For touch probes

Workpiece measurement

Installation instructions

Article number	260605
Version	V4A
Machine control	Brother

Translation of the original German document.

The language version of the manufacturer (DE) is relevant for the technical content.

Subject to technical change without notice.

Table of Contents

1. Introduction

Please read and observe these instructions and the other applicable documents!

1.1 Legend – Warnings, marks, symbols

⚠ CAUTION!

This information indicates a dangerous situation that, if not avoided, may result in mild to medium injury.

▶ ... and shows you how you can avoid it.

NOTICE

This information warns about an immediate threat of property damage.

▶ ... and shows you how you can avoid it.

✓ The check mark indicates the required preconditions.

▷ The white triangle prompts you to carry out an action.

⇨ The arrow indicates the consequences of your action.

(1) ... The number in brackets refers to a respective item in an illustration.

ⓘ Here you will find additional instructions and tips.

*; x This character in a file name or similar acts as a place holder for the version level, numbering, etc.

GN LED is lit.

GN LED flashes.

off LED switched off.

GN green RD red YE yellow BU blue VT violet WH white

TQ turquoise red-green-blue alternating

1.2 Abbreviations and technical terms

NC	Numerical control.	(Numerical Control)
PLC	Programmable logic controller.	(Programmable Logic Control)
N/A	Abbreviation in table – stands for *not available, not applicable, not relevant, not occupied, reserved ...*	(Not Available ...)

2. Safety

2.1 Intended use

The BLUM *Quickstart* software is exclusively developed and intended:

- for installation on the intended machine control.
- for measurement tasks on the workpiece.
- for use with one or more multidirectional BLUM probes for workpiece measurement.
- For use in combination with suitable BLUM technology cycles.
- for installation by trained specialists with comprehensive knowledge of sensitive areas (NC PLC, ...) of the corresponding machine control or by trained BLUM service employees.
- for programming by trained specialists with comprehensive knowledge of NC programming of the corresponding machine control system or by trained BLUM service employees.
- for operation by trained specialist personnel.

2.2 Further applicable documents

- Measuring system data sheets (for any measuring devices, receivers, interfaces, extension modules and accessory products involved).
- Measuring system operating instructions (as appropriate: measuring devices involved).
- Measuring system installation instructions (as appropriate: receivers, interfaces, extension modules involved).
- Wiring diagrams *Wiring*.
- Installation instructions *SETUP* (as appropriate: software, technology cycles involved).
- Programming instructions *APPL* (as appropriate: software, technology cycles involved).
- Operating instructions *APPL* (as appropriate: software involved).
- Documentation from the component manufacturer (any hardware involved – industrial PC, etc.).
- Documentation of the machine manufacturer.
- Documentation of the control manufacturer.

2.3 General safety instructions

NOTICE

Property damage caused by malfunction due to faulty data.

- Operate BLUM measuring systems exclusively with BLUM software.
- Only install BLUM software that has been programmed to match the machine control.
- Always limit the measurement set overtravel in the BLUM software.
- Only change the machine settings after consulting with the machine manufacturer or the customer.

NOTICE

Property damage caused by errors in the machine control due to faulty adaptations.

- BLUM software must be installed exclusively by trained specialists with comprehensive knowledge of the sensitive areas (NC, PLC,...) of the corresponding machine control system or by trained BLUM service employees.

NOTICE

Property damage caused by a collision due to faulty calculations.

- Always enter values within the BLUM parameter table in metric units (*mm*, *mm/min* …) – regardless of the machine control setting.
- Always enter values outside the BLUM parameter table (transfer parameters, tool table, ...) in metric units (*mm*, *mm/min* …) **or** in imperial units (in, in/min, ...) – as per the machine control setting.
- If necessary, turn the machine off and on again after changing the measurement unit.
- Always calibrate or adjust the measuring system after changing the measurement unit.

NOTICE

Property damage caused by collision due to faulty data.

- Always adapt programs and parameters of the BLUM software correctly to the machine (kinematics, deceleration ramp, etc.), measuring device (measuring set overtravel, etc.) and machine control.

NOTICE

Property damage due to measuring errors.

- Ensure that the machine is always at operating temperature during calibration and measurement.
- Always clamp the measuring object securely.
- Always calibrate and measure using the same constant feed rate.

NOTICE

Measuring error due to missing or incorrect calibration.

- Always calibrate before measuring.
- Ensure that the machine is always at operating temperature during calibration and measurement.
- Ensure that the determined calibration temperature is not overwritten under any circumstances.
- Always calibrate and measure using the same constant feed rate.

3. Software structure

The *Quickstart* software is the central basic software for TC measuring systems with a suitable multi-directional probe. The standard measuring cycles are included.

3.1 Program overview

Program	Description
8700	MAIN Main program
8701	TOUCH XYZ Touching of single points and corners
8702	XY CONTOUR Touching of contours
8703	PROTECTED MOVE Protected travel block
8704	MEASURE Measuring block
8705	SET WCS Set zero point
8706	SET TOOL Tool correction
8707	TOLERANCE Tolerance control
8708	PROBE ONOFF STATUS Switch the probe on/off (level-controlled)
8709	CALIB-MEAS SPHERE Calibration on sphere
8710	USER GLOBAL Input of user data
8711	3-POINTS CONTOUR Probing of contours with 3 points
8712	CORNER MAIN Calculation of a corner/contour location
8713	CORNER MOVE Position calculation CORNER MAIN program
8714	CORNER CALCULATION Result calculation CORNER MAIN program
8715	ANGLE-DISTANCE Calculation of angles or distances
8716	DPRNT Data output via command DPRNT
8717	TC-USER 1 Settings for the 1st probe
8718	TC-USER 2 Optional: Settings for a 2nd probe
8719	TC-USER 3 Optional: Settings for a 3rd probe

4. Installation requirements

- Functioning and appropriate multi-directional BLUM measuring system (TC50, TC52, TC60, TC62, etc.).
- Machine control: Brother C00, D00
- 18 free program names, 20 free program names when both optional programs, 8718 TC-USER 2 and 8719 TC-USER 3, are used.
- 45 kB free NC memory.
- #1…#33, #110…#149 freely available.
- 10 global, consecutive variables for outputting results (standard: #100…#109).
  6 permanent, consecutive variables for saving the calibration values (standard: #500…#999).
- 3 call levels.
- 1 freely available measuring input.
- 2 PLC inputs for error monitoring (ERROR, BATTERY).
- The *Skip* function must be available.
- The *G65 – simple user macro call* function must be available.

ⓘ The function *Measurement with inclined working plane* (G68.2) is not available.

5. Installation

5.1 Installing software

NOTICE

Measuring errors due to concentricity errors caused by missing spindle indexing.

▶ For a correct 3-axis measurement, set the concentricity at the probe (concentricity error < 0.005 mm).

NOTICE

Property damage due to collision caused by incorrectly entered tool length.

▶ Always enter the tool length correctly.

NOTICE

Property damage from collision due to lacking or incorrectly executed function test.

▶ Always perform a function test before completing the commissioning.

▶ Always perform the function test in a single set.

▶ Always perform the function test at a reduced feed rate.

ⓘ The measuring cycles are examples for the solution of measuring tasks. They must be adapted by the machine manufacturer and user to the respective machine type.

✓ The mechanical installation is completed.

✓ The electrical installation via an interface is completed.

✓ G65 – simple user macro call is set.

✓ The skip function is installed.

▷ Check/adapt the stop read-ahead – see *5.2 Checking/adapting the stop read-ahead*.

▷ Transfer the software to the machine control – see *5.3 Transferring software to the machine control*.

▷ Adapt the USER GLOBAL program – see *5.4 Adapting the USER GLOBAL program*.

▷ Adjust the wording of the error texts if necessary – see *5.5 Adapting the language of the error texts*.

▷ Adapt the TC-USER 1 program – see *5.6 Adapting the TC-USER 1 program*.

▷ Test the measuring cycles.

▷ Adapt the data output if necessary – see *5.7 Adapting the data output*.

⇨ The software is installed.

5.2 Checking/adapting the stop read-ahead

The M159 command (stand-alone, without further NC commands) is stored as a stop read-ahead in all programs. Before the programs are transferred to the control, it must be checked whether the stop read-ahead used is valid.

If the stop read-ahead is invalid, the M159 commands must be replaced in all programs by the stop read-ahead specified by the machine manufacturer.

5.3 Transferring software to the machine control

▷ Transfer the software to the machine control.

▷ Check whether the data are located on the machine control.

⇨ The software has been transferred to the machine control.

5.4 Adapting the USER GLOBAL program

The measuring cycles are in modular design. The program 8710 is divided into multiple sequences:

Sequence	Description
N100	**SPINDELINDEXING 180 DEGREE**
N200	**BASIC SPINDLEORIENTATION**
N300	**GENERAL SETTINGS**
N400	**G-CODE PREDEFINITIONS**
N1200	**ERRORMESSAGES USERDEFINED**

The sequences N100…N400 must be supplemented and adapted to the machine.

5.4.1 Adjusting the spindle indexing

In program 8710, the correct spindle indexing must be entered from line N100 and line N200.

Spindle indexing 180° – automatic

From line N100, the command input for the spindle indexing is saved with the calibration (option bit #128 BIT2 (4) = 1).
The entry is made between the text marks **(1 --->)** and **(1 <---)**. If necessary, adapt the corresponding indexing commands here:

```
(************************)
N100
IF[[[#128AND4]/4]NE0.]GOTO120
(1--->)
(SPO 180)
 M19R[180](SPINDLEINDEXING 180 DEGREE)
(1<---)
GOTO120
N110#3006=115(TURN SPINDLE BY 180 DEG.)
N120M[99]
(************************)
```

Spindle indexing 180° – manual

If the spindle cannot be indexed automatically, the rotation by 180° must be made by hand:

▷ Set option bit #128 BIT2 (4) = 0 (no spindle indexing).
⇨ The machine stops with a message.
▷ Turn the probe manually by 180°.
▷ Press the *NC Start* button.
⇨ Spindle indexing has been performed.

If this is not possible, e.g. because the local parameters are deleted after command M0, the probe must be mechanically adjusted so that it has no run-out (run-out error < 0.001 mm).

Basic spindle indexing 0°

The command input for basic spindle indexing (basic indexing or 0°) is saved from line N200.
The entry is made between the text marks **(2 --->)** and **(2 <---)**:

```
(************************)
N200
(2--->)
(SPO 0)
 M19      (BASIC SPINDLEORIENTATION)
(2<---)
(************************)
```

5.4.2 Adjusting the machine-specific settings

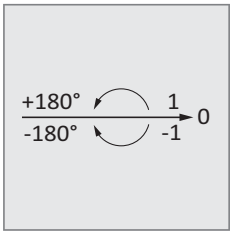
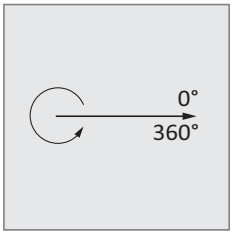
In program 8710, the machine-specific definitions are entered from line N300. The following macro variables must be tested and, if necessary, adapted in this order.

Variable	Description
#2	**Country code language tags** The error texts are displayed, depending on #2: 0 English 1 German 2 French 99 User-defined Texts for the error messages can be adapted. Default value: 1
#111	**Basic address results** Start address of 10 consecutive result parameters. ⓘ Using the setting parameters #110 to #149 is not allowed. Default value: 100 Example: 100 (the measuring results are stored in #100…#109)
#117	**ERROR input signal** If the measuring input signal level falls off, the control issues a trigger signal. The control cannot distinguish between a valid trigger point or an error condition, e.g. a transmission error. To increase the measurement reliability, the validity of a trigger point must be checked. The ERROR signal must be checked for this purpose. #1001 ⓘ The receiver signals must be connected to the control and linked to the PLC with the corresponding parameters . 1010 ERROR signal on IN1010 (falling signal flank) 0 No ERROR-signal available -1010 ERROR signal on IN1010 (rising signal flank) Default value: 0
#118	**$\overline{\text{STATUS}}$ input signal** It is checked whether the probe has already been deflected before a measurement. ⓘ The receiver signals must be connected to the control and linked to the PLC with the corresponding parameters . 1011 $\overline{\text{STATUS}}$ signal on IN1011 (falling signal flank) 0 No $\overline{\text{STATUS}}$ signal available -1011 $\overline{\text{STATUS}}$ signal on IN1011 (rising signal flank) Default value: 0
#119	**BATTERY input signal** If the BATTERY signal is applied, the input can be entered in #119. ⓘ The receiver signals must be connected to the control and linked to the PLC with the corresponding parameters . 1012 ERROR signal on IN1012 (falling signal flank) 0 No BATTERY signal available -1012 ERROR signal on IN1012 (rising signal flank) Default value: 0

Variable	Description		
#128	**Option bit 1 (basic adjustments measurement)** Some data relevant to the software are stored in bits. Enter and add desirable options.		
	Example:		2+4+32 or 38 (BIT1, BIT2, BIT5 set)
	BIT0	0	Feed override is enabled. When measuring, the speed of the feed can be controlled with the override.
		1	Feed override is disabled. When measuring, the speed of the feed cannot be controlled.
	BIT1	0	The traverse movements in program 8703 (PROTECTED MOVE) are protected. ⓘ The program 8703 (PROTECTED MOVE) is used from program 8700 (MAIN) for prepositioning and can also be called directly by the user. ⓘ In the program 8717 (TC-USER), the feed for the protective traverse movement in #9 can be defined.
		2	*NOTICE* Property damage due to collision caused by failure to delete remaining distance when the stylus is deflected. ▶ Always ensure that the traverse path is free. The traverse movements in program 8703 (PROTECTED MOVE) are carried out with G0.
	BIT2	0	The machine has spindle indexing.
		4	The machine has no spindle indexing.
	BIT3	0	The data output via DPRNT takes place without a comment. The data are not formatted.
		8	The data output via DPRNT takes place with a comment. The results are assigned.
	BIT4	0	N/A
		16	N/A
	BIT5	0	Format for calculating ATAN: ATAN [#i / #j]
		32	Format for calculating ATAN: ATAN [#i]/ [#j]
	BIT6	0	Data for determining the angle or distance is written in the background.
		64	The *Distance/angle* function is not used → time savings.

Variable	Description		
	BIT7	0	When calling 8700 (MAIN) or 8703 (PROTECTED MOVE), 8710 (USERPARATAB) is executed.

		128	*NOTICE* Property damage from collision due to incorrect application of the *Switching on the probe* function (parameter M1.).
			▶ Only use the function for consecutive quickstart calls.
			▶ Ensure that there are no G-code calls between the quickstart calls.
			When calling 8700 (MAIN) or 8703 (PROTECTED MOVE), 8710 (USERPARATAB) is only executed if *M1.* (switch on probe) is transferred.
			OK:
			`G65P8703 X… Y… Z… M1.`
			`G65P8703 X… Y… Z… M3.`
			`G65P8700 S… M3.`
			`G65P8703 X… Y… Z… M3.`
			`G65P8700 Z… M2.`
			NOK:
			`G65P8700 Z… M1.`
			`G65P8703 X… Y… Z… M3.`
			`G0G90 X… Y… Z…`
			`G65P8700 X… M2.`

	BIT8	0	Retraction of probe to start position. If an error occurs during measurement, the probe is retracted to the start position of the active measuring block.
		256	Retraction of probe to block position. If an error occurs during measurement, the probe is retracted to the start position of the active measuring block or of the protected move.
	BIT9	0	The results of the angle calculation are shown from -180° < 0° < 180°. 
		512	The results of the angle calculation will be shown from 0° ...359°. 
	BIT10	0	The probe is not oriented during measurement (default).
		1024	The probe is oriented in the measuring direction during measurement (mono-directional). ⓘ Alignment towards measuring direction is necessary. ⓘ Prerequisite: #128 BIT 2 = 0 (machine has spindle orientation)

Variable	Description
#3	**Axis configuration/axis number XYZ** The control-internal parameters from which the current position of the WCS can be read out are defined. The 3 decimal places correspond to the axes X, Y, Z: X-axis: Hundreds digit Y-axis: Tens digit Z-axis: Unit digit Default value: 123 Example: 123 The current position of the WCS in X is read from #504**1**. The current position of the WCS in Y is read from #504**2**. The current position of the WCS in Z is read from #504**3**. The current position of the WCS in A is read from #504**4**. The current position of the WCS in B is read from #504**5**. The current position of the WCS in C is read from #504**6**.
#4	**Axis number A-axis** In case of a clockwise direction of rotation (DIN), the axis number is entered with a positive sign; in case of an anticlockwise direction of rotation, a negative sign is entered. Default value: 0 Example: 4 (clockwise direction of rotation) -4 (anticlockwise direction of rotation)
#5	**Axis number B-axis** In case of a clockwise direction of rotation (DIN), the axis number is entered with a positive sign; in case of an anticlockwise direction of rotation, a negative sign is entered. Default value: 0 Example: 5 (clockwise direction of rotation) -5 (anticlockwise direction of rotation)
#6	**Axis number C-axis** In case of a clockwise direction of rotation (DIN), the axis number is entered with a positive sign; in case of an anticlockwise direction of rotation, a negative sign is entered. Default value: 0 Example: 6 (clockwise direction of rotation) -6 (anticlockwise direction of rotation)
#7	**Main rotation axis for angle correction function** Selection of the main rotation axis that is to be corrected when using angle measurement. This axis is corrected in case of an angle measurement with transfer parameter *D*. 1 A-axis 2 B-axis 3 C-axis Default value: 0

5.4.3 Adapting the G-code definitions

In program 8710, the G-code definitions are entered from line N400:

G-code	Description
G90	Absolute movements
G80	Bore cycles off
G40	Tool length and tool radius correction off

Example

```
N400(****G-CODE PREDEFINITIONS****)
G04
G90G80G40
N410(****)
```

Tab. 5-1 Adapting the G-code definitions

5.5 Adapting the language of the error texts

In case of an error, the probe is switched off and an error text is output. The output language can be selected:

▷ In program 8710 in #2, select the language.

⇨ The output language has been selected.

ⓘ If an invalid value is entered, the error message is output in English.

The texts can be individually modified and additional functions can be inserted as required from line 2100. If the error messages need to be displayed in any other language, the error messages can be translated and adjusted in the user area.

▷ In program 8710 in #2, set value 99 (user-defined).

▷ Adapt the error texts from line N2100.

⇨ Error texts have been adapted.

```
…
N1100(****************ERRORMESSAGE ENGLISH**********************)
N1101#3000=101(INVALID_CALL_PARAMETERS)
N1102#3000=102(OUT_OF_TOLERANCE)
N1103#3000=103(UNEXPECTED_OBSTACLE)
…
N1200(****************ERRORMESSAGE DEUTSCH**********************)
N1201#3000=101(UNGUELTIGE_AUFRUFPARAMETER)
N1202#3000=102(TOLERANZ_UEBERSCHRITTEN)
N1203#3000=103(UNERWARTETES_HINDERNIS)
…
N1300(****************ERRORMESSAGE FRENCH***********************)
N1301#3000=101(PARAMETRES_NON_VALIDES)
N1302#3000=102(HORS_TOLERANCE)
N1303#3000=103(OBSTACLE_INATTENDU)
…
N2100(****************ERRORMESSAGES USERDEFINED*****************)
N2101#3000=101(UD:_INVALID_CALL_PARAMETERS)      Invalid call parameter.
N2102#3000=102(UD:_OUT_OF_TOLERANCE)             Tolerance exceeded.
N2103#3000=103(UD:_UNEXPECTED_OBSTACLE)          Unexpected obstacle.
N2104#3000=104(UD:_MEASURING_WITHOUT_TRIGGER)    Measuring block without trigger.
N2105#3000=105(UD:_ERROR_TOOL_COMPENSATION)      Tool correction error.
N2106#3000=106(UD:_ERROR_MEAS.STROKE/PRT.MOVE)   Error in measuring block/Protected Move.
N2107#3000=107(UD:_INVALID_MEASURING_POSITION)   Wrong measuring position.
N2108#3006=1(UD:108_BATTERY_WEAK)                Battery low.
#121=0
M[99]
N2109#3000=109(UD:_WRONG_PROBE_LENGTH)           Wrong probe length.
N2110#3000=110(UD:_ERROR_ON_SWITCH-ON)           Error when switching on or off.
N2111#3000=111(UD:_WRONG_TOOL)                   Wrong tool.
N2112#3000=112(UD:_NO_CALIBRATIONVALUE_IN_Z)     No calibration values in Z.
N2113#3000=113(UD:_ERROR_PROG._USERPARATAB)      USERPARATAB program error.
N2115#3006=1(UD:115_TURN_SPINDLE_180_DEGREE)     Turn spindle by 180°.
IF[#121NE0]GOTO2116
#3006=1(PARAMETERSETTING)                        Parameter settings.
N2116#121=0
M[99]
N9999
…
```

5.6 Adapting the TC-USER 1 program

ⓘ If multiple probes are to be used, this program can be copied and saved with the program numbers 8718 and 8719. The desired probe is selected using the transfer parameter *B*.

The measuring cycles are in modular design. The program 8717 is divided into multiple sequences:

Sequence	Description
N10	**TC OFF**
N20	**USER END**
N30	**USER START**
N40	**TC ON**
N50	**USER SETTINGS TC**

The sequences must be supplemented and adapted to the machine.

5.6.1 Adapting the *Switching off the probe* sequence

The command input for switching off the probe is saved from line N10.

The entry is made between the text marks **(1 --->)** and **(1 <---)**.

All machine-readable functions such as macro variables, M-codes and other functions can be used for switching off.

```
N10(*** TC OFF ***)
(1--->)
(TC 1 OFF)
 #1110=0                                   Reset output TC-ON.
 M159                                      Stop read-ahead.
(1<---)
N20(*** USER END ***)
```

5.6.2 Adapting the user end sequence

The command input for the NC commands used to restore processing settings is stored as of line N20.

The entry is made between the text marks **(2 --->)** and **(2 <---)**.

```
N20(*** USER END ***)
(2--->)
 Entry of optional functions.
(2<---)
M[99]
```

5.6.3 Adapting the user end sequence

The command input for NC commands to measure is saved from line N30.

The entry is made between the text marks **(3 --->)** and **(3 <---)**.

```
N30(*** USER START ***)
(3--->)
 Entry of optional functions.
(3<---)
N40(*** TC ON ***)
```

5.6.4 Adapting the *Switching on the probe* sequence

The command input for switching on the probe is saved from line N40.

The entry is made between the text marks **(4 --->)** and **(4 <---)**.

All machine-readable functions such as macro variables, M-codes and other functions can be used for switching on.

```
N40(*** TC ON ***)
(4--->)
(TC 1 ON)
 #1110=1                                    Set output TC-ON.
 M159                                       Stop read-ahead.
(4<---)
(*********************************)
```

5.6.5 Testing the probe status

NOTICE

Property damage due to collision caused by a traverse movement that was not monitored.

▶ Connect interface to $\overline{\text{STATUS}}$.

To ensure that the probe is switched on, the status of the ERROR signal is checked in the program 8710 in #117.

In no address is stored for the ERROR signal, a micro move is executed automatically. For this purpose, the probe is moved with a measuring block by 0.015 mm. If the probe is switched on, it reaches the programmed target position.

5.6.6 Setting up the impulse control for switching the probe on and off

ⓘ Only enter the addresses for the output signals MODE TC (#20) and START TC (#21) for the impulse control of the probe only when using the impulse control.

ⓘ If only one output is available for impulse control, #20 and #21 must be identical.

The probe can be switched on and off by the BLUM software by means of impulse control. In the program 8717 (8718, 8719), the start addresses for the outputs of the signals MODE TC and START must be entered in #20 and #21. The sequences TC-OFF and TC-ON remain empty in this case – see *5.6.1 Adapting the Switching off the probe sequence* and *5.6.4 Adapting the Switching on the probe sequence*.

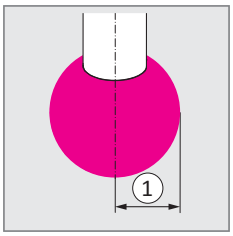
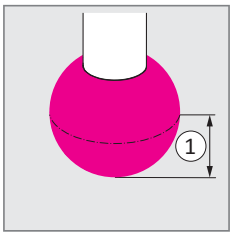
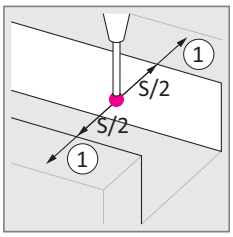
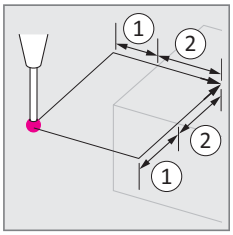
The impulse control can also be triggered by M functions. In this case, the M functions are entered in the sequences TC-OFF and TC-ON, and the macro variables remain unoccupied:

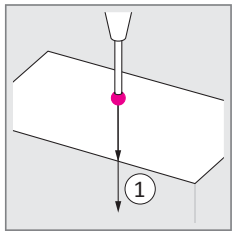
```
N10(*** TC OFF ***)
(1--->)
(TC 1 OFF)
                                            No entry.
 M159                                       Stop read-ahead.
(1<---)
N20(*** USER END ***)
```

```
N40(*** TC ON ***)
(4--->)
(TC 1 ON)
                                            No entry.
 M159                                       Stop read-ahead.
(4<---)
(*********************************)
```

5.6.7 Adjusting the probe-specific definitions

In subroutine 8717, the probe-specific definitions are entered from line N50. The following macro variables must be tested and, if necessary, adapted in this order.

Variable	Description
#1	**Tool correction number (H number or T number) of the probe** Normally, the tool correction number (H number) corresponds to the magazine slot of the probe. If the active tool correction number is to be used, #4111 can be used for the active H number or #4120 for the active T number. *NOTICE* Property damage caused by collision due to the faulty activation of a tool. ▶ Activate the correct tool. Example: #4111 Active H number 20 TC with active H number 20
#2	**Basic address permanent parameters (calibration values)** Start address for 6 free, consecutive calibration parameters. ⓘ The value from #2 is copied to #110. #2 is an intermediate memory. ⓘ The calibration parameters must not be deleted when the machine is switched off. ⓘ Parameters #100...# 199 are not permitted to be used. Default value: 500 ← 730 Example: 500 (calibration values are stored in #500...#505)
#3	**Probe ball radius XY** The probe ball radius XY (1) is entered in #3. ⓘ If the probe ball radius is entered with #3 = 0, the radius is read from the tool table and copied in #3 and #4 (Z). For this function, only a ball is permitted as a stylus. 
#4	**Probe ball radius Z** The probe ball radius Z (1) is entered in #4. ⓘ If the probe ball radius is entered with #3 = 0, the radius is read from the tool table and copied in #3 and #4 (Z). For this function, only a ball is permitted as a stylus. 
#5	**Overtravel/measuring distance X, Y** #5 is the overtravel (1) at single points and contours (diameter, inside width, outside width, etc.) if *Q* is not transferred.  **Special case: corner** At corners in 2 or 3 axes, the measuring distance is the difference between the position (prepositioning) before the measuring block and the expected trigger point. The default value of the measuring distance (1) for probing in X and Y is defined with #5. #5 is also defined as overtravel (2) if *Q* is not transferred.  Default value: 5

Variable	Description
#6	**Overtravel/measuring distance Z** For probing in Z, the overtravel (1) is stored in #6. Default value: 3 
#7	**Measuring feed of the 1st measuring block** For the first measuring block, a measuring feed depending on the measuring input must always be defined. Value range: 1000 mm/min…5000 mm/min Default value: 2000 mm/min
#8	**Measuring feed of the 2nd measuring block** If a value ≠ 0 is assigned to the parameter #8, a 2nd measuring block is executed with the value that has been transferred. If #8=0, no 2nd measuring block is executed. Value range: 100 mm/min…1000 mm/min Default value: 500 mm/min
#9	**Feed of protected travel block** Default value: 5000 mm/min
#10	**Retraction speed** #10 can be used to define whether the probe is moved to the start position during measurement with a specified speed (G00 = 0) or a defined speed (G01 ≠ 0). Default value: 0 Example: 0 G00 20000 G01 F20000
#16	**Basic address tool length** Basic address of the tool memory for the tool length. Default value: 10000
#17	**Basic address tool radius** Basic address of the tool memory for the tool radius. Default value: 12000
#20	**Address of the output signal MODE TC for pulse control of the probe** Address of the NC output to set the MODE TC at the interface for switching on the probe. Default value: 0 Example: 1100
#21	**Address of the output signal START TC for pulse control of the probe** Address of the NC output to set the START TC at the interface for switching on the probe. Default value: 0 Example: 1101

5.7 Adapting the data output

ⓘ Further file output destinations can be defined as per the specifications of the machine manufacturer.

ⓘ The chosen interface must be prepared for the data output.

ⓘ The machine parameters and the settings in 8716 have an influence on the output format.

ⓘ The settings selected on the NC for data transmission apply for the data output via DPRNT.

The results data can be output and reported. The desired data output type must be set. The following data output types are available:

- Data output to machine control via DPRNT
- Customer-specific data output via PDRNT

The selection for the data output type is stored in program 8716 from line N10. The entry is made between the text marks **(1 --->)** and **(1 <---)**.

```
N10(--->1)
#20=2. (LOG-FILE 2: DPRNT / 4: USER)
(<---1)
```

5.7.1 Adapting the data output via DPRNT

In the program 8710, the data output format can be adapted in parameter #128 BIT 3.

ⓘ Further adjustments can be made in the program 8716 (PROTOCOL).

Example

0.101	Position inside diameter in X: 0,101 mm (#100).
0.051	Position inside diameter in Y: 0,051 mm (#100).
0.101	Deviation of position of inside diameter in X: 0.1 mm (#103).
0.051	Deviation of position of inside diameter in Y: 0.1 mm (#104).
50005	Inside diameter dimension: 50.005 (#106).
0.005	Deviation of contour dimension (#107).
	No entry.
0.103	
0.052	
0.103	
0.052	
50.001	
0.001	
…	

Tab. 5-2 Data output without comment

MV 111+0 0.101	Position inside diameter in X: 0,101 mm (#100).
MV 111+1 0.051	Position inside diameter in Y: 0,051 mm (#100).
MV 111+3 0.101	Deviation of position of inside diameter in X: 0.1 mm (#103).
MV 111+4 0.051	Deviation of position of inside diameter in Y: 0.1 mm (#104).
MV 111+6 50.005	Inside diameter dimension: 50.005 (#106).
MV 111+7 0.005	Deviation of contour dimension (#107).
YEAR 2021 / MONTH: 07 / DAY: 22	
TIME: 14: 35: 52	
MV 111+0 0.103	
MV 111+1 0.052	
MV 111+3 0.103	
MV 111+4 0.052	
MV 111+6 50.001	
MV 111+7 0.001	

Tab. 5-3 Data output with comment

5.7.2 Adapting the customer-specific data output via DPRNT

In program 8716 (DPRNT), the data output format can be customized from line 400. Any output formats can be created. The entry is made between the text markers **(--->3)** and **(<---3)**:

```
N400
(-->3 ENTER OUTPUT-COMMAND USER)
POPEN                                                  Open the interface.
(DPRNT: PROGRAMM CALL -> SEE MANUAL BROTHER)           Data output of the desired macro variables.
DPRNT[COMMENT_1/#100[44]/COMMENT_2/#101[44]/COMMENT_3/#102[44]/COMMENT_4/#103[44]]
PCLOS                                                  Close the interface.
(<--3 ********************)
```

6. Settings

ⓘ These adaptations are no needed for standard startup.

6.1 Adapting the SET WCS program

ⓘ The addresses for the workpiece zero points depend on the machine options.

The start addresses for saving the workpiece zero points are entered in program 8705 from line 20.

If needed, the following macro variables can be adjusted:

Variable	Description
#1	**Start address offset WCS** Number of the parameter in which the 1st offset value of the WCS data (X value of the external offset) – see .
#2	**Distance of the WCS-memory locations (X to Y to Z...)** Difference between the number of the storage location of a value and the number of the storage location of the value of the next axis in this WCS (delta amount between storage locations of adjacent axes).
#3	**Distance of memory location between the single axes (X1 to X2 ...)** Difference between the number of the storage location of a value of an axis in a WCS and the number of the storage location of the value of the axis in the next WCS (delta amount between storage locations of adjacent WCSs).
#4	**Start address of an optional WCS G54 P1…P48** Number of the parameter in which the 1st offset value of the optional WCS data (X value of the 1st optional offset) is stored. ⓘ If no optional WCSs are available, the value can be set to zero.
#5	**Start address of optional WCS fixture offset** Number of the parameter in which the 1st offset value of the optional WCS data for the fixture offset (X value of the 1st optional offset) is stored. ⓘ If no optional WCSs are available, the value can be set to zero.

Example

```
N20(****DEFAULT SETTING WCS****)
#1=5201         (OFFSET WCS)
#2=1            (OFFSET AXIS)
#3=20           (INTERVAL AXIS)
#4=7001         (-> OPTIONAL WCS P1...48)
#5=5            (-> OPTIONAL FIXTURE OFFSET/TYPE KINEMATIK A:1 B:2 C:4 AB:3 AC:5 BC:6)
N30
```

Tab. 6-1 Adapting the SET WCS program

6.2 Adapting the SET TOOL program

The start addresses for the tool correction memory are entered in program 8706 (SET TOOL) from line N10.
If needed, the following macro variables can be adjusted:

Variable	Description
#1	**Basic address tool length wear** Basic address of the tool correction memory for tool length wear.
#2	**Basic address tool radius wear** Basic address of the tool correction memory for tool radius wear.
#3	**Maximum tolerance** Maximum permissible correction value.
#7	**Maximum permissible correction factor**

ⓘ The addresses for the tool correction memory depend on the machine options.

ⓘ The basic addresses are the addresses before the addresses of the 1st tool. Here the data of the 1st tool are stored in the corresponding parameters.

Example

```
N10 (*** BASIC ADRESS TOOLMEMORY ***)
#1=10000 (BASE ADDRESS – LENGTH WEAR)
#2=12000 (BASE ADDRESS – RADIUS WEAR)
(*** BASIC ADRESS TOOLMEMORY ***)
```

Tab. 6-2 Adapt the basic addresses of the wear correction values

```
#3=2.0(MAX. TOLERANCE)
#7=2.0(MAX. CORR. FACTOR)
```

Tab. 6-3 Adapt the maximum tolerance and maximum correction factor

7. Annex

7.1 Calibration parameter

Parameter	Description	
#110	**Basic address of calibration values**	
	Start address of 6 consecutive calibration values.	
#110+0	**Calibration value in X**	
	Example:	2.785 (probe ball radius 3 mm, High-Speed-Skip)
#110+1	**Calibration value in Y**	
	Example:	2.788 (probe ball radius 3 mm, High-Speed-Skip)
#110+2	**Probe centre offset in X**	
	Example:	0.005 (probe ball radius 3 mm, High-Speed-Skip)
#110+3	**Probe centre offset in Y**	
	Example:	0.010 (probe ball radius 3 mm, High-Speed-Skip)
#110+4	**Saving of basic rotation for G68**	
#110+5	**Calibration value Z**	
	Example:	0.206 (probe ball radius 3 mm, High-Speed-Skip)

7.2 Result parameter

Parameter	Description
#111	**Basic address results** Start address of 10 consecutive result parameters.
#111+0	**Result of the measurement in X in the current WCS**
#111+1	**Result of the measurement in Y in the current WCS**
#111+2	**Result of the measurement in Z in the current WCS**
#111+3	**Deviation between the measuring result in X and the set position in X** If no set position is transferred in X (parameter *I*), this value corresponds to the X measurement result.
#111+4	**Deviation between the measuring result in Y and the set position in Y** If no set position is transferred in Y (parameter *J*), this value corresponds to the Y measurement result.
#111+5	**Deviation between the measuring result in Z and the set position in Z** If no set position is transferred in Z (parameter *K*), this value corresponds to the Z measurement result.
#111+6	**Result of contour measurement** Diameter bore, inside width or outside width.
#111+7	**Deviation of the measurement result from the set value transferred with parameter S**
#111+8	**Result of check for component presence** 1 Component available -1 Component not available
#111+9	**Result of the angle measurement to activate an nth axis** If #111+9 ≠0, the entered value, when writing the WCS, is written into the axis which is entered in program 8710 (USERPARATAB) under #7.
#142	**Angle-distance function: Result of angle measurement**
#143	**Angle-distance function: Deviation between result and**
#144	**Angle-distance function: Result of distance measurement in X (set value)**
#145	**Angle-distance function: Result of distance measurement in Y (set value)**
#146	**Angle-distance function: Result of distance measurement in Z (set value)**

7.3 Diagnosis parameters

Parameter	Description
#112	**Tool correction number (H-code)** Before point: Internal storage of the probe number of the selected item (transferred with parameter B and stored here) After point: Tool correction number (H number) of the probe
#113	**Probe ball radii XY, Z** Before point: Probe ball radius XY After point: Probe ball radius Z
#114	**Measuring distance XY, Z** Before point: Measuring path in X and Y After point: Measuring path in Z
#115	**Feed 1st measuring block, 2nd measuring block** Before point: Feed 1st measuring block After point: Feed 2nd measuring block
#116	**Feed protected move, feed G00/G01** Before point: Feed protected move After point: Feed G00/G01
#120	**Axis assignment of main axes** Storage of the axis numbers for the main axes X, Y, Z.
#121	**Error marker** Storage of error number.
#122	**Tool length from memory** Tool length of the active tool.
#123	**Measuring result in X** Skip position.
#124	**Measuring result in Y** Skip position.
#125	**Measuring result in Z** Skip position.
#129	**Tool length offset** Offset of the tool length and skip position.
#130	**Axis assignment of rotation axes** Storage of the axis numbers for the rotation axes A, B, C.
#131	**Calibration value in X** Internal calibration value in X, adapted to rotation (e.g. G68).
#132	**Calibration value in Y** Internal calibration value in Y, adapted to rotation (e.g. G68).
#133	**Probe centre offset in X** Internal probe centre offset in X, adapted to rotation (e.g. G68).
#134	**Probe centre offset in Y** Internal probe centre offset in Y, adapted to rotation (e.g. G68).
#135	**Task** Type of measuring point.
#136	**Angle-distance function: Measuring result in X of the 1st measurement**
#137	**Angle-distance function: Measuring result in Y of the 1st measurement**
#138	**Angle-distance function: Measuring result in Z of the 1st measurement**
#139	**Angle-distance function: Measuring result in Y of the 2nd measurement**
#140	**Angle-distance function: Measuring result in Y of the 2nd measurement**

Parameter	Description
#141	**Angle-distance function: Measuring result in Y of the 2nd measurement**
#147	**Measuring point marker** Adapted marker for tool corrections.
#148	**TC pulse addresses** Storage of addresses for the control in pulse mode. Before point: TC start address After point: TC mode address
#149	**Skip data start address** Start addresses of the skip data in *Angled surface machining* mode.

8. Service

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