

UPGRADE INSTRUCTIONS

for

SINUMERIK 840D
Software Version 07.04.08.00

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1 Requirements for Upgrade

Software version 07.04.08.00 (NCK 65.01.00) is a version for software update and further development. The NCK functionality corresponds to software version 07.02.12.00 (NCK 59.05.00) with additional new functions. The drive software has been changed with version 07.04.08.00.

The current upgrade instructions are part of the release for general availability in Prodis Aktuell.

1.1 System software 07.04.08.00 (NCK Version 65.01.00)

Export versions		
Order number	Designation on PC card 16MB	For hardware
6FC5250-7DY30-4AH0	NCU system software 2 axes	NCU *.4/ NCU*.5
6FC5250-7CY30-4AH0	NCU system software 6 axes	NCU *.4/ NCU*.5
6FC5250-7BY30-4AH0	NCU system software 12 axes	NCU *.4/ NCU*.5
6FC5250-7AY30-4AH0	NCU system software 31 axes	NCU *.4/ NCU*.5
6FC5250-7HY30-4AH0	NCU system software for 4 axes grinding	NCU *.4/ NCU*.5
Standard versions (restricted to exports)		
Order number	Designation on PC card 16MB	For hardware
6FC5250-7CX30-4AH0	NCU system software 6 axes	NCU *.4/ NCU*.5
6FC5250-7BX30-4AH0	NCU system software 12 axes	NCU *.4/ NCU*.5
6FC5250-7AX30-4AH0	NCU system software 31 axes	NCU *.4/ NCU*.5

Software V07.04.nn cannot be used for older NCU types.

The following module types are permissible:

6FC5357-0BB34-0AE1
6FC5357-0BB_4-0AA_
6FC5357-0BB_5-0AA_
6FC5357-0BB35-0AE0

1.2 Tools

- for software version V07.04.nn a 16MB PC card (6FC5247-0AA11-1AA3) is required.
- 6FC5250-6AY00-3AG0 (...-4AG0) SinuCom NC with SinuCom FFS
For PC card programming SinuCom FFS is to be used for software version 6.4.13 and higher.
- 6FC5252-7AX21-4AG0 :tool box V 07.04.01 with basic PLC program 07.04.01
PG/PC with STEP7 Version 5.2 and higher and optional online MPI link.
- Current documentation for SW 7 with additional information on the functions.

1.3 PLC operating system

- PLC314C-2DP auf NCU *.4 firmware version >= 10.60.22
- PLC317-2DP auf NCU *.5 firmware version >= 20.71.30

1.4 Machine control panel

Version 02.01.01

(version 01.02.03 enables bus address 6 only)

2 Data Backup

2.1 General requirements for upgrade

Prior to upgrading the NCK ensure that at least 50KB dynamic memory is available for each channel. This can be checked in MD18050 INFO_FREE_MEM_DYNAMIC. If less memory is available, additional memory must be provided by extending MD18210 USER_MEM_DYNAMIC. If this is not possible, a more powerful CPU must be used, or unused memory must be released. The machine data, which are identified in the list as D-RAM, are suitable for this purpose.

An additional 50KB of static memory should be available. This can be checked with MD18060 INFO_FREE_MEM_STATIC. If the available memory is insufficient, memory space can be freed by unloading NC programs.

Set machine data 11210 UPLOAD_MD_CHANGES_ONLY = FF, 11220 INI_FILE_MODE = 1 or 2.

2.2 Data backup

- **NCK**

Before the NCK is upgraded, a backup must be made to permit recovery of the machine's current database. This is done by creating a series start-up file.

- **PLC**

In addition to the NCK backup, a PLC backup must be created. This backup must be performed with the PLC in Stop state. Set S4 on the NCU module to position 2. This will switch the PLC to the Stop state.

If you want to upgrade the basic PLC program you will need STEP 7. For this, you will have to install the new tool box via SETUP. You also need the customer project of this system. The required blocks are transferred from the new tool box library to the customer project (or a copy). OBs FC12 and DB 4 must not be transferred (these are blocks for creating new user programs) because they have been modified by the machine manufacturer. After having replaced the NCK software, transfer the blocks to the PLC by using STEP7. A new PLC series start-up file is to be created.

- **Replacing the software**

Switch off the control and replace the PC card. The card stays in the control. Set switch S3 to position 1, set S4 to position 3 and switch on the control. When it has powered up, the state "7-Segment display shows digit 6 / PLC LED PS flashes / PF red" is established. The NC standard machine data have now been loaded. NC and PLC are cleared.

The PLC is started up by switching S4 from position 3 to position 0
=> S4 in position 3 => S4 in position 0. Now the PLC must switch to Run mode.
Set S3 to position 0.

You can check the software version in menu *Diagnosis/Service Displays/Version*.

- **Loading the backups**

Once the manufacturer password has been set, the NCK backup can be loaded in menu *Services/ Series start-up/Load start-up archive/* after selecting the back-up file.

Once completed, the PLC backup can be loaded.

Once the PLC backup file has been loaded you must switch the system off and on again so that all components are powered up at the same time.

3 General Information

3.1 General restrictions

- Function G643 (block-internal smoothing) has been released for applications in the tool change area (e.g. optimizations for approaching the tool change position). It is not enabled for applications in the machining process.
- Function G644 (smoothing at max. possible dynamics) has been released for applications in the tool change area (e.g. optimizations for approaching the tool change position). It is not enabled for applications in the machining process.
- The functions FCUB and FLIN in combination with compressor COMPCAD have not been released.
- PROFIBUS master-slave coupling with NCU *.4 as slave has not been released.

3.2 Frames

If \$MC_MM_SYSTEM_FRAME_MASK Bit 1 = 1, the work offset external will be suppressed by G153. This represents a change in behavior compared to other releases of software version 6.

The default of \$MC_CHSFRAME_POWERON_MASK has changed. MD24008 is now defaulted with zero (previously "one"). The system frame for the scratching function is therefore also maintained via power ON reset

3.3 Series start-up file

The series start-up enables an easy and quick start-up of machines of the same series. These machines must have the same electrical equipment (e.g. NCU CPU, software) and the same mechanical conditions. If they do not match, the series start-up is not necessarily a suitable method for a start-up. You will then have to choose another method for data backup (e.g. separate data backups with Initial.ini etc.), as machine data might have to be adjusted.

Pay special attention to the different NCU memory limits. If they are fully utilized, the memory space might not suffice after an NCK software upgrade or replacement of an NCU.

Prior to creating the data backups, machine data \$MN_UPLOAD_MD_CHANGES_ONLY is to be checked. It should be defaulted with value "0" or "FF"hex. Other values such as "1" may cause problems on reading in the data backup after software upgrades. Value FFhex is to be preferred.

3.4 Restriction of the number of axes and channels

In software version 6.5.10 and higher, the different software variants (two axes...31 axes versions) can be used on all NCUs of type *.4 and type *.5.

PLC programs can thus be maintained as general programs that can be used for different machine variants. This way it is possible to manage 6, 12 or 31 physical axes out of 31 axes.

The restriction of the number of axes and channels is still valid.

The following combinations are possible:

HW \ SW	2A/2C	6A/2C	12A/2C	31A/10C
561.4 / 5	2A/2C	2A/2C	2A/2C	2A/2C
571.4 / 5	2A/2C	6(31)A/2C	6(12)A/2C	6(31)A/2C
572.4 / 5	2A/2C	6(31)A/2C	12(31)A/2C *)	31A/6C
573.4 / 5	2A/2C	6(31)A/2C	12(31)A/2C *)	31A/10C

A=axes, C=channel, 2(31)=two out of 31 axes

*) for software version 07.02.12 and higher: 12(31)A/4C.

3.5 DMP block

The number of axes including the DMP block is limited to 31. If, for example, a DMP block is used with 31-axis software, at total of 30 axes are still possible.

3.6 Alarm 14132: incorrect configuration of orientation axes

This alarm is output in case of errors on assigning orientation axes to the machine kinematics. However, this alarm will also occur, if no position measuring system is active on an axis involved in the transformation.

3.7 Alarm 10752: local block buffer overflow during tool radius compensation

Output of alarm 10752 can be avoided by increasing machine data
\$MC_CUTCOM_MAXNUM_DUMMY_BLOCKS=41.

3.8 Alarm 380001 PROFIBUS DP: Ramp-up error cause 1002 parameter 00

The alarm is output after deleting the PLC with S4 in position 3. It should no longer occur after loading of the basic PLC program.

3.9 Alarm 15150: reloading from external sources was aborted

Output of alarm 15150 can be avoided by increasing the value of machine data
\$MN_MM_EXT_PROG_BUFFER_SIZE.

3.10 Spindle data

The machine data for describing the spindle dynamics must be set in such a manner that it approximately corresponds to the actual dynamics of the spindle. If the values are increased unnecessarily, alarms may occur during changeover from spindle to positioning operation.

3.11 NCU system resources

The NCU load due to position controllers and interpolators should not exceed 60-65% in "reset" mode. The current load can be checked under diagnostics/system stress

3.12 Log file 07.04.08.00 31 axes

```
-----  
|          P C M _ V E R S          |  
| usage: Version: V02.03 from 21.06.99 |  
| <path / name of PCM - imagefile *.abb > |  
|          S I N U M E R I K 8 4 0 D   A U T / E 2 3 1   |  
|          C O N T E N T S          |  
|          0 7 . 0 4 . 0 8 8 4 0 D 3 1 A   1 0 s t _ v i e w   |  
-----
```

PCM - Version: 02.18

```
-----  
System          Versionstamp   Date   Checksum Linkdate/Time   Length   at  
-----  
Monitor Loader   65.01.00 02/05/06 020506 1AE7CAFC 02/05/06 13:50:41 017E14 000140  
Communic.Monitor 01.01.07 10.05.94|100594 5C080795 10/05/94 13:26:36 0030D0 017F54  
Communic.System 05.07.00 05/03/14|150305 7F89160B 15/03/05 15:01:40 00D0D8 01B024  
PLC314C-FB15SI07.04.01 07.04.02*06/04/21 210406 1F99EB56 21/04/06 10:01:39 00A4FC 0280FC  
PLC317-FB15 SI07.04.01 07.04.02*06/04/21 210406 CAD946FC 21/04/06 10:03:08 007D84 0325F8  
Monitor System 65.01.00 02/05/06 020506 F42956BA 02/05/06 13:50:18 0040E0 03A37C  
Operating System 65.01.00 02/05/06|020506 1D4AE8A5 02/05/06 13:51:02 00BFA4 03E45C  
Numeric ContSI65.01.00 65.01.00 05/05/06| 80506 C55F3D38 8/05/06 10:21:34 37D254 04A400  
VSA System SI05.01.32 05.01.34 27/06/06 270606 E3148D6A 27/06/06 08:57:27 03C8E4 3C7654  
VSA Data Description 05.01.34 26/06/06 260606 87A15A94 26/06/06 10:34:01 004B90 403F38  
VSA Default Data 05.01.34 26/06/06 260606 198EBEFA 26/06/06 10:34:01 000BB4 408AC8  
Drive Version Info 05.01.34 26/06/06 260606 61180B45 26/06/06 12:51:49 01FE90 40967C  
-----
```

HSA System	SI05.01.32	05.01.34	27/06/06	270606	E4DEA23D	27/06/06	08:58:56	03CC68	42950C
HSA Data Description	05.01.34	26/06/06	260606	6ADE7D1D	26/06/06	10:34:01		005E50	466174
HSA Default Data	05.01.34	26/06/06	260606	ED76CD28	26/06/06	10:34:01		000E90	46BFC4
SLM Data Description	05.01.34	26/06/06	260606	9767ADF3	26/06/06	10:34:01		004A90	46CE54
SLM Default Data	05.01.34	26/06/06	260606	DA57D17B	26/06/06	10:34:01		000BB4	4718E4
Inverter Codes	06.08.13	26/06/06	20606	C767E8BE	2/06/06	15:52:58	0010E8	472498	
VSA Motor Codes	06.08.13	26/06/06	20606	639577A3	2/06/06	15:52:59	00A23C	473580	
HSA Motor Codes	06.08.13	26/06/06	20606	EF0A4700	2/06/06	15:52:58	003A74	47D7BC	
SLM Motor Codes	06.08.13	26/06/06	20606	B34AF980	2/06/06	15:52:58	003C24	481230	
VSA Inverter Data	06.08.13	26/06/06	010606	360F73EE	01/06/06	17:02:26	000518	484E54	
VSA Motor Data	06.08.13	26/06/06	010606	C0EAC2C8	01/06/06	17:02:26		00A254	48536C
HSA Inverter Data	06.08.13	26/06/06	010606	55652695	01/06/06	17:02:26	0003A0	48F5C0	
HSA Motor Data	06.08.13	26/06/06	010606	123DFF80	01/06/06	17:02:26	005110	48F960	
SLM Motor Data	06.08.13	26/06/06	010606	2A299B9B	01/06/06	17:02:27		002A6C	494A70
DriveSystem	SI06.08.12	06.08.14	28/06/06	280606	A1988A40	28/06/06	13:05:28	05FBA8	4974DC
VSA-2 Data Description	06.08.14	26/06/06	280606	B7185B03	28/06/06	13:05:08		00A6D0	4F7084
VSA-2 Default Data	06.08.14	26/06/06	280606	C904CBB9	28/06/06	13:05:10		002110	501754
HSA-2 Data Description	06.08.14	26/06/06	280606	59FD32A9	28/06/06	13:05:08		009F50	503864
HSA-2 Default Data	06.08.14	26/06/06	280606	F97433DE	28/06/06	13:05:10		002124	50D7B4
SLM-2 Data Description	06.08.14	26/06/06	280606	9E1E3603	28/06/06	13:05:08		00A6D0	50F8D8
SLM-2 Default Data	06.08.14	26/06/06	280606	496DC8F2	28/06/06	13:05:10		002110	519FA8
HLA System	01.02.15	21/12/05	211205	A7DE713A	21/12/05	14:06:16	0359C0	51C0B8	
HLA Data Description	01.02.15	21/12/05	211205	962F04E3	21/12/05	14:06:43		003410	551A78
HLA Default Data	01.02.15	21/12/05	211205	3393C91E	21/12/05	14:06:44	000D78	554E88	
HLA Valve Data	01.02.15	21/12/05	211205	4F233E4D	21/12/05	14:35:49	001E68	555C00	
Driver Module	01.01.01	14.06.94	50899	B838268F	5/08/99	18:30:36	0000C4	557A68	
Serialnumber	01.01.01	24.01.95	221100	0327C431	22/11/00	11:27:40	0000D4	557B2C	
NCK Anpasszyklen fuer	07.01.05	26/04/06	250406	8B231CA6	25/04/06	16:42:58		002E7C	557C00
Joblist for IBN	02.03.00	03/24/06	80506	73BB60CE	8/05/06	10:22:26	00039C	55AA7C	
Joblist for IBN/KOMP	02.03.00	03/24/06	80506	6E382009	8/05/06	10:22:27	0003CC	55AE18	
Joblist for UPGRADE	02.03.00	03/24/06	80506	DB7C2F39	8/05/06	10:22:29		0003B4	55B1E4
Link Loader	05.01.01	98/06/03	061098	F50A5D72	06/10/98	08:37:23	00029C	55B598	
Link Debugger Aequidis	05.03.01	00/11/28	281100	E5024825	28/11/00	13:42:35		0091AC	55B834
Link Software Aequid	05.02.05	02/01/07	070102	6083ACE7	07/01/02	11:05:01		008A8C	5649E0
DP Software Aequid	01.00.06	02/08/13	130802	FCAE5BA2	13/08/02	10:36:01		01FC18	56D46C
NCKS840d-31a10c	65.01.00	05/05/06	80506	365D7784	8/05/06	10:22:18		00089C	58D084
NCKS840d-31a10c	65.01.00	05/05/06	80506	365D778C	8/05/06	10:22:18		00089C	58D920
NCKS840d-31a10c6	65.01.00	05/05/06	80506	43026723	8/05/06	10:22:20		0008F4	58E1BC
NCKS840d-2a2c	65.01.00	05/05/06	80506	429531E6	8/05/06	10:22:17	000D54	58EAB0	

number of bytes: 0x0058F804 length of ABB file: 0x01000000

3.13 Machine control panel

The machine control panel is operated on MPI, OPI or via PROFIBUS.

3.14 Contour handwheel

The 'Contour handwheel' function is now locked through an option.

If the function is selected through the VDI interface DB[channel].DBB30 without a set option, travel-out of residual NC distances will not be derived from the handwheel motion (as previously). Present residual distances are moved out of the material and alarm "22400 channel%1 option contour handwheel not set" (cancel clear) is displayed.

3.15 Alarm 1000 system error 100000

The 16 MB PC card can only be used in certain NCU modules (see section 1.1).

3.16 Variable \$AA_POWER

The following signals **cannot** be used for diagnostics.

- \$AA_Power
- Servo trace signal active power
- DAC signal active power

Alternatively the active power can be determined from the measured torque setpoint and the actual speed (servo trace, DAC):

$$P_{\text{nom(act)}} = M_{\text{nom}} * 2\pi * N / 60$$

4 Secondary Conditions

4.1 PLC memory capacity of NCU *.4

A load memory of 480KB is guaranteed for the user. It is possible to exceed this limit, i.e. to occupy more memory space. However, this may cause problems on reading in PLC series start-up files. Message: memory full.

4.2 Auxiliary functions in OB40

Sporadically, the PLC does not recognize auxiliary functions in the following combinations:

H/T function analysis in OB40 (parameter IRAuxfuT/H =true of FB1)

In the part program:

```
m=qu(55)
```

```
h2=33
```

The H function is lost sporadically.

Remedy: program m55.

4.3 Coupled-axis groupings

When coupled-axis groupings are switched on via synchronized actions or across the channels, the user is to assure that the control parameters (e.g. acceleration, velocity) of the slave axis are met. In these cases, no verification is performed in the NC.

4.4 NCU link

When NCUs are combined via the link function, NCUs of the same type will always (MLFB) have to be used.

If a link connection with different interpolation cycles is to be configured, the basic system clock rates of both systems must be the same. Otherwise alarm 4013 with error code SYSCLOCK_SAMPLE_TIME_RATIO is displayed.

Exception:

It must be considered that processors with different cycles are used in the NCUs. If a service job can only replace a module by a faster NCU, the slower NCU must be the master. It is not mandatory that all NCUs are replaced.

4.5 Gantry axes

If the slave axis in a gantry grouping rotates in the opposite direction (AX_MOT_DIR=1), the function generator (rectangular) must not be used.

4.6 Loadable compile cycles

It is possible to load a maximum of ten loadable compile cycles. They include libraries with file extension ????.ELF.

Loading of more than one technological function may cause incorrect value assignments. This effect will occur, if loadable compile cycle applications do not set up their machine data according to consistently ascending numbers within the three sections NCK, channel and axis MD.

Loading of a correct archive might cause mutual overwriting of the contents of individual CC machine data.

4.7 Alarm 4185

Assigned help functions that are not active and have not been rejected by an alarm are recognized now. Alarm 4185 is output in this case.

4.8 Program pre-processing

When the program pre-processing function is used, alarms 15170 "Program could not be compiled" and 15450 "Unable to save the compiled program" are output after an upgrade to SW 6.4.

Reason:

Under SW 6.4, the compiled program is no longer stored in SRAM, but in DRAM instead.

However, via MD \$MN_MM_DRAM_FILE_MEM_SIZE, sufficient DRAM memory has to be reserved for this purpose.

But there is also the option of storing the compiled program in SRAM, if the DRAM memory space does not suffice. To do so, set \$MN_PREPROCESSING_LEVEL, bit 6.

4.9 PLC starting behavior

- It is impermissible to operate NCU *.4 in switch position 1 of S4. The PLC would not start the cyclic operation after reset or power OFF/ON.

- If the PLC was put to a stop state by a PI service or a PG operation (e.g. on loading a hardware configuration), it will have to be restarted by PG operation or by using switch S4. Power OFF/ON or reset will not start the cyclic operation.

4.10 Alarm 380040 in software version 7.2.nn

If the alarm is displayed in Power Line, an address conflict between the existing PLC I/Os and the prepared machine data for Solution Line has occurred. In the case of error, an address must be assigned in machine data MD 13050 Drive Logic Address which has not be configured in the PLC.

5 Overview of New Functions in Software V 07.04.07.00 and Higher

5.1 Couplings

Due to the introduction of generic couplings, the user can select the coupling characteristics required for his application. This is achieved by flexible programming. Additional coupling characteristics can be used later without a problem.

5.2 Output order of the M functions can be specified after block search

The collected values of the M functions after block search are available through the system variables. The order can be determined by a predefined procedure.

The correct order and tool dependency, if required, can be ensured in the ASUB after block search by using an application. Current output of the M functions can be locked with NC start after block search.

5.3 Conversion routines RTOB/BTOR

Conversion routines rtob/btor have been implemented for changeover from REAL<>BOOL.

5.4 Safety

The number of safety checksums has been extended for version 7.4.6 and higher:

MD_SAFE_DES_CHECKSUM[0] and [1] and MD_SAFE_ACT_CHECKSUM[0] and [1] are available now. For 840D Power Line the value of the MD_SAFE_DES_CHECKSUM[1]=0.

Both checksums must be copied after upgrade.

5.5 Safety

The maximum values of the following machine data have been increased:

- safe_velo_switch_delay → 10 min.
- safe_stop_switch_time_c → 10 min.
- safe_stop_switch_time_d → 10 min.
- safe_stop_switch_time_e → 10 min.
- safe_pulse_disable_delay → 10 min.

5.6 TOOLMAN edge location considerations

Magazine edge locations can now be limited with regard to the tool size.

5.7 ET200Pro-F peripherals (I/Os)

ET200Pro-F peripherals (I/Os) are now supported and can also be used in combination with Safety Integrated.

5.8 Machine data for individual version input

Individual machine data blocks (e.g. channel or axis machine data) can be identified with an individual ID that can be recognized in the control. For this purpose, machine data (that have not analyzed by the control) are now provided in form of a character string, which can also be written through the start-up files (archives) and the standard human-machine interface. The data entered by the user are displayed as additional information in the version display of the NCU and can be read out with the machine configuration / version data.

Example:

```
$MN_OEM_GLOBAL_INFO[0] = mach. type nn / ChanData Version V 1.0
```

5.9 Access to the PROFIBUS I/Os of the NCK

The "NckProfibusCom" functionality enables direct data exchange between the NCK and the PROFIBUS I/Os.

Data can be exchanged via synchronized actions in the part program or compile cycles. The PROFIBUS I/Os are accessed in the IPO cycle.

5.10 PLC user alarms

The maximum number of PLC user alarms has been increased to 32 groups.

6 Functional Improvements and Further Developments Comp. to 07.02.12.00

BRKdb03310	BRKdb08623	BRKdb09546	BRKdb09574	BRKdb09624	BRKdb09670
BRKdb10188	BRKdb10197	BRKdb10214	BRKdb10215	BRKdb10226	BRKdb10294
BRKdb10301	BRKdb10359	BRKdb10394	BRKdb10686	BRKdb10747	BRKdb10889
BRKdb10894	BRKdb10965	CHMdc08853	CHMdc09003	CHMdc09429	CHMdc09531
CHMdc09861	CHMdc09905	CHMdc10006	CHMdc10015	CHMdc10020	CHMdc10038
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ERLde88165 ERLde88207