SIEMENS

HUBITRON HBG800-DP wireless handwheel

SINUMERIK 840D/ 840D sl

Warranty and liability

Note

The application examples are not binding and do not claim to be complete regarding the circuits shown, equipment and any other eventuality. The application examples do not represent customer-specific solutions. They are only intended to provide support for typical applications. You are responsible for ensuring that the described products are used correctly. These application examples do not relieve you of the responsibility to use safe practices in application, installation, operation and maintenance. When using these application examples, you recognize that we cannot be made liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to these application examples at any time without prior notice. If there are any deviations between the recommendations provided in these application examples and other Siemens publications – e.g. catalogs – the contents of the other documents have priority.

We do not accept any liability for the information contained in this document.

Any claims against us – based on whatever legal reason – resulting from the use of the examples, information, programs, engineering and performance data, etc. described in this application example, shall be excluded. Such an exclusion shall not apply in the case of mandatory liability, e.g. under the German Product Liability Act ("Produkthaftungsgesetz"), in case of intent, gross negligence, or injury of life, body or health, guarantee for the quality of a product, fraudulent concealment of a deficiency or breach of a condition which goes to the root of the contract ("wesentliche Vertragspflichten"). The damages for a breach of a substantial contractual obligation are, however, limited to the foreseeable damage, typical for the type of contract, except in the event of intent or gross negligence or injury to life, body or health. The above provisions do not imply a change in the burden of proof to your detriment.

Any form of duplication or distribution of these application examples or excerpts thereof is prohibited without the express consent of Siemens Industry Sector.

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit http://www.siemens.com/industrialsecurity.

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit http://support.automation.siemens.com.

Table of contents

1　General information

The application describes the connection of the HUBITRON HBG 800-DP and HBG 800-DP FS *wireless handwheels* to a SINUMERIK 840D sl, as well as their operation.

Because this application can be used for both handwheel types as well as the SINUMERIK 840D sl, 840D, 840Di sl and 840Di controller types, only the HBG 800-DP and SINUMERIK 840D sl types are mentioned in the subsequent description.

In the application example, the HBG 800-DP emulates partially the buttons on the MCP310/MCP483 *machine control panel (MCP)*.

The assigned buttons of the HBG 800-DP *front foil* supplied from HUBITRON are supported in the application. The free foil buttons are used as follows:

- Button 4 selects axis 4
- Button 16 selects axis 5 and further axes
- Button 8 is assigned for the channel selection
- Button 15 switches between the workpiece-related and the machine-related position display
- Button 14 switches between the workpiece- and the machine-coordinate system

The application has been implemented for the HBG 800-DP with its *factory settings*.

NOTICE	After the application has been integrated, it is the responsibility of the user to thoroughly check the safety-relevant functions of the machine!

1.1　Prerequisites

For the deployment of the application example on
SINUMERIK 840D sl Milling, the following conditions should be satisfied:

- PROFIBUS DP
- 1. – 3. Geometry axes are the 1st – 3rd channel axes of the associated channel
- MCP310/MCP483 signals are transferred to the interface using FC24/FC19
- NCK as of version 5.2

1.2 Installing the wireless handwheel

A description and circuit diagram for the HBG 800-DP wireless handwheel are provided with the product when delivered, or are available at

www.hubitron.de/downloads.htm

Electrically install the device according to the circuit diagram.

Note   Observe the manufacturer's instructions!

For SINUMERIK 840D/840Di it is necessary to connect the handwheel cable.

This is not required for SINUMERIK 840D sl / 840Di sl, provided the handwheel pulses are transferred using PROFIBUS DP.

Use *dip switches* to set the required PROFIBUS DP address at the *connecting adapter* of the HBG 800-DP.

With the *factory setting* (*Invert Out*) of the manufacturer, the '*Feed Stop*' and '*Spindle Stop*' signals have a sensible switching behavior. If you do not wish to use the HBG 800-DP *wireless handwheel* with this default setting, then this can be changed in the HBG *Setup mode*.

1.3 Machine data

The '*Handwheel travel in JOG*' and '*Start-up: Handwheels*' machine data described in the function descriptions must be used for the *wireless handwheel*.

1.3.1 Machine data setting for the HBG handwheel impulse transfer with PROFIBUS DP for SINUMERIK 840D sl / 840Di sl.

Index i = handwheel number in the NCK-1 (example for handwheel 2 => index i = 2-1 =1)

NC-MD11350 $MN_HANDWHEEL_SEGMENT[i] = 5 (PROFIBUS DP)
NC-MD11351 $MN_HANDWHEEL_MODULE[i] = Index +1
NC-MD11352 $MN_HANDWHEEL_INPUT[i] = 1
NC-MD11353 $MN_HANDWHEEL_LOGIC_ADDRESS[i] = address from the STEP7 hardware configuration of the HBG 'Encoder' module (see Figure 2-1).

2 Adaptations to the PLC program

An example for integrating the PLC function "HBG800DP" is saved in the project 'HUB_730_3PN_PLC_V02' of the archive 'Hub_730_3pn_plc_v02.zip'.
The project contains a variable table 'VAT_HBG800_V02' for the diagnostic support of the PLC function.

2.1 Connecting the HBG 800-DP to PROFIBUS DP

The GSD file, as well as additional documentation on the device, are provided on a data storage medium, which belongs to the scope of the HBG 800-DP wireless handwheel. Install the file 'HBG_AFFE.GSD' with 'HBG_1N.BMP' and update the catalog in the SIMATIC Manager. The wireless handwheel can be found in the catalog '*Standard \ PROFIBUS DP \...*' (*see Fig. 2-1*). Open the '*HBG800-DP Gateway V1.00*' directory, and drag '*HBG800-DP*' to the existing PROFIBUS DP master. Assign the PROFIBUS DP address as was selected in *Section1.2* along with the input and output addresses of the module. These must be assigned so that they are contiguous and without any gaps. If the handwheel pulses are transferred using PROFIBUS DP, the address of the '*Encoder*' module must be located within the I/O area. An address assignment example is shown in *Fig. 2-1*. Save the changed configuration with the '*Save and compile*' function!

Fig. 2-1

2.2 Symbol list

The symbol list of the user program must be supplemented to include the following entries. The user must define the block numbers that have not been allocated; the specified data type FB 2 is mandatory for the instance data blocks HBG_Instz_AV / CD / MD.

Table 2-1

Symbol	Address	Data type
HBG800_DP	FC	FC
HBG	DB	DB
HBG_Instz_AV	DB	FB 2
HBG_Instz_CD	DB	FB 2
HBG_Instz_MD	DB	FB 2

2.3 Blocks used

For the HBG 800-DP function expansion, the following blocks are also required in addition to the blocks mentioned in Section 2.2:

- "GET", FB 2 function from the basic PLC program for the corresponding controller version (gp8x0d.. or bp7x0_..).

- Only for SINUMERIK 840D sl variants

  The use of the 'HBG800DP_V0200_sl.AWL' source code for SINUMERIK 840D sl requires the "BHGDisp" function, FC 13 from the bg7x0 PLC basic program.

- Only for SINUMERIK 840D variants

  The use of the 'HBG800DP_V0200.AWL' source code for SINUMERIK 840D requires the "DI_STRING" function, FC 5 from the STEP7 library 'StandardLibrary \ IEC Function Blocks \ Blocks'. If FC 5 already exists in the basic PLC program, copy FC 5 "DI_STRING", insert it in the 'Blocks' directory of your own project and rename it. The symbol list is adapted automatically. Refer to the example HUB_730_3PN_PLC_V02, where "DI_STRING" FC 5 has been renamed as FC505.

2.4   Source code

The blocks listed in the symbol list in Section 2.2 can be generated by compiling the source code files.

'HBG800DP_V0200.AWL' for SINUMERIK 840D / 840 Di or
'HBG800DP_V0200_sl.AWL' for SINUMERIK 840D sl / 840Di sl

The source code has English mnemonics. Place the required STL file in the 'Source' directory of your own PLC project using the "Insert new object / external source" function of the SIMATIC Manager.
Before compiling the source code, you must customize the RD1 and RD2 parameters of the first FB2 "GET" call in the file. Enter for "hbg" the DB address of the 'HBG' symbol specified in the symbol list.

Example:
RD1:= P#DB"hbg".DBX884.0 …   ➜ RD1:=P#DB506.DBX884.0…
RD2:= P#DB"hbg".DBX892.0 …   ➜ RD2:=P#DB506.DBX892.0…

Then compile the HBG800DP_V0200.AWL or HBG800DP_V0200_sl.AWL source code in accordance with the controller variant.

NOTICE	After the first compilation of the source code, load the data blocks from Table 2-1 as well as the blocks before the "HBG800_DP" function named under Section 2.3! After each change and compilation of the source code, you must first load the "HBG800_DP" function, then the "HBG" data block and the associated instance data blocks!

2.5 Integrating the "HBG800_DP" function in the PLC user program

Users must integrate the "HBG800_DP" function into their PLC program so that when the wireless hand-held terminal is active, the machine is operated only from the wireless handwheel. If, before calling the "HBG800_DP" function, the machine control panel buttons are to be evaluated, this can be interlocked using an appropriate logic operation with the 'HBG_Active' parameter.

The "HBG800_DP" function must be called immediately before the "MCP_IFM"/ "MCP_IFM2" function. Please refer to the example below.

The function also uses a data block reserved for it (in the example shown below, DB506) whose DBB0 – DBB9 data area is free for OEM PLC applications.

Example of a multi-channel configuration:

```
CALL "HBG800_DP"(
HBG_On_Condition          :=M200.0,
HBG_Stop                  :=M200.1,
HBG_In                    :=P#I100.0,
HBG_Out                   :=P#Q100.0,
HBG_Safe_But_1            :=I151.2,
HBG_Safe_But_2            :=I151.3,
HBG_Inv_Fd_Sp_Stop        :=TRUE,//  TRUE = HBG factory default setting
HBG_Sel_Channel           :=True,
HBG_Max_Incr              :=100,
HBG_Release_Cus_Key       :=FALSE,
HBG_Sp_Key_to_MCP         :=TRUE,
Sp_Start_Ext_Active       :=FALSE,
MPG2                      :=TRUE,
HWheelMMC                 :=FALSE,
MCP310                    :=FALSE,
HBG_Active                :="ALMSG_DB".A7000xx[36],// 'HBG is active'
HBG_Status                :=DB506.DBB1,
HBG_Req_Channel_Sel       :=DB506.DBX2.0,
HBG_Sp_Stop_Inv           :=DB506.DBX2.1,// *Spindle Stop from HBG
HBG_Sp_Start_Ext          :=DB506.DBX2.2,// Spindle Start from HBG
BAG_No                    :=DB506.DBB3,
Chan_No                   :=DB506.DBB4);


A   "ALMSG_DB".A7000xx[36];// 'HBG is active'
JC cifm;
L   B#16#1;
T   DB506.DBB3;// == BAGNo of function HBG800_DP and MCP_IFM
L   B#16#1;
T   DB506.DBB4;// == ChanNo of function HBG800_DP and MCP_IFM
```

```
cifm:        CALL "MCP_IFM"(
             BAGNo          : = B#16#1,// or DB506.DBB3 for multi mode group app.
             ChanNo         : = DB506.DBB4,// or B#16#1 for single channel app.
             SpindleIFNo    : = B#16#4,
             FeedHold       : = M100.0,
             SpindleHold    : = M100.1);
```

2.6 Explanation of the parameters for the "HBG800_DP" function

Table 2-2

Parameter	Type	Type	Remark
HBG_On_Condition	I	Bool	TRUE: Operation of the HBG has been enabled for the machine. FALSE: Operation of the HBG is locked. The input can be used to lock the activation of the HBG 800-DP for impermissible operating states (e.g. program processing is active, AUTO mode is selected).
HBGStop	I	Bool	Locks the rotary encoder on the HBG and the traversal of the axes using the axis movement buttons. The "HBG Stop" message is shown on the HBG display. This signal can be used to prevent an axis movement by the HBG depending on the machine status.
HBG_In	I	Pointer	Start address for the input signals of the HBG that was assigned in Section 2.1.
HBG_Out	I	Pointer	Start address for the output signals of the HBG that was assigned in Section 2.1.
HBG_Safe_But_1/2	I	Bool	It must be parameterized with the PLC inputs of the wired safety buttons 1 and 2 of the wireless handwheel!
HBG_Inv_Fd_Sp_Stop	I	Bool	TRUE: The HBG supplementary options Out 1 for the 'Invert Feed Stop' button and Out 2 for the 'Invert Spindle Stop' button have the Hubitron factory setting 1. FALSE: Both supplementary options have the setting 0.
HBG_Sel_Channel	I	Bool	TRUE: Button 8 of the HBG 800-DP can be used to select the channel for a multi-channel system configuration using the "HBG800_DP" PLC function. The selected mode group and the channel number are provided in the 'BAG_No' and 'Chan_No' outputs. FALSE: No channel selection by the PLC function.
HBG_Max_Incr	I	Int	The parameter limits the increment value for the INC machine function in handwheel and jogging operation. Input values 1, 10, 100, 1000 and 10000 are

Parameter	Type	Type	Remark
			possible. The maximum value is determined by the deployed MCP types. INC1 preassigns other values.
HBG_Release_Cus_Key	I	Bool	TRUE: The freely assigned customer buttons of the MCP are not masked by the "HBG800_DP" PLC function and so are also available after calling the evaluation function. FALSE: The freely assigned customer buttons of the MCP are masked and are so not available after calling the evaluation function.
HBG_Sp_Key_to_MCP	I	Bool	TRUE: The 'Spindle Stop' and 'Spindle Start' buttons of the HBG 800-DP emulate the 'Spindle Hold' and 'Spindle Start' buttons of the MCP. With the use of MCP310, the 'Spindle Right' button is emulated for 'Spindle Start'. FALSE: The two spindle buttons of the HBG 800-DP do not emulate any spindle buttons of the MCP. The OEM must program the spindle functions. Recommendation: Specify 'TRUE' for MCP483 and the value for MCP310 depending on the OEM application.
Sp_Start_Ext_Active	I	Bool	If the 'HBG_Sp_Key_to_MCP' parameter is preassigned with 'FALSE', this input must be supplied with the 'Spindle Start' signal of the OEM PLC program for evaluation.
MPG2	I	Bool	TRUE: The interface of the second handwheel is used for the HBG handwheel. FALSE: The interface of the first handwheel is used for the HBG handwheel.
HWheelMMC	I	Bool	The preassignment of the parameter should be made the same as the 'HWheelMMC' parameter of the FB1 call in the PLC user program! The handwheel selection must be locked by the HMI during the handwheel operation using HBG 800-DP.
MCP310	I	Bool	Designation of the deployed MCP. The specification 'TRUE' causes the MCP310 (FC24: MCP_IFM2), 'FALSE' causes the MCP483 (FC19:MCP_IFM) interface to be supported.
HBG_Active	O	Bool	TRUE: The buttons, handwheel, potentiometer 1 and potentiometer 2 of the HBG 800-DP are released. FALSE: 'HBG_On_Condition' input of the "HBG800_DP" function has 'FALSE' status, 'HBG-Status' bit 1 or 2 = 1, or there is no wireless connection of the HBG 800-DP.

Parameter	Type	Type	Remark
HBG_Status	O	Byte	Contains the operating information of the HBG 800-DP. Bit 0 = 1: An HBG wireless connection exists Bit 1 = 1: Initialization error of the HBG Bit 2 = 1: No serial connection to the HBG
HBG_Req_Channel_Sel	O	Bool	Each activation of the HBG button 8 causes the output signal for a PLC cycle to have the 'TRUE' status. The OEM can so specify the channel selection for a multi-channel system configuration.
HBG_Sp_Stop_Inv	O	Bool	'TRUE': The 'Spindle Stop' button of the HBG 800-DP is not pressed. The signal can be used in the PLC user program for the 'Spindle Stop' function if the HBG button is not to emulate the 'Spindle Stop' button of the MCP ('HBG_Sp_Key_to_MCP' = 'FALSE').
HBG_Sp_Start_Ext	O	Bool	'TRUE': The 'Spindle Start' button of the HBG is activated. The signal can be used in the PLC user program for the 'Spindle Start' function if the HBG 800-DP button is not to emulate the 'Spindle Start' button of the MCP ('HBG_Sp_Key_to_MCP' = 'FALSE'). The result of the external 'Spindle Start' control must be notified to the 'HBG800_DP' module using the 'Sp_Start_Ext_Active' parameter.
BAG_No	I/O	Byte	The number of the mode group from which the mode signals are read. Input area = B#16#01 – B#16#0A with access to the first MCP. Input area = B#16#11 – B#16#1A with access to the second MCP. Invalid values select mode group number 1 and channel number 1. This parameter receives as input value the same preassignment as the 'BAGNo' parameter of the "MCP_IFM" function! 'HBG_Sel_Channel' parameter = 'FALSE': The input value is transferred to the output. 'HBG_Sel_Channel' parameter = 'TRUE': The mode group number determined by the function is transferred to the output.
Chan_No	I/O	Byte	The channel number for channel signals and for reading the channel data. Input area = B#16#01 – B#16#0A Invalid values select mode group number 1 and channel number 1. This parameter receives as input value the same preassignment as the 'ChanNo' parameter of the "MCP_IFM" function! 'HBG_Sel_Channel' parameter = 'FALSE': The input value is transferred to the

Parameter	Type	Type	Remark
			output. 'HBG_Sel_Channel' parameter = 'TRUE': The channel number selected by the function is transferred to the output.

Note	The following parameters of the 'HBG800_DP' block must have the specified states in order to operate the device. HBG_On_Condition : = TRUE HBGStop : = FALSE HBG_Active : = TRUE

2.7 Parameterizing the FB1 "RUN_UP" for the "HBG800_DP" function

The 'NCKomm' parameter must be supplied with the 'TRUE' setting.

2.8 Adapting the "HBG800_DP" function

The OEM can change the HBG800DP_V02...AWL source code to customize the functions of the wireless handwheel to its own requirements. The possibilities are described in the following sections.

2.8.1 Free OEM data storage

The "HBG" data block defined in the symbol list (see Section 2.2) makes the data bytes 0 – 9 available to the users for integration of the "HBG800_DP" function in their PLC program.

2.8.2 OEM text

The variable 'Text_1_OEM' contains general information that is displayed when the HBG 800-DP is switched on. For the application example, the following text

```
HBG 800-DP
SIN840D sl
```

is entered. The OEM can save its own information here, such as company name, machine type.

Note: Variables with defined text lengths are stored in the '// Start OEM modifications of HBG application' area of the 'HBG' data block. Any changes to these text lengths require a change to the preassigned pointers and consequently all subsequent pointers must be adapted.

2.8.3 Display resolution

The 'NC_MD510xy' variable can be used to adapt the display resolution of the HBG 800-DP to the controller in the '// Start OEM modifications of HBG application' area of the data block.

2.8.4 Axis selection

This function uses the channel axis number to determine the information of the axis names, the current axis values (such as position and speed) and the machine axis number. If no machine axis number is assigned to a channel axis number, its selection causes the

```
SIN840D sl
ModeGr Ch
```

text to be displayed. A new axis selection is required.

HBG 800-DP can be used to specify the axis selection for each channel in the '// Start OEM modifications of HBG application' area of the 'DATA BLOCK HBG'.

The axis selection button for the channel axis assignment is defined in the 'ChanAx_No_Chx' (x = channel number) variables. This makes it possible to

specify the sequence or cause the axes to be hidden. Because of the Axis selection button to the Geometry axis assignment, 'ChanAx_No_Chx[1]' to 'ChanAx_No_Chx[3]' should not be changed.

Axis selection button 1 is assigned to 'ChanAx_No_Chx[1]', axis selection button 2 is assigned to 'ChanAx_No_Chx[2]', etc. 'ChanAx_No_Chx[5]' to maximum 'ChanAx_No_Chx[20]' are selected using axis selection button 5; after the number of active channel axes is reached, the numbering begins with 'ChanAx_No_Chx[5]' again. The value of the array includes the channel axis number.

Note The separating of the channel axis numbers and the filling of the freed axes with '0'' in the 'ChanAx_No_Chx' parameter produces the most efficient axis selection on the HBG 800-DP for the operator.

Application examples for channel 1 with eight axes are shown in Table 2-3.

Table 2-3

No.	Application description
1.	ChanAx_No_Ch1: ARRAY [1..20] OF INT:=1,2,3,4,5,6,7,8,9,10,… Axis selection buttons 1 - 4 are permanently assigned to ChanAx_No_Chx[1] – [4]. Channel axes 1 - 4 are selected accordingly for axis selection buttons 1 - 4. Axis selection button 5 selects channel axes 5 – 8, channel axes 9,10, … are not affected by the selection.
2.	ChanAx_No_Ch1: ARRAY [1..20] OF INT:=1,2,3,5,4,6,7,8,9,10,… Axis selection button 4 selects channel axis 5; axis selection button 5 selects channel axis 4 and 6 - 8.
3.	ChanAx_No_Ch1: ARRAY [1..20] OF INT:=1,2,3,0,5,6,7,8,9,10,… If 'ChanAx_No_Chx[1] – [4]' has the value 0, no new axis is selected and the most recently selected axis remains available.
4.	ChanAx_No_Ch1: ARRAY [1..20] OF INT:=1,2,3,4,5,0,0,8,9,10,… If one of the "ChanAx_No_Chx[5] – [20]' arrays contains the entry 0, the next array with an entry larger than 0 is fetched. Button 5 selects channel axes 5 and 8; axes 6 and 7 are hidden.
5.	ChanAx_No_Ch1: ARRAY [1..20] OF INT:=1,2,3,5,6,7,8,9,10,… Axis selection button 4 selects channel axis 5; axis selection button 5 selects channel axes 6 - 9. Channel axis 9, however, does not exist in the example.
6.	ChanAx_No_Ch1: ARRAY [1..20] OF INT:=1,2,3,5,6,7,8,0,9,10,… Axis 4 is hidden, axis selection button 4 selects channel axis 5; axis selection button 5 selects channel axes 6 - 8.

2.8.5 Lock or release MCP buttons

With activated wireless handwheel, the buttons and the switch of the MCP are locked, except for the 'Reset', 'Spindle Hold' and 'Feed Hold' buttons. The 'HBG_Release_Cus_Key' = 'FALSE' or 'TRUE' parameter can be used to lock or release the free customer buttons.

NOTICE	The user is responsible for releasing the locked MCP buttons. The user must also guarantee safety for man and machine by the releasing this button lock.

In the 'HBG On/Off' network, 'Skip inputs of MCP' area of the 'HBG800_DP' function, it is possible to specifically release or lock buttons of the machine control panel, for example the RESET button. The buttons are masked using the instruction 'L DW#16#Wert' and can be affected by adding or subtracting the bit-specific value in the corresponding byte.

Example:

The RESET button must be locked for the MCP483. The associated signal is bit 7 of the input byte (n+3). The instruction 'L DW#16#00001580' masks byte (n+0 – n+3) of the input area. The first two left-justified positions of the numerical value cover 8 bits (bit 7 – 4 and bit 3 – 0) of byte (n+0). Bit 7 has a significance of 8. You must subtract this value from the value 8 of bits 4 – 7 of byte (n+3). Replace the value 'DW#16#00001580' with the value 'DW#16#00001500' for locking the RESET button.

3 Operating the application

3.1 Switching the wireless handwheel on and off

During the switch-on operation, the wireless handwheel should be located in the charging station in order to avoid inadvertently initiating an EMERGENCY OFF signal.

The selected axis is deselected by switching the wireless handwheel on and off.

The EMERGENCY OFF button on the device must be unlocked to switch on the wireless handwheel. Press one of the two safety buttons on the HBG 800-DP hand-held terminal. The connection is established if both safety buttons were released. After successfully establishing the connection, the applied text for this example appears

```
HBG 800-DP
SIN840D sl
```

in the display. The wireless handwheel can now be removed from the charging station.

For the further operation of the wireless handwheel, the HBG release of the machine control must be present.

The override values set on the wireless handwheel become active.

The HBG can be switched off by pressing the EMERGENCY OFF button at the device or by placing it in the charging station.

When switching off the HBG or by clearing the HBG release at the machine control, the set override values of the MCP become active again.

The RESET, 'Spindle Hold' and 'Feed Hold' buttons of the machine control panel are not locked.

3.2 Displays

3.2.1 Text displays

With the operation of the HBG 800-DP, the messages listed in Table 3-1 can appear on the display. The messages overwrite the current display.

Table 3-1

Message	Status
HGB 800-DP SIN840D sl	The wireless connection has been established and the HBG release of the machine control is missing.
SIN840D sl ModeGr Ch	The HBG 800-DP is operational and no axis is selected. The numeric value suffixed to the 'ModeGr' and 'Ch' designators specify the mode group number and the channel number from which the axes are selected.
HBG Stop	Because of the machine status, a lock for axis movements is present. The rotary encoder, the axis movement buttons, the 'Feed Start' button and the 'Spindle Start' button do not have any function on the HBG 800-DP.
NC Alarm	An NC alarm is present. The rotary encoder, the axis movement buttons, the 'Feed Start' button and the 'Spindle Start' button on the HBG 800-DP are locked.
Reset	The Reset button of the machine control panel has been pressed. The rotary encoder, the axis movement buttons, the 'Feed Start' button and the 'Spindle Start' button on the HBG 800-DP are locked.
HBG Status: Bit …	The HBG 800-DP has detected an internal operational status whose information is notified as a bit. The bit and its status are displayed in the second text line. The operation of the HBG is suppressed when the message appears. The operating instructions of the HBG 800-DP wireless handwheel provide information about the HBG status bits.
Data Error: F …	This message is used for the commissioning support of the HBG 800-DP and is not to be expected during its deployment. An error while reading or converting the axis data was detected. The current values can no longer be displayed correctly. The text in the second line indicates the data (e.g. FB2- Act Val) that activated the message. The operation of the HBG 800-DP is locked when this message appears. To acknowledge the message, the HBG release of the machine control or the HBG must be switched on and off.
Application Version V02.00sl / Version V02.00pl	Version details of the HBG 800-DP application for SINUMERIK 840D sl / 840D (e.g. V02.00).

3.2.2   Display information

Pressing an axis selection button selects the desired axis. The selection is indicated by the LED assigned to the selection button illuminating.

The axis name is displayed with maximum five characters and the position value of the selected axis in the first text line of the display. The position value display is shifted to the right if the read position value requires more positions than available in the display. If in this situation the INC machine function is selected, e.g. by pressing the handwheel button, the position value is shifted to the left so that all decimal places are displayed. The deselection of the INC machine function, e.g. by pressing the jogging button, clears the display.

The current values for the speed and the override of the selected axis are displayed in the second text line. They are replaced with the S value and the spindle override value when a spindle is selected.

Note	With SINUMERIK 840D, but not SINUMERIK 840D sl, for very large position values, the position display of the HBG 800-DP, when compared to the position display of the controller, can deviate by several increments at the last decimal places.

3.3   Safety buttons

To select 'Feed start', 'Spindle start' and for axis movements, both safety buttons of the HBG 800-DP must be pressed simultaneously previously. This is also necessary after clearing the '**HBG Stop**', '**NC Alarm**' and '**Reset**' messages.

3.4   Selecting a channel

The third button from the left in the second button row of the HBG 800-DP can be used to select the channel for multi-channel applications from which the axes can be selected for traversing. When the channel is selected, the following information appears

```
SIN840D sl
ModeGr Ch
```

This shows from which mode group and channel the axes are selected. When pressed initially, the channel number is incremented; if this channel is located in another mode group, it will also be updated. When the last channel number is reached, the numbering begins again with the first displayed channel number (normally ModeGr1 CH1).

3.5   Selecting an axis

Pressing an axis selection button selects the desired axis. When the LED associated with the axis selection button illuminates, traversal of the axis is possible. The axis selection buttons 1 – 4 have a permanent axis assignment. The fifth axis selection button (first button row, third button from the left) can be used to select axis 5 and other axes. The selection of the last axis reselects the fifth axis. The selected axis can now be traversed in jog or handwheel operation.

3.6 Traversing an axis

3.6.1 Jogging

The initial pressing of the jog operation button causes the handwheel function to be deselected and jog operation to be activated. The selection is indicated by the LED assigned to the jog operation button illuminating.

To traverse the selected axis, the two safety buttons must be pressed simultaneously previously and then one of the axis movement buttons pressed.

When the jog operation button is pressed again, the INC1 machine function is selected and the 'I1' increment value appears in the second text line instead of the F or S value. When the button is pressed again, the increment is increased; when the F or S value reappears in the display, the INC machine function is deactivated.

3.6.2 Handwheel

The handwheel is activated by pressing the handwheel button. When the button is pressed initially, jog operation is deselected and the INC1 machine function selected. The 'I1' increment value appears in the second text line rather than the F or S value. Pressing the button again increases the increment. INC1 is reselected when the maximum value is reached.

To traverse the axis, the two safety buttons must be pressed simultaneously previously and then the handwheel activated.

3.7 Switchover of the WCS/MCS display system

The right-hand button of the first button row of the HBG 800-DP can be used to switch the position display of the axis between workpiece position and the machines position. The position display is made with the metric/inch unit system of the display system. With the display of the workpiece position, the LED assigned to the button illuminates. The selection of the workpiece coordinate system (WCS) suppresses the switchover. In spindle operation, spindles are always displayed with the axis designator of the machine display system (MCS). In axis operation, spindles in the WCS display system receive the channel-specific axis designator.

3.8 Switchover of the WCS/MCS coordinate system

The right-hand button of the second button row of the HBG 800-DP emulates the 'WCS MCS' button of the machine control panel. The LED in the button is switched together with the 'WCS MCS' LED of the MCP. When the button is pressed, the selected axis is deselected and the following text appears

```
HBG 800-DP
SIN840D sl
```

When the button is pressed, a switchover is made between the workpiece coordinate system (WCS) and the machine coordinate system (MCS). If the workpiece coordinate system is selected, the WCS display system is preset automatically.

The X, Y, Z axis selection buttons are used to select the desired geometry axis in the workpiece coordinate system (WCS). If the WCS coordinate system with active transformation is selected, the geometry axis involved with the transformation will be identified with the 'Geo' suffix to the axis name, e.g. 'XGeo'. This indicates to the user that a different machine axis performs the movement. If the machine coordinate system (MCS) with active transformation is selected, the channel axis involved with the transformation is displayed with the name of the assigned geometry axis, e.g. 'XGeo'. Machine axes retain their axis identifier.

3.9 DRF (Differential Resolver Function) handwheel function

With the detection of the DRF handwheel function, the axis selection using the HBG selects automatically the MCS coordinate system, as well as the INC 1 machine function and the handwheel. The text 'DRF' appears instead of the override value. The handwheel button can be used to change the increment!

The position display of the selected axis shows with the MCS display system the machine position; the WCS display system displays the DRF offset.

To traverse the axis, the two safety buttons must be pressed simultaneously previously and then the handwheel pressed.

4 Internet links

This list does not claim to be complete and provides only a selection of suitable information.

Table 4-1

	Topic	Title
\1\	HUBITRON control technology downloads	http://www.hubitron.de/downloads

5 Contact

Siemens AG

Industry Sector
I DT MC MTS APC 1 2
Frauenauracher Strasse 80
D - 91056 Erlangen
mailto: MC-MTS-APC-Tech-Team.i-dt@siemens.com

6 History

Table 6-1

Version	Date	Revision
V1.0	05/2013	First edition
V2.0	04/2014	Second edition – traversal of axes from different channels