading procedure has been finished, the program generates the following display:

TEST SELECTION MENU	
1 = Supply voltages	CCAL = Keyboard test
2 = Watchdog	L = Show input voltages
3 = Timer	C = Color planes
4 = EPROM	CC = Screen adjust
5 = RAM	CT = Color stripes
6 = HDD	RND = Color editor
7 = RS 232 (plug: X21)	CE = Deutsch
8 = RS 422 (plug: X22)	Z = Enter key code
9 = Handwheel (plug: X23)	
X = Ethernet interface (opt)	END = Quit
Y = Softw. prot. module (opt)	
Q = Select all	
MESSAGE	

Starting the self-running tests

The self-running tests are listed on the left half of the screen; the tests on the right half are interactive.



- ▶ Switch to the left list



- ▶ Start the self-running tests (Q key on the numerical keypad!)

Evaluation

- The currently active test is marked by a blinking cursor
- Green tick: Test successfully finished
- Red "F": Test finished, result not correct



Note

If the tests 7, 8 and 9 are run without an adapter, a red "F" is displayed. The same is true, if the options Ethernet and Software protection module are not available.

Exiting the test program



- ▶ Switch to the right list



- ▶ Place the cursor on the menu item "END = end test"



- ▶ Confirm

The TNC is rest and the NC software started.

Restoring the default settings on the machine

- ▶ Do not confirm the message "Power Interrupted"
- ▶ Switch off the main switch of the machine
- ▶ Reestablish the connections
- ▶ Switch on the main switch of the machine
- ▶ Do not confirm the message "Power Interrupted"



- ▶ Select the Programming and Editing mode

- ▶ Restore the non-volatile PLC markers and words in RAM, see page 268
- ▶ Confirm the message "Power interrupted" and switch the machine on

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	Measures for correcting error
TNC screen remains black after main switch ON	<ul style="list-style-type: none"> ■ TNC monitor defective. ■ Power supply to monitor defective ■ Power supply to logic unit defective ■ A major short-circuit generates a reset in the power supply unit of the TNC 	<ul style="list-style-type: none"> ■ Check the visual display unit BC, see page - 197 ■ Check power supply to logic unit, see page - 171 ■ 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	<ul style="list-style-type: none"> ■ Electrical offset ■ Approach behavior of axis not optimized ■ Axis did not reach the positioning window 	<ul style="list-style-type: none"> ■ Carry out offset adjustment, see page - 251 ■ Re-optimize axis (contact machine manufacturer for information)
Strong vibration of controller, already in current controller mode, accompanied by loud noises (initial operation)	<ul style="list-style-type: none"> ■ 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 	<ul style="list-style-type: none"> ■ Check the grounding of your machine according to the HEIDENHAIN grounding diagram after consultation with the machine tool builder, see page - 155 ■ Ensure the grounding clamps are secure
Servo lag is too high at standstill	<ul style="list-style-type: none"> ■ Electrical offset 	<ul style="list-style-type: none"> ■ Carry out offset adjustment, see page - 251
"Relay external DC voltage missing" message does not disappear	<ul style="list-style-type: none"> ■ EMERGENCY STOP chain interrupted ■ Logic unit defective 	<ul style="list-style-type: none"> ■ Check output "Control is ready" and acknowledgement I3, see page - 219
Servo lag is too high at standstill	<ul style="list-style-type: none"> ■ Electrical offset 	<ul style="list-style-type: none"> ■ Carry out offset adjustment, see page - 251
When the machine is switched on, the error message "EMERGENCY STOP defective" is generated	<ul style="list-style-type: none"> ■ Logic unit defective ■ Main contactor defective 	<ul style="list-style-type: none"> ■ Check the related components, see page - 220



4 Overview of Components

4.1 Standard Components

Logic unit
LE 426 CB
LE 430 CA



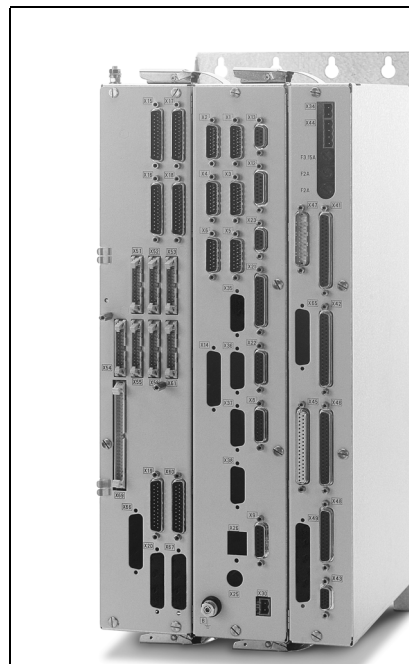
- Analog nominal speed value interface
- Position encoder interface, fixed (signal type, cutoff frequency)

Logic unit
LE 426 PB
LE 430 PA



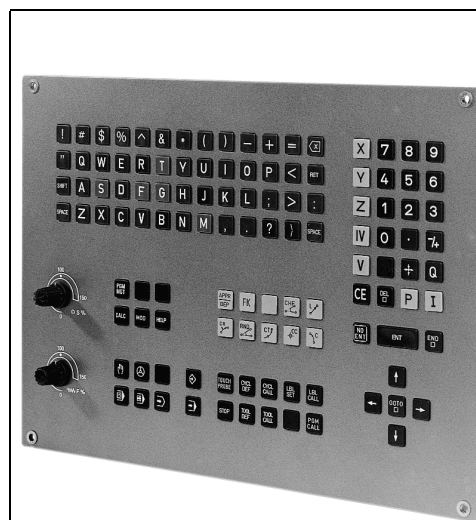
- Digital and analog interface to servo amplifier
- Position encoder interface, fixed (signal type, cutoff frequency)

Logicunit LE 426 M
LE 430 M

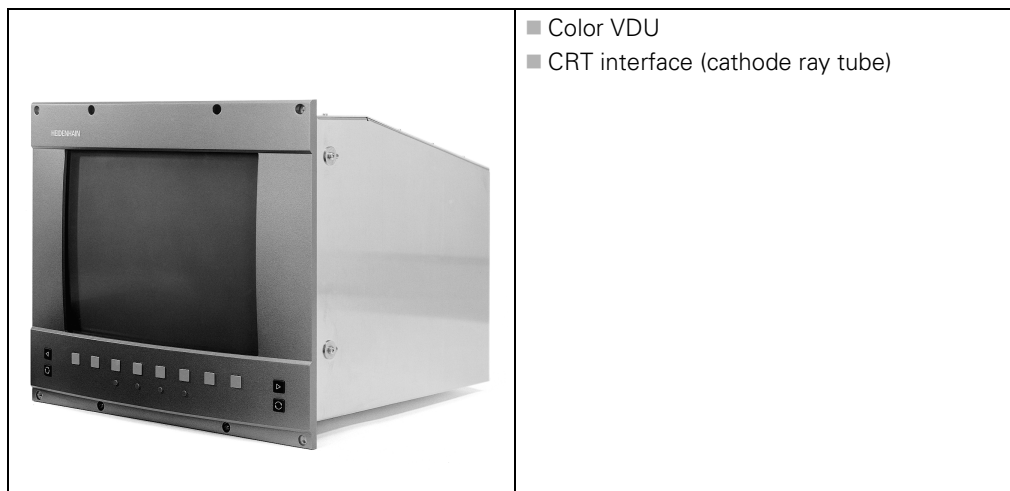


- Digital and analog interface to servo amplifier
- Position encoder interface, parameterizable

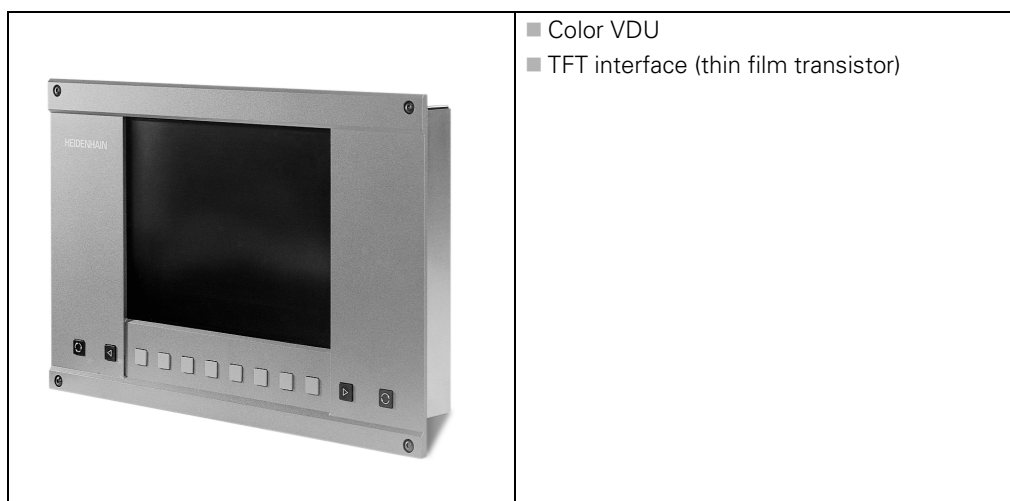
TE 420 operating panel
TE 401 operating panel



**BC 120 (BC 110B)
visual display unit**

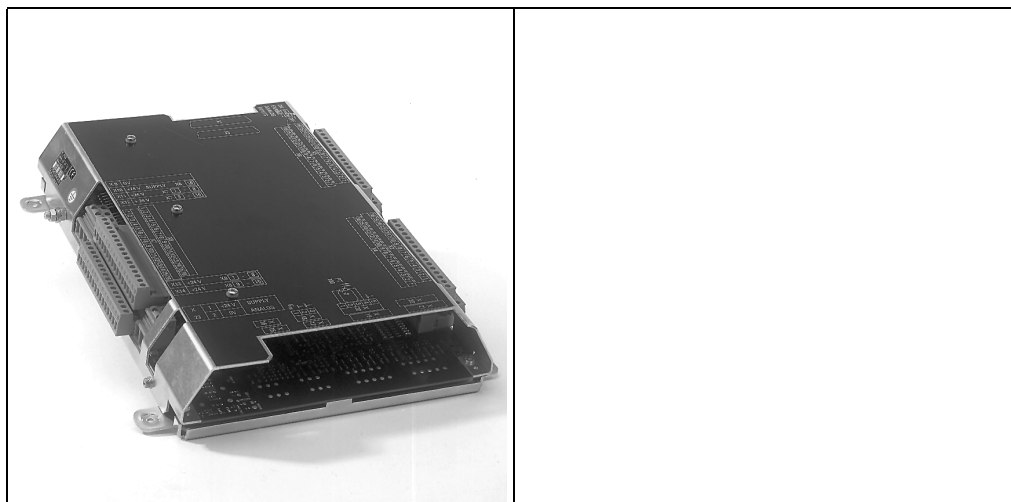


**BF 120 visual
display unit**

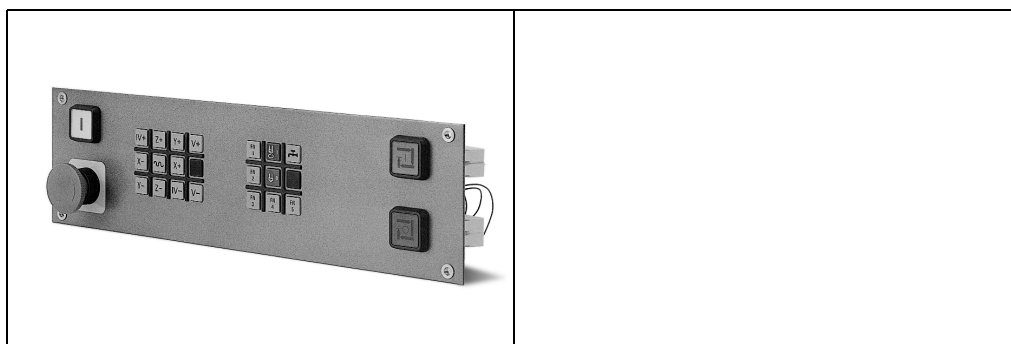


4.2 Accessories

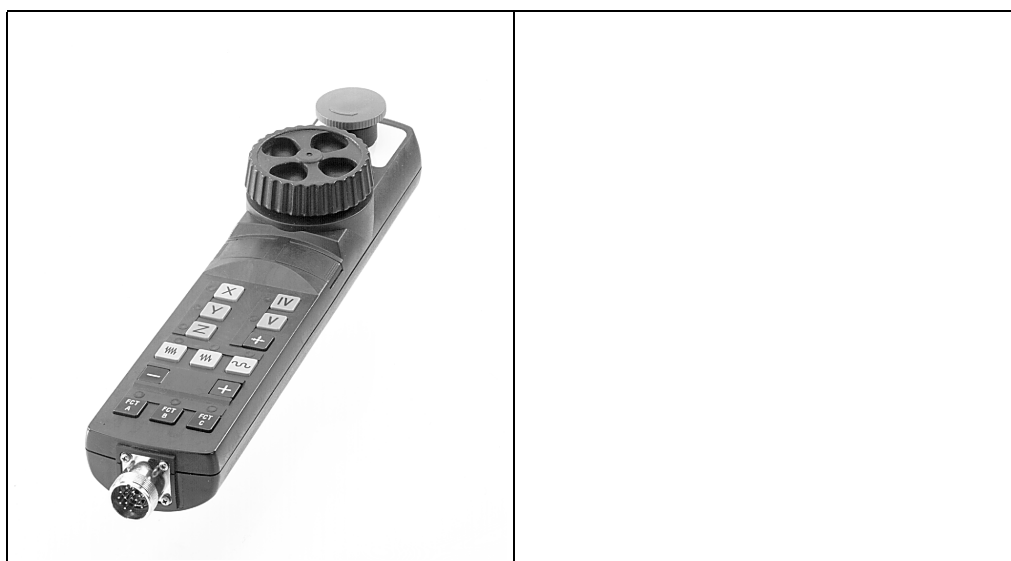
PLC input/
output unit
PL 410 B
PL 405 B



Machine operating
panel MB 420



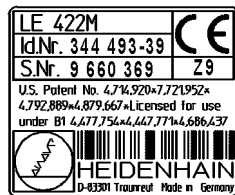
Handwheel
HR 410



5 Important Features of HEIDENHAIN Components

5.1 Hardware Identification

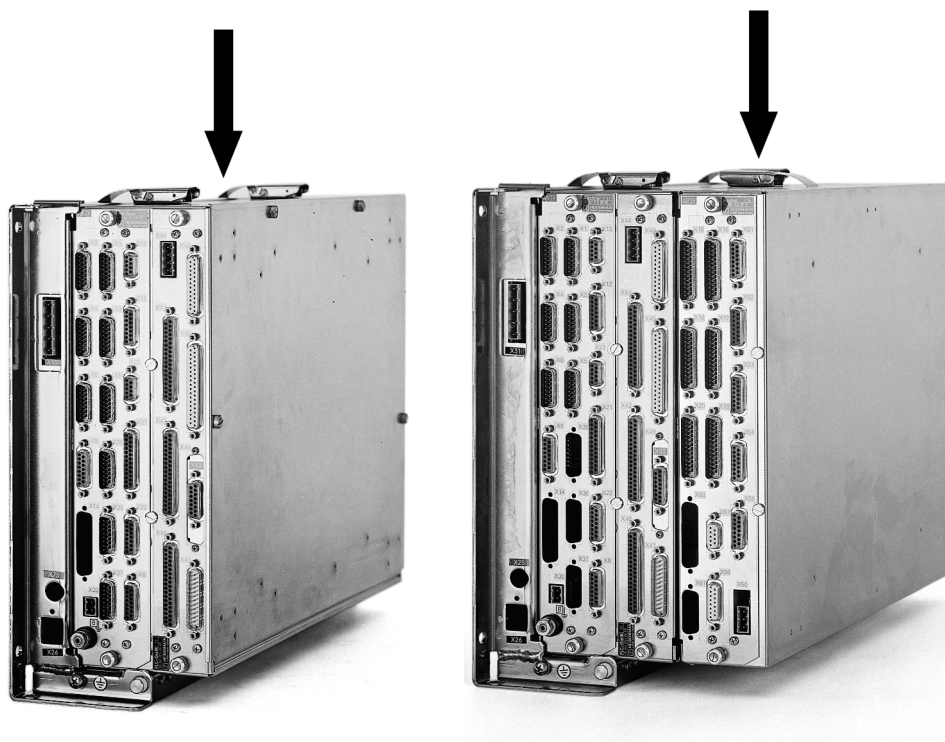
ID plate (example)



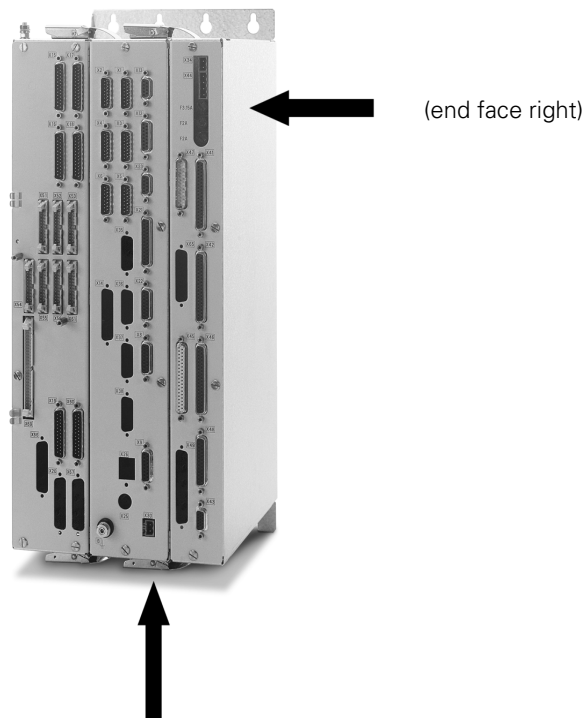
Note

The location of the ID plate with unit designation, ID number and serial number is shown below.
Each unit can be identified through its own number.

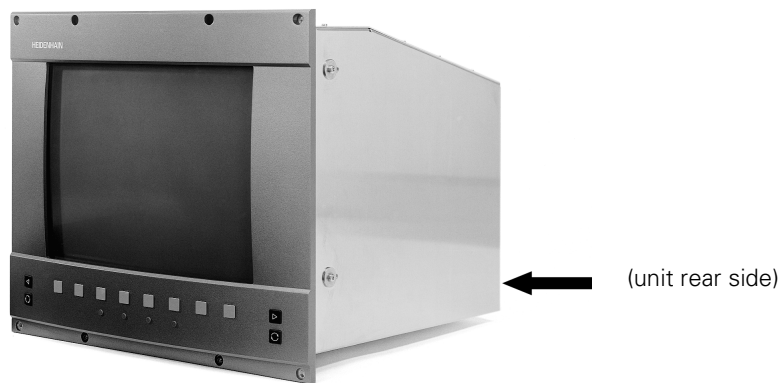
LE 426 CB/430 CA
LE 426 PB/430 PA



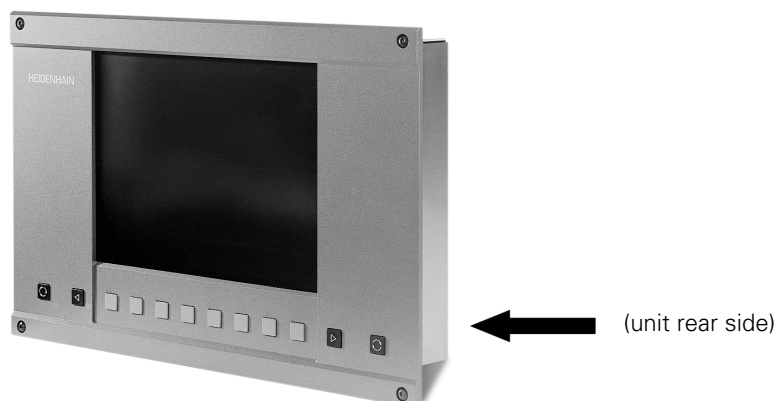
LE 426 M/430 M



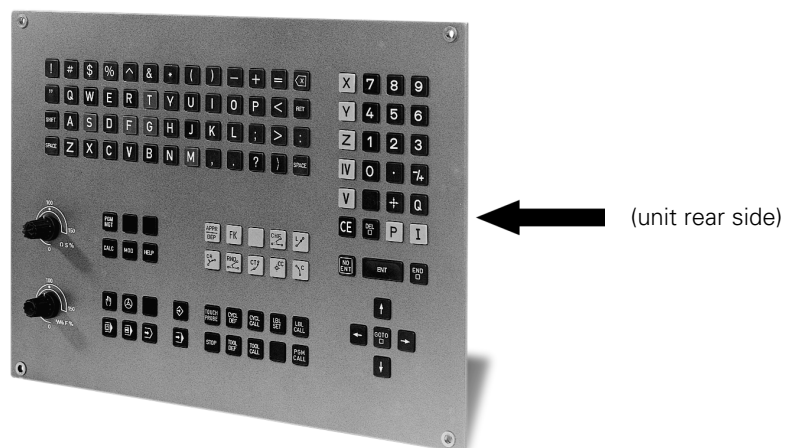
**BC 120
BC 110B**



BF 120



TE 420



5.2 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 TNC.

Display on the TNC

► Press the following keys to display the currently active NC software on the TNC screen:



► Select the Programming and Editing mode



► Press MOD key

Power interrupted Error	Programming and editing					
Code number						
NC : software number F280476 15						
PLC: software number BASIS--33						
SETUP: 286197 17						
DSP1:246280 03						
DSP2:246270 02						
DSP3:246280 03						
0	RS232 R9422 SETUP	USER PARAMETER	HELP	SERVICE OFF/ON		END

NC software

NC : software number F280476 15

F Identifier for EPROM or Flash hardware
 No F: NC software is stored on plug-in EPROMs
 With F: NC software is stored on Flash EEPROMs
 (can be deleted electrically);
 write access via the data interface during software update

280476 Program number of NC software
15 Version of NC software

PLC software

PLC: software number BASIS--33

BASIS--33 Random string which the machine manufacturer uses to identify his PLC software

Setup

SETUP: 286197 17

286197 Program number of the SETUP
17 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.

DSP software

```
DSP1:246280 03  
DSP2:246270 02  
DSP3:246280 03
```

246280 Program number of DSP software
03 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.

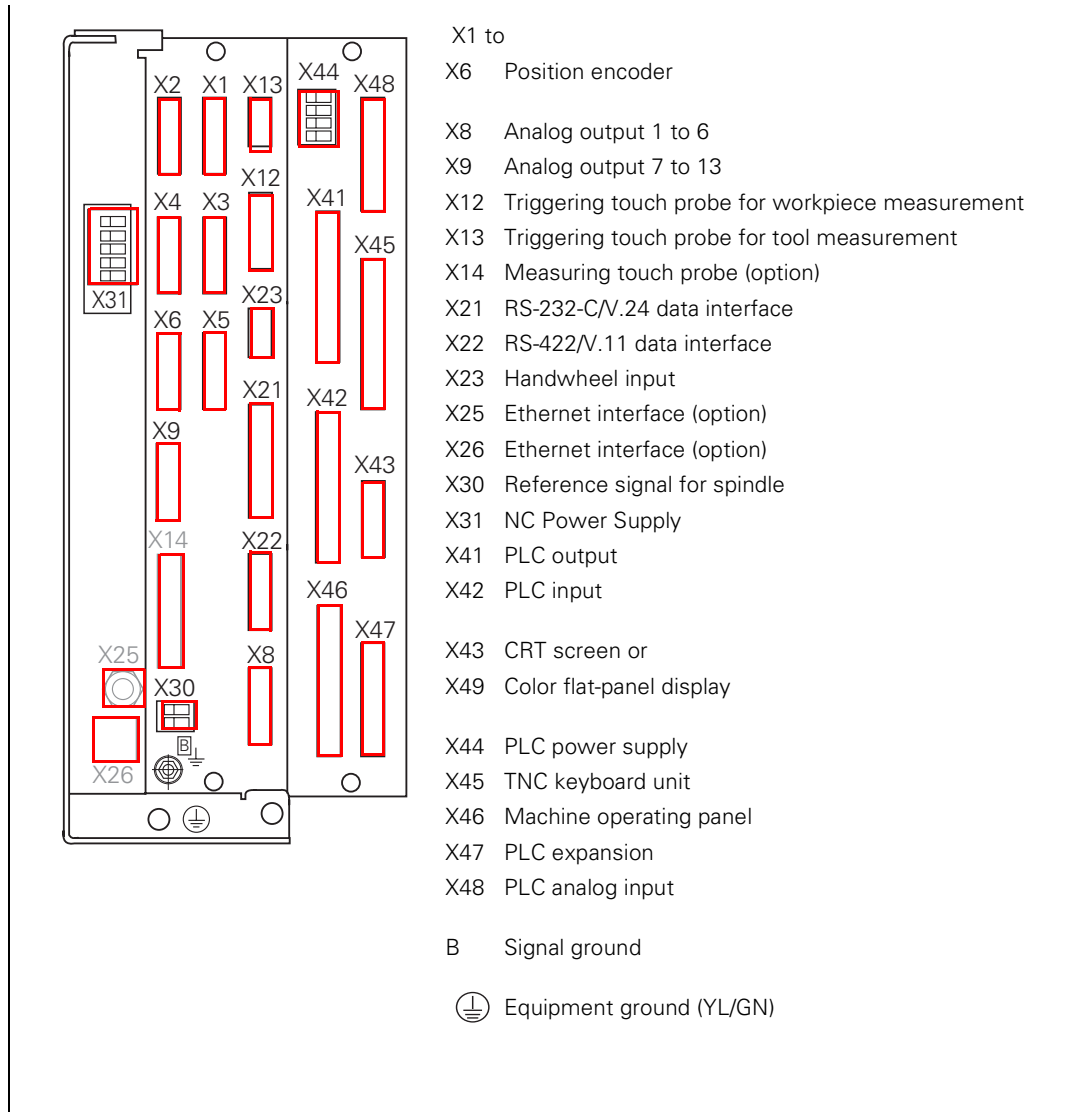


6 Connector Designation and Layout

6.1 Logic Units

6.1.1 Designation and position of connections

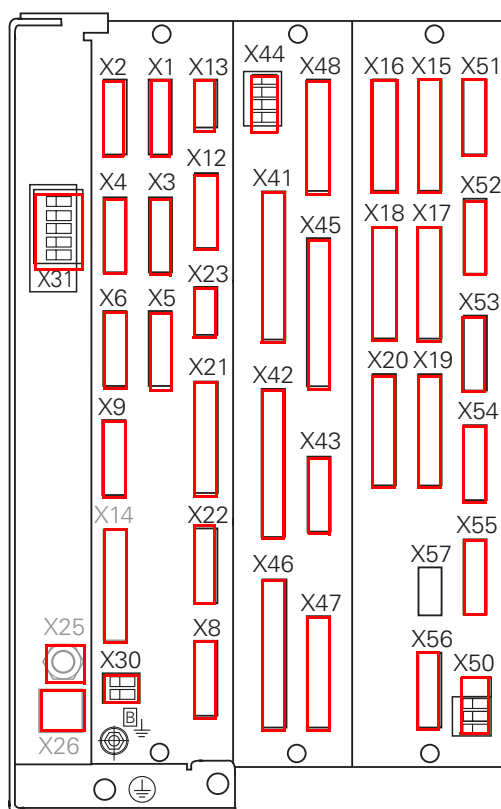
LE 426 CB



Caution

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

LE 426 PB (Spindle up to 12.000 rpm)



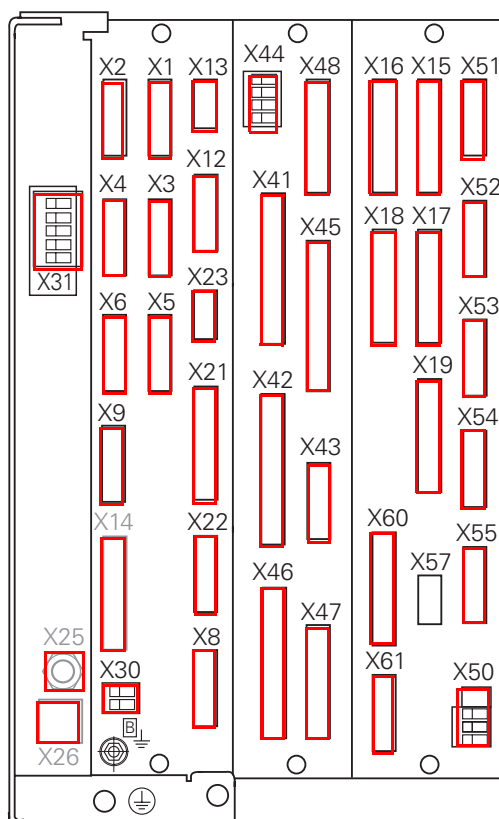
- X1 to
- X6 Position encoder
- X8 Analog output 1 to 6
- X9 Analog output 7 to 13
- X12 Triggering touch probe for workpiece measurement
- X13 Triggering touch probe for tool measurement
- X14 Measuring touch probe (option)
- X15 to
- X20 Speed encoder
- X21 RS-232-C/V.24 data interface
- X22 RS-422/V.11 data interface
- X23 Handwheel input
- X25 Ethernet interface (option)
- X26 Ethernet interface (option)
- X30 Reference signal for spindle
- X31 NC Power Supply
- X41 PLC output
- X42 PLC input
- X43 CRT screen or
- X49 Color flat-panel display
- X44 PLC power supply
- X45 TNC keyboard unit
- X46 Machine operating panel
- X47 PLC expansion
- X48 PLC analog input
- X50 Input for drive motor enabling
- X51 to
- X56 Output to motor power module
- X57 Reserved
- B Signal ground
- ⏏ Equipment ground (YL/GN)




Caution

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

LE 426 PB (Spindle up to 24,000 rpm)

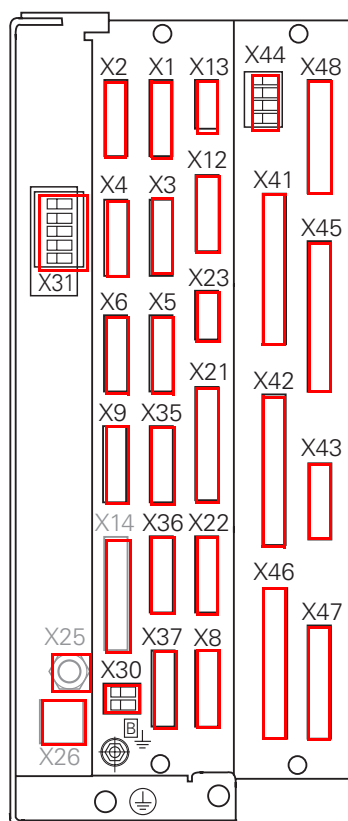


- X1 to
- X6 Position encoder
- X8 Analog output 1 to 6
- X9 Analog output 7 to 13
- X12 Triggering touch probe for workpiece measurement
- X13 Triggering touch probe for tool measurement
- X14 Measuring touch probe (option)
- X15 to
- X19 Encoder for speed
- X21 RS-232-C/V.24 data interface
- X22 RS-422/V.11 data interface
- X23 Handwheel input
- X25 Ethernet interface (option)
- X26 Ethernet interface (option)
- X30 Reference signal for spindle
- X31 NC Power Supply
- X41 PLC output
- X42 PLC input
- X43 CRT screen or
- X49 Color flat-panel display
- X44 PLC power supply
- X45 TNC keyboard unit
- X46 Machine operating panel
- X47 PLC expansion
- X48 PLC analog input
- X50 Input for drive motor enabling
- X51 to
- X55 Output to motor power module
- X57 Reserved
- X60 Encoder for spindle speed
- X61 Output to motor power module of the spindle
- B Signal ground
-  Equipment ground (YL/GN)



Caution

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

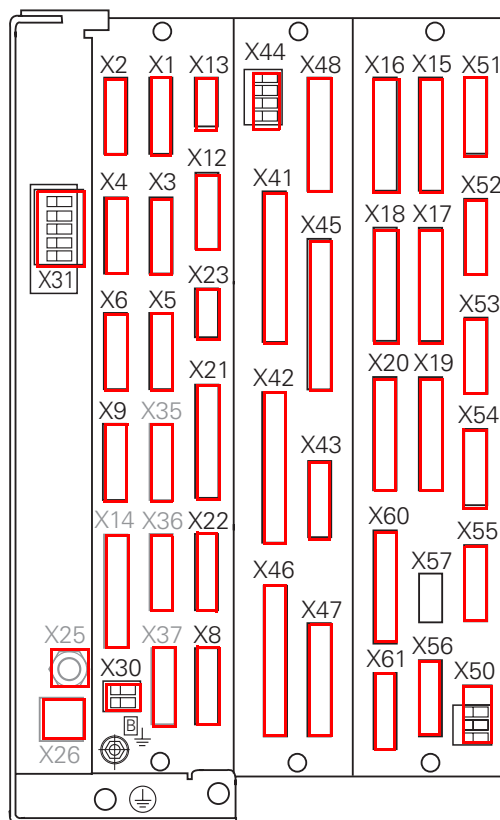



- X1 to
X6 Position encoder
- X8 Analog output 1 to 6
X9 Analog output 7 to 13
X12 Triggering touch probe for workpiece measurement
X13 Triggering touch probe for tool measurement
- X14 Measuring touch probe (option) or
X38 Additional position encoder input (option)
- X21 RS-232-C/V.24 data interface
X22 RS-422/V.11 data interface
X23 Handwheel input
X25 Ethernet interface (option)
X26 Ethernet interface (option)
X30 Reference signal for spindle
X31 NC Power Supply
- X35 to
X37 Position encoder
- X41 PLC output
X42 PLC input
- X43 CRT screen or
X49 Color flat-panel display
- X44 PLC power supply
X45 TNC keyboard unit
X46 Machine operating panel
X47 PLC expansion
X48 PLC analog input
- B Signal ground
⏏ Equipment ground (YL/GN)



Caution

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



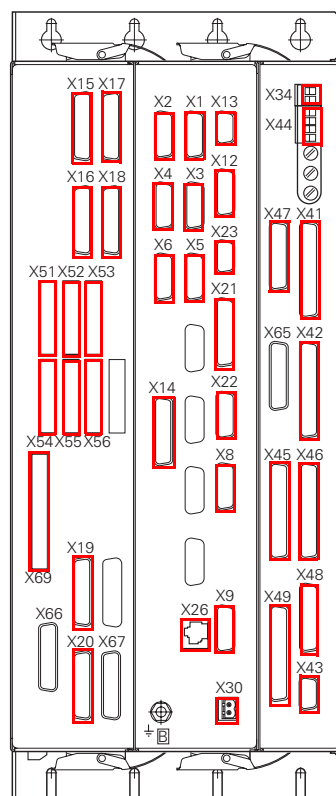
- X1 to X6 Position encoder
- X8 Analog output 1 to 6
- X9 Analog output 7 to 13
- X12 Triggering touch probe for workpiece measurement
- X13 Triggering touch probe for tool measurement
- X14 Measuring touch probe (option) or
- X38 Additional position encoder input (option)
- X15 to X20 Speed encoder
- X21 RS-232-C/V.24 data interface
- X22 RS-422/V.11 data interface
- X23 Handwheel input
- X25 Ethernet interface (option)
- X26 Ethernet interface (option)
- X30 Reference signal for spindle
- X31 NC Power Supply
- X35 to X37 Position encoder for 3 axes with analog speed command interface (option)
- X41 PLC output
- X42 PLC input
- X43 CRT screen or
- X49 Color flat-panel display
- X44 PLC power supply
- X45 TNC keyboard unit
- X46 Machine operating panel
- X47 PLC expansion
- X48 PLC analog input
- X50 Input for drive motor enabling
- X51 to X56 Output to motor power module
- X57 Reserved
- X60 Encoder for spindle speed
- X61 Output to motor power module of the spindle
- B Signal ground
-  Equipment ground (YL/GN)



Caution

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

LE 426 M (Spindle up to 12.000 rpm)



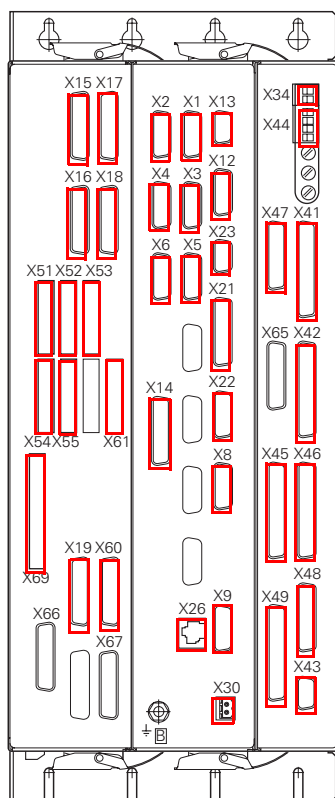
- X1 to
- X6 Position encoder
- X8 Analog output 1 to 6
- X9 Analog output 7 to 13
- X12 Triggering touch probe for workpiece measurement
- X13 Triggering touch probe for tool measurement
- X14 Measuring touch probe (option)
- X15 to
- X20 Speed encoder 1 V_{PP}
- X21 RS-232-C/V.24 data interface
- X22 RS-422/V.11 data interface
- X23 Handwheel input
- X25 Ethernet interface (option)
- X26 Ethernet interface (option)
- X30 Reference signal for spindle
- X34 Input 24 V for output "control-is-Test"
- X41 PLC output
- X42 PLC input
- X43 CRT screen or
- X49 Color flat-panel display
- X44 PLC power supply
- X45 TNC keyboard unit
- X46 Machine operating panel
- X47 PLC expansion
- X48 PLC analog input
- X51 to
- X56 Output to motor power module
- X65 to
- X67 Reserved
- X69 Power supply
- B Signal ground
- ⏏ Equipment ground (YL/GN)



Caution

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

LE 426 M (Spindle up to 24,000 rpm)



X1 to

- X6 Position encoder
- X8 Analog output 1 to 6
- X9 Analog output 7 to 13
- X12 Triggering touch probe for workpiece measurement
- X13 Triggering touch probe for tool measurement

X14 Measuring touch probe (option)

X15 to

- X19 Speed encoder for axes 1 V_{PP}
- X21 RS-232-C/V.24 data interface
- X22 RS-422/V.11 data interface
- X23 Handwheel input
- X25 Ethernet interface (option)
- X26 Ethernet interface (option)
- X30 Reference signal for spindle

X34 Input 24 V for output "control-is-Test"

X41 PLC output

X42 PLC input

X43 CRT screen or

X49 Color flat-panel display

X44 PLC power supply

X45 TNC keyboard unit

X46 Machine operating panel

X47 PLC expansion

X48 PLC analog input

X51 to

- X55 Output to motor power module of the axes
- X60 Speed encoder for spindle 1 V_{PP}
- X61 Output to motor power module of the spindle

X65 to

X67 Reserved

X69 Power supply

B Signal ground



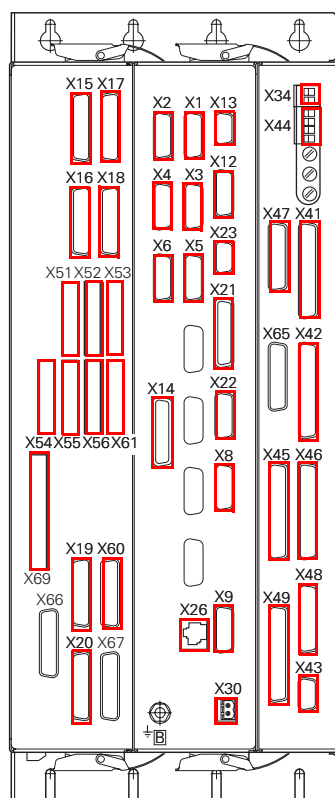
Equipment ground (YL/GN)




Caution

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

LE 430 M/6 Axes

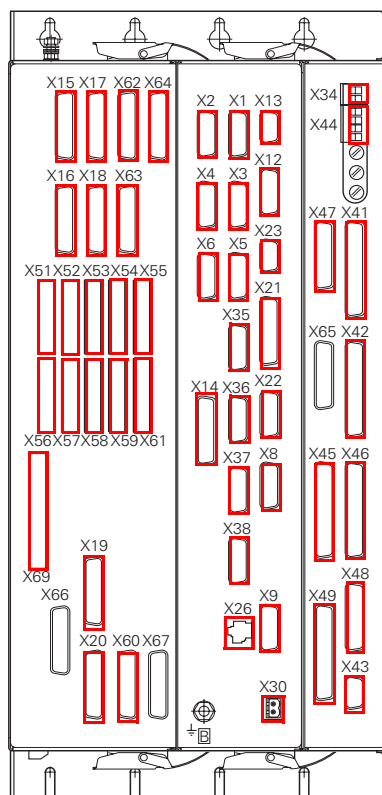



- X1 to
- X6 Position encoder
- X8 Analog output 1 to 6
- X9 Analog output 7 to 13
- X12 Triggering touch probe for workpiece measurement
- X13 Triggering touch probe for tool measurement
- X14 Measuring touch probe (option)
- X15 to
- X20 Speed encoder 1 V_{PP}
- X21 RS-232-C/V.24 data interface
- X22 RS-422/V.11 data interface
- X23 Handwheel input
- X25 Ethernet interface (option)
- X26 Ethernet interface (option)
- X30 Reference signal for spindle
- X34 Input 24 V for output "control-is-Test"
- X41 PLC output
- X42 PLC input
- X43 CRT screen or
- X49 Color flat-panel display
- X44 PLC power supply
- X45 TNC keyboard unit
- X46 Machine operating panel
- X47 PLC expansion
- X48 PLC analog input
- X51 to
- X56 Output to motor power module
- X60 Encoder for spindle speed
- X61 Output to motor power module of the spindle
- X65 to
- X67 Reserved
- X69 Power supply
- B Signal ground
-  Equipment ground (YL/GN)



Caution

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



- X1 to X6 and X35 to X38 Position encoder
- X8 Analog output 1 to 6
- X9 Analog output 7 to 13
- X12 Triggering touch probe for workpiece measurement
- X13 Triggering touch probe for tool measurement
- X14 Measuring touch probe (option)
- X15 to X20 and X62 to X64 Speed encoder
- X21 RS-232-C/V.24 data interface
- X22 RS-422/V.11 data interface
- X23 Handwheel input
- X25 Ethernet interface (option)
- X26 Ethernet interface (option)
- X30 Reference signal for spindle
- X34 Input 24 V for output "control-is-Test"
- X41 PLC output
- X42 PLC input
- X43 CRT screen or
- X49 Color flat-panel display
- X44 PLC power supply
- X45 TNC keyboard unit
- X46 Machine operating panel
- X47 PLC expansion
- X48 PLC analog input
- X51 to X59 Output to motor power module
- X60 Measuring system: Spindle speed
- X61 Output to motor power module of the spindle
- X65 to X67 Reserved
- X69 Power supply
- B Signal ground
-  Equipment ground (YL/GN)



Caution

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

6.1.2 Pin layouts



Note

On the following pages you will find the pin layouts for the individual connectors (shown in increasing numerical order).

X1 to X6: Inputs for encoders with 11 μA_{PP}

Pin layout for:

- TNC 426 CB/PB: all inputs
- LE 430 CA/PA: all inputs
- LE 426 M, LE 430 M (xxx xxx-2x): all inputs
- LE 426 M, LE 430 M/6 axes (as of xxx xxx-3x): X1 to X4
- LE 430 M/9 axes (as of xxx xxx-3x): X35 to X38

Logic unit		Encoder cable	
D-sub connection (male) 15-pin	Assignment	D-sub connector (female) 15-pin	
1	+5 V	1	Brown
2	0 V	2	White
3	$I_1 +$	3	Green
4	$I_1 -$	4	Yellow
5	0 V	5	White/Brown (internal shield)
6	$I_2 +$	6	Blue
7	$I_2 -$	7	Red
8	0 V	8	
9	+5 V	9	
10	$I_0 +$	10	Gray
11	0 V	11	
12	$I_0 -$	12	Pink
13	0 V	13	
14	Do not assign	14	
15	Do not assign	15	
Housing	External shield	Housing	External shield

Pin layout for:

- LE 426 M, LE 430/6 axes with EPROMs (as of xxx xxx-3x): X5, X6
- LE 430 M/9 axes (as of xxx xxx-3x): X1 to X6
- LE 426 M, LE 430 M with Flash EPROMs: all inputs

Logic unit		Adapter (317 505-05)			Encoder cable	
D-sub connection (male) 15-pin	Assignment	Female		Male	D-sub connector (female) 15-pin	
1	+5 V	1	—	1	1	Brown
2	0 V	2	—	2	2	White
3	I ₁ +	3	—	3	3	Green
4	I ₁ −	4	—	4	4	Yellow
5	Do not assign	5	—	5	5	White/Brown (internal shield)
6	I ₂ +	6	—	6	6	Blue
7	I ₂ −	7	—	7	7	Red
8	0 V	8	—	8	8	
9	+5 V	9	—	9	9	
10	I ₀ +	10	—	10	10	Gray
11	0 V	11	—	11	11	
12	I ₀ −	12	—	12	12	Pink
13	0 V	13	—	13	13	
14	Do not assign	14	—	14	14	
15	Do not assign	15	—	15	15	
Housing	External shield	Housing			Housing	External shield

X1 to X6:

**Inputs for encoders
with 1 V_{pp}**

Pin layout for D-sub connector and socket:

LE		Adapter cable 309.783-xx Adapter cable 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:
Inputs for encoders
with EnDat
interface

Pin layout for D-sub connector and socket

LE		Adapter cable 331.115-xx			Connecting cable 323.897-xx			Adapter cable 313.791-xx		
Male	Assignm.	Female	Color	Female	Male	Color	Female	Male	Color	Female
1	+5 V (U_P)	1	Brown/ Green	7	7	Brown/ Green	7	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	



Note

If necessary, the machine manufacturer may use adapter connectors for adjusting the encoder signals to the logic unit. These are connected directly to the input on the TNC.

**Adapter connector
TTL (HEIDENHAIN)
/ 1 V_{PP}
Id.Nr. 317505-01**

Pin layout of D-sub connector (female) and D-sub connector (male):

D-sub connctr. (female) 15-pin	Assignment	D-sub connection (male) 15-pin	Assignment
1	+5 V (U _P)	1	+5 V (U _P)
2	0 V (U _N)	2	0 V (U _N)
3	A+	3	U _{a1}
4	A-	4	-U _{a1}
5	0 V	5	0 V
6	B+	6	U _{a2}
7	B-	7	-U _{a2}
8	0 V	8	0 V
9	+5 V	9	+5 V
10	R+	10	U _{a0}
11	0 V	11	0 V
12	R-	12	-U _{a0}
13	0 V	13	0 V
14	-U _{aS}	14	-U _{aS}
15	Not assigned	15	Not assigned

**Adapter connector
TTL (SIEMENS)
/ 1 V_{PP}
Id.Nr. 317505-02**

Pin layout of D-sub connector (female) and D-sub connector (male):

D-sub connctr. (female) 15-pin	Assignment	D-sub connection (male) 15-pin	Assignment
1	Not assigned	1	Not assigned
2	0 V	2	0 V
3	A+	3	U _{a1}
4	A-	4	-U _{a1}
5	Not assigned	5	Not assigned
6	B+	6	U _{a2}
7	B-	7	-U _{a2}
8	Not assigned	8	Not assigned
9	Not assigned	9	Not assigned
10	R+	10	Not assigned
11	Not assigned	11	Not assigned
12	R-	12	U _{a0}
13	Not assigned	13	-U _{a0}
14	Not assigned	14	Not assigned
15	Not assigned	15	Not assigned

Adapter connector
11 μA_{pp} / 1 V_{pp}
Id.Nr. 313119-01

Pin layout of D-sub connector (female) and D-sub connector (male):

D-sub connctr. (female) 15-pin	Assignment	D-sub connection (male) 15-pin	Assignment
1	+5 V (U_P)	1	+5 V (U_P)
2	0 V (U_N)	2	0 V (U_N)
3	A+	3	0°+
4	A–	4	0°–
5	0 V	5	0 V
6	B+	6	90°+
7	B–	7	90°–
8	0 V	8	0 V
9	+5 V	9	+5 V
10	R+	10	R+
11	0 V	11	0 V
12	R–	12	R–
13	0 V	13	0 V
14	Not assigned	14	Not assigned
15	Not assigned	15	Not assigned

X8:
Analog
outputs 1 to 6

Pin layout on logic unit and connecting cable:

Logic unit		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**

Pin layout on logic unit and connecting cable:

Logic unit		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	Analog output 13: ± 10 V	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	Analog output 13: 0 V	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
the touch probe**

see "Touch Probe Systems" on page 152

**X13: Connection of
the touch probe**

see "Touch Probe Systems" on page 152

**X14: Measuring
touch probe SP 2/1**

see "TS 220" on page 152

**X15 to X20:
Inputs 1 V_{PP}
for speed encoders**

Pin layout on logic unit and adapter cable:

LE		Adapter cable 289.440-xx			Connecting cable 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: Inputs
for speed encoders
with EnDat
interface**

Pin layout on logic unit and adapter cable:

LE		Adapter cable 336.376-xx				Connecting cable 340.302-xx		
Male	Assignment	Female	Color	Female		Male	Color	Female
1	+5 V (U_P)	1	Brown/Green	10	Possibly: Line drop compensator 336.397-01	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.

X21: RS-232-C/V.24 Pin layouts on logic unit, connecting cables, and adapter block:
data interface

Logic unit		Connecting cable Id. Nr. 239.760-xx			AB Id. Nr. 310,085-01		Connecting cable Id. Nr. 274 545-01		
D-sub cnctr. (female) 25-pin	Assingm.	D-sub cnctr. (male) 25-pin		D-sub cnctr. (female) 25-pin	D-sub cnctr. (male) 25-pin	D-sub cnctr. (female) 25-pin	D-sub cnctr. (male) 25-pin		D-sub cnctr. (female) 25-pin
1	GND	1	WH/BN Ext. shield	1	1	1	1	WH/BN External shield	1
2	RXD	2	Green	3	3	3	3	Yellow	2
3	TXD	3	Yellow	1	2	2	2	Green	3
4	CTS	4	Gray	5	5	5	5	Pink	4
5	RTS	5	Pink	4	4	4	4	Gray	5
6	DTR	6	Blue	20	20	20	20	Brown	6
7	Signal GND	7	Red	7	7	7	7	Red	7
20	DSR	20	Brown	6	6	6	6	Blue	20
8 to 19, 21 to 25	Do not assign			8	8	8	8		8
Housing	External shield	Housing	Ext. shield	Housing	Housing	Housing	Housing	External shield	Housing

X22: RS-422/V.11 Pin layouts on logic unit, connecting cables, and adapter block:
data interface

Logic unit		Connecting cable Id. Nr. 289.208-xx			AB Id. Nr. 310 085-01	
D-sub cnctr. (female) 15-pin	Assignment	D-sub cnctr. (male) 15-pin		D-sub cnctr. (female) 15-pin	D-sub cnctr. (male) 15-pin	D-sub cnctr. (female) 15-pin
1	Chassis GND	1	black external shield	1	1	1
2	RXD	2	Blue	2	2	2
3	CTS	3	Gray	3	3	3
4	TXD	4	White	4	4	4
5	RTS	5	Green	5	5	5
6	DSR	6	White/Green	6	6	6
7	DTR	7	Green/Pink	7	7	7
8	Signal GND	8	Black	8	8	8
9	RXD	9	Red	9	9	9
10	CTS	10	Pink	10	10	10
11	TXD	11	Brown	11	11	11
12	RTS	12	Yellow	12	12	12
13	DSR	13	Brown/Green	13	13	13
14	DTR	14	Red/Blue	14	14	14
15	Do not assign	15	Violet	15	15	15
Housing	External shield	Housing	External shield	Housing	Housing	Housing

X23: Handwheel input see "Handwheels" on page 148

X25:
BNC connection for Ethernet

Pin layout

BNC connection (female)	Assignment
Inner conductor (core)	Data (RXI, TXO)
Shielding	GND

X26:
RJ45 connection for Ethernet

Pin layout

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

X30:
Spindle reference signal

Pin layout

Connecting terminal	Assignment
1	+24 V
2	0 V

X31:
NC power supply

Pin layout

Cnnctn. terminals	Assignment	LE 426 PB, LE 430 PA	LE 426 CB, LE 430 CA
	Equipment ground (YL/GY)		
U ₁	Phase 1	400 Vac ± 10% 50 to 60 Hz via isolating transformer	
U ₂	Phase 2		
–U _Z	DC-link voltage –	385 Vdc to 660 Vdc	–
+U _Z	DC-link voltage +		

X34:
Supply voltage for "control-is-ready"

Pin layout

Connecting terminal X34	Assignment
1	+24 V
2	0 V

X35 to X38: Inputs for encoders

see "X1 to X6: Inputs for encoders with 11 μAPP" on page 106

X41:
PLC output on the
logic unit

Pin layout on the LE:

Logic unit		Connecting cable Id. Nr. 244.005-xx Id. Nr. 263.954-xx	
D-sub connection (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 with 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; not disconnectable with EM. STOP			
25	O24	25	Yellow/Brown
26	O25	26	Gray/Brown
27	O26	27	Yellow/Brown
28	O27	28	White/Yellow
29	O28	29	Gray/White
30	O29	30	Pink/Blue
31	O30	31	Pink/Red
32	Test output; do not assign	32	Brown/Blue
33	Test output; do not assign	33	Pink/Green
34	Control is ready	34	Brown
35	Test output; do not assign	35	Yellow/Pink
36	Test output; do not assign	36	Violet
37	Test output; do not assign	37	White
Housing	External shield	Housing	External shield

X42:
PLC input on the
logic unit

Pin layout on the LE:

Logic unit		Connecting cable Id. Nr. 244 005-xx, Id. Nr. 263.954-xx	
D-sub connection (female) 37-pin	Assignment	D-sub connection (male) 37-pin	
1	I0	1	Gray/Red
2	I1	2	Brown/Black
3	I2	3	White/Black
4	I3 Acknowledgement "Control is ready"	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	LE 426 CB/PB/ 430 CA/PA: do not assign LE 426 M/430 M: I3 Drive release	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



X43:
Visual display unit
BC

see "Visual Display Units" on page 132

X44:
PLC power supply

Pin layout

Terminal	Assignment	PLC outputs
1	+24 V cannot be switched off via EMERGENCY STOP	O24 to O30 control is ready
2	+24 V can be switched off via EMERGENCY STOP	O16 to O23
3		O0 to O15
4	0 V	

X47:
PLC expansion on
the LE

see "Pin layouts" on page 130

X48:
Analog input (PLC)
on the logic unit

Pin layout

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
17	Analog input 3: 0 V (reference potential)
20 to 25	Do not assign
Housing	External shield

X49:
Visual display unit
BF 120

see "BF 120" on page 138

X50:
Drive release
LE 426 PB
LE 430 PA

Pin layout for logic units up to Id. Nr. xxx xxx-3x:

Connecting terminal	Assignment
1	+24 Vdc
2	Do not assign
3	0 V

Pin layout for logic units beginning with Id. Nr. xxx xxx-4x:

Connecting terminal	Assignment
1	+24 Vdc
2 to 6	Do not assign
7	0 V

X51 to X56:
Outputs to motor
power stage
LE 426 PB
LE 430 PA

Pin layout of logic unit, connecting cable, and expansion board:

Logic unit		Connecting cable Id. Nr. 289.208-xx			Expansion board Id. Nr. 324 952-xx	
D-sub connctn. (female) 15-pin	Assignment	D-sub connctr. (male) 15-pin		D-sub connctr. (female) 15-pin	X1, X2 D-sub connection (female) 15-pin	
1	Do not assign	1	Black	1	1	
2	PWM U ₁	2	Blue	2	2	
3	PWM U ₂	3	Gray	3	3	
4	PWM U ₃	4	White	4	4	
5	Reset	5	Green	5	5	
6	Ready	6	White/Pink	6	6	
7	I _{actl 2} ⁻	7	Gray/Pink	7	7	
8	I _{actl 1} ⁻	8	Black	8	8	
9	0 V U ₁	9	Red	9	9	
10	0 V U ₂	10	Pink	10	10	
11	0 V U ₃	11	Brown	11	11	
12	0 V (analog)	12	Brown/Green	12	12	
13	Temp. warn.	13	Red/Green	13	13	
14	I _{actl 2} ⁺	14	Red/Blue	14	14	
15	I _{actl 1} ⁺	15	Violet	15	15	
Housing	External shield	Housing	External shield	Housing	Housing	

X57:
LE 426 PB
LE 430 PA

Reserved, do not assign

X51 to X59:
Outputs to motor
power stage
LE 426 M
LE 430 M

Ribbon connector, 20-pin	Assignment
1a	PWM U ₁
1b	0 V U ₁
2a	PWM U ₂
2b	0 V U ₂
3a	PWM U ₃
3b	0 V U ₃
4a	SH2
4b	0 V (–SH2)
5a	SH1B
5b	0 V (SH1B)
6a	+I _{ACT 1}
6b	–I _{ACT 1}
7a	0 V (analog)
7b	+I _{ACT 2}
8a	–I _{ACT 2}
8b	0 V (analog)
9a	Do not assign
9b	Do not assign
10a	Temp. warning
10b	Ready

X60:
Input 1 V_{PP}
for spindle speed
encoders

see “X15 to X20: Inputs 1 VPP for speed encoders” on page 112

X61:
Output to spindle
motor power stage

see “X51 to X59: Outputs to motor power stage LE 426 M LE 430 M” on page 120

X62 to X64:
Inputs 1 V_{PP} for
speed encoders

see “X15 to X20: Inputs 1 VPP for speed encoders” on page 112

X69:
NC power supply
and control signals

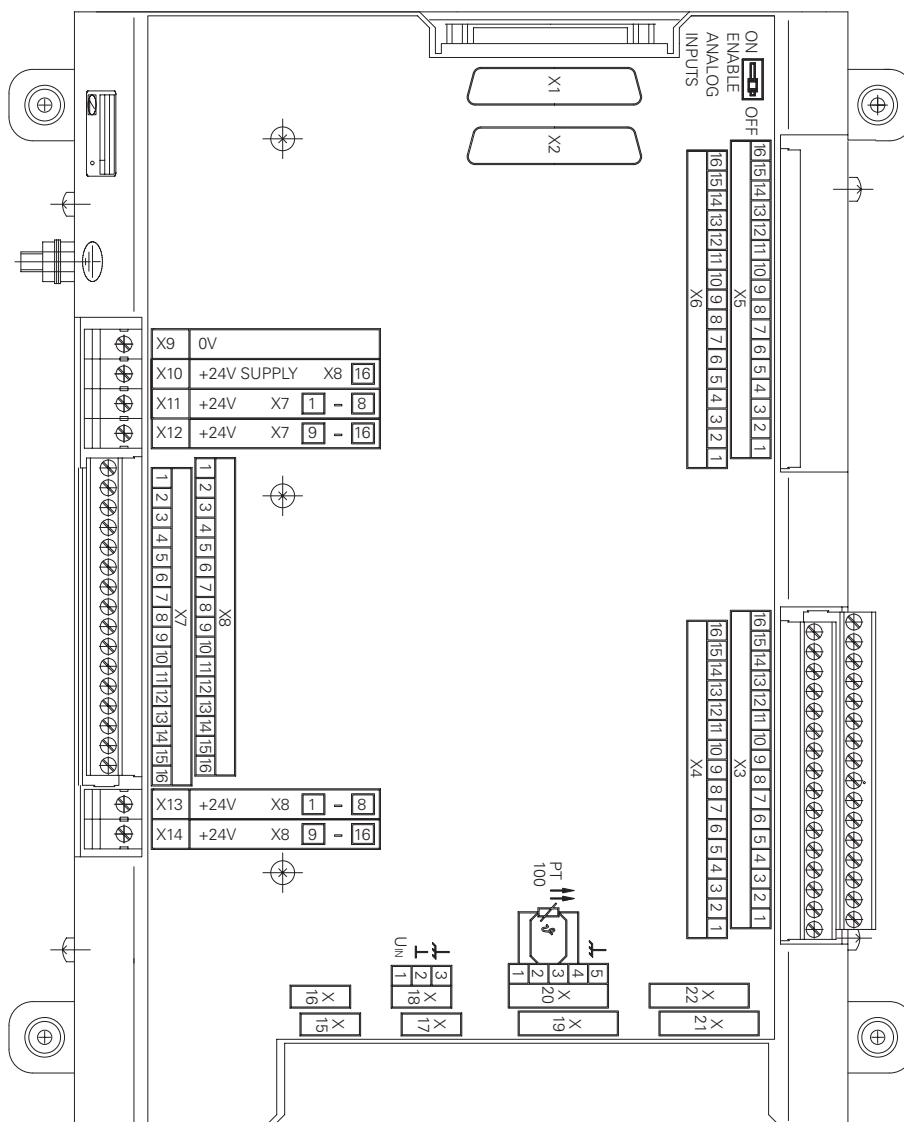
The LE 426 M, LE 430 M is supplied via X69. With lengths of 600 mm and longer, the ribbon cable is led doubled to the LE to increase the line cross section.

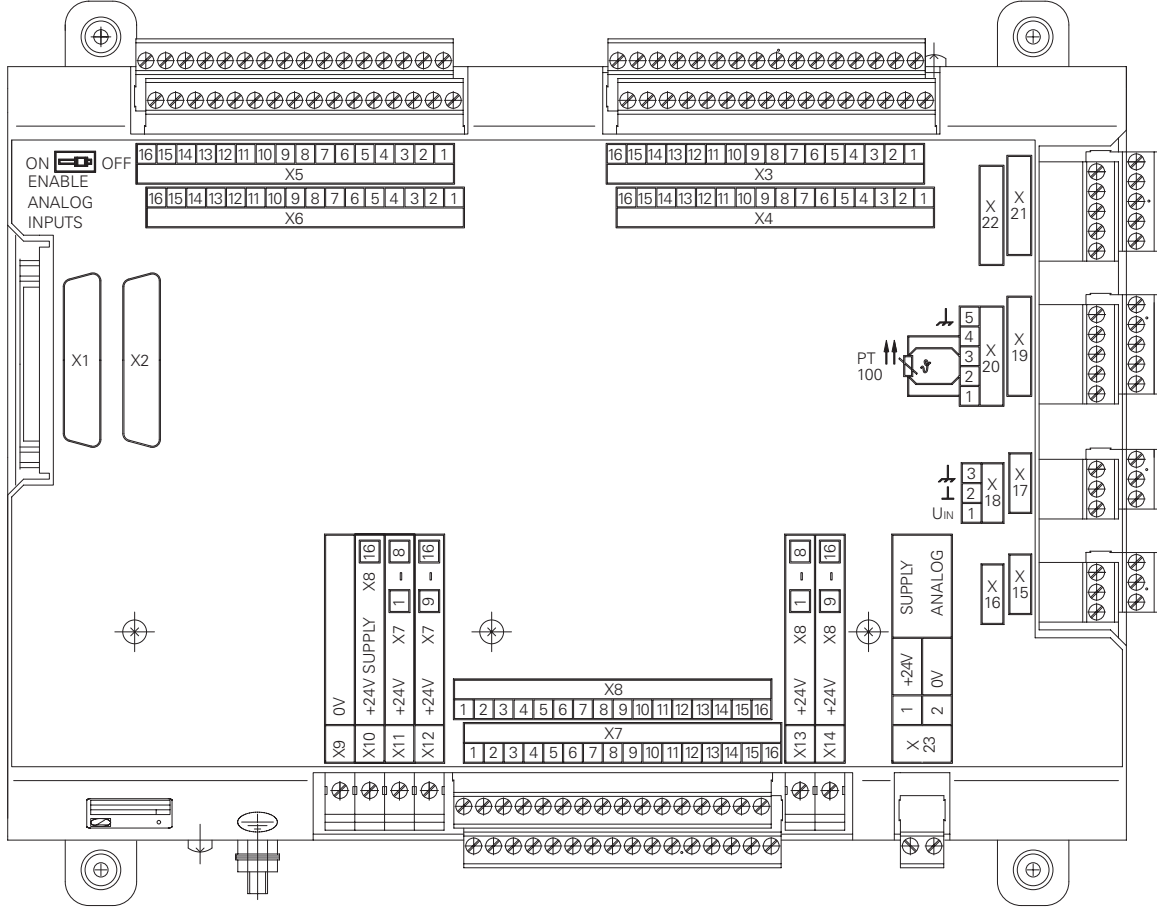
Ribbon connector, 50-pin	Assignment
1a to 5b	+5 V
6a to 7b	+12 V
8a	+5 V (low-voltage separation)
8b	0 V (low-voltage separation)
9a	+15 V
9b	-15 V
10a	UZAN
10b	0 V
11a	IZAN
11b	0 V
12a	RES.PS
12b	0 V
13a	PF.PS.ZK
13b	GND
14a	ERR.UZ.GR
14b	GND
15a	ERR.IZ.GR
15b	GND
16a	ERR.TMP
16b	GND
17a	RDY.PS
17b	GND
18a	ERR.ILEAK
18b	GND
19a	Do not assign
19b	GND
20a	Do not assign
20b	GND
21a	Do not assign
21b	GND
22a	Do not assign
22b	GND
23a	Reserved (SDA)
23b	GND
24a	Reserved (SLC)
24b	GND
25a	RES.LE
25b	GND

6.2 PLC Expansion Boards

6.2.1 Designation and position of connectors

PL 405 B





6.2.2 Pin layouts

X1: Pin layout of logic unit, connecting cable, and PL:
PLC expansion on the LE

Logic unit		Connecting cable Id. Nr. 289.111-xx			1. PL 4xx B	
D-sub cnnctr. (male) 25-pin	Assignment	D-sub cnnctr. (female) 25-pin		D-sub cnnctr. (male) 25-pin	D-sub cnnctr. (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	Address 6	5	White/Green	5	5	Address 6
6	INTERRUPT	6	Pink/Green	6	6	INTERRUPT
7	RESET	7	Green/Blue	7	7	RESET
8	WRITE EXTERN	8	White/Blue	8	8	WRITE EXTERN
9	WRITE EXTERN	9	White/Red	9	9	WRITE EXTERN
10	Address 5	10	Gray/Pink	10	10	Address 5
11	Address 3	11	Blue	11	11	Address 3
12	Address 1	12	Green	12	12	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	Address 7	18	White/Yellow	18	18	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	Serial OUT	21	White/Gray	21	21	Serial OUT
22	Serial OUT	22	White/Pink	22	22	Serial OUT
23	Address 4	23	Black	23	23	Address 4
24	Address 2	24	Gray	24	24	Address 2
25	Address 0	25	White	25	25	Address 0
Housing	External shield	Housing	External shield	Housing	Housing	External shield

X2:

Pin layout of logic unit, connecting cable, and PL:

PLC expansion
PL 4xx B on the
PL 410 B

PL 410B		Connecting cable Id. Nr. 289.111-xx			PL 4xx B	
D-sub cnctr. (male) 25-pin	Assignment	D-sub cnctr. (female) 25-pin		D-sub cnctr. (male) 25-pin	X1 D-sub connection (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	Address 6	5	White/Green	5	5	Address 6
6	INTERRUPT	6	Pink/Green	6	6	INTERRUPT
7	RESET	7	Green/Blue	7	7	RESET
8	WRITE EXTERN	8	White/Blue	8	8	WRITE EXTERN
9	WRITE EXTERN	9	White/Red	9	9	WRITE EXTERN
10	Address 5	10	Gray/Pink	10	10	Address 5
11	Address 3	11	Blue	11	11	Address 3
12	Address 1	12	Green	12	12	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	Address 7	18	White/Yellow	18	18	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	Serial OUT	21	White/Gray	21	21	Serial OUT
22	Serial OUT	22	White/Pink	22	22	Serial OUT
23	Address 4	23	Black	23	23	Address 4
24	Address 2	24	Gray	24	24	Address 2
25	Address 0	25	White	25	25	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 the outputs	O32 – O39	O64 – O71	O128 – O135	O160 – O167
X12	+24 Vdc power supply for the outputs	O40 – O47	O72 – O79	O136 – O143	O168 – O175
X13	+24 Vdc power supply for the outputs	O48 – O55	O80 – O87	O144 – O151	O176 – O183
X14	+24 Vdc power supply for the outputs	O56 – O62	O88 – O94	O152 – O158	O184 – O190

**X15 to X18:
Analog input on
the PL 410 B**

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

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

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

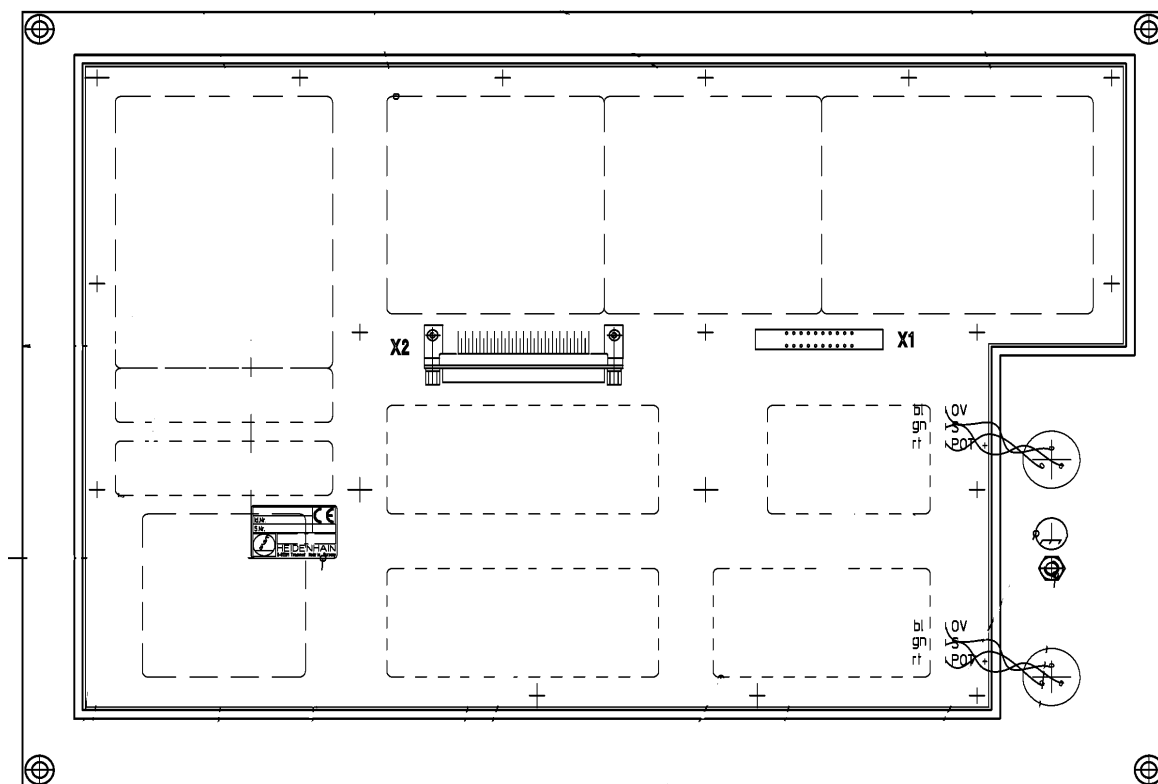
**X23:
Power supply for
the analog inputs
on the PL 410B**

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

6.3 TNC Operating Panel

6.3.1 Designation and position of connectors

TE 401B/420



6.3.2 Pin layouts

X1:
Connection of the
soft keys on the
visual display unit

Pin layout of the TNC 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

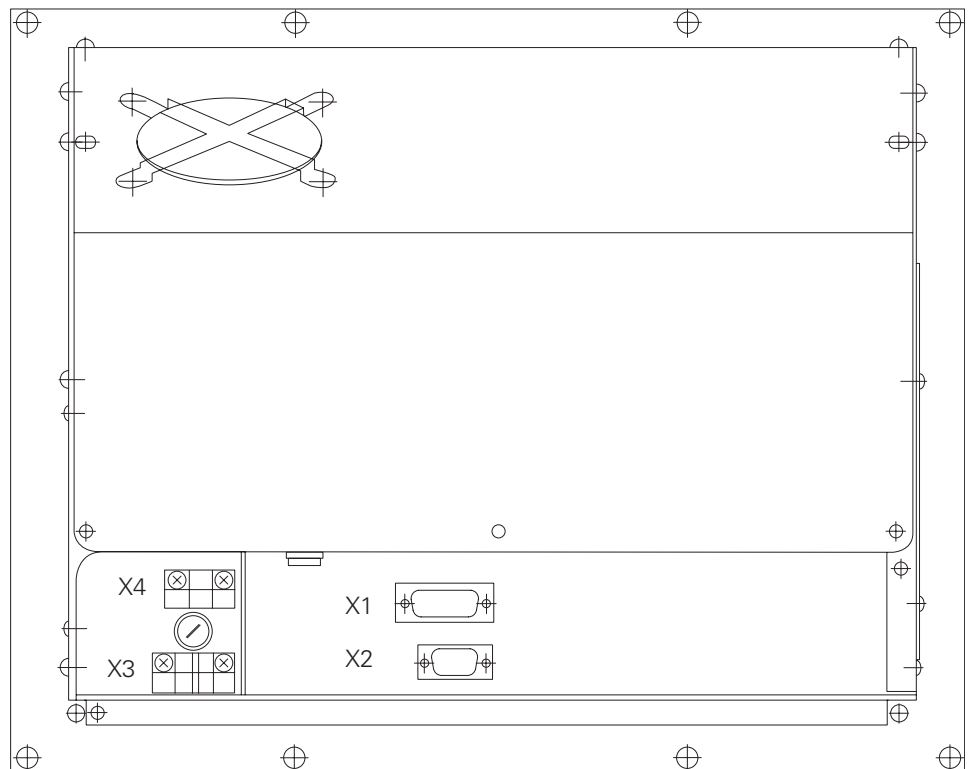
X2:
TNC operating
panel

Pin layout of logic unit, connecting cable, and TNC operating panel:

Logic unit		Connecting cable Id. Nr. 263 954-xx			
X45: D-sub connctn. (female) 37-pin	Assignment	D-sub cnctr. (male) 37- pin		D-sub cnctr. (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

6.4 Visual Display Units

6.4.1 BC 110B



Pin layouts

X1: Connection to logic unit

Logic unit Id. Nr. xxx xxx-3x		Connecting cable 250.477-xx			BC 110B
X43: D-sub connctn. (female) 15-pin 2-row	Assignment	D-sub connctr. (male) 15-pin 2-row		D-sub connctr. (female) 15-pin 2-row	X1: D-sub connctr. (male) 15-pin 2-row
1	GND	1		1	1
2	Do not assign	2		2	2
3	Do not assign	3		3	3
4	Do not assign	4		4	4
5	Do not assign	5		5	5
6	Do not assign	6		6	6
7	R	7	Coax red	7	7
8	Do not assign	8		8	8
9	HSYNC	9	Yellow	9	9
10	VSYNC	10	Pink	10	10
11	GND	11	Black	11	11
12	Do not assign	12		12	12
13	Do not assign	13		13	13
14	G	14	Coax green	14	14
15	B	15	Coax blue	15	15
Housing	External shield	Housing	External shield	Housing	Housing

X2: Connection of the soft keys of the VDU

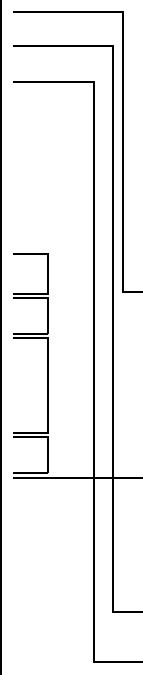
see "X1: Connection of the soft keys on the visual display unit" on page 130

X3: Line voltage connection

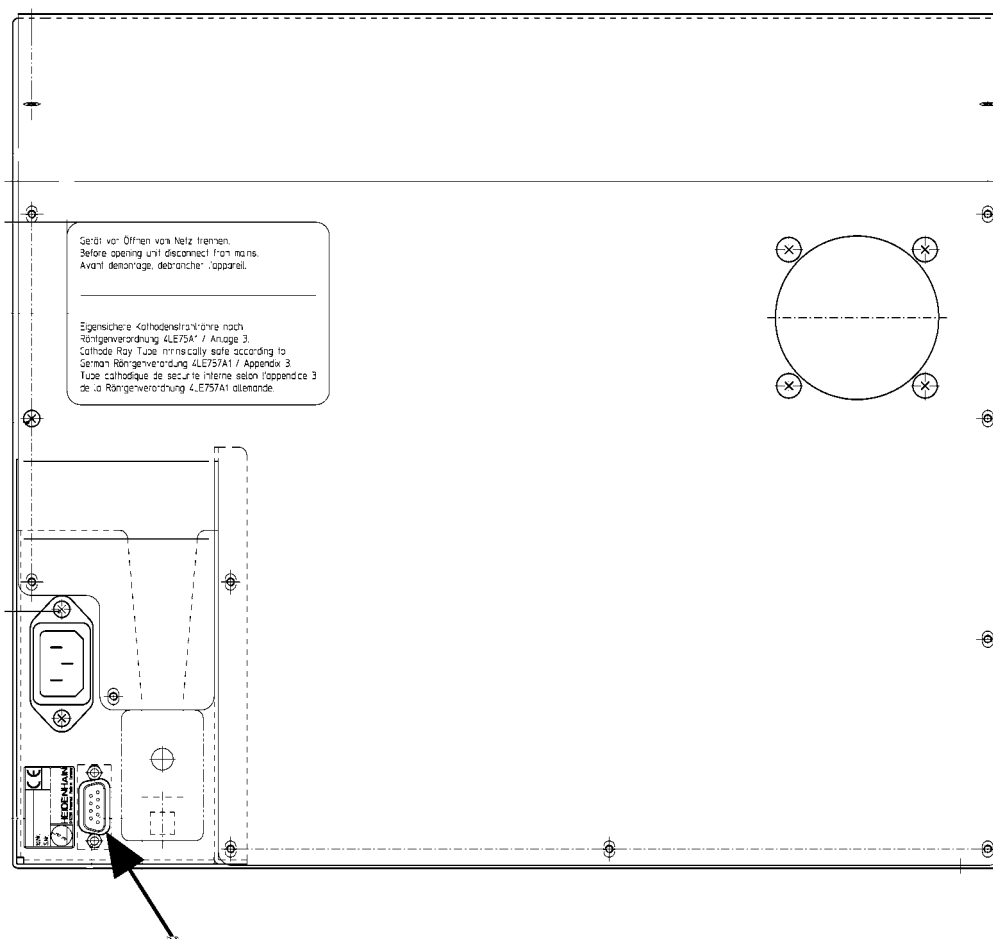
Clamping connector, 3-pin	Assignment
	According to lable

X4: Do not use

**X1: Connection to
logic unit**

Logic unit Id. Nr. xxx xxx-4x		Extension cable 312.878-xx			Adapter 313 434-01	BC 110B
X43: D-sub connctn. (female) 15-pin 3-row	Assignment	D-sub connctr. (male) 15-pin 3-row		D-sub connctr. (female) 15-pin 3-row	3-row/ 2-row	X1: D-sub connctr. (male) 15-pin 2-row
1	R	1	Coax I red	1		1
2	G	2	Coax I green	2		2
3	B	3	Coax I blue	3		3
4	Do not assign	4		4		4
5	Do not assign	5		5		5
6	GND	6	Coax S red	6		6
7	GND	7	Coax S GN	7		7
8	GND	8	Coax S blue	8		8
9	Do not assign	9		9		9
10	GND	10	Gray	10		10
11	GND	11	Green	11		11
12	Do not assign	12		12		12
13	HSYNC	13	Pink	13		13
14	VSYNC	14	Yellow	14		14
15	Do not assign	15		15		15
Housing	External shield	Housing	External shield	Housing	Housing	Housing

6.4.2 BC 120



Pin layouts

Line voltage connection via EURO connector

X2: Connection of the soft keys of the VDU

see "Pin layouts" on page 130

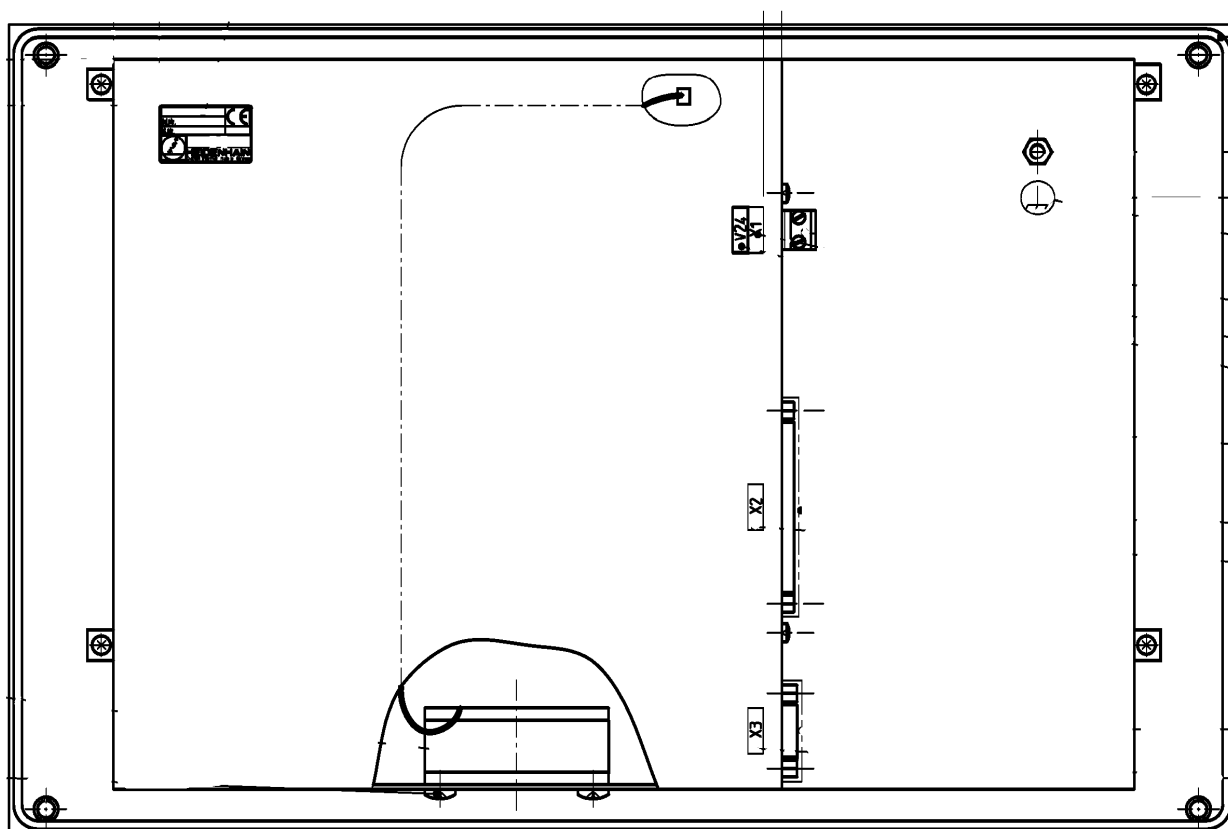
Connection to logic unit

Logic unit Id. Nr. xxx xxx-3x		Adapter 313 434-02	Extension cable 312.878-xx			BC 120
X43: D-sub connctn. (female) 15-pin 2-row	Assignment	2-row/ 3-row	D-sub connctr. (male) 15-pin 3-row		D-sub connctr. (female) 15-pin 3-row	D-sub connctr. (male) 15-pin 3-row
1	GND		1	Coax I red	1	1
2	Do not assign		2	Coax I green	2	2
3	Do not assign		3	Coax I blue	3	3
4	Do not assign		4		4	4
5	Do not assign		5		5	5
6	Do not assign		6	Coax S red	6	6
7	R		7	Coax S GN	7	7
8	Do not assign		8	Coax S blue	8	8
9	HSYNC		9		9	9
10	VSYNC		10	Gray	10	10
11	GND		11	Green	11	11
12	Do not assign		12		12	12
13	Do not assign		13	Pink	13	13
14	G		14	Yellow	14	14
15	B		15		15	15
Housing	External shield	Housing	Housing	External shield	Housing	Housing

Connection to logic unit

Logic unit Id. Nr. xxx xxx-4x		Connecting cable 312 878-xx			BC 120
X43: D-sub connctn. (female) 15-pin 3-row	Assignment	D-sub cnnctr. (male) 15-pin 3-row		D-sub connctr. (female) 15-pin 3-row	D-sub cnnctr. (male) 15-pin 3-row
1	R	1	Coax I red	1	1
2	G	2	Coax I green	2	2
3	B	3	Coax I blue	3	3
4	Do not assign	4		4	4
5	Do not assign	5		5	5
6	GND	6	Coax S red	6	6
7	GND	7	Coax S GN	7	7
8	GND	8	Coax S blue	8	8
9	Do not assign	9		9	9
10	GND	10	Gray	10	10
11	GND	11	Green	11	11
12	Do not assign	12		12	12
13	HSYNC	13	Pink	13	13
14	VSYNC	14	Yellow	14	14
15	Do not assign	15		15	15
Housing	External shield	Housing	External shield	Housing	Housing

6.4.3 BF 120



Connection layouts

X1 Power supply

Terminal block, plug compatible, 2-pin	Assignment
1	+24 V power supply
2	0 V

X3 Connection of soft keys to keyboard unit

see "Pin layouts" on page 130

X2: Connection to logic unit

Pin layout for the logic unit, the connecting cable, and the visual display unit:

Logic unit		Extension cable 312 876-xx			Connecting cable 312.875-xx			BF 120
X49: D-sub connection (female) 62-pin	Assignment	D-sub connctr. (male) 62-pin		D-sub connctr. (female) 62-pin	D-sub connctr. (male) 62-pin		D-sub connctr. (female) 62-pin	X2: D-sub connctr. (male) 62-pin
1	0 V	1	Gray/Black	1	1	Gray/Black	1	1
2	CLK.P	2	Brown/Black	2	2	Brown/Black	2	2
3	HSYNC	3	Green/Black	3	3	Green/Black	3	3
4	BLANK	4	Orange/Black	4	4	Orange/Black	4	4
5	VSYNC	5	Blue/Black	5	5	Blue/Black	5	5
6	0 V	6	Green/White	6	6	Green/White	6	6
7	R0	7	Orange/White	7	7	Orange/White	7	7
8	R1	8	Brown/White	8	8	Brown/White	8	8
9	R2	9	Gray/White	9	9	Gray/White	9	9
10	R3	10	Blue/White	10	10	Blue/White	10	10
11	0 V	11	Violet/White	11	11	Violet/White	11	11
12	G0	12	Violet/Brown	12	12	Violet/Brown	12	12
13	G1	13	Violet/Green	13	13	Violet/Green	13	13
14	G2	14	Violet/Orange	14	14	Violet/Orange	14	14
15	G3	15	Violet/Blue	15	15	Violet/Blue	15	15
16	0 V	16	Red/Gray	16	16	Red/Gray	16	16
17	B0	17	Red/Brown	17	17	Red/Brown	17	17
18	B1	18	Yellow/Gray	18	18	Yellow/Gray	18	18
19	B2	19	Yellow/Brown	19	19	Yellow/Brown	19	19
20	B3	20	Yellow/Green	20	20	Yellow/Green	20	20
21	0 V	21	Free	21	21	Free	21	21
22	0 V	22	Black/Gray	22	22	Black/Gray	22	22
23	CLP.P	23	Black/Brown	23	23	Black/Brown	23	23
24	HSYNC	24	Black/Green	24	24	Black/Green	24	24
25	BLANK	25	Black/Orange	25	25	Black/Orange	25	25

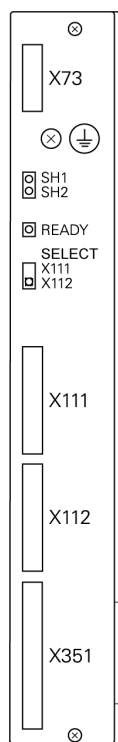
Logic unit		Extension cable 312 876-xx			Connecting cable 312.875-xx			BF 120
X49: D-sub connection (female) 62-pin	Assignment	D-sub connctr. (male) 62-pin		D-sub connctr. (female) 62-pin	D-sub connctr. (male) 62-pin		D-sub connctr. (female) 62-pin	X2: D-sub connctr. (male) 62-pin
26	VS $\overline{\text{Y}}\text{NC}$	26	Black/Blue	26	26	Black/Blue	26	26
27	0 V	27	White/Green	27	27	White/Green	27	27
28	R $\overline{0}$	28	White/Orange	28	28	White/Orange	28	28
29	R $\overline{1}$	29	White/Brown	29	29	White/Brown	29	29
30	R $\overline{2}$	30	White/Gray	30	30	White/Gray	30	30
31	R $\overline{3}$	31	White/Blue	31	31	White/Blue	31	31
32	0 V	32	Gray/Violet	32	32	Gray/Violet	32	32
33	G $\overline{0}$	33	Brown/Violet	33	33	Brown/Violet	33	33
34	G $\overline{1}$	34	Green/Violet	34	34	Green/Violet	34	34
35	G $\overline{2}$	35	Orange/Violet	35	35	Orange/Violet	35	35
36	G $\overline{3}$	36	Blue/Violet	36	36	Blue/Violet	36	36
37	0 V	37	Gray/Red	37	37	Gray/Red	37	37
38	B $\overline{0}$	38	Brown/Red	38	38	Brown/Red	38	38
39	B $\overline{1}$	39	Gray/Yellow	39	39	Gray/Yellow	39	39
40	B $\overline{2}$	40	Brown/Yellow	40	40	Brown/Yellow	40	40
41	B $\overline{3}$	41	Green/Yellow	41	41	Green/Yellow	41	41
42	0 V	42	Free	42	42	Free	42	42
43	DISP. LOW	43	Red/Blue	43	43	Red/Blue	43	43
44	DISP. LOW	44	Blue/Red	44	44	Blue/Red	44	44
45	DISP.ON	45	Red/Orange	45	45	Red/Orange	45	45
46	DISP.ON	46	Orange/Red	46	46	Orange/Red	46	46
47	C0	47	Green/Red	47	47	Green/Red	47	47
48	C1	48	Red/Green	48	48	Red/Green	48	48
49	C2	49	Orange/Yellow	49	49	Orange/Yellow	49	49
50	C3	50	Yellow/Orange	50	50	Yellow/Orange	50	50
51	C4	51	Yellow/Blue	51	51	Yellow/Blue	51	51
52	C5	52	Blue/Yellow	52	52	Blue/Yellow	52	52

Logic unit		Extension cable 312 876-xx			Connecting cable 312.875-xx			BF 120
X49: D-sub connection (female) 62-pin	Assignment	D-sub cnnctr. (male) 62-pin		D-sub cnnctr. (female) 62-pin	D-sub cnnctr. (male) 62-pin		D-sub cnnctr. (female) 62-pin	X2: D-sub cnnctr. (male) 62-pin
53 to 56	Do not assign	53 to 56	Free	53 to 56	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	Free	57 to 62	57 to 62
Housing		Housing		Housing	Housing		Housing	Housing

6.5 Interface Card for Simodrive 611D

6.5.1 Interface card Id.Nr. 324 955-xx

Overview of 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 TNC

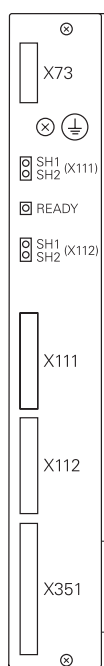
see "X51 to X59: Outputs to motor power stage LE 426 M LE 430 M" on page 120

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)	<ul style="list-style-type: none"> ■ 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 normal aus	<p>No controller enable for axis via LE. With PLC module 9161, the LE sets the axis-specific internal current and speed controller (X111 or X112 Pin 4a high).</p> <ul style="list-style-type: none"> ■ Speed and current controller are not active? ■ Clamping axis clamped? ■ No M function active for spindle?

6.5.2 Interface card Id.Nr. 313.437-xx

Overview of LEDs and connectors



Designation

Operating element

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

Pin layout X111, X112 Connection to TNC

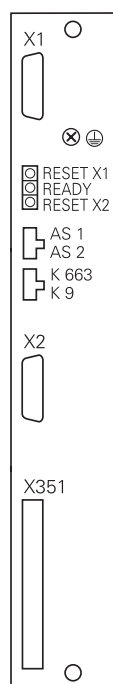
see "X51 to X59: Outputs to motor power stage LE 426 M LE 430 M" on page 120

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)	<ul style="list-style-type: none"> ■ 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 normal aus	<p>No controller enable for axis via LE. With PLC module 9161, the LE sets the axis-specific internal current and speed controller (X111/X112 pin 4a high).</p> <ul style="list-style-type: none"> ■ Speed and current controller are not active? ■ Clamping axis clamped? ■ No M function active for spindle?

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

Overview of LEDs and connectors



Designation

Element

X1	Connection of LE
	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 LE
X351	SIMODRIVE unit bus

Pin layout X1, X2 Connection to TNC

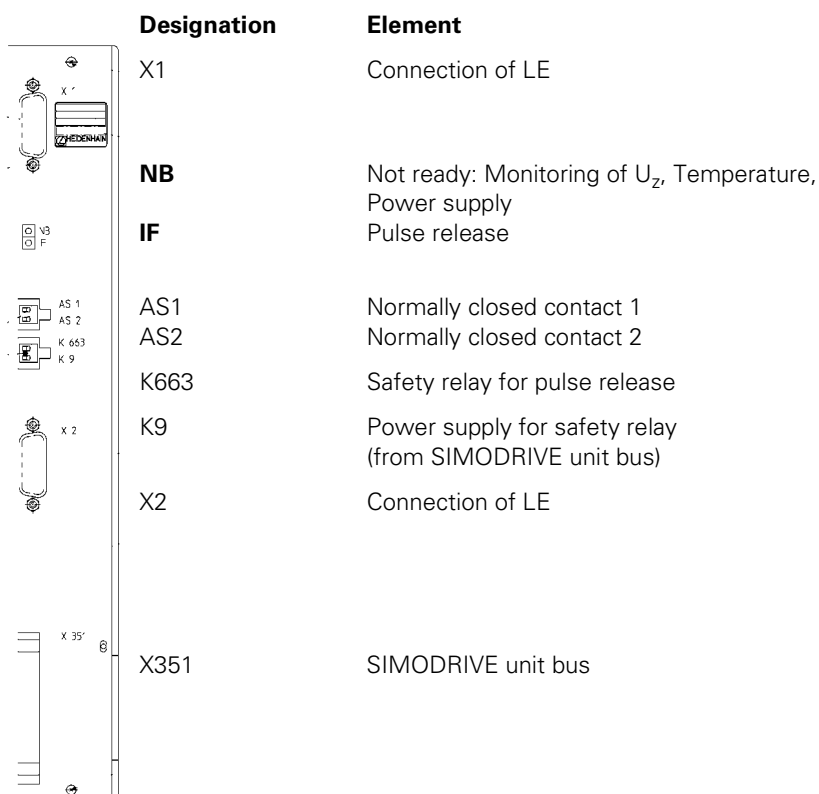
see "X51 to X56: Outputs to motor power stage LE 426 PB LE 430 PA" on page 119

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)	<ul style="list-style-type: none"> ■ 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 normal aus	No controller enable for axis via LE. Path for PWM signals not enabled. With PLC module 9161, the LE sets the axis-specific internal current and speed controller (X1 pin 5 high).
RESET X2 (red)	LED normal aus	No controller enable for axis via LE. Path for PWM signals not enabled With PLC module 9161, the LE sets the axis-specific internal current and speed controller (X2 pin 5 high).

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

Overview of LEDs and connectors



Pin layout X1, X2 Connection to TNC

see "X51 to X56: Outputs to motor power stage LE 426 PB LE 430 PA" on page 119

Description of LEDs

LED	Condition	Meaning/Possible causes of error
IF (green),	LED On (operating state)	Pulse enable
	LED Off (error)	<ul style="list-style-type: none"> ■ 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)	<ul style="list-style-type: none"> ■ 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)?

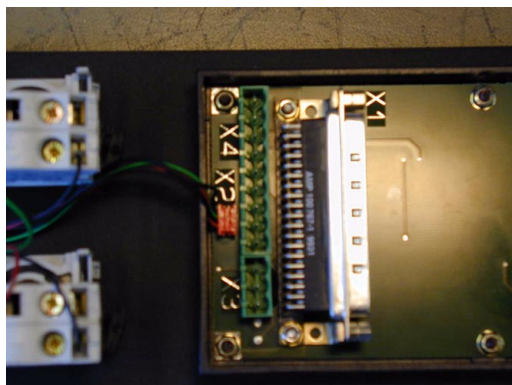


Note

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.

6.6 Machine Operating Panel

6.6.1 MB 420



Pin layout

X1: Connection to logic unit

Logic unit		Connecting cable Id. Nr. 263 954-xx			MB 420	
X46: D-sub cnnctr. (female) 37-pin	Assignment	D-sub cnnctr. (male) 37-pin		D-sub cnnctr. (female) 37-pin	X1: D-sub cnnctr. (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	FN1
12	I139	12	Pink/Brown	12	12	FN2
13	I140	13	Yellow/Blue	13	13	FN3
14	I141	14	Green/Blue	14	14	FN4
15	I142	15	Yellow	15	15	FN5
16	I143	16	Red	16	16	Spindle on
17	I144	17	Gray	17	17	Spindle off
18	I145	18	Blue	18	18	Coolant On/Off
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	Black
23	I150	23	White/Pink	23	23	Black
24	I151	24	Gray/Green	24	24	Via X3
25	I152	25	Yellow/Brown	25	25	Via X3

Logic unit		Connecting cable Id. Nr. 263 954-xx			MB 420	
X46: D-sub cnctr. (female) 37-pin	Assignment	D-sub cnctr. (male) 37-pin		D-sub cnctr. (female) 37-pin	X1: D-sub cnctr. (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	0 V (PLC)	34	Brown	34	34	
35	0 V (PLC)	35	Yellow/Pink	35	35	
36	+24 V (PLC)	36	Violet	36	36	
37	+24 V (PLC)	37	White	37	37	
Housing	External shield	Housing	External shield	Housing	Housing	

X3: PLC inputs

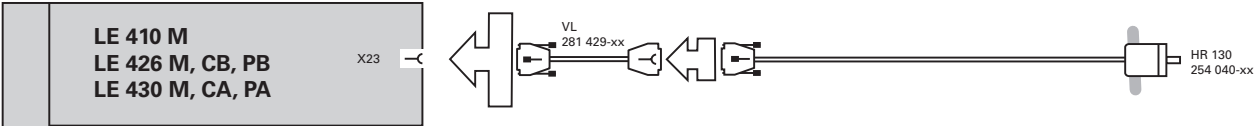
Terminal	Assignment
1	I151
2	I152
3	+24 V

X4: PLC outputs

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

6.7 Handwheels

6.7.1 HR 130 (Panel-mounted handwheel)



Pin layouts

X23: Handwheel input

Pin layout of the logic unit:

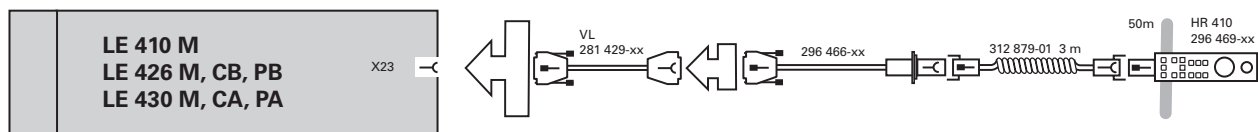
D-sub connection (female) 9-pin	Assignment
1	CTS
2	0 V
3	RTS
4	+12 V ± 0.6 V (U _V)
5	Do not assign
6	DTR
7	TxD
8	RxD
9	DSR
Housing	External shield

Pin layout for extension cable and handwheel:

Extension cable Id. Nr. 281 429-xx			HR 130 Id. Nr. 254.040-xx	
D-sub connctr. (male) 9-pin	Color	D-sub connctr. (female) 9-pin	D-sub connctr. (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		



6.7.2 HR 410 (Portable handwheel)



Pin layouts

X23: Handwheel input

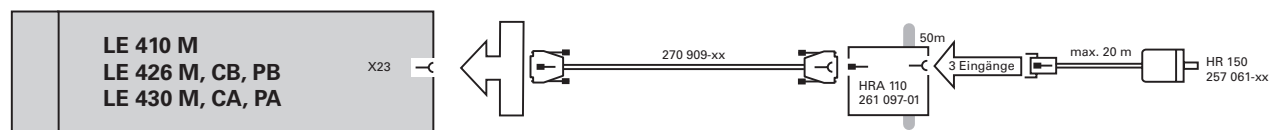
Pin layout of the logic unit:

D-sub connection (female) 9-pin	Assignment
1	CTS
2	0 V
3	RTS
4	+12 V \pm 0.6 V (U_V)
5	Do not assign
6	DTR
7	$\overline{\text{TxD}}$
8	$\overline{\text{RxD}}$
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			Connecting cable			HR 410 Id. Nr. 296 469-xx	
D-sub cnnctr. (male) 9-pin		D-sub cnnctr. female 9-pin	D-sub cnnctr. (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	White	2	2	White	E	E	White	E	E	
4	Brown	4	4	Brown	D	D	Brown	D	D	
6	Yellow	6	6	Yellow	B	B	Yellow	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			

6.7.3 HRA 110 (Multi-axis handwheel)



Pin layout

X1, X2, X3: Inputs for the 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 the logic unit

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

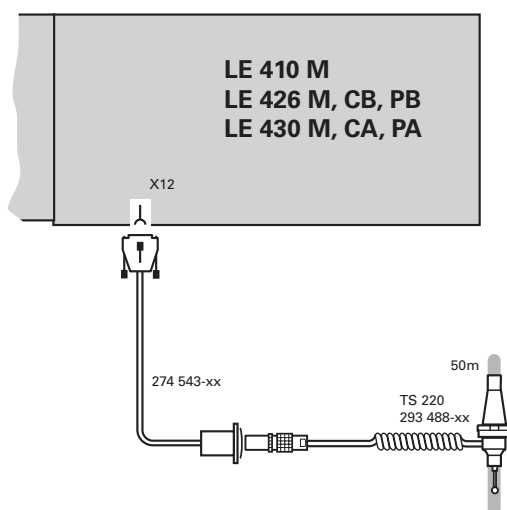
Pin layout on the HRA 110:

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.

6.8 Touch Probe Systems

6.8.1 TS 220

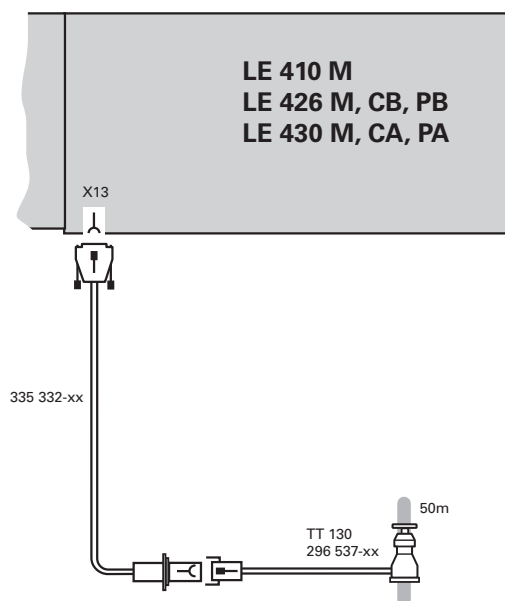


Pin layout

LE, X12		Adapter cable 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 \pm 10% (U_P), max. 100 mA	5	Gray	3	3	
6	+5 V \pm 5% (U_P), max. 100 mA	6	Brown/ Green	2	2	Brown
7	Battery warning	7	Gray			
8	0 V (U_N)	8	White/Green	1	1	White
9	Trigger signal	9	Green	5	5	Green
10	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.

6.8.2 TT 130



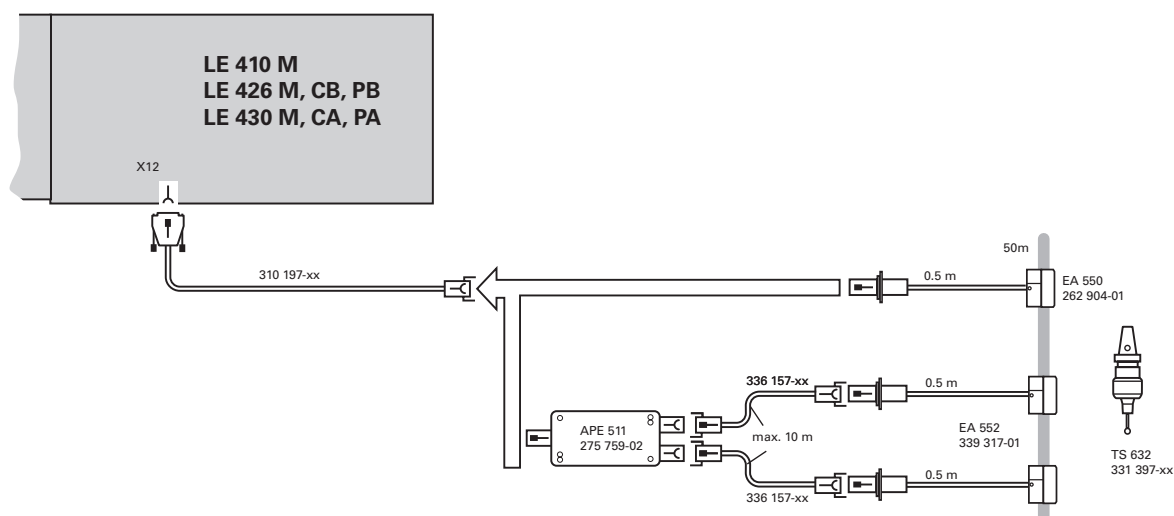
Pin layout

Pin layout on adapter cable and touch probe:

LE, X13		Adapter cable 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 \pm 5% (U_P)	4	Brown/Green	2	2	Brown
5	Do not assign	5		5	5	
6	Do not assign	6				
7	+5 V \pm 5% (U_P)	7				
8	Trigger signal	8	Brown	3	3	Green
9	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.

6.8.3 TS 630 / TS 632



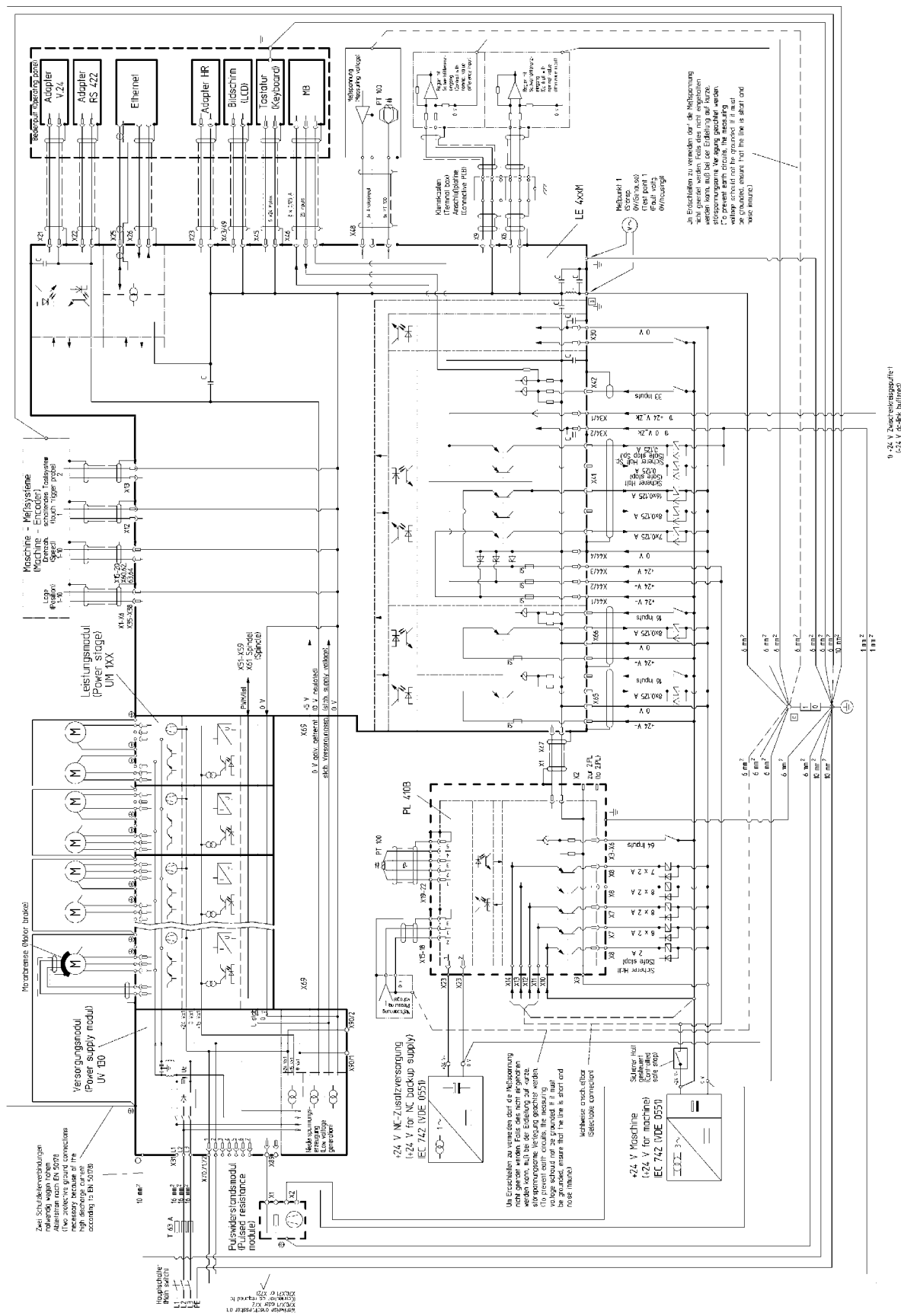
Pin layout

LE, X12		Adapter cable 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 \pm 10% (U_P), max. 100 mA	5	Gray	3	3	
6	+5 V \pm 5% (U_P), max. 100 mA	6	Brown/ Green	2	2	Brown
7	Battery warning	7	Gray			
8	0 V (U_N)	8	White/Green	1	1	White
9	Trigger signal	9	Green	5	5	Green
10	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.

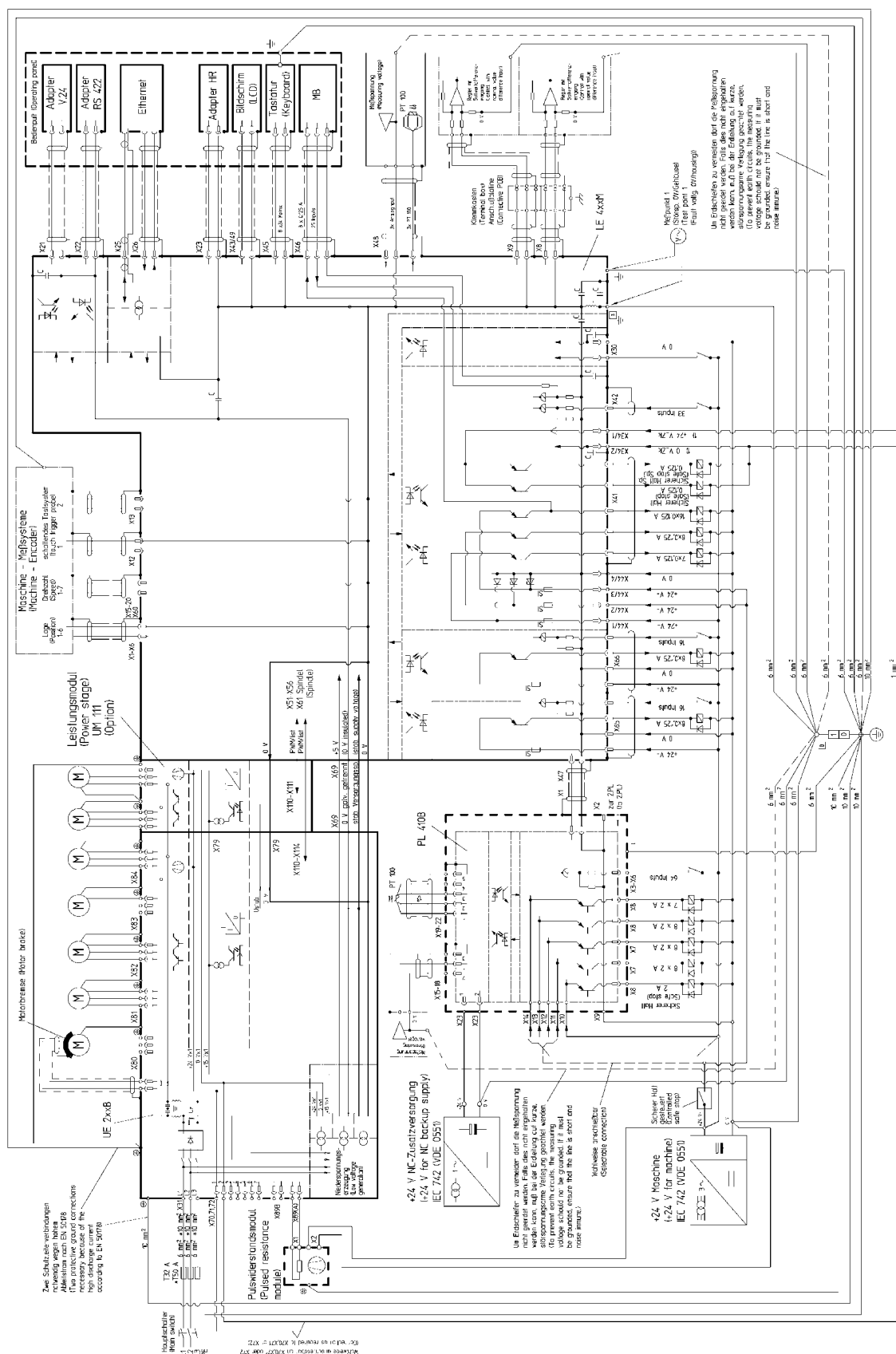
Pin layout for TS 632 with two EA 552 via the APE 511:

LE	Adapter cable 310 197-xx	APE 511 275.759-xx		Connecting cable 336 157-xx			EA 552 339 317-xx		TS 632
		Male	Female	Male	Color	Female	Male	Color	
See TS 632 with EA 550 for the layout		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.		

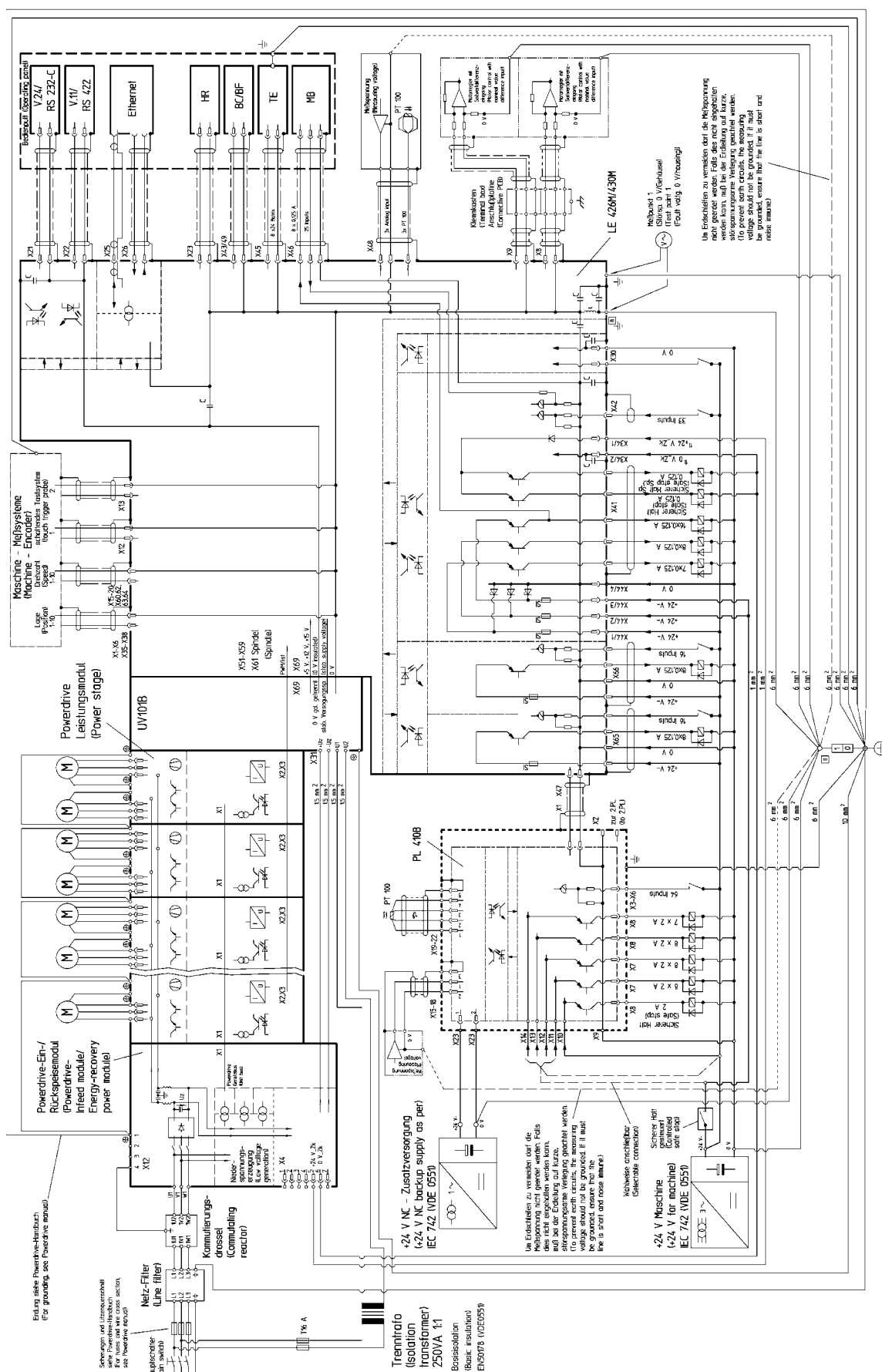


7-157



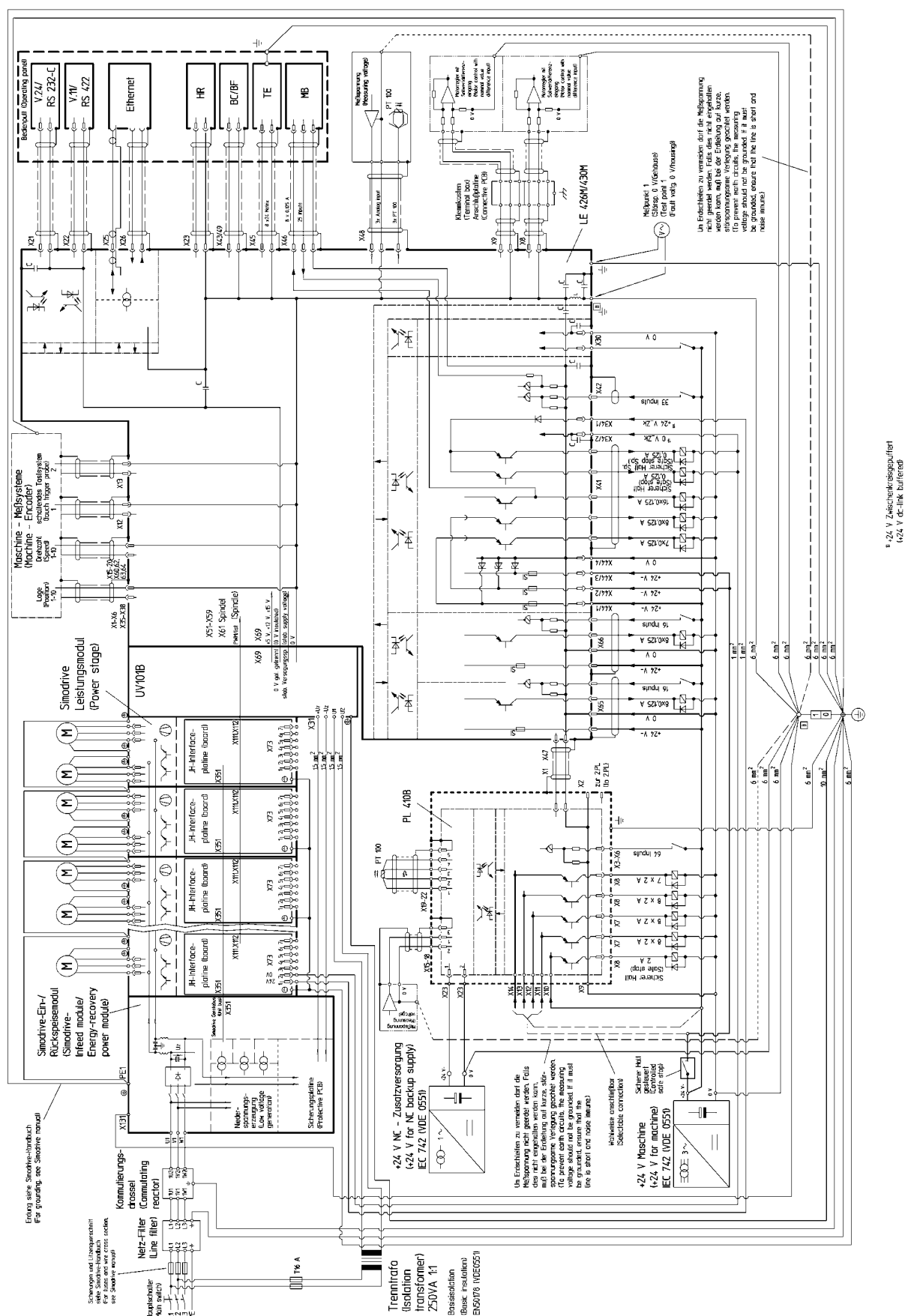
+24 V Zwischenkreisgepuffert
(+24 V dc-link buffered)

gültig für UE2308,2408,2423
(Applies to UE2308,2408,2423)
x89B bei UE2308,UE2408,UE2423 nicht vorhanden
(x89B does not exist with UE2308,UE2408,UE2423)



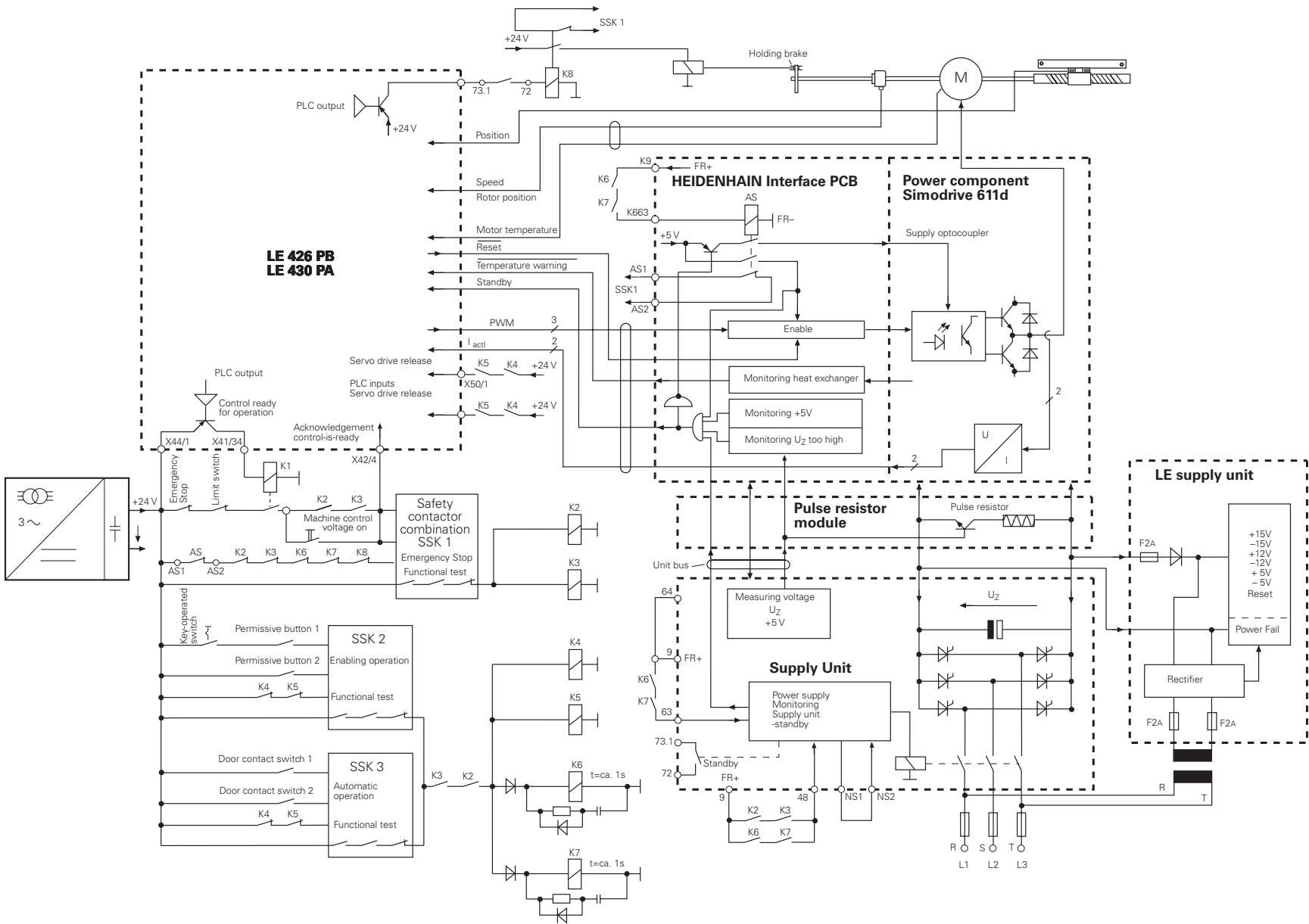
^b +24 V Zwischenkreisegepuffert
(+24 V dc-link buffered)

2209E1 01 A 0E

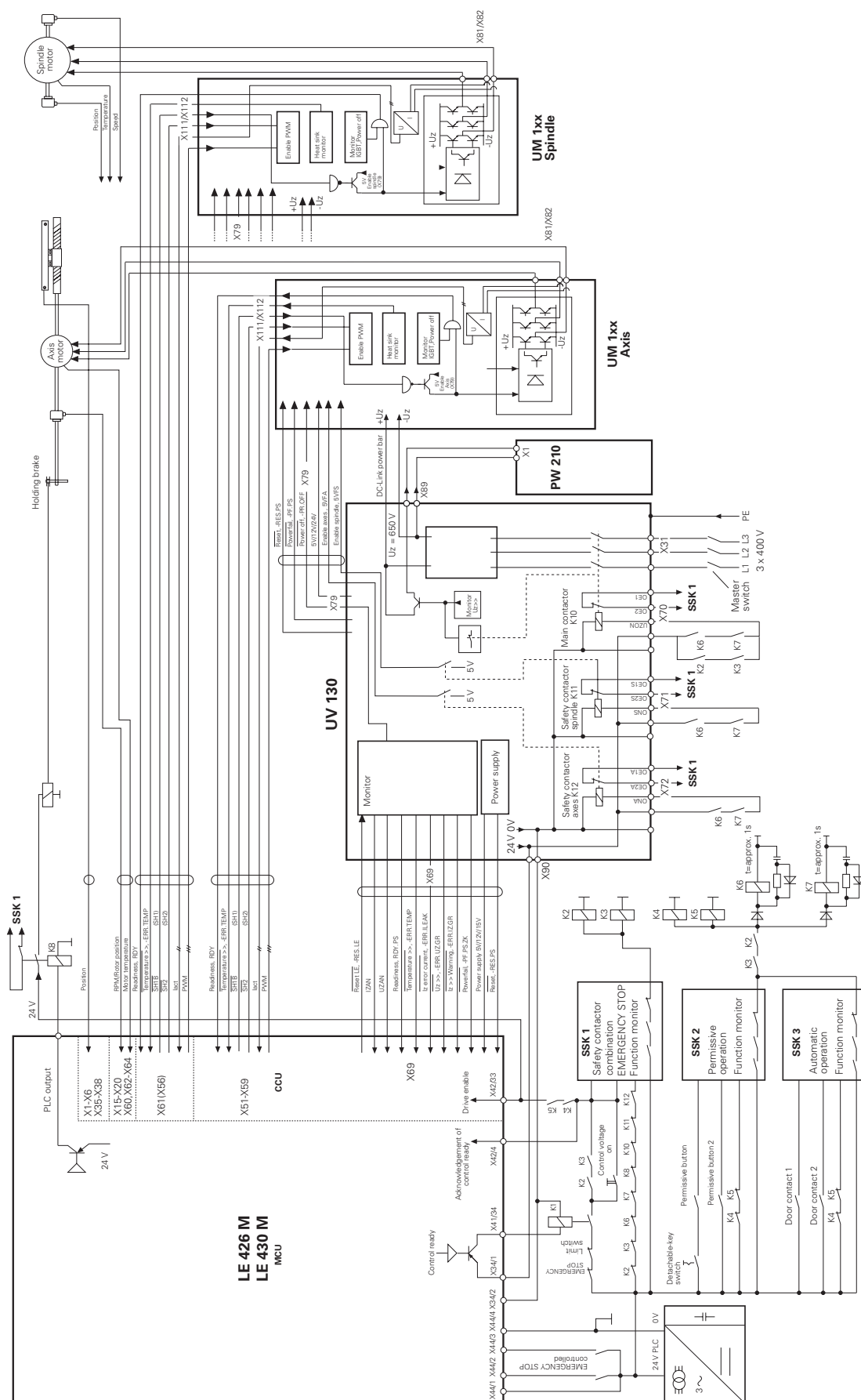


7.2 Basic Circuit Diagrams

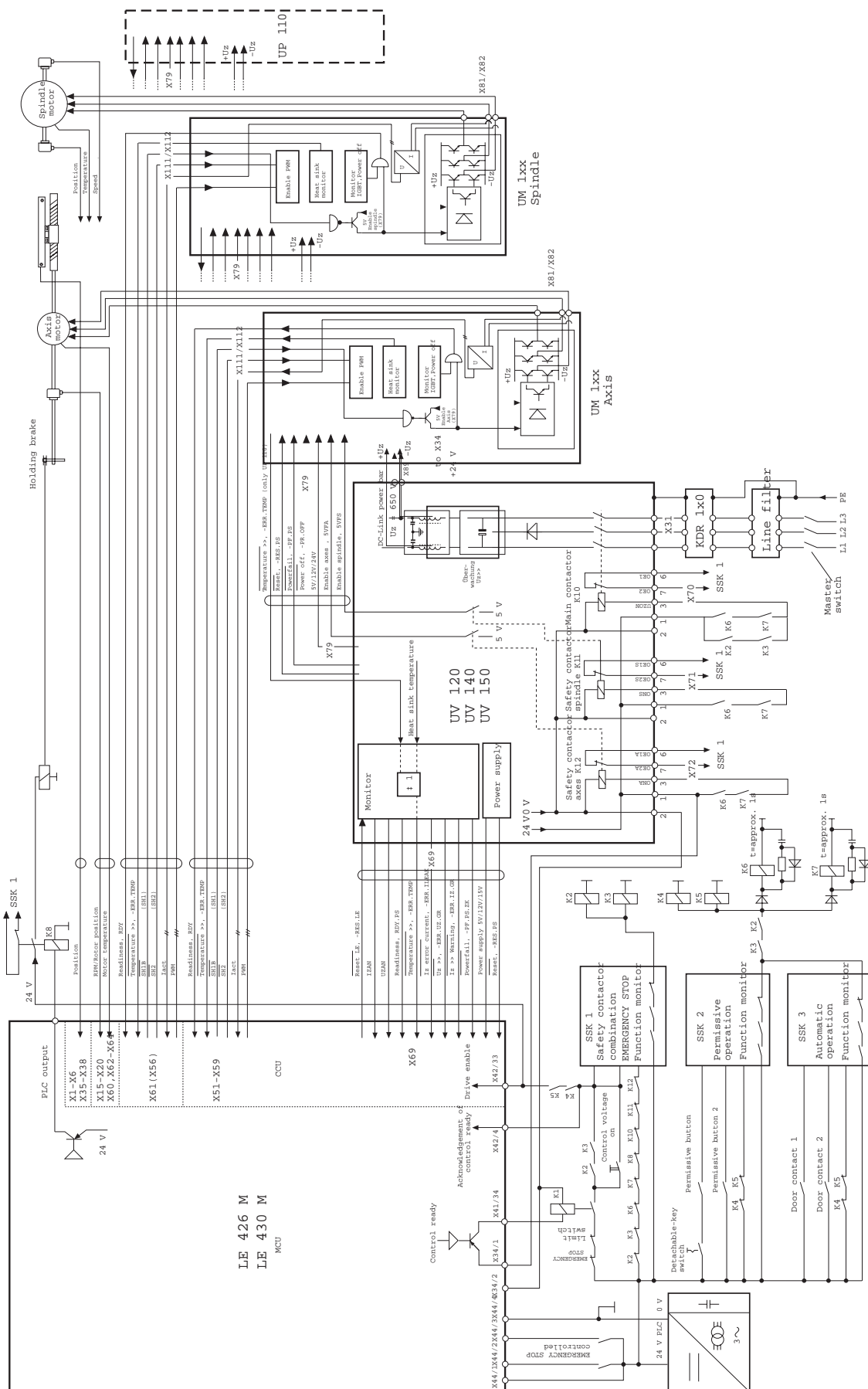
TNC 430 PB, TNC 426 PA

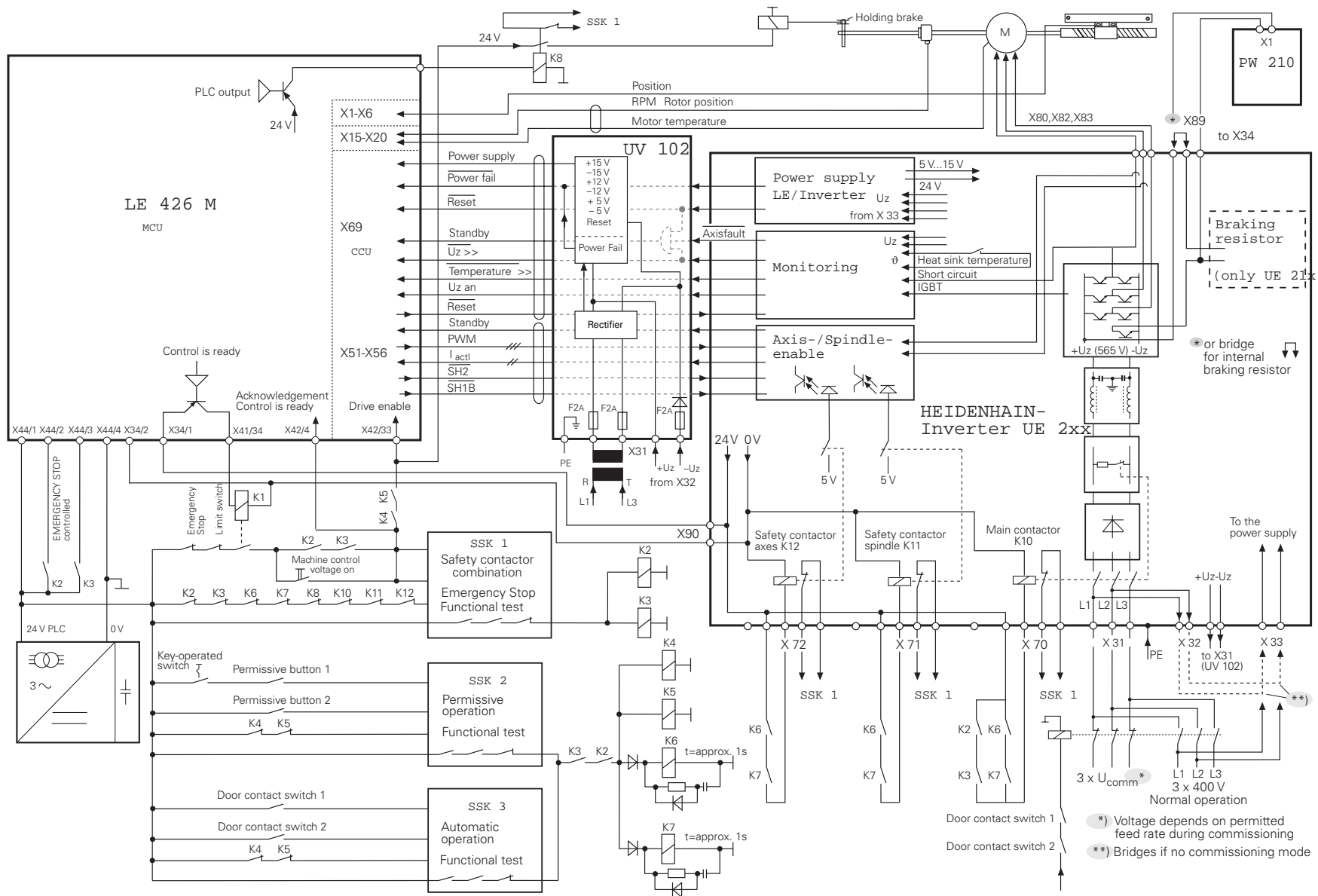


TNC 426 M, TNC 430M with modular non-regenerative HEIDENHAIN inverter



TNC 426 M, TNC 430 M with modular regenerative HEIDENHAIN inverter



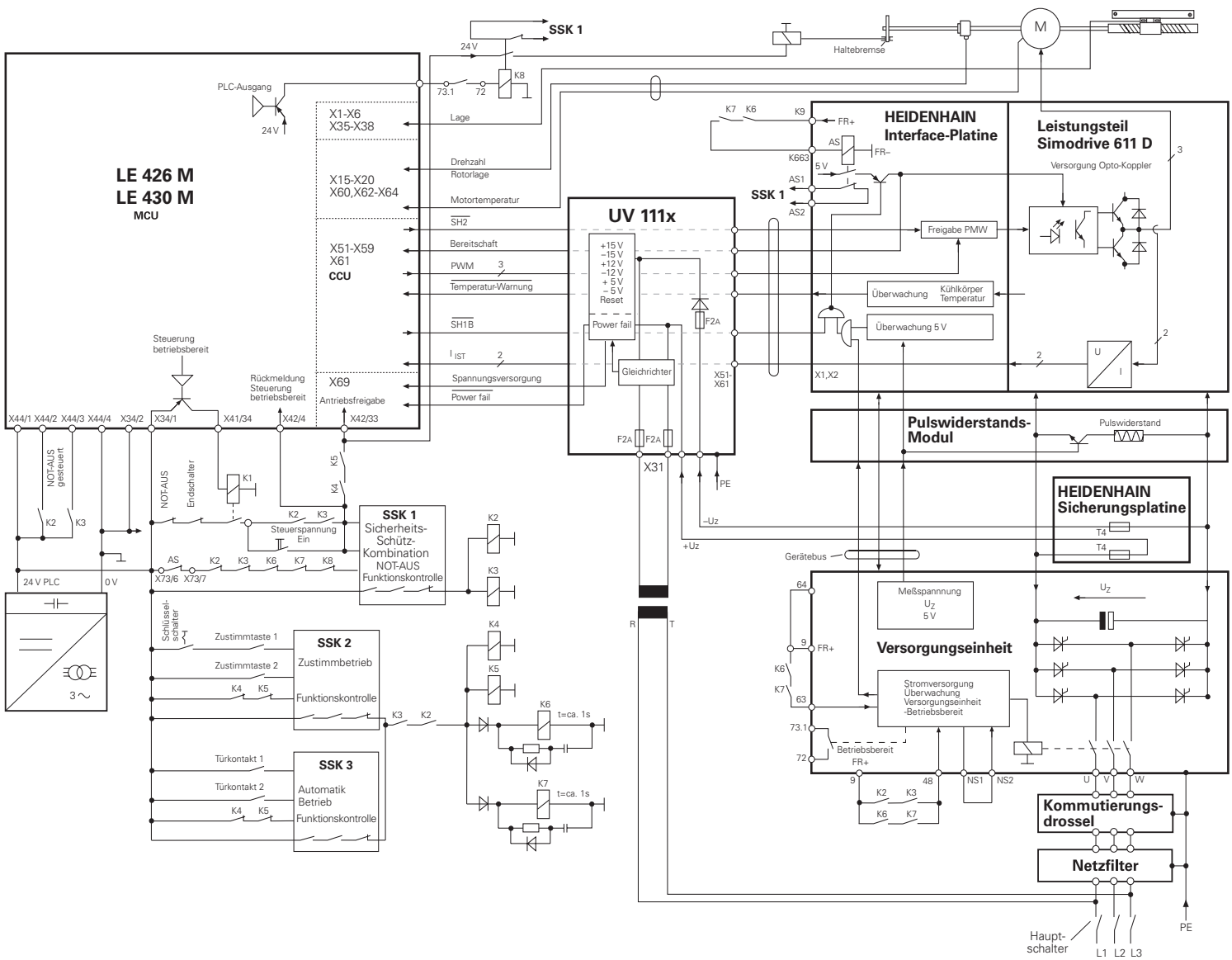


TNC 426 M, TNC 430 M with HEIDENHAIN compact inverter UE 2xx with UV 102



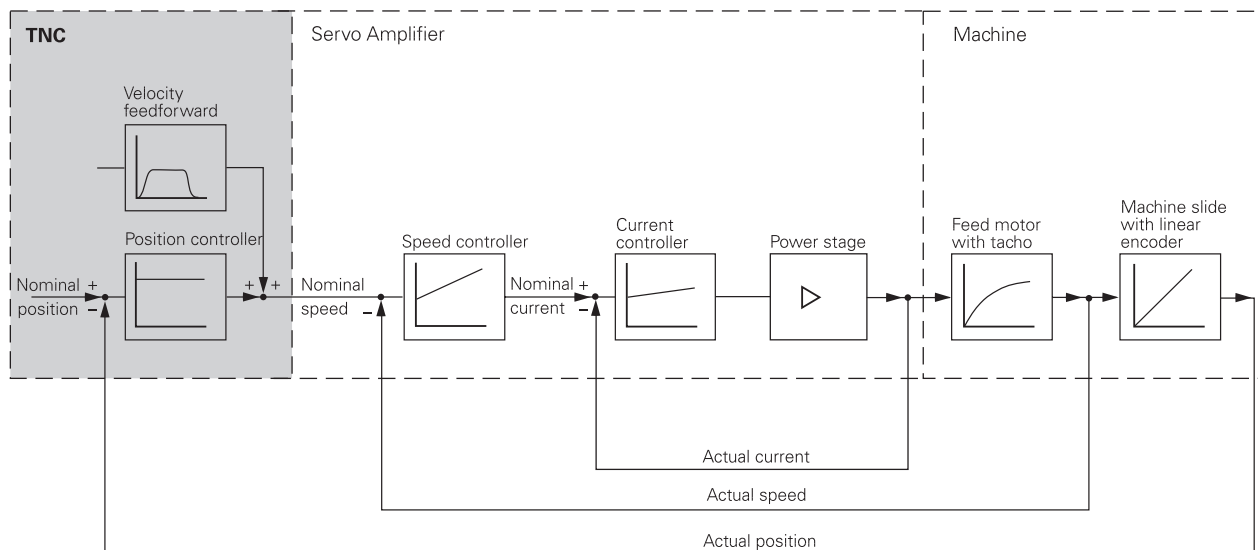
7 - 166



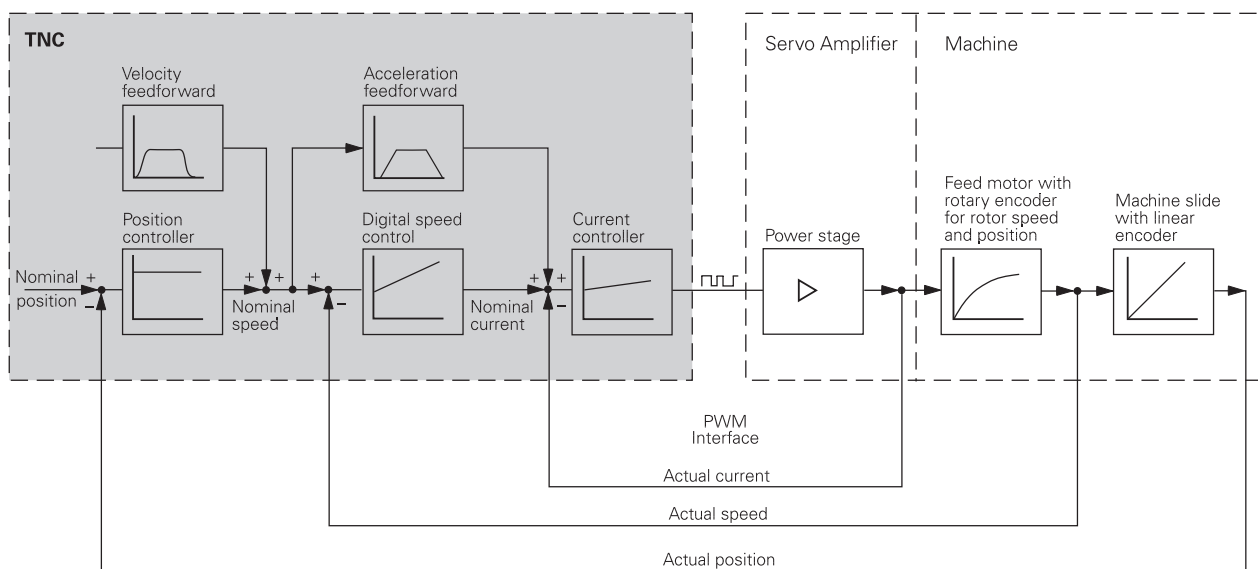


7.3 Block Diagrams

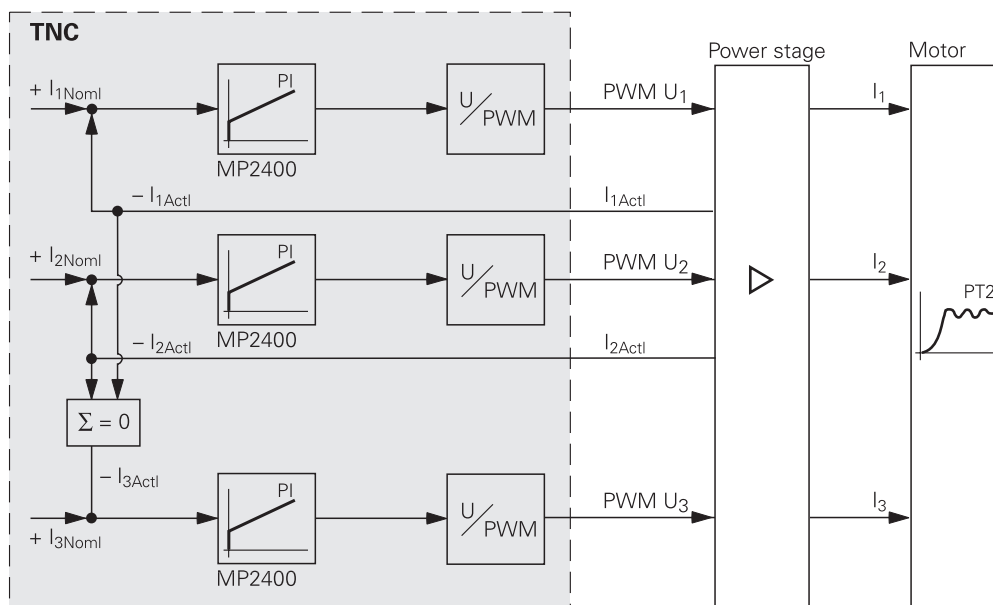
Analog axis/spindle



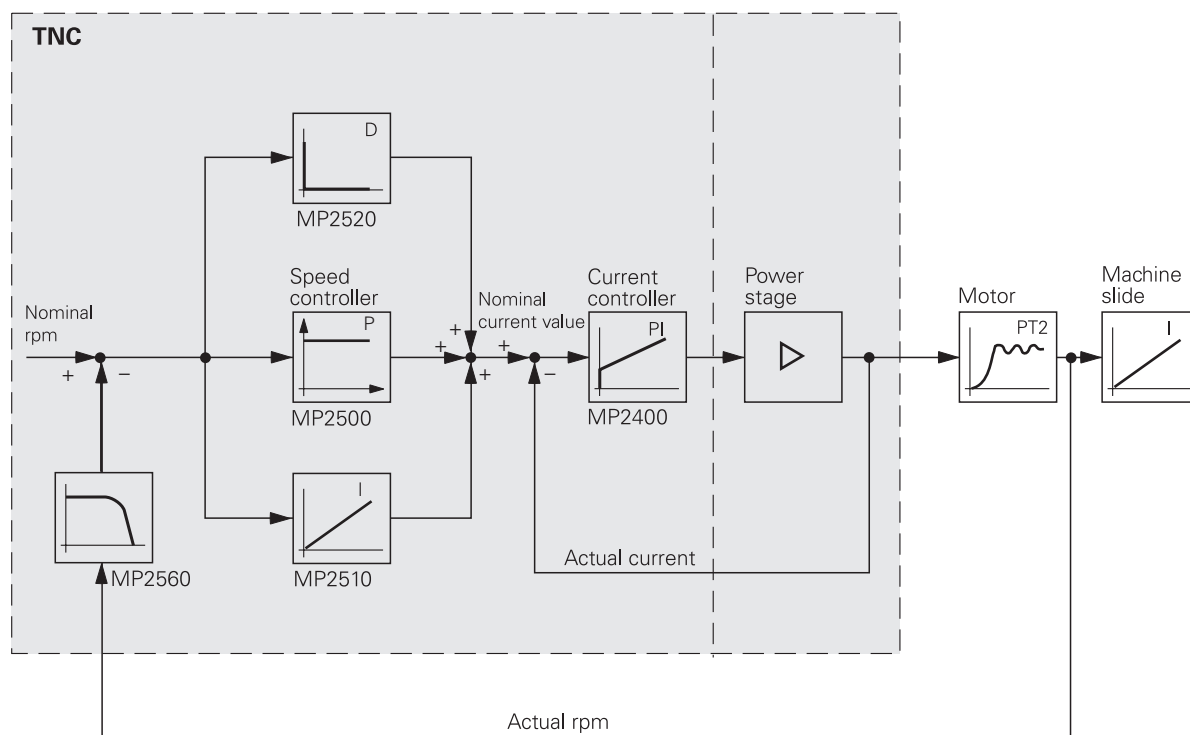
Digital axis/spindle



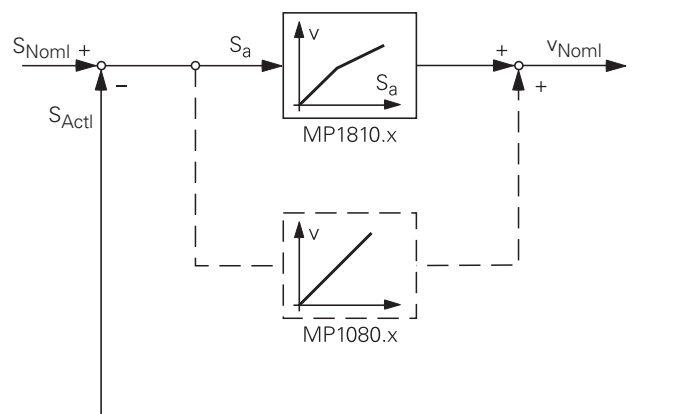
Block diagram of the current controller



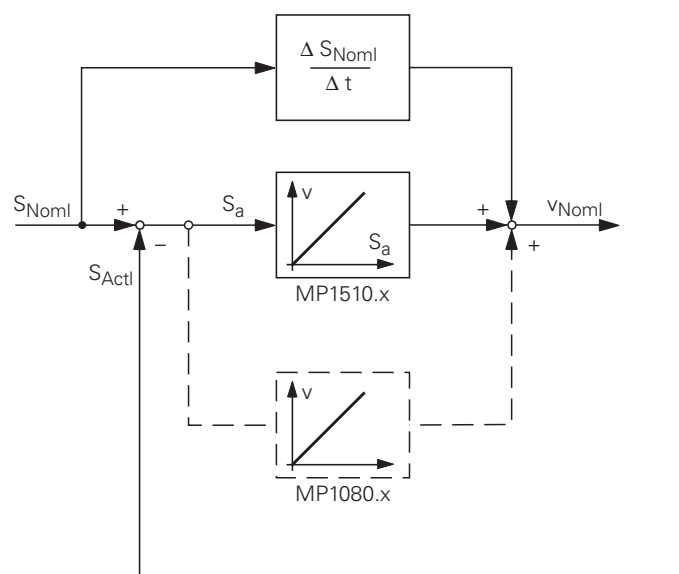
Block diagram of the speed controller



**Block diagram of
position feedback
control with servo
lag**



**Block diagram of
position feedback
control with
velocity
feedforward control**



8 Power Supply

8.1 LE 426 CB/430 CA



DANGER


Danger of electrical shock!

High voltages and currents

8.1.1 Dc-link power supply

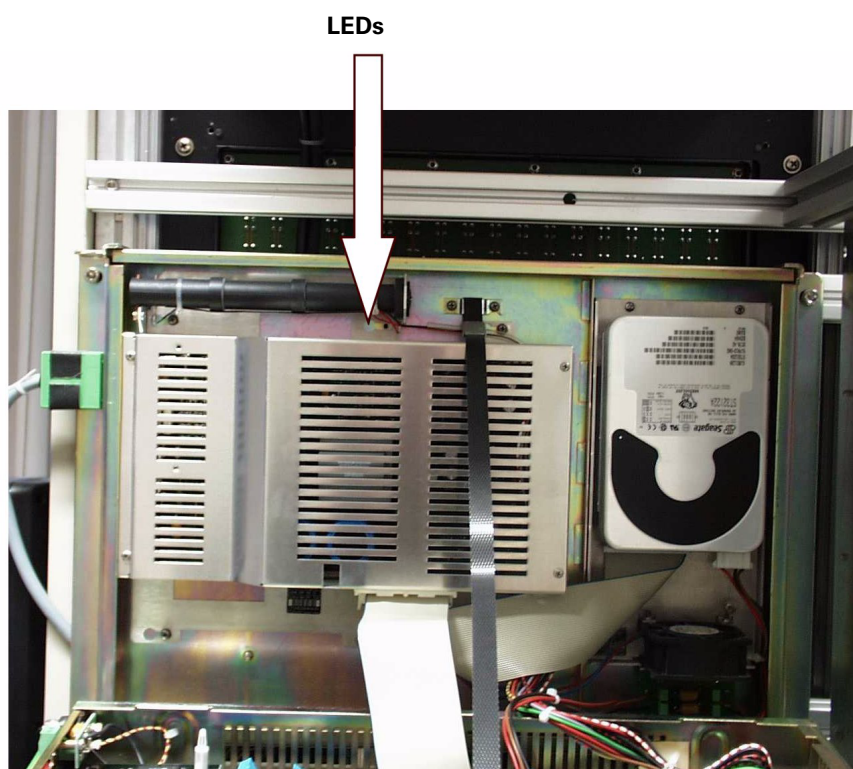
X31 NC power supply

Power is supplied to the logic unit via connection X31, terminal U1/U2. The terminals -U_z/+U_z are not connected.

Connecting terminals	Assignment	LE 426 CB, LE 430 CA
	Equipment ground (YL/GY)	
U ₁	Phase 1	140 Vac to 450 Vac 50 to 60 Hz
U ₂	Phase 2	
-U _z	Free	
+U _z	Free	

Position of the dc-link power supply

The power supply assembly (dc-link power supply) can be found on the inside of the logic unit housing.



Service diagnosis for dc-link power supply

LEDs

When checking the power supply unit, proceed as follows:

- Open the housing of the logic unit.



DANGER

Danger of electrical shock!

High voltages and currents

- Check the LEDs on the power supply board when the logic unit is switched on.
- Is the second LED from left lit up (+ 5 V)?
- Is the third LED lit up (- RES)?



Note

If one of the LEDs is not lit up, either the power supply is below the minimum limit or the power supply unit is defective.

Supply lines U1/U2



- Check the supply lines U1/U2 at connection X31.

DANGER

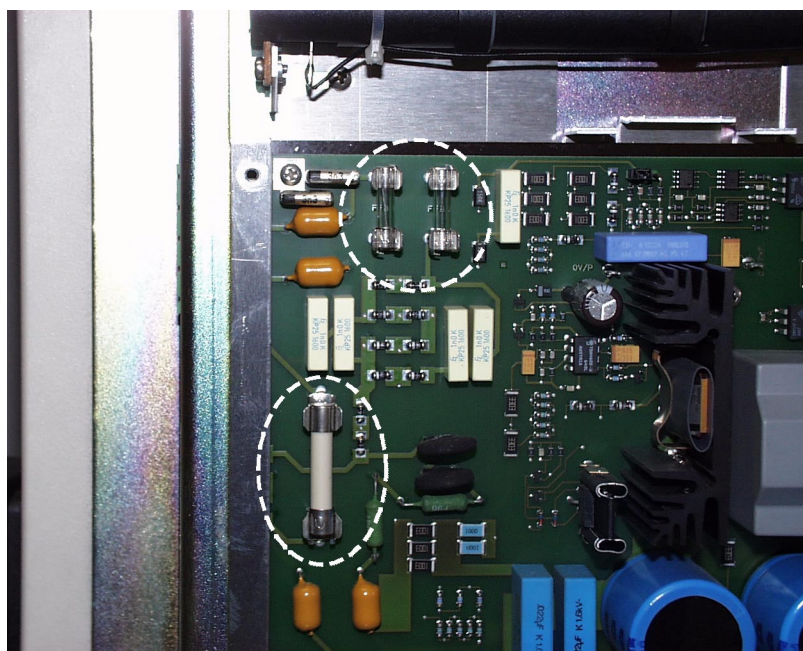
Danger of electrical shock!

High voltages and currents

- Does power supply exist?
- Is connection fixed tightly?
- Are the contacts on the connector / socket in order?

Fuses

- Switch off the main switch of the machine.
- Open the housing of the logic unit.
- Remove the cover from the power supply assembly.
- Check the fuses on the power supply board.



Note

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

8.2 LE 426 PB / 430 PA



DANGER


Danger of electrical shock!

High voltages and currents

8.2.1 Dc-link power supply

X31 NC power supply

Power is supplied to the logic unit via connection X31, terminal U1/U2 and -U_z/+U_z.

Connecting terminals	Assignment	LE 426 PB, LE 430 PA
	Equipment ground (YL/GY)	
U ₁	Phase 1	330 Vac to 450 Vac via isolating transformer. 50 to 60 Hz
U ₂	Phase 2	
-U _z	dc-link voltage -	385 Vdc to 660 Vdc
+U _z	dc-link voltage +	

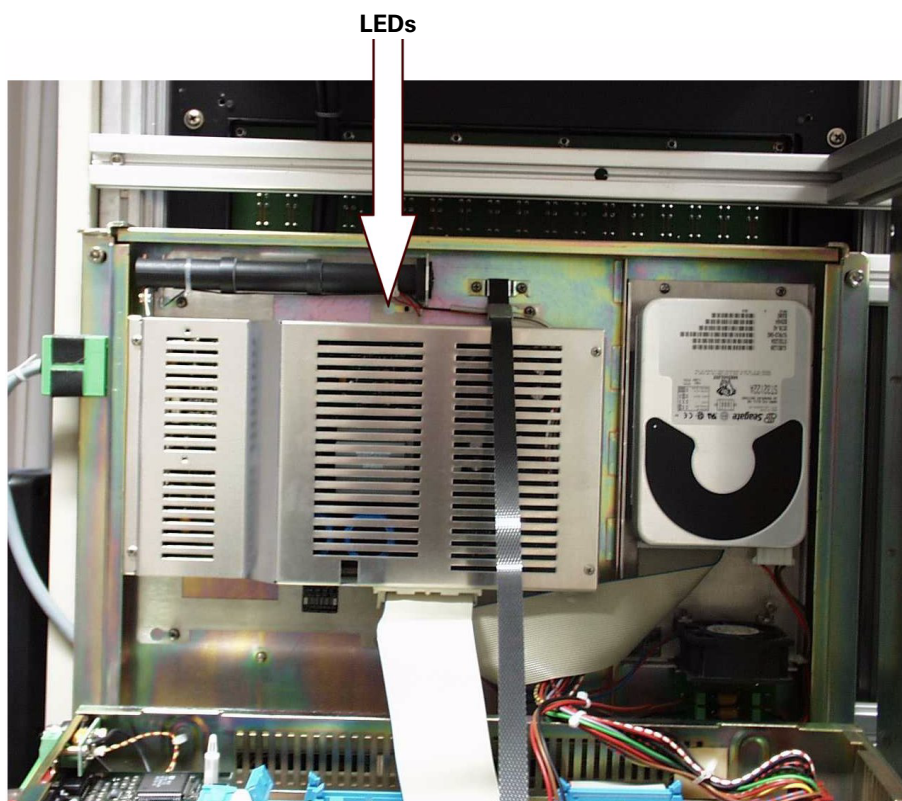


Note

Depending on the machine manufacturer, the connections may differ (e.g. U_z+ / U_z- open).

Position of the dc-link power supply

The power supply assembly (dc-link power supply) can be found on the inside of the logic unit housing.



Service diagnosis for dc-link power supply

LEDs

When checking the power supply unit, proceed as follows:

- Open the housing of the logic unit.



DANGER

Danger of electrical shock!

High voltages and currents

- Check the LEDs on the power supply board when the logic unit is switched on.
- Is the first LED from left lit up (- PWF)? Only lit if +/- Uz is connected.
- Is the second LED lit up (+ 5 V)?
- Is the third LED lit up (- RES)?



Note

If one of the LEDs is not lit up, either the power supply is below the minimum limit or the power supply unit is defective.

Supply line U1 / U2 and - Uz / +Uz

- Check the supply lines at connection X31.



DANGER

Danger of electrical shock!

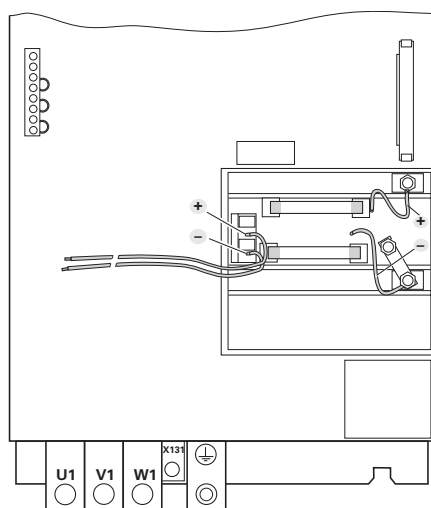
High voltages and currents

- Is power supply available at ac connection U1 / U2?
- Is power supply available at dc connection - Uz / +Uz (dc-link)?



Note

The power supply from the dc link is usually lead via a protective PCB. This is secured onto the conductor bar of the SIMODRIVE 611D power supply unit.



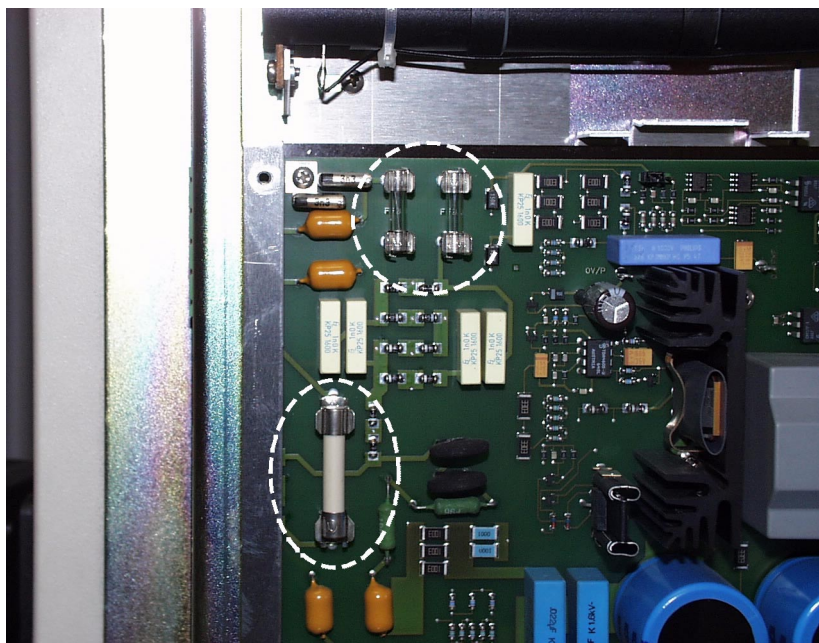
DANGER

Danger of electrical shock!

High voltages and currents

Fuses

- ▶ Switch off the main switch of the machine.
- ▶ Open the housing of the logic unit.
- ▶ Remove the cover from the power supply assembly.
- ▶ Check the fuses on the power supply board.



Note

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

8.3 LE 426M / 430M with Simodrive 611D



DANGER

Danger of electrical shock!


High voltages and currents

8.3.1 Power supply unit UV 101/B or UV 111

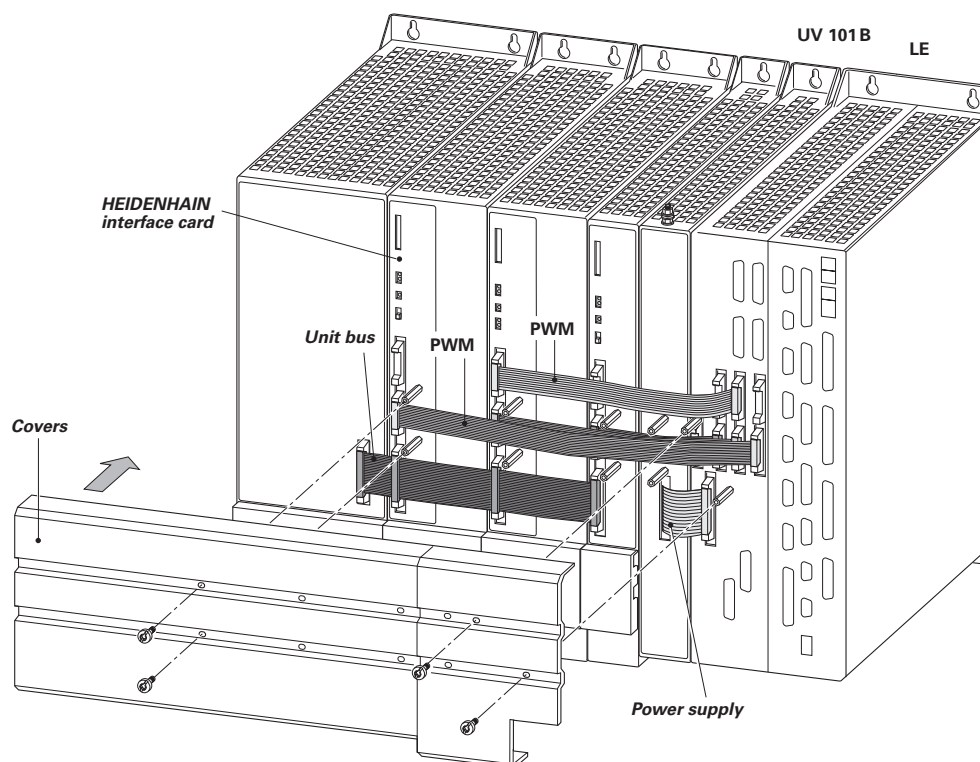
X31

NC power supply

Power is supplied to the logic unit via connection X31, terminal U1/U2 and -U_z/+U_z. The UV is connected to the logic unit via ribbon cable, connection X69.

Connecting terminals	Assignment	Voltage ranges
	Equipment ground (YL/GY)	
U ₁	Phase 1	400 Vac ± 10 % 50 Hz to 60 Hz
U ₂	Phase 2	
-U _z	dc-link voltage -	depending on regenerative feedback module
+U _z	dc-link voltage +	

Mounting attitude of UV



Service diagnosis
UV 101 B
UV 111

When checking the power supply unit, proceed as follows:



DANGER

Danger of electrical shock!

High voltages and currents

LEDs

► Check the LEDs on the power supply board when the logic unit is switched on. You will need to look down at the power supply board through the upper grid of the housing.

- Is LED + 5 V*2 lit up (1st from left)?
- Is LED + 15 V lit up (2nd from left)?
- Is LED + 12 V lit up (3rd from left)?
- Is LED - 15 V lit up (4th from left)?



Note

If one of the LEDs is not lit up or if the brightness is not correct, the UV power supply unit is probably defective.

Supply line
U1 / U2 and
- Uz / +Uz

► Check the supply lines at connection X31. This connection can be found on the underside of the power supply unit.



DANGER

Danger of electrical shock!

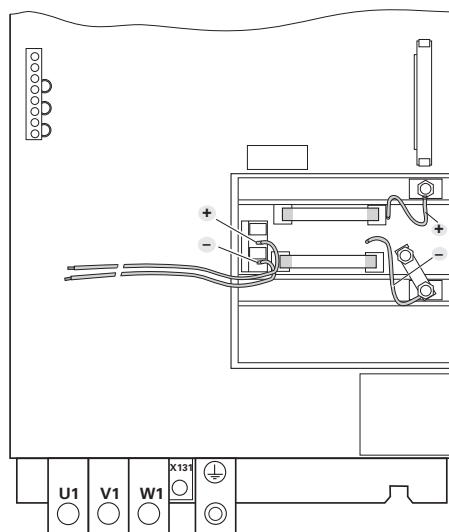
High voltages and currents

- Is power supply available at ac connection U1 / U2?
- Is power supply available at dc connection - Uz / +Uz (dc-link)?



Note

The power supply from the dc link is usually lead via a protective PCB. This is secured to the conductor bar on the inverter.



DANGER

Danger of electrical shock!

High voltages and currents

8.4 LE 426M/430M with HEIDENHAIN Inverter



Note

Please consult the Service manual **Inverter Systems and Motors** !

8.5 Power Supply to PLC

8.5.1 Logic unit LE 426.B/430.A

X44
Power supply to PLC outputs

Power is supplied to the PLC outputs via connection X44.

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.
- ▶ Open the logic unit and check the three fuses on the PLC graphic board in the area of connection X44. Replace these if necessary.

8.5.2 Logic unit LE 426M/430M

X44
Power supply to PLC outputs

Power is supplied to the PLC outputs via connection X44.

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.
- ▶ Check the fine-wire fuses on the front side of the logic unit in the area of connection X44. Replace these if necessary.

X34
Power supply to
"control-is-ready"
output

Power is supplied to "control-is-ready" output via connection X34.

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
- ▶ Check the fine-wire fuses on the front side of the logic unit in the area of connection X34. Replace these if necessary.

8.5.3 PLC expansion board PL 405B/410B

X9/X10
Power supply to
logic unit

Power is supplied to PL electronics and "control-is-ready" output (X8, PIN 16) via X9 (0 V) and X10 (+ 24 V).

X11, X12, X13, X14
Power supply to
PLC outputs

Power is supplied to the PLC outputs (in groups) via X11 to X14.

Assignment of
supply terminals/
PLC outputs

Terminal	Assignment	1. PL	2. PL	3. PL	4th PL
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

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 contacts Ok?



Note

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

8.6 Buffer Battery

8.6.1 LE 426 CB/PB and LE 430 CA/PA

General

If the machine is switched off, the power for the RAM is supplied by the buffer battery.

For safeguarding the RAM memory, an additional capacitor was integrated onto the PCB of the TNC. This capacitor stores the RAM content for approx. one day without batteries.



Caution

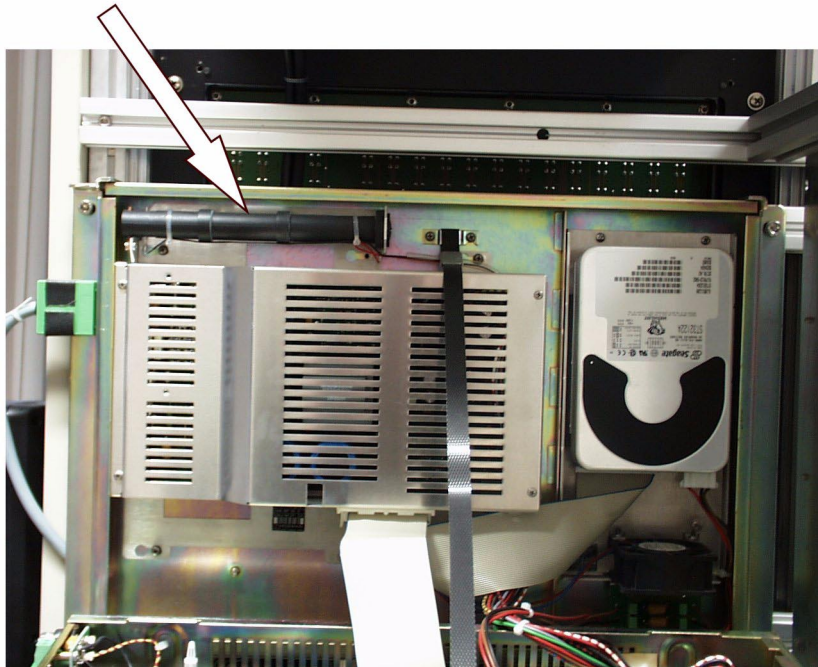
When the error message **Change buffer battery** appears, you must replace the batteries within one week.

Rated voltage is approx. 4.5 V

Location of buffer battery

The buffer battery can be found behind a heavy-gauge compression fitting in the power supply unit of the LE.

Buffer Battery



Note

The capacitor is only loaded when the TNC 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.
- Open the logic unit.
- Replace the old batteries (3 AA size, leak-proof, IEC designation: LR6).

8.6.2 LE 426 M and LE 430 M

General

If the machine is switched off, the power for the RAM is supplied by the buffer battery.

For safeguarding the RAM memory, an additional capacitor was integrated onto the PCB of the TNC. This capacitor stores the RAM content for approx. one day without batteries.



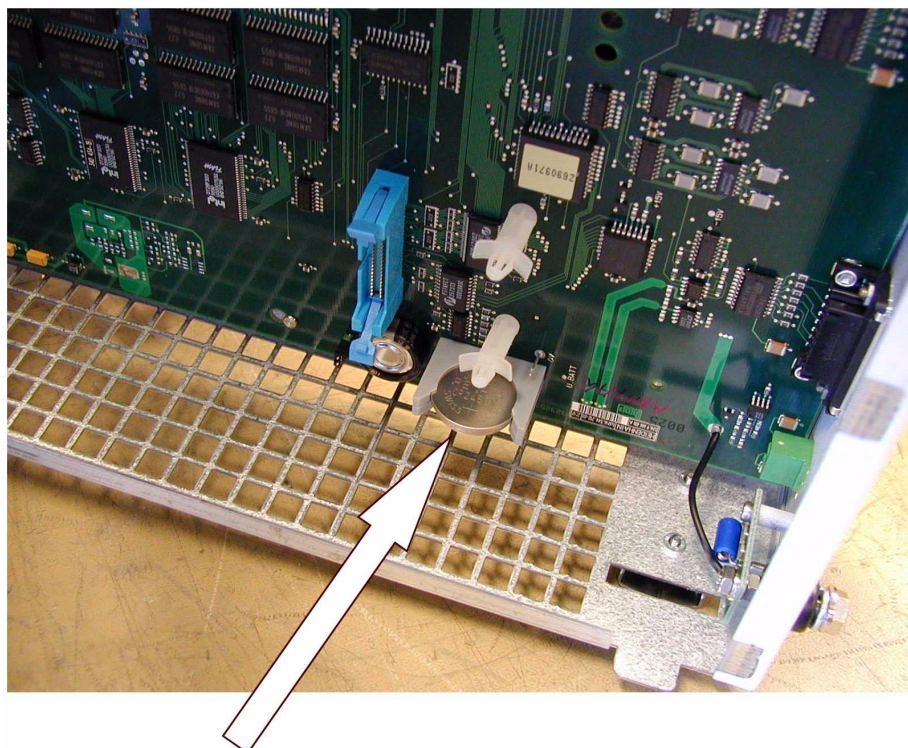
Caution

When the error message **Change buffer battery** appears, you must replace the batteries within one week.

Rated voltage is approx. 3 V

Location of buffer battery

The buffer battery is located near the lower edge of the processor board.



Buffer battery



Note

The capacitor is only loaded when the TNC 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.
- Open the logic unit.
- Exchange the battery (Id.Nr. 315 878-01).

8.7 Info Menu

Call



► PROGRAMMING AND EDITING mode (select operating mode)



► Call input field for code number



► Enter code number and acknowledge

Manueller Betrieb	Programming and editing					
<p>STACK DUMP SIM OFF</p> <p>STACK DUMP RUN OFF</p> <p>U[BATT] 4,735 V</p> <p>U[ACCU] 4,959 V</p> <p>U[VCC] 4,997 V</p> <p>TEMP 30 °C</p>						
	RS232 RS422 SETUP	USER PARAMETER	MP EDIT	PLC EDIT	HELP	END

Description

The following information is displayed on the screen:

U[BATT]	4.651 V	Voltage of buffer battery
U[ACCU]	5.001 V	Load status of capacitor
U[VCC]	5.001 V	5 V supply voltage
TEMP	25 °C	Temperature inside logic unit



Note

These values are updated internally in the minutes cycle. The display is only updated with the new call of the Info menu.

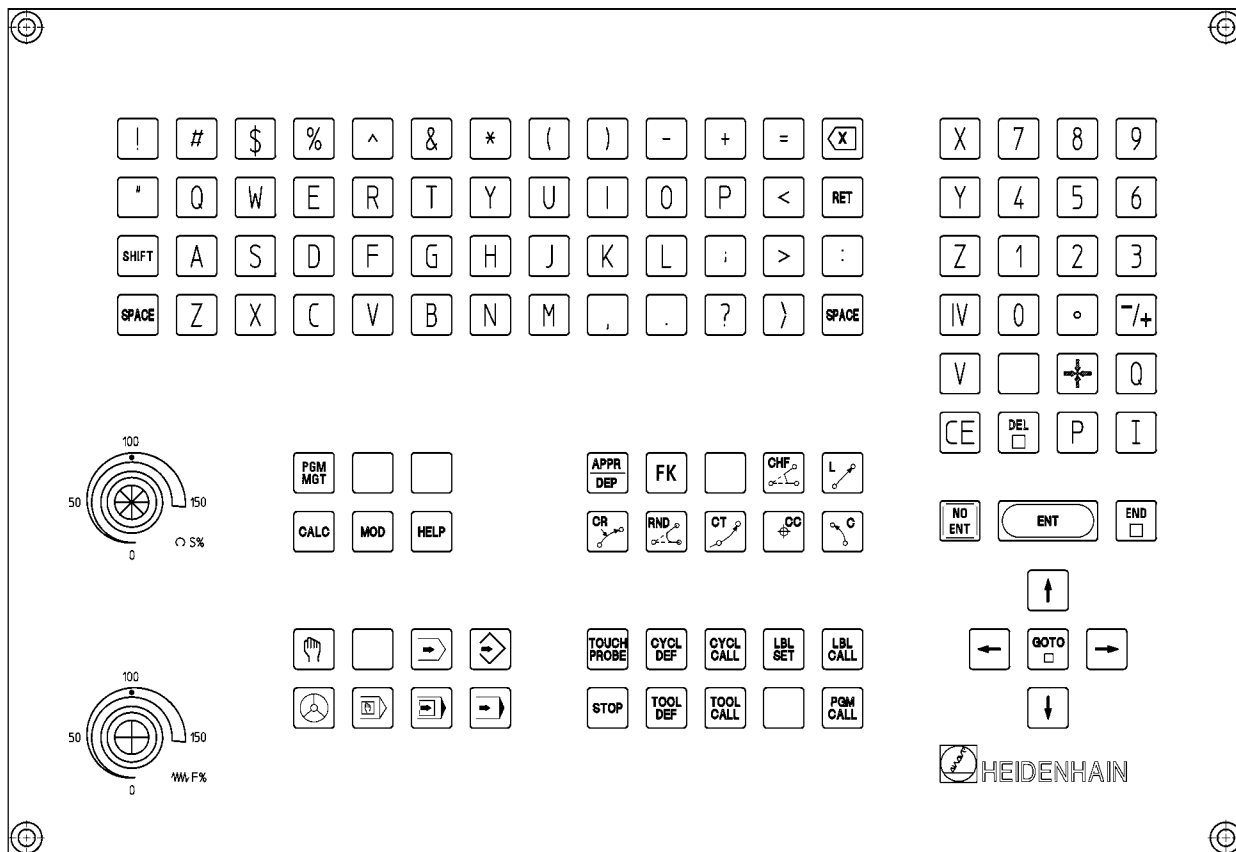


9 Keyboard Unit TE 401 B/420

9.1 Front View of the Keyboard Unit

TE 401 B (black)

TE 420 (gray)



9.2 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

All keys are active in every operating mode. The keys on the ASCII keypad are only active in the ASCII editor.

Checking the potentiometers

Procedure:

- ▶ Switch off the main switch of the machine.
- ▶ Insert the measuring adapter at connection X45 of logic unit between the logic unit 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.

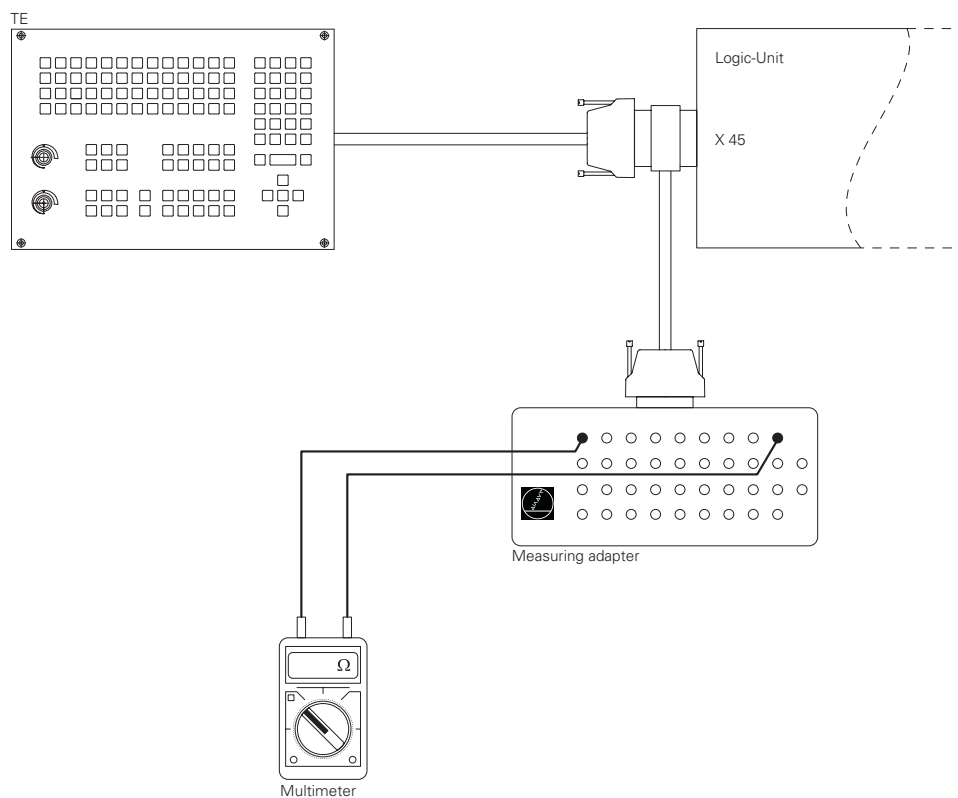
Potentiometers	PIN	Voltage range
Override F%	37 = 0 V / 35 = + pot.	(0 ... approx. 4.95 V
Spindle S%	37 = 0 V / 34 = + pot.	(0 ... approx. 4.95 V



Note

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

Measuring circuit













9.3 Key Matrix of the Keyboard Unit

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
!										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									X					
Q										X										X				
W											X								X					
E											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				
RET																X			X					
SHIFT										X											X			

X2 Pin Key	1 RL0	2 1	3 2	4 3	5 4	6 5	7 6	8 7	9 8	17 16	18 17	19 18	28 19	29 20	31 21	32 22	20 SL0	21 1	22 2	23 3	24 4	25 5	26 6	27 7
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	
PGM MGT								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
						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					
									X											X				
								X												X				
							X													X				
							X												X					
								X											X					
						X														X				
					X															X				
TOUCH PROBE				X													X							
CYCL DEF								X										X						
CYCL CALL							X											X						
LBL SET						X												X						
LBL CALL					X													X						

X2 Pin Key	1 RL0	2 1	3 2	4 3	5 4	6 5	7 6	8 7	9 8	17 16	18 17	19 18	28 19	29 20	31 21	32 22	20 SL0	21 1	22 2	23 3	24 4	25 5	26 6	27 7
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							
CE					X																	X		
DEL				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
				X																				X
					X																			X
		X																				X		
	X																					X		
	X																X							
								X														X		
						X																X		
							X															X		
								X															X	
						X																	X	

Key matrix of keys on visual display units

BC 110B





X1 Pin ^a	4b	3b	2b	1b	1a	2a	3a	4a
X2 Pin ^a	13	14	15	16	20	21	22	23
^b Key	RL12	RL13	RL14	RL15	SL0	SL1	SL2	SL3
				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
	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 => logic unit (D-Sub, 37-pin)

SK = Soft key (SK1..SK8 from left to right)

X1 Pin ^a	4b	3b	2b	1b	1a	2a	3a	4a
X2 Pin ^a	13	14	15	16	20	21	22	23
^b Key	RL12	RL13	RL14	RL15	SL0	SL1	SL2	SL3
				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	
		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 => logic unit (D-Sub, 37-pin)
SK = Soft key (SK1..SK8 from left to right)

MB 420 Machine Operating Panel

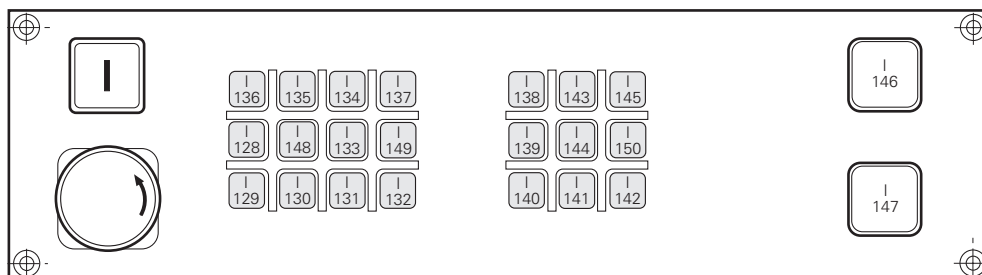
The PLC inputs of the MB 420 operating panel (E128 - E150) can be checked at the 37-pin flange socket of the MB 420 or at the flange socket X46 (connection of operating panel) of the TNC.



Note

Use the TABLE function in the PLC mode for assistance.

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

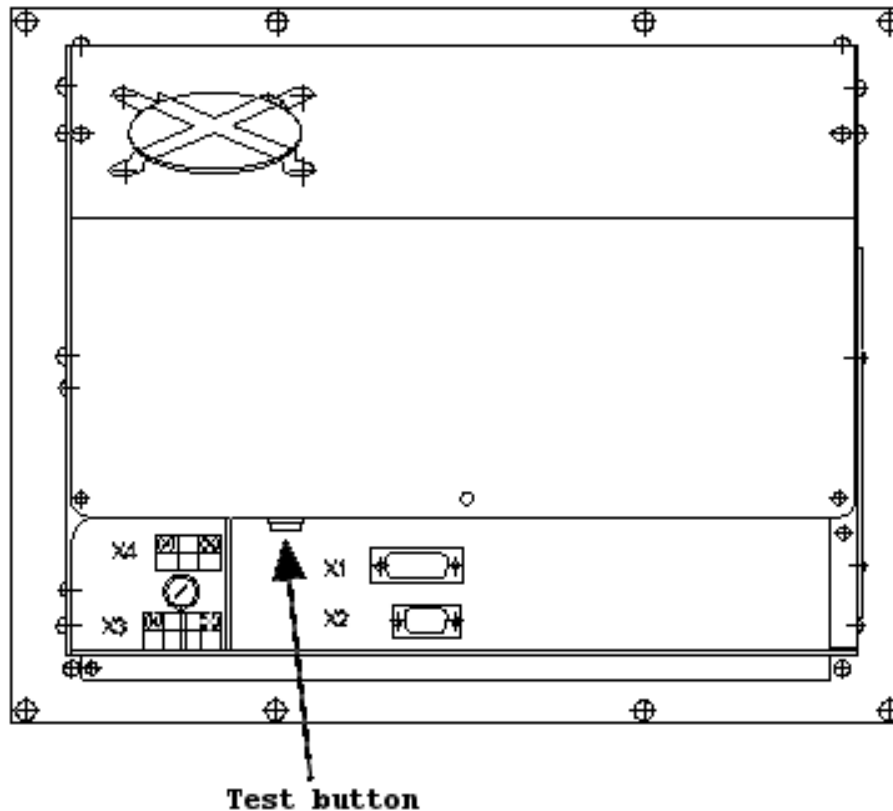




10 Visual Display Units

10.1 Checking the BC 110 B Visual Display Unit

Position of test button



Fault diagnosis

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

- First check the line voltage connection (X3) for the visual display unit.

If the power supply is in order, but the screen still remains black:

- Press the test button on the rear side of the unit.

If the screen unit displays a bright, square field:

- Check the connection cable between X1 and the control (X43).

If this cable is functioning properly, then it is likely that the visual display drive of the logic unit is defective.

- In this case, exchange the logic unit.

If, however, the screen remains black even after the test button has been pressed:

- Exchange the visual display unit.



Note

You will find the layout for the connectors in the Chapter "Connector Designation and Layout"
You can also check the control signals for the display unit using an oscilloscope.

10.2 Checking the BC 120 Visual Display Unit

Fault diagnosis

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

- ▶ Switch off the main switch of the machine.
- ▶ Disconnect visual display unit connection X43 on the logic unit.
- ▶ Switch on the main switch of the machine again.

Does the message "Please check signal cable"

or

the message "Signal missing" appear on the screen?

- ▶ If yes, the visual display unit is probably in order.

- ▶ If no, proceed as follows:

- ▶ First check the power supply at the logic unit.

If this power supply is also Ok:

- ▶ Check the line voltage connection at the Euro connector of the visual display unit.

If this power supply is also Ok:

- ▶ Switch off the main switch of the machine.

- ▶ Instead of the BC 120, connect a PC display unit with standard VGA to the logic unit.

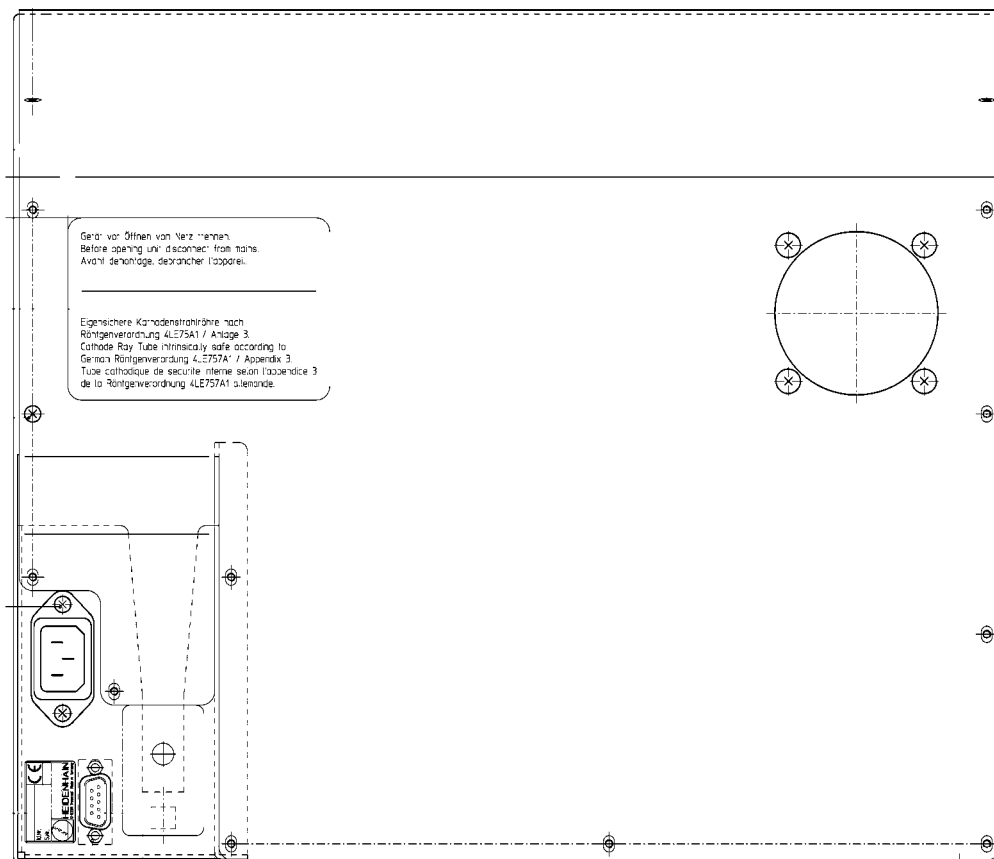
- ▶ Switch on the main switch of the machine again.

If this visual display unit functions properly, the BC 120 is probably defective.

- ▶ Exchange your BC 120.

If this screen also fails to function, it is likely that the visual display drive of the logic unit is defective.

- ▶ In this case, exchange the logic unit.

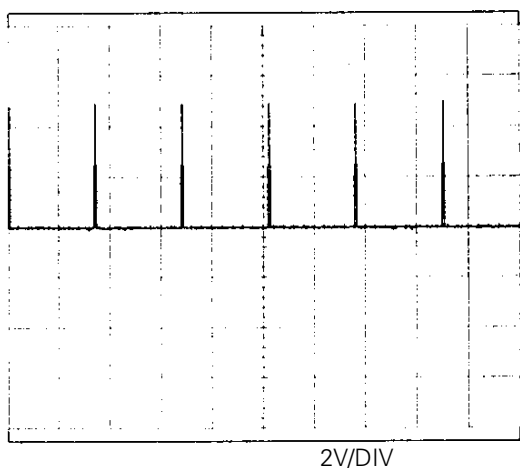


Note

You will find the layout for the connectors in the Chapter "Connector Designation and Layout"
You can also check the control signals for the display unit using an oscilloscope.

V-SYNC PIN 9

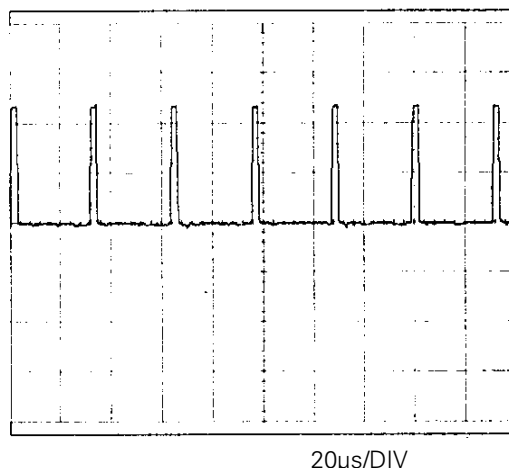
2V/DIV



2V/DIV

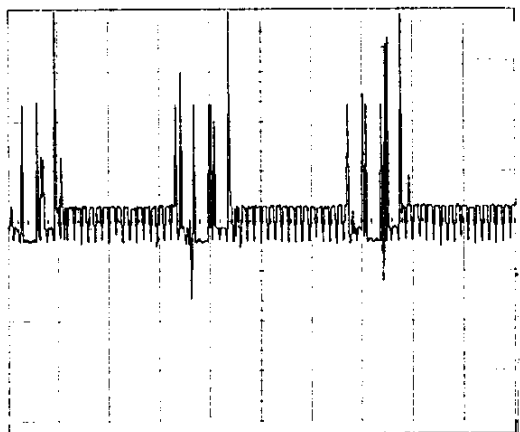
H-SYNC PIN 10

2V/DIV



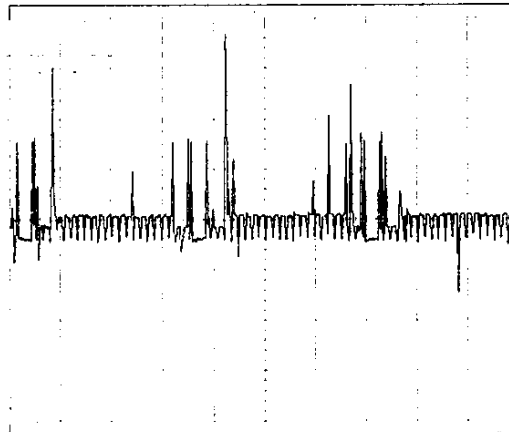
20µs/DIV

R-analog PIN 7

0.2V/
DIV

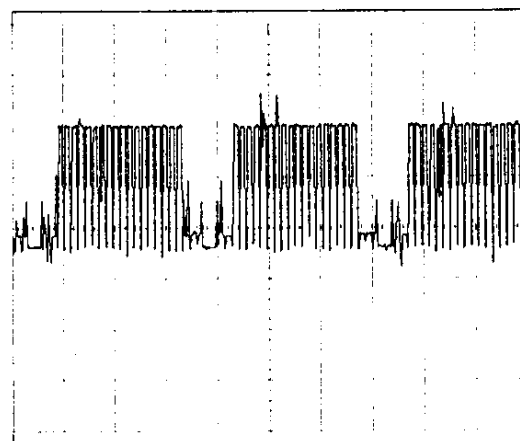
5 ms/DIV

G-analog PIN 14

0.2V/
DIV

5 ms/DIV

B-analog PIN 15

0.2V/
DIV

5 ms/DIV

**Note**

These signals were recorded with VISUAL DISPLAY UNIT connected. The color signals R-analog, G-analog and B-analog can also display different forms (depending on machine parameters and figures displayed).

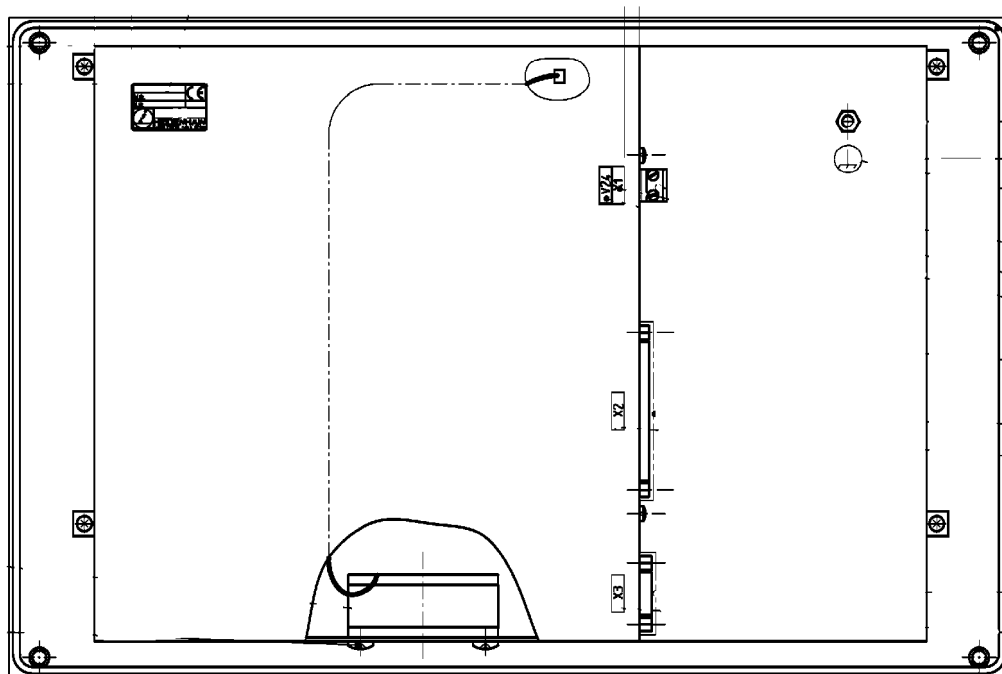
10.3 Checking the BC 120F Visual Display Unit

Fault diagnosis

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

- First check the line voltage at the 2-pin connection of the visual display unit.

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



Note

With the TNC 426M/430M, in case of emergency, it is possible to drive a BC 120 instead of the BF 120, or PC display unit with standard VGA interface at connector X43, if the logic unit is still functioning properly.

11 File Management of the TNC

11.1 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 TNC, see page 77
95 148	Calls the active machine parameter list, see page 208
807 667	Calls the PLC mode, see page 206
75 368	Offset adjustment for analog axes, see page 251
79 513	Info menu (battery voltage, charge status of the capacitor etc.), see page 183
857 282	Resets the operating hours counter
688 379	Integrated Oscilloscope, see page 253
531 210	Resets the non-volatile PLC markers/words and the control data in RAM

11.2 Where are Which Data in the TNC?

Different partitions

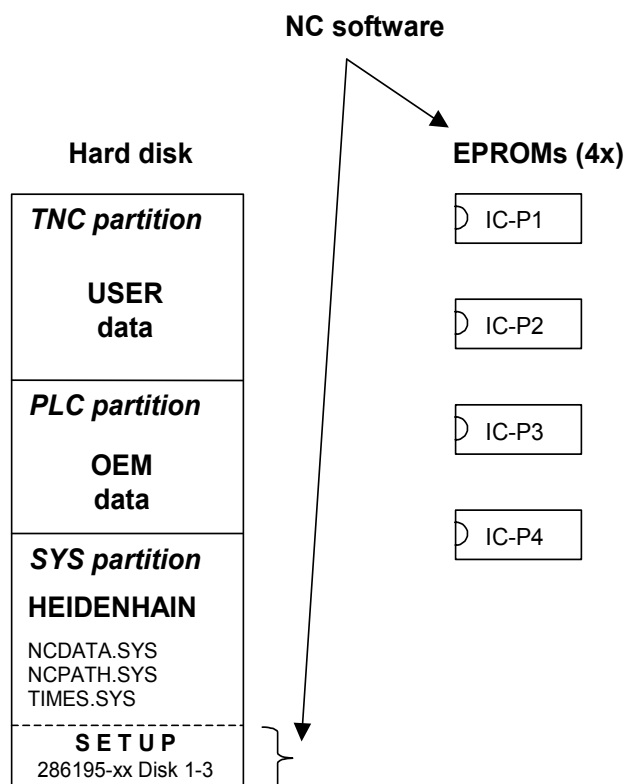
The hard disk of the TNC is divided into three partitions:

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.

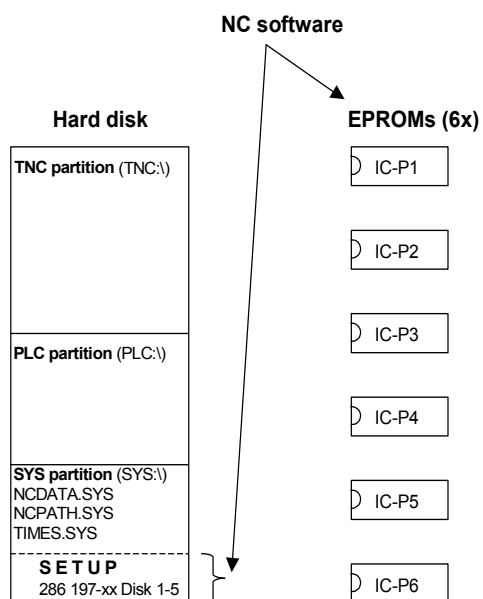


Caution

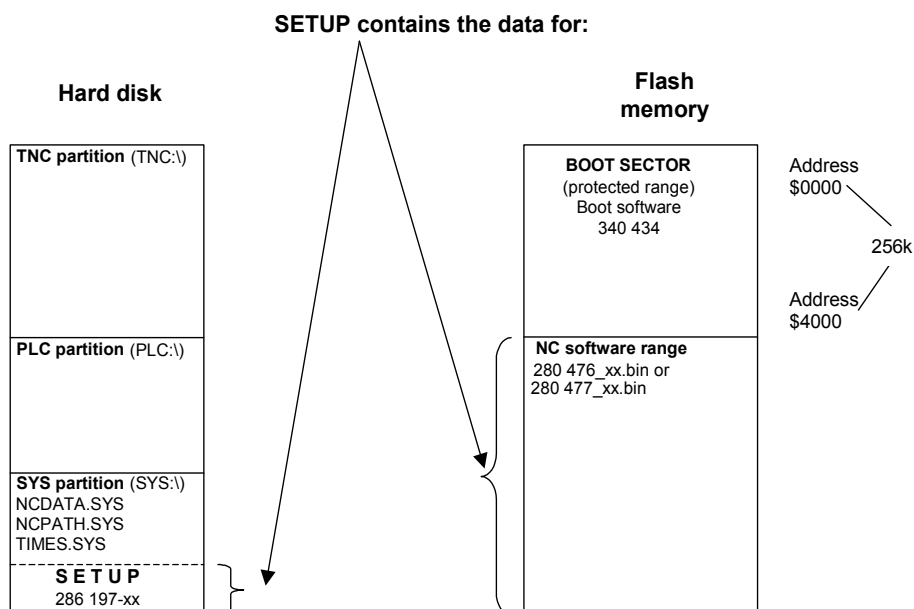
Changes to the SYS partition can result in a malfunction of your TNC.



**NC-software
structure
280 476/477
EPROM hardware**



**NC-software
structure
280 476/477
Flash hardware**



11.3 TNC Partition (TNC:\)

Calling the TNC partition

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



► Select the Programming and Editing mode



► Call the program management

Manueller Betrieb

RS232:\

RS422:\

TNC:\

TNC:\

 DEMO

EXAMPLES

 SEMINAR

 TEST2

Programming and editing

Path = TNC:\EXAMPLES

TNC:\EXAMPLES*.*

File name	bytes	Status	Date	Time
276	.D	766 S	16-02-1998	11:32:44
108	.H	494	16-02-1998	11:33:02
110	.H	420	16-02-1998	11:32:34
111	.H	350	16-02-1998	11:32:34
115	.H	494	16-02-1998	11:32:34
121	.H	986	16-02-1998	11:32:36
123	.H	602	16-02-1998	11:32:36
124	.H	564	16-02-1998	11:32:36
125	.H	736	16-02-1998	11:32:36
132	.H	998	16-02-1998	11:32:38
144	.H	420	16-02-1998	11:32:38

58 file(s) 921600 kbyte vacant

PAGE
↑

PAGE
↓

SELECT

COPY DIR

SELECT
TYPE

WINDOW

LAST FILES

END

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.

Overview of most important files

File type	TNC file extension
NC program HEIDENHAIN language	.H
Active tool table	TOOL.T
NC program in ISO format	.I
Pallet table	.P
Datum table	.D
Text file (ASCII)	.A
Pocket table	TOOL_P.TCH

Select file list for display



SHOW ALL 	SHOW 	SHOW 	SHOW 	SHOW 	SHOW 	SHOW 	END
--------------	----------	----------	----------	----------	----------	----------	-----

File information

FILE NAME	Files which are saved in the current directory
BYTE	Size of each file in bytes
STATUS	The following letters may be found in the STATUS column:
	E File selected in the Programming and Editing mode
	S File selected in the Test Run mode
	M File selected in a Program Run mode
	P File cannot be deleted or edited
	IN File dimensions in inches
	W File transferred incompletely to external data medium and cannot be run
DATE	Date on which file was last changed
TIME	Time at which file was last changed

11.4 PLC Partition (PLC:\)

Calling the PLC partition

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



► Select the Programming and Editing mode



► Prepare 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 **READ ONLY** 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

Manueller Betrieb		PLC programming																																																																					
		Path =PLC:\IB_PGMSK																																																																					
RS422:\		PLC:\IB_PGMSK*.*																																																																					
PLC:\																																																																							
TNC:\																																																																							
PLC:\																																																																							
IB_PGMSK																																																																							
LANGUAGE																																																																							
CZECH																																																																							
DANISH																																																																							
DUTCH																																																																							
ENGLISH																																																																							
FINNISH																																																																							
FRENCH																																																																							
GERMAN																																																																							
HUNGARIA																																																																							
		<table><thead><tr><th>File name</th><th>bytes</th><th>Status</th><th>Date</th><th>Time</th></tr></thead><tbody><tr><td>ACHSEN</td><td>.PLC 5189</td><td></td><td>27-01-1998</td><td>13:27:30</td></tr><tr><td>GETRIEBE</td><td>.PLC 340</td><td></td><td>27-01-1998</td><td>13:27:30</td></tr><tr><td>HELPDIAG</td><td>.PLC 16786</td><td></td><td>27-01-1998</td><td>13:27:32</td></tr><tr><td>HRXX_MAN</td><td>.PLC 6186</td><td></td><td>27-01-1998</td><td>13:27:34</td></tr><tr><td>INITIAL</td><td>.PLC 3135</td><td></td><td>27-01-1998</td><td>13:27:34</td></tr><tr><td>KEYBOARD</td><td>.PLC 5265</td><td></td><td>27-01-1998</td><td>13:27:36</td></tr><tr><td>KUEHLMIT</td><td>.PLC 464</td><td></td><td>27-01-1998</td><td>13:27:36</td></tr><tr><td>MAIN</td><td>.PLC 1324</td><td>M</td><td>27-01-1998</td><td>13:27:36</td></tr><tr><td>MASK_FIL</td><td>.PLC 896</td><td></td><td>27-01-1998</td><td>13:27:36</td></tr><tr><td>M_FUNKT</td><td>.PLC 1880</td><td></td><td>27-01-1998</td><td>13:27:36</td></tr><tr><td>OEM_FUNK</td><td>.PLC 1113</td><td></td><td>27-01-1998</td><td>13:27:36</td></tr><tr><td colspan="5">18 file(s) 33416 kbyte vacant</td></tr></tbody></table>					File name	bytes	Status	Date	Time	ACHSEN	.PLC 5189		27-01-1998	13:27:30	GETRIEBE	.PLC 340		27-01-1998	13:27:30	HELPDIAG	.PLC 16786		27-01-1998	13:27:32	HRXX_MAN	.PLC 6186		27-01-1998	13:27:34	INITIAL	.PLC 3135		27-01-1998	13:27:34	KEYBOARD	.PLC 5265		27-01-1998	13:27:36	KUEHLMIT	.PLC 464		27-01-1998	13:27:36	MAIN	.PLC 1324	M	27-01-1998	13:27:36	MASK_FIL	.PLC 896		27-01-1998	13:27:36	M_FUNKT	.PLC 1880		27-01-1998	13:27:36	OEM_FUNK	.PLC 1113		27-01-1998	13:27:36	18 file(s) 33416 kbyte vacant				
File name	bytes	Status	Date	Time																																																																			
ACHSEN	.PLC 5189		27-01-1998	13:27:30																																																																			
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INITIAL	.PLC 3135		27-01-1998	13:27:34																																																																			
KEYBOARD	.PLC 5265		27-01-1998	13:27:36																																																																			
KUEHLMIT	.PLC 464		27-01-1998	13:27:36																																																																			
MAIN	.PLC 1324	M	27-01-1998	13:27:36																																																																			
MASK_FIL	.PLC 896		27-01-1998	13:27:36																																																																			
M_FUNKT	.PLC 1880		27-01-1998	13:27:36																																																																			
OEM_FUNK	.PLC 1113		27-01-1998	13:27:36																																																																			
18 file(s) 33416 kbyte vacant																																																																							
PAGE	PAGE	SELECT	COPY DIR	SELECT	WINDOW	LAST FILES	END																																																																
↑	↓																																																																						

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 most important files

File type	TNC file extension
Converted PLC programs	.PLC
Text file (ASCII)	.A
Texts for Help files	.HLP
Important system file	OEM.SYS
Other system files	.SYS
Data for axis error compensation	.COM
Data for axis error compensation	.CMA
Error table for PLC	.PET
Machine parameter lists	.MP

Select file list for display



Use this key to switch between soft-key rows.

SHOW ALL 	.PLC FILES	SHOW 	.HLP FILES	.SYS FILES	.COM FILES	.CMA FILES	END
SHOW ALL 	.PET FILES						END

File information

FILE NAME	Files which are saved in the current directory
BYTE	Size of each file in bytes
STATUS	The following letters may be found in the STATUS column:
	E File selected in the Programming and Editing mode
	S File selected in the Test Run mode
	M File selected in a Program Run mode
	P File cannot be deleted or edited
	IN File dimensions in inches
	W File transferred incompletely to external data medium and cannot be run
DATE	Date on which file was last changed
TIME	Time at which file was last changed

11.5 Machine Parameter Editor

Call the active machine parameter list

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



► Select the Programming and Editing 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 TNC automatically enters this parameter list into the OEM.SYS under MPFILE = xxxx.

Manueller Betrieb	Machine parameter programming						
File: IB_MP.MP Line: 23 Column: 14 OVERWR							
MP 10 : 000011111 ;ACHSEN MIT MESSYSTEM							
;MP20.0 UEBERPRUEFEN DER ABSOLUTPOSITION DER ABSTANDSCODIERTEN							
; REFERENZMARKEN							
;EINGABE: %XXXXXXXXX							
; 0 = NICHT AKTIV							
; 1 = AKTIV							
;MP20.1 UEBERPRUEFEN DER AMPLITUDE DER MESZSYSTEM-SIGNALE							
;MP20.2 UEBERPRUEFEN DES FLANKENABSTANDS DER MESZSYSTEM-SIGNALE							
;MP21.0 UEBERPRUEFEN DER ABSOLUTPOSITION DER ABSTANDSCODIERTEN							
; REFERENZ-MARKEN AM MESZSYSTEM FUER DIE SPINDEL-LAGE							
;MP21.1 UEBERPRUEFEN DER AMPLITUDE DER SIGNALE AM MESZSYSTEM							
; FUER DIE SPINDEL-LAGE							
;EINGABE: %X							
INSERT OVERWRITE	MOVE WORD >>	MOVE WORD <<	PAGE ↓	PAGE ↑	BEGIN ↑	END ↓	FIND



► 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 the Programming and Editing mode



- ▶ Call input field for code number



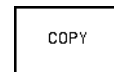
- ▶ Enter code number and acknowledge



- ▶ Call Program Management

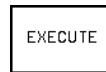


- ▶ Using the arrow keys, move the cursor to the active machine parameter file (status M)



- ▶ Press soft key

- ▶ Enter a name for the target file only if you wish to save the backup file for the MP list under a new name.



- ▶ 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.

Activate backup copy for test purposes

- ▶ Press the following key combination to activate the backup copy of the machine parameter list:



- ▶ Select the Programming and Editing mode



- ▶ Call input field for code number



- ▶ Enter code number and acknowledge



- ▶ Call Program Management



- ▶ Using the arrow keys, move the cursor onto the backup file



- ▶ Download file into editor



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

11.6 Switching the Position Display for Service Purposes

Call

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



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



- ▶ Activate MOD function

Manual operation						PLC programming	
Position display 1 ACTL. Position display 2 LAG Change MM/INCH MM Program input HEIDENHAIN Axis selection %00000							
NC : software number 280472 06 PLC: software number WALLNER							
POSITION/ INPUT PGM	TRAVERSE RANGE <1>	TRAVERSE RANGE <2>	TRAVERSE RANGE <3>	HELP	MACHINE TIME ⌚		END

Description of settings

Possible position displays:

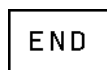
NOML	Nominal position
DIST.	Distance to go
ACTL	Actual position
REF	Distance from machine datum
LAG	Current following error



- ▶ Using the arrow keys, select POSITION DISPLAY



- ▶ Switch to the desired position display (or activate the menu by pressing MOD)



- ▶ Exit subordinate mode

11.7 Command Shell

General

In the command shell all areas of the hard disk can be accessed by entering commands via the QWERTY keyboard. For this purpose the NC software must not run.



Caution

In the command shell access is provided to system data and system parameters. 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.

Calling the command shell



- Press the EMERGENCY STOP button of your machine
- Activate the command shell from the BOOT MODE

Note

Please contact your HEIDENHAIN service agency for information on activating the BOOT MODE.

The most important commands

HELP, overview of all possible commands

Input: CMD>HELP



- Confirm

DIR, contents of a directory

Example: Contents of the PLC directory

Input: CMD>DIR PLC:



- Confirm

COPY, copy files

Example: Copy the file TEST.A in the PLC partition to TEST1.A

Input: CMD>COPY PLC:\TEST.A PLC:\TEST1.A



- Confirm

TYPE, view files

Example: View the file TEST1.A

Input: CMD>TYPE PLC:\TEST1.A



- Confirm

DELETE, delete files

Example: Delete the file TEST1.A from the PLC partition

Input: CMD>DELETE PLC:\TEST1.A



- Confirm

Exit the command shell

- Enter the command EXIT



- Confirm



ENT

- The boot mode is terminated and the NC software started



12 Encoder Interface

12.1 Position Encoders Circuit

Position encoder inputs

The position encoder inputs can be found on the processor board.

- X1 = position encoder axis 1
- X2 = position encoder axis 2
- X3 = position encoder axis 3
- X4 = position encoder axis 4
- X5 = position encoder axis 5
- X6 = position encoder axis 6
- X35 = position encoder axis 7 (option)
- X36 = position encoder axis 8 (option)
- X37 = position encoder axis 9 (option)
- X38 = position encoder axis 10 (option)

Example
Error in X-axis
TNC 426.B
TNC 430.A

For fault diagnosis, proceed as follows:

Machine
parameters used
in example

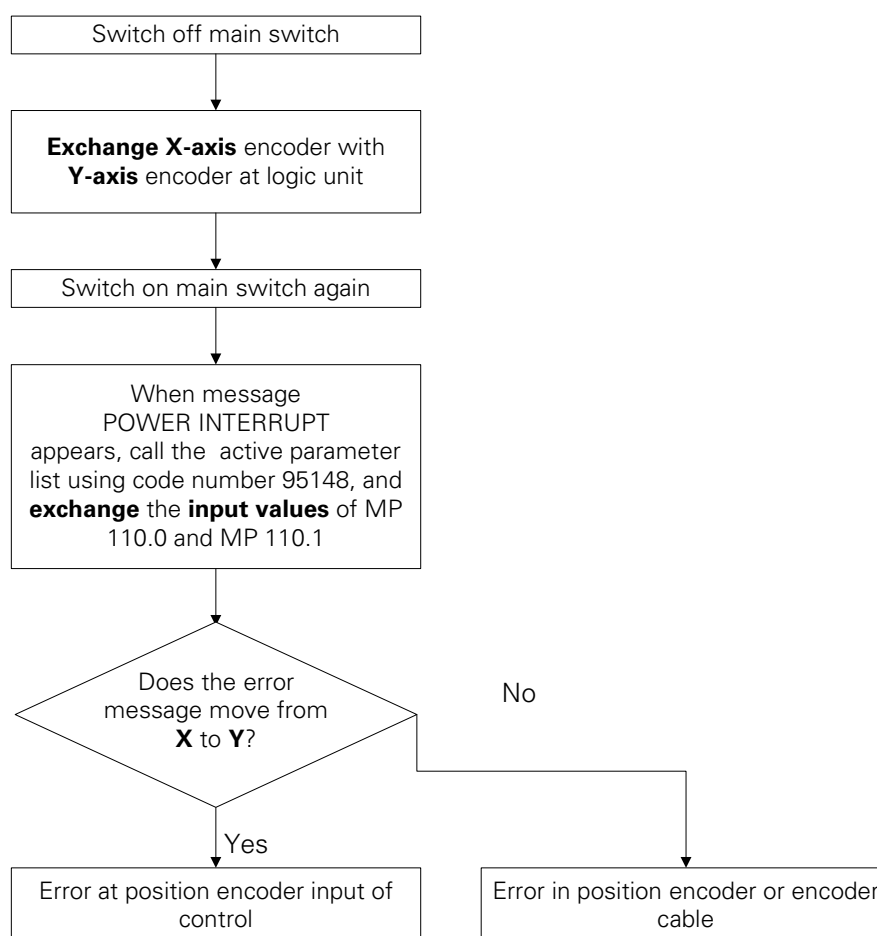
MP 100.x = CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
 MP 110.0 = 1 (X-axis at X1 input)
 MP 110.1 = 2 (Y-axis at X2 input)
 MP 110.2 = 3 (Z-axis at X3 input)
 MP 110.3 = 4 (C-axis at X4 input)



Caution

Only encoders which send the same signal may be exchanged.

Flowchart for diagnosing an error in the position encoders circuit



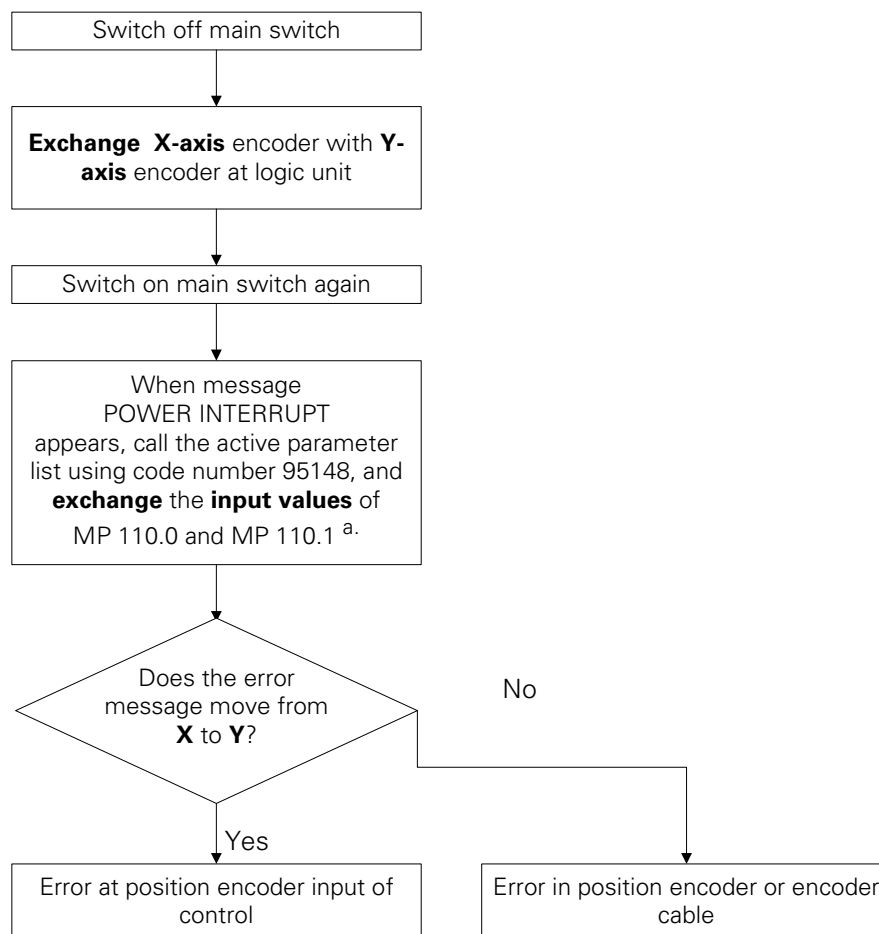
**Example error
in X-axis
TNC 426M
TNC 430M**

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.

12.2 Speed Encoders Circuit

Speed encoder inputs

The speed encoder inputs can be found on the drive control board.

- X15 = speed encoder axis 1
- X16 = speed encoder axis 2
- X17 = speed encoder axis 3
- X18 = speed encoder axis 4
- X19 = speed encoder axis 5
- X20 = speed encoder axis 6
- X60 = speed encoder for spindle with spindle DSP
- X62 = speed encoder axis 7 (option)
- X63 = speed encoder axis 8 (option)
- X64 = speed encoder axis 9 (option)

Example Error in X-axis

For fault diagnosis, proceed as follows:

Machine parameters used in example

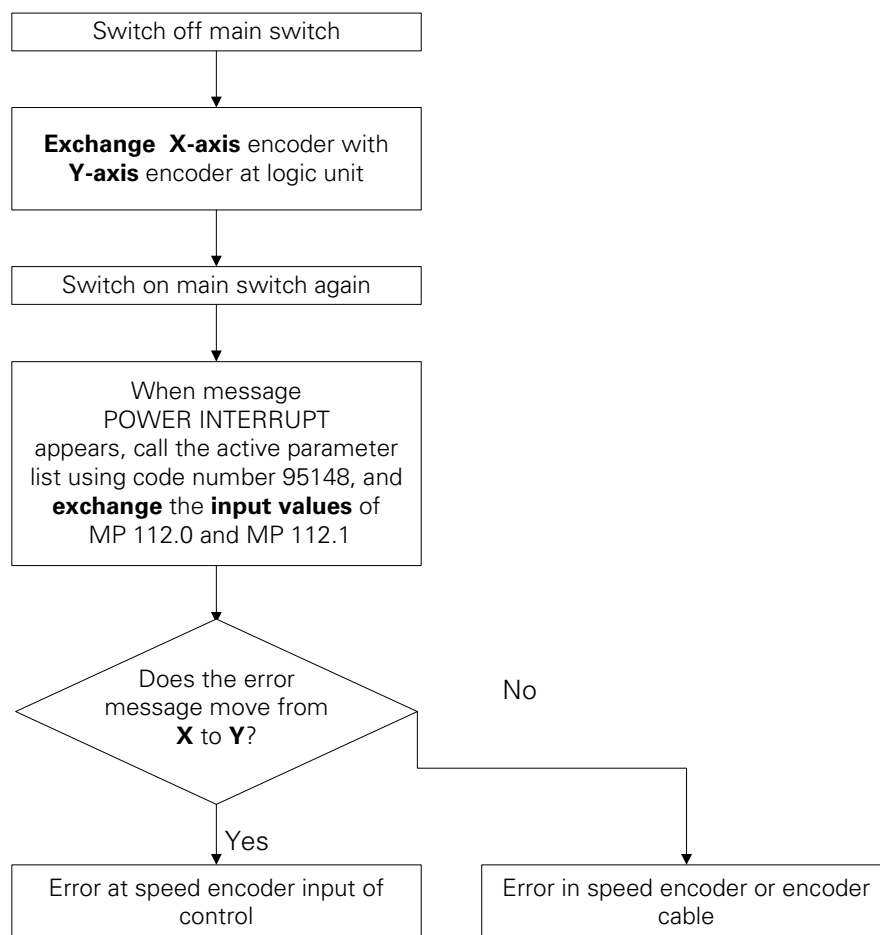
MP 100.x = CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 112.0 = 15 (X-axis at X15 input)
MP 112.1 = 16 (Y-axis at X16 input)
MP 112.2 = 17 (Z-axis at X17 input)
MP 112.3 = 18 (C-axis at X18 input)



Caution

Only encoders within the groups X15 to X20 and X62 to X64 may be exchanged.
The input X60 is reserved for the spindle with spindle DSP. This input cannot be used for an axis. Moreover, the spindle cannot be connected to another input in case X60 is defective.

Flowchart for diagnosing an error in the position encoders circuit



12.3 Inspecting a Position Encoder

PWM8

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 PWM measurement of the different encoder signals (11µA, 1Vpp, TTL) at the TNC 426.B/430.A. You will find a **connection diagram** of the adapters and Id. Numbers in the PWM8 operating manual.

Internal oscilloscope

With the TNC 426/430, the analog encoder signals of the **position encoder** (see page 253) can be recorded in the **internal oscilloscope** with encoder: I1 (0° signal) and encoder: I2 (90° signal), see Chapter Servo Amplifier Interface. The reference signal cannot be recorded.

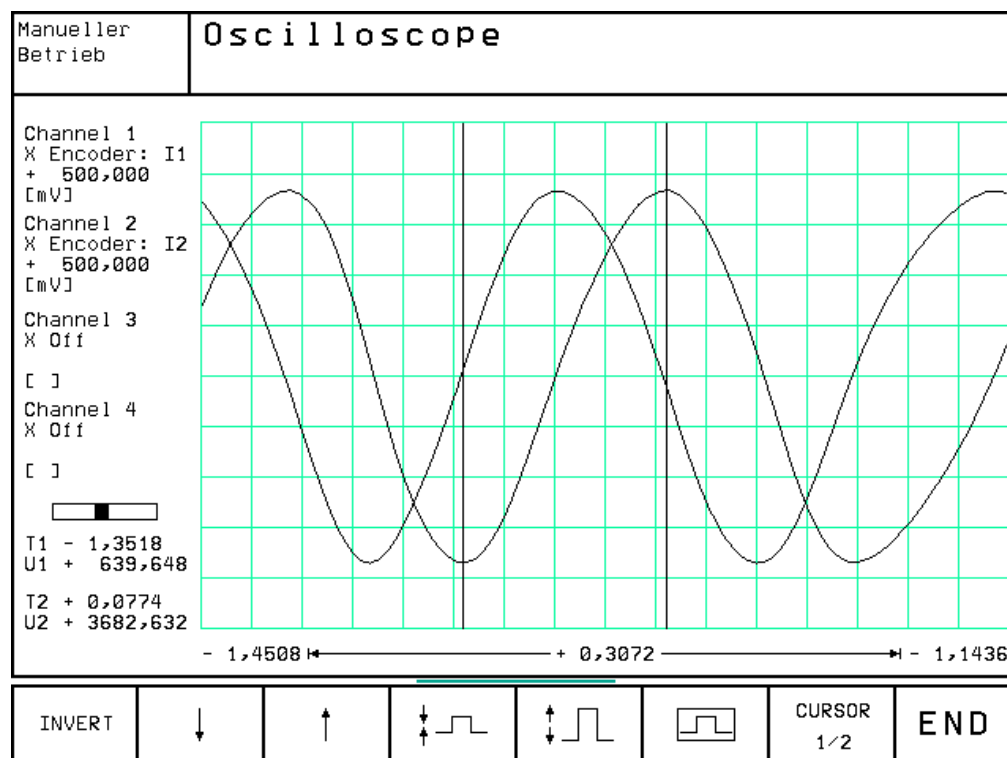


Caution

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

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

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



13 Checking the Enables on the TNC

13.1 General

If one or several enables are missing, an error message is output or the axes (or the spindle) cannot be operated.

On the following pages you will find a description of the procedure for checking the different enables.

13.2 "Control-is-Ready" Output (X41 / Pin 34) and Acknowledgement I3 (X41 / Pin 4)

13.2.1 Checking the output (X41/34) and acknowledgement I3

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 the level is low, proceed as follows:
- ▶ Measure the power supply at the control-is-ready output.
 - TNC 4xx C/P: connection X44/Pin1
 - TNC 4xx M: connection X34

If the power supply is in order, then the control-is-ready output on the logic unit is probably defective.



Note

In an emergency situation, you could use the control-is-ready output of the PL board.

If the level is high, proceed as follows:

- ▶ Check PLC input I3 in the PLC table:
 - If I3 = 0: Internal level of I3 is low.
 - If I3 = 1: Internal level of I3 is high.

If the level is low, proceed as follows:

- ▶ Measure the input voltage at connector X42/pin4.
 - If the input voltage is high (+24 V), the high level is not recognised by the PLC.
Input I3 on the logic unit is 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 output "control-is-ready" from the HEIDENHAIN inverter system via connector X34, potential differences between the 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 logic unit 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 161.) is probably too long, or the main contactor is defective.
- ▶ Inspect the main contactor.

13.2.2 Flowcharts of the TNC booting routine

General

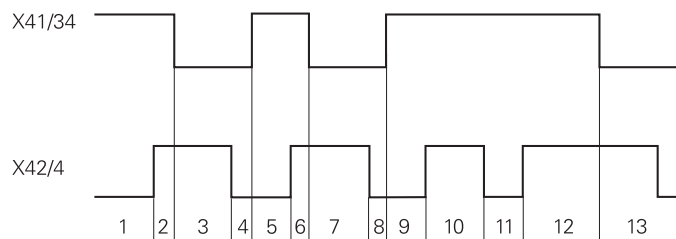
The booting routine must be run each time the TNC is started (power interruption, reset etc.).

On the next pages you will find the signal states of the control-is-ready output (X41/34) and the acknowledgement I3 (X42/4).

The booting routines depend on the control hardware and software

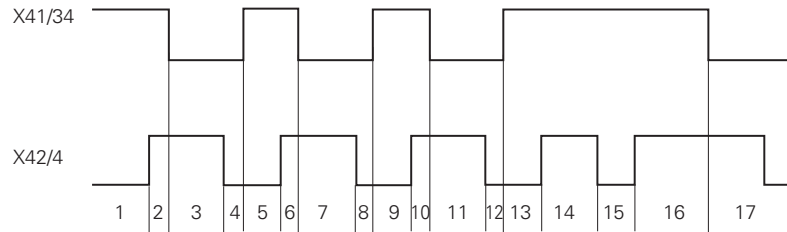
TNC	Diagram
TNC 426 CB with NC software 280474 to 477	3, see page - 223
TNC 426 PB without spindle DSP and NC software 280474 to 477	1, see page - 221
TNC 426 PB with spindle DSP and NC software 280474 to 477	2, see page - 222
TNC 426 M without spindle DSP and NC software 280474/475	1, see page - 221
TNC 426 M with spindle DSP and NC software 280474/475	2, see page - 222
TNC 426 M without spindle DSP and NC software 280476/477 < version 06	1, see page - 221
TNC 426 M with spindle DSP and NC software 280476/477 < version 06	2, see page - 222
TNC 426 M without spindle DSP and NC software 280476/477 > version 06	3, see page - 223
TNC 426 M with spindle DSP and NC software 280476/477 > version 06	3, see page - 223
TNC 430 CA with NC software 280474 to 477	3, see page - 223
TNC 430 PA with NC software 280474 to 477	2, see page - 222
TNC 430 M with NC software 280476/477 < version 06	2, see page - 222
TNC 430 M with NC software 280476/477 > version 06	3, see page - 223

Flowchart 1



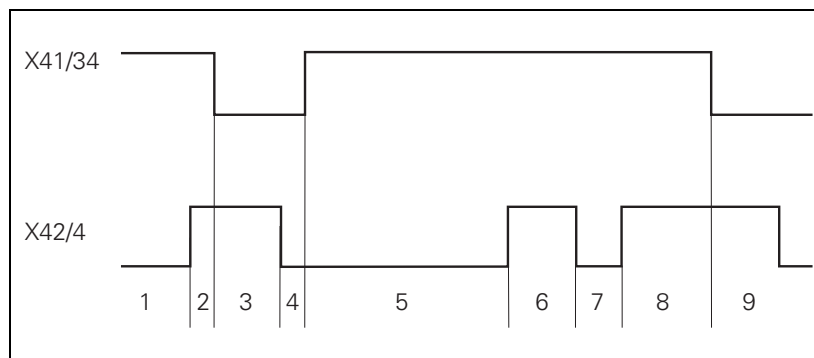
		Screen display
1	Waiting for machine control voltage	Relay external DC voltage missing
2	Recognition of the machine control voltage on X42/4 and switch-off of the control-is-ready signal on X41/34 by host computer (t < 66 ms)	
3	Max. time in which the acknowledgement "control-is-ready" on X42/4 must go to 0 (t < 380 ms)	If exceeded, EMERGENCY STOP defective
4	Recognition of acknowledgement and setting of X41/34 (t < 20 ms)	
5	Waiting for machine control voltage	Relay external DC voltage missing
6	Recognition of the machine control voltage on X42/4 and switch-off of the control-is-ready signal on X41/34 by DSP (t < 120 ms).	
7	Max. time in which the acknowledgement "control-is-ready" on X42/4 must go to 0 (t < 380 ms)	If exceeded, EMERGENCY STOP defective
8	Recognition of acknowledgement and setting of X41/34 (t < 120 ms)	
9	Waiting for machine control voltage	Relay external DC voltage missing
10	Normal control operation. Control-is-ready output and acknowledgment are high.	
11	Control voltage is switched off externally.	External EMERGENCY STOP
12	After switching on the machine control voltage again, the error message can be cleared, and then the control operates normally.	
13	After detecting a fault, the control switches off the control-is-ready output (X41/34).	Blinking error message

Flowchart 2



		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	Max. time in which the acknowledgement "control-is-ready" on X42/4 must go to 0 ($t < 380$ ms)	If exceeded, EMERGENCY STOP defective
4	Recognition of acknowledgement and setting of X41/34 ($t < 20$ ms)	
5	Waiting for machine control voltage	Relay external DC voltage missing
6	Recognition of the machine control voltage on X42/4 and switch-off of the control-is-ready signal on X41/34 by DSP ($t < 120$ ms).	
7	Max. time in which the acknowledgement "control-is-ready" on X42/4 must go to 0 ($t < 380$ ms)	If exceeded, EMERGENCY STOP defective
8	Recognition of acknowledgement and setting of X41/34 ($t < 120$ ms)	
9	Waiting for machine control voltage	Relay external DC voltage missing
10	Recognition of the machine control voltage on X42/4 and switch-off of the control-is-ready signal on X41/34 by DSP 2 ($t < 120$ ms)	
11	Max. time in which the acknowledgement "control-is-ready" on X42/4 must go to 0. ($t < 380$ ms)	If exceeded, EMERGENCY STOP defective
12	Recognition of acknowledgement and setting of X41/34 ($t < 120$ ms)	
13	Waiting for machine control voltage.	Relay external DC voltage missing
14	Normal control operation. Control-is-ready output and acknowledgment are high.	
15	Control voltage is switched off externally.	External EMERGENCY STOP
16	After switching on the machine control voltage again, the error message can be cleared, and then the control operates normally.	
17	After detecting a fault, the control switches off the control-is-ready output (X41/34).	Blinking error message

Flowchart 3



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 ($t < 66 \text{ ms}$).	
3	Max. time in which the acknowledgement "control-is-ready" on X42/4 must go to 0 ($t < 380 \text{ ms}$).	If exceeded, EMERGENCY STOP defective
4	Recognition of the acknowledgment and setting of X41/34 ($t < 20 \text{ ms}$)	
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 the machine control voltage again, the error message can be cleared, 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



14 Interface to Servo Amplifier

14.1 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	Axis 1
MP 120.1	Assignment nominal value output	Axis 2
MP 120.2	Assignment nominal value output	Axis 3
MP 120.3	Assignment nominal value output	Axis 4
MP 120.4	Assignment nominal value output	Axis 5
MP 120.5	Assignment nominal value output	Axis 6
MP 120.6	Assignment nominal value output	Axis 7
MP 120.7	Assignment nominal value output	Axis 8
MP 120.8	Assignment nominal value output	Axis 9
MP 120.7	Assignment nominal value output	Axis 8
MP 120.8	Assignment nominal value output	Axis 9
MP 121.0	Assignment nominal value output	1. Spindle
MP 121.1	Assignment nominal value output	2. Spindle

TNC 426/430

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

- 0 = no nominal speed 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
- 13 = **analog** nominal speed value (± 10 V) at connection **X9** channel 13
- 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**
- 61 = **digital** nominal value (PWM signal) at connection **X61**
- 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**



Caution

The machine manufacturer is responsible for assignment of the axes (axis 1, axis 2, etc.) to the axis designations (X, Y, Z, etc.) in machine parameter **MP 100.X**. (see Machine Parameter List).

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

14.2 Overview of Test Routines for Error Diagnosis

Brief description of test routines for error diagnosis	Description
Analog nominal value interface	
■ TNC / Non-HEIDENHAIN inverter	Test routine 1
Digital nominal value interface at TNC 426 PB / 430 PA	
■ SIMODRIVE 611 D / TNC with DCG testing unit	Test routine 2
■ SIMODRIVE 611 D / TNC without DCG testing unit	Test routine 3
■ Two-axis module SIMODRIVE 611 D / servo motor, if no error at the logic unit	Test routine 4
Digital nominal value interface at TNC 426 M / 430 M	
■ Modular HEIDENHAIN inverter system / TNC with DCG testing unit	Test routine 5
■ Modular HEIDENHAIN inverter system / TNC without DCG testing unit	Test routine 6
■ Two-axis module UM 12x HEIDENHAIN / servo motor, if no error at the logic unit	Test routine 7
■ SIMODRIVE 611 D / TNC with DCG testing unit	Test routine 8
■ SIMODRIVE 611 D / TNC without DCG testing unit	Test routine 9
■ Two-axis module SIMODRIVE 611 D / servo motor, if no error at the logic unit	Test routine 10
■ Compact inverter HEIDENHAIN UE 2xx / TNC with DCG testing unit	Test routine 11



Note

Also use the HEIDENHAIN tool DSP-status for error diagnosis.

14.2.1 Test routine 1, Checking the analog speed command interface

General

The control outputs an analog voltage of 0V to $\pm 10V$, in proportion to the traversing speed (see machine parameter MP1050.x, analog voltage for rapid traverse). This voltage can be measured directly at the LOGIC UNIT or at the connecting terminals of the servo amplifier with a multimeter via TEST ADAPTER.

Error: No axis traverse!

Procedure for error diagnosis:

- ▶ Switch off main switch of machine.
- ▶ Connect TEST ADAPTER to terminal X8 or X9 of LE, and connect multimeter to sockets of defective axis on TEST ADAPTER.
If no TEST ADAPTER exists, connect multimeter directly to nominal value input of 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 the original input values so these can be restored after the diagnosis has been completed).

MP	Input value	Function	Original input values
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)	

- ▶ Approach reference points to be approached before 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 display for the following:
 - CONTROL-IN-OPERATION must be On.
 - **F** for Feed display must light up normally (inverse display means no feed enable).
 - The symbol for "axis not in position control loop" must not appear before the position display, (e.g. +X +100.2769).
- ▶ 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 TEST ADAPTER reads $10V \pm 0.1V$, then the control is OK.

If no voltage is recorded, proceed as follows:

- ▶ Switch off main switch.
- ▶ Disconnect X8 or X9 from LE.
- ▶ Disconnect the nominal value lead at the servo amplifier and check it.

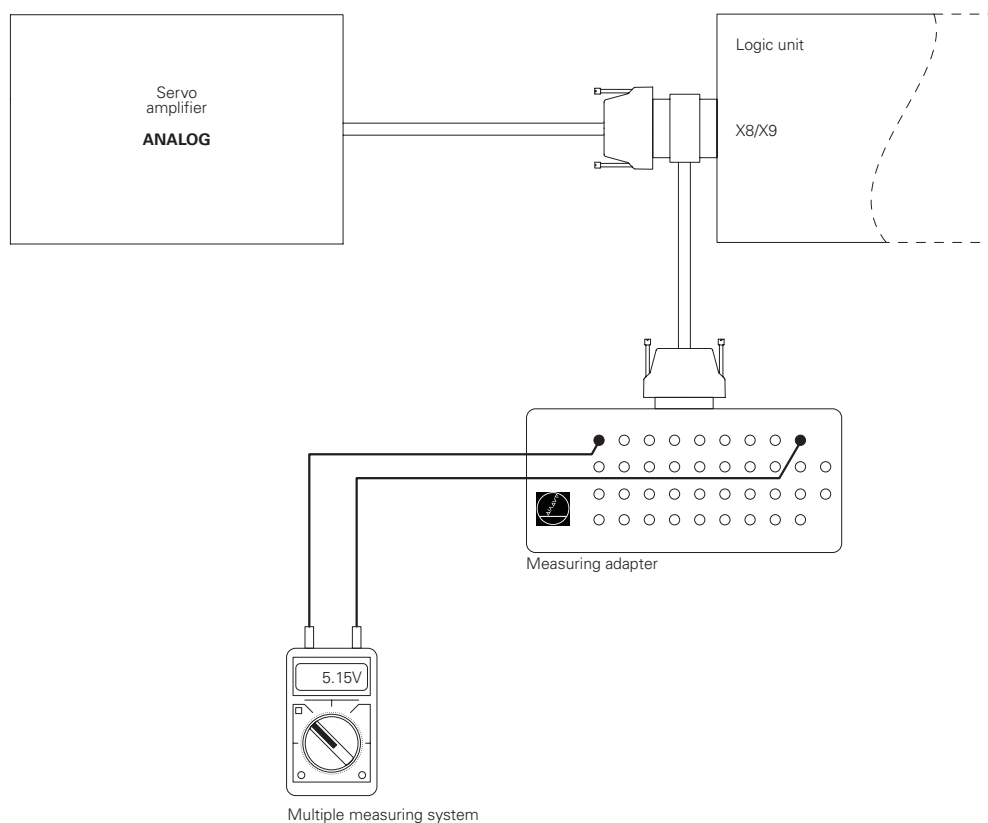
If the nominal value lead is OK, then:

- ▶ Reconnect X8 or X9 at LE (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 LE is defective.

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



Specifications of the analog outputs

Load capacity:	$R_{L\min} \geq 5\text{ k}\Omega$ $C_{L\max} \leq 2\text{ nF}$
Short-circuit stability:	Outputs have continuous short-circuit stability
Voltage range:	$U_{\text{amax}} = +10\text{ V} \pm 100\text{ mV}$ $U_{\text{amin}} = -10\text{ V} \pm 100\text{ mV}$
Resolution:	16 bit = 65 536 steps
Smallest step:	$\frac{10\text{ V}}{65536} = 0.153\text{ mV}$

14.2.2 Test routine 2

General

A **digital** axis / spindle of the TNC 426 PB / 430 PA is adapted to the SIMODRIVE 611 D via an **interface card** from HEIDENHAIN. This card is inserted into the drive module.

Machine parameters used in example

MP 100.x	= - - - -CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
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	= 61 (1. spindle at motor power stage connection X61, Spindle DSP)
MP 121.1	= 0 (2. spindle not active)

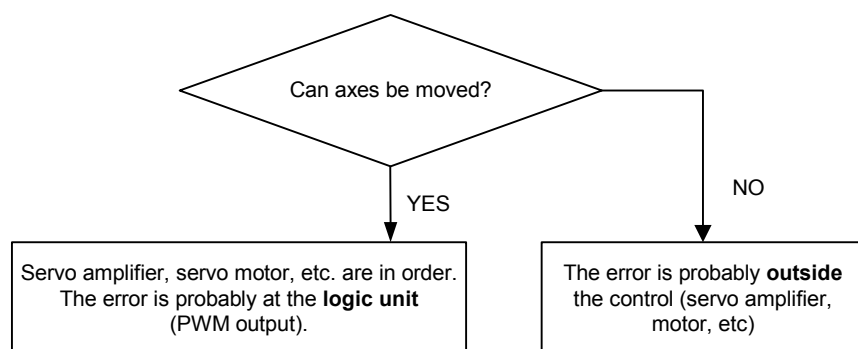
Example Error in X-axis

- ▶ Switch off main switch of machine.
- ▶ At the TNC, disconnect motor power stage connection of the axis to be checked.
In example X51 (X-axis).
- ▶ Connect DCG testing unit to interface card at the SIMODRIVE 611 D, according to connection diagram.
- ▶ Switch on main switch of machine.
- ▶ Do not acknowledge POWER INTERRUPT message. Call machine parameter list with code number 95148.
- ▶ In machine parameter MP 120.x/121.x, enter the value **0** for the axis to be checked (**no** nominal value output from TNC).
In example MP 120.0 = 0
- ▶ Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- ▶ Check the servo amplifier, see basic circuit diagram on page 161
 - Power supply unit of Simodrive ready?
 - Axis module ready?
- ▶ For axes with clamping device, check the opening of the clamping. If necessary, open the clamping externally.
- ▶ Set basic setting values on DCG:
 - Err.1: Up (active)
 - Err.2: Up (active)
 - Torque: Left limit
 - Speed: Left limit
 - Power switch: On
 - Controller on: Up
- ▶ Turn the potentiometers for speed and torque up together and then back until a continuous axis motion is reached.

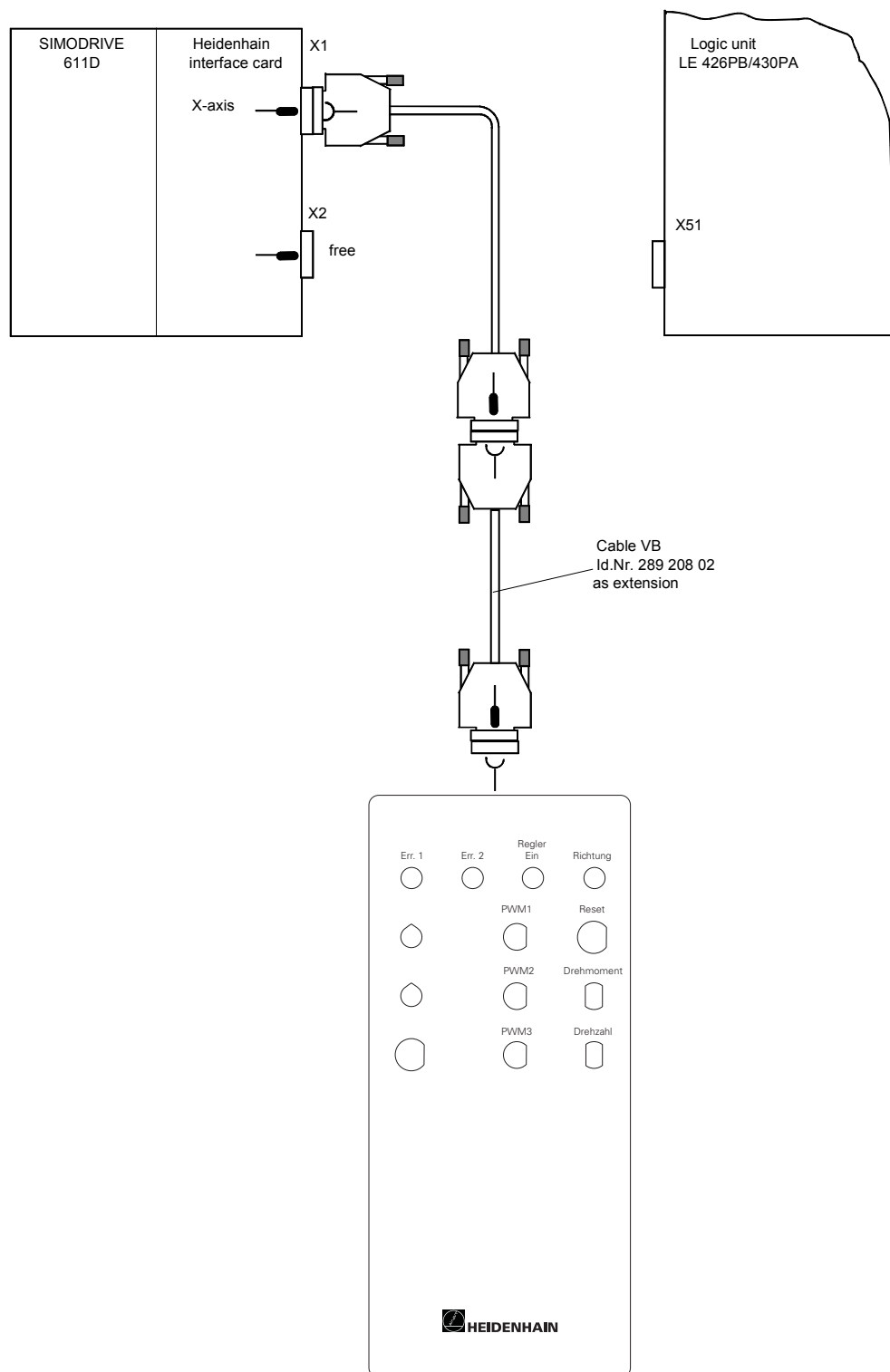


DANGER

- For height axes, take precautions to ensure that the axis does not fall down.
- Only turn the torque potentiometer up far enough that the current does not exceed the maximum value from the motor or the power stage.
For this, measure the current with an external amperemeter.



Connection



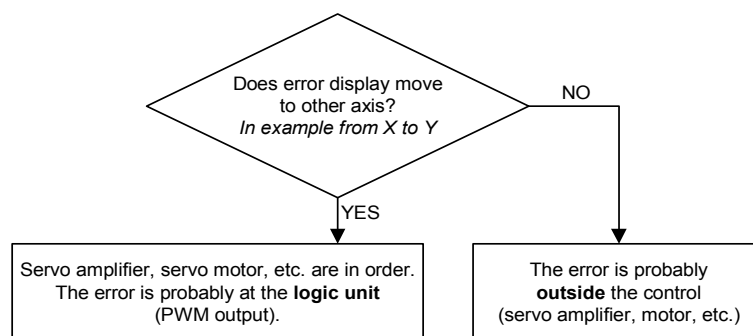
14.2.3 Test routine 3

Machine parameters used in example

MP 100.x	=	----CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
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	=	61 (1. spindle at motor power stage connection X61, Spindle DSP)
MP 121.1	=	0 (2. spindle not active)

Example Error in X-axis

- ▶ Switch off main switch of machine.
- ▶ Exchange the motor power stage connection of the defective axis with that of a functional axis at the logic unit.
In the example X51 (X-axis) with X52 (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) = 52, MP 120.1 (Y-axis) = 51
- ▶ Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- ▶ Check the servo drive and the TNC; see basic circuit diagram on page 161
 - Power supply unit of Simodrive ready?
 - Axis module ready?
 - Input I3 = 1 (+24 V)
 - Input X50/Pin1 = 1 (+24 V)
 - Output "control-is ready" = 1 (+24 V)
- ▶ Check the status display of the TNC:
 - Does feed rate enable exist?
Inverse F means no feed rate enable by PLC.
- ▶ Check PLC marker M4563.
- ▶ Check PLC word W1060.
 - Is position control loop closed?
If the symbol "axis not in controlled loop" is displayed in front of axis (e.g. +X -100.2769), the PLC has not yet closed the control loop.
- ▶ Check PLC word W1040.
 - STIB On (star in status display).
If the star does not exist, the PLC may trigger an NC stop.
- ▶ Check PLC marker M4560.
 - M4560 = 1 -> no NC stop by PLC
 - M4560 = 0 -> no NC stop by PLC
- ▶ Start positioning of axis.



14.2.4 Test routine 4

General

If the **logic unit 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-parameter settings used in example

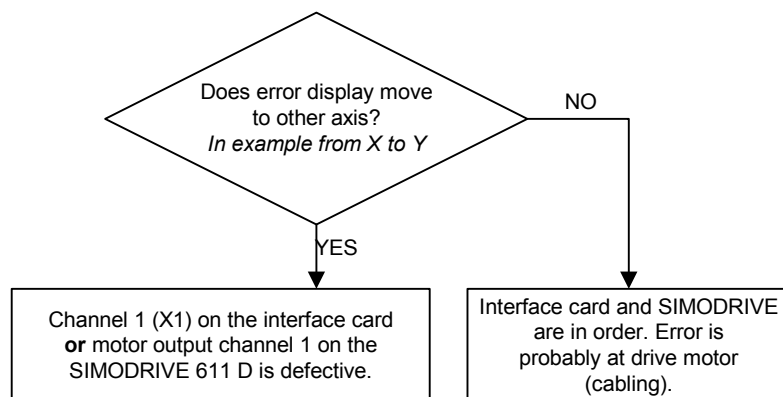
Interface card: **X1** (motor power stage connection for channel 1) connected with **X51** (TNC, X-axis)
X2 (motor power stage connection for channel two) connected with **X52** (TNC, Y-axis)

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 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 = 61 (1. spindle at motor power stage connection **X61, Spindle DSP**)
MP 121.1 = 0 (2. spindle not active)

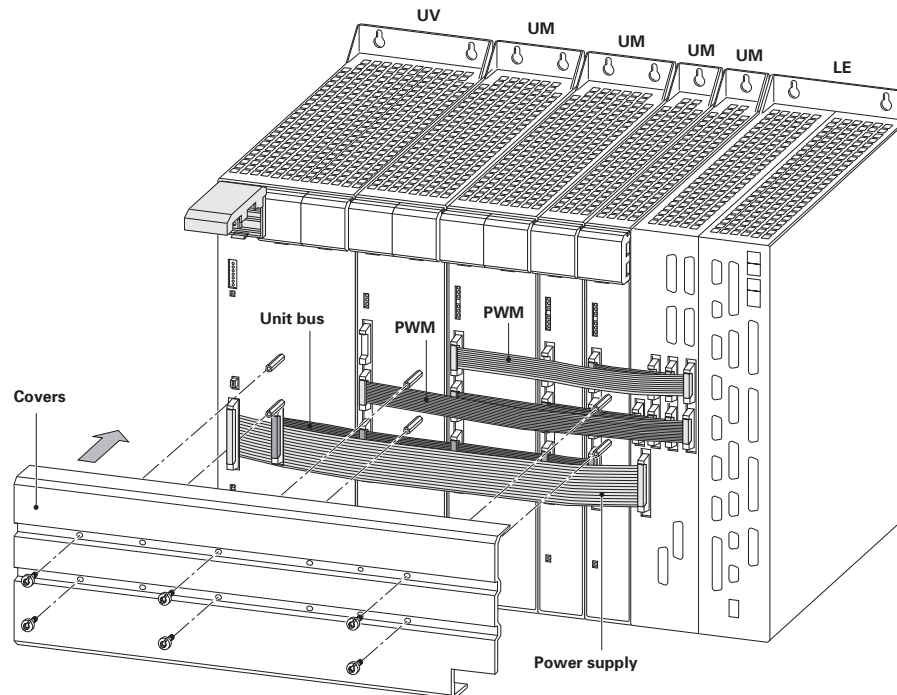
Example Error in X-axis

- ▶ Switch off main switch of machine.
- ▶ Exchange motor power stage connections **X1** and **X2** 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.
- ▶ Check the servo drive and the TNC; see basic circuit diagram on page 161.
 - Power supply unit of Simodrive ready?
 - Axis module ready?
 - Input I3 = 1 (+24 V)
 - Input I32 = 1 (+24 V)
 - Output "control-is ready" = 1 (+24 V)
- ▶ Check the status display of the TNC:
 - Does feed rate enable exist?
Inverse F means no feed rate enable by PLC.
- ▶ Check PLC marker M4563.
- ▶ Check PLC word W1060:
 - Is position control loop closed?
If the symbol "axis not in position control loop" is displayed in front of the axis (e.g. +X -100.2769), the PLC has not yet closed the control loop.
- ▶ Check PLC word W1040:
 - STIB On (star in status display).
If the star does not exist, the PLC may trigger an NC stop.
- ▶ Check PLC marker M4560:
 - M4560 = 1 -> no NC stop by PLC
 - M4560 = 0 -> no NC stop by PLC
- ▶ Start positioning of axis.



14.2.5 Test routine 5

Basic arrangement of components



Machine parameters used in example

MP 100.x	= - - - -CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
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	= 61 (1. spindle at motor power stage connection X61, Spindle DSP)
MP 121.1	= 0 (2. spindle not active)

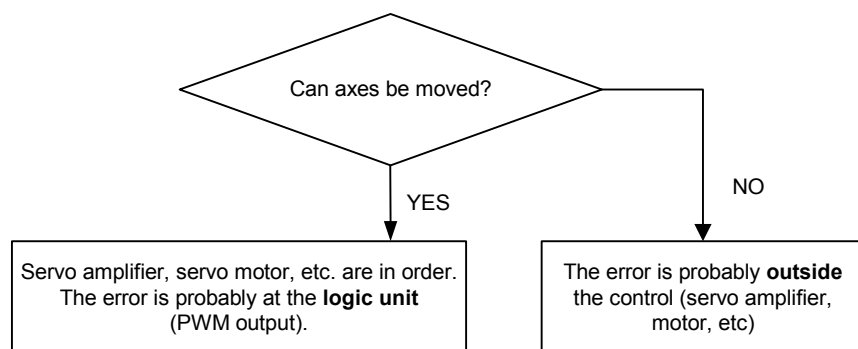
Example Error in X-axis

- ▶ Switch off main switch of machine.
- ▶ Remove the cover of the ribbon cables for the inverter modules.
- ▶ At the TNC, disconnect motor power stage connection of the axis to be checked.
In example X51 (X-axis)
- ▶ Connect DCG testing unit to PWM input of inverter module according to Connection Diagram.
- ▶ Switch on main switch of machine.
- ▶ Do not acknowledge POWER INTERRUPT message. Call machine parameter list with code number 95148.
- ▶ In machine parameter MP 120.x/121.x, enter the value **0** for the axis to be checked (**no** nominal value output from TNC).
In above example MP 120.0 = 0
- ▶ Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- ▶ Check the servo amplifier; see basic circuit diagram on page 161.
 - Is power supply unit UV xxx ready?
 - Is axis module UM xxx ready?
- ▶ For axes with clamping device, check the opening of the clamping.
If necessary, open the clamping externally.
- ▶ Set basic setting values on DCG:
 - Err.1: Up (active)
 - Err.2: Up (active)
 - Torque: Left limit
 - Speed: Left limit
 - Power switch: On
 - Controller on: Up
- ▶ Turn the potentiometers for speed and torque up together and then back until a continuous axis motion is reached.

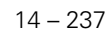


DANGER

- For height axes, take precautions to ensure that the axis does not fall down.
- Only turn the torque potentiometer up far enough that the current does not exceed the maximum value from the motor or the power stage.
For this, measure the current with an external amperemeter.



November 2001



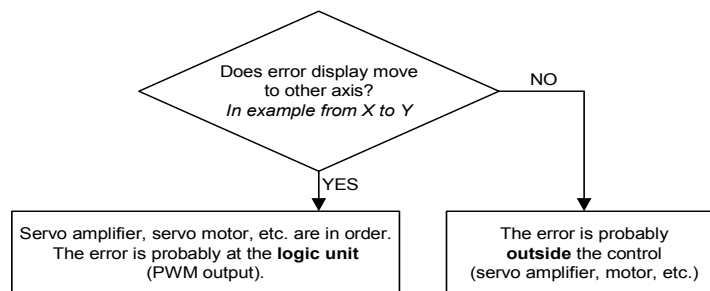
14.2.6 Test routine 6

Machine parameters used in example

MP 100.x	= ----CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 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	= 61 (1. spindle at motor power stage connection X61, Spindle DSP)
MP 121.1	= 0 (2. spindle not active)

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 logic unit**.
In the example X51 (X-axis) with X52 (Y-axis)
Note: 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.
- ▶ Check the servo drive and the TNC; see basic circuit diagram on page 161.
 - Is power supply unit UV xxx ready?
 - Is axis module UM xxx ready?
 - Input I3 = 1 (+24 V)
 - Input I32 = 1 (+24 V)
 - Output "control-is ready" = 1 (+24 V)
- ▶ Check the status display of the TNC:
 - Does feed rate enable exist?
Inverse F means no feed rate enable by PLC.
- ▶ Check PLC marker M4563.
- ▶ Check PLC word W1060:
 - Is position control loop closed?
If the symbol "axis not in controlled loop" is displayed in front of axis (e.g. +X -100.2769), the PLC has not yet closed the control loop.
- ▶ Check PLC word W1040:
 - STIB On (star in status display).
If the star does not exist, the PLC may trigger an NC stop.
- ▶ Check PLC marker M4560:
 - M4560 = 1 -> no NC stop by PLC
 - M4560 = 0 -> no NC stop by PLC
- ▶ Start positioning of axis.



14.2.7 Test routine 7

General

If the **logic unit 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.

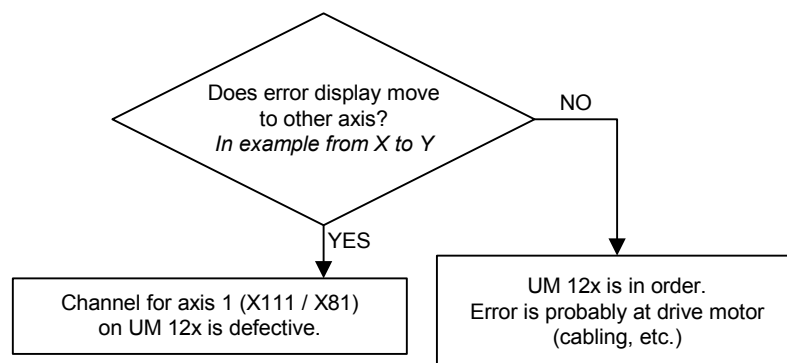
Configuration and machine-parameter settings used in example

UM 12x: **X111** (motor power stage connection of channel 1) connected with **X51** (TNC, X-axis)
X112 (motor power stage connection of channel 2) connected with **X56** (TNC, 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 120.0 = 51 (X-axis at motor power stage connection **X51**)
MP 120.1 = 56 (Y-axis at motor power stage connection **X56**)
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 = 61 (1. spindle at motor power stage connection **X61, Spindle DSP**)
MP 121.1 = 0 (2. spindle not active)

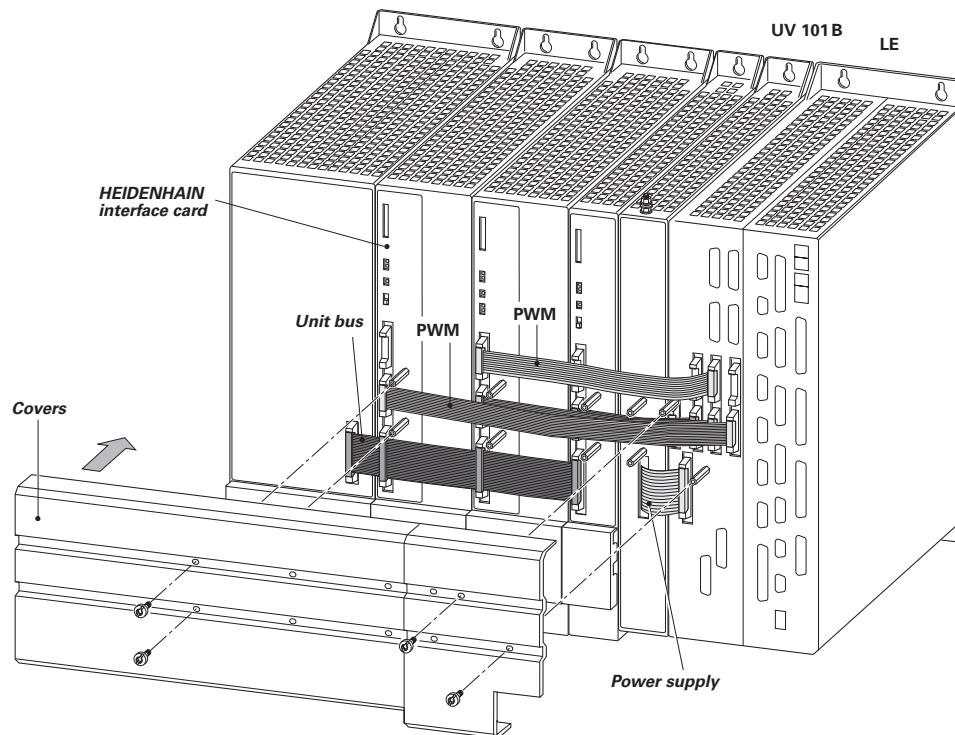
Example Error in X-axis

- ▶ 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.
- ▶ Check the servo drive and the TNC; see basic circuit diagram on page 161.
 - Is power supply unit UV xxx ready?
 - Is axis module UM xxx ready?
 - Input I3 = 1 (+24 V)
 - Input I32 = 1 (+24 V)
 - Output "control-is ready" = 1 (+24 V)
- ▶ Check the status display of the TNC:
 - Does feed rate enable exist?
Inverse F means no feed rate enable by PLC.
- ▶ Check PLC marker M4563.
- ▶ Check PLC word W1060:
 - Is position control loop closed?
If the symbol "axis not in controlled loop" is displayed in front of axis (e.g. +X -100.2769),
the PLC has not yet closed the control loop.
- ▶ Check PLC word W1040:
 - STIB On (star in status display).
If the star does not exist, the PLC may trigger an NC stop.
- ▶ Check PLC marker M4560:
 - M4560 = 1 -> no NC stop by PLC
 - M4560 = 0 -> no NC stop by PLC
- ▶ Start positioning of axis.



14.2.8 Test routine 8

Basic arrangement of components



General

A **digital** axis / spindle of the TNC 426 M / 430 M is adapted to the SIMODRIVE 611 D via an **interface card** from HEIDENHAIN. This card is inserted into the drive module.

Machine parameters used in example

MP 100.x	= ----CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 120.0	= 51 (X-axis at motor power stage connection X51)
MP 120.1	= 56 (Y-axis at motor power stage connection X56)
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	= 61 (1. spindle at motor power stage connection X61, Spindle DSP)
MP 121.1	= 0 (2. spindle not active)

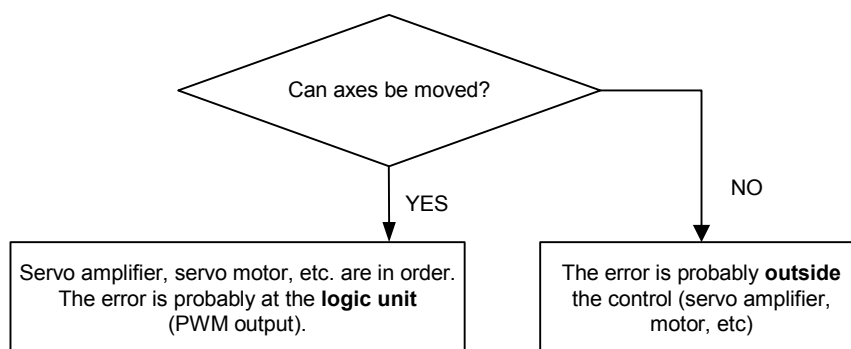
Example Error in X-axis

- ▶ Switch off main switch of machine.
- ▶ Remove cover from ribbon cables.
- ▶ At the TNC, disconnect motor power stage connection of the axis to be checked.
In example X51 (X-axis)
- ▶ Connect DCG testing unit to interface card at the SIMODRIVE 611D, according to Connection Diagram.
- ▶ Switch on main switch of machine.
- ▶ Do not acknowledge POWER INTERRUPT message. Call machine parameter list with code number 95148.
- ▶ In machine parameter MP 120.x/121.x, enter the value **0** for the axis to be checked (**no** speed nominal value output from TNC).
In example MP 120.0 = 0
- ▶ Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- ▶ Check the servo amplifier; see basic circuit diagram on page 161
 - Power supply unit of Simodrive ready?
 - Axis module ready?
- ▶ For axes with clamping device, check the opening of the clamping.
If necessary, open the clamping externally.
- ▶ Set basic setting values on DCG:
 - Err.1: Up (active)
 - Err.2: Up (active)
 - Torque: Left limit
 - Speed: Left limit
 - Power switch: On
 - Controller on: Up
- ▶ Turn the potentiometers for speed and torque up together and then back until a continuous axis motion is reached.

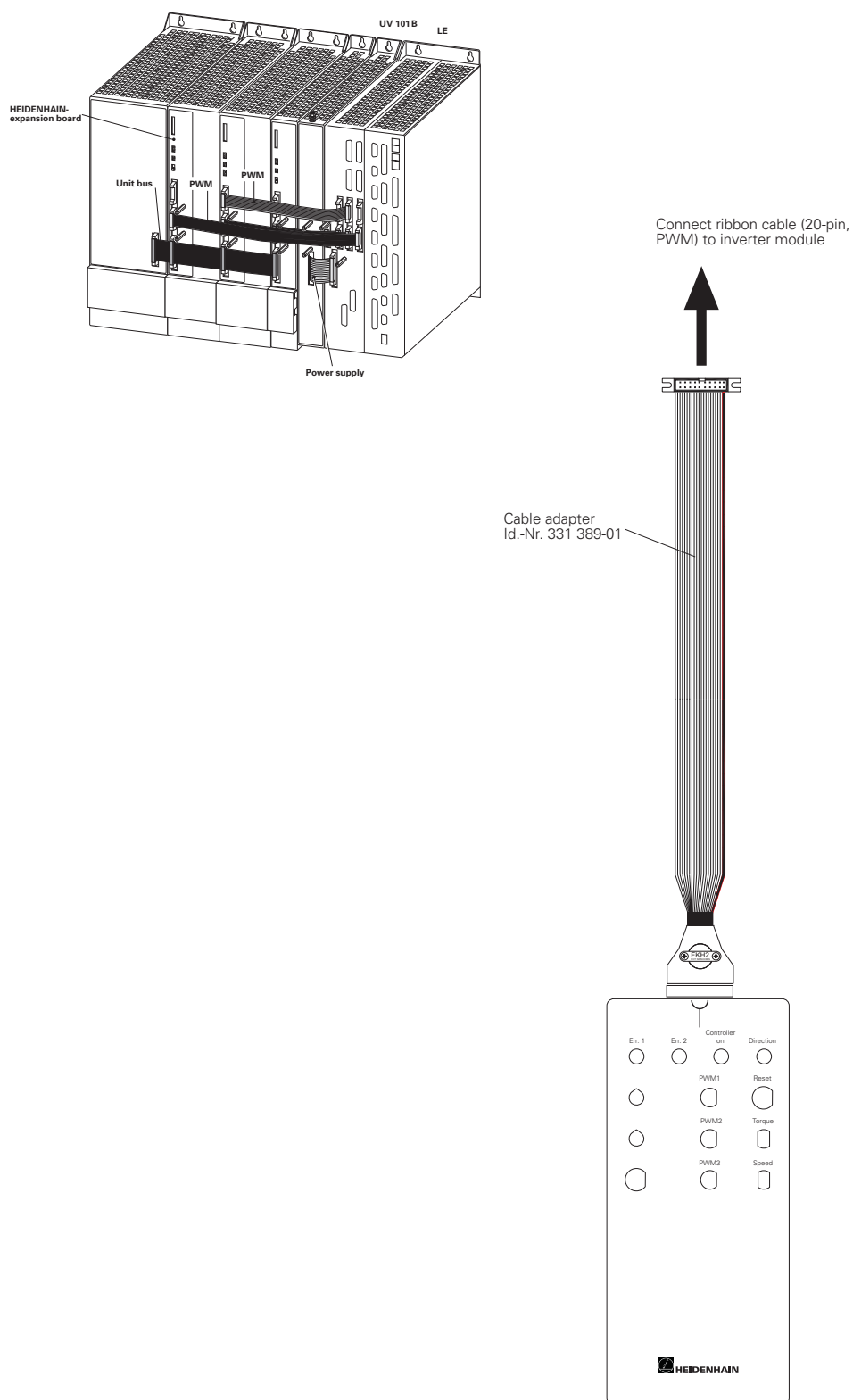


DANGER

- For height axes, take precautions to ensure that the axis does not fall down.
- Only turn the torque potentiometer up far enough that the current does not exceed the maximum value from the motor or the power stage.
For this, measure the current with an external amperemeter.



Connection



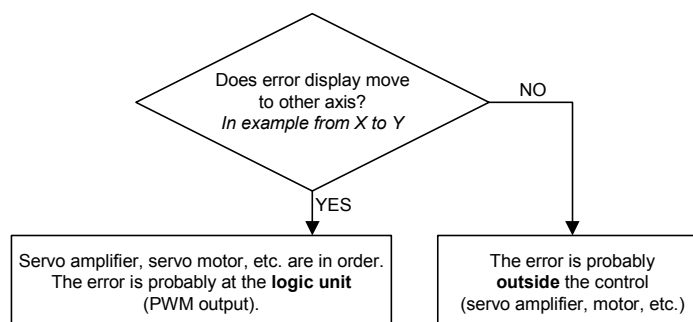
14.2.9 Test routine 9

Machine parameters used in example

MP 100.x	= ---- -CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
MP 120.0	= 51 (X-axis at motor power stage connection X51)
MP 120.1	= 56 (Y-axis at motor power stage connection X56)
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	= 61 (1. spindle at motor power stage connection X61, Spindle DSP)
MP 121.1	= 0 (2. spindle not active)

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 logic unit**.
In the example X51 (X-axis) with X56 (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) = 56, MP 120.1 (Y-axis) = 51
- ▶ Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- ▶ Check the servo drive and the TNC; see basic circuit diagram on page 161.
 - Power supply unit of Simodrive ready?
 - Axis module ready?
 - Input I3 = 1 (+24 V)
 - Input I32 = 1 (+24 V)
 - Output "control-is ready" = 1 (+24 V)
- ▶ Check the status display of the TNC:
 - Does feed rate enable exist?
Inverse F means no feed rate enable by PLC.
- ▶ Check PLC marker M4563.
- ▶ Check PLC word W1060:
 - Is position control loop closed?
If the symbol "axis not in controlled loop" is displayed in front of axis (e.g. +X -100.2769), the PLC has not yet closed the control loop.
- ▶ Check PLC word W1040:
 - STIB On (star in status display).
If the star does not exist, the PLC may trigger an NC stop.
- ▶ Check PLC marker M4560:
 - M4560 = 1 -> no NC stop by PLC
 - M4560 = 0 -> no NC stop by PLC
- ▶ Start positioning of axis.



14.2.10 Test routine 10

General

If the **logic unit 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

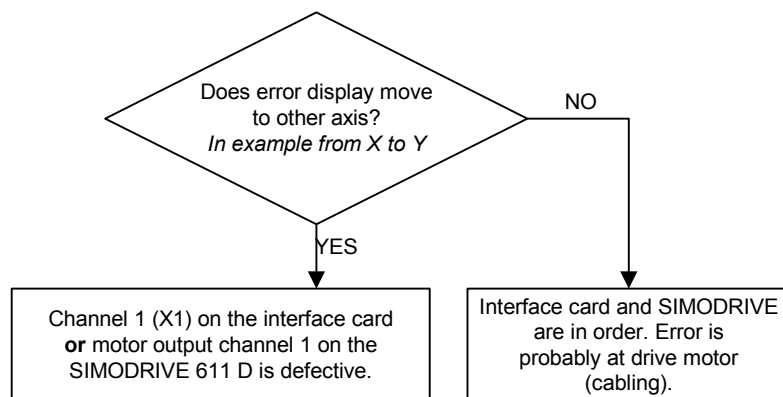
Interface card: **X111** (motor power stage connection of channel 1) connected with **X51** (TNC, X-axis)
X112 (motor power stage connection of channel 2) connected with **X56** (TNC, Y-axis)

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 120.0 = 51 (X-axis at motor power stage connection **X51**)
MP 120.1 = 56 (Y-axis at motor power stage connection **X56**)
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 = 61 (1. spindle at motor power stage connection **X61, Spindle DSP**)
MP 121.1 = 0 (2. spindle not active)

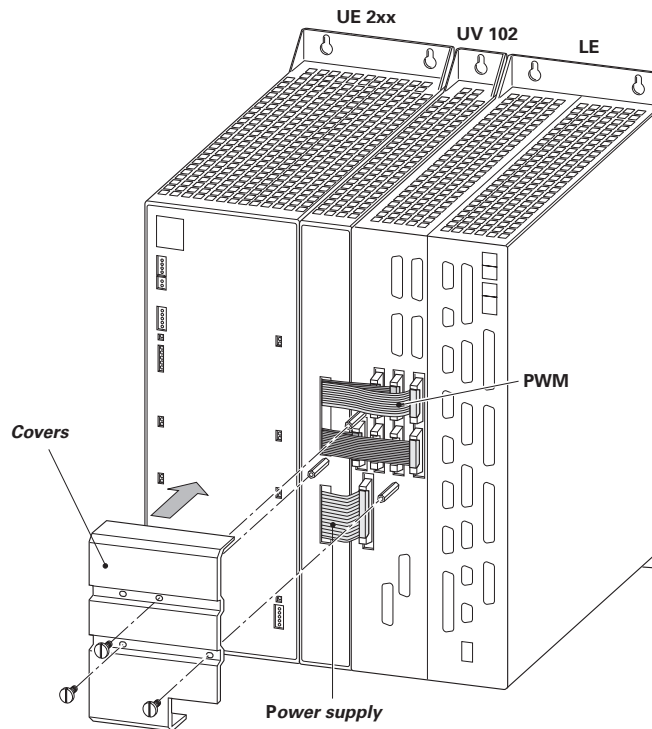
Example Error in X-axis

- ▶ 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.
- ▶ Check the servo drive and the TNC; see basic circuit diagram on page 161
 - Power supply unit of Simodrive ready?
 - Axis module ready?
 - Input I3 = 1 (+24 V)
 - Input I32 = 1 (+24 V)
 - Output "control-is ready" = 1 (+24 V)
- ▶ Check the status display of the TNC:
 - Does feed rate enable exist?
Inverse F means no feed rate enable by PLC.
- ▶ Check PLC marker M4563.
- ▶ Check PLC word W1060:
 - Is position control loop closed?
If the symbol "axis not in controlled loop" is displayed in front of axis (e.g. +X -100.2769), the PLC has not yet closed the control loop.
- ▶ Check PLC word W1040:
 - STIB On (star in status display).
If the star does not exist, the PLC may trigger an NC stop.
- ▶ Check PLC marker M4560:
 - M4560 = 1 -> no NC stop by PLC
 - M4560 = 0 -> no NC stop by PLC
- ▶ Start positioning of axis.



14.2.11 Test routine 11

Basic arrangement of components



Assignment ribbon leads/motor connections

The 20-pin ribbon lead connections on the UV 102 are assigned to the motor connections on the UE 2xx as follows:

UV 102 upper row, bottom connection:	1st axis, connected internally with motor connection X81
UV 102 upper row, middle connection:	2nd axis, connected internally with motor connection X82
UV 102 upper row, upper connection:	3rd axis, connected internally with motor connection X83
UV 102 lower row, bottom connection:	4th axis, connected internally with motor connection X84
UV 102 lower row, upper connection:	spindle, connected internally with motor connection X80

Machine parameters used in example

MP 100.x	= - - - - CZYX (X = 1st axis, Y = 2nd axis, Z = 3rd axis, C = 4th axis)
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	= 54 (Z-axis at motor power stage connection X54)
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)

Connection on the UE 2xx is as follows:

X-axis motor to motor output X81
Y-axis motor to motor output X82
Z-axis motor to motor output X84
A-axis motor to motor output X83
Spindle motor to motor output X80

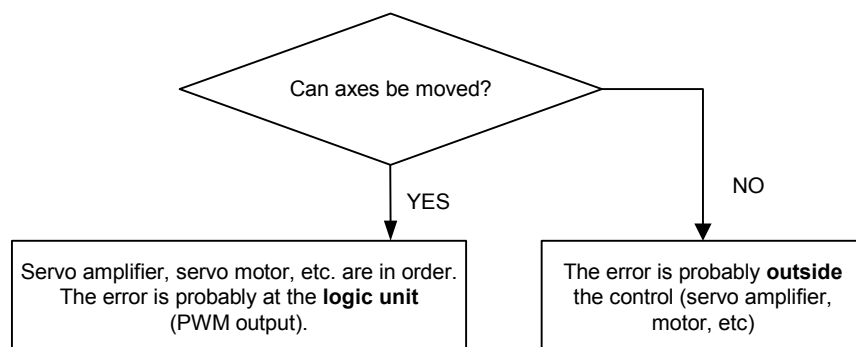
Example Error in X-axis

- ▶ Switch off main switch of machine.
- ▶ Remove cover from ribbon cables.
- ▶ At the TNC, disconnect motor power stage connection of the axis to be checked.
In example X51 (X-axis)
- ▶ Connect DCG testing unit to PWM input of inverter module according to Connection Diagram.
- ▶ Switch on main switch of machine.
- ▶ Do not acknowledge POWER INTERRUPT message. Call machine parameter list with code number 95148.
- ▶ In machine parameter MP 120.x/121.x, enter the value **0** for the axis to be checked (**no** speed nominal value output from TNC).
In above example MP 120.0 = 0
- ▶ Acknowledge POWER INTERRUPT with CE key and switch on control voltage.
- ▶ Check the servo amplifier; see basic circuit diagram on page 161.
 - Is compact inverter UE 2xx ready?
- ▶ For axes with clamping device, check the opening of the clamping.
If necessary, open the clamping externally.
- ▶ Set basic setting values on DCG:
 - Err.1: Up (active)
 - Err.2: Up (active)
 - Torque: Left limit
 - Speed: Left limit
 - Power switch: On
 - Controller on: Up
- ▶ Turn the potentiometers for speed and torque up together and then back until a continuous axis motion is reached.

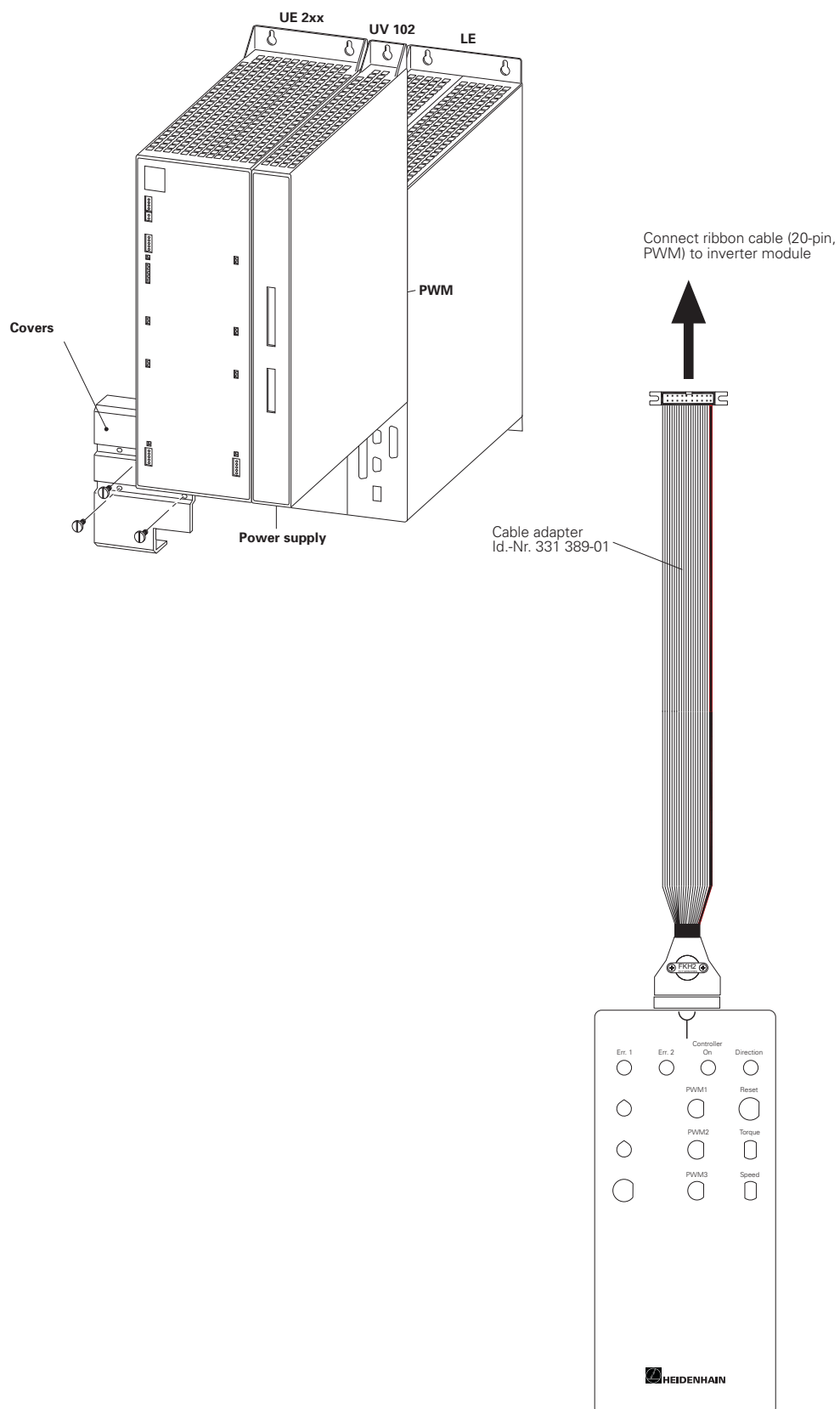


DANGER

- For height axes, take precautions to ensure that the axis does not fall down.
- Only turn the torque potentiometer up far enough that the current does not exceed the maximum value from the motor or the power stage.
For this, measure the current with an external amperemeter.



Connection



14.3 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 parameter (if you change the machine parameter, 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:
$$\text{LAG [mm]} = \frac{\text{traversing speed [m/min]}}{\text{kv-factor}}$$

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

14.4 Adjusting the Electrical Offset

General

Electrical offset adjusting is required if

- you have exchanged the logic unit.
- 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** (off)
- MP 7290.x (position display step) : **6** (display step 0.1 µm)



- ▶ Select the Manual operating mode

- ▶ Switch position display to LAG.



- ▶ Select the Programming and Editing mode



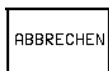
- ▶ Prepare for entry of code number



- ▶ 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 $\pm 3\text{-}5\text{ }\mu\text{m}$).
- ▶ Reset the original values in machine parameters and in the position display.

Offset adjusting via code number

Procedure:



► Select the Programming and Editing mode



► Prepare for entry of code number

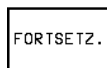


► Enter the code number



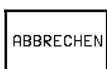
► Confirm

► Press one of the following soft keys:

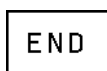


Carry out an offset compensation. The values are stored in the nonvolatile memory.

Offset adjusting via code number compensates the current offset values. Later changes in offset are not compensated.



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



Exit the menu without making any changes.

14.5 Integrated Oscilloscope

Call

The TNC 426.B/430.A has an integral oscilloscope.

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

Manueller Betrieb	Oscilloscope						
Output		Ramp					
Feed rate		1000					
Sample time		0.6MS					
Channel 1	X	Actl.speed					
Channel 2	X	Lag					
Channel 3	X	I nominal					
Channel 4		Off					
Trigger		Channel 1					
Trigger threshold		+10					
Slope		+					
Pre-trigger		25%					
OSCI				SAVE SCREEN		MP EDIT	END

Description of elements

The oscilloscope allows you to trace and save the following characteristic curves of the axes in a maximum of four channels:

Actl. speed	Actual value of the axis feed rate (mm/min). Calculated from position encoder	
Noml. speed	Nominal value of the axis feed rate (mm/min). Calculated from the difference between the nominal position values. The servo lag is not considered.	
Feed rate	Contouring tool feed rate (mm/min)	
Actual pos	Actual position (mm)	
Noml. pos	Nominal position (mm)	
Lag	Servo lag of position controller (µm)	
Position: I1	Encoder signal 1 of position encoder (0° signal)	
Position: I2	Encoder signal 2 of position encoder (90° signal)	
Saved	Last traced signal is saved	
PLC	The PLC operands (B, W, D, I, O, T, C) are recorded. Enter the desired operand in the input field beside PLC.	
Analog axes:	Volt.analog	Analog voltage = nominal velocity value (mV)
Digital axes:	V (ACT RPM)	Actual speed value (mm/min); Calculated with speed encoder and regulated with MP2020
	V (NOML RPM)	Nominal velocity value (mm/min): Output quantity of the position controller
	I (INT RPM)	Integral-action component of nominal current value (A)
	I nominal	Nominal current value (A) that determines torque

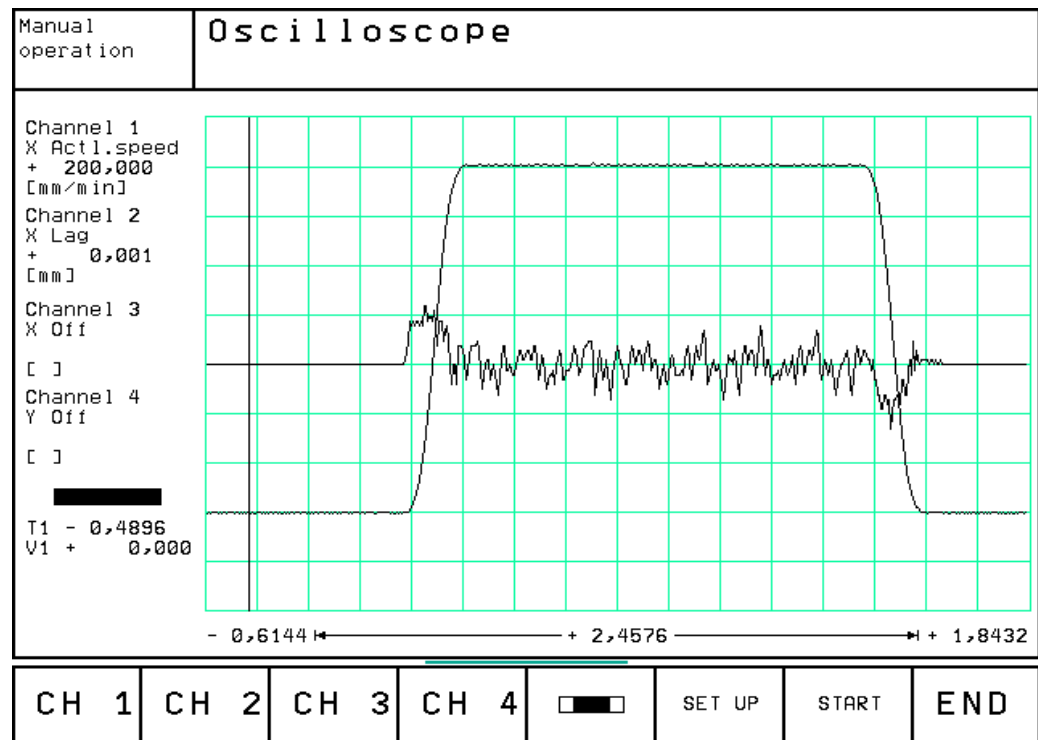
The recorded data is stored until a new recording is started or another graphic function is activated.

Output	<p>► Select whether the nominal speed value is to be output as a jump or a ramp</p> <p>If you select "ramp", then the programmed feed rate is effective, like the k_v factors and accelerations set in the machine parameters.</p> <p>If you select "jump", then a jump is output as nominal speed value when the axis direction keys are activated in the Manual mode. The position control loop is open while the jump is being output. You must define the height of the jump in the input field "Feed rate".</p>								
Feed rate	<p>► Define the height of the jump for the nominal speed value (mm/min). If you have defined a ramp as output, this field has no meaning.</p>								
Sample time	<p>4 096 grid points are recorded in a time of between 2.4576 s and 24.576 s. You can set the sample time for recording the signals:</p> <p>► Enter a value between 0.6 and 6 ms</p>								
Channel 1 to channel 4	<p>► For each of the four channels, establish which signal is to be recorded for which axis (input possibilities as above).</p>								
Trigger	<p>► Define the type of recording.</p> <p>You have the following possibilities:</p> <table> <tr> <td>FREE RUN</td><td>Recording is started and ended via soft keys.</td></tr> <tr> <td></td><td>When you press the STOP soft key, the last 4096 events are saved.</td></tr> <tr> <td>SINGLE SHOT</td><td>When you press the START soft key, the next 4096 events are saved.</td></tr> <tr> <td>CHANNEL 1 to 4</td><td>Recording begins as soon as the trigger threshold for the set channel is crossed.</td></tr> </table>	FREE RUN	Recording is started and ended via soft keys.		When you press the STOP soft key, the last 4096 events are saved.	SINGLE SHOT	When you press the START soft key, the next 4096 events are saved.	CHANNEL 1 to 4	Recording begins as soon as the trigger threshold for the set channel is crossed.
FREE RUN	Recording is started and ended via soft keys.								
	When you press the STOP soft key, the last 4096 events are saved.								
SINGLE SHOT	When you press the START soft key, the next 4096 events are saved.								
CHANNEL 1 to 4	Recording begins as soon as the trigger threshold for the set channel is crossed.								
Trigger threshold	<p>► Enter the trigger threshold in the following dimensions:</p> <ul style="list-style-type: none"> ■ Velocity [mm/min] ■ Position [mm] ■ Shaft speed [mm/min] ■ Servo lag [μm] ■ Analog voltage [mV] ■ Current [A] 								
Edge	<p>► Define whether recording will be triggered with the rising (positive) or falling (negative) edge.</p>								
Pre-trigger	<p>The saved recording begins before the trigger time by the value set here.</p> <p>► Enter time value.</p>								

Oscilloscope display

For the oscilloscope display:

- Press the OSCI soft key



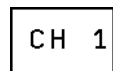
During recording, the selected signals are continuously displayed. Once recording is complete, the memory content is displayed.

For every channel, the manner of the signal and the resolution are also shown. The length of the recorded range, as a percentage of the total memory content, is shown as a bar in the status field.

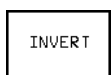
Use the cursor to move the arrow keys. The amplitude of the selected channel as well as the time (with reference to start of recording) are shown in the status field.

With the soft key CURSOR 1/2, you can activate a second soft key. The current amplitude and time are also displayed for this cursor. The time and the amplitude displayed for the second cursor depend on the status of the first cursor. This function allows you to measure the acceleration time of an axis.

Meaning of the soft keys

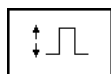


Select one of the four channels. A new soft-key row with the following soft keys appears:

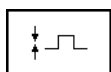


Invert the signal.

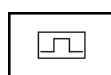
Arrows move the signal up or down.



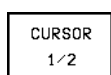
Increase the vertical resolution.



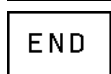
Decrease the vertical resolution.



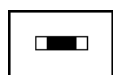
Optimum vertical resolution. The signal is centered in the picture. With NO ENT you can return to the resolution originally selected.



Switch to second cursor.



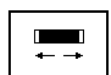
Return to oscilloscope display.



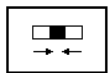
Select soft-key row to be displayed.

A new soft-key row with the following soft keys appears:

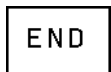
Arrows move the signal to the left or to the right



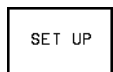
Decrease the horizontal resolution.



Increase the horizontal resolution.



Return to oscilloscope display.

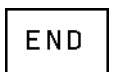


Back to setup menu.



Start recording.

Recording is ended with the trigger condition or with the STOP soft key.



Exit the oscilloscope function.

Save recording

The last recorded signal is stored with "Saved".

The soft key SAVE SCREEN allows you to store the recorded signals, along with all the settings, in a file on the hard disk. The file must have the extension .DTA. You can recall these data with the PC program PLCdesign.

15 PLC Interface

15.1 Specifications

PLC inputs

Voltage ranges	Logic unit	PL 410B
"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 if $U_i = 3.2$ V	1.0 mA	0.65 mA

Address	Number	Device
I0 to I31	31 + Control-is-ready signal	Logic unit X42 (PLC input)
I128 to I152	25	Logic unit X46 (machine operating panel)
I64 to I127	64	First PLC input/output unit
I192 to I255	64	Second PLC input/output unit
I256 to I319	64	Third PLC input/output unit
I320 to I383	64	Fourth PLC input/output unit

PLC outputs

Transistor outputs with current limit:

Output	Logic unit	PL 410B
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 (max. current consumption of PL: 20 A)

- Permissible load: resistance load; inductive load only with anti-surge diode parallel to inductivity.
- At the logic unit, no more than one output may be short-circuited at the same time (short circuit **of one** output does not lead to an overload).
- Not more than half of the PLC outputs may be closed at the same time (simultaneity factor 0.5).

Address	Number	Device
O0 to O30	31	Logic unit X41 (PLC output)
O0 to O7		Logic unit 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

15.2 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 test adapter to X42 or X46 between the logic unit 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 for entry of code number



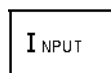
- ▶ Enter the code number



- ▶ Confirm



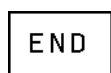
- ▶ Call TABLE function



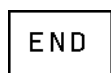
- ▶ Display table for inputs

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 test adapter to X41 or X46 between the logic unit 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



- ▶ Prepare for entry of code number



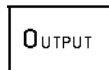
- ▶ Enter the code number



- ▶ Confirm



- ▶ Call TABLE function



- ▶ 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:

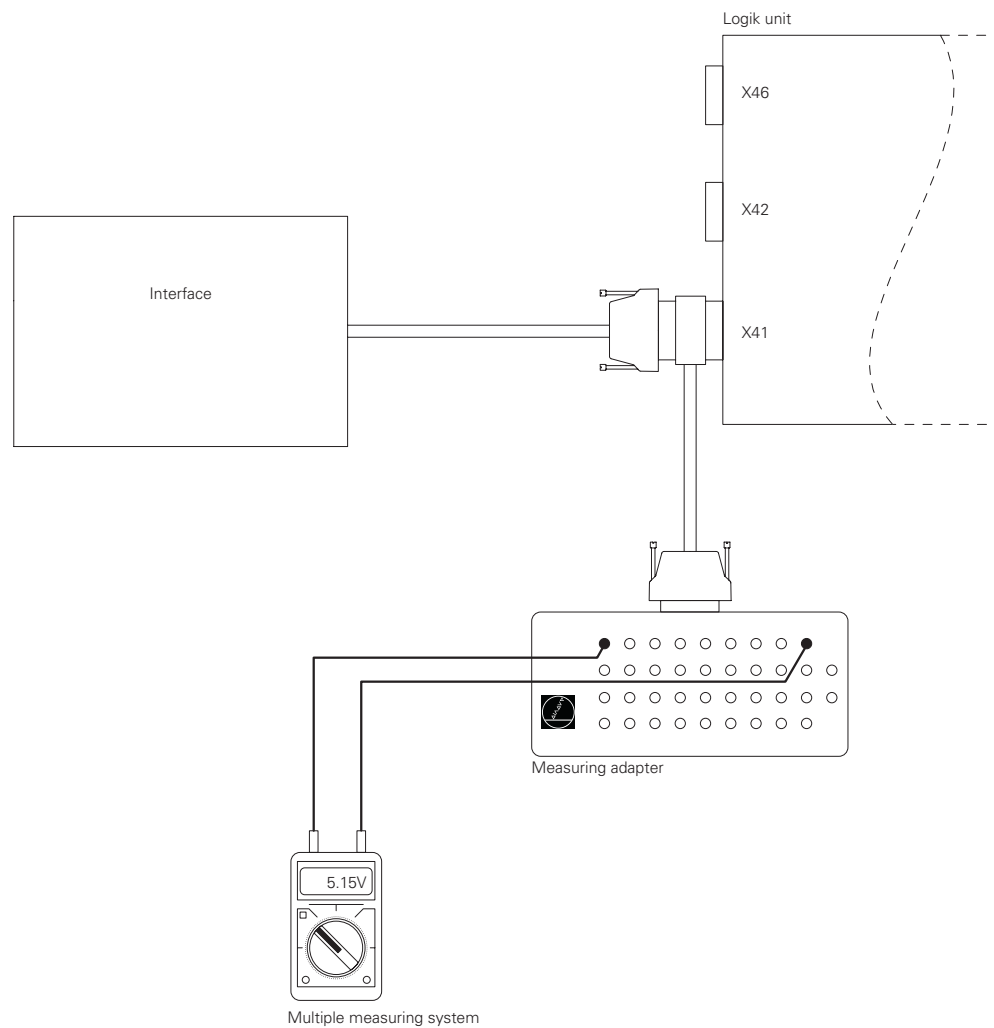
Check that there is no short circuit in the connecting cable and measure the output current for this output; see "Specifications" on page 257. If the output current is not exceeded and the cable is Ok, then the output board of the logic unit or the PL 405B/510B I/O unit is defective.



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



Measuring circuit for PLC inputs and outputs on LE



DANGER

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

15.3 Service Diagnosis in PLC mode

15.3.1 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



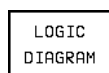
► The TRACE function is called via the TRACE soft key.

Manual operation			PLC program trace mode			
Operand	Accu	Active	Line	Command		Comment
			32	UNTIL		
			* 33	CM	WRITE_OUTPUTS	
			34	;FALLS AENDERUNG STATT GEFUNDEN HAT WIRD GESCHR		
1	1		* 35	L	M973	;MG_S-STROMDREHZAHL
0	0		* 36	A	Q15	;O-SPINDEL-REGLERF
			37	IFT		
-----	-----		38	L	W4060	;WL-STROMDREHZAHLR
			39	BS	K+15	
-----	-----		40	=	W4060	;WL-STROMDREHZAHLR
			41	ELSE		
\$0000001F	\$0000001F		* 42	L	W4060	;WL-STROMDREHZAHLR
	\$0000001F		.. 43	BC	K+15	
\$0000001F	\$0000001F		* 44	=	W4060	;WL-STROMDREHZAHLR
			45	ENDI		
SELECT M/I/O/T/C	LOGIC DIAGRAM	FIND	[HEX] ⇕ DECIMAL	[START STOP DISPLAY	START TRACE	STOP TRACE
						END

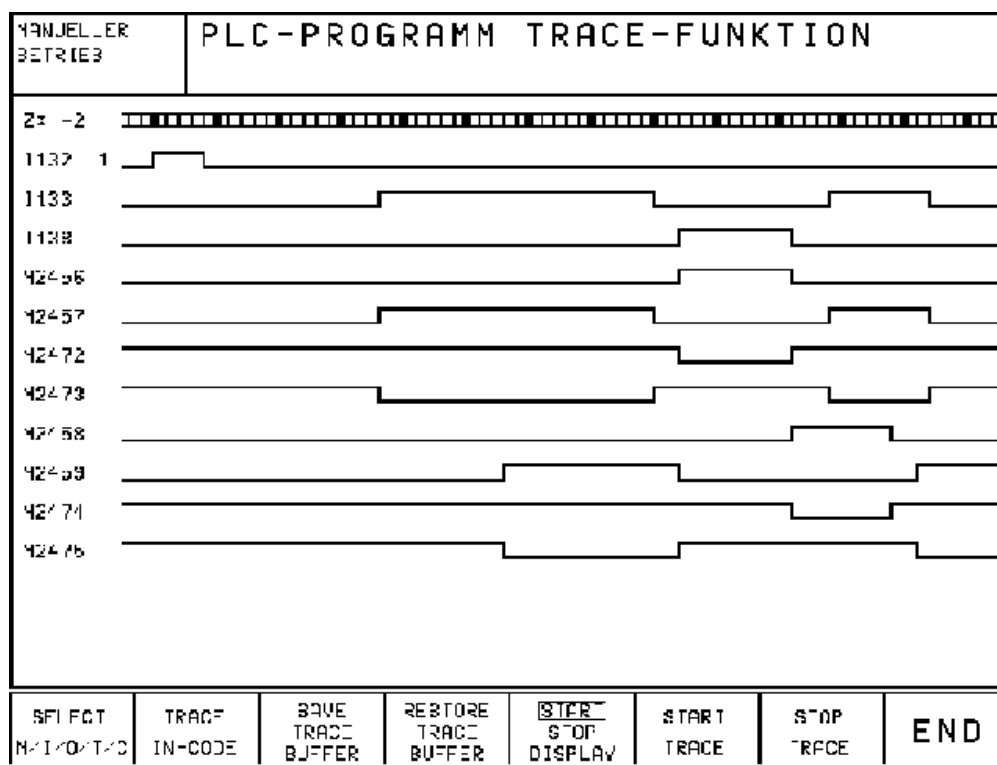
The statement list (STL) of the converted program is displayed. In addition, the contents of the operand and the accumulator is displayed in HEX or decimal code for every program line. Every active command of the STL is identified with a "*".

15.3.2 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.



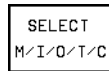
► Soft key for storing a completed trace on the hard disk



► Soft key for loading a saved trace into the logic diagram

Selection of operands and start of recording

► Press the following key combination:



► 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)



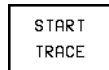
No trigger

If a trigger condition is not entered for any of the operands, the operand states are 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 function



► TNC 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.

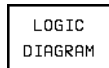
PCTR flashing : Trigger condition has not yet arrived

PCTR static : Trigger condition has arrived, buffer is written

PCTR off : Buffer full, LOGIK DIAGRAM can be called



► Switch to TRACE mode



► Calling the logic diagram

15.3.3 TABLE Function

► Press the following key combination:

► Call TABLE function



S E T	R E S E T	M A R K E R	I N P U T	O U T P U T	C O U N T E R	T I M E R	E N D
-------	-----------	-------------	-----------	-------------	---------------	-----------	-------



► Key on visual display unit

B Y T E	W O R D	D O U B L E	<div>HEX ⇕ DECIMAL</div>		SAVE M/B/W/D	RESTORE M/B/W/D	E N D
---------	---------	-------------	----------------------------------	--	-----------------	--------------------	-------

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.

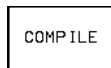
Positions can be selected within the tables using the cursor keys or the GOTO key.

15.4 Re-compile PLC program

Main screen

Manueller Betrieb	PLC programming						
<p>Processing time Maximum 42% Current 23% Code length : 23 KBYTE</p> <p>PGM in exec.mem : PLC:\IB_PGMSK\MAIN.PL PLC:\ERRTAB.PET</p> <p>PGM in edit mem : PLC:\OEM.SYS</p>							
EDIT	TABLE	TRACE	COMPILE	PROCESS MONITOR	OSCI	MP EDIT	END

Compile PLC program



► Prepare conversion



► Using the arrow keys, find the file to be compiled



Caution

Only the main program may be compiled.



► Confirm

The selected PLC-PGM is compiled and downloaded into the process memory.

15.5 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 of defining the error text: <ul style="list-style-type: none"> ■ Direct entry of the error text (max. 32 characters) ■ Line number of the PLC error text file defined in OEM.SYS with PLCERROR = (#<line nr.>) ■ 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. Error display does not flash. 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.
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.



► Exit PET table

15.6 Creating a Cross Reference List for Diagnosis Purposes

- ▶ Press the following key combination to create a cross reference list for fault diagnosis:



- ▶ Select the Programming and Editing mode



- ▶ Call input field for code number



- ▶ Enter the code number



- ▶ Confirm



- ▶ Call the program management



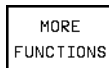
- ▶ Find the desired program using the arrow keys



- ▶ Confirm

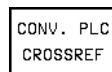


- ▶ Switch to soft-key row

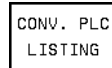


- ▶ Call formats

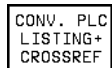
Select one of the following formats:



- Convert to cross reference list without PLC statement list



- Convert to PLC statement list (similar to PLC program)



- Convert to PLC statement list and cross reference list

- ▶ Enter the target file with file extension .A (ASCII)



- ▶ Start creation of cross reference list

15.7 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



► Prepare for entry of code number



► Enter the code number



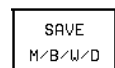
► Confirm



► Call TABLE function



► Switch soft-key row

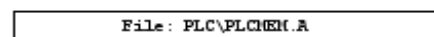


RANGE =

► Enter the PLC marker or word range which is to be stored.
The maximum range of the nonvolatile PLC markers and words (e.g.. M0... M999, W0... W126) is entered automatically by the TNC as the default setting.



► Confirm setting



► Enter the target directory and the file name, under which the information is to be stored on the hard disk.

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



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



► Exit PLC operating mode

Writing back to RAM memory

► Press the following key combination:



► Select the Programming and Editing mode



► Prepare for entry of code number



► Enter the code number



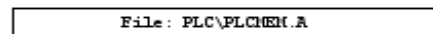
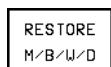
► Confirm



► 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 TNC is PLC\PLCMEM.A.



► The stored states of the PLC markers and words are written back to the RAM memory.



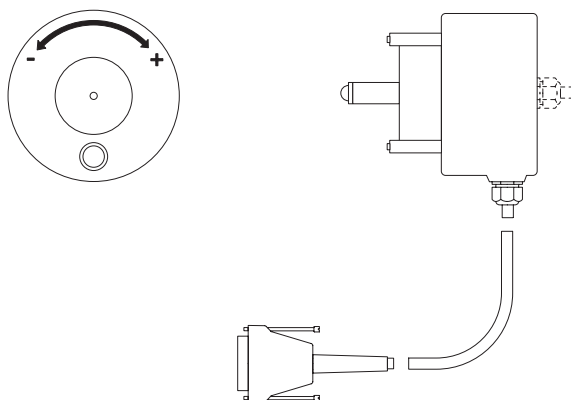
► Exit PLC operating mode



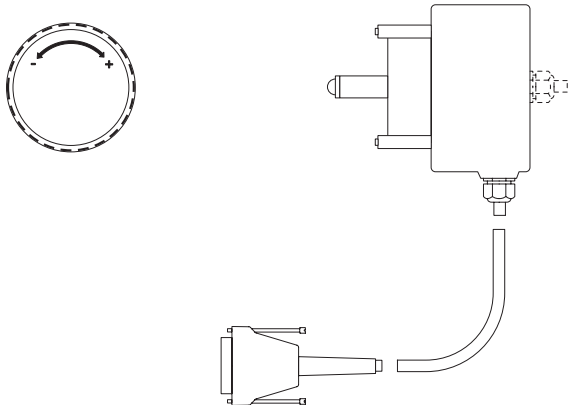
16 Serial Handwheels

16.1 Handwheel HR 130/130.001/330

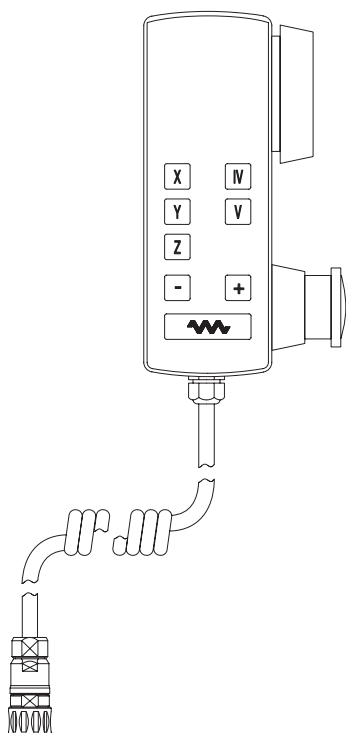
HR130



HR 130.001

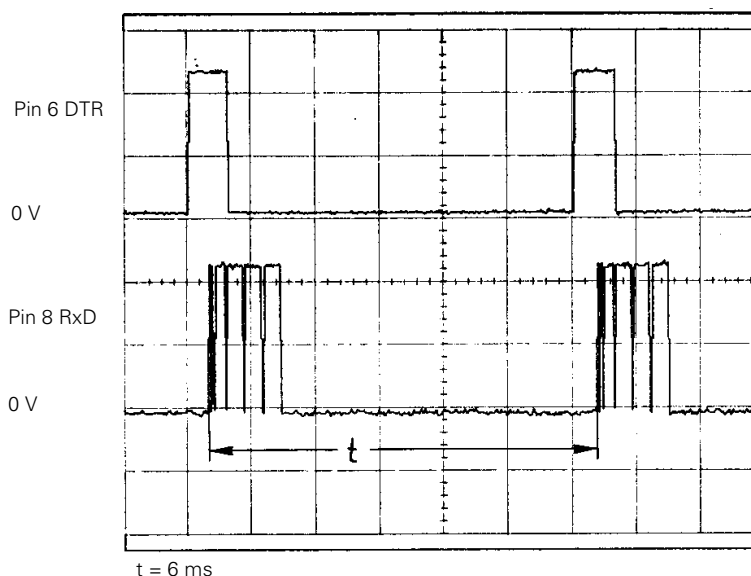


HR 330



Checking data transmission

The serial handwheel HR 130 and handwheel HR 330 with auxiliary keys can be checked using an oscilloscope. The following signals can be measured at handwheel input X23 of the LE. The signals must correspond to the following diagram:



Note

Power is supplied to the handwheel via the logic unit.
(X23 Pin 2 = 0 V, Pin 4 = + 12 V)

Checking the keys

The handwheel HR 330 keys are checked in conjunction with machine parameter MP 7640:

MP7640 = 1: HR 330 (evaluation of all keys via NC)

The axis keys on the machine operating panel move the highlight for actual position capture or datum setting.

The axis keys on the HR move the handwheel symbol on the display unit.

The rapid traverse, + and – keys are evaluated directly by the NC. The PLC inputs I160 to I162 are set accordingly.

MP7640 = 2: HR 330/130 (evaluation of all keys via NC)

The axis keys on the operating panel and the axis keys on the HR move both the highlight as well as the handwheel symbol on the display unit.

The axis can also be selected via TNC keyboard unit (for panel-mounted handwheel HR 130).

The rapid traverse, + and – keys are evaluated directly by the NC. The PLC inputs I160 to I162 are set accordingly.

MP7640 = 3: HR 330 (evaluation of +, – and rapid traverse keys via PLC)

The axis keys on the machine operating panel move the highlight for actual position capture or datum setting.

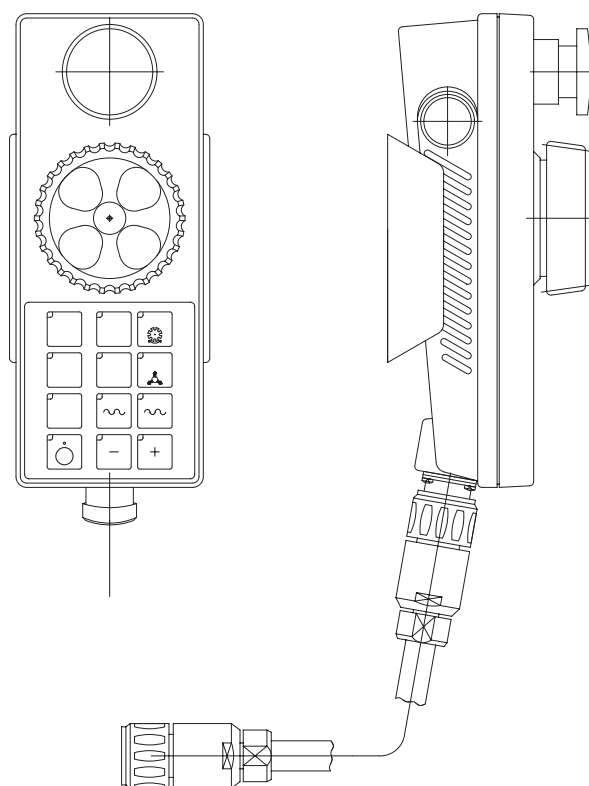
The axis keys on the HR move the handwheel symbol on the display unit.

The rapid traverse, + and – keys must be evaluated by the PLC. The PLC inputs I160 to I162 are set accordingly.

Assignment of the keys to the PLC inputs:

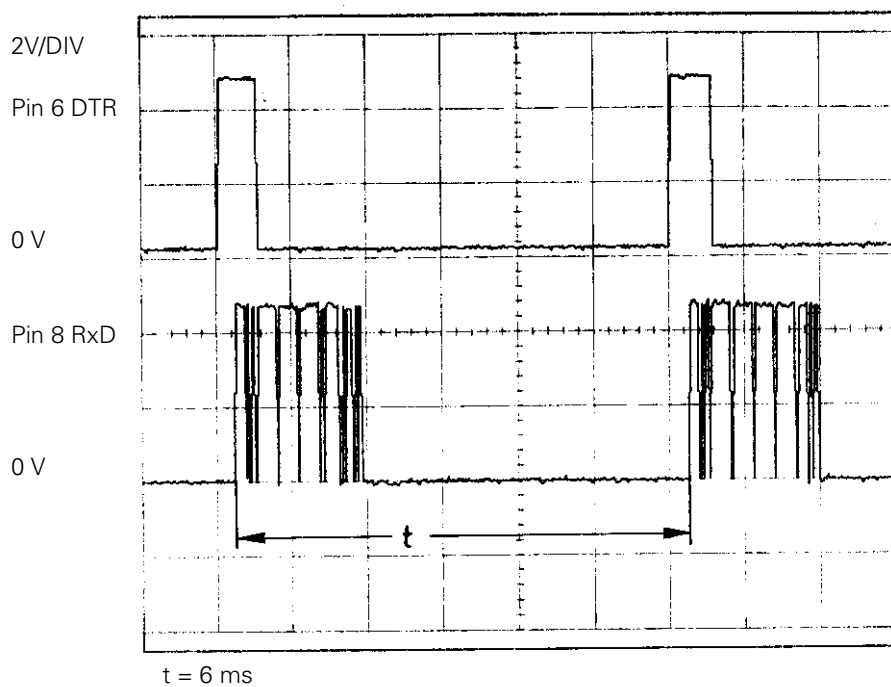
Key on HR	PLC input
+	I160
-	I161
Rapid traverse	I162

16.2 HR 332 Handwheel



Checking data transmission

The HR 332 serial handwheel can be checked using an oscilloscope. The following signals can be measured at handwheel input X23 of the LE. The signals must correspond to the following diagrams:



Note

Power is supplied to the handwheel via the logic unit.

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

Checking the keys

Set machine parameter **MP7640 = 4**.

The axis keys on the machine operating panel move the highlight for actual position capture or datum setting.

The axis keys on the HR move the handwheel symbol on the display unit.

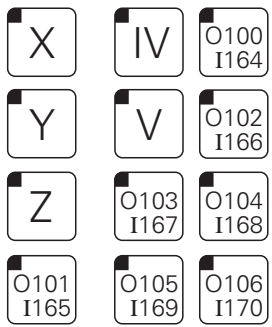
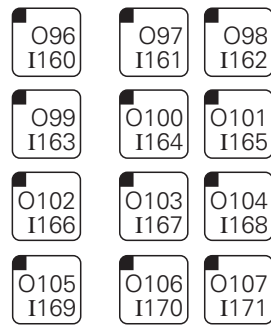
MP7645.0 determines whether all twelve keys and their LEDs are contactable via PLC or whether the axis-selection keys and their LEDs are excepted.

Depending on the input value of the MP7645.0, the twelve keys of handwheel HR 332 are assigned to different PLC inputs.

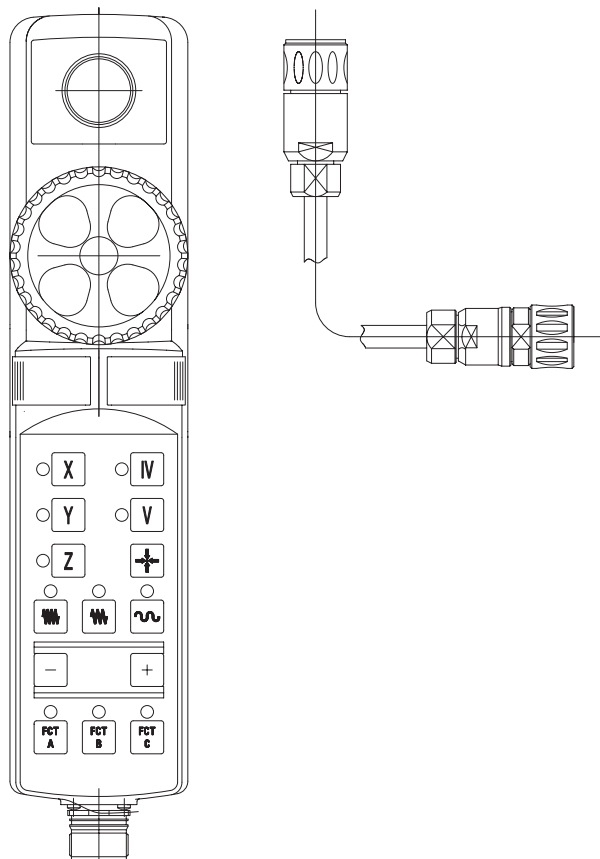
Depending on the input value of the MP7645.0, the twelve LEDs of handwheel HR 332 are assigned to different PLC outputs.

When a key is pressed, the corresponding PLC input is set. As soon as a PLC output is set, the corresponding LED lights up.

MP 7645.0 determines the assignment of HR 332:

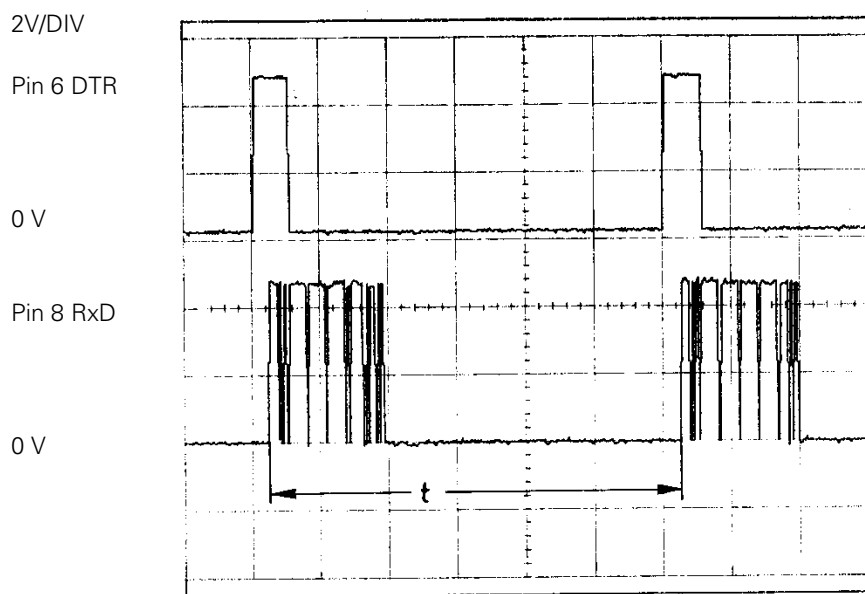
MP7645.0 = 0	MP7645.0 = 1
<p>The keys X, Y, Z, IV and their LEDs are assigned to the NC. All the other keys are assigned to the PLC inputs I164 to I170. The LEDs are assigned to PLC outputs O100 to O106.</p> <p>With the exception of the axis-selection keys and their LEDs, all other keys and LEDs are freely contactable via PLC.</p>	<p>All twelve keys are assigned to the PLC inputs I160 to I171. The twelve LEDs are assigned to PLC outputs O96 to O107. The handwheel symbol in the status window can be set with Module 9036.</p> <p>All twelve keys and LEDs can be freely contacted through the PLC.</p>
	

16.3 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 LE. The signals must correspond to the following diagram:



t = 6 ms



Note

Power is supplied to the handwheel via the logic unit.

(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																																				
<table><tr><td>X</td><td></td><td>IV</td></tr><tr><td>Y</td><td></td><td>V</td></tr><tr><td>Z</td><td></td><td>ISTWERT- ÜBER- NAHME</td></tr><tr><td>VORSCHUB KLEIN</td><td>VORSCHUB MITTEL</td><td>VORSCHUB GROß</td></tr><tr><td>—</td><td></td><td>+</td></tr><tr><td>O109 I173</td><td>O110 I174</td><td>O111 I175</td></tr></table>	X		IV	Y		V	Z		ISTWERT- ÜBER- NAHME	VORSCHUB KLEIN	VORSCHUB MITTEL	VORSCHUB GROß	—		+	O109 I173	O110 I174	O111 I175	<table><tr><td>O96 I160</td><td></td><td>O97 I161</td></tr><tr><td>O98 I162</td><td></td><td>O99 I163</td></tr><tr><td>O100 I164</td><td></td><td>O103 I167</td></tr><tr><td>O104 I168</td><td>O105 I169</td><td>O106 I170</td></tr><tr><td>I171</td><td></td><td>I172</td></tr><tr><td>O109 I173</td><td>O110 I174</td><td>O111 I175</td></tr></table>	O96 I160		O97 I161	O98 I162		O99 I163	O100 I164		O103 I167	O104 I168	O105 I169	O106 I170	I171		I172	O109 I173	O110 I174	O111 I175
X		IV																																			
Y		V																																			
Z		ISTWERT- ÜBER- NAHME																																			
VORSCHUB KLEIN	VORSCHUB MITTEL	VORSCHUB GROß																																			
—		+																																			
O109 I173	O110 I174	O111 I175																																			
O96 I160		O97 I161																																			
O98 I162		O99 I163																																			
O100 I164		O103 I167																																			
O104 I168	O105 I169	O106 I170																																			
I171		I172																																			
O109 I173	O110 I174	O111 I175																																			
<p>With the exception of the function keys A, B and C, all keys are evaluated by the NC.</p> <p>MP7670.x determines the appropriate interpolation factors for low, medium and high speeds.</p> <p>MP7671.x defines the low, medium and high speeds. The speed is indicated as a % factor of the manual feed rate (MP1020.x).</p>	<p>All keys are evaluated by the PLC.</p> <p>Handwheel axis and handwheel interpolation are set with Module 9036.</p> <p>W766 allows the feed rate be altered by pressing the axis-direction keys.</p>																																				

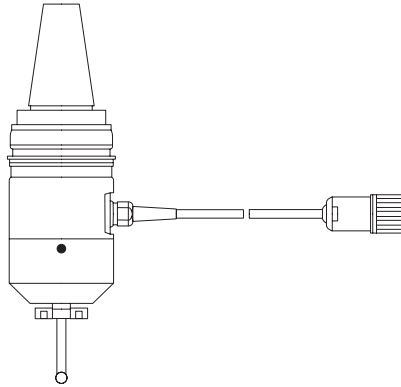
17 3-D Touch Probes

17.1 Overview

17.1.1 Touch probes for workpiece setup and measurement

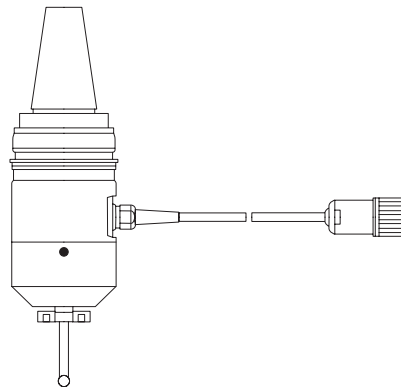
TS 220

With cable connection

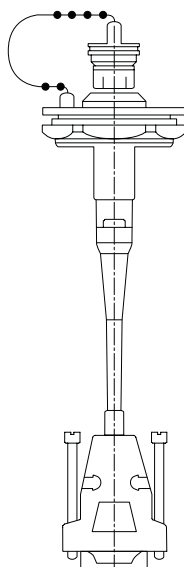


17.1.2 Touch probe for digitizing

TS 120



**Cable adapter for
TS 120**



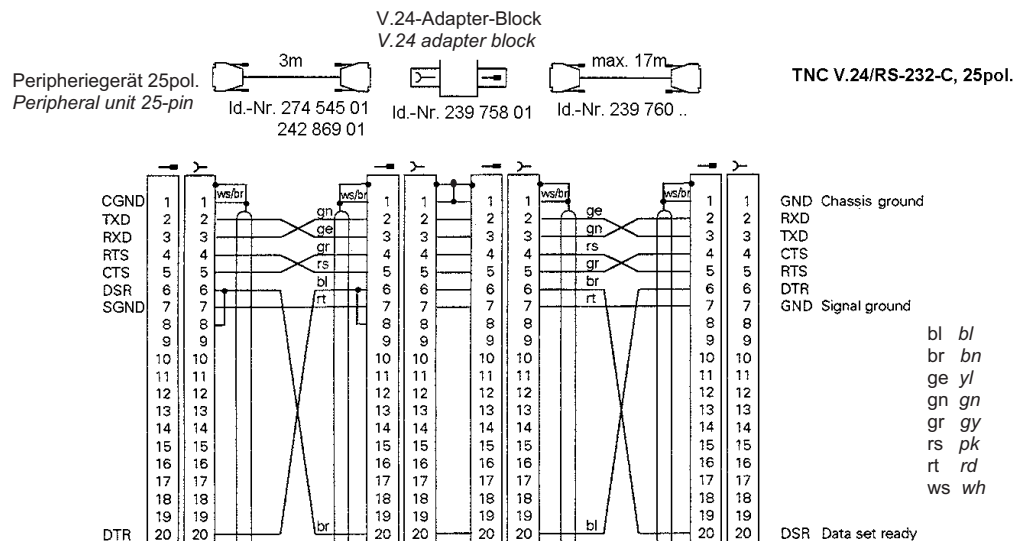


18 Data Interfaces

18.1 Wiring Diagram for Data Interfaces

18.1.1 RS-232-C/V.24

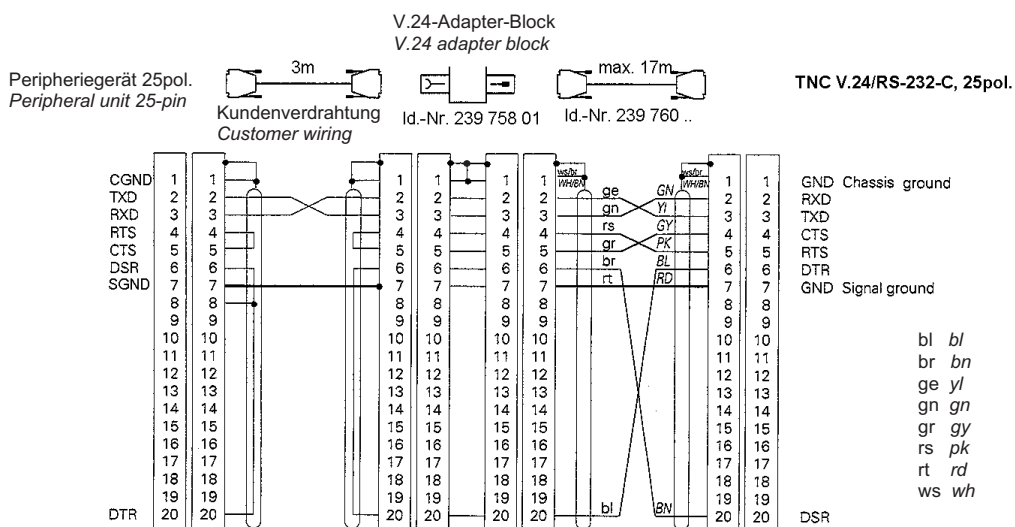
With adapter block for hardware handshake, TNC 25-pin / peripheral unit 25-pin



Note

If your peripheral unit has a different pin layout to the one described above, the HEIDENHAIN connection cable cannot be used.

With adapter block for software handshake, TNC 25-pin / peripheral unit 25-pin

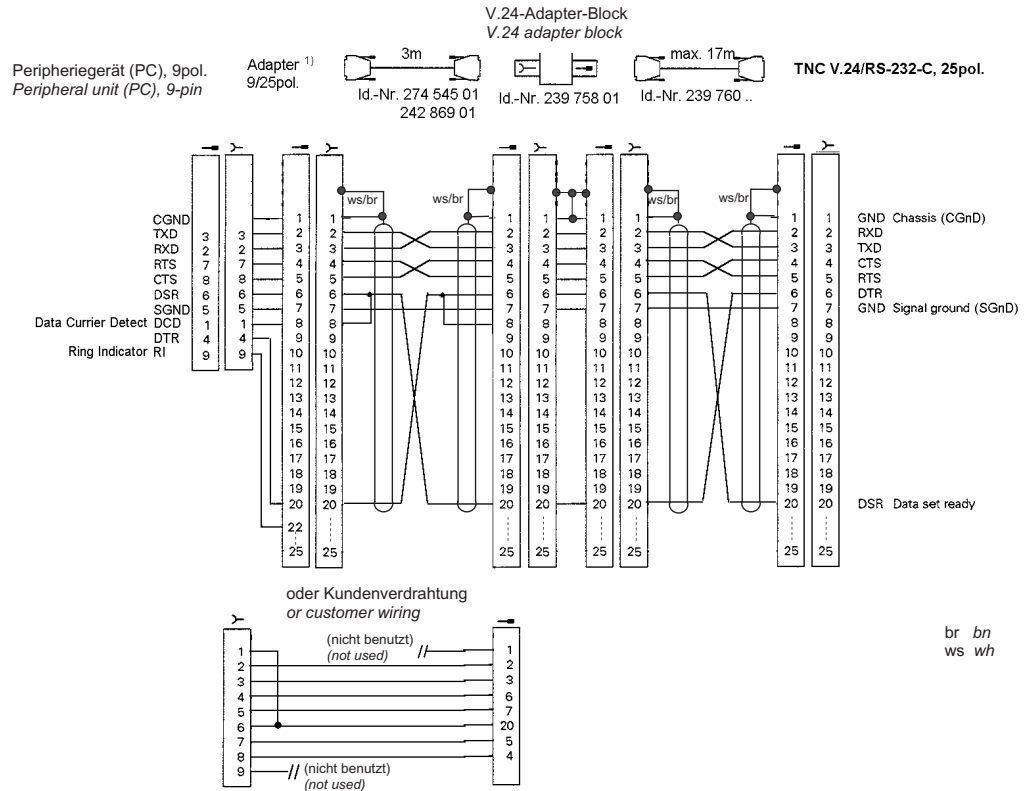


Note

This wiring only allows transfer stop with DC3 (software handshake).

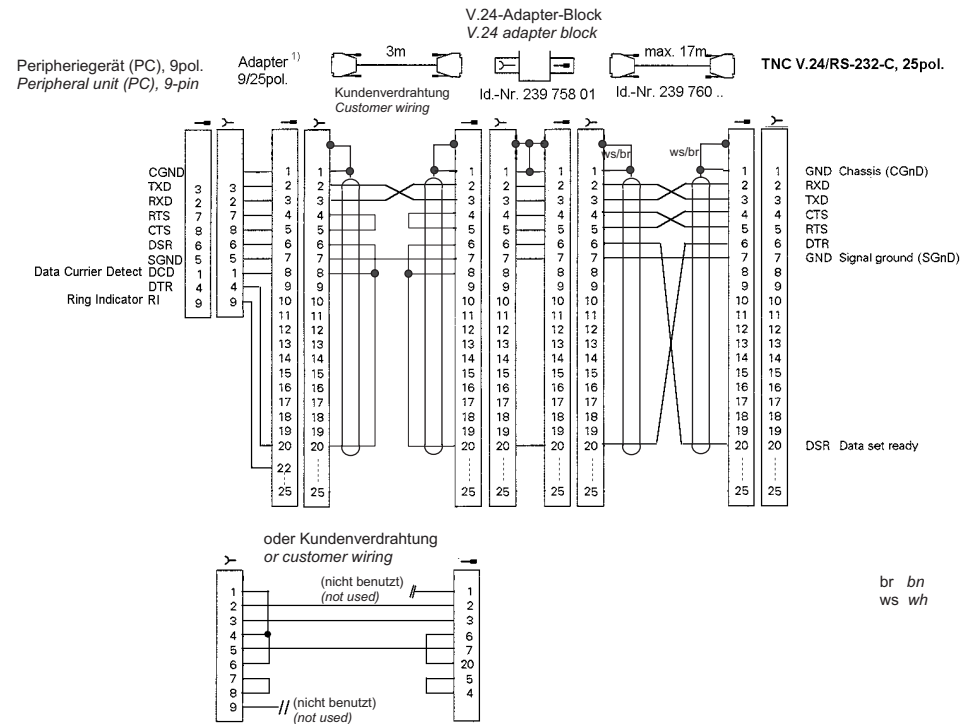
The RS-232-C/V.24 data interface has different pin layouts at the logic unit and the V.24 adapter block.

With adapter block for hardware handshake, TNC 25-pin / peripheral unit 9-pin



¹⁾ Customer wiring or part available on market

With adapter block for software handshake, TNC 25-pin / peripheral unit 9-pin

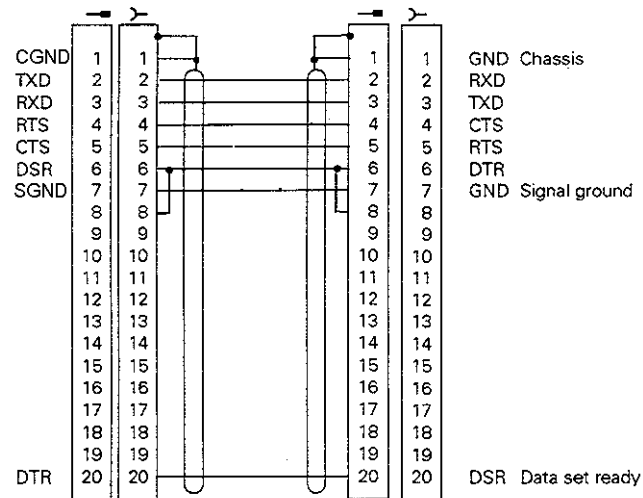


¹⁾ Customer wiring or part available on market

Direct connection for hardware handshake, TNC 25-pin / peripheral unit 25-pin (1:1)

Peripheriegerät 25pol.
Peripheral unit 25-pin

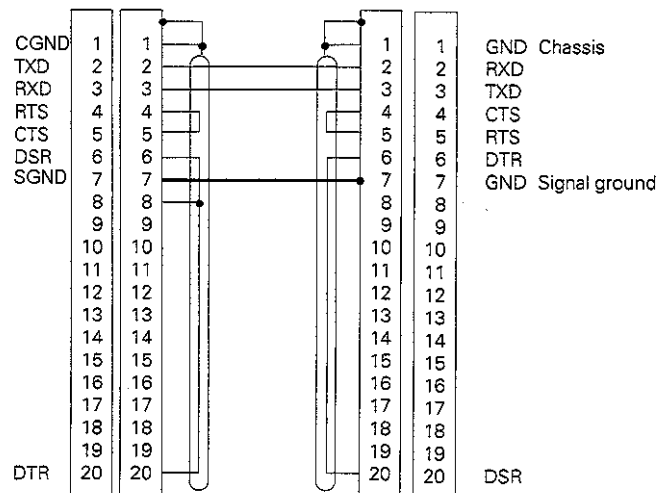
TNC V.24/RS-232-C, 25pol.



Direct connection for software handshake, TNC 25-pin / peripheral unit 25-pin (1:1)

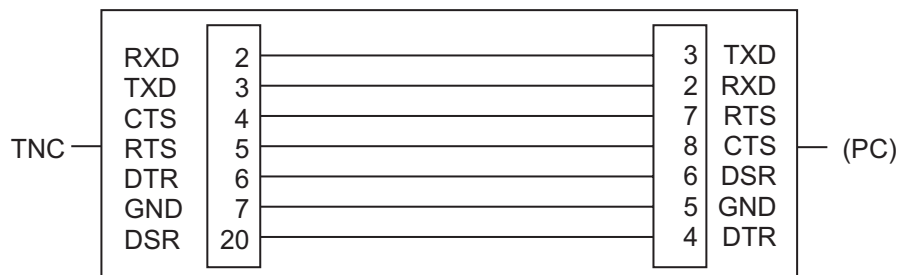
Peripheriegerät 25pol.
Peripheral unit 25-pin

TNC V.24/RS-232-C, 25pol.



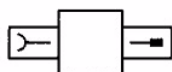
25polig
(direkt an der Steuerung)
25-pin
(directly on the control)

9polig
(COM 1)

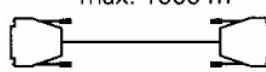


Data interface

max. 1000 m

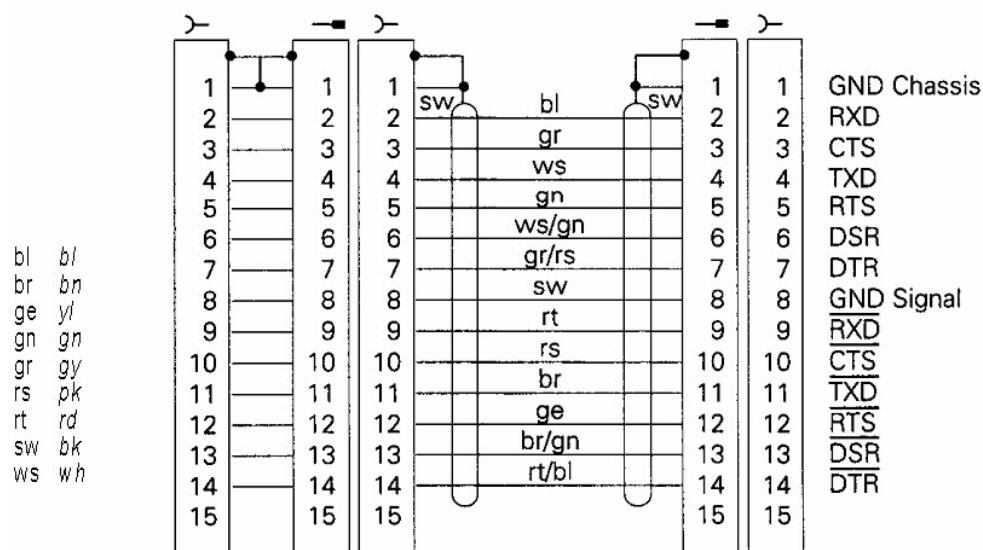


Id.-Nr. 249 819 01



Id.-Nr. 250 478..

X22 V.11/RS-422



The RS-422/V.11 data interface has the same pin layout at the logic unit X22 and at the V.11 adapter block.



18.2 Data Interface Operating Modes

18.2.1 Overview of operating modes

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

FE1

For connection of HEIDENHAIN floppy-disk unit FE 401 B (or floppy-disk unit FE 401, software 230 626 03 and later) 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:	Adjusted to mode
Transfer stop:	Software handshake with DC3

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

FE2

For connection of HEIDENHAIN floppy-disk unit FE 401 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:	Adjusted 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 Adjusting of machine parameters from MP5000
Data format:	Adjusting of machine parameters from MP5000
Baud rate:	110 - 115 200 baud
Interface parameters:	Adjusting of machine parameters from MP5000
Transfer stop:	Software handshake with DC3 or hardware handshake with RTS set via machine parameter from MP 5000

LSV-2:

The LSV-2 protocol allows various functions such as file management, remote control, and diagnosis of the TNC 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, none parity
Baud rate:	110 - 115 200 baud
Interface parameters:	adjusted to mode
Transfer stop:	Software handshake via protocol

18.2.2 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 for entry of code number



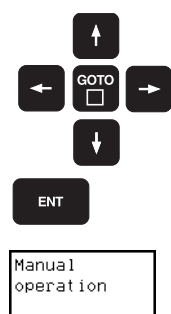
In the Programming and Editing, and Test Run modes, you can call the setup menu for the data interfaces by pressing the MOD key and the soft key RS232/RS422 SETUP.

Manueller Betrieb	Programming and editing					
RS232 interface			RS422 interface			
Mode of op.: FE1			Mode of op.: LSV-2			
Baud rate			Baud rate			
FE : 38400			FE : 9600			
EXT1 : 9600			EXT1 : 9600			
EXT2 : 9600			EXT2 : 9600			
LSV-2: 115200			LSV-2: 110			
Assign:						
Print :						
Print-test :						
PGM MGT: Enhanced						
Key	RS232 RS422 SETUP	USER PARAMETER	MP EDIT	PLC EDIT	HELP	END

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 the MOD function RS 232/RS 422, press the END soft key

19 Transfer of Files via Data Interface

19.1 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 (X21)

RS 422:\ V-11 data interface (X22)

TNC:\ TNC Partition (USER)

PLC:\ PLC Partition (via code number)

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

Operating mode	Drive symbol with PGM MGT
FE1 FE2	
EXT1, EXT2	
LSV2	
Ethernet	

19.2 Downloading Files from the TNC via Data Interface



Note

The following procedures describe the downloading and uploading of files using the data transfer software **TNCremoNT 2.0 V** and serial interface.

Preparation

Carry out the following steps:

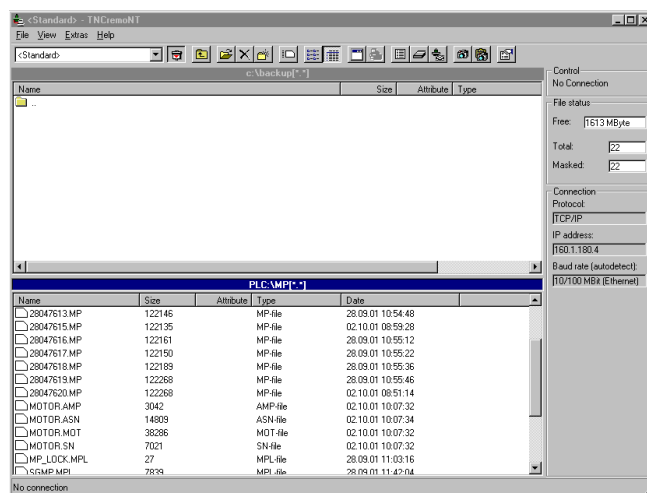
- ▶ Connect the data transfer cable to the PC and to the machine.
- ▶ Start the data transfer software TNCremoNT 2.0 on your PC.
- ▶ Select the operating mode LSV2 on the TNC.
- ▶ Set the baud rate on the TNC.
- ▶ Set mode on TNCremoNT to LSV-2, under Extras/Configuration/Connect (serial connection)
- ▶ Set corresponding COM interface and baud rate on TNCremoNT, under Extras/Configuration/Options.

Download files

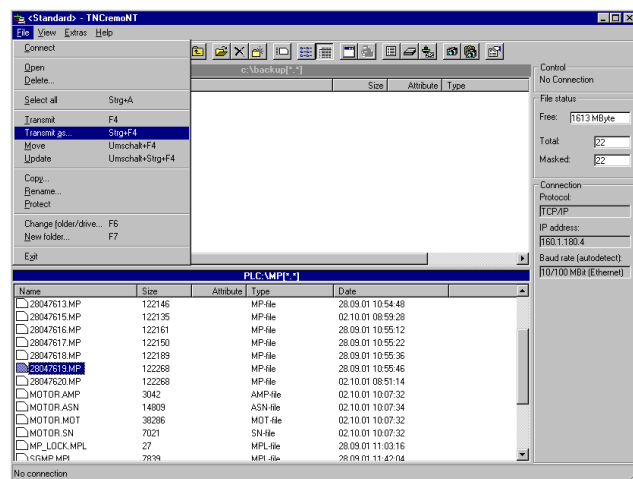


- Establish connection with TNC.

- ▶ 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 TNC), select the directory containing the file you wish to download. In the example PLC\AMP.



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



Note

Files can also be copied using the mouse (drag & drop).

19.3 Uploading Files onto the TNC via Data Interface



Note

The following procedures describe the downloading and uploading of files using the data transfer software **TNCremoNT 2.0** and serial interface.

Preparation

Carry out the following steps:

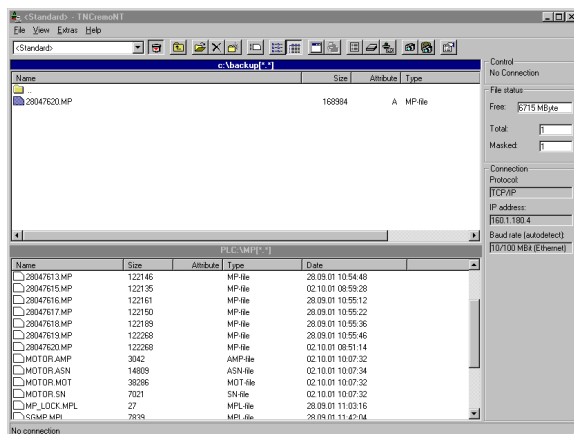
- Connect the data transfer cable to the PC and to the machine.
- Start the data transfer software TNCremoNT 2.0 on your PC.
- Select the operating mode LSV2 on the TNC.
- Set the baud rate on the TNC.
- Set mode on TNCremoNT to LSV-2, under Extras/Configuration/Connect (serial connection)
- Set corresponding COM interface and baud rate on TNCremoNT, under Extras/Configuration/Options.

Upload files onto TNC

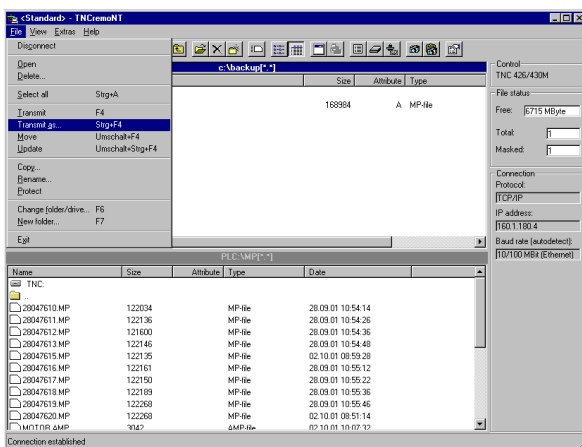


- Establish connection with TNC.

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



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



Note

Files can also be copied using the mouse (drag & drop).



20 Replacing Instructions

20.1 Important Information



Note

Always comply with the safety precautions!

Necessary aids

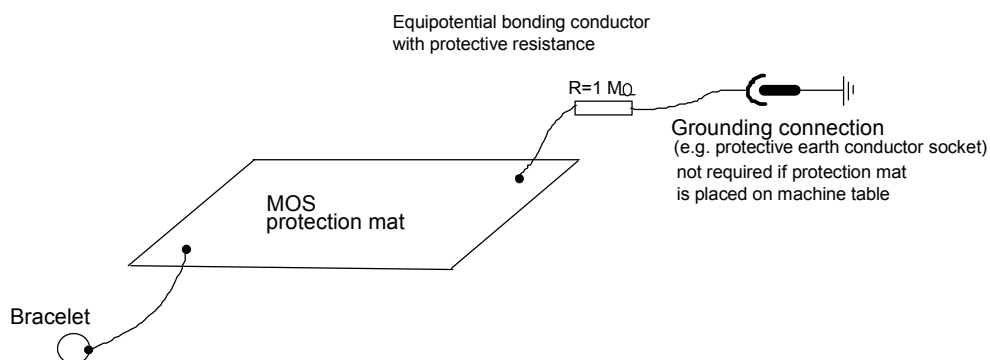
- PC with HEIDENHAIN transfer software TNCremoNT (or TNCremo, TNC BACK)
- 1 IC pull and place tool (for EPROM exchange)
- 1 MOS protection device (for EPROM exchange)

MOS protection



Caution

- Always use an MOS protection device when exchanging EPROMs.
- There should be no contact between PCBs or EPROMs with a statically loaded object (packaging, storing, or during work preparation).



Exchange units

- Replacement logic units are equipped with the latest software.
- Replacement hard disk drives are loaded with the corresponding data if the NC software version is indicated.
- Replacement logic units are delivered without software protection module.

20.2 NC Software Update for PGM Nr. 280 474/475



Note

Always comply with the safety precautions!

A software update may only be executed after consultation with the machine manufacturer.

Data in RAM memory

When the TNC is being prepared for a software update, then all of the important information in the RAM memory 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

- ▶ Check if you have enough free space available on the hard disk for the converted files (at least 1.5 times the largest file). If necessary, download some of the larger files with TNCremoNT and delete them in the TNC.
- ▶ Delete any NC programs in the TNC partition that you no longer require to accelerate the converting process. Contact the machine user for information.
- ▶ Press the EMERGENCY STOP button of your machine
- ▶ Press the following key combination:



- ▶ Select the Programming and Editing mode



- ▶ Prepare for entry of code number



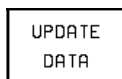
- ▶ Enter the code number



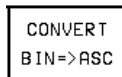
- ▶ Confirm



- ▶ Call submenu



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



- ▶ The files on the hard disk are converted in turn into ASCII format



- ▶ Exit the subordinate mode once conversion has been completed

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.

Exchanging EPROMs



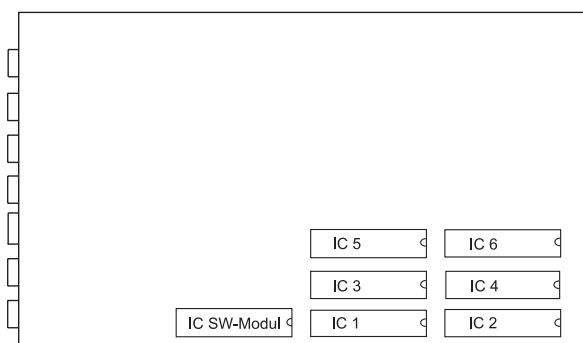
Caution

- Always use an MOS protection device when exchanging EPROMs.
- There should be no contact between PCBs or EPROMs with a statically loaded object (packaging, storing, warehousing).

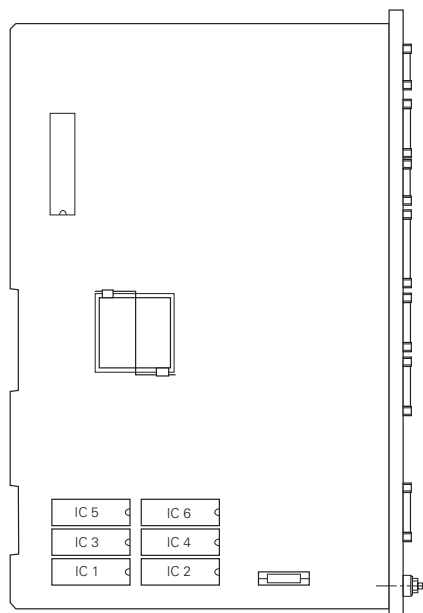
► Switch off the machine and exchange the EPROMs using the IC pull and place tool.

Position of EPROMs

LE 426.B/430.A



LE 426M/430M



Recommissioning the control

- ▶ Switch on the main switch.
- ▶ **Do not confirm** error messages that may be displayed on the TNC.
- ▶ Update and activate the machine parameter file.
- 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.



- ▶ Try to activate the machine parameter list.
The TNC carries out a Reset.

Cancel the error message "MP: Not defined"

Manual operation	MP: not defined						
File: 10_MP.MP Line: 470 Column: 14 OVERUR							
MP 1095 : 0?							
<pre> \$MP1095 \$Lagesollwertfilter \$Eingabe: 0 oder 1 \$ 0 = Einfachfilter \$ 1 = Doppelfilter \$MP1096 \$Toleranz \$Eingabe: 0 bis 3,000 [mm] \$vorgeschlagener Eingabewert: 0,02 mm MP 1096 : 0,02 </pre>							
INSERT OVERWRITE	MOVE WORD >>	MOVE WORD <<	PAGE ↓	PAGE ↑	BEGIN ↑	END ↓	FIND

- ▶ by entering a value for the new parameter.



Note

Contact the machine manufacturer for more information.
See also file Lies_mp.A on setup disk 1.

For error message "MP: Incorrect number"

Strom- Unterbrechung Fehler	Machine parameter programming						
File: AL_47617.MP Line: 980 Column: 14 OVERUR							
<pre> MP 2020.0 : 4 MP 2020.1 : 4 MP 2020.2 : 4 MP 2020.3 : 4 MP 2020.4 : 4 \$MP 2030.0 : 0 \$REMOVED WITH VERSION 19 \$----- \$MP2100 Typ der Achs-Leistungsteile \$Eingabe: Name aus Datei <Motor.amp> MP 2100.0 : SPG-SYNCHRON-(SM) MP 2100.1 : SPG-SYNCHRON-(SM) </pre>							
INSERT OVERWRITE	MOVE WORD >>	MOVE WORD <<	PAGE ↑	PAGE ↓	BEGIN ↑	END ↓	FIND

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



- ▶ After each change, try to activate the machine parameter list.
The TNC carries out a Reset.

Loading the Setup

Preparation

- ▶ Switch off main switch of machine.
- ▶ Connect the data transfer cable to the PC and to the machine.
- ▶ Switch on main switch of machine again.
- ▶ **Do not confirm** error messages that may be displayed on the TNC.
- ▶ Set the baud rate on the TNC.
Start of data transfer.
- ▶ Place the first of the setup disks (disk 1) in your PC drive and open drive.














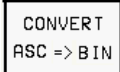

Note

If your Setup is contained on disks, copy the contents of the individual disks to your PC (e.g. C:\SETUP\DISK1, DISK2, etc.
If you have downloaded Setup from the Internet, the directories are created automatically once the files have been unzipped.

For operating systems Windows 3.1 and 3.11:

- ▶ In the directory ... \DISK1, call the file Setup.bat as follows:
 - SETUP for transfer via COM 1
 - SETUP 2 for transfer via COM 2, etc.
- ▶ Follow the following instructions on the PC.
For operating systems Windows 95, 98 and NT:
- ▶ In the directory ... \DISK1, call the file Setup32.bat as follows:
 - SETUP 32 for transfer via COM 1
 - SETUP 32 2 for transfer via COM 2
- ▶ Follow the following instructions on the PC.

Converting data from ASCII to binary

- ▶ Press the EMERGENCY STOP button of your machine
- ▶ **Do not confirm** error messages that may be displayed on the TNC
- ▶ Press the following key combination:
 -  ▶ Select the Programming and Editing mode
 -  ▶ Prepare for entry of code number
 -       ▶ Enter the code number
 -  ▶ Confirm
 -  ▶ Call submenu
 -  ▶ Call submenu
Note: It is not necessary to enter the directory that is shown on the TNC screen
 -  ▶ The files on the hard disk are converted in turn into binary format
 -  ▶ Exit the subordinate mode once conversion has been completed



Note

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

Restoring the default settings on the machine

- ▶ 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.

20.3 NC Software Update for PGM Nr. 280 476/477, EPROM Hardware



Note

Always comply with the safety precautions!

A software update may only be executed after consultation with the machine manufacturer.

Data in RAM memory

When the TNC is being prepared for a software update, then all of the important information in the RAM memory 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

- ▶ Check if you have enough free space available on the hard disk for the converted files (at least 1.5 times the largest file). If necessary, download some of the larger files with TNCremoNT and delete them in the TNC.
- ▶ Delete any NC programs in the TNC partition that you no longer require to accelerate the converting process. Contact the machine user for information.
- ▶ Press the EMERGENCY STOP button of your machine.
- ▶ Press the following key combination:



- ▶ Select the Programming and Editing mode



- ▶ Prepare for entry of code number



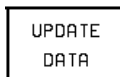
- ▶ Enter the code number



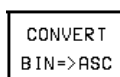
- ▶ Confirm



- ▶ Call submenu



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



- ▶ The files on the hard disk are converted in turn into ASCII format.



- ▶ Exit the subordinate mode once conversion has been completed.

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.

Exchanging EPROMs



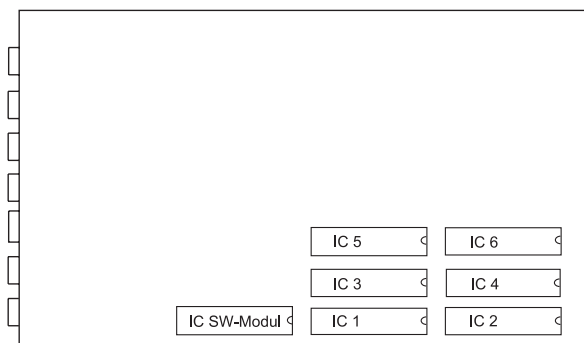
Caution

- Always use an MOS protection device when exchanging EPROMs.
- There should be no contact between PCBs or EPROMs with a statically loaded object (packaging, storing, warehousing).

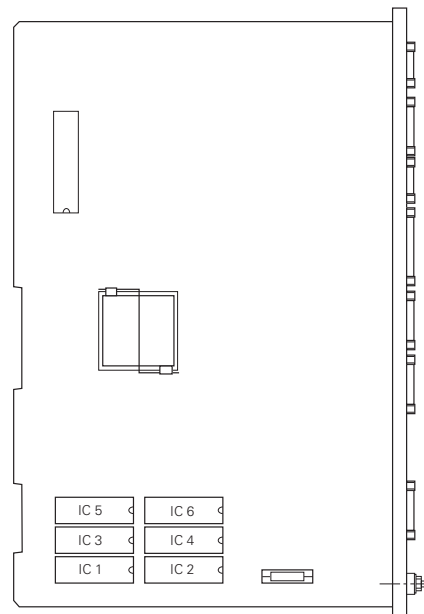
► Switch off the machine and exchange the EPROMs using the IC pull and place tool.

Position of EPROMs

LE 426.B/430.A



LE 426M/430M



Recommissioning the control

- ▶ Switch on the main switch.
- ▶ **Do not confirm** error messages that may be displayed on the TNC .
- ▶ Update and activate the machine parameter file.
- 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.



- ▶ Try to activate the machine parameter list.
The TNC carries out a Reset.

Cancel the error message "MP: Not defined"

Manual operation	MP: not defined						
File: 10_MP_MP Line: 470 Column: 14 OVERWR MP 1095 : 0? ;MP1095 ;Lagesollwertfilter ;Eingabe: 0 oder 1 ; 0 = Einfachfilter ; 1 = Doppelfilter ;MP1096 ;Toleranz ;Eingabe: 0 bis 3,000 [mm] ;vorgeschlagener Eingabewert: 0,02 mm MP 1096 : 0,02							
INSERT OVERWRITE	MOVE WORD >>	MOVE WORD <<	PAGE ↓	PAGE ↑	BEGIN ↑	END ↓	FIND



- ▶ by entering a value for the new parameter.

Note

Contact the machine manufacturer for more information.
See also file Lies_mp.A on setup disk 1.

For error message "MP: Incorrect number"

Strom- Unterbrechung Fehler	Machine parameter programming						
File: AL_47617_MP Line: 980 Column: 14 OVERWR MP 2020.0 : 4 MP 2020.1 : 4 MP 2020.2 : 4 MP 2020.3 : 4 MP 2020.4 : 4 ;MP 2030.0 : 0 ;REMOVED WITH VERSION 19 ;----- ;MP2100 Typ der Achs-Leistungsteile ;Eingabe: Name aus Datei <Motor.amp> MP 2100.0 : SPG-SYNCHRON-(SM) MP 2100.1 : SPG-SYNCHRON-(SM)							
INSERT OVERWRITE	MOVE WORD >>	MOVE WORD <<	PAGE ↑	PAGE ↓	BEGIN ↑	END ↓	FIND

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



- ▶ After each change, try to activate the machine parameter list. The TNC carries out a Reset.

Loading the Setup

Preparation

- ▶ Switch off main switch of machine.
- ▶ Connect the data transfer cable to the PC and to the machine.
- ▶ Switch on main switch of machine again.
- ▶ **Do not confirm** error messages that may be displayed on the TNC.
- ▶ Set the baud rate on the TNC.
Start of data transfer.
- ▶ Place the first of the setup disks (disk 1) in your PC drive and open drive.



Note

If your Setup is contained on disks, copy the contents of the individual disks to your PC (e.g. C:\SETUP\DISK1, DISK2, etc.)
If you have downloaded Setup from the Internet, the directories are created automatically once the files have been unzipped.

For operating systems Windows 3.1 and 3.11:

- ▶ In the directory ... \DISK1, call the file Setup.bat as follows:
 - SETUP for transfer via COM 1
 - SETUP 2 for transfer via COM 2, etc.

- ▶ Follow the following instructions on the PC.

For operating systems Windows 95, 98 and NT:

- ▶ In the directory ... \DISK1, call the file Setup32.bat as follows:
 - SETUP 32 for transfer via COM 1
 - SETUP 32 2 for transfer via COM 2
 - SETUP 32 160.1.180.13 (e.g.) for transfer via Ethernet



Note

If no connection can be established via Ethernet, check the network settings (code number NET123) of the TNC.

- ▶ Follow the following instructions on the PC.

Converting data from ASCII to binary

- ▶ Press the EMERGENCY STOP button of your machine
- ▶ **Do not confirm** error messages that may be displayed on the TNC
- ▶ Press the following key combination:



- ▶ Select the Programming and Editing mode



- ▶ Prepare for entry of code number



- ▶ Enter the code number



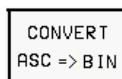
- ▶ Confirm



- ▶ Call submenu



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



- ▶ The files on the hard disk are converted in turn into binary format.



- ▶ Exit the subordinate mode once conversion has been completed



Note

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

Restoring the default settings on the machine

- ▶ 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.

20.4 NC Software Update for PGM Nr. 280 476/477, Flash Hardware



Note

Always comply with the safety precautions!

A software update may only be executed after consultation with the machine manufacturer.

Data in RAM memory

When the TNC is being prepared for a software update, then all of the important information in the RAM memory 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

- ▶ Check if you have enough free space available on the hard disk for the converted files (at least 1.5 times the largest file). If necessary, download some of the larger files with TNCremoNT and delete them in the TNC.
- ▶ Delete any NC programs in the TNC partition that you no longer require to accelerate the converting process. Contact the machine user for information.
- ▶ Press the EMERGENCY STOP button of your machine.
- ▶ Press the following key combination:



- ▶ Select the Programming and Editing mode



- ▶ Prepare for entry of code number



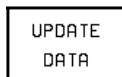
- ▶ Enter the code number



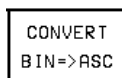
- ▶ Confirm



- ▶ Call submenu



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



- ▶ The files on the hard disk are converted in turn into ASCII format.



- ▶ Exit the subordinate mode once conversion has been completed

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.

Loading the NC software and the setup

Preparation

- ▶ Switch off main switch of machine
- ▶ Connect the data transfer cable to the PC and to the machine
- ▶ Switch on main switch of machine again
- ▶ **Do not confirm** error messages that may be displayed on the TNC
- ▶ Set the baud rate on the TNC
- Start of data transfer
- ▶ Place the CD with the SETUP in your PC drive and open drive



Note

If you have downloaded Setup from the Internet, the files are created automatically once they have been unzipped.

For operating systems Windows 3.1 and 3.11:

- ▶ Call the file Setup.bat as follows:
 - SETUP for transfer via COM 1
 - SETUP 2 for transfer via COM 2, etc.
- ▶ Follow the following instructions on the PC.

For operating systems Windows 95, 98 and NT:
- ▶ Call the file Setup32.bat as follows:
 - SETUP 32 for transfer via COM 1
 - SETUP 32 2 for transfer via COM 2
 - SETUP 32 160.1.180.13 (e.g.) for transfer via Ethernet
- ▶ Follow the following instructions on the PC.



Note

If no connection can be established via Ethernet, check the network settings (code number NET123) of the TNC.

- First, the NC software (file 280476_xx.bin) is stored on the hard disk.
- When data transfer has been finished the TNC is reset.
- On the screen the following message is displayed:

LOADING SOFTWARE "SYS:\280476\20\280476_20.BIN"

PLEASE WAIT

and the data are copied from the hard disk to the flash ROM.

- After booting the TNC with the new NC software the transfer is continued automatically.



Caution

Do not press any key on the TNC during data transfer, since this could generate an error message in the control which would abort data transfer.

- As soon as all setup data have been transferred the control is again reset to activate the files.



Note

If copying the binary file into the flash ROM is not successful, the TNC automatically activates the previously active version. The following message is displayed on the TNC screen:

```
LE430 LOADER V3.0
LOADING SOFTWARE "SYS:\280476\20\280476_20.BIN"
PLEASE WAIT.
ERROR 8 WHILE LOADING SOFTWARE.
NOW TRYING TO RELOAD PREVIOUS VERSION.
LOADING SOFTWARE " SYS:\280476\16\280476_16.BIN "
PLEASE WAIT.
```

- Take the appropriate action according to the error message (ERROR X).

Error message	Explanation	Cause/Action
ERROR 0	No errors	-
ERROR 1	Insufficient memory	Reload the setup. If the error message is generated again, the processor board (RAM) is probably defective.
ERROR 2	Flash ROM supplies invalid response to query command	Reload the setup. If the error message is generated again, the processor board (flash-ROM) is probably defective or there is an incorrect type of flash-ROM on the processor board.
ERROR 3	Attempt to write to or delete from protected area of flash-ROM	Reload the setup. If the error message is generated again, the binary file is probably defective or invalid.
ERROR 4	Address not in flash-ROM	see Error 3
ERROR 5	Address not a multiple of 4	see Error 3
ERROR 6	Time limit exceeded when writing or deleting the flash-ROM	Reload the setup. If the error message is generated again, the processor board (flash-ROM) is probably defective.
ERROR 7	Error on writing or deleting the flash-ROM	see Error 6
ERROR 8	Specified binary file does not exist	The binary file entered in the LST file of the setup does not exist. Upload new setup and restart the procedure.
ERROR 9	Other I/O errors, e.g. hard disk, data interface	
ERROR 10	Faulty binary data (S3 records), e.g. line checksum, line number, invalid character	The binary file in the setup is defective. Upload new setup and restart the procedure.

- When the TNC has booted with the old NC software, the following message is displayed on the screen: "Selected Software not loaded"

Recommissioning the control

- **Do not confirm** error messages that may be displayed on the TNC.
- Update and activate the machine parameter file.
- 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.



- Try to activate the machine parameter list. The TNC carries out a Reset.

Cancel the error message "MP: Not defined"

Manual operation	MP: not defined
File: IB_MP.MP Line: 470 Column: 14 OVERWR	
MP 1095 : 0?	
;MP1095 ;Lagesollwertfilter ;Eingabe: 0 oder 1 ; 0 = Einfachfilter ; 1 = Doppelfilter ;MP1096 ;Toleranz ;Eingabe: 0 bis 3,000 [mm] ;vorgeschlagener Eingabewert: 0,02 mm MP 1096 : 0,02	
INSERT OVERWRITE	MOVE WORD >>
MOVE WORD <<	PAGE ↓
PAGE ↑	BEGIN ↑
END ↓	FIND



- by entering a value for the new parameter.

Note

Contact the machine manufacturer for more information.
See also file Lies_mp.A on setup disk 1.

For error message "MP: Incorrect number"

Strom- Unterbrechung Fehler	Machine parameter programming
File: AL_47617.MP Line: 980 Column: 14 OVERWR	
MP 2020.0 : 4 MP 2020.1 : 4 MP 2020.2 : 4 MP 2020.3 : 4 MP 2020.4 : 4 ;MP 2030.0 : 0 ;REMOVED WITH VERSION 19 ;----- ;MP2100 Typ der Achs-Leistungsteile ;Eingabe: Name aus Datei <Motor.amp> MP 2100.0 : SPG-SYNCHRON-(SM) MP 2100.1 : SPG-SYNCHRON-(SM)	
INSERT OVERWRITE	MOVE WORD >>
MOVE WORD <<	PAGE ↑
PAGE ↓	BEGIN ↑
END ↓	FIND

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



- After each change, try to activate the machine parameter list. The TNC carries out a Reset.

Converting data from ASCII to binary

- ▶ Press the EMERGENCY STOP button of your machine.
- ▶ **Do not confirm** error messages that may be displayed on the TNC.
- ▶ Press the following key combination:



- ▶ Select the Programming and Editing mode



- ▶ Prepare for entry of code number



- ▶ Enter the code number



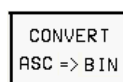
- ▶ Confirm



- ▶ Call submenu



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



- ▶ The files on the hard disk are converted in turn into binary format.



- ▶ Exit the subordinate mode once conversion has been completed.



Note

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

Restoring the default settings on the machine

- ▶ 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.

20.5 Backup/Restoring Hard-Disk Data



Note

The following procedures describe the downloading and uploading of files using the data transfer software **TNCremoNT 2.0 V** and serial interface.

20.5.1 Data backup

Preparation

Carry out the following steps:

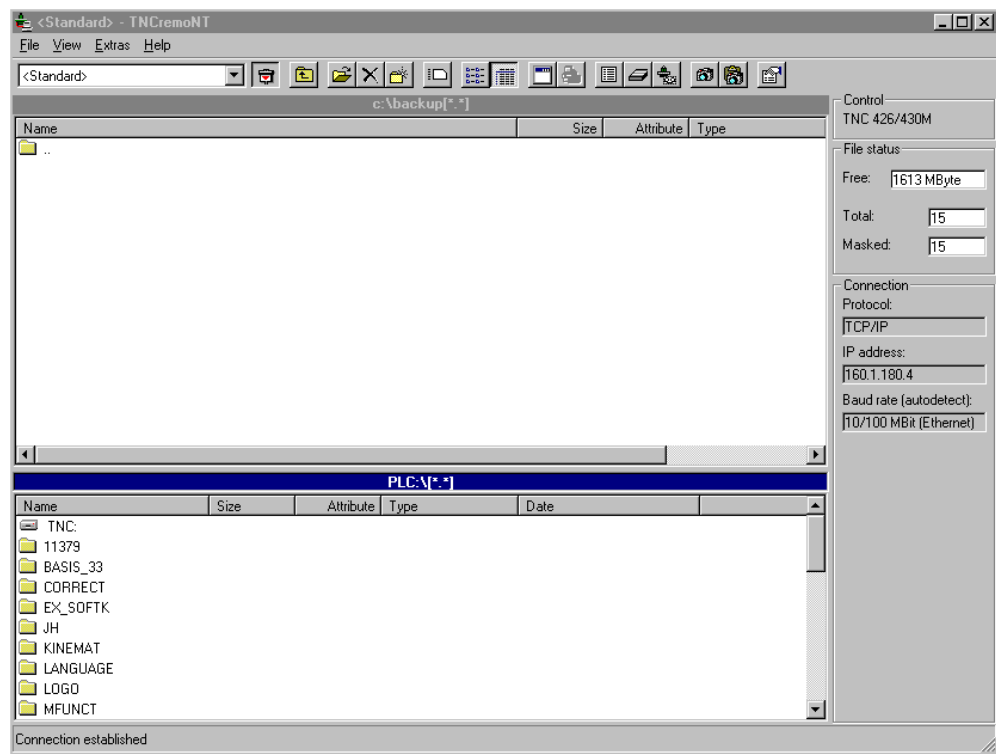
- ▶ Connect the data transfer cable to the PC and to the machine.
- ▶ Start the data transfer software TNCremoNT 2.0 on your PC.
- ▶ Select the operating mode LSV2 on the TNC.
- ▶ Set the baud rate on the TNC.
- ▶ Set mode on TNCremoNT to LSV-2, under Extras/Configuration/Connect (serial connection)
- ▶ Set corresponding COM interface and baud rate on TNCremoNT, under Extras/Configuration/Options.

Select partition



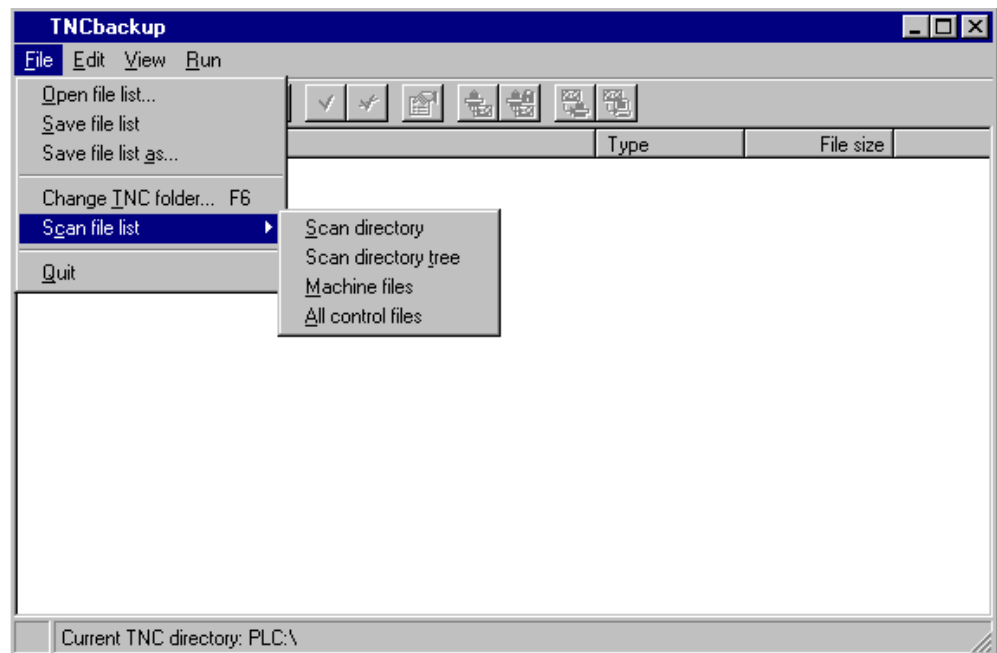
- ▶ Establish connection with TNC

- ▶ In the lower screen half (TNC contents), select the partition that you want to save.
 - TNC: for backup of TNC partition
 - PLC: for backup of PLC partition
- ▶ Go to the root directory for the selected partition (in the example PLC:)



Selecting backup

- ▶ Call the backup menu via Extras/Backup.
- ▶ Select files to be saved using menu item File/Scan a file list.
 - Scan directory tree:
Select marked directory with all its subdirectories and files.
 - Scan directory:
Select only the files in the directory without subdirectories
 - Machine files:
Complete PLC partition as well as the files from the SYS partition, in which the current states of the nonvolatile PLC markers/words, the counters for the machine pages, etc. are stored.
 - All control files:
In addition to the machine data, also the TNC partition.



Starting 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 the PC:

- *.BCK: Backup file with the original files in compressed format
- *.LST: Reference list containing the directories and the files

20.5.2 Restoring the data

Preparation

Carry out the following steps:

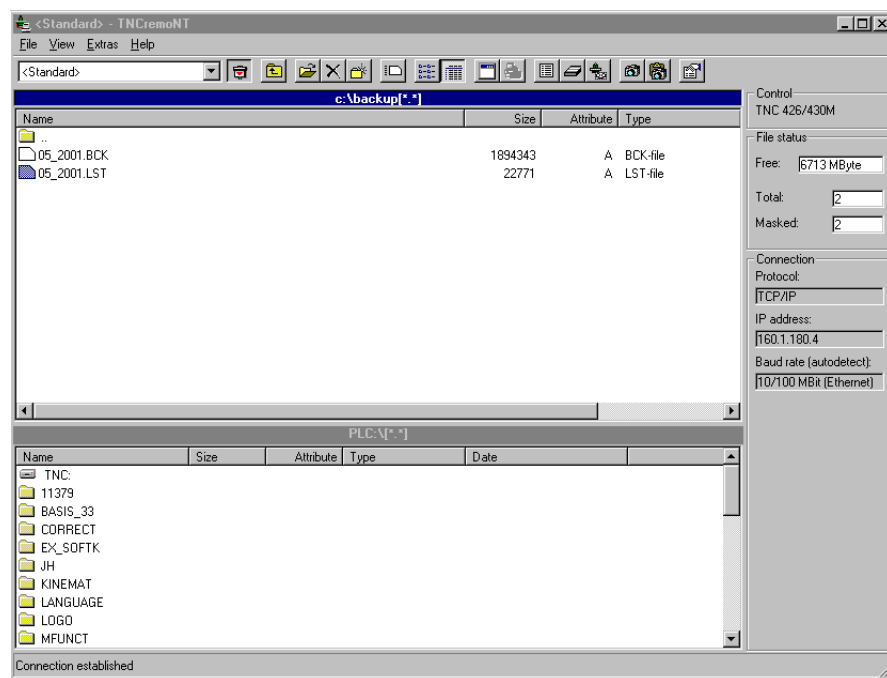
- ▶ Connect the data transfer cable to the PC and to the machine.
- ▶ Start the data transfer software TNCremoNT 2.0 on your PC.
- ▶ Select the operating mode LSV2 on the TNC.
- ▶ Set the baud rate on the TNC.
- ▶ Set mode on TNCremoNT to LSV-2, under Extras/Configuration/Connect (serial connection).
- ▶ Set corresponding COM interface and baud rate on TNCremoNT, under Extras/Configuration/Options.

Establish connection

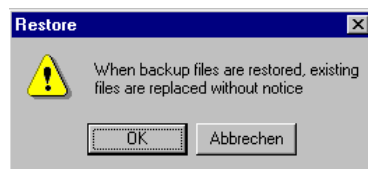


- ▶ Establish connection with TNC

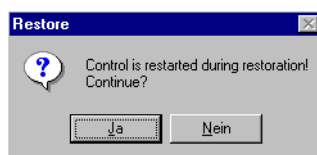
- ▶ In the upper screen half (PC contents), select the directory where you have stored the backup file.
In the example C:\Backup



- ▶ 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.



20.6 Exchanging the Complete LOGIC UNIT

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.

Data backup

- ▶ Carry out a data backup for "All Control Files" (see section Backup/Restore).

Removing the defective logic unit

- ▶ Switch off main switch of machine.
- ▶ Remove and label all of the connections on the logic unit.
- ▶ Open the mounting screws.
- ▶ Remove the defective logic unit.
- ▶ M hardware: Before dispatch secure the hard disk in the logic unit using the shipping braces.

Integrating the new logic unit

- ▶ M hardware: Remove the shipping braces before mounting the logic unit.
- ▶ Insert new logic unit and screw into place.
- ▶ Reestablish all of the connections.



Caution

Do not confuse any of the connectors!

- ▶ Switch on main switch of machine.
- ▶ Download the backup files.

Restoring the default settings on the machine

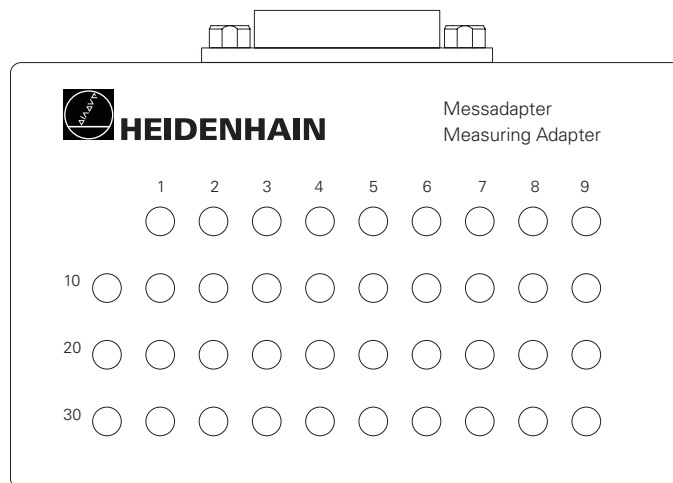
- ▶ Carry out an offset adjustment via code number 75368.
- ▶ Recalibrate touch probes.
- ▶ Initialize swivel head again.
Contact the machine manufacturer for more information.
- ▶ Initialize tool changer again.
Contact the machine manufacturer for more information.

21 Inspection, Measuring and Test Equipment

21.1 Universal Test Adapter (Id.Nr. 255 480 01)

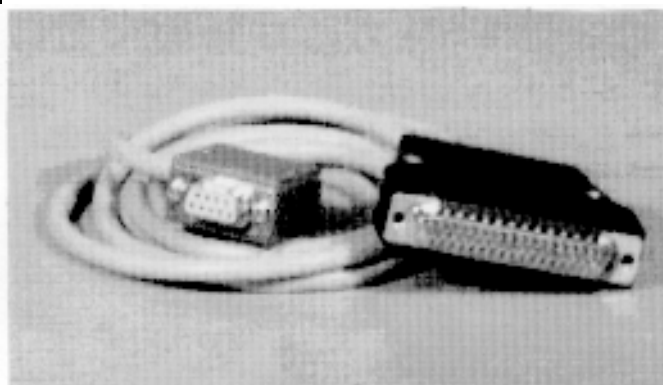
Test adapter

The test adapter is used for checking the inputs or outputs on 9 - 37-pin D-sub connections.

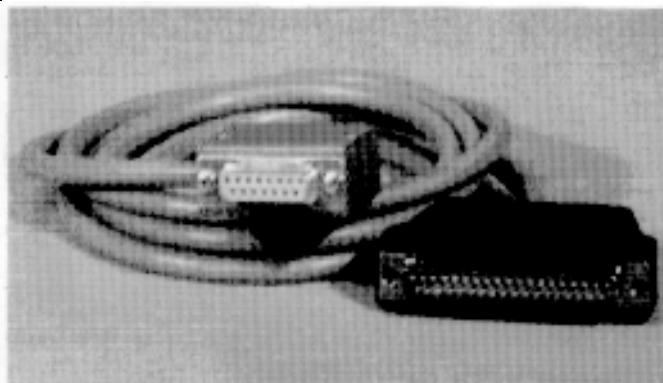


Accessories

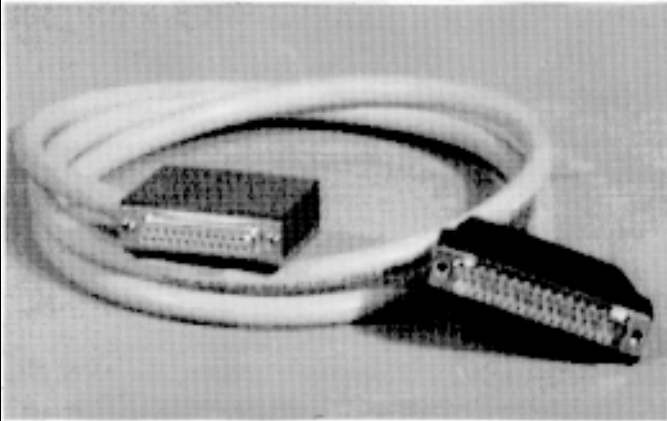
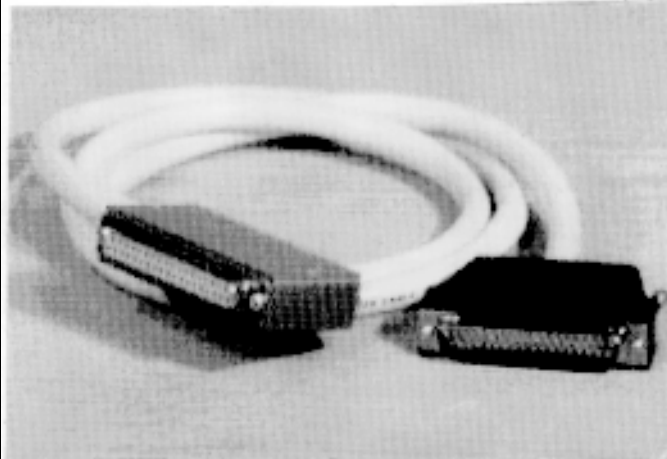
A separate cable adapter is required für every connector size.



Adapter cable, 9-pin.
Id.Nr. 255 481 01



Adapter cable, 15-pin.
Id.Nr. 255 482 01

	<p>Adapter cable, 25-pin. Id.Nr. 255 483 01</p>
	<p>Adapter cable, 37-pin. Id.Nr. 255 484 01</p>

21.2 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 adjusting 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 μ APP, 1 VPP) or of original scanning signals (interface board TTL, HTL) via 3 BNC sockets, e.g. on an oscilloscope

21.3 Drive Control Generator DCG (Id.Nr. 296 737-01)

General

With the Drive Control Generator for a single axis (DCG), a nominal value can be preset for HEIDENHAIN inverters.

The DCG is connected to the PWM interface of the inverter via adapter cable see "Accessories DCG" on page 316.

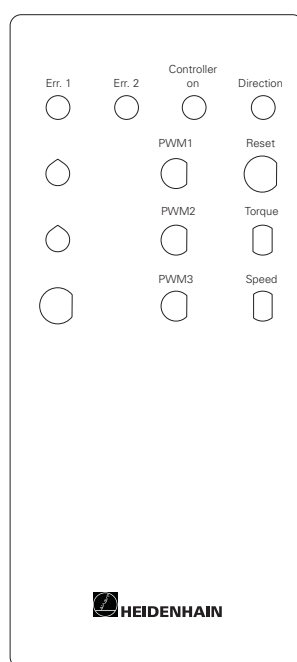
Specifications

Power Supply	230 V
Power consumption	4 watts
Spindle speed and torque	can be set individually
Direction switching	

21.3.1 Functional description of DCG controls and displays

On the front side of the DCG, you will find flip switches, keys, potentiometers and sockets.

The power switch can be found at the bottom of the unit, directly beside the power line input.



Designation Operating element

Err. 1	Flip switch READY
Err. 2	Flip switch TEMPERATURE
	<u>WARNING</u>
Controller On	Flip switch
Direction	Flip switch
Reset	Key
PWM 1	BNC socket
PWM 2	BNC socket
PWM 3	BNC socket
Torque	Potentiometer
Speed	Potentiometer
(Without)	2 insulated terminals
(Without)	Key connecting insulated terminals

Flip switches

Designation	Switch position		Remark
	UP (ON)	DOWN (OFF)	
Err.1:	The axis is not moved until the READY signal is acknowledged by the drive.	The READY signal is not evaluated. The axis is moved independently of signal.	Recommended switch position UP If the READY signal has been sent and there is no
Err.2	The axis is not moved if $\overline{\text{TEMPERATURE WARNING}}$ signal is acknowledged by the drive.	The $\overline{\text{TEMPERATURE WARNING}}$ signal is not evaluated. The axis is moved independently of signal.	$\overline{\text{TEMPERATURE WARNING}}$, then the drive may be controlled. If this rule is ignored, then damage may be caused to the servo amplifier.
Controller on	DCG is ready for operation	DCG is not ready for operation	Do not switch from DOWN to UP until all settings have been checked.
Direction	Changing motor direction		The speed of the motor must first be reduced to 0.



Caution

Care required when checking vertical axes:

After a change of direction of vertical axes, the axis might slump (speed and torque = 0).

To prevent this happening, you need to use the unnamed keys and insulated terminals to control the braking protection or a clamping device.

Potentiometers

Designation	Potentiometer position		Remark
	Left limit	Clockwise rotation	
Torque	OFF	Increase torque	Always left limit as starting position
Speed	OFF	Increase speed	

Keys

Designation	Activating key	Remark
Reset	The axis is stopped through Reset for drive	
(Without designation)	The two unnamed insulated terminals are connected to control external function	e.g. braking protection or clamping device

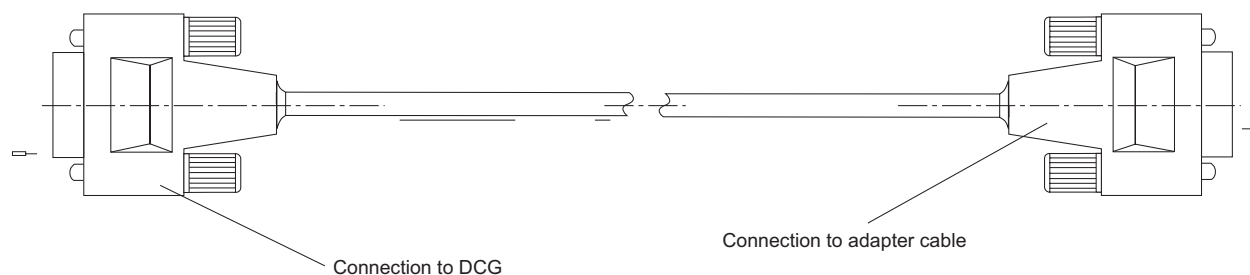
BNC sockets

PWM 1	For connecting an oscilloscope for PWM signal phase 1
PWM 2	For connecting an oscilloscope for PWM signal phase 2
PWM 3	For connecting an oscilloscope for PWM signal phase 3

21.3.2 Accessories DCG

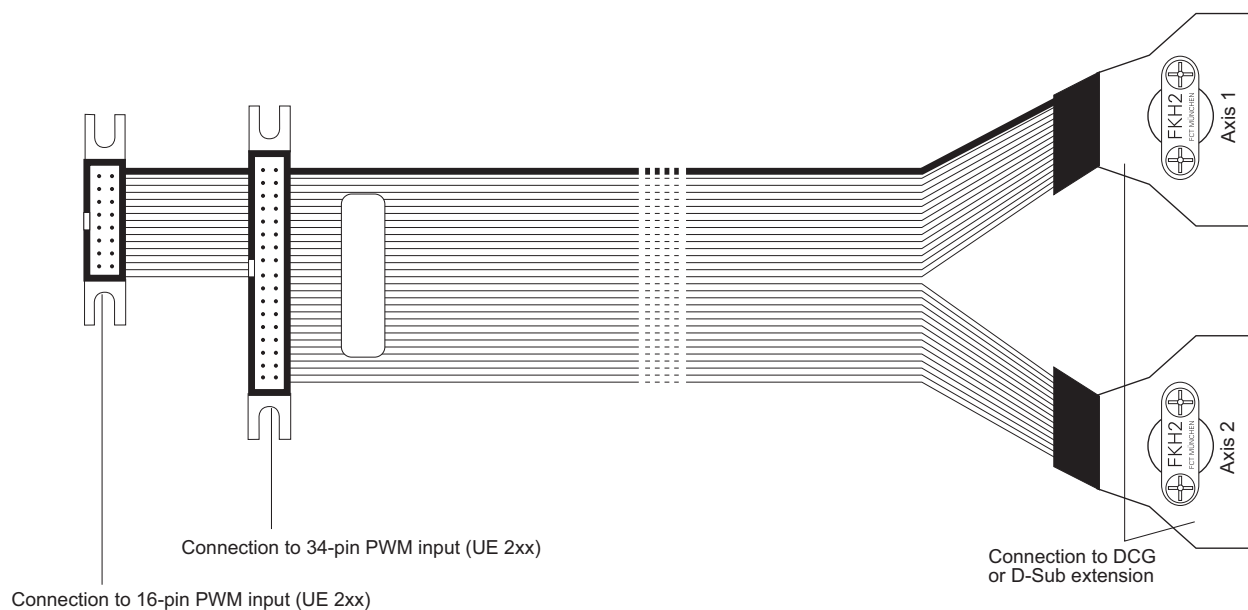
15-pin, D-sub extension
Id.Nr. 289 208-02

D-sub extension BU64/ST63 for connecting the DCG to adapter cable



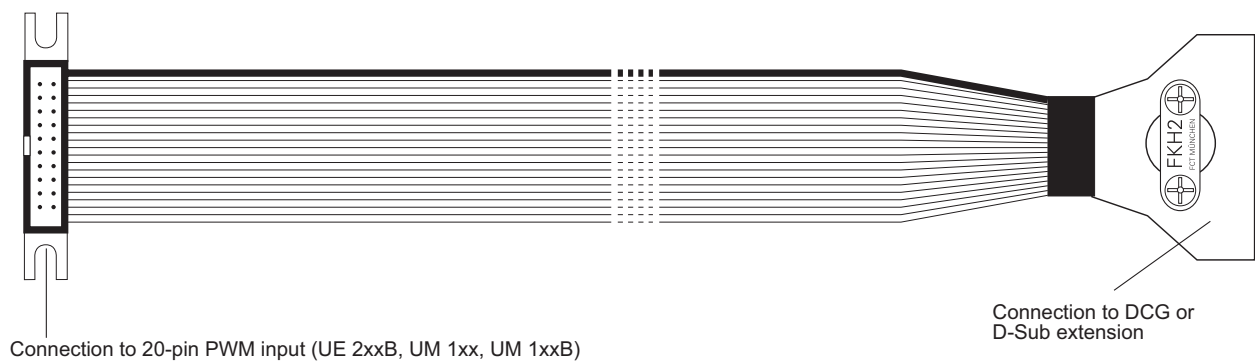
16/34-pin, plug-type connector, adapter cable
Id.Nr. 326.602-01

Adapter cable for testing unit TNC/DCG 2x15-pin D-sub-2xcable connector 16/34-pin for connecting DCG to PWM input (UE 2xx)
length: 300 mm



**20-pin,
plug-type
connector, adapter
cable**
Id.Nr. 331.389-01

Adapter cable for testing unit TNC/DCG 15-pin D-sub cable connector 20-pin for connecting DCG to PWM input (UE 2xxB), UM 1xx, UM 1xxB)
length: 300 mm



**DCG with
accessories**





MACHINE PARAMETER LIST

(Excerpt from THB TNC 426/430)

4.3 List of Machine Parameters

4.3.1 Encoders and Machines

MP	Function and Input	Software version and behavior	Page
MP10	Active axes Format: %xxxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Axis not active 1: Axis active	RESET	6 – 5
MP20	Monitoring functions for the axes Format: %xxxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Monitoring not active 1: Monitoring active	PLC RUN	6 – 11
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	6 – 11
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	6 – 5, 6 – 26
MP100.0	Traverse range 1		
MP100.1	Traverse range 2		
MP100.2	Traverse range 3		
MP110.0-8	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		6 – 14

MP	Function and Input	Software version and behavior	Page
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	280 474-03	6 – 16, 6 – 175
MP111.0	Position encoder input for the first spindle		
MP111.1	Position encoder input for the second spindle		
MP112.0-8	Assignment of speed encoder inputs to the axes Input: 0: No speed encoder input 15 to 20: Speed encoder inputs X15 to X20 62 to 64: Speed encoder inputs X62 to X64	280 474-03	6 – 14
MP113	Speed encoder for the spindle/spindles Input: 0: No speed encoder input 15 to 20: Speed encoder inputs X15 to X20 60: Speed encoder input X60 (only LE with integral spindle DSP) 62 to 64: Speed encoder inputs X62 to X64	280 474-03	6 – 16, 6 – 177
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: %xxxxxxxxxx Input: Bit 0 to bit 5: Position encoder inputs X1 to X6 Bit 6 to bit 9: Position encoder inputs X35 to X38 0: 1 V_{PP} 1: 11 μA_{PP}	280 474-01	6 – 9
MP115.1	Reserved Format: %xxxxxxxxxx Input: Enter %0000000000		
MP115.2	Input frequency of the position encoder inputs Format: %xxxxxxxxxx Input: Bit 0 to bit 5: Position encoder inputs X1 to X6 Bit 6 to bit 9: Position encoder inputs X35 to X38 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	Page
MP120.0-8	Assignment of speed encoder outputs to the axes Input: 0: No servo-controlled axis 1 to 6: Analog output 1 to 6 at terminal X8 7 to 13: Analog output 7 to 13 at terminal X9 51 to 59: Digital output X51 to X59	280 474-01 RESET	6 – 14
MP120.0-8	Assignment of speed encoder outputs to the axes Input: 0: No servo-controlled axis A1 to A6: Analog outputs 1 to 6 terminal X8 A 7 to A13: Analog outputs 7 to 13 at terminal X9 D1 to D6: Digital axes 1 to 6	RESET	
MP121 MP121	Nominal speed command output of the spindle/spindles Nominal speed command output of the spindle Input: 0: No servo-controlled axis A1 to A6 or 1 to 6: Analog outputs 1 to 6 at terminal X8 A7 to A13 or 7 to 13: Analog outputs 7 to 13 at terminal X9 S1: Digital spindles	RESET	6 – 16
MP121.0	Nominal speed command output of the first spindle Input: 0: No servo-controlled axis 1 to 6: Analog output 1 to 6 at terminal X8 7 to 13: Analog output 7 to 13 at terminal X9 51 to 59, 61: Digital outputs X51 to X59, X61	280 474-01 RESET	
MP121.1	Nominal speed command output of the second spindle Input: 0: No servo-controlled axis 1 to 6: Analog output 1 to 6 at terminal X8 7 to 13: Analog output 7 to 13 at terminal X9 51 to 59: Digital output X51 to X59	280 474-01 RESET	
MP210	Counting direction of position encoder output signals Format: %xxxxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Positive 1: Negative	RESET	6 – 10

MP	Function and Input	Software version and behavior	Page
MP331.0-8	Distance for the number of signal periods in MP332 Input: 0.0001 to 99.9999 999 [mm] or [°]	PLC REF	6 – 9
MP332.0-8	Number of signal periods for the distance in MP331 Input: 1 to 16 777 215	PLC REF	6 – 9
MP334.0-8	Nominal increment between two fixed reference marks on encoders with distance-coded reference marks Input: 1 to 65 535 0: 1 000	280 474-09 PLC	6 – 9
MP340.0-8	Interpolation factor for external interpolation Input: 0 to 99 0 = 1: No external interpolation	280 474-13	6 – 9
MP410 MP410.3 MP410.4	Assignment of axis keys IV and V Input: Axis designation XYZABCUVWxyzabcuvw– Axis key IV Axis key V	PLC RESET	6 – 5
MP420.0-8	Hirth coupling for axes 1 to 9 Input: 0: No Hirth coupling 1: Hirth coupling	PLC	6 – 391
MP430.0-8	Prescribed increment for Hirth coupling Input: 0.0000 to 30.0000 [°]	PLC	6 – 391
MP710.1-8	Backlash compensation for axes 1 to 9 Input: -1.0000 to +1.0000 [mm] or [°]	PLC	6 – 34
MP711.0-8	Height of the spikes during circular movement (only analog) for axes 1 to 9 Input: -1.0000 to +1.0000 [mm] (digital: 0)	PLC RUN	6 – 45
MP712.0-8	Compensation value per control loop cycle time for axes 1 to 9 Input: 0.000000 to 99.999999 [mm] (digital: 0)	PLC RUN	6 – 45
MP715.0-8	Height of the spikes during circular movement (only analog) for axes 1 to 9 Input: -1.0000 to +1.0000 [mm] (digital: 0)	PLC RUN	6 – 45
MP716.0-8	Compensation value per control loop cycle time for axes 1 to 9 Input: 0.000000 to 99.999999 [mm] (digital: 0)	PLC RUN	6 – 45
MP720.0-8	Linear axis error compensation for axes 1 to 9 Input: -1.000 to +1.000 [mm/m]	PLC	6 – 36

MP	Function and Input	Software version and behavior	Page
MP730	Selection of linear/nonlinear axis error compensation Format: %xxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Linear axis error compensation 1: Nonlinear axis error compensation	PLC	6 – 36, 6 – 41
MP750.0-8	Backlash in axes 1 to 9 Input: -1.0000 to +1.0000 [mm] or [°]	PLC	6 – 35
MP752.0-8	Compensation time for backlash in axes 1 to 9 Input: 0 to 1000 [ms]	PLC	6 – 35
MP810.0-8	Display mode for rotary axes and PLC auxiliary axes in axes 1 to 9 Input: 0.0000 to 99 999.9999 [°] 0: Display +/-99 999.9999 1: Modulo value for display	PLC REF	6 – 226
MP812	Activate software limit switches for swivel axes with modulo display, M94 and encoders with EnDat interface Input: %xxxxxxx 0: Software limit switch not active 1: Software limit switch active	280 476-07 RESET	6 – 226
MP850.0-8	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	6 – 85
MP855.0-8	Synchronization monitoring for axes 1 to 9 Input: 0 to 100.0000 [mm] 0: Monitoring not active	PLC	6 – 87
MP860.0-8	Datum for synchronization control for axes 1 to 9 Input: 0: Datum at position after switch-on 1: Datum at reference marks 2: Axis is torque slave axis	280 474-04 PLC	6 – 87, 6 – 92

MP	Function and Input	Software version and behavior	Page
MP910.0-8	Positive software limit switches, traverse range 1 (default setting after power on) Input: -99 999.9999 to +99 999.9999 [mm] or [°]	PLC	6 – 23
MP911.0-8	Positive software limit switches, traverse range 2 Input: -99 999.9999 to +99 999.9999 [mm] or [°]	PLC	6 – 23
MP912.0-8	Positive software limit switches, traverse range 3 Input: -99 999.9999 to +99 999.9999 [mm] or [°]	PLC	6 – 23
MP920.0-8	Negative software limit switches, traverse range 1 (default setting after power on) Input: -99 999.9999 to +99 999.9999 [mm] or [°]	PLC	6 – 23
MP921.0-8	Negative software limit switches, traverse range 2 Input: -99 999.9999 to +99 999.9999 [mm] or [°]	PLC	6 – 23
MP922.0-8	Negative software limit switches, traverse range 3 Input: -99 999.9999 to +99 999.9999 [mm] or [°]	PLC	6 – 23
MP950.0-8	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	6 – 218
MP951.0-8	Simulating tool change position for TOOL-CALL during block scan for axes 1 to 9 Input: -99 999.9999 to +99 999.9999 [mm] or [°]	PLC RUN	6 – 289
MP960.0-8	Machine datum for axes 1 to 9 Input: -99 999.9999 to +99 999.999 [mm] or [°] Values with respect to the scale reference point	PLC REF	6 – 100, 6 – 218

4.3.2 Positioning

MP	Function and Input	Software version and behavior	Page
MP1010.0-8	Rapid traverse in axes 1 to 9 Input: 10 to 300 000 [mm/min]	PLC	6 – 123
MP1020.0-8	Manual feed rate for axes 1 to 9 Input: 10 to 300 000 [mm/min]	PLC	6 – 123
MP1030.0-8	Positioning window Input: 0.0001 to 2.0000 [mm]	PLC	6 – 157
MP1040	Analog axes: Polarity of nominal value voltage Digital axes: Algebraic sign of the nominal speed value Format: %xxxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Positive 1: Negative		6 – 10
MP1050.0-8	Analog axes: Analog voltage for rapid traverse in axes 1 to 9 Input: 1.000 to 9.000 [V] Digital axes: without function Input: 1	PLC	6 – 123
MP1060.0-8	Acceleration for axes 1 to 9 Input: 0.001 to 20.0 [m/s or 1000°/s]	PLC	6 – 114
MP1070	Radial acceleration Input: 0.001 to 5.000 [m/s or 1000°/s]	PLC RUN	6 – 147
MP1080.0-8	Analog axes: Integral factor for offset adjustment for axes 1 to 9 Input: Enter 0 to 65 535 Input: 0	PLC RUN	6 – 146
MP1087.0-8	Max. permissible axis-specific jerk for Manual mode Input: 0.1 to 1000.0 [m/s or 1000°/s]	280 476-10 PLC RUN	6 – 114
MP1089.0-8	Max. permissible axis-specific jerk for Pass Over Reference Point mode Input: 0.1 to 1000.0 [m/s or 1000°/s]	280 476-03 PLC RUN	6 – 114

MP	Function and Input	Software version and behavior	Page
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	6 – 114
MP1092	Feed rate threshold from which MP1090.1 becomes effective Input: 10 to 300 000 [mm/min]	PLC RUN	6 – 114
MP1094	HSC filter Input: 0: HSC filter inactive 0.1 to 166.0: Cutoff frequency for HSC filter	280 474-07	6 – 114
MP1095 MP1095.0 MP1095.1	Nominal position value filter Input: 0: Single filter 1: Double filter in the Program Run, Full Sequence; Program Run, Single Block; and Positioning With Manual Data Input operating modes in the Manual, Handwheel, Jog Increment and Pass Over Reference Point operating modes	PLC RUN	6 – 114
MP1096	Tolerance for contour transitions Input: 0: No nominal position value filter 0.001 to 3.000 [mm]	PLC RUN	6 – 114, 6 – 148
MP1097.0-8	Max. permissible axis-specific jerk (single/HSC filter) Input: 0.1 to 1000.0 [m/s or 1000°/s]	PLC RUN	6 – 114
MP1098.0-8	Max. permissible axis-specific jerk (double/HSC filter) Input: 0.1 to 1000.0 [m/s or 1000°/s]	PLC RUN	6 – 114
MP1099 MP1099.0 MP1099.1	Minimum filter order Input: 0 to 20 Minimum filter configuration for single filter (MP1095 = 0) Minimum filter configuration for double filter (MP1095 = 1)	PLC RUN	6 – 114
MP1110.0-8	Standstill monitoring for axes 1 to 9 Input: 0.0010 to 30.0000 [mm]	PLC	6 – 157
MP1140.0-8	Threshold from which movement monitoring is effective for axes 1 to 9 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	6 – 156

MP	Function and Input	Software version and behavior	Page
MP1150	Delay time for erasing the nominal velocity value with the erasable error message: EXCESSIVE SERVO IN <AXIS> Input: 0 to 65.535 [s] Recommended: 0 s	280 476-01 PLC RUN	6 – 155
MP1150.0	Delay time for erasing the nominal velocity value with the erasable error message: EXCESSIVE SERVO IN <AXIS> Input: 0 to 65.535 [s] Recommended: 0		
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] 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]		
MP1220	Analog axes: automatic cyclic offset adjustment Input: 0 to 65 536 [s] 0: No automatic adjustment	removed as of 280 474-07 PLC RUN	6 – 146
MP1320	Direction for traversing the reference marks Format: %xxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Positive 1: Negative	PLC	6 – 100
MP1330.0-8	Velocity for traversing the reference marks for axes 1 to 9 Input: 80 to 300 000 [mm/min]	PLC RUN	6 – 100
MP1331.0-8	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	6 – 100
MP1340.0-8	Sequence for traversing the reference marks Input: 0: No evaluation of reference marks 1: Axis X 2: Axis Y 3: Axis Z 4: Axis 4 5: Axis 5 6: Axis 6 7: Axis 7 8: Axis 8	PLC REF	6 – 100

MP	Function and Input	Software version and behavior	Page
MP1350.0-8	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	PLC REF	6 – 100
MP1390	Velocity feedforward in the POSITIONING WITH MANUAL DATA INPUT, PROGRAM RUN SINGLE BLOCK and PROGRAM RUN FULL SEQUENCE operating modes Input: 0: Operation with velocity feedforward control 1: Operation with following error (lag)	removed as of 280 474-07 PLC	6 – 116
MP1391	Velocity feedforward control in the MANUAL and HANDWHEEL operating modes Format: %xxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Operation with following error (lag) 1: Operation with velocity feedforward control	PLC RUN	6 – 47, 6 – 117
MP1392	Velocity feedforward in the POSITIONING WITH MANUAL DATA INPUT, PROGRAM RUN SINGLE BLOCK and PROGRAM RUN FULL SEQUENCE operating modes Format: %xxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Operation with following error (lag) 1: Operation with velocity feedforward control	280 474-07 PLC RUN	6 – 116
MP1396.0-8	Feedback control with velocity semifeedforward for axes 1 to 9 Input: 0.001 to 0.999 1: Velocity feedforward control	280 476-09 PLC RUN	6 – 122

4.3.3 Operation with Velocity Feedforward Control

MP	Function and Input	Software version and behavior	Page
MP1410.0-8	Position monitoring for operation with velocity feedforward (erasable) for axes 1 to 9 Input: 0.0010 to 30.0000 [mm] Recommended: 0.5 mm	PLC	6 – 154
MP1420.0-8	Position monitoring for operation with velocity feedforward (EMERGENCY STOP) for axes 1 to 9 Input: 0.0010 to 30.0000 [mm] Recommended: 2 mm	PLC	6 – 154
MP1510.0-8	k_v factor for velocity feedforward for axes 1 to 9 Input: 0.100 to 20.000 [(m/min)/mm]	PLC RUN	6 – 120
MP1511.0-8	Factor for static friction compensation for axes 1 to 9 Input: 0 to 16 777 215 [s]	PLC RUN	6 – 47
MP1512.0-8	Limit to the amount of static friction compensation for axes 1 to 9 Input: 0 to 16 777 215 [counting steps]	PLC RUN	6 – 47
MP1513.0-8	Limit to the amount of static friction compensation for axes 1 to 9 Input: 0 to 300 000 [mm/min]	PLC RUN	6 – 47
MP1515.0-8	k_v factor for velocity feedforward effective after M105 for axes 1 to 9 Input: 0.100 to 20.000 [(m/min)/mm]	PLC RUN	6 – 120
MP1516.0-8	k_v factor for velocity semifeedforward for axes 1 to 9 Input: 0.100 to 20.000 [(m/min)/mm]	PLC RUN	6 – 122
MP1521	Transient response during acceleration and deceleration Input: 1 to 255 [ms] 0: Function inactive	PLC	6 – 114

4.3.4 Operation with Following Error (Servo Lag)

MP	Function and Input	Software version and behavior	Page
MP1710.0-8	Position monitoring for operation with following error (erasable) for axes 1 to 9 Input: 0.0000 to 300.0000 [mm] Recommended: 1.2 · following error	PLC	6 – 154
MP1720.0-8	Position monitoring for operation with following error (EMERGENCY STOP) for axes 1 to 9 Input: 0.0000 to 300.0000 [mm] Recommended: 1.4 · following error	PLC	6 – 154
MP1810.0-8	k_v factor for operation with following error for axes 1 to 9 Input: 0.100 to 20.000 [(m/min)/mm]	PLC	6 – 118
MP1815.0-8	k_v factor for operation with following error effective after M105 for axes 1 to 9 Input: 0.100 to 20.000 [(m/min)/mm]	PLC	6 – 118
MP1820.0-8	Multiplier for the k_v factor for axes 1 to 9 Input: 0.001 to 1.00000	PLC	6 – 124
MP1830.0-8	Kink point for axes 1 to 9 Input: 0.000 to 100.000 [%]	PLC	6 – 124

4.3.5 Integrated Speed and Current Control

MP	Function and Input	Software version and behavior	Page
MP2000	Type of drive Input: 0: Output of nominal speed value (analog axis) 1: Output of current pulse (digital axis)	RESET	6 – 455
MP2001	Type of drive for spindle Input: 0: Output of nominal speed value (analog spindle) 1: Output of current pulses (digital spindle)		6 – 455
MP2020.0-8	Traverse per motor revolution for axes 1 to 9 Input: Digital axes: without function Digital axes: 0 to 100.000 [mm] or [°]		6 – 156
MP2100.0-8	Type of power module for axes 1 to 9 Input: Name of the selected power module (entered by the TNC)		6 – 458
MP2200.0-8	Motor model for axes 1 to 9 Input: Name of the selected motor (is entered by the TNC)		6 – 458
MP2101	Model of power module for the spindle Input: Name of the selected power stage (is entered by the TNC)		6 – 458
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]	280 476-09	6 – 139
MP2180	PWM frequency Input: 3 000 to 7 000 [Hz] 0 = 5000 Hz (for HEIDENHAIN inverters)	280 472-07	6 – 459
MP2190	dc link voltage U_Z Input: 0 to 10 000 [V] HEIDENHAIN inverter UE 2xx, UE 2xxB, UV 130: 565 V UV 120, UV 140: 650 V		6 – 459
MP2191	Braking the first spindle for an Emergency Stop Input: 0: With monitoring of the maximum braking current 1: Without monitoring of the maximum braking current	280 474-03	6 – 192
MP2201	Motor model for the spindle Input: Name of the selected motor (is entered by the TNC)		6 – 458

MP	Function and Input	Software version and behavior	Page
MP2221	Spindle monitoring functions Format: %xx Input: Bit 0 – Monitoring the reference mark 0: Monitoring active 1: Monitoring inactive Bit 1 – Monitoring the rotational direction (only with spindle DSP) 0: Monitoring active 1: Monitoring inactive	280 474-12 PLC	6 – 177
MP2302.0-8	Reference value for I^2t monitoring of feed motors for axes 1 to 9 Input: 0 to 1000.000 [- rated current of motor] 0: I^2t monitoring of feed motors turned off 1: Rated current of motor as reference value		6 – 162
MP2303	Reference value for I^2t monitoring of spindle motor Input: 0 to 1000.000 [- rated current of motor] 0: I^2t monitoring of spindle motors turned off 1: Rated current of motor as reference value		6 – 162
MP2312.0-8	Reference value for utilization of feed motors for axes 1 to 9 Input: 0 to 1000.000 [- rated current of motor] 0 or 1: Reference value is rated current of motor		6 – 165
MP2313	Reference value for utilization display of the spindle motor Input: 0 to 1000.000 [- rated current of motor] 0 or 1: Reference value is rated current of motor		6 – 165
MP2340.0-8	Speed starting from which the field angle begins to shift on synchronous motors for the axes 1 to 9 Input: 0 to 100 000 min 0: No field angle offset		6 – 459
MP2350.0-8	Field-angle offset on synchronous motors for axes 1 to 9 Input: 0 to 60 [°]		6 – 459
MP2360.0-8	Time constant for braking axes 1 to 8 or the second spindle in an emergency stop Input: 0.01 to 5.00 [s] 0: Function inactive	280 474-10	6 – 192

MP	Function and Input	Software version and behavior	Page
MP2361	Time constant for braking the first spindle in an emergency stop Input: 0.01 to 5.00 [s] 0: Function inactive	280 474-10	6 – 192
MP2391 MP2391.0 MP2391.1	Maximum power for braking the first spindle in an emergency stop Input: 0.1 to 3000.000 [kW] 0: Braking power is not limited. Wye connection Delta connection	280 474-10	6 – 194
MP2393 MP2393.0 MP2393.1	Power limiting of spindle motor Input: 0: No power limit 0.1 to 3000.000 [kW] Wye connection Delta connection	280 476-01	6 – 187
MP2395 MP2395.0 MP2395.1	Maximum power for braking the first spindle in a power failure Input: 0.1 to 3000.000 [kW] 0: Braking power is not limited. Wye connection Delta connection	280 476-09	6 – 194
MP2400.0-8	Gain for current controller at standstill for axes 1 to 9 Input: 0.00 to 9 999.00 [V/A] 0: Controller disable		6 – 143
MP2401	Gain for the spindle current controller at standstill Input: 0.00 to 9 999.99 [V/A] 0: Controller disable		6 – 207
MP2402.0-8	Gain for current controller at maximum speed for axes 1 to 9 Input: 0.00 to 9 999.99 [V/A] 0: Value from MP2400.x		6 – 143
MP2403	Gain for the spindle current controller at maximum speed Input: 0.00 to 9 999.99 [V/A] 0: Value from MP2401		6 – 207

MP	Function and Input	Software version and behavior	Page
MP2421.0-1	Proportional factor of the spindle current controller for wye and delta connection Input: 0.00 to 9 999.99 [VA]		6 – 207
MP2431.0-1	Integral factor of the spindle current controller for wye and delta connection Input: 0.00 to 9 999.99 [V/As]		6 – 207
MP2500.0-8	Proportional factor of the speed controller for axes 1 to 9 Input: 0 to 1 000 000.000 [As]	PLC	6 – 130
MP2501.0-1	Proportional factor of the spindle speed controller for wye and delta connection Input: 0 to 100 000 000.000 [As]	PLC	6 – 206
MP2510.0-8	Integral factor of the speed controller for axes 1 to 9 Input: 0 to 100 000 000 [A]	PLC	6 – 130
MP2511.0-1	Integral factor of the spindle speed controller for wye and delta connection Input: 0 to 100 000 000 [A]	PLC	6 – 206
MP2512.0-8	Limiting the integral component of the speed controller for axes 1 to 9 Input: 0.000 to 30.000 [s] (realistically: 0.1 to 2.0)	PLC	6 – 47, 6 – 134
MP2520.0-8	Differential factor of the speed controller for axes 1 to 8 Input: 0 to 1.0000 [As]	PLC	6 – 131
MP2521.0-1	Differential factor of the spindle speed controller for wye and delta connection Input: 0 to 1.0000 [As]	PLC	6 – 206
MP2530.0-8	PT ₂ element of the speed controller (2nd-order delay) for axes 1 to 8 Input: 0 to 1.0000 [s]	PLC	6 – 132
MP2531.0-1	PT ₂ second-order time delay element of the speed controller for the first spindle for wye and delta connection Input: 0 to 1.0000 [s] 0 = 0.001 s	PLC	6 – 206
MP2540.0-8	Band-rejection filter damping for axes 1 to 8 Input: 0.0 to 18.0 [dB]	PLC	6 – 132
MP2541	Band-rejection filter damping of the spindle Input: 0.0 to 18.0 [dB]	PLC	6 – 206

MP	Function and Input	Software version and behavior	Page
MP2550.0-8	Band-rejection filter center frequency for axes 1 to 8 Input: 0.0 to 999.9 [Hz]	PLC	6 – 132
MP2551	Band-rejection filter central frequency of the spindle Input: 0.0 to 999.9 [Hz]	PLC	6 – 206
MP2560.0-8	Low-pass filter for axes 1 to 9 Input: 0: No low-pass filter 1: 1st-order low-pass filter 2: 2nd-order low-pass filter	280 474-07 PLC	6 – 131
MP2561	Low-pass filter spindle Input: 0: No low-pass filter 1: 1st-order low-pass filter 2: 2nd-order low-pass filter	280 474-07 PLC	6 – 206
MP2590.0-8	Braking ramp for axes 1 to 8 or the second spindle in an emergency stop Input: 0.1 to 999.9 [rpm/ms] 0: Function inactive	280 476-03 PLC RUN	6 – 144, 6 – 192
MP2591	Braking ramp for the first spindle for an Emergency Stop Input: 0.1 to 999.9 [rpm/ms] 0: Function inactive	280 476-03 PLC RUN	6 – 192
MP2600.0-8	Acceleration feedforward for axes 1 to 9 Input: 0 to 6.0000 [A/(U/s)]	PLC	6 – 134
MP2602.0-8	IPC time constant T for axes 1 to 9 Input: 0.0001 to 1.0000 [s] 0: IPC inactive	280 476-05 PLC RUN	6 – 136
MP2604.0-8	IPC time constant T for axes 1 to 9 Input: 0.0001 to 1.0000 [s] 0: IPC inactive	280 476-05 PLC RUN	6 – 136
MP2606.0-8	Following error during the jerk phase for axes 1 to 9 Input: 0.000 to 10.000	280 476-07 PLC RUN	6 – 136
MP2610.0-8	Friction compensation at rated speed for axes 1 to 9 (effective only with velocity feedforward control) Input: 0 to 30.0000 [A] 0: No friction compensation (or analog axis)	PLC	6 – 48

MP	Function and Input	Software version and behavior	Page
MP2612.0-8	Delay of friction compensation at rated speed for axes 1 to 9 (effective only with velocity feedforward control) Input: 0.0000 to 1.0000 [s] (typically: 0.015 s) 0: No friction compensation (or analog axis)	PLC	6 – 48
MP2620.0-8	Friction compensation at rated speed for axes 1 to 9 Input: 0 to 30.0000 [A] 0: No friction compensation (or analog axis)	PLC	6 – 48
MP2630.0-8	Holding current for axes 1 to 9 Input: -30.000 to +30.000 [A]	PLC	6 – 137
MP2800.0-8	Movement monitoring for position and speed for axes 1 to 9 Input: Digital axes: without function Digital axes: 0 to 99 999.999 [mm] 0: No monitoring	PLC	6 – 156
MP2900.0-8	Tensioning torque between master and slave for master-slave torque control (entry for the slave axis) Input: -100.00 to +100.00 [Nm]	280 474-04 PLC	6 – 95
MP2910.0-8	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)]	280 474-04 PLC	6 – 95
MP2920.0-8	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	280 474-04 PLC	6 – 95
MP2930.0-8	Speed rating factor of the torque-master-slave control (entry for the slave axis) Input: -100.00 to +100.00 [%]	280 474-04 PLC	6 – 95

4.3.6 Spindle

MP	Function and Input	Software version and behavior	Page
MP3010	<p>Output of speed, gear range</p> <p>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 servo-controlled spindle for oriented spindle stop 7: Same as 4, but with servo-controlled spindle for oriented spindle stop 8: Same as 5, but with servo-controlled spindle for oriented spindle stop</p>	<p>PLC</p> <p>RESET</p>	6 – 174
MP3011	<p>Function of analog output S, if MP3010 < 3</p> <p>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)</p>	RESET	6 – 444
MP3012	<p>Feed rate from output of an analog voltage of 10 V, MP3011 = 1</p> <p>Input: 0 to 300 000 [mm/min]</p>		6 – 444
MP3013.x	<p>Characteristic curve kink points (velocity) for output of the analog voltage with M202</p> <p>Input: 10 to 300 000 [mm/min]</p>	<p>PLC</p> <p>RUN</p>	6 – 445
MP3014.x	<p>Characteristic curve kink points (voltage) for output of the analog voltage with M202</p> <p>Input: 0.000 to 9.999 [V]</p>	<p>PLC</p> <p>RUN</p>	6 – 445
MP3020	<p>Speed range for S-code output</p> <p>Format: xxyz xx: S code for minimum speed yy: S code for maximum speed z: speed increment</p> <p>Input: 0 to 99 999</p>	PLC	6 – 188

MP	Function and Input	Software version and behavior	Page
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	6 – 182, 6 – 447
MP3120	Zero speed permitted Input: 0: S = 0 allowed 1: S = 0 not allowed	PLC	6 – 181
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	6 – 180
MP3140	Counting direction of spindle position encoder output signals Input: 0: Positive counting direction with M03 1: Negative counting direction with M03	PLC RUN	6 – 180
MP3142	Line count of the spindle position encoder Input: 100 to 9 999 [lines]	PLC RUN	6 – 175
MP3143	Mounting configuration of the spindle position encoder Input: 0: Position encoder directly on the first spindle 1: Position encoder via transmission (transmission in MP3450.x and MP3451.x) X30 pin 1: reference pulse 2: Position encoder via transmission (transmission 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	6 – 175
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	6 – 181

MP	Function and Input	Software version and behavior	Page
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	6 – 181, 6 – 182
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	6 – 185
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 rpm)/ms]	PLC RUN	6 – 179
MP3412 MP3412.0 MP3412.1 MP3412.2 MP3412.3	Multiplication factor for MP3411.x Input: 0.000 to 1.999 With M05 With oriented spindle stop With tapping with floating tap holder With rigid tapping	PLC RUN	6 – 180, 6 – 196, 6 – 201, 6 – 205
MP3415 MP3415.0 MP3415.1 MP3415.2 MP3415.3	Overshoot behavior of the spindle with M03, M04 and M05 Input: 0 to 1000 [ms] With M03, M04 and M05 For oriented spindle stop With tapping With rigid tapping	PLC RUN	6 – 179, 6 – 196, 6 – 201, 6 – 205
MP3420	Spindle positioning window Input: 0 to 360.0000 [°]	PLC RUN	6 – 196
MP3430	Deviation of the reference mark from the desired position (spindle preset) Input: 0 to 360 [°]	PLC RUN	6 – 196

MP	Function and Input	Software version and behavior	Page
MP3440.0-7	k_V factor for spindle orientation for gear ranges 1 to 8 Input: 0.1 to 10 [(1000°/min) /°]	PLC RUN	6 – 196
MP3450.0-7	Number of spindle position-encoder revolutions for gear ranges 1 to 8 Input: 0 to 255 0: No transmission	PLC RUN	6 – 175
MP3451.0-7	Number of spindle position-encoder revolutions for gear ranges 1 to 8 Input: 0 to 255 0: No transmission	PLC RUN	6 – 175
MP3510.0-7	Rated speed for the gear ranges 1 to 8 Input: 0 to 99 999.999 [rpm]	PLC	6 – 181
MP3515.0-7	Maximum spindle speed for gear ranges 1 to 8 Input: 0 to 99 999.999 [rpm]	PLC	6 – 185
MP3520.0	Speed activation through marker M4011 Input: 0 to 99 999.999 [rpm]	PLC RUN	6 – 199
MP3520.1	Spindle speed for oriented stop Input: 0 to 99 999.999 [rpm]		6 – 196

4.3.7 Integral PLC

MP	Function and Input	Software version and behavior	Page
MP4020	<p>PLC Compatibility with TNC 415 / TNC 425</p> <p>Format: %xxxxxxxxxx</p> <p>Input:</p> <ul style="list-style-type: none"> Bit 0 = Change words (W1024 and subsequent) into markers Bit 1 = Change markers (4000 and subsequent) into markers (2000 and subsequent) Bit 2 = Change configuration bits from MP4310 into markers (M2192 to M2239 and M3200 to M3263) Bit 3 = Error markers are available Bit 4 = Remanent markers in the range M1000 to M1999 Bit 5 = Single- or double-spindle operation 0: Single-spindle operation 1: Double-spindle operation Bit 6: Reserved Bit 7: Transferring the values of the Pt 100 inputs 0: Values with a change rate of 1 K/s get accepted 1: Accept results immediately. Bit 8 – Behavior after an external 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, before being transferred to the NC, is first processed by an active PLC window Bit 10 – Behavior of a disabled key 0: Disabled key only works on the active PLC window 1: Disabled key works on neither the active PLC window, nor on the NC 	RESET	6 – 388, 6 – 125, 6 – 210, 6 – 332
MP4030	<p>Assignment of physical to logical PL</p> <p>Input:</p> <ul style="list-style-type: none"> 0: First logical PL 1: Second logical PL 2: Third logical PL 3: Fourth logical PL 	280 476-01 PLC	6 – 382
MP4030.0	First physical PL		
MP4030.1	Second physical PL		
MP4030.2	Third physical PL		
MP4030.3	Fourth physical PL		

MP	Function and Input	Software version and behavior	Page
MP4060.0-8	Traverse distance for lubrication of axes 1 to 9 Input: 0 to 99 999 [mm] or [°]	PLC RUN	6 – 24
MP4070	Compensation amount per PLC cycle for lagged-tracking axis error compensation Input: 0.0001 to 0.005 [mm]	PLC RUN	6 – 42
MP4130.0	Number of the high-speed PLC input for switching off the monitoring functions Input: 0 to 255 [no. of the PLC input] TNC 426 M, TNC 430 M: If you use I32, enter the following values: up to 280 474-11: MP4130.0 = 159 as of 280 474-12: MP4130.0 = 32 as of 280 476-01: MP4130.0 = 32		6 – 152
MP4131.0	Activation criterion for fast PLC input for switching off the monitoring functions Input: 0: Activation at low level 1: Activation at high level		6 – 152
MP4210.0-47	Setting a number in the PLC (D768 to D956) Input: -99 999.9999 to +99 999.9999		6 – 199
MP4220.0-8	Setting a number in the PLC (W960 to W974) Input: 10 to 30 000		7 – 36
MP4230.0-31	Setting a number in the PLC (Module 9032) Input: -99 999.9999 to +99 999.9999		7 – 36
MP4231.0-31	Setting a number in the PLC (Module 9032) Input: -99 999.9999 to +99 999.9999		7 – 36
MP4310.0-6	Setting a number in the PLC (W976 to W988, M4300 to M4411) Input: 10 to 30 000		7 – 36

4.3.8 Configuration of the Data Interface

MP	Function and Input	Software version and behavior	Page
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	8 – 15
MP5020 MP5020.0 MP5020.1 MP5020.2	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 Operating mode EXT1 Operating mode EXT2 Operating mode EXT3 (PLC)	PLC, CN123 RUN	8 – 18
MP5030 MP5030.0 MP5030.1 MP5030.2	Data transfer protocol Input: 0 = standard data transfer protocol 1 = blockwise transfer 2 = without protocol (only for MP5030.2) Operating mode EXT1 Operating mode EXT2 Operating mode EXT3 (PLC)	PLC, CN123 RUN	8 – 18

MP	Function and Input	Software version and behavior	Page
MP5040	Data transfer rate in operating mode EXT3 (data transfer through PLC) Input: 0: 110 baud 1: 150 baud 2: 300 baud 3: 600 baud 4: 1200 baud 5: 2400 baud 6: 4800 baud 7: 9600 baud 8: 19200 baud 9: 38400 baud 10: 57600 baud 11: 115200 baud	PLC RUN	8 – 31

4.3.9 3-D touch probe

MP	Function and Input	Software version and behavior	Page
MP6010	Selection of the touch probe Input: 0: Touch probe with cable transmission 1: Touch probe with infrared transmission	PLC, CN123	6 – 340
MP6120	Probing feed rate (triggering touch probe) Input: 1 to 3000 [mm/min]	PLC, CN123 RUN	6 – 343
MP6130	Maximum measuring range Input: 0.001 to 99 999.9999 [mm]	PLC, CN123 RUN	6 – 343
MP6140	Setup clearance over measuring point Input: 0.001 to 99 999.9999 [mm]	PLC, CN123 RUN	6 – 343
MP6150	Rapid traverse in probing cycle (triggering touch probe) Input: 10 to 20 000 [mm/min]	PLC, CN123 RUN	6 – 343
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 by the PLC	PLC, CN123 RUN	6 – 346
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	280 474-08 PLC, CN123 RUN	6 – 344
MP6162	Orientation angle Input: 0 to 359.9999 [°]	280 474-08 PLC, CN123 RUN	6 – 344
MP6163	Minimum difference between the current spindle angle and MP6162 before executing an oriented spindle stop Input: 0 to 3.0000 [°]	280 474-08 PLC, CN123 RUN	6 – 344
MP6165	Orient the probe before approaching with Cycle 0 or 1, or with manual probing Input: 0: Probe is not oriented before each probing process 1: Probe is oriented and always deflected in the same direction	280 476-10 PLC, CN123 RUN	6 – 344
MP6170	Number of measurements in a programmed measurement (touch probe block) Input: 1 to 3	PLC, CN123 RUN	6 – 347

MP	Function and Input	Software version and behavior	Page
MP6171	Confidence range for programmed measurement (MP6170 > 1) Input: 0.002 to 0.999 [mm]	PLC, CN123 RUN	6 – 347
MP6180 MP6180.0 MP6180.1 MP6180.2	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] X coordinate Y coordinate Z coordinate	280 472-05 PLC, CN123	6 – 346
MP6181 MP6181.0 MP6181.1 MP6181.2	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] X coordinate Y coordinate Z coordinate	280 472-05 PLC, CN123	6 – 346
MP6182 MP6182.0 MP6182.1 MP6182.2	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] X coordinate Y coordinate Z coordinate	280 472-05 PLC, CN123	6 – 346
MP6185	Distance of probing point below ring top surface during calibration Input: +0.001 to +99 999.9999 [mm]	280 472-05 PLC, CN123	6 – 347

4.3.10 Digitizing with TS (option)

MP	Function and Input	Software version and behavior	Page
MP6200	Selection of triggering or measuring touch probe (only with "digitizing with measuring touch probe" option) Input: 0: Triggering touch probe (e.g. TS 220) 1: Measuring touch probe	PLC, CN123	6 – 340, 6 – 362
MP6210	Number of oscillations in normal direction per second Input: 0 to 65.535 [1/s]	PLC, CN123 RUN	6 – 355
MP6220	Traverse distance for lubrication of the touch probe axis at line end Input: 0.000 to 999.999 [mm]	PLC, CN123 RUN	6 – 357
MP6221	Time after which the probe axis must be lubricated Input: 0 to 65 535 [mm]	PLC, CN123 RUN	6 – 357
MP6230	Feed rate in normal direction Input: 0 to 1 000 [mm/min]	PLC, CN123 RUN	6 – 355
MP6240	Maximum deflection of the stylus Input: 0 to 10.000 [mm]	PLC, CN123 RUN	6 – 355
MP6260	Output of M90 in NC blocks with digitized data Input: 0: No output of M90 1: Output of M90 in every NC block	PLC, CN123 RUN	6 – 355
MP6270	Rounding of decimal places Input: 0: Output in 0.001-mm steps (1 µm) 0: Output in 0.01-mm steps (10 µm) 2: Output in 0.0001-mm steps (0.1 µm)	PLC, CN123 RUN	6 – 355

4.3.11 Digitizing with Measuring Touch Probe (option)

MP	Function and Input	Software version and behavior	Page
MP6310	Deflection depth of the stylus (measuring touch probe) Input: 0.1000 to 2.0000 [mm]	PLC, CN123	6 – 362
MP6320	Counting direction of encoder output signals (measuring touch probe) Format: %xxx Input: Bits 0 to 2 represent axes X to Z 0: Positive 1: Negative	CN123	6 – 362
MP6321	Measuring the center offset while calibrating the measuring touch probe Input: 0: Calibration with measurement of the center offset 1: Calibration without measuring the center offset	CN123	6 – 347, 6 – 363
MP6322.0-2	Assignment of the touch probe axes to the machines axes X, Y and Z Input: 0: Touch probe axis X 1: Touch probe axis Y 2: Touch probe axis Z	CN123	6 – 363
MP6330	Maximum deflection of the stylus (measuring touch probe) Input: 0.1 to 4.000 [mm]	CN123	6 – 363
MP6350	Feed rate for positioning to the MIN point and approaching the contour (measuring touch probe) Input: 1 to 3 000 [mm/min]	CN123	6 – 363
MP6360	Probing feed rate (measuring touch probe) Input: 1 to 3000 [mm/min]	CN123	6 – 343, 6 – 363
MP6361	Rapid traverse in probing cycle (measuring touch probe) Input: 10 to 10 000 [mm/min]	CN123	6 – 344, 6 – 363
MP6362	Feed rate reduction, if the stylus of the measuring touch probe is deflected to the side Input: 0: Feed rate reduction not active 1: Feed rate reduction active	PLC, CN123	6 – 363
MP6370	Radial acceleration when digitizing with measuring touch probe Input: 0.001 to 3.000 [m/s] Recommended input value: 0.1	PLC, CN123 RUN	6 – 363
MP6390	Target window for contour line Input: 0.1000 to 4.0000 [mm]	PLC, CN123	6 – 363

4.3.12 Tool measurement with TT

MP	Function and Input	Software version and behavior	Page
MP6500	<p>Tool measurement with TT 130</p> <p>Format: %xxxxxxxxxxxxxx</p> <p>Input: Bit 0 – Cycles for tool measurement 0: Disabled 1: Not disabled 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 stationary spindle (bit 1=1) 1: Tool length measurement with rotating spindle, only if in the tool table a Tool offset for radius (TT: R-OFFS) is entered 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, when exceeding the breaking tolerance, is not stopped 1: When exceeding the breaking tolerance, the NC program is stopped and the error message "tool broken" is displayed Bit 6 – NC stop during "tool measurement" 0: The NC program, when exceeding the breaking tolerance, is not stopped 1: When exceeding the breaking tolerance, the NC program is stopped and the error message "touch point inaccessible" is displayed</p>	PLC	6 – 364, 6 – 365, 6 – 367, 6 – 369, 6 – 371

MP	Function and Input	Software version and behavior	Page
MP6500	<p>Tool measurement with TT 130</p> <p>Format: %xxxxxxxxxxxxxx</p> <p>Input:</p> <p>Bit 7 – Reserved</p> <p>Bit 8 – Probing routine</p> <p>0: Probe contact is probed from several directions</p> <p>1: Probe contact is probed from one direction</p> <p>Bit 9 – Automatic measurement of the probe contact basic rotation (bit 8 = 1)</p> <p>0: Basic rotation is not measured</p> <p>1: Basic rotation of the probe element is automatically measured</p> <p>Bit 10 – Probing routine (bit 8 = 1)</p> <p>0: Pre-positioning to starting point in all three principle axes</p> <p>1: Pre-positioning to starting point in the tool axis and in the axis of the probing direction (MP6505) (bit 9= 0)</p> <p>Bit 11 – "Tool checking" and changing in the tool routine</p> <p>0: After "tool checking" the tool table is changed</p> <p>1: After "tool checking" the tool table is not changed</p> <p>Bit 12 – PLC datum shift</p> <p>0: Do not include</p> <p>1: Include</p> <p>Bit 13 –</p> <p>0: Tool is measured in the tilt position in which the tool touch probe was also calibrated</p> <p>1: Tool is measured in a different tilt position</p> <p>Bit 14 – Tool measurement with number of teeth 0</p> <p>0: Tool measurement with rotating spindle</p> <p>1: Tool measurement with stationary spindle</p>	PLC	6 – 364, 6 – 365, 6 – 367, 6 – 369, 6 – 371

MP	Function and Input	Software version and behavior	Page
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 in the angle reference axis (0° axis) 3: Negative probing direction in the +90° axis Traverse range 1 Traverse range 2 Traverse range 3	PLC, CN123	6 – 366
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, CN123	6 – 369
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, CN123	6 – 369
MP6520	Probing feed rate for tool measurement with non-rotating tool Input: 1 to 3 000 [mm/min]	PLC, CN123 RUN	6 – 370
MP6530 MP6530.0 MP6530.1 MP6530.2	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] Traverse range 1 Traverse range 2 Traverse range 3	PLC, CN123	6 – 366
MP6531 MP6531.0 MP6531.1 MP6531.2	Diameter or edge length of the TT 130 probe contact for 3 traverse ranges Input: 0.001 to 99.9999 [mm] Traverse range 1 Traverse range 2 Traverse range 3	PLC	6 – 367

MP	Function and Input	Software version and behavior	Page
MP6540	Safety zone around the probe contact of the TT 130 for pre-positioning Input: 0.001 to 99 999.9999 [mm]	PLC, CN123	6 – 366
MP6540.0	Safety clearance in tool axis direction	280 474-03	
MP6540.1	Safety clearance in the plane perpendicular to the tool axis	280 474-03	
MP6550	Rapid traverse in probing cycle for TT 130 Input: 10 to 20 000 [mm/min]		6 – 366
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 the PLC	PLC, CN123 RUN	6 – 365

MP	Function and Input	Software version and behavior	Page
MP6570	Max. permissible surface cutting speed at the tooth edge Input: 1.0000 to 129.0000 [m/min]	PLC, CN123	6 – 370
MP6572	Maximum permissible speed during tool measurement Input: 1 to 1000 [rpm] 0: 1000 [rpm]	280 476-09 PLC, CN123 RUN	6 – 370
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, CN123	6 – 367
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, CN123	6 – 367
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, CN123	6 – 367
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	280 476-01 PLC, CN123	6 – 370
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	280 476-01 PLC, CN123	6 – 370

4.3.13 Tapping

MP	Function and Input	Software version and behavior	Page
MP7110.0	Minimum for feed rate override during tapping Input: 0 to 150 [%]	PLC RUN	6 – 201
MP7110.1	Maximum for feed rate override during tapping Input: 0 to 150 [%]		6 – 201
MP7120.0	Dwell time for reversal of spindle rotational direction Input: 0 to 65.535 [s]	PLC RUN	6 – 201
MP7120.1	Advanced switching time of the spindle during tapping with coded spindle-speed output Input: 0 to 65.535 [s]		6 – 202
MP7120.2	Spindle slow-down time after reaching the hole depth Input: 0 to 65.535 [s]		6 – 201
MP7130	Run-in behavior of the spindle during rigid tapping Input: 0.001 to 10 [°/min]	PLC	6 – 205
MP7150	Positioning window of the tool axis during rigid tapping Input: 0.0001 to 2 [mm]	PLC	6 – 205
MP7160	Spindle response during Cycle 17 and 18 Format: %xxx Input: Bit 0 – Oriented spindle stop with Cycle 17 0: Before execution of Cycle 17 spindle orientation 1: Before execution of Cycle 17 no spindle orientation Bit 1 – Limit spindle speed during Cycle 17 and 18 0: Spindle speed is not limited 1: Spindle speed is limited so that about 1/3 of the time the spindle runs at constant speed Bit 2 – Spindle in position feedback control during Cycle 17 and 18 0: Spindle operated without position feedback control 1: Spindle operated with position feedback control	PLC, CN123 RUN	6 – 205

4.3.14 Display and Operation

MP	Function and Input	Software version and behavior	Page
MP7210	Programming station Input: 0: Controlling and programming 1: Programming station with PLC active 2: Programming station with PLC inactive	CN123	6 – 318
MP7212	Power interrupted message Input: 0: Acknowledge message with CE key 1: Message does not appear	PLC, CN123 RUN	6 – 321
MP7220	Block number increment for ISO programs Input: 0 to 250	PLC, CN123 RUN	6 – 295
MP7224.0	Disabling soft keys for file types Format: %xxxxxxx 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, CN123 RUN	6 – 294
MP7224.1	Protecting file types Format: %xxxxxxx 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		6 – 294

MP	Function and Input	Software version and behavior	Page
MP7226.0	Size of the pallet table Input: 0 to 255 [lines]	PLC, CN123 RUN	6 – 303
MP7226.1	Size of the datum table Input: 0 to 255 [lines]		6 – 296
MP7229	Depiction of the NC program	PLC, CN123	6 – 239
MP7229.0	Line number for program testing Input: 100 to 9999	RUN	
MP7229.1	Program length to which FK blocks are allowed Input: 100 to 9999		
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, CN123 RUN	6 – 320
MP7230.0	NC conversational language		
MP7230.1	PLC conversational language (user parameters), soft keys for OEM cycles		
MP7230.2	Write PLC error messages		
MP7230.3	Help files		
MP7235	Time difference to Universal Time (Greenwich Mean Time) Input: -23 to +23 [hours] 0: Universal Time (Greenwich Mean Time) 1: Central European Time (CET) 2: Central European daylight-saving time	PLC, CN123 RUN	6 – 326

MP	Function and Input	Software version and behavior	Page
MP7237 MP7237.0 MP7237.1 MP7237.2	<p>Displaying and resetting the operating times</p> <p>Display PLC operating times</p> <p>Input: Bits 0 to 7 represent PLC operating times 1 to 8 0: Do not display 1: Display</p> <p>Resetting PLC operating times with the code number 857282</p> <p>Input: Bits 0 to 7 represent PLC operating times 1 to 8 0: Do not reset 1: Reset</p> <p>Resetting NC operating times with the code number 857282</p> <p>Input: Bit 0 – No function Bit 1 – “Machine on” operating time Bit 2 – “Program run” operating time 0: Do not reset 1: Reset</p>	PLC RUN	6 – 323
MP7238.0-7	<p>Dialog messages for PLC operating times 1 to 8</p> <p>Input: 0 to 4095 Dialog no. from the file (OEM.SYS)</p>	PLC RUN	6 – 323
MP7245	<p>Disabling auxiliary cycles</p> <p>Input: 0: Auxiliary cycles disabled 1: Auxiliary cycles permitted</p>	280 474-09 PLC RUN	6 – 280
MP7246	<p>Disabling paraxial positioning blocks</p> <p>Input: 0: Paraxial positioning block enabled 1: Paraxial positioning block disabled</p>	PLC RUN	6 – 321
MP7260	<p>Number of tools in the tool table</p> <p>Input: 0 to 30 000</p>	CN123	6 – 395
MP7261.0-3	<p>Number of pockets in the tool magazine 1 to 4</p> <p>Input: 0 to 32 767</p>	CN123	6 – 395
MP7262	<p>Maximum tool index number for indexed tools</p> <p>Input: 0 to 9</p>	280 474-03 CN123	6 – 409
MP7263	<p>Hiding/showing the POCKET TABLE soft key</p> <p>Format: %x Input: Bit 0 – 0: POCKET TABLE soft key is shown 1: POCKET TABLE soft key is hidden</p>	280 474-04 CN123	6 – 395
MP7266	<p>Elements of the tool table</p> <p>Input: 0: No display 1 to 99: position in the tool table</p>	CN123	6 – 395

MP	Function and Input	Software version and behavior	Page
MP7267	Elements of the pocket table Input: 0: No display 1 to 99: Position in the pocket table	CN123	6 – 396
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)		
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 the feed rate also before pressing an axis direction key (smallest value from MP1020 for all axes)	PLC, CN123 RUN	6 – 231
MP7280	Decimal character Input: 0: Decimal comma 1: Decimal point	PLC, CN123 RUN	6 – 320
MP7281	Depiction of the NC program Input: 0: All blocks all at once 1: Current block all at once, others line by line 2: All blocks line by line; block all at once. when editing	280 476-03 PLC RUN	6 – 239
MP7285	Tool length offset in the tool-axis position display Input: 0: Tool length is not offset 1: Tool length is offset	PLC, CN123 RUN	6 – 225
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°	280 474-09 PLC, CN123 RUN	6 – 225

MP	Function and Input	Software version and behavior	Page
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, CN123 RUN	6 – 225
MP7291 MP7291.0 MP7291.1 MP7291.2	Display of axes on the screen Format: XYZZABCUVWxyzabcuvw- Input: Characters 1 to 9 from right represent lines 1 to 9. Character 10 is the spindle S, which is always output in line 9. Display in traverse range 1 Display in traverse range 2 Display in traverse range 3	PLC RUN	6 – 5
MP7295	Disabling "datum setting" Format: %xxxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Not disabled 1: Disabled	PLC, CN123 RUN	6 – 218
MP7296	"Datum setting" through axis keys Input: 0: Datum can be set by axis keys and by soft keys 1: Datum can be set only by soft key	PLC, CN123 RUN	6 – 218
MP7300	Erasing the status display and Q parameters Input: 0: Status display, Q parameters and tool data are deleted when the program is selected. 1: Status display, Q parameters and tool data are deleted with M02, M30, END PGM, or when a program is selected. 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 or with M02, M30, or END PGM. 4: Status display and Q parameters are deleted when a program is selected. 5: Status display and Q parameters are deleted when a program is selected or with M02, M30, or END PGM. 6: Erase the status display when a program is selected, or with M02, M30, or END PGM. 7: Erase the status display when a program is selected, or with M02, M30, or END PGM.	PLC, CN123 RUN	6 – 235

MP	Function and Input	Software version and behavior	Page
MP7310	<p>Graphic display mode</p> <p>Format: %xxxx</p> <p>Input: Bit 0 – Projection in three planes: 0: German-preferred projection 1: US-preferred projection</p> <p>Bit 1 – Rotation of the coordinate system in the working plane by 90°: 0: No rotation 1: Rotation by +90°</p> <p>Bit 2 – BLK form after datum shift: 0: Shifted 1: Not shifted</p> <p>Bit 3 – Display of the cursor position: 0: No display 1: Display</p>	PLC, CN123 RUN	6 – 224
MP7315	<p>Tool radius for graphic simulation without TOOL CALL</p> <p>Input: 0.0000 to 99 999.9999 [mm]</p>	PLC, CN123 RUN	6 – 446
MP7316	<p>Penetration depth of the tool</p> <p>Input: 0.0000 to 99 999.9999 [mm]</p>	PLC, CN123 RUN	6 – 446
MP7317 MP7317.0 MP7317.1	<p>M function for graphic simulation</p> <p>Beginning of graphic simulation</p> <p>Input: 0 to 88</p> <p>Interruption of the graphic simulation</p> <p>Input: 0 to 88</p>	PLC, CN123 RUN	6 – 446
MP7330.0-15	<p>Specifying the user parameters 1 to 16</p> <p>Input: 0 to 9999.00 (no. of the user parameter)</p>	PLC RUN	6 – 317
MP7340.0-15	<p>Dialog messages for user parameters 1 to 16</p> <p>Input: 0 to 4095 (line number of the PLC dialog message file)</p>	PLC RUN	6 – 317

4.3.15 Colors

MP	Function and Input	Software version and behavior	Page
MP7350	Window frames	PLC RUN	6 – 219
MP7351	Error messages	PLC RUN	6 – 219
MP7352 MP7352.0 MP7352.1 MP7352.2	"Machine" operating mode display Background Text for operating mode Dialog	PLC RUN	6 – 219
MP7353 MP7353.0 MP7353.1 MP7353.2	"Programming" operating mode display Background Text for operating mode Dialog	PLC RUN	6 – 219
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	6 – 219
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	6 – 219
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	6 – 220
MP7357 MP7357.0 MP7357.1	"Machine" soft-key display Background Symbols	PLC RUN	6 – 220
MP7358 MP7358.0 MP7358.1	"Programming" soft-key display Background Symbols	PLC RUN	6 – 220
MP7360 MP7360.0 MP7360.1 MP7360.2 MP7360.3 MP7360.4	Graphics: 3-D view Background Top surface Front face Text display in the graphics window Lateral face	PLC RUN	6 – 220

MP	Function and Input	Software version and behavior	Page
MP7361 MP7361.0 MP7361.1 MP7361.2 MP7361.3 MP7361.4	Graphics: Projection in three planes Background Top view Front and side view Axis cross and text in the graphic display Cursor	PLC RUN	6 – 220
MP7362 MP7362.0 MP7362.1 MP7362.2 MP7362.3	Additional text display in the graphic window and pocket calculator Background of graphic window and pocket calculator Background of status display and keys of the pocket calculator Status symbols and pocket calculator symbols (c in "cos") Status values and texts of the pocket calculator (os in "cos")	PLC RUN	6 – 220
MP7363 MP7363.0 MP7363.1 MP7363.2 MP7363.3 MP7363.4	Programming graphics Background Resolved contour Subprograms and frame for zooming Alternative solutions Unresolved contour	PLC RUN	6 – 220
MP7364 MP7364.0-6 MP7364.7 MP7364.8 MP7364.9	Color of the help illustrations for cycles Colors 1 to 7 of the graphic program used Line color (color 8 of the graphic program) Color for highlighted graphic elements if defined in the help illustration Background	PLC RUN	6 – 220
MP7365 MP7365.0 MP7365.1 MP7365.2 MP7365.3 MP7365.4 MP7365.5 MP7365.6 MP7365.7	Oscilloscope Background Channel 1 Channel 2 Channel 3 Channel 4 Selected channel Grid Cursor and text	PLC RUN	6 – 220

MP	Function and Input	Software version and behavior	Page
MP7366	Pop-up window (HELP key, pop-up menus etc.)	PLC	6 – 221
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	6 – 221
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		
MP7392	Screen saver	PLC, CN123	6 – 221
	Input: 1 to 99 [min] 0: No screen saver	RUN	

4.3.16 Machining and Program Run

MP	Function and Input	Software version and behavior	Page
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, CN123 RUN	6 – 287
MP7411	Tool data in the touch probe block Format: %xx Input: Bit 0 – 0: The calibrated data of the touch probe is used. 1: The current tool data from the last TOOL CALL is used. Bit 1 – 0: Only one set of touch probe calibration data 1: More than one set of touch probe calibration data are managed in the tool table.	280 476-01 PLC, CN123 RUN	6 – 344
MP7420	Cycles for milling pockets with combined contours Format: %xxxxx Input: Bit 0 – Milling direction for channel milling: 0: Channel milling of the contours for pockets counterclockwise, clockwise for islands 1: Channel milling of the contours for pockets clockwise, 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 only if the programmed contours intersect Bit 3 – Rough-out and channel milling to pocket depth or for every infeed 0: Rough-out and channel milling uninterrupted to pocket depth 1: For each process: first channel milling, then rough-out depending on bit 1 Bit 4 – Position after completion of the cycle: 0: Tool moves to the same position as before the cycle was called 1: Tool moves only in the tool axis to the clearance height	PLC, CN123 RUN	6 – 287
MP7430	Overlap factor for pocket milling Input: 0.1 to 1.414	PLC, CN123 RUN	6 – 285

MP	Function and Input	Software version and behavior	Page
MP7431	Arc end-point tolerance Input: 0.0001 to 0.016 [mm]	PLC, CN123 RUN	6 – 320
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 acknowledgement of the M function 1: No program stop. Acknowledgement is not waited for. Bit 3 – Switching of k_v factors with M105/M106 0: Function is not in effect 1: Function is in effect Bit 4 – Reduced feed rate in the tool axis with M103 0: Function is not in effect 1: Function is in effect 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 started	PLC, CN123 RUN	6 – 45, 6 – 118, 6 – 120, 6 – 280, 6 – 447
MP7441	Calling a fixed cycle without M3 or M4 Format: %x Input: Bit 0 – 0: Error message "Spindle ?" is not suppressed. 1: Error message "Spindle ?" is suppressed.	280 474-04 PLC, CN123 RUN	6 – 280
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: Spindle orientation by the NC	280 476-09 PLC, CN123 RUN	6 – 195

MP	Function and Input	Software version and behavior	Page
MP7450	Offsetting the tool change position from MP951.x in block scan Format: %xxxxxxxx Input: Bits 0 to 8 correspond to axes 1 to 9 0: Do not offset 1: Offset	PLC RUN	6 – 289
MP7451.0-8	Feed rate for returning to the contour for axes 1 to 9 Input: 10 to 300 000 [mm/min]	PLC	6 – 289
MP7460	Angle for constant contour speed at corners Input: 0.0001 to 179.9999 [°]	PLC, CN123 RUN	6 – 150
MP7470	Maximum contouring tool feed rate at 100% override Input: 0 to 300 000 [mm/min] 0: No limitation	PLC, CN123 RUN	–
MP7471	Maximum velocity of the principle axes during compensating movements through M128 Input: 0 to 300 000 [mm/min]	280 472-05 PLC, CN123 RUN	6 – 82
MP7475	Reference for datum table Input: 0: Reference is workpiece datum 1: Reference is machine datum (MP960.x)	PLC, CN123 RUN	6 – 296

MP	Function and Input	Software version and behavior	Page
MP7500	<p>Tilting working plane</p> <p>Format: %xxxxxxxxx</p> <p>Input: Bit 0 – “Tilted working plane”</p> <p>0: Off</p> <p>1: On</p> <p>Bit 1 –</p> <p>0: Angles correspond to the position of the tilting axes of the head/table.</p> <p>1: Angles correspond to the spatial angle (the TNC calculates the position of the tilting axes of the head/table).</p> <p>Bit 2 –</p> <p>0: With Cycle 19 the tilting axes are not positioned.</p> <p>1: With Cycle 19 the tilting axes are positioned.</p> <p>Bit 3 –</p> <p>0: The active tilting-axis position, with respect to the machine datum, is included.</p> <p>1: The first axis assumes a 0° position.</p> <p>Bit 4 –</p> <p>0: The mechanical offset when changing the spindle head when calling M128, M114 or “tilted working plane” is compensated for.</p> <p>1: Mechanical offset during PLC datum shift is compensated for.</p>	PLC	6 – 79

MP	Function and Input	Software version and behavior	Page
MP7500	<p>Tilting working plane</p> <p>Format: %xxxxxxx</p> <p>Bit 5 – 0: The active tilting-axis position, with respect to the machine datum, is included. 1: The tilting-axis position, which is entered with the 3D ROT soft key, is used.</p> <p>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.</p> <p>Bit 7 – 0: The active tilting-axis position, with respect to the machine datum, is included. 1: The active tilting-axis position, in case a) Manual tilting is active, is derived from the tilting angles in the 3D ROT window; b) Manual tilting is inactive, is derived from the reference coordinates.</p> <p>Bit 8 – 0: The active tilting-axis position, depending on bits 3, 5 and 7, is included. 1: In case manual tilting is active, the datum to be set for the principle axes X, Y and Z is recalculated to the home position of the tilting element.</p>	PLC	6 – 79
MP7502	<p>Functionality of M144/M145</p> <p>Input: %xxx</p> <p>Bit 0 0: M144/M145 not active 1: M144/M145 active</p> <p>Bit 1 – M144/M145 in the automatic operating modes 0: M144/M145 active 1: M144 is activated automatically at the start of an NC program. Deactivation only with M145 during an NC program.</p> <p>Bit 2 – M144/M145 in the manual operating modes 0: M144/M145 not active 1: M144/M145 active</p>	280 476-09 PLC RUN	6 – 83

MP	Function and Input	Software version and behavior	Page
MP7510	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	PLC RUN	6 – 80
MP7510.0-14	Transformation 1 to transformation 15		
MP7520	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, relative to the machine datum for the tilting table	PLC RUN	6 – 80
MP7520.0-14	Transformation 1 to transformation 15		
MP7530	Type of dimension for transformation Input: -99 999.9999 to +99 999.9999 0: Free tilting axis	PLC RUN	6 – 80
MP7530.0-14	Transformation 1 to transformation 15		
MP7550	Home position of the tilting element Input: -99 999.9999 to +99 999.9999	280 474-01 PLC	6 – 80
MP7550.0	A Axis	RUN	
MP7550.1	B Axis		
MP7550.2	C Axis		

4.3.17 Hardware

MP	Function and Input	Software version and behavior	Page
MP7600.0	Position controller cycle time = $MP7600.0 \cdot 0.6 \text{ ms}$ Input: 1 to 20 (Proposed input value: 7)	280 474-07	6 – 116
MP7600.1	PLC cycle time = position controller cycle time · MP7600.1 Input: 1 to 20 Proposed input value: 7 (= 21 ms)		6 – 116, 7 – 3
MP7620	Feed rate override and spindle speed override Format: %xxxxxxx Input: Bit 0 – Feed rate override if rapid traverse key in the Program Run mode is pressed 0: Override not effective 1: Override effective Bit 1 – Non-functional Bit 2 – Feed rate override if rapid traverse key and machine direction button in Manual operating mode are pressed 0: Override not effective 1: Override effective Bit 3 – Feed rate override and spindle speed override in 1% steps or along a nonlinear 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	6 – 114, 6 – 185, 6 – 231
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	6 – 375
MP7641	Entry of the interpolation factor Input: 0: Through TNC keyboard 1: Through PLC Module 9036	PLC RUN	6 – 375

MP	Function and Input	Software version and behavior	Page
MP7645	Initializing parameter for handwheel	PLC	6 – 379
MP7645.0	Layout of the handwheel keypad for HR 410 Input: 0: Evaluation of the keys by the NC, including LEDs 1: Evaluation of the keys by PLC	RUN	
MP7645.0	Assignment of a third handwheel via axis selector switch S2, or 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 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 3rd 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		

MP	Function and Input	Software version and behavior	Page
MP7650	Counting direction for handwheel Format: %xxxxxxxxx Input: 0: Negative counting direction 1: Positive counting direction	as of 280 474-07 bit-coded PLC RUN	6 – 375
MP7660	Threshold sensitivity for electronic handwheel Input: 0 to 65 535 [increments]	PLC RUN	6 – 375
MP7670	Interpolation factor for handwheel Input: 0 to 10	PLC RUN	6 – 375, 6 – 378
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)		
MP7671	Handwheel feed rate in the "handwheel" operating mode with HR 410 Input: 0 to 1000 [% of MP1020]	PLC RUN	6 – 378
MP7671.0	Low speed		
MP7671.1	Medium speed (only HR 410)		
MP7671.2	High speed (only HR 410)		

MP	Function and Input	Software version and behavior	Page
MP7680	<p>Machine parameter with multiple function</p> <p>Format: %xxxxxxxxxxxxx</p> <p>Input:</p> <ul style="list-style-type: none"> 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	6 – 148, 6 – 150, 6 – 287, 6 – 289, 6 – 338, 6 – 408

MP	Function and Input	Software version and behavior	Page
MP7680	<p>Machine parameter with multiple function</p> <p>Format: %xxxxxxxxxxxxx</p> <p>Bit 8 – Insertion of rounding arc or cubic spline</p> <p>0: Rounding arc is inserted.</p> <p>1: Instead of the rounding arc a cubic spline is inserted</p> <p>Bit 9 – Constant jerk on spline (bit 8 = 1)</p> <p>0: No constant jerk</p> <p>1: Constant jerk</p> <p>Bit 10 – Cutter-radius-compensated outside corners</p> <p>0: Insertion of a circular arc</p> <p>1: Insertion of a spline curve</p> <p>Bit 11 – Reserved</p> <p>Bit 12 – Behavior of Cycle 28</p> <p>0: Standard behavior</p> <p>1: The slot wall is tangentially approached and departed; at the beginning and end of the slot a rounding arc with a diameter equal to the slot is inserted.</p>	<p>PLC</p> <p>RUN</p>	<p>6 – 148,</p> <p>6 – 150,</p> <p>6 – 287,</p> <p>6 – 289,</p> <p>6 – 338,</p> <p>6 – 408</p>
MP7681	<p>M/S/T/Q transfer to the PLC during block scan</p> <p>Format: %xxxx</p> <p>Input:</p> <p>Bit 0 –</p> <p>0: During block scan, transfer M functions to the PLC.</p> <p>1: Collect M functions, and after the block scan, transfer them to the PLC.</p> <p>Bit 1 –</p> <p>0: Transfer T code to the PLC during block scan.</p> <p>1: Transfer last T code to the PLC after block scan.</p> <p>Bit 2 –</p> <p>0: During block scan, transfer S or G code to the PLC.</p> <p>1: After block scan, transfer S or G code to the PLC.</p> <p>Bit 3 –</p> <p>0: During block scan, transfer FN19 outputs to the PLC.</p> <p>1: After block scan, transfer last FN19 outputs to the PLC.</p>	<p>PLC</p>	<p>6 – 291</p>

MP	Function and Input	Software version and behavior	Page
MP7682	<p>Machine parameters with multiple function</p> <p>Format: %xxx</p> <p>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</p>	PLC RUN	6 – 80, 6 – 225, 6 – 226
MP7683	<p>Pallet tables, executing</p> <p>Format: %xxxxx</p> <p>Input: Bit 0 – Operating mode PROGRAM RUN, SINGLE BLOCK 0: During the start, a line of the NC program is run. The pallet change macro is executed completely. 1: During the start, a complete NC program is run. Bit 1 – Operating mode PROGRAM RUN, FULL SEQUENCE 0: During the start, a complete NC program is run. 1: At the start all NC programs are executed up to the next pallet. Bit 2 – PROGRAM RUN, FULL SEQUENCE operating 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 pallet table is reached, the process begins again with the first line. 0: Function is not in effect 1: Function is in effect (bit 2 = 1) Bit 4 – Editing the active pallet table 0: Active pallet table cannot be edited. 1: In the operating modes PROGRAM RUN, FULL SEQUENCE and PROGRAM RUN, SINGLE BLOCK, the active 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 alone</p>	PLC RUN	6 – 241, 6 – 300

MP	Function and Input	Software version and behavior	Page
MP7690	<p>MEMORY TEST during switch-on</p> <p>Format: %xxx</p> <p>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</p>		6 – 320

4.3.18 Second Spindle

MP	Function and Input	Software version and behavior	Page
MP13010 to MP13520	<p>Machine parameter block for the second spindle</p> <p>Input: Function and input range are identical with MP3010 to MP3520.</p>	280 474-03	6 – 210