



# ENGINEERING DOCUMENT

757-4002-097

CAD #D8478

**SUBJECT: Siemens I/R Module, Servo Drive, and Spindle Drive Setup Procedure with Ultimex 3 ISA Control. Applicable Machining Centers: BMC30M, BMC30HT, BMC30SSM, BMC4020HT and BMC4020SSM.**

## RECORD OF CHANGES

Responsible  Dan Ornelas Originator	Reviewed/Approved  Mgr. Control Systems Engineering
6/20/96 Date	Date

Revision	ECN #	Revision Description	Rev By	Date	Appd By	Date
A	13709	Original Release				
B	13760	Change P-31 = 15, P-146 = -500, and P-242 = 6	DEO	7/23/96	MFC	7/30/96
C	13933	1) Page 7, section VII-E-4 was ...until the axis stops rotating. 2) Page 8, section VIII was ...FA0 for motor P/N. Section X added Z=opt. 3) Attachment "A" and Attachment "B" Page 1, P-027 was 20 RPM and Page 4, P-144 was 1.00 degree. 4) Added BMC30SSM. 5) Page 6, section VII-B-1, reworked "KP" adjustment procedure.	DEO	12/16/96	MFC	12/17/96
D	14012	1) Page 9, section XII-A, BMC30's Drive code Parameter added 13. 2) Page 11, section XIV-B4, Spindle RPM Range acceptability table was added.	SAW	7/14/97	DEO	7/14/97
E	14098	1) Page 6, Revised "TN" adjustment procedure for fine-tuning. 2) Page 8, Added spindle motor option K03. 3) Page 13, section A1, parameter P1-149 was 29H (uni-directional). 4) Attachment "B" for BMC4020 machines, P-149 was 29H.	DEO	9/16/97		

**I. INTENT**

To provide a standardized method of configuration and adjustment with Siemens I/R module, servo drives, and spindle drives being used on Ultimax 3 ISA type machining centers.

## II. APPLICABILITY

Specific to all BMC30M, 30HT, 4020HT, and 4020SSM Ultimax 3 type machining centers using software version 1.62 or later. This is the only procedure to be used within Hurco facilities and should be used at customer installations to help achieve factory proven performance.

## III. INDEX

Page 3	I/R Module Startup Sequence
Page 5	ULTIMAX 3 Control Parameter Verification, Servo
Page 5	Servo Drive Start-up Sequence
Page 6	Servo Drive Adjustments and Tuning
Page 8	Hurco/Siemens Part Identification Table, Servo
Page 8	ULTIMAX 3 Control Parameter Verification, Spindle
Page 8	Hurco/Siemens Part Identification Table, Spindle
Page 9	Spindle Start-up Sequence
Page 9	Identify Drive and Motor Type
Page 10	Parameter List, Manual Entry
Page 10	Spindle Zero RPM and Maximum RPM Calibration
Page 12	Orient Zero Mark Setup with Motor Encoder
Page 13	Orient Zero Mark Setup with Motor Encoder & Proximity Sensor
Page 15	Re-initialize Spindle Drive
Attachment A	Siemens Spindle Parameter List, BMC30HT & BMC30M
Attachment B	Siemens Spindle Parameter List, BMC4020HT & BMC4020SSM

## IV. I/R MODULE START-UP SEQUENCE

**CAUTION:** During this procedure high voltage will be present once the I/R module has been powered up. It will take approximately 5 minutes to discharge when power is removed. Begin sequence with control power turned **OFF**. **Do not** disconnect or reconnect wires or connections unless power is **OFF** and the DC link has discharged.

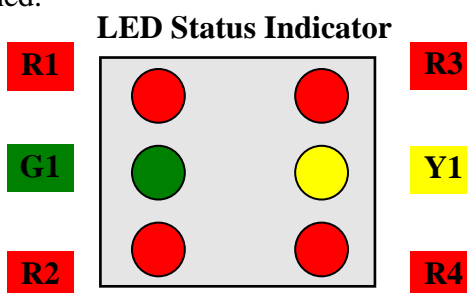
- A. Remove all external interface wiring (X161 and X121), the DC link connections, as well as signal ribbon cables. This isolates the module from the effects of possible problems from other modules and any other external wiring errors.
- B. Visually check to make sure that all I/O, ribbon, and power cables are securely terminated at the proper locations. Also verify that the 600VDC bus bar links are securely terminated. They are located behind a plastic protective front cover.
- C. Verify configuration of dip switch **S1**, access located through top of the module case. Configure the module to indicate “fault” when applicable. The internal relay will energize if power is **ON** and no fault is present. Switch settings are as follows:

<b>S1-1</b>	<b>OFF</b>
<b>S1-2</b>	<b>ON</b>
<b>S1-3</b>	<b>OFF</b>

<b>S1-4</b>	<b>OFF</b>
<b>S1-5</b>	<b>OFF</b>
<b>S1-6</b>	<b>OFF</b>

- D. Apply main power to terminal at location U1, V1, and W1 via **CB4** (32A). Measure line voltage across each phase, it should be 380VAC to 420VAC (Reading may be as high as 440VAC which is acceptable when there is a no load condition). No LED's will illuminate at this time.
- E. Reinstall external wiring connectors at X161 and X121. This will prepare the module for power-up operation.
- F. Reapply three phase main power via CB4 (32A). This will verify that the module is functioning properly. The DC link will be enabled and the **green** and **yellow** LED's will illuminate. The **red** fault LED should remain extinguished.

- G1** - Unit Not Ready  
**Y1** - Unit Ready  
**R1** - +/- 15V Too Low  
**R2** - Supply Undervoltage, Phase Failure,  
- or Control Axis Fault  
**R3** - 5V Too Low  
**R4** - DC Link Voltage Too High



- G. Verify low voltage power supply is functioning properly by measuring the following test points with respect to ground (**X141-15**).

<b>X141-7</b>	<b>24 +/- 1 VDC</b>
<b>X141-45</b>	<b>15 +/- 0.5 VDC</b>
<b>X141-44</b>	<b>-15 +/- 0.5 VDC</b>
<b>X141-10</b>	<b>-24 +/- 1 VDC</b>

- H. Enable control power from the ULTIMAX Control by selecting **MANUAL** Mode; **F7** (“Reset Servos and Spindle”); depress **<POWER ON>**. At this point the Drive Enable signal is enabled and DC link voltage is present at the bus. The **green** LED will be extinguished and the **yellow** LED will remain illuminated. At this point the I/R Module is considered operational.

## **V. ULTIMAX 3 CONTROL PARAMETERS VERIFICATION, SERVO**

Load parameters from the latest Engineering Document published to date (757-4002-048) per machine type.

- A. On the Ultimax Control select: **MANUAL** Mode; **F2** (“Change Tool or Diagnostics”); **F7** (“ATC and Machine Diagnostics”); **<ENTER>**, **103**, **<ENTER>**.

- B. Select each axis softkey to review and/or load the Axis Tuning Parameters.
- C. If an Axis Parameter needs to be changed then simply enter the correct values per the referenced Engineering Document.
- D. After completing all changes for an axis, select the **BEGIN TUNE** softkey followed by the **STORE PARAMETERS** softkey.
- E. Press the **EXIT** softkey to return to the ATC & Machine Diagnostics screen.
- F. Press the Auxiliary mode key.
- G. Select the **SYSTEM CONFIGURATION** softkey.
- H. Insert the Machine Configuration diskette into the floppy drive.
- I. Select the **BACKUP MACHINE CONFIGURATION** softkey.
- J. When complete, remove the diskette from the floppy drive and store in safe location.

## VI. SERVO DRIVE START-UP SEQUENCE

CAUTION: During this procedure high voltage will be present once the Servo modules have been powered up. It will take approximately 5 minutes to discharge when power is removed. Begin sequence with control power turned **OFF**. **Do not** disconnect or reconnect wires or connections unless power is **OFF** and the DC link has discharged. Also the following procedure requires that the I/R Module be operational as a prerequisite. Bracket notation [ ] describes the second axis on a 2-axis module when applicable.

- A. Beginning with the leftmost module, isolate any module to the right by removing the ribbon harness, I/O, and the DC link connections. This isolates the module from the effects of possible problems from other modules or any external wiring errors.
- B. Preset motor controller settings via internally located switches. Remove the controller PCB front panel by loosening top and bottom captive screws. Carefully pull the controller PCB assembly out of its module. Preset the controller switches as follows:

System	Switch S1 [S4]	Switch S2 [S5]	Switch S3 [S6]
BMC30M	ALL switch jumpers <b>OPEN</b>	Bits 1, 6, 9 <b>ON</b> Bits 2-5, 7, 8, 10 <b>OFF</b>	Bit 8 <b>ON</b> Bits 1-7 <b>OFF</b>
BMC30HT	ALL switch jumpers <b>OPEN</b>	Bits 1, 9 <b>ON</b> Bits 2-8, 10 <b>OFF</b>	Bit 8 <b>ON</b> Bits 1-7 <b>OFF</b>
BMC4020HT	ALL switch jumpers <b>OPEN</b>	Bits 1, 9 <b>ON</b> Bits 2-8, 10 <b>OFF</b>	Bit 8 <b>ON</b> Bits 1-7 <b>OFF</b>

BMC4020SSM	ALL switch jumpers OPEN	Bits 1, 9 ON Bits 2-8, 10 OFF	Bit 8 ON Bits 1-7 OFF
------------	-------------------------	----------------------------------	--------------------------

**Description**

S1 [S4]		<b>Tachometer Matching Switch</b>
S2 [S5]	Bit 1	<b>Motor Rotation Direction</b> vs. Voltage polarity
	Bits 2-5	<b>Current Limit</b>
	Bits 6-9	<b>Current Gain</b>
	Bit 10	<b>Velocity Mode</b> vs. Current Mode
S3 [S6]	Bits 1-7	<b>Factory Default Settings</b>
	Bit 8	<b>Current Controller Integrator Active</b>

- C. Switch presetting for motor controller is complete. Reinstall the controller PCB assembly into the module. Be careful to align the assembly in the card guide and “seat” it firmly into the rear connector. Re-secure the retaining screws at the top and bottom of the front panel.

**VII. SERVO DRIVE ADJUSTMENTS AND TUNING**

- A. Visually check and make sure the ribbon harness, I/O, and the DC link connections are securely terminated at the proper locations for the module under test.
- B. Axis amplifier “**Proportional Gain**” adjustment. This adjustment is used to best match the servo axis performance to the requirements of the machine and controller.
- 1.<sup>C5</sup> Initially adjust the potentiometer labeled “**KP**” to **30-50%** from zero in a clockwise direction. Zero being the hardstop when rotating the potentiometer fully counter clockwise. Adjust “**KP**” until motor starts to oscillate, then back off until it stops. After it stops, turn the pot slightly **10%** counter clockwise (**25%** is typically a good final setting for this adjustment).
- C.<sup>E1</sup> Axis amplifier “**Integral Gain**” adjustment. This adjustment is used to best match the servo axis performance to the requirements of the machine and controller.
- Adjust the potentiometer labeled “**TN**”, to approximately **70%** from zero in a clockwise direction. Zero being the hardstop when rotating the potentiometer fully counter clockwise.
  - Connect a digital voltmeter (DVM) to drive test point “**W**” (positive lead) and test point “**M**” (common) for specific axis under adjustment.
  - Program the given axis to move back and forth at 50 IPM and observe the stability of speed regulator current expressed as a voltage.
  - Fine adjust the “**Integral Gain Adjustment**” potentiometer labeled “**TN**” until the voltage measured at drive test points becomes stable (typically +/-10mV fluctuation is adequate).
- D. The “**AD**” potentiometer serve the purpose of “**Low Speed Adaption**” which is non-functional in our application because we are not setting S3 [S5] bit 5 ON. Therefore just leave this potentiometer at the factory default setting.

- E. Axis amplifier “**Drift**” adjustment. This adjustment minimizes motor rotation when a 0V command is issued in velocity loop. **Do not adjust the VR potentiometer on the MX4 board!** Leave them at their factory setting. The range of adjustment available from the Siemens Servo modules is sufficient to balance servo offset.
1. On the ULTIMAX Control select: **MANUAL** Mode; **F2** (“Change Tool or Diagnostics”); **F7** (“ATC and Machine Diagnostics”); **<ENTER>, 101, <ENTER>; F6** (“Toggle Following Error Display”); **F7** (“Axis Balance Adjust”).
  2. Select the appropriate softkey to choose the axis to be balanced.
  3. At the prompt, press the **START** push-button, followed immediately by pressing **MOTION HOLD** to provide a zero voltage signal from the selected MX4 DAC channel. (The machine control loop is now open for this channel. The presence of system unbalance will be immediately apparent by the drift of the values in the Following Error display).
  4. <sup>C1</sup> Adjust the uppermost potentiometer labeled “**DRIFT**” to minimize axis rotation. In this mode it is impossible to guarantee no rotation. **Verify the quality of the null by observing minimal change in the counts being displayed in the Standing (Zero Speed) Following Error column.**
- F. Axis amplifier “**Tachometer**” adjustment. This adjustment is used in the velocity loop and made to scale the motor speed with reference to the voltage applied at speed command input terminals X331 [X332] 56 and 14.
1. Run a setup machine program so that the axis moves back and forth at 10% of maximum feedrate. (Example: BMC 4020 Max. feedrate (X, Y) = 19,990 and (Z) = 15,000 mmpm, therefore 10% would be 1,999 and 1,500 mmpm respectively.
  2. Then adjust the potentiometer labeled “**T**”, tachometer, until the DAC output measured at terminals X331 [X332] 56 and 14 = **+95 +/- 0.005** and **-95 +/- 0.005**.
- G. At this point repeat steps in Sections VI and VII for any additional axis module in the system. Once all axis modules have been setup and tested the system is ready to become operational.

## VIII. HURCO/SIEMENS PART IDENTIFICATION TABLE, SERVO

System	Torque Nm	Hurco P/N (Motor)	Siemens Motor P/N	Rated Speed RPM	Siemens Drive P/N
BMC30	6.5	402-6011-018	1FT5066-1AF71-4FG0 <sup>C2</sup>	3000	6SN1123-1AA00-0AA0 (1-axis) 6SN1118-0AD11-0AA0 (1-axis) 6SN1123-1AB00-0AA0 (2-axis) 6SN1118-0AE11-0AA0 (2-axis)
BMC30HT	10.0	402-6011-002	1FT5072-1AF71-1FG0 <sup>C2</sup>	3000	6SN1123-1AA00-0BA0 (1-axis) 6SN1118-0AD11-0AA0 (1-axis) 6SN1123-1AB00-0BA0 (2-axis)

					6SN1118-0AE11-0AA0 (2-axis)
BMC4020HT	10.0	402-6011-002	1FT5072-1AF71-1FG0 <sup>C2</sup>	3000	6SN1123-1AA00-0BA0 (1-axis) 6SN1118-0AD11-0AA0 (1-axis) 6SN1123-1AB00-0BA0 (2-axis) 6SN1118-0AE11-0AA0 (2-axis)
BMC4020SSM	10.0	402-6011-002	1FT5072-1AF71-1FG0 <sup>C2</sup>	3000	6SN1123-1AA00-0BA0 (1-axis) 6SN1118-0AD11-0AA0 (1-axis) 6SN1123-0AB00-0BA0 (2-axis) 6SN1118-0AE11-0AA0 (2-axis)

## IX. ULTIMAX 3 CONTROL PARAMETERS VERIFICATION, SPINDLE

Spindle Parameters are loaded by default (WITH SOFTWARE VERSION 1.62). These parameters must be verified against the latest control parameters published to date (757-4002-048). DSP parameters may be edited in the “Tune Axis Parameter” screen. Depress <ENTER>, **103**, <ENTER> while in the “ATC and Machine Diagnostics” screen of **MANUAL** machine mode.

## X. HURCO/SIEMENS PART IDENTIFICATION TABLE, SPINDLE

System	Power (HP)	Hurco P/N (Motor)	Siemens Motor P/N	Motor RPM	Spindle RPM	X'mission Ratio	Siemens Drive P/N
BMC30M	15 HP	402-6011-001	1PH6137-4NB49-Z Z=L69+K83+K03 <sup>E2</sup>	8000	8000	1.00	6SN1123-1AA00-0GA0 6SN1121-0BA13-0AA0
BMC30HT	15 HP	402-6011-001	1PH6137-4NB49-Z Z=L69+K83+K03 <sup>E2</sup>	8000	8000	1.00	6SN1123-1AA00-0GA0 6SN1121-0BA13-0AA0
BMC4020HT	20 HP	402-6011-015	1PH6163-4NB49-Z Z=L69+K83+K03 <sup>E2</sup>	6500	6500	1.00	6SN1123-1AA00-0FA0 6SN1121-0BA13-0AA0
BMC4020SSM	20 HP	402-6011-015	1PH6163-4NB49-Z Z=L69+K83+K03 <sup>E2</sup>	6500	8125	1.25	6SN1123-1AA00-0FA0 6SN1121-0BA13-0AA0

## XI. SPINDLE START-UP SEQUENCE

- A. The following procedure requires that the I/R Infeed Module be operational as a prerequisite. The I/R Infeed Module is the DC power source for the Spindle Module.
- B. Visually check to make sure that all I/O, encoder, ribbon, and power cables are securely terminated at the proper locations. Also verify that the 600VDC bus bar links are securely connected. They are located behind a plastic protective front cover.  
CAUTION: Once the drive system has been powered up high voltage is present. It will take approximately 5 minutes to discharge when power is removed.
- C. Apply power to system via **CB4** (32A), Spindle Module LED display should indicate “**P-095**” the first time the module unit is initiated.

## XII. IDENTIFY DRIVE AND MOTOR TYPE



- A. Enter “Drive Code” into Parameter “**P-095**”, identifies drive type to drive software. This can be accomplished by pressing the “**P**” key on spindle keypad then the “+” or “-” key to increment or decrement the value as required. Once the proper value from table below is entered simply press “**P**” to place the system back into parameter mode.

	System	Parameter P-095 “Drive Code”
D1	BMC30M	13(..0LA0), 8(..0GA0)
D1	BMC30HT	13(..0LA0), 8(..0GA0)
	BMC4020HT	10
	BMC4020SSM	10

- B. Enter “Motor Code” into Parameter “**P-096**”, identifies motor type to drive software. This can be accomplished by pressing the “**P**” key on spindle keypad then the “+” or “-” key to increment or decrement the value as required. Once the proper value from table below is entered simply press “**P**” to place the system back into parameter mode.

	System	Parameter P-096 “Motor Code”
	BMC30M	133
	BMC30HT	133
	BMC4020HT	134
	BMC4020SSM	134

- C. Verify “Encoder Pulse Code” value in Parameter “**P-098**”. The motor measuring system should have encoder pulses per revolution equal to **2048**. If the value differs, change value from spindle keypad by using the “+” or “-” key to increment or decrement the value as required.
- D. Go to “Initialization” parameter “**P-097**”. Change the parameter value by pressing the “+” key on the keypad. The display should indicate “**1**”, then change to “**P-000**”. The LCD’s should now indicate the “status” of the module with intermittently flashing “**P-000**”. At this point specific functions and features can be implemented.

### **XIII. PARAMETER LIST, MANUAL ENTRY**

At this point proceed through the Parameter List in Attachment A (BMC30HT & BMC30M) or Attachment B (BMC4020HT & BMC4020SSM) and verify each parameter and change any parameter as necessary from the list. Several parameters are predetermined from firmware and require no change. These parameters can be identified with notation “**mot 1**” or “**mot2**” in description column. It is important that all parameters agree with appropriate Parameter List for proper operation.

- A. In order to change machine specific parameters disable write protection by changing parameter “**P-051**” to “**4H**”.
- B. Toggle through each parameter in Attachment A or Attachment B and change the values to correspond to value settings in the list.

- C. After all parameter value settings have been incorporated and verified transfer the data into the drives EPROM by changing the value or parameter “P-052” to “1” to store the changes. Once the data has been stored parameter “P-052” will return to “0”.
- D. Finally enable write protection parameter “P-051” to “0H” so that changes cannot be made inadvertently.
- E. Repeat this procedure whenever a change is necessary.

#### **XIV. SPINDLE ZERO RPM AND MAXIMUM RPM CALIBRATION**

- A. To achieve the Spindle Zero Drift (spindle velocity of Zero RPM) proceed as follows: **Do not adjust the VR potentiometers on the MX4 board!** Leave them at their factory settings. The range of adjustment available from the Siemens Spindle Module is sufficient to balance spindle offset.
  - 1. To ensure that the Spindle is in the Closed Loop Velocity mode, on the Ultimex Control select: **Auxiliary Mode; F4** (“System Config.”); **F4** (“Display Machine Config.”); **<ENTER>, 100, <ENTER>; F4** (“Spindle”); **F1** (“Physical Parameter”). Make change to Closed Loop Velocity if necessary.
  - 2. On the Ultimex Control select: **MANUAL Mode; F2** (“Change Tool or Diagnostics”); **F7** (“ATC and Machine Diagnostics”); **<ENTER>, 101, <ENTER>; F6** (“Toggle Following Error Display”); **F7** (“Axis Balance Adjust”); and **F4** (“Spindle”).
  - 3. When the **START CYCLE** push-button is depressed, the Ultimex Control executes the following signal sequence - each stage lasting a few seconds, and its results (in counts) displayed on the Ultimex screen:
 

Zero signal: **small (+) signal; small (-) signal.** Cycle repeats.

When the program starts, press the **MOTION HOLD BUTTON**, this will hold the DAC at zero output. The spindle will probably rotate slowly, indicating a need for balance.
  - 4. Adjust parameter “P-015”, Offset Correction Speed Setpoint at the spindle drive. Increase or decrease the hexadecimal value as necessary until the spindle stops rotating. It will be necessary to use parameters “P-051” and “P-052” to invoke this change. **Verify the quality of the null by observing no change in the counts being displayed in the Following Error column and no physical spindle rotation.**
- B. To calibrate The Maximum Spindle Speed parameter (ensuring that the Ultimex Control reflects true Spindle speed), proceed as follows:
  - 1. In **MANUAL** Mode, set the Manual Spindle Speed value to the maximum spindle speed of the machine. **Note this commanded (desired) value.**

2. The machine must now be put back into Open Loop mode. On the Ultimac Control, select: **AUXILIARY** Mode; **F4** (“System Configuration”); **F4** (“Display Machine Configuration”); **<ENTER>**, **100**, **<ENTER>**; **F4** (“Spindle”); **F1** (“Physical Parameters”); and **F5** (“Open Loop”).
3. Obtain a tachometer reading of Spindle RPM. **Note this measured value.**

4. It is likely that there will be a discrepancy between the commanded or rated RPM and the measured Spindle speeds. To offset this situation you may use the following formula to adjust the DAC voltage. Calculate this new required voltage value (to two decimal places), and enter it into the Ultimac screen. Use **<ENTER>**, **100**, **<ENTER>** screen.

Programmed RPM	Acceptable RPM Range <sup>D2</sup>
65 (4020HT)	64-66*
80 (SSM, 30’s)	79-81*
2000 (Both)	1998-2002
4000 (4020HT)	3996-4004
6000 (SSM, 30’s)	5994-6006
6500 (4020HT)	6493-6507
8000 (SSM, 30’s)	7992-8008

(\*) Rounded to whole number

**New “Max DAC” Voltage = (Desired RPM / Measured RPM) ♦ Old “Max DAC” Voltage**

(Example: Measured spindle speed = 5980 RPM with original DAC voltage on MAX3 screen of 9.5, but 6000 RPM is desired. DAC voltage value should be changed to **6000/5980 ♦ 9.5 = 9.53V**).

5. The Spindle Drive RPM setup is complete.

## **XV. ORIENT ZERO MARK SETUP WITH MOTOR ENCODER**

- A. Procedure will work properly with motor encoder when spindle has a 1:1 ratio and a timing belt is used for transmission to ensure no motion loss. To achieve an orient zero mark proceed as follows
  1. When using motor encoder, the spindle should be set for the shortest approach from either direction. This is accomplished by setting parameter **“P-149”** to **“21H”**.
  2. Parameter **“P-131”** defines the number of encoder counts between two references signals taking into account the 1:1 ratio. Set parameter to **“2048”**. When the drive unit is powered up, the position counter is checked during the first one or two revolutions of the spindle.
  3. Parameter **“P-141”** set to **“0H”**, assigns motor encoder evaluation when required to orient spindle.
  4. Request transfer of switching parameters **“P-141”** for positioning by setting parameter **“P-143”** to **“1”**. The parameter is automatically reset to **“0”**.

5. Remove spindle drive key.
  6. Install ATC Setup Taper into the spindle and flange into the ATC.
  7. Move ATC to “right” position from the Ultimex Control/ Select: **MANUAL** Mode; **F2** (“Change Tool or Diagnostics”); **F1** (“Magazine Right”).
  8. Set the ATC height from Ultimex Control, select: **MANUAL** Mode; **F2** (“Change Tool or Diagnostics”); **F7** (“ATC and Machine Diagnostics”); **<ENTER, 101, <ENTER>**; Select the correct position, jog the Z-axis down until it is properly aligned with the tool changer. Proper alignment is achieved when the Z-axis is positioned at a height relative to the tool changer which allows tools to be taken from and returned to the tool changer. When the Z-axis is aligned, press softkey **F1** (“Store Z Position”).
  9. Rotate the spindle at least one complete revolution by hand to a position so the drive key may be re-installed.
  10. Initialize the Internal Zero Mark by setting parameter “**P-129**” to “**1H**”, it will then automatically reset back to “**0H**”. The new Zero Mark Offset is automatically stored in parameter “**P-130**”.
  11. Record the position actual value for zero mark offset from parameter “**P-140**”.
  12. Move ATC to “left” position from the Ultimex Control. Select: **MANUAL** Mode; **F2** (“Change Tool or Diagnostics”); **F8** (“Magazine Left”).
- B. Verify orient zero mark setup.
1. In **MANUAL** Mode, set the Manual Spindle Speed value to 3000 RPM.
  2. Depress **<SPINDLE ON>**, **<START>**. Allow the spindle to reach desired speed. Depress **<SPINDLE OFF>** to stop the spindle.
  3. On the Ultimex Control select: **MANUAL** Mode; **F6** (“Orient Spindle”). Depress **<CYCLE START>**, spindle will orient itself the zero mark position.
  4. Observe parameter “**P-140**”, actual value zero mark offset. The value should be (+) or (-) 1 count from the value recorded in step **XV(A)11**. Also on the **MANUAL** display **SPINDLE** field will indicate **ORIENTED**. If orient command is out of tolerance then repeat steps in section **XV**.

## **XVI. ORIENT ZERO MARK SETUP WITH MOTOR ENCODER & PROXIMITY SENSOR**

- A. Procedure will work properly with motor encoder and proximity switch when spindle has a 1:1.25 ratio and a timing belt is used for transmission to ensure no motion loss. To achieve an orient zero mark proceed as follows:

- 1.<sup>E3</sup> When using a proximity switch, the spindle is set for the shortest approach from either direction. This is accomplished by setting parameter “**P-149**” to “**21H**”.
  2. Parameter “**P-131**” defines the number of encoder counts between two reference signals taking into account the 1:1.25 ratio. Set parameter to “**1638**”. When the drive unit is powered up, the position counter is checked during the first one or two revolutions of the spindle.
  3. Parameter “**P-141**” set to “**2H**”, assigns proximity switch with motor encoder evaluation when required to orient spindle.
  4. Request transfer of switching parameters “**P-141**” for position by setting parameter “**P-143**” to “**1**”. The parameter is automatically reset to “**0**”.
  5. Remove spindle drive key.
  6. Install ATC Setup Tool taper into the spindle and flange into the ATC.
  6. Move ATC to “right” position from the Ultimex Control. Select: **MANUAL** Mode; **F2** (“Change Tool or Diagnostics”); **F1** (“Magazine Right”).
  8. Set the ATC height from Ultimex Control, select: **MANUAL** Mode; **F2** (“Change Tool or Diagnostics”); **F7** (“ATC and Machine Diagnostics”); **<ENTER, 101, <ENTER>**; Select the correct position, jog the Z-axis down until it is properly aligned with the tool changer. Proper alignment is achieved when the Z-axis is positioned at a height relative to the tool changer which allows tools to be taken from and returned to the tool changer. When the Z-axis is aligned, press softkey **F1** (“Store Z Position”).
  9. Rotate the spindle at least one complete revolution by hand to a position so the drive key may be re-installed.
  10. Initialize the Internal Zero Mark by setting parameter “**P-129**” to “**1H**”, it will then automatically reset back to “**0H**”. The new Zero Mark Offset is automatically stored in parameter “**P-130**”.
  11. Record the position actual value for zero mark offset from parameter “**P-140**”.
  12. Move ATC to “left” position from the Ultimex Control. Select: **MANUAL** Mode; **F2** (“Change Tool or Diagnostics”); **F8** (“Magazine Left”).
- B. Verify orient zero mark setup.
1. In **MANUAL** Mode, set the Manual Spindle Speed value to 3000 RPM.
  2. Depress **<SPINDLE ON>**, **<START>**. Allow the spindle to reach desired speed. Depress **<SPINDLE OFF>** to stop the spindle.

3. On the Ultimex Control select: **MANUAL** Mode; **F6** (“Orient Spindle”). Depress <**CYCLE START**>, spindle will orient itself the zero mark position.
4. Observe parameter “**P-140**”, actual value zero mark offset. The value should be (+) or (-) 1 count from the value recorded in step **XVI(A)11**. Also on the **MANUAL** display **SPINDLE** field will indicate **ORIENTED**. If orient command is out of tolerance then repeat steps in section **XV**.

## **XVII. RE-INITIALIZE SPINDLE DRIVE**

If for some reason it is necessary to re-initialize the spindle drive, reset all parameters to the original factory settings, perform the following steps:

- A. Set parameters:       **“P-051” to “4H”**  
                                  **“P-097” to “0H”**  
                                  **“P-052” to “1H”** it will automatically reset back to **“0H”**
  
- B. Power the system down, wait until the LCD’s extinguish. Then power the system back up, the LCD readout will display parameter **“P-095”**.
  
- C. To restart and re-initialize the drive begin again at the beginning of these procedures for Siemens spindle drive.

ATTACHMENT "A"

**SIEMENS SPINDLE PARAMETER LIST, BMC30HT, BMC30M, & BMC30SSM**

<i>P No.</i>	<i>DESCRIPTION</i>	<i>DIMENSION</i>	<i>SETTING</i>
P-000	Operating display	-	N/A
P-001	Speed setpoint	RPM	N/A
P-002	Speed actual value	RPM	N/A
P-003	Motor voltage	V	N/A
P-004	Utilization	%	N/A
P-006	DC link voltage	V	N/A
P-007	Motor current	A	N/A
P-008	Motor reactive power	kVA	N/A
P-009	Motor active power	KW	N/A
P-010	Motor temperature	°C	N/A
P-011	Status of the binary inputs	hex	N/A
P-012	Normalization, DAU $n_{act}$ display	%	100.0
P-013	Normalization, DAU $P/P_{max}$ display	%	100.0
P-014	Speed for max. motor useful speed	mot 1 RPM	8000
P-015	Offset correction, speed setpoint	hex	(*)
P-016	Ramp-up time, RFG	s	0.01
P-017	Ramp-down time, RFG	s	0.01
P-018	Smoothing time, speed setpoint smoothing	ms	5
P-019	Degree of rounding-off, speed setpoint	dec	0
P-020	Diagnostics, speed actual value	hex	N/A
P-021	$n_{min}$ for " $n_{act} < n_{min}$ " signal	mot 1 RPM	80
P-022	Shutdown speed, pulse cancellation	mot 1 RPM	2
P-023	$n_x$ for " $n_{act} < n_x$ " signal	mot 1 RPM	6000
P-024	Normalization, setpoint	V	9.5
P-026	Normalization, DAU $M/M_{rated}$	%	100.0
P-027	Toler, bandwidth for " $n_{act} = n_{set}$ " signal	mot 1 RPM	$30^{C3}$
P-028	Diagnostics	hex	N/A
P-029	Speed limiting	RPM	8000
P-030	Min. steady-state speed	RPM	0
P-031	P gain, speed controller	mot 1 dec	$15.0^{B1}$
P-032	Integral action time, speed controller	mot 1 ms	20
P-033	Encoder resolution for NC	dec	3
P-035	Smoothing time, torque setpoint	mot 1 ms	3
P-036	Encoder phase error correction	dec	0
P-037	Changeover speed, motor encoder evalu.	mot 1 RPM	32000
P-038	Hysteresis, P-037	mot 1 RPM	50
P-039	1st torque limit value	mot 1 %	125
P-040	Regenerative limiting	mot 1 %	100
P-041	2nd torque limit value	mot 1 %	50
P-042	Changeover speed for P-040	mot 1 RPM	500

(\*) Different value for each machine.



## SIEMENS SPINDLE PARAMETER LIST, BMC30HT, BMC30M, &amp; BMC30SSM

<i>P No.</i>	<i>DESCRIPTION</i>	<i>DIMENSION</i>	<i>SETTING</i>
P-043	Hysteresis, P-042 mot 1	RPM	20
P-044	Selection, torque setpoint smoothing	hex	1H
P-045	Switch-in speed, torque setpoint smooth mot 1	RPM	4000
P-046	Hysteresis, P-045 mot 1	RPM	50
P-047	M <sub>dx</sub> for "M <sub>d</sub> < M <sub>dx</sub> " signal mot 1	%	90
P-048	Normalization, torque setpoint	%	100
P-049	Offset, torque setpoint	hex	0H
P-050	Changeover speed from M <sub>d1</sub> to M <sub>d2</sub> mot 1	RPM	2100
P-051	Write protection	hex	N/A
P-052	Transfer parameters into FEPR0M	hex	N/A
P-053	Control word	hex	11H
P-054	M19, speed setpoint normalization	RPM	525
P-055	M19, speed setpoint offset correction	hex	0H
P-056	M19, changeover speed	RPM	525
P-058	Switch-off threshold, rounding-off M19	RPM	0
P-062	M19 changeover threshold, I comp., speed cont.	RPM	4
P-063	Max. motor temperature	°C	150
P-064	Fixed temperature	°C	0
P-065	Timer stage, motor temperature alarm	s	240
P-066	Address, DAU 1	hex	3044H
P-067	Shift factor, DAU 1	dec	0
P-068	Address, DAU 2	hex	3048H
P-069	Shift factor, DAU 2	dec	0
P-072	Address, DAU 4	hex	C04H
P-073	Shift factor, DAU 4	dec	0
P-074	Offset, DAU 4	hex	0H
P-076	Address, DAU 3	hex	3050H
P-077	Shift factor, DAU 3	dec	0
P-078	Offset, DAU 1	hex	0H
P-079	Offset, DAU 2	hex	0H
P-080	Offset, DAU 3	hex	0H
P-081	Terminal function assignment E1	dec	1
P-082	Terminal function assignment E2	dec	28
P-083	Terminal function assignment E3	dec	3
P-084	Terminal function assignment E4	dec	6
P-085	Terminal function assignment E5	dec	4
P-086	Terminal function assignment E6	dec	2
P-087	Terminal function assignment E7	dec	9
P-088	Terminal function assignment E8	dec	10
P-089	Terminal function assignment E9	dec	11

(\*) Different value for each machine.

## SIEMENS SPINDLE PARAMETER LIST, BMC30HT, BMC30M, &amp; BMC30SSM

<i>P No.</i>	<i>DESCRIPTION</i>	<i>DIMENSION</i>	<i>SETTING</i>
P-090	Control word	hex	1H
P-091	Frequency filter 1, HPC	Hz	300
P-092	Quality filter 1, HPC	dec	1.00
P-093	Offset correction, speed setpoint HPC	hex	0H
P-094	Normalization, speed setpoint HPC	RPM	65
P-095	Power section code number	dec	8
P-096	Motor code number	dec	133
P-097	Initialization	hex	1H
P-098	Encoder pulse number, motor measuring system	dec	2048
P-099	Firmware release	dec	2.30
P-100	Operating display	-	N/A
P-101	Setpoint for open-loop torque controlled operation	%	N/A
P-102	Speed actual value	RPM	N/A
P-103	Frequency, torque setpoint filter	Hz	300
P-104	Quality, torque setpoint filter	dec	1.00
P-106	Smoothing time, speed setpoint, HPC	ms	100
P-107	Frequency, filter 2 HPC	Hz	300
P-108	Quality, filter 2 HPC	dec	1.00
P-109	Torque limit, HPC	%	100
P-110	Regenerative limit, HPC	%	100
P-111	P-gain, speed controller HPC	dec	10.0
P-112	Integral action time, speed controller HPC	ms	20
P-113	Channel selection, speed setpoint	hex	3H
P-114	Normalization, speed setpoint, C axis	RPM	65
P-115	Offset correction, speed setpoint, C axis	hex	0H
P-116	Correction, P-gain, current controller	dec	0
P-117	Selection, torque setpoint filter	hex	0H
P-118	Type, torque setpoint filter	hex	0H
P-119	Flux adaptation HPC	%	100
P-120	Changeover speed, current contr. adapt.	RPM	2200
P-121	Position reference value 1	dec	0
P-122	Position reference value 2	dec	0
P-123	Position reference value, incremental	dec	256
P-124	Position reference value 3	dec	0
P-125	Position reference value 4	dec	0
P-126	Bandwidth, integrator enable speed controller	dec	10.0
P-128	Actual position reference value	dec	N/A
P-129	Setting the internal zero mark	hex	0H
P-130	Zero mark offset	dec	(*)
P-131	Max. pulse number between 2 zero marks	dec	2048

(\*) Different value for each machine.

## SIEMENS SPINDLE PARAMETER LIST, BMC30HT, BMC30M, &amp; BMC30SSM

<i>P No.</i>	<i>DESCRIPTION</i>	<i>DIMENSION</i>	<i>SETTING</i>
P-132	Absol. pos. act. value without zero mark offset	dec	N/A
P-133	Difference between 2 external zero marks	dec	N/A
P-134	Initiation point for P-136	degr.	10.0
P-135	Initiation point for P-137 / P-138	degr.	2.0
P-136	P gain, gradient 1	hex	220H
P-137	P gain, gradient 2	hex	220H
P-138	P gain, gradient 2 (HMS)	hex	44H
P-139	Multiplier for braking parabola	hex	100H
P-140	Absol. pos. actual value with zero mark offset	dec	N/A
P-141	Changeover parameter, positioning	hex	0H
P-142	Flag for speed increase	hex	0H
P-143	Transfer parameter P-141	hex	0H
P-144	Response bandwidth, relay 1	degr.	2.00 <sup>C3</sup>
P-145	Response bandwidth, relay 2	degr.	5.00
P-146	Search speed for spindle positioning	RPM	-500 <sup>B1</sup>
P-147	Position counter status regarding the BERO	dec	N/A
P-148	Motion window, spindle positioning	degr.	1.0
P-149	Start-up parameter C axis/position	hex	21H
P-150	Board identification	hex	300H
P-151	Write protection	hex	N/A
P-152	Transfer parameter into the EEPROM	hex	N/A
P-154	Oscillation setpoint 1	RPM	0
P-155	Oscillation setpoint 2	RPM	0
P-156	Oscillation interval time 1	ms	1000
P-157	Oscillation interval time 2	ms	1000
P-159	Motor moment of inertia	mot 1 kgm <sup>2</sup>	0.085
P-160	Rated motor output	mot 1 kW	7.9
P-161	Rated motor current	mot 1 A	43.6
P-162	Rated motor voltage	mot 1 V	159.0
P-163	Rated motor speed	mot 1 RPM	525
P-164	Rated motor frequency	mot 1 Hz	18.8
P-165	Motor no-load voltage	mot 1 V	136.0
P-166	Motor no-load current	mot 1 A	18.6
P-167	Stator resistance, cold	mot 1 mΩ	139
P-168	Rotor resistance, cold	mot 1 mΩ	101
P-169	Stator leakage reactance	mot 1 mΩ	196
P-170	Rotor leakage reactance	mot 1 mΩ	272
P-171	Main field reactance	mot 1 mΩ	4150
P-172	Upper speed X <sub>h</sub> characteristic	mot 1 RPM	2200

(\*) Different value for each machine.

## SIEMENS SPINDLE PARAMETER LIST, BMC30HT, BMC30M, &amp; BMC30SSM

<i>P No.</i>	<i>DESCRIPTION</i>		<i>DIMENSION</i>	<i>SETTING</i>
P-173	Speed at the start of field weakening	mot 1	RPM	1525
P-174	Max. motor speed	mot 1	RPM	8000
P-175	Gain factor X <sub>h</sub> characteristic	mot 1	%	128
P-176	Stall torque reduction factor	mot 1	%	100
P-177	Start calculation, motor 1 (P-096)		hex	N/A
P-179	Select, min/max memory		hex	0H
P-180	Enable motor changeover (star/delta)		hex	0H
P-181	Address for min/max memory		hex	D02H
P-182	Min. value min/max memory		hex	N/A
P-183	Max. value min/max memory		hex	N/A
P-185	Address for monitoring 1		hex	C06H
P-186	Threshold for monitoring 1		hex	0H
P-187	Pull-in delay, monitoring 1		s	0.00
P-188	Drop-out delay, monitoring 1		s	0.00
P-189	Hysteresis, monitoring 1		hex	1H
P-190	Address for monitoring 2		hex	C06H
P-191	Threshold for monitoring 2		hex	0H
P-192	Pull-in delay, monitoring 2		s	0.00
P-193	Drop-out delay, monitoring 2		s	0.00
P-194	Hysteresis, monitoring 2		hex	1H
P-195	Lower adaptation speed	mot 1	RPM	1000
P-196	Upper adaptation speed	mot 1	RPM	1200
P-198	P gain, upper adaptation speed	mot 1	dec	24.0
P-199	Reduction factor, P gain	mot 1	%	100
P-201	Integral action time, upper adapt. speed	mot 1	ms	80
P-202	Reduction factor, integral action time	mot 1	%	100
P-203	Control word, speed controller adapt.	mot 1	dec	0
P-206	Selection, transient recorder		hex	N/A
P-207	Set transient recorder		hex	N/A
P-208	Address for start condition		hex	N/A
P-209	Threshold for start condition		hex	N/A
P-210	Address for stop condition		hex	N/A
P-211	Threshold for the stop condition		hex	N/A
P-212	Address, signal 1		hex	N/A
P-213	Address, signal 2		hex	N/A
P-214	Start trace output		hex	N/A
P-215	Shift factor, signal 1		dec	N/A
P-216	Shift factor, signal 2		dec	N/A
P-217	Trigger signal 1		hex	N/A
P-218	Trigger signal 2		hex	N/A

(\*) Different value for each machine.

## SIEMENS SPINDLE PARAMETER LIST, BMC30HT, BMC30M, &amp; BMC30SSM

<i>P No.</i>	<i>DESCRIPTION</i>	<i>DIMENSION</i>	<i>SETTING</i>
P-219	Motor moment of inertia mot 2	kgm <sup>2</sup>	0.085
P-220	Rated motor output mot 2	kW	7.9
P-221	Rated motor current mot 2	A	43.6
P-222	Rated motor voltage mot 2	V	159.0
P-223	Rated motor speed mot 2	RPM	525
P-224	Rated motor frequency mot 2	Hz	18.8
P-225	Motor no-load voltage mot 2	V	136.0
P-226	Motor no-load current mot 2	A	18.6
P-227	Stator resistance, cold mot 2	mΩ	139
P-228	Rotor resistance, cold mot 2	mΩ	101
P-229	Stator leakage reactance mot 2	mΩ	196
P-230	Rotor leakage reactance mot 2	mΩ	272
P-231	Main field reactance mot 2	mΩ	4150
P-232	Upper speed, X <sub>h</sub> characteristic mot 2	RPM	2200
P-233	Speed at the start of field weakening mot 2	RPM	1525
P-234	Max. motor speed mot 2	RPM	8000
P-235	Gain factor X <sub>h</sub> characteristic mot 2	%	128
P-236	Stall torque reduction factor mot 2	%	100
P-237	Start calculation, other motor	hex	N/A
P-238	Motor code number mot 2	dec	133
P-239	Start calculation, motor 2 (P-238)	dec	N/A
P-241	Programmable, signal 1	dec	2
P-242	Programmable, signal 2	dec	6 <sup>B1</sup>
P-243	Programmable, signal 3	dec	1
P-244	Programmable, signal 4	dec	4
P-245	Programmable, signal 5	dec	5
P-246	Programmable, signal 6	dec	9
P-247	Control word signal	hex	0H
P-248	Delay time, fault message F-11	ms	750
P-249	Memory loc. segment, monitor	hex	N/A
P-250	Memory loc. address, monitor	hex	N/A
P-251	Value display, monitor memory location	hex	N/A
P-254	Display of active functions 1	hex	N/A
P-255	Display of active functions 2	hex	N/A
P-258	Speed for max. motor useful speed mot 2	RPM	8000
P-260	n <sub>min</sub> for "n <sub>act</sub> < n <sub>min</sub> " signal mot 2	RPM	12
P-261	Shutdown speed, pulse cancellation mot 2	RPM	2
P-262	n <sub>x</sub> for "n <sub>act</sub> < n <sub>x</sub> " signal	RPM	6000
P-263	Toler. bandw. for "n <sub>act</sub> = n <sub>set</sub> " signal mot 2	RPM	20
P-264	Speed limiting mot 2	RPM	8000

(\*) Different value for each machine.

ATTACHMENT "A"

**SIEMENS SPINDLE PARAMETER LIST, BMC30HT, BMC30M, & BMC30SSM**

<i>P No.</i>	<i>DESCRIPTION</i>		<i>DIMENSION</i>	<i>SETTING</i>
P-265	P gain, speed controller	mot 2	dec	32.0
P-266	Integral action time, speed controller	mot 2	ms	20
P-267	Changeover speed, mot. encoder select.	mot 2	RPM	32000
P-268	Hysteresis, P-267	mot 2	RPM	50
P-269	1st torque limit	mot 2	%	100
P-270	Regenerative limiting	mot 2	%	100
P-271	2nd torque limit	mot 2	%	50
P-272	Changeover speed for P-270	mot 2	RPM	500
P-273	Hysteresis P-272	mot 2	RPM	20
P-274	Switch-in speed, torque setpoint smoothing	mot 2	RPM	4000
P-275	Hysteresis P-274	mot 2	RPM	50
P-276	Frequency, torque setpoint filter	mot 2	Hz	300
P-277	Quality, torque setpoint filter	mot 2	dec	1.00
P-278	Correction, P-gain, current controller	mot 2	dec	0
P-280	Select, torque setpoint filter	mot 2	hex	0H
P-281	Type of torque setpoint filter	mot 2	hex	0H
P-283	Lower adaptation speed	mot 2	RPM	1000
P-284	Upper adaptation speed	mot 2	RPM	1200
P-285	P-gain, upper adaptation speed	mot 2	dec	24.0
P-286	Reduction factor, P-gain	mot 2	%	100
P-288	Integral action time, upper adaptation speed	mot 2	ms	80
P-289	Reduction factor, integral action time	mot 2	%	100
P-290	Changeover speed from Md1 to Md2	mot 2	RPM	2100
P-291	Max. motor temperature (degrees Celsius)	mot 2	deg.C	150
P-292	Changeover speed, current contr. adapt.	mot 2	RPM	2200
P-293	Control word, speed controller adapt.	mot 2	dec	0
P-299	Checksum parameters		hex	(*)
P-311	Current for I/F open-loop control		%	40.0
P-312	Frequency for I/F open-loop control		Hz	0.0
P-313	Selection, I/F open-loop control		dec	0H
P-316	Display P-gain, current controller		dec	N/A
P-340	Speed deviation, slip monitoring		%	10.0
P-341	Torque reduction, slip monitoring		%	50.0
P-343	Delay time, slip monitoring		ms	200
P-344	Torque reduction speed, slip monitoring		%/ms	0.50
P-345	Torque increase speed, slip monitoring		%/ms	0.10
P-346	Hysteresis to P-340		%	0.00
P-347	Speed deviation, actual slip monitoring		%	N/A

(\*) Different value for each machine.

## SIEMENS SPINDLE PARAMETER LIST, BMC4020HT &amp; BMC4020SSM

<i>P No.</i>	<i>DESCRIPTION</i>	<i>DIMENSION</i>	<i>SETTING</i>
P-000	Operating display	-	N/A
P-001	Speed setpoint	RPM	N/A
P-002	Speed actual value	RPM	N/A
P-003	Motor voltage	V	N/A
P-004	Utilization	%	N/A
P-006	DC link voltage	V	N/A
P-007	Motor current	A	N/A
P-008	Motor reactive power	kVA	N/A
P-009	Motor active power	KW	N/A
P-010	Motor temperature	°C	N/A
P-011	Status of the binary inputs	hex	N/A
P-012	Normalization, DAU $n_{act}$ display	%	100.0
P-013	Normalization, DAU P/P <sub>max</sub> display	%	100.0
P-014	Speed for max. motor useful speed	mot 1 RPM	6500
P-015	Offset correction, speed setpoint	hex	(*)
P-016	Ramp-up time, RFG	s	0.01
P-017	Ramp-down time, RFG	s	0.01
P-018	Smoothing time, speed setpoint smoothing	ms	5
P-019	Degree of rounding-off, speed setpoint	dec	0
P-020	Diagnostics, speed actual value	hex	N/A
P-021	$n_{min}$ for “ $n_{act} < n_{min}$ ” signal	mot 1 RPM	65
P-022	Shutdown speed, pulse cancellation	mot 1 RPM	2
P-023	$n_x$ for “ $n_{act} < n_x$ ” signal	mot 1 RPM	6000
P-024	Normalization, setpoint	V	9.5
P-026	Normalization, DAU M/M <sub>rated</sub>	%	100.0
P-027	Toler, bandwidth for “ $n_{act} = n_{set}$ ” signal	mot 1 RPM	30 <sup>C3</sup>
P-028	Diagnostics	hex	N/A
P-029	Speed limiting	RPM	6500
P-030	Min. steady-state speed	RPM	0
P-031	P gain, speed controller	mot 1 dec	15.0 <sup>B1</sup>
P-032	Integral action time, speed controller	mot 1 ms	20
P-033	Encoder resolution for NC	dec	3
P-035	Smoothing time, torque setpoint	mot 1 ms	3
P-036	Encoder phase error correction	dec	0
P-037	Changeover speed, motor encoder evalu.	mot 1 RPM	32000
P-038	Hysteresis, P-037	mot 1 RPM	50
P-039	1st torque limit value	mot 1 %	125
P-040	Regenerative limiting	mot 1 %	100
P-041	2nd torque limit value	mot 1 %	50
P-042	Changeover speed for P-040	mot 1 RPM	500

(\*) Different value for each machine. (\*\*) Different value for HT vs. SSM, see last page for values.

## SIEMENS SPINDLE PARAMETER LIST, BMC4020HT &amp; BMC4020SSM

<i>P No.</i>	<i>DESCRIPTION</i>	<i>DIMENSION</i>	<i>SETTING</i>
P-043	Hysteresis, P-042 mot 1	RPM	20
P-044	Selection, torque setpoint smoothing	hex	1H
P-045	Switch-in speed, torque setpoint smooth mot 1	RPM	4000
P-046	Hysteresis, P-045 mot 1	RPM	50
P-047	M <sub>dx</sub> for “M <sub>d</sub> < M <sub>dx</sub> ” signal mot 1	%	90
P-048	Normalization, torque setpoint	%	100
P-049	Offset, torque setpoint	hex	0H
P-050	Changeover speed from M <sub>d1</sub> to M <sub>d2</sub> mot 1	RPM	2000
P-051	Write protection	hex	N/A
P-052	Transfer parameters into FEPROM	hex	N/A
P-053	Control word	hex	11H
P-054	M19, speed setpoint normalization	RPM	500
P-055	M19, speed setpoint offset correction	hex	0H
P-056	M19, changeover speed	RPM	500
P-058	Switch-off threshold, rounding-off M19	RPM	0
P-062	M19 changeover threshold, I comp., speed cont.	RPM	4
P-063	Max. motor temperature	°C	150
P-064	Fixed temperature	°C	0
P-065	Timer stage, motor temperature alarm	s	240
P-066	Address, DAU 1	hex	3044H
P-067	Shift factor, DAU 1	dec	0
P-068	Address, DAU 2	hex	3048H
P-069	Shift factor, DAU 2	dec	0
P-072	Address, DAU 4	hex	C04H
P-073	Shift factor, DAU 4	dec	0
P-074	Offset, DAU 4	hex	0H
P-076	Address, DAU 3	hex	3050H
P-077	Shift factor, DAU 3	dec	0
P-078	Offset, DAU 1	hex	0H
P-079	Offset, DAU 2	hex	0H
P-080	Offset, DAU 3	hex	0H
P-081	Terminal function assignment E1	dec	1
P-082	Terminal function assignment E2	dec	28
P-083	Terminal function assignment E3	dec	3
P-084	Terminal function assignment E4	dec	6
P-085	Terminal function assignment E5	dec	4
P-086	Terminal function assignment E6	dec	2
P-087	Terminal function assignment E7	dec	9
P-088	Terminal function assignment E8	dec	10
P-089	Terminal function assignment E9	dec	11

(\*) Different value for each machine. (\*\*) Different value for HT vs. SSM, see last page for values.



## SIEMENS SPINDLE PARAMETER LIST, BMC4020HT &amp; BMC4020SSM

<i>P No.</i>	<i>DESCRIPTION</i>	<i>DIMENSION</i>	<i>SETTING</i>
P-090	Control word	hex	1H
P-091	Frequency filter 1, HPC	Hz	300
P-092	Quality filter 1, HPC	dec	1.00
P-093	Offset correction, speed setpoint HPC	hex	0H
P-094	Normalization, speed setpoint HPC	RPM	65
P-095	Power section code number	dec	10
P-096	Motor code number	dec	134
P-097	Initialization	hex	1H
P-098	Encoder pulse number, motor measuring system	dec	2048
P-099	Firmware release	dec	2.30
P-100	Operating display	-	N/A
P-101	Setpoint for open-loop torque controlled operation	%	N/A
P-102	Speed actual value	RPM	N/A
P-103	Frequency, torque setpoint filter	Hz	300
P-104	Quality, torque setpoint filter	dec	1.00
P-106	Smoothing time, speed setpoint, HPC	ms	100
P-107	Frequency, filter 2 HPC	Hz	300
P-108	Quality, filter 2 HPC	dec	1.00
P-109	Torque limit, HPC	%	100
P-110	Regenerative limit, HPC	%	100
P-111	P-gain, speed controller HPC	dec	10.0
P-112	Integral action time, speed controller HPC	ms	20
P-113	Channel selection, speed setpoint	hex	3H
P-114	Normalization, speed setpoint, C axis	RPM	65
P-115	Offset correction, speed setpoint, C axis	hex	0H
P-116	Correction, P-gain, current controller	dec	0
P-117	Selection, torque setpoint filter	hex	0H
P-118	Type, torque setpoint filter	hex	0H
P-119	Flux adaptation HPC	%	100
P-120	Changeover speed, current contr. adapt.	RPM	2300
P-121	Position reference value 1	dec	0
P-122	Position reference value 2	dec	0
P-123	Position reference value, incremental	dec	256
P-124	Position reference value 3	dec	0
P-125	Position reference value 4	dec	0
P-126	Bandwidth, integrator enable speed controller	dec	10.0
P-128	Actual position reference value	dec	N/A
P-129	Setting the internal zero mark	hex	0H
P-130	Zero mark offset	dec	(*)
P-131	Max. pulse number between 2 zero marks	dec	(**)

(\*) Different value for each machine. (\*\*) Different value for HT vs. SSM, see last page for values.

## SIEMENS SPINDLE PARAMETER LIST, BMC4020HT &amp; BMC4020SSM

<i>P No.</i>	<i>DESCRIPTION</i>	<i>DIMENSION</i>	<i>SETTING</i>
P-132	Absol. pos. act. value without zero mark offset	dec	N/A
P-133	Difference between 2 external zero marks	dec	N/A
P-134	Initiation point for P-136	degr.	10.0
P-135	Initiation point for P-137 / P-138	degr.	2.0
P-136	P gain, gradient 1	hex	220H
P-137	P gain, gradient 2	hex	220H
P-138	P gain, gradient 2 (HMS)	hex	44H
P-139	Multiplier for braking parabola	hex	100H
P-140	Absol. pos. actual value with zero mark offset	dec	N/A
P-141	Changeover parameter, positioning	hex	(**)
P-142	Flag for speed increase	hex	0H
P-143	Transfer parameter P-141	hex	0H
P-144	Response bandwidth, relay 1	degr.	2.00 <sup>C3</sup>
P-145	Response bandwidth, relay 2	degr.	5.00
P-146	Search speed for spindle positioning	RPM	-500 <sup>B1</sup>
P-147	Position counter status regarding the BERO	dec	N/A
P-148	Motion window, spindle positioning	degr.	1.0
P-149	Start-up parameter C axis/position	hex	21H <sup>E4</sup>
P-150	Board identification	hex	300H
P-151	Write protection	hex	N/A
P-152	Transfer parameter into the EEPROM	hex	N/A
P-154	Oscillation setpoint 1	RPM	0
P-155	Oscillation setpoint 2	RPM	0
P-156	Oscillation interval time 1	ms	1000
P-157	Oscillation interval time 2	ms	1000
P-159	Motor moment of inertia	mot 1 kgm <sup>2</sup>	0.170
P-160	Rated motor output	mot 1 kW	11.5
P-161	Rated motor current	mot 1 A	66.2
P-162	Rated motor voltage	mot 1 V	149.0
P-163	Rated motor speed	mot 1 RPM	500
P-164	Rated motor frequency	mot 1 Hz	17.7
P-165	Motor no-load voltage	mot 1 V	128.0
P-166	Motor no-load current	mot 1 A	27.8
P-167	Stator resistance, cold	mot 1 mΩ	87
P-168	Rotor resistance, cold	mot 1 mΩ	48
P-169	Stator leakage reactance	mot 1 mΩ	131
P-170	Rotor leakage reactance	mot 1 mΩ	145
P-171	Main field reactance	mot 1 mΩ	2620
P-172	Upper speed X <sub>h</sub> characteristic	mot 1 RPM	2300
P-173	Speed at the start of field weakening	mot 1 RPM	1600

(\*) Different value for each machine. (\*\*) Different value for HT vs. SSM, see last page for values.

## SIEMENS SPINDLE PARAMETER LIST, BMC4020HT &amp; BMC4020SSM

<i>P No.</i>	<i>DESCRIPTION</i>		<i>DIMENSION</i>	<i>SETTING</i>
P-174	Max. motor speed	mot 1	RPM	6500
P-175	Gain factor X <sub>h</sub> characteristic	mot 1	%	141
P-176	Stall torque reduction factor	mot 1	%	100
P-177	Start calculation, motor 1 (P-096)		hex	N/A
P-179	Select, min/max memory		hex	0H
P-180	Enable motor changeover (star/delta)		hex	0H
P-181	Address for min/max memory		hex	D02H
P-182	Min. value min/max memory		hex	N/A
P-183	Max. value min/max memory		hex	N/A
P-185	Address for monitoring 1		hex	C06H
P-186	Threshold for monitoring 1		hex	0H
P-187	Pull-in delay, monitoring 1		s	0.00
P-188	Drop-out delay, monitoring 1		s	0.00
P-189	Hysteresis, monitoring 1		hex	1H
P-190	Address for monitoring 2		hex	C06H
P-191	Threshold for monitoring 2		hex	0H
P-192	Pull-in delay, monitoring 2		s	0.00
P-193	Drop-out delay, monitoring 2		s	0.00
P-194	Hysteresis, monitoring 2		hex	1H
P-195	Lower adaptation speed	mot 1	RPM	1000
P-196	Upper adaptation speed	mot 1	RPM	1200
P-198	P gain, upper adaptation speed	mot 1	dec	24.0
P-199	Reduction factor, P gain	mot 1	%	100
P-201	Integral action time, upper adapt. speed	mot 1	ms	80
P-202	Reduction factor, integral action time	mot 1	%	100
P-203	Control word, speed controller adapt.	mot 1	dec	0
P-206	Selection, transient recorder		hex	N/A
P-207	Set transient recorder		hex	N/A
P-208	Address for start condition		hex	N/A
P-209	Threshold for start condition		hex	N/A
P-210	Address for stop condition		hex	N/A
P-211	Threshold for the stop condition		hex	N/A
P-212	Address, signal 1		hex	N/A
P-213	Address, signal 2		hex	N/A
P-214	Start trace output		hex	N/A
P-215	Shift factor, signal 1		dec	N/A
P-216	Shift factor, signal 2		dec	N/A
P-217	Trigger signal 1		hex	N/A
P-218	Trigger signal 2		hex	N/A
P-219	Motor moment of inertia	mot 2	kgm <sup>2</sup>	0.170

(\*) Different value for each machine. (\*\*) Different value for HT vs. SSM, see last page for values.

## SIEMENS SPINDLE PARAMETER LIST, BMC4020HT &amp; BMC4020SSM

<i>P No.</i>	<i>DESCRIPTION</i>		<i>DIMENSION</i>	<i>SETTING</i>
P-220	Rated motor output	mot 2	kW	11.5
P-221	Rated motor current	mot 2	A	66.2
P-222	Rated motor voltage	mot 2	V	149.0
P-223	Rated motor speed	mot 2	RPM	500
P-224	Rated motor frequency	mot 2	Hz	17.7
P-225	Motor no-load voltage	mot 2	V	128.0
P-226	Motor no-load current	mot 2	A	27.8
P-227	Stator resistance, cold	mot 2	mΩ	87
P-228	Rotor resistance, cold	mot 2	mΩ	48
P-229	Stator leakage reactance	mot 2	mΩ	131
P-230	Rotor leakage reactance	mot 2	mΩ	145
P-231	Main field reactance	mot 2	mΩ	2620
P-232	Upper speed, X <sub>h</sub> characteristic	mot 2	RPM	2300
P-233	Speed at the start of field weakening	mot 2	RPM	1600
P-234	Max. motor speed	mot 2	RPM	6500
P-235	Gain factor X <sub>h</sub> characteristic	mot 2	%	141
P-236	Stall torque reduction factor	mot 2	%	100
P-237	Start calculation, other motor		hex	N/A
P-238	Motor code number	mot 2	dec	134
P-239	Start calculation, motor 2 (P-238)		dec	N/A
P-241	Programmable, signal 1		dec	2
P-242	Programmable, signal 2		dec	6 <sup>B1</sup>
P-243	Programmable, signal 3		dec	1
P-244	Programmable, signal 4		dec	4
P-245	Programmable, signal 5		dec	5
P-246	Programmable, signal 6		dec	9
P-247	Control word signal		hex	0H
P-248	Delay time, fault message F-11		ms	750
P-249	Memory loc. segment, monitor		hex	N/A
P-250	Memory loc. address, monitor		hex	N/A
P-251	Value display, monitor memory location		hex	N/A
P-254	Display of active functions 1		hex	N/A
P-255	Display of active functions 2		hex	N/A
P-258	Speed for max. motor useful speed	mot 2	RPM	6500
P-260	n <sub>min</sub> for “n <sub>act</sub> < n <sub>min</sub> ” signal	mot 2	RPM	12
P-261	Shutdown speed, pulse cancellation	mot 2	RPM	2
P-262	n <sub>x</sub> for “n <sub>act</sub> < n <sub>x</sub> ” signal		RPM	6000
P-263	Toler. bandw. for “n <sub>act</sub> = n <sub>set</sub> ” signal	mot 2	RPM	20
P-264	Speed limiting	mot 2	RPM	6500
P-265	P gain, speed controller	mot 2	dec	32.0

(\*) Different value for each machine. (\*\*) Different value for HT vs. SSM, see last page for values.

## SIEMENS SPINDLE PARAMETER LIST, BMC4020HT &amp; BMC4020SSM

<i>P No.</i>	<i>DESCRIPTION</i>		<i>DIMENSION</i>	<i>SETTING</i>
P-266	Integral action time, speed controller	mot 2	ms	20
P-267	Changeover speed, mot. encoder select.	mot 2	RPM	32000
P-268	Hysteresis, P-267	mot 2	RPM	50
P-269	1st torque limit	mot 2	%	100
P-270	Regenerative limiting	mot 2	%	100
P-271	2nd torque limit	mot 2	%	50
P-272	Changeover speed for P-270	mot 2	RPM	500
P-273	Hysteresis P-272	mot 2	RPM	20
P-274	Switch-in speed, torque setpoint smoothing	mot 2	RPM	4000
P-275	Hysteresis P-274	mot 2	RPM	50
P-276	Frequency, torque setpoint filter	mot 2	Hz	300
P-277	Quality, torque setpoint filter	mot 2	dec	1.00
P-278	Correction, P-gain, current controller	mot 2	dec	0
P-280	Select, torque setpoint filter	mot 2	hex	0H
P-281	Type of torque setpoint filter	mot 2	hex	0H
P-283	Lower adaptation speed	mot 2	RPM	1000
P-284	Upper adaptation speed	mot 2	RPM	1200
P-285	P-gain, upper adaptation speed	mot 2	dec	24.0
P-286	Reduction factor, P-gain	mot 2	%	100
P-288	Integral action time, upper adaptation speed	mot 2	ms	80
P-289	Reduction factor, integral action time	mot 2	%	100
P-290	Changeover speed from Md1 to Md2	mot 2	RPM	2000
P-291	Max. motor temperature (degrees Celsius)	mot 2	deg.C	150
P-292	Changeover speed, current contr. adapt.	mot 2	RPM	2300
P-293	Control word, speed controller adapt.	mot 2	dec	0
P-299	Checksum parameters		hex	(*)
P-311	Current for I/F open-loop control		%	40.0
P-312	Frequency for I/F open-loop control		Hz	0.0
P-313	Selection, I/F open-loop control		dec	0H
P-316	Display P-gain, current controller		dec	N/A
P-340	Speed deviation, slip monitoring		%	10.0
P-341	Torque reduction, slip monitoring		%	50.0
P-343	Delay time, slip monitoring		ms	200
P-344	Torque reduction speed, slip monitoring		%/ms	0.50
P-345	Torque increase speed, slip monitoring		%/ms	0.50
P-346	Hysteresis to P-340		%	0.00
P-347	Speed deviation, actual slip monitoring		%	N/A

(\*) Different value for each machine. (\*\*) Different value for HT vs. SSM, see last page for values.

ATTACHMENT "B"

SIEMENS SPINDLE PARAMETER LIST, BMC4020HT & BMC4020SSM

ORIENT SPECIFIC FUNCTIONS FOR "HT" VS. "SSM"

<i>P No.</i>	<i>BMC4020HT</i>	<i>BMC4020SSM</i>
P-131	2048	1638
P-141	0H	2H

(\*). Different value for each machine. (\*\*). Different value for HT vs. SSM, see last page for values.