

<Operationmanual_Basic Gripping_TIA_V2_1(EN).docx>

topic:

<FB Basic Gripping>

version:

<2.1>

History

Author	Reason for change/changes made	Release	Date
Nock	Basic version	1.01	03.04.2019
Nock	Time-optimized, no handshake before motion commands	1.1	21.08.2019
Nock	Displaying parameter change with output bit Automatic reset of the direction flags	1.21	23.03.2020
Nock	Optimization of the drive command routines Addition ErrorReset for StepReset	2.1	01.07.2022

Content

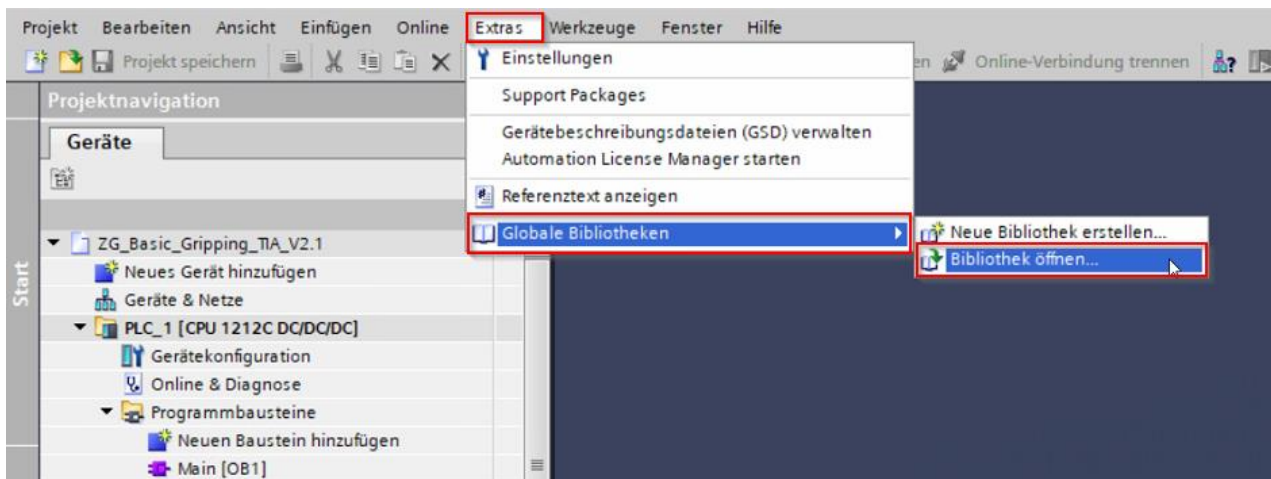
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1 Foreword

For the usage of the function block a correct hardware configuration must be created first. In this example a Siemens CPU1212C DC/DC/DC with a Siemens IO Link master is used. After the hardware settings the function block can be implemented. For this go through the following steps.

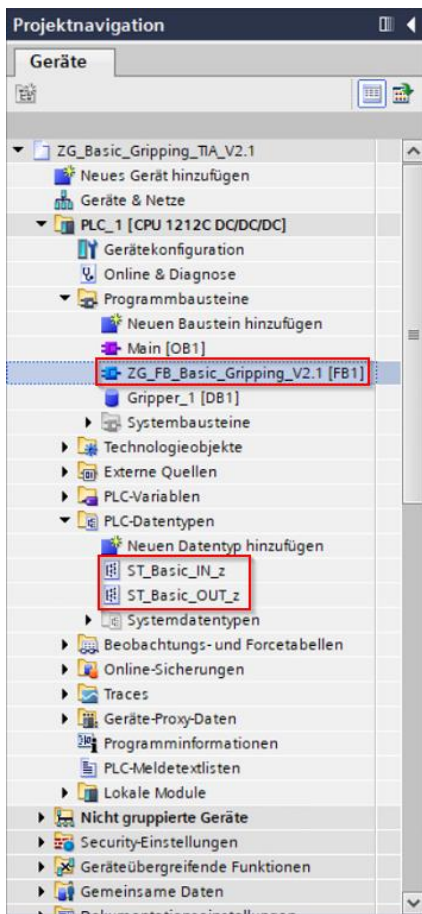
2 Integrating the library

Global libraries can be selected and integrated in the menu „Extra“ -> „Global libraries“ -> „Open library“. Please select the global library „ZG_Basic_Gripping_TIA_V2.1“.



Operation manual function block (TIA Portal)

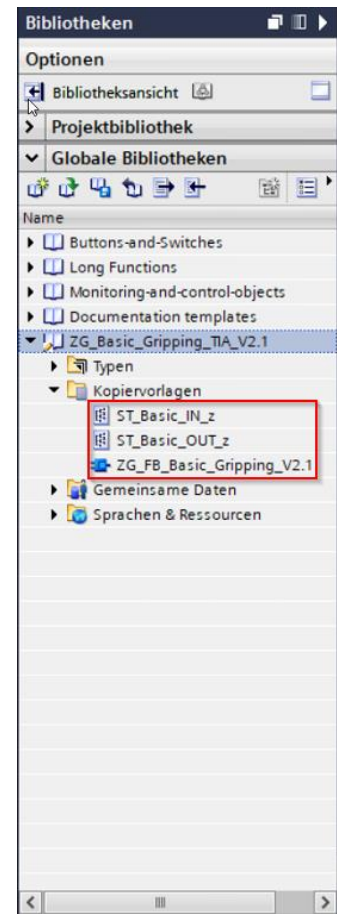
Basic Gripping



A new window now opens at the right edge of the screen, in which the "Global Libraries" can be selected and opened. Select in the folder "Copy templates" the two data types "ST_Basic_IN_z" and "ST_Basic_OUT_z" and copy these under the column "PLC data types" into your project.

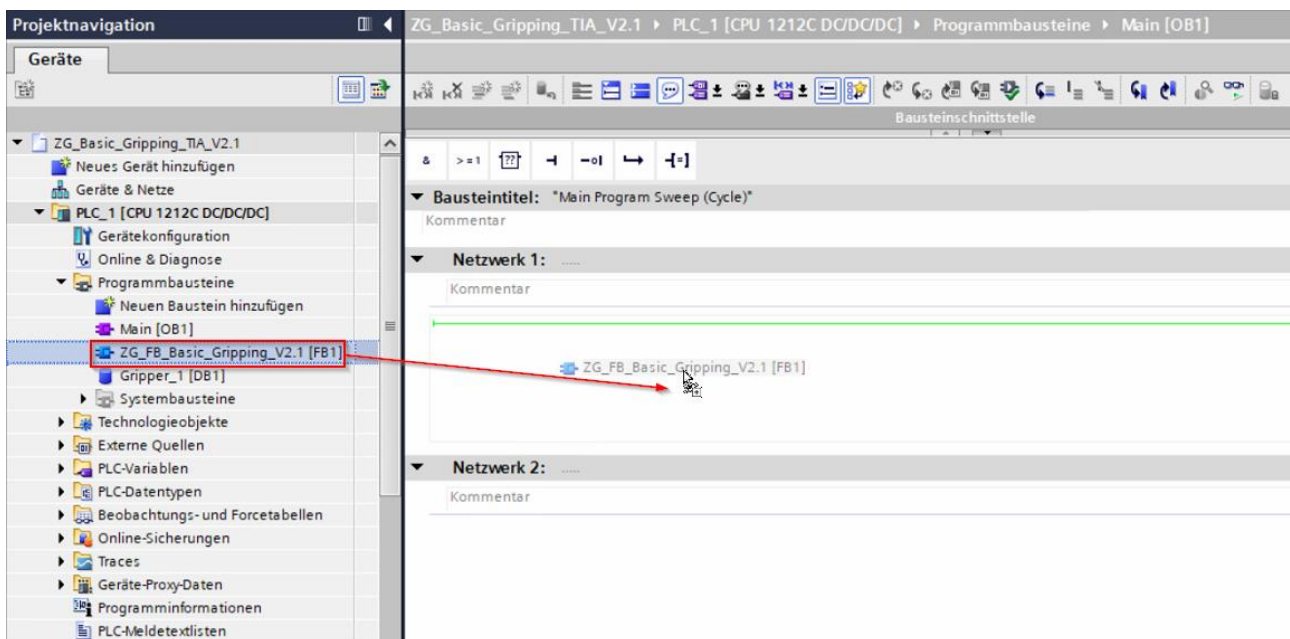
The function block "ZG_FB_Basic_Gripping_V2.1" is inserted under the category "Program blocks".

The copying can be implemented by "Drag&Drop".



3 MAIN

Open the "Main" organization block and copy the "ZG_FB_Basic_Gripping_V2.1" function block into the desired network.



Operation manual function block (TIA Portal)

Basic Gripping

The "Call options" open, in which a single instance is generated. You can name the instance "Gripper_1", for example. If you have several grippers in use, you will need a correspondingly large number of blocks and will have to create additional instances for them.



Nomenclature:

Prefix	Meaning
Inp	Input variable
Out	Output variable
cmd	Command input
b	Binary signal (BOOL)
i8	Variable in byte size (BYTE)
i16	Variable in word size (WORD)
st	Data structure (STRUCT)
t	Time (TIME)
g	Global variable

4 PLC variables

Direct links to the gripper are created in the "PLC variables" section. Open the "Standard variable table" in the project navigation. A variable of the data type "ST_Basic_IN_z" as well as "ST_Basic_OUT"_z must be entered. It is important to enter the correct address that was assigned during the hardware configuration. Only the first address must be entered. The following addresses are generated and assigned automatically.

	Name	Variablen-tabelle	Datentyp	Adresse	Rema...	Erreic...	Schrei...	Sichtb...	Kommen
1	g_st_Gripper1_IN	Standard-Variablen-tabelle	*ST_Basic_IN_z	%I8.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	g_st_Gripper1_OUT	Standard-Variablen-tabelle	*ST_Basic_OUT_z	%Q8.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	<Hinzufügen>				<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

5 Using the function block

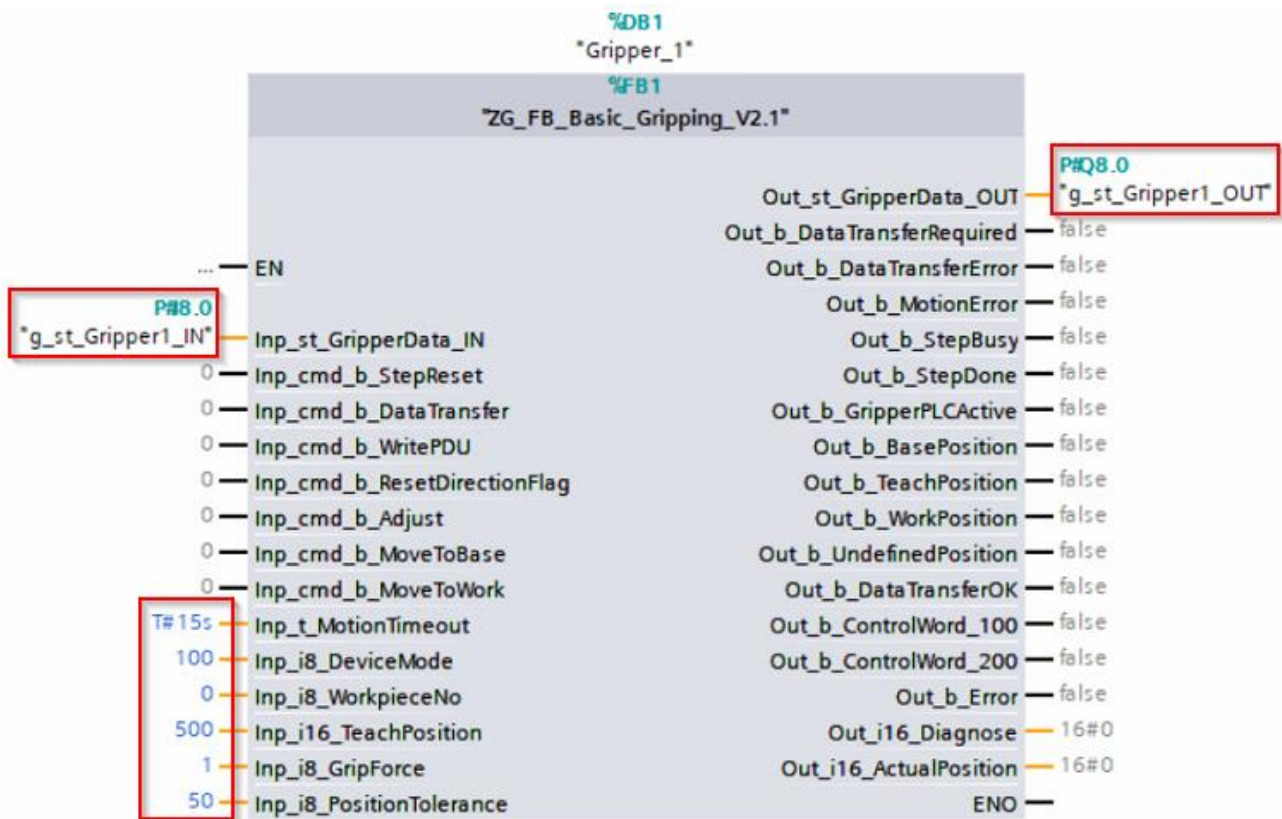
To enable the function block to access the address ranges of the IO-Link data, the variables "Inp_st_GripperData_IN" and "Out_st_GripperData_OUT" must be linked to the variables created in point 4. The gripper can be parameterized by writing to the input variables on the block.

To move the gripper, the position and moving data must be transferred. The values listed in the following table can be used as standard values. Other values may prove to be more suitable. Please refer to the installation and operating instructions. You can enter these parameters as constants on the module, as in this example, or you can use variables of the appropriate length, so that the circuitry is flexible. When not connected, the variables are pre-initialized with the default values.

Variable	Value
Inp_t_MotionTimeout	T#15s
Inp_i8_DeviceMode	100
Inp_i8_WorkpieceNo	0
Inp_i16_TeachPosition	500
Inp_i8_GripForce	1
Inp_i8_PositionTolerance	50

The "Inp_i8_DeviceMode" variable corresponds to the device mode of the gripper. These modes can be found in the assembly and operating instructions of the gripper. In this example, DeviceMode 100 was selected, which corresponds to the "Universal operation" mode.

The finished module should now correspond to the following figure:



Finally, you need to compile the settings and load them into the device.

6 Functions of the function block

Depending on the input wiring of the function block, the corresponding functions are executed. Further information can also be found in the comments in the block header.

6.1 Resetting the step sequence „Inp_cmd_b_StepReset“ (BOOL)

The input variable "Inp_cmd_b_StepReset" resets the step sequence within this block. This happens regardless of which step the block is currently in. If the block issues the error "Out_b_DataTransferError" or "Out_b_MotionError", it can only be acknowledged by this input.

6.2 Transferring data with handshake „Inp_cmd_b_DataTransfer“ (BOOL)

After each change of a process parameter (except "ControlWord") or at a cold start of the gripper, the parameters must be confirmed with a data transfer. If the "Out_b_DataTransferRequired" output variable is "TRUE", the gripper is not yet operating with the currently set parameters. In this case, the process parameters must be transferred with a positive signal edge at the "Inp_cmd_b_DataTransfer" input. The variable "Out_b_DataTransferRequired" then changes to "FALSE". Thereby the "ControlWord" is set to value 1 and waits for bit 12 of the "Status-Word". Bit 12 becomes "TRUE" as soon as the data transfer is completed. Then the "ControlWord" is set to 0 again and waited until bit 12 becomes "FALSE". This procedure is a handshake and should be used for error-free data transfer.

6.3 Saving workpiece recipes „Inp_cmd_b_WritePDU“ (BOOL)

With a positive signal edge, the currently set process parameters at the function block input are stored in the currently set "WorkpieceNo". The "ControlWord" is set to value 2 and bit 12 of the "StatusWord" is wai-

ted for. This procedure can take up to 30 seconds. The parameters are stored in the internal recipe locations and can be reloaded by specifying the "WorkpieceNo". Up to 32 recipes can be stored in the gripper.

6.4 Resetting the direction flags „Inp_cmd_b_ResetDirectionFlag“ (BOOL)

If a gripper is moved in the direction of "WorkPosition", for example, bit 14 of the "Status word" is set in the gripper. This signal remains until a movement in the other direction or a cold start of the gripper. If a gripper is to be moved several times in succession in the same direction, e.g. by changing positions, then this bit must first be reset. This can be done by a positive signal edge at the input "Inp_cmd_b_ResetDirectionFlag". Thereby the "ControlWord" is set to the value 4 and waits until bit 13 and bit 14 of the "StatusWord" change to "FALSE". After this, a new movement in the same direction can be carried out. From block version V1.21 onwards, this procedure is carried out automatically before the gripper is moved, if necessary.

6.5 Drive to BasePosition „Inp_cmd_b_MoveToBase“ (BOOL)

With a positive signal edge, the gripper jaws move with the set device mode in the direction of the set "BasePosition". The "ControlWord" is set to the value 256.

6.6 Drive to WorkPosition „Inp_cmd_b_MoveToWork“ (BOOL)

With a positive signal edge, the gripper jaws move with the set device mode in the direction of the set "WorkPosition". The "ControlWord" is set to the value 512.

6.7 Limiting of the motion time „Inp_t_MotionTimeout“ (TIME) and „Out_b_MotionError“ (BOOL)

The "Inp_t_MotionTimeout" time can be used to define the maximum time the gripper may take to move until it reaches its target position. This depends on the parameterization of the gripper and must be adapted project-specifically. If the gripper does not reach its target position within the set time, the "MotionError" error is activated. The "Out_b_MotionError" output is set to "TRUE".

6.8 Data transfer is required „Out_b_DataTransferRequired“ (BOOL)

The variable "Out_b_DataTransferRequired" is automatically activated if at least one process parameter was changed at the inputs. As long as this variable is active, the gripper has not yet accepted the changed values. For data transfer, a positive signal edge must be set at the "Inp_cmd_b_DataTransfer" input variable. The "Out_b_DataTransferRequired" variable then changes to "FALSE" and the gripper uses the currently set parameters.

6.9 Error in the DataTransfer „Out_b_DataTransferError“ (BOOL)

The "Out_b_DataTransferError" output is set to "TRUE" if the data transfer could not be carried out successfully and the feedback of the gripper was not sent within one second. This can occur, among other things, if the set process parameters are not plausible. The error code can be taken from the variable "Out_i16_Diagnosis". The error codes are described in more detail in the installation and operating instructions. This error can be acknowledged by setting the "Inp_cmd_b_StepReset" input.

6.10 Function block is busy „Out_b_StepBusy“ (BOOL)

If the block is processing a command and is in a step, this output is active and signals that it is blocked for further commands.

6.11 Ready for commands „Out_b_StepDone“ (BOOL)

If the block is in the initial step and ready for commands, this output is "TRUE". Querying this bit before a command for programming step chains is recommended.

6.12 Bit 6 of the StatusWord „Out_b_GripperPLCActive“ (BOOL)

This signal indicates the operational readiness of the control in the gripper. In the event of a cold start or restart after a power failure, the gripper can only receive data again when this signal is "TRUE".

6.13 Bit 8 of the StatusWord „Out_b_BasePosition“ (BOOL)

As soon as the gripper has reached its set "BasePosition" and is at standstill, this signal is activated. The size of the range is defined by the "PositionTolerance".

6.14 Bit 9 of the StatusWord „Out_b_TeachPosition“ (BOOL)

As soon as the gripper has reached its set "TeachPosition" and is at standstill, this signal is activated. The size of the range is defined by the "PositionTolerance".

6.15 Bit 10 of the StatusWord „Out_b_WorkPosition“ (BOOL)

As soon as the gripper has reached its set "WorkPosition" and is at standstill, this signal is activated. The size of the range is defined by the "PositionTolerance".

6.16 Bit 11 of the StatusWord „Out_b_UndefinedPosition“ (BOOL)

If the gripper is stationary and is neither at "BasePosition" nor at "TeachPosition" or "WorkPosition", this signal is "TRUE".

6.17 Bit 12 of the StatusWord „Out_b_DataTransferOK“ (BOOL)

With this bit the gripper gives the feedback that a data transmission has been successfully executed. Therefore it is used in a handshake procedure.

6.18 Bit 13 of the StatusWord „Out_b_ControlWord_100“ (BOOL)

This direction flag becomes active when the gripper has received a "MoveToBase" command. The gripper cannot execute another "MoveToBase" command in this state. The flag is set to "FALSE" again when the gripper receives a "MoveToWork" command or a reset is performed manually via "Inp_cmd_b_ResetDirectionFlag" (see 6.4).

6.19 Bit 14 of the StatusWord „Out_b_ControlWord_200“ (BOOL)

This direction flag becomes active when the gripper has received a "MoveToWork" command. The gripper cannot execute another "MoveToWork" command in this state. The flag is set to "FALSE" again when the gripper receives a "MoveToBase" command or a reset is performed manually via "Inp_cmd_b_ResetDirectionFlag" (see 6.4).

6.20 Bit 15 of the StatusWord „Out_b_Error“ (BOOL) and „Out_i16_Diagnose“ (WORD)

If the diagnostic value of the gripper is not 0, this bit is set. The error code is output in the data word "Out_i16_Diagnosis". The descriptions of the error codes can be taken from the assembly and operating instructions.

6.21 Actual position "Out_i16_ActualPosition" (WORD)

In this data word the actual position of the gripper jaws is output in 0.01mm.