

Function block H4U.app Position Force

H4U.app xF - TIA Portal

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English

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1 About this documentation

1.1 About this documentation

This documentation is valid for the following products:

- **H4U.app** Position Force



This Quick Start Guide is valid only in conjunction with the application manual "Function block **H4U.app** Position Force" (R.01939-FK).

Read the commissioning instructions and, in particular, the above document completely before working with the function block.



This document describes the function block for a TIA Portal. This function block is therefore referred to as TIA_H4Uapp_xF in the following description.

2 Description

2.1 Brief description

The software module **H4U.app** xF controls the position (x) or force (F) of a hydraulic axis. It is used to activate valves and pump systems (fixed or variable displacement pump), which control the hydraulic axis.

The software module can be integrated directly in the PLC application of the existing machine control.

The **H4U.app** xF supports various system topologies for valve-controlled and displacement-controlled axes. In the case of valve-controlled axes, the software monitors and compensates system pressures for an optimized velocity feedforward control. For pump-based control concepts the app determines limiting values for the control on the basis of the performance data of the pump and the motor. Operating state monitoring ensures that the pump is operated within the admissible operating limits.

To allow accelerated parameterization pre-defined data sets are available with technical parameters and characteristic curves for Bosch Rexroth pumps and valves. These data sets are directly used as data structure in the PLC application

2.2 Interface description

The input and output data of the software module **H4U.app** xF are shown in the following figure and the following table.

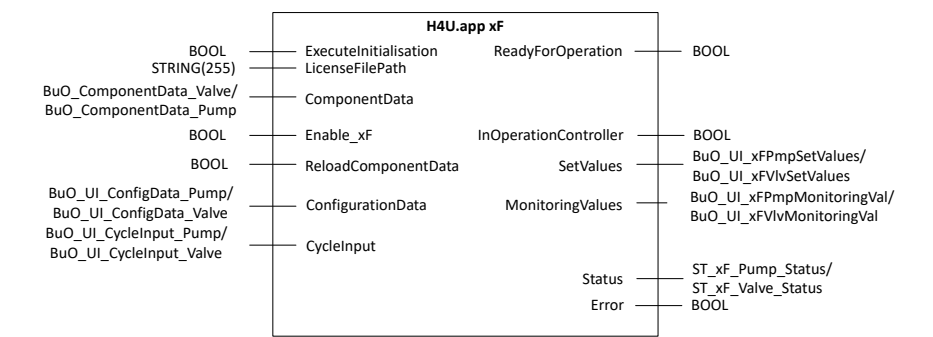


Fig. 1: I/O assignment of the function block.



The structures and functionalities used are described in detail in the Application Manual “Function block **H4U.app** Position Force” (R.01939-FK).

VAR_INPUT						
Name	Type	Min	Max	Def	Unit	Comment
ExecuteInitialisation	BOOL	False	True	False	[-]	Enable of the non-real-time license and component check
LicenseFilePath	STRING(255)	-	-	-	[-]	Path to license file
ComponentData	BuO_Component-Data_Valve/BuO_Component-Data_Pump	-	-	-	[-]	Configuration of components used
Enable_xF	BOOL	False	True	False	[-]	Enable of real-time-capable controller functionality
ReloadComponent-Data	BOOL	False	True	False	[-]	Reload component data at runtime
ConfigurationData	BuO_UI_ConfigData_Pump / BuO_UI_ConfigData_Valve	-	-	-	[-]	Configuration parameters of the controller. (For details, see application manual)
CyclicInput	BuO_UI_CyclicInput_Pump / BuO_UI_CyclicInput_Valve	-	-	-	[-]	Cyclically required input data (for details, see application manual)
VAR_OUTPUT						
ReadyForOperation	BOOL	False	True	False	[-]	The initialization of the H4U.app has been completed and it is possible to call the functionality of the H4U.app .
InOperation-Controller	BOOL	False	True	False	[-]	The function block executes the controller.
SetValues	BuO_UI_xFPmpSetValues/ BuO_UI_xFVlvSetValues	-	-	-	[-]	Actuating values (for details, see application manual)
MonitoringValues	BuO_UI_xFPmpMonitoringVal/ BuO_UI_xFVlvMonitoringVal	-	-	-	[-]	Diagnostic values (for details, see application manual)

Status	ST_xF_Pump_Status/ ST_xF_Valve_Status	-	-	-	[-]	Status of the app (for details, see application manual)
Error	BOOL	False	True	False	[-]	Shows that an error occurred during the execution.

2.3 Functional description

The function block **H4U.app xF** makes available functions for the closed-loop control of position and force control for hydraulic axes. Before the controller functionality can be used, initializing with license and component database check has to be executed. To this end, first the path to the license file has to be written at input *LicenseFilePath* and the component data at input *ComponentData*. The license and component data check is started with a rising edge at input *ExecutelInitialisation*. After the check is completed, the output switches to *ReadyForOperation* = TRUE.

After successful initialization the controller functionality can be utilized. The function block is parameterized with input *ConfigurationData* and the required actual and command values are applied to input *CyclicInput*. The controller functionality is activated with input *Enable_xF* = TRUE.

Reloading of the component data at runtime can be triggered with the input *ReloadComponentData*. During reloading of component data, the output remains *ReadyForOperation* = TRUE.

As long as the input is set *Enable_xF* = TRUE, license enabling is stored. For a change in licensing, a new license file has to be handed over and initializing has to be restarted with *ExecutelInitialization*. Afterwards, the change is only accepted upon an edge reversal at *Enable_xF*. The license file may only be read in anew while the system is in a safe state.

In the event of an error, output *Error* changes from FALSE to TRUE and the cause of error can be determined from the structure at output *Status*. Invalid component data will not result in an error (for details, see application manual).

2.4 Integrating the library

To be able to use the **H4U.app xF** in the TIA Portal, the provided library has to be imported:

- Activate the license in the Bosch Rexroth licensing portal (for this you require the serial number of the control unit) and download the license file: ➡ <https://licensing.boschrexroth.com/>
 ⓘ For licensing enter the serial number of the control without blank before the year.
- The license file is to be stored in the file system in the directory "*UserFiles/*". The path to the license file then has to be handed over to the **H4U.app**.
 ⓘ For some systems, a suitable card reader is required for the memory card used for storing the license file.
 ⓘ The file name and the license name can be adapted if you wish to use, for example, a common file path for several projects.
- Depending on the actuator use the appropriate module *TIA_H4Uapp_xF_Pump* or *TIA_H4Uapp_xF_Valve* for the next steps.

4. ➤ Integrate the function block in the application project as illustrated in the implementation example. It is recommended that the function block be globally instantiated. Initializing should be carried out in a task with low priority, which can be blocked until initializing is completed. The controller functionality has to be executed in a fast task that meets hard real-time requirements.
5. ➤ Select the component data for Bosch Rexroth pumps or valves, respectively, from the available database and provide it to the input *ComponentData*. If required, updated component data can be made available by the Bosch Rexroth Service in the form of a data block.

Alternative: Hand over own component data, for details, see application manual "Function block **H4U.app** Position Force" (R.01939-FK).

Configuring the **H4U.app**: To this end, import the pre-configuration from the available data block, adapt it according to the application at hand and transmit it to the input *ConfigurationData*. For details, see Application Manual "Function block **H4U.app** Position Force" (R.01939-FK).
6. ➤ Link values of the input structure *CyclicInput* and control values in the output structure *SetValues* according to the system topology. For details, see Application Manual "Function block **H4U.app** Position Force" (R.01939-FK).
7. ➤ For controller optimization, diagnostics and troubleshooting: Details can be found in the Application Manual "Function block **H4U.app** Position Force" (R.01939-FK).

2.5 Implementation example

The function block can be integrated as follows:

```
(**--#-#-#-#-#-#-#---Declaration VAR_Global---#-#-#-#-#-#-#-#*)

DATA_BLOCK "GlobalVar"
VAR
bError: Bool;
bDoInit: Bool;
strErrorState: "ST_xF_Pump_Status";
stPumpData: "BuO_ComponentData_Pump";
strFilePath: String;
END_VAR

BEGIN
strFilePath := 'UserFiles/license.lic';
END_DATA_BLOCK


(**--#-#-#-#-#-#-#---Declaration - Initialisation---#-#-#-#-#-#-#-#*)

FUNCTION_BLOCK "NRT_FB"

VAR
    fbRTrig: R_TRIG; //check for rising edge
    fbPumpDataBase : "PumpDataBase"; // Call pump database to get data structure for pump
END_VAR


(**--#-#-#-#-#-#-#---Implementation - Initialisation ---#-#-#-#-#-#-#-#*)

// This function block is called in a task with a minor priority. No controller action is
performed. This function block is doing the licensing and initialisation of the global
instance of the H4u App XF
// Code for non real time function block
// Call rTrig to check for rising edge
#fbRTrig(CLK := "GlobalVar".bDoInit);
```



```

"fb_h4u_xFPump".ConfigurationData := #stConfigData;
//Set actual values and command values to app
"fb_h4u_xFPump".CyclicInput.ForceAct := #rActForce;
"fb_h4u_xFPump".CyclicInput.ForceCmd := #rDesForce;
"fb_h4u_xFPump".CyclicInput.PositionAct := #rActPos;
"fb_h4u_xFPump".CyclicInput.PositionCmd := #rDesPos;

//Get pump data from provided database when positive flank occurs
IF #fbRTrig.Q THEN
#fbPumpDataBase(CfgPumpType := 1,
    PumpDb => "fb_h4u_xFPump".ComponentData.PumpDataBase[0]);
END_IF;

//Call function block when ready for operating
IF "fb_h4u_xFPump".ReadyForOperation AND := #bReloadComponentData THEN
    "fb_h4u_xFPump"(ReloadComponentData := #bReloadComponentData);
ELSE
    "fb_h4u_xFPump"();
END_IF;

// reset flag after reloading component data
IF "fb_h4u_xFPump".ReadyForOperation AND
"fb_h4u_xFPump".Status.Status_xF_Pump.DoneInit THEN
    #bReloadComponentData := FALSE;
END_IF;

//Set outgoing command values, these values are to be mapped to the physical outputs to
control the device
#rValveCmd := "fb_h4u_xFPump".SetValues.ValveCmd[1];
#rSpeedCmd := "fb_h4u_xFPump".SetValues.SpeedCmd[1];

//Check for errors and copy state output of app to global error var
IF "fb_h4u_xFPump".Error THEN
    "fb_h4u_xFPump".Enable_xF := FALSE;
    "GlobalVar".bError := TRUE;
    "GlobalVar".strErrorState := "fb_h4u_xFPump".Status;
ELSE
    "GlobalVar".bError := FALSE;
END_IF;
//END of Real time function block.
END_FUNCTION_BLOCK

```

3 Service and support

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Preparation of information

We can help you in a fast and efficient way if you keep the following information available:

- Details about the product concerned, particularly the type code and serial number.
- Your contact details (phone number, e-mail address)

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