

Learn-/Training Document

Siemens Automation Cooperates with Education (SCE) | From Version V14 SP1

TIA Portal Module 031-600 Global Data Blocks for the SIMATIC S7-1200

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- SIMATIC S7-1200 AC/DC/RELAY (set of 6) "TIA Portal" Order no.: 6ES7214-1BE30-4AB3
- SIMATIC S7-1200 DC/DC/DC (set of 6) "TIA Portal" Order no.: 6ES7214-1AE30-4AB3
- Upgrade SIMATIC STEP 7 BASIC V14 SP1 (for S7-1200) (set of 6) "TIA Portal" Order no.: 6ES7822-0AA04-4YE5

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Global Data Blocks for the SIMATIC S7-1200

1 Goal

In this chapter, you will become acquainted with the use of global data blocks for the SIMATIC S7-1200 with the TIA Portal programming tool.

The module explains the structure and creation of and access to global data blocks for the SIMATIC S7-1200. It also shows the steps for creating a global data block in the TIA Portal and for accessing this data in the program with read and write access.

The SIMATIC S7 controllers listed in Chapter 3 can be used.

2 Prerequisite

This chapter builds on the chapter Analog Values with the SIMATIC S7 CPU1214C DC/DC/DC. You can use the following project for this chapter, for example: "SCE_EN_031-500_Analog_Values_S7-1200.zap14".

3 Required hardware and software

- 1 Engineering station: requirements include hardware and operating system (for additional information, see Readme on the TIA Portal Installation DVDs)
- 2 SIMATIC STEP 7 Basic software in TIA Portal as of V14 SP1
- 3 SIMATIC S7-1200 controller, e.g. CPU 1214C DC/DC/DC with ANALOG OUTPUT SB1232 signal board, 1 AO Firmware as of V4.2.1

Note: The digital inputs and analog inputs and outputs should be fed out to a control panel.

4 Ethernet connection between engineering station and controller



4 Theory

4.1 Data blocks

In contrast to logic blocks, data blocks contain no instructions. Rather, they serve as memory for user data.

Data blocks thus contain variable data that is used by the user program. You can define the structure of global data blocks as required.

Global data blocks store data that can be used **by all other blocks** (see Figure 1). Only the associated function block should access instance data blocks. The maximum size of data blocks varies depending on the utilized CPU.



Figure 1: Difference between global DB and instance DB.

Application examples for global data blocks are:

- Saving of information about a storage system. "Which product is located where?"
- Saving of recipes for particular products.

The data in data blocks is stored retentively in most cases. This data is then retained in the event of a power failure or after a STOP/START of the CPU.

4.2 Data types of the SIMATIC S7-1200

The SIMATIC S7-1200 has many different data types for representing different numerical formats. A list of some of the elementary data types is given below.

Data type	Size (bits)	Range	Example of constant entry
Bool	1	0 to 1	TRUE, FALSE, O, 1
Byte	8	16#00 to 16#FF	16#12, 16#AB
Word	16	16#0000 to 16#FFFF	16#ABCD, 16#0001
DWord	32	16#00000000 to 16#FFFFFFFF	16#02468ACE
Char	8	16#00 to 16#FF	'A', 'r', '@'
Sint	8	-128 to 127	123,-123
Int	16	-32,768 to 32,767	123, -123
Dint	32	-2,147,483,648 to 2,147,483,647	123, -123
USInt	8	0 to 255	123
UInt	16	0 to 65,535	123
UDInt	32	0 to 4,294,967,295	123
Real	32	+/-1.18 x 10 $^{-38}$ to +/-3.40 x 10 38	123.456, -3.4, 1.2E+12 3.4E-3
LReal	64	+/-2.23 x 10 $^{-308}$ to +/-1.79 x 10 308	12345.123456789 -1.2E+40
Time	32	T#-24d_20h_31 m_23s_648ms to T#24d_20h_31 m_23s_647ms Saved as: -2,147,483,648 ms to +2,147,483,647 ms	T#5m_30s 5#-2d T#1d_2h_15m_30x_45ms
String	Variable	0 to 254 characters in byte size	'ABC'
Array		With arrays, data of a uniform data type is arranged one after the other and addressed consecutively in the address area. The properties of each array element are identical and are configured in the array tag.	
Struct		The STRUCT data type represents a data structure that consists of a fixed number of components of different data types. Components of STRUCT or ARRAY data type can also be nested in a structure. For other data types, refer to the online help.	

4.3 Optimized blocks

S7-1200 controllers have optimized data storage. In optimized blocks all tags are automatically sorted based on their data type. The sorting ensures that data gaps between the tags are minimized and the tags are stored in a manner that optimizes their access by the controller.

- The tags are always accessed as fast as possible because the file storage by the system is
 optimized and is independent of the declaration.
- There is no danger of inconsistencies due to incorrect, absolute accesses because symbolic access is generally used.
- Declaration changes do not result in access errors because accesses by process visualization systems, for example, occur symbolically.
- Individual tags can be selectively defined as retentive.
- No settings are needed or possible in the instance data block. Everything will be set in the assigned FB (e.g., retentivity).
- Memory reserves in the data block enable changes to be made without loss of actual values (download without reinitialization).

4.4 Downloading without reinitialization

To enable the subsequent editing of user programs that are already running in a CPU, the S7-1200 controllers support the option of expanding the interfaces of optimized function or data blocks during operation. You can download the modified blocks without switching the controller to STOP mode and without affecting the actual values of previously downloaded tags.



Figure 2: Download without reinitialization

The following steps can be performed while the controller is in RUN mode:

- 1. Activate "Download without reinitialization"
- 2. Insert newly defined tags in an existing block
- 3. Download expanded block to the controller

The newly defined tags are initialized. The existing tags retain their current value.

Prerequisite: a memory reserve must have been defined for the block beforehand and the block with this memory reserve must have downloaded to the CPU.

5 Task

In this chapter, the program from chapter "SCE_EN_031-500 Analog Values_S7-1200" will be expanded to include a data block that centrally provides the parameters for the two functions "MOTOR_SPEEDCONTROL" [FC10] and "MOTOR_ SPEEDMONITORING" [FC11].

6 Planning

The data management and setpoint setting for the "MOTOR_SPEEDCONTROL" [FC10] and "MOTOR_SPEEDMONITORING" [FC11] functions will be carried out using the global data block "SPEED_MOTOR" [DB2].

This will be added to the "031-500_Analog_Values_S7-1200" project. This project must be retrieved from the archive beforehand.

In the "Main" [OB1] organization block, the two functions "MOTOR_SPEEDCONTROL" [FC10] and "MOTOR_SPEEDMONITORING" [FC11] must then be connected with the tags from global data block "SPEED_MOTOR" [DB2].

6.1 Global data block for speed control and speed monitoring of the motor

Speed setpoint and actual speed value will be created in Real data format (32-bit floating-point number) as the first tags in the "SPEED_MOTOR" [DB2] data block. The speed setpoint is thereby given the start value + 10 rpm.

A structure (Struct) 'Positive_Speed' will then be created for monitoring the positive speed limits.

This structure contains the 2 tags 'Threshold_Error' (start value + 15 rpm) and 'Threshold_ Warning' (start value + 10 rpm) in Real data format (32-bit floating-point number) and the 2 tags 'Error' and 'Warning' in Bool data format (binary number).

The structure (Struct) 'Positive_Speed' will then be inserted again as a copy and renamed to 'Negative_Speed' for monitoring the negative speed limits.

The 'Threshold_Error' tag is given the start value - 16 rpm and the 'Threshold_Warning' tag the start value - 14 rpm.

6.2 Technology diagram

Here you see the technology diagram for the task.



Figure 3: Technology diagram

Schalter der Sortieranlage Switches of sorting station	Automatikbetrieb Automatic mode	Handbetrieb / Manual mode -S3 Tippbetrieb -M1 vorwärts/ Manual -M1 forwards
-P1 enton -P4 aktivient/active -P4 aktive -P4 a		 -S4 Tippbetrieb -M1 rückwärts/ Manual -M1 backwards -P7 ausgefahren/extended -S6 Zylinder -M4 ausfahren/ cylinder -M4 extend -S5 Zylinder -M4 einfahren/ cylinder -M4 retract

Figure 4: Control panel

6.3 Reference list

DI	Туре	Identifier	Function	NC/NO
1 0.0	BOOL	-A1	Return signal emergency stop OK	NC
I 0.1	BOOL	-K0	Main switch "ON"	NO
I 0.2	BOOL	-S0	Mode selector manual (0)/ automatic (1)	Manual = 0 Auto = 1
I 0.3	BOOL	-S1	Pushbutton automatic start	NO
I 0.4	BOOL	-S2	Pushbutton automatic stop	NC
I 0.5	BOOL	-B1	Sensor cylinder -M4 retracted	NO
I 1.0	BOOL	-B4	Sensor part at slide	NO
l 1.3	BOOL	-B7	Sensor part at end of conveyor	NO
IW64	BOOL	-B8	Sensor actual value speed of the motor +/-10V corresponds to +/- 50 rpm	

The following signals are required as global operands for this task.

DO	Туре	Identifier	Function	
Q 0.2	BOOL	-Q3	Conveyor motor -M1 variable speed	
QW 64	BOOL	-U1	Manipulated value speed of the motor in 2 directions +/- 10V corresponds to +/- 50 rpm	

Legend for reference list

AI

- DI Digital Input DO Digital Output
 - Analog Input AO Analog Output
- I Input Q Output
- NC Normally Closed
- NO Normally Open

7 Structured step-by-step instructions

You can find instructions on how to carry out planning below. If you already have a good understanding of everything, it will be sufficient to focus on the numbered steps. Otherwise, simply follow the detailed steps in the instructions.

7.1 Retrieve an existing project

Before we can expand the "SCE_EN_031-500_Analog_Values_S7-1200.zap14" project from chapter "SCE_EN_031-500_Analog_Values_S7-1200", we must retrieve this project from the archive. To retrieve an existing project that has been archived, you must select the relevant archive with
Project
Retrieve in the project view. Confirm your selection with Open. (
Project
Retrieve
Select a .zap archive
Open)



- The next step is to select the target directory where the retrieved project will be stored. Confirm your selection with "OK".
 - (® Target directory ® OK)

® Save the opened project under the name 031-600_Global_Data_Blocks_S7-1200.
 (® Project ® Save as ... ® 031-600_Global_Data_Blocks_S7-1200 ® Save)



7.2 Create the global data block "SPEED_MOTOR"

Select the 'Program blocks' folder of your CPU 1214C DC/DC/DC and then click "Add new block" to create a new global data block there.

(® CPU_1214C [CPU 1214C DC/DC/DC] ® Add new block)



® Select in the next dialog and rename your new block to: "SPEED_MOTOR". Select 'Global DB' as the type. The number '2' will be automatically assigned. Select the "Add new and open" check box. Click "OK".

(® Detablished R Name: SPEED_MOTOR ® Type: Global DB ® ■ Add new and open ® OK)

Add new block					×
Name:					
SPEED_MOTOR					
	Type:	Global DB	-		
OB	Language:	DB	*		
Organization block	Number:	2 Manual	\$		
		 Automatic 			
FB	Description: Data blocks (DI	Bs) save program data.			
Function block	more				
=					
Function					
Data block					
> Additional infor	mation				
Add new and open				ОК	Cancel

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- Inte "SPEED_MOTOR" data block is automatically displayed. Start by creating the 'Speed_Setpoint' and 'Speed_Actual_Value' tags shown here with their associated comments. Select 'Real' as the data type. Also set a start value of 10.0 rpm for the 'Speed_Setpoint'.
 - (® Speed_Setpoint ® Real ® 10.0 ® Speed_Actual_Value ® Real)

03	1-600	_Global_Data_Blocks_	_\$7-1200 → CPU_	1214C [CPU 121	4C DC/DC/D)C] → Program	m block	s 🕨 SPEED	_MOTOR [DB2] _∎≡×
1	2	🔩 🛃 🗮 🚏 Keepa	ctual values 🔒 S	napshot 🧤 🛤	Copysnap	shots to start va	lues 🖁	. 🕵 Load	start values	as actual values 📲 🗐
	SPEE	D_MOTOR								
	N	ame	Data type	Start value	Retain	Accessible f	Writa	Visible in	Setpoint	Comment
1	-	Static								
2	-	Speed_Setpoint	Real	10.0						Speed setpoint in revolution per minute (range:+/-50rpm)
3	-	Speed_Actual_Value	Real	0.0						Speed actual value in revolution per minute (range:+/-50rpm)
4		<add new=""></add>								

Note: Be sure to use the correct data types.

® Next we create a tag structure 'Struct' so it can be duplicated later. (® Struct)

i) S	PER	🔩 🛃 🔚 😤 Keepa ED MOTOR	ctual values 🔒 🗄	Snapshot 🔤 🛤	, Copy snap	oshots to start va	lues 🍘	Load	start values	as actual values 🛛 📕 🖟	E
	1	lame	Data type	Start value	Retain	Accessible f	Writa	Visible in	Setpoint	Comment	
4	•	 Static 									
-		Speed_Setpoint	Real	10.0						Speed setpoint in revolution per minute (range:+/-50rpm)	
4		Speed_Actual_Value	Real	0.0						Speed actual value in revolution per minute (range:+/-50rpm)	
		<add new=""></add>									
			String	^							
			Struct								
			Time								
			Time_Of_Day								
			UDInt								
			UInt								
			USInt	=							
			WChar	~							

® Name the structure 'Positive_Speed' and enter a comment.

(
 Positive_Speed)

· 🛒 🔍	💊 🛃 😤 Keepa	ctual values	Snapshot 🧤 🛤	, Copysnap	shots to start val	ues 🖳	🛃 Load	start values	as actual values 🛛 🖳 🕄
SPEED_	MOTOR								
Nam	ie	Data type	Start value	Retain	Accessible f	Writa	/isible in	Setpoint	Comment
	Static								
	Speed_Setpoint	Real	10.0						Speed setpoint in revolution per minute (range:+/-50rpm)
-	Speed_Actual_Value	Real	0.0						Speed actual value in revolution per minute (range:+/-50rpm)
	 Positive_Speed 	Struct							Parameters for error / warning positive speed
	<add new=""></add>								
	<add new=""></add>								

 R Create the tags for the speed monitoring with the corresponding start values below the structure as shown here.

0	1-60	00_	Global_Data_Blocks_	S7-1200 → CPU	J_1214C [CPU 12	14C DC/DC/I	OC] 🕨 Program	n blocks	SPEED	_MOTOR [[DB2]	• • ×
lill.	S	U,	Keep ac	tual values 🔒	Snapshot 🛤 🛤	Copysnap	shots to start val	ues 🔣	. 🛃 Load	start values	as actual values 🛛 🗐 🔉	
	SPE	ED_	MOTOR									
		Nam	e	Data type	Start value	Retain	Accessible f	Writa	Visible in	Setpoint	Comment	
1		• !	tatic									
2	-		Speed_Setpoint	Real	10.0						Speed setpoint in revolution per minute (range:+/-50rpm)	
3	-		Speed_Actual_Value	Real	0.0						Speed actual value in revolution per minute (range:+/-50rpm)	(
4	-01	• •	Positive_Speed	Struct							Parameters for error / warning positive speed	
5	-		Threshold_Error	Real	15.0	~					Speed limit / if exceeded an error is displayed	
6	-		Threshold_Warning	Real	10.0	V					Speed limit / if exceeded an warning is displayed	
7	-		Error	Bool	false	V					Error limit exceeded	
8	-		Warning	Bool	false	V					Warning limit exceeded	
9		•	<add new=""></add>									

Note: Be sure to use the correct data types.

® Then select the structure and copy it.

(® Copy)

PEED_MOTOR Name Data ✓ Static ✓ Speed_Setpoint Real ✓ Speed_Actual_Value Real ✓ Insert row ✓ Add row ✓ Cut CC ✓ Copy CO	a type	Start value 10.0 0.0 11.0 15.0 10.0	Retain	Accessible f	Writa	Visible in	Setpoint	Comment Speed setpoint in revolution per minute (range:+/-50rpm) Speed actual value in revolution per minute (range:+/-50rpm) Parameters for error / warning positive speed	
Name Data ▼ Static Image: Static st	a type	Start value 10.0 0.0 15.0 10.0	Retain	Accessible f	Writa	Visible in	Setpoint	Comment Speed setpoint in revolution per minute (range:+/-50rpm) Speed actual value in revolution per minute (range:+/-50rpm) Parameters for error / warning positive speed	
Static Speed_Setpoint Real Speed_Actual_Value Real Speed_Actual_Value Add row X Cut Copy		10.0 0.0 15.0 10.0						Speed setpoint in revolution per minute (range:+/-50rpm) Speed actual value in revolution per minute (range:+/-50rpm) Parameters for error / warning positive speed	
■ Speed_Setpoint Real ■ Speed_Actual Value Real ■ Speed_Actual Value Real ■ Insert row ■ Add row X Cut Copy Cut		10.0 0.0 15.0 10.0						Speed setpoint in revolution per minute (range:+/-50rpm) Speed actual value in revolution per minute (range:+/-50rpm) Parameters for error / warning positive speed	
Speed_Actual_Value Real Section Control Control Section Contr		0.0 15.0 10.0						Speed actual value in revolution per minute (range:+/-50rpm) Parameters for error / warning positive speed	_
	CtrleX	15.0						Parameters for error / warning positive speed	
Matter for a for	Ctrl+X	15.0				-			
¥ Cut Cut Copy C	Ctrl+X	10.0						Speed limit / if exceeded an error is displayed	
X Cut C III Copy C	Ctrl+X		 Image: A start of the start of					Speed limit / if exceeded an warning is displayed	
E Copy (SUITA	false	v					Error limit exceeded	
	Ctrl+C	false	 Image: A start of the start of					Warning limit exceeded	
Paste C	Ctrl+V								
X Delete	Del								
Rename	F2								
Update interface									
Go to next point of use Ctrl+Sh	Shift+G								
Go to definition Ctrl+SH	Shift+D								
X Cross-references	F11								

® Paste the copied structure below the 'Positive_Speed' structure again.

(® Paste)

🥩 🛼 🖥	k 🚬 🤷 Keep ac	tual values 🔒 S	napshot 🔤 🛤	Copysnap	shots to start valu	ies 🖳	B. Load	start values	as actual values 🛛 🕮 🖉	
PEED_MC	TOR									
Name		Data type	Start value	Retain	Accessible f	Writa	Visible in	Setpoint	Comment	
💶 🔻 Stati	c									
💷 = S	peed_Setpoint	Real	10.0						Speed setpoint in revolution per minute (range:+/-50rpm)	
💷 = S	peed_Actual_Value	Real	0.0						Speed actual value in revolution per minute (range:+/-50rpm)	
💷 = 🔻 P	ositive_Speed	Struct							Parameters for error / warning positive speed	
	Threshold_Error	Real	15.0						Speed limit / if exceeded an error is displayed	
	Threshold_Warning	Real	10.0	Image: A start and a start					Speed limit / if exceeded an warning is displayed	
• •	Error	Bool	false	Image: A start and a start					Error limit exceeded	
•	Warning	Bool	false	V					Warning limit exceeded	
Incast source	add naus		1	-			-	-		
Add row										
Cut	Ctrl+X									
Сору	Ctrl+C									
Paste	Ctrl+V									
Delete	Del									
Rename	F2									

- ® Rename the new structure to 'Negative_Speed' and enter a comment.
 - (® Negative_Speed)

iř i	ř,	۵.,	🛃 📰 🤭 Keep ac	tual values 🔒 S	napshot 🔤 🖷	Copy snap	shots to start valu	ues 🖪	R. Load	start values	asactual values 📕 💷	
S	PEE	D_	MOTOR									
	N	lame	9	Data type	Start value	Retain	Accessible f	Writa	Visible in	Setpoint	Comment	
-	•	- 5	tatic									
-	•		Speed_Setpoint	Real	10.0						Speed setpoint in revolution per minute (range:+/-50rpm)	
-	•		Speed_Actual_Value	Real	0.0						Speed actual value in revolution per minute (range:+/-50rpm)	
-		•	Positive_Speed	Struct							Parameters for error / warning positive speed	
-			Threshold_Error	Real	15.0						Speed limit / if exceeded an error is displayed	
-			Threshold_Warning	Real	10.0						Speed limit / if exceeded an warning is displayed	
-			Error	Bool	false	\checkmark					Error limit exceeded	
-			Warning	Bool	false						Warning limit exceeded	
-		•	Negative_Speed	Struct							Parameters for error / warning negative speed	
			Threshold_Error	Real	-16.0						Speed limit / if exceeded an error is displayed	
			Threshold_Warning	Real	-14.0						Speed limit / if exceeded an warning is displayed	
2			Error	Bool	false	V					Error limit exceeded	
			Warning	Bool	false						Warning limit exceeded	
1			<add new=""></add>									

® Do not forget to click Save project. The finished global data block "SPEED_MOTOR" [DB2] is shown below. Check to verify that Retain is selected and the corresponding start value is entered for all tags. The data will thus be retained in the data block even after a power failure or a STOP/START of the CPU. The check boxes for 'Accessible from HMI' and 'Visible in HMI' should also all have a check mark so that all tags in future expansions of this project will be accessible by the visualization systems (HMI). We will select the 'Setpoint' check box box only for the default values in our data block.

(R 🗹 🗹 🗹 🗹

031	-60	0_0	Global_Data_Blocks_S	57-1200 ▶ CPU_	_1214C [CPU 12	4C DC/DC/D)C] 🕨 Progran	n blocks	SPEED	_MOTOR [[DB2]	₽∎×
101	1. K	ii,	🛃 📰 🤭 Keep ad	tual values 🔒	Snapshot 🖷 🛤	, Copy snap	shots to start val	ues 🖁	R. Load	start values	as actual values 🛛 🖳	
1	SPE	ED_	MOTOR									
	1	lame	•	Data type	Start value	Retain	Accessible f	Writa	Visible in	Setpoint	Comment	
1	•	• 5	tatic									
2	•		Speed_Setpoint	Real	10.0						Speed setpoint in revolution per minute (range:+/-50rpm)	
3	•		Speed_Actual_Value	Real	0.0						Speed actual value in revolution per minute (range:+/-50rpm)	
4		• •	Positive_Speed	Struct							Parameters for error / warning positive speed	
5			Threshold_Error	Real	15.0	Image: A start and a start					Speed limit / if exceeded an error is displayed	
6			Threshold_Warning	Real	10.0						Speed limit / if exceeded an warning is displayed	
7	•		Error	Bool	false						Error limit exceeded	
8			Warning	Bool	false	¥					Warning limit exceeded	
9		•	Negative_Speed	Struct							Parameters for error / warning negative speed	
10	•		Threshold_Error	Real	-16.0						Speed limit / if exceeded an error is displayed	
11			Threshold_Warning	Real	-14.0	V					Speed limit / if exceeded an warning is displayed	
12			Error	Bool	false	V					Error limit exceeded	
13			Warning	Bool	false	Image: A start and a start					Warning limit exceeded	
14	1		<add new=""></add>							-		

Note: The use of setpoints is described further below in the step-by-step instructions.

7.3 Access to data of the data block in the organization block

® Open the "Main" [OB1] organization block with a double-click.



- ® Delete the temporary tags in "Main" [OB1] that are no longer needed. Only the Boolean tag 'Motor_Speed_Control_Ret_Val' is still needed.

31-6	-6	00	_Global_Data_Blocks_S7-1200 CPU_12	14C [CPU 1214C	DC/DC/DC] 🕨 Prog	ram blocks 🔸 Main [OB1] 🛛 🗕 🖬 🗮 🗙
ŝ e	ы	1	🖗 🔮 🐛 🖿 🚍 🖃 🗐 📲 📲 🖉 😫	🖃 🈰 🍋 🖌	🖩 🐨 🖷 😍 🗲	표표報 티 일 ॥ 영 에 👌 🖻
Ma	Ma	in				
		Na	ame	Data type	Default value	Comment
-00		•	Input			
-00			Initial_Call	Bool		Initial call of this OB
-00			Remanence	Bool		=True, if remanent data are available
-0		•	Temp			
		•	Motor_speed_monitoring_error_max	insert row		
-00		•	Motor_speed_monitoring_warning_max	Add row		
-00		•	Motor_speed_monitoring_warning_min		Co-L-N	
		•	Motor_speed_monitoring_error_min	Cut	Ctrl+X	
			Motor_speed_monitoring_actual_speed	D Parte	Ctrl+C	
		•	Motor_speed_monitoring_Ret_Val	■ 10300	Culter	
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B Have the "SPEED_MOTOR" [DB2] data block and the "Main" [OB1] organization block displayed side by side by clicking the 'III' icon to vertically split the editor area.
(In III)

IA Siemens - C:\Users\mde\Documents\Automation\031	-600_Global_Data_Blocks_\$7-1200\031-600_Global_Data	a_Blocks_S7-1200			_ 🗆 X			
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📲 Main [OB1]		hard hard						
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MOTOR_SPEEDMONITORING [FC11]	▼ Block title: "Main Program Sween (Curle)"				2 SKS			
The motor_auto [FB1]	Comment							
MOTOR_AUTO_DB [DB1]	Sector Se							
SPEED_MOTOR [DB2]	▼ 🕄 Network 1: Speed monitoring conveyor motor				= _			
Technology objects	Comment				bra			
External source files	General source files							

- I Use drag & drop to move the tags needed for the interconnection from the "SPEED_MOTOR" [DB2] data block onto the connections of the called functions and function blocks in the "Main" [OB1] organization block. First we move the 'Speed_Actual_Value' tag onto the 'Actual_speed' output of the "MOTOR_SPEEDMONITORING" [FC11] block.
 - (
 Speed_Actual_Value)

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-12.0 - error_min	ENO -										
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 R Also connect the other contacts in Network 1 with tags from the "SPEED_MOTOR" [DB2] data block as shown here.



® Connect the contacts in Network 2 with tags from the "SPEED_MOTOR" [DB2] data block as shown here.



 Connect the contacts in Network 3 with tags from the "SPEED_MOTOR" [DB2] data block as shown here.



7.4 Save and compile the program

To save your project, click the Save project button in the menu. To compile all blocks, click the "Program blocks" folder and select the icon for compiling in the menu.
 (® Save project ® Program blocks ®)



® The "Info", "Compile" area shows which blocks were successfully compiled.

		O Properties	1 Info	追 🗓 Diagn	ostics		•
General (1) Cross-reference	s Compile Energy Suite	Syntax					
🕄 👍 📵 Show all messages	•						
Compiling finished (errors: 0; warning	(s: 0)						
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✓ ▼ CPU_1214C				7		0	0
Program blocks				~		0	0
SPEED_MOTOR (DB2)	Block was successfully compiled.			~			
Main (OB1)	Block was successfully compiled.			~			
S	Compiling finished (errors: 0; warnin	gs: 0)					
<	Ш						>

7.5 Download the program

 After successful compilation, the complete controller with the created program including the hardware configuration can, as described in the previous modules, be downloaded. (
 ID)

VA Siemens - C:\Users\mde\Documents\Automation\031-6	00_Global_Data_Blocks_S7-1200031-600_Global_Data_Blocks_S7-1200	_ 🗆 X
Project Edit View Insert Online Options Tools Wi	ndow Help Totally Integrated Automat	tion
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	▼ Block title: "Main Program Sweep (Cycle)"	^ U.
Device configuration	Comment	
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- Main [OB1]	9501	
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MOTOR_SPEEDMONITORING [FC11]		sks
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MOTOR_AUTO_DB [DB1]	"-88" — speed Al	
SPEED_MOTOR [DB2]		÷
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External source files	Threshold_Error_max Error_max — Error	ries
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✓ Details view	Threshold_ Speed_limit, Warning_max — Warning	
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Name	Speed. *SPEED_MOTOR*.	
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🙀 Online backups 🗸 🗸	Properties	
Verview 🖽 Overview 📲 Main (Ol	31) 🔝 💙 The project 031-600_Global_Data_Bloc	

7.6 Monitor/modify values in data blocks

® The desired block must be open for monitoring the tags of a downloaded data block. The

monitoring can then be activated/deactivated by clicking the icon. (® SPEED_MOTOR [DB2] ®)

Project tree III IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		x -) - (L _{BT} Goonline	Go offline	2 11		Search	in project>	-11			PURTA
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Image: Speed Set point Real Image: Speed Set point Real <th>Devices</th> <th></th>	Devices														
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Image: Motor Speec Monitor Ning [FC11] Image: Motor Speec Motor Spee	MOTOR_SPEEDCONTROL [F	C10]	9	-	•	Negative_Speed	Struct								Paran
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Image: SPEED_MOTOR [DB2] Image: SPEED_MOTOR [DB2] Image: Image: Image: SPEED_MOTOR [DB2] Image: Image: SPEED_MOTOR [DB2] Image:	MOTOR_AUTO_DB [DB1]		12	-01		Error	Bool	f	false						Error
Image: Speed_Setpoint Real Speed_Setpoint Real Speed_Setpoint Real Speed_Setpoint Real Speed_Setpoint Real Speed_Setpoint Real	SPEED_MOTOR [DB2]		13	-01		Warning	Bool	f	false						Warni
Name Offset Data t Speed_Setpoint Real > Speed_Setpoint Real > Positive_Speed Struct	Technology objects					-									
> □ PLC tags > □ PLC data types □ Details view □ Details view Name Offset Data t > Speed_Setpoint Real > Positive_Speed Struct > Negative_Speed Struct	External source files														
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Positive_Speed Struct Negative_Speed Struct C	Speed Actual Value	Real													
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® In the 'Monitor value' column, the values currently available in the CPU can be monitored.

			ata_Blocks_\$7-1200	CPU_1214C [CPU	1214C DC/DC/I	DC] → Program bl	ocks 🕨 SPE	ED_MOTOR [DB2]	_ # = ×
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5	SPE	ED	_MOTOR							
		Nar	ne	Data type	Start value	Monitor value	Retain	Accessible f	Writa	Visible in
1		•	Static							
2 -			Speed_Setpoint	Real	10.0	10.0				
3 4			Speed_Actual_Value	Real	0.0	10.42933				
4 -			 Positive_Speed 	Struct						
5 -	1		Threshold_Error	Real	15.0	15.0				
6 -			Threshold_Warning	Real	10.0	10.0				
7 -			Error	Bool	false	FALSE				
8 -	1		 Warning 	Bool	false	TRUE	 Image: A start of the start of			
9 -			 Negative_Speed 	Struct						
10 -	•		Threshold_Error	Real	-16.0	-16.0				
11 -			Threshold_Warning	Real	-14.0	-14.0	 Image: A start of the start of			
12 -			Error	Bool	false	FALSE	Image: A start and a start			
13 -			 Warning 	Bool	false	FALSE				

If you right-click on one of the values, the 'Modify' dialog for modifying this value opens (® Modify ® Modify value: 15.0 ® OK)

	oba	I_D	ata_Blocks_\$7-1	1200 🕨 CP	U_1214C [CPU	1214C DC/DC/L	DC] 🕨 Program	blocks > SPE	ED_MOTOR [DB2	_∎≡×
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	SP	ED.	MOTOR							
		Nam	ne	Data	a type	Start value	Monitor value	Retain	Accessible f Wri	ta Visible in
1	-	•	Static							
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6	-	j.	Threshold		51220_110101					
7	-	á	Error	Aodify value:	15.0		Format:	Floating-point	number 💌	
8	-	(i	Warning							
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10		3	Threshold						concer	
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12	-	1	Error	Boo	d .	false	FALSE			
13	-	1	Warning	Boo	I	false	FALSE			
	<					111				>

7.7 Initialize setpoints / reset start values

The setpoints can be initialized by clicking the ¹ icon. For the tags whose 'Setpoint' check box is selected ¹, the start value will then be applied as the current value. (® ¹)

)0_G		57-1200 ⊁ CPU	_1214C [CPU 1214	IC DODODC] 🕨	Program blo	cks 🕨 SPEED <u>.</u>	_мото	R [DB2]		_ 🕫 🖬 🗙
ý	1	8.	🛃 🖿 🖤 Keep ac	tual values 🧕	Snapshot 🍬 👒	Copy snapshots to	o start values	🛃 🕵 Load	start valu	ues as actual	values 🛃	8, 3
	SPE	ED_I	MOTOR (snapshot cre	Data type	5:04:14 PM)	Monitorivalue	Patain	Accessible f	Write	Visible in	Satooint	Comment
1	-	▼ St	atic	Dotto type	Start value	Monitor value	ne com					comment
2	ā		Speed Setpoint	Real	10.0	15.0						Speed set
3			Speed_Actual_Value	Real	0.0	15.12044					Ā	Speed act
4			Positive_Speed	Struct				 Image: A start of the start of	 Image: A start of the start of			Parameter
5			Threshold_Error	Real	15.0	15.0		~	V			Speed lim
6			Threshold_Warning	Real	10.0	10.0		V	V	Image: A start and a start		Speed lim
7			Error	Bool	false	TRUE		V	V	Image: A start and a start		Error limit
8			Warning	Bool	false	TRUE	Image: A start and a start	V	V			Warning li
9		• •	Negative_Speed	Struct					V	Image: A start and a start		Parameter
10			Threshold_Error	Real	-16.0	-16.0			V	V		Speed lim
11			Threshold_Warning	Real	-14.0	-14.0			V	V		Speed lim
12			Error	Bool	false	FALSE		V	V	V		Error limit
13			Warning	Bool	false	FALSE	Image: A start and a start	\checkmark	1	V		Warning li
	<											>

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ι <u></u>	

2 💺 🛃	E 😤 Keep ac	tual values 🔒	Snapshot 🐂 👒	Copy snapshots to	o start values	🛃 🐼 Load	start valu	ues as actual	values 🛃	B. 📑
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Nar Reset	start values	Data type	Start value	Monitor value	Retain	Accessible f	Writa	Visible in	Setpoint	Comment
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📶 🖷 Spee	d_Actual_Value	Real	0.0	15.12044				Image: A state of the state		Speed act
💷 🔹 🔻 Positi	ive_Speed	Struct			\checkmark		¥			Parameter
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🕣 = W	arning	Bool	false	FALSE		 Image: A set of the set of the	 Image: A start of the start of	 Image: A start of the start of		Warning li
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< I-600_Global SPEED_MOTO	_Data_Blocks_S E P Keep ac	57-1200 → CP tual values eated: 7/6/201	J_1214C [CPU 121 Snapshot 🧠 🗠 7 5:04:14 PM) Start value		Program blo o start values Retain	cks SPEED	_MOTO start valu	R [DB2] ues as actual	values	
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7.8 Snapshots in data blocks

If you click the 's' icon, a snapshot of the actual values can be taken in order to apply these values as start values or to transfer them back to the CPU later by clicking the icon 's' (8 s).

🤌 🔩 🧱 🗮 😤 Keep a	ctual values 🔒 Sn	apshot 🐂 👒	Copy snapshots to	to start values	🛃 🛃 Load	start value	es as actual	values 📃	, 💵 📑
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Speed_Setpoint	Real	10.0	15.0						Speed s
Speed_Actual_Value	Real	0.0	15.12044						Speed a
Positive_Speed	Struct								Paramet
Threshold_Error	Real	15.0	15.0						Speed li
Threshold_Warning	Real	10.0	10.0						Speed li
Error	Bool	false	TRUE						Error lim
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Threshold_Warning	Real	-14.0	-14.0						Speed li
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R Alternatively, values from the snapshot can be copied to the start values by clicking the '
icon for all values or by clicking the '
icon for the setpoints only. Only the setpoints are needed here in most cases.

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Speed_Actual_Value	Real	0.0	15.12044	15.12044						Speed actual val
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If you want to load the start values back into the actual values there are two possibilities. Alternatively all start values can be copied to the actual values by clicking the ', icon or only the setpoints by clicking the ', icon.

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	Reenac	tual values	Snaps	hot 18 18	Convenanshot	s to start value		Load st	art values as	actual values	B. B.
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-0.	Speed_Actual_Value	Real	0.0	15.12044	15.12044					Ē	Speed actual value
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	Threshold_Error	Real	15.0	15.0	15.0	 Image: A start of the start of					Speed limit / if exce
• 0	Threshold_Warning	Real	10.0	10.0	10.0	 Image: A start of the start of					Speed limit / if exce
-	Error	Bool	false	TRUE	TRUE						Error limit exceede
•	Warning	Bool	false	TRUE	TRUE						Warning limit excee
	Negative_Speed	Struct									Parameters for erro
-	Threshold_Error	Real	-16.0	-16.0	-16.0						Speed limit / if exce
-	Threshold_Warning	Real	-14.0	-14.0	-14.0						Speed limit / if exce
- D	Error	Bool	false	FALSE	FALSE						Error limit exceede
- D	Warning	Bool	false	FALSE	FALSE	V					Warning limit excee
<	Warning Iobal_Data_Blocks_S	Bool	false	FALSE	FALSE	Program t	locks > S	PEED_N	MOTOR [DB.	2]	Warning limit excee
€	Warning	Bool	false CPU_1214 CPU_Snaps	FALSE	FALSE	Program t s to start value	vlocks ≥ S	PEED_N	KOTOR [DB:	2] actual values	Warning limit excee _ = 1
4 * 1-600_G 31-600_G \$ # * \$ \$PEED_N	Warning	Bool	false CPU_1214 Gala Snaps 2017 5:15:	FALSE	FALSE	Program t s to start value	vlocks ≥ S	PEED_N Load sta	KOTOR [DB.	2] actual values	Warning limit excee _ = 1
31-600_G SPEED_N Name	Warning	Bool 57-1200 tual values eated: 7/6/ Data type	CPU_1214	FALSE	FALSE	Program b s to start value Retain	s sccessible f	PEED_N Load str	OTOR [DB.	2] actual values Setpoint	Warning limit excee
42 ■ 500_G 500_G 500_G 500_N 800_S 80	Warning lobal_Data_Blocks_1	Bool	CPU_1214	FALSE	FALSE	Program I s to start value Retain	s s ccessible f	PEED_N	AOTOR [DB.	2] actual values	Warning limit excee
	Warning Iobal_Data_Blocks_4 Iobal_Data_Blocks_4 Keep ac MOTOR (snapshot creation atic Speed_Setpoint	Bool 37-1200 → tual values eated: 7/6/ Data type Real	CPU_1214	FALSE	FALSE III C DC/DC/DC/ Copy snapshot Monitor value	Program I s to start value Retain	s & &	PEED_N Load str	AOTOR [DB. art values as Visible in	2] actual values Setpoint	Warning limit excee
42 • 31-600_G 31-600_G SPEED_N Name 42 ▼ Str 42 ■ 42 ■	Warning Iobal_Data_Blocks_5 Iobal_Data_Blocks_5 Iobal_Data_Blocks_5 Keep ac MOTOR (snapshot crr atic Speed_Setpoint Speed_Actual_Value	Bool 37-1200 → tual values sated: 7/6/ Data type Real Real Real	CPU_1214	FALSE	FALSE III C DC/DC/DC] Copy snapshot Monitor value 15.0 15.12044	Program I s to start value Retain	s & &	PEED_N Load stu	ADTOR [DB. art values as . Visible in	2] actual values Setpoint	Warning limit excee
 42 41-600_G 31-600_G SPEED_N Name 42 43 43 43 44 44 45 44 44 45 44 44 44 45 46 47 47 48 49 49 40 40 41 41 41 42 44 45 46 46 47 <	Warning	Bool 57-1200 tual values eated: 7/6/ Data type Real Real Struct	GPU_1214 Image: Start value 15.0 0.0	FALSE	FALSE	Program I s to start value Retain P	s ccessible f	PEED_N Load str	OTOR [DB.	2] actual values	Warning limit excee # 1 # # Comment Speed setpoint in r Speed actual value Parameters for error
	Warning Iobal_Data_Blocks_1 WoTOR (snapshot cre atic Speed_sctual_Value Positive_Speed Threshold_Error	Bool 57-1200 → tual values cated: 7/6/ Data type Real Real Struct Real	false CPU_1214 CPU_12	FALSE IC [CPU 1214 hot 12 12 16 PM) Snapshot 15.0 15.12044 15.0	FALSE COPY SNAPSHOT Monitor value 15.0 15.12044 15.0	Program t s to start value Retain V V V	s s s	PEED_A	ACTOR [DB. art values as Visible in	2] actual values	Warning limit excee
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43 • \$1.600_G \$1.600_G \$2.50	Warning Iohal_Data_Blocks_ Iohal_Data_Blocks_ WoTOR (snapshot crr atic Speed_Setpoint Speed_Setpoint Speed_Setwallyalue Positive_Speed Threshold_Error Threshold_Error Threshold_Warning Error Warning Negative_Speed	Bool tual values eated: 7/6/ Data type Real Real Struct Real Bool Struct	false CPU_1214 CPU_1214 CPU_1214 Snaps 2017 5:15: Start value 15.0 0.0 15.0 10.0 false false	FALSE IC (CPU 1214 hot the the the the the the the the the th	FALSE	Program t s to start value Retain V V V V V V V V V V	Nocks > S Accessible f Y Y Y Y Y Y Y Y Y Y Y Y Y	Veeed_A	ACTOR [DB. art values as Visible in VV VV VV VV	2] actual values Setpoint	Warning limit exceed Unit of the second Unit
Image: Constraint of the second se	Warning Iobal_Data_Blocks_4 Iobal_Data_Blocks_4 WoTOR (snapshot crr atic Speed_Setpoint Speed_Actual_Value Positive_Speed Threshold_Error Warning Negative_Speed Threshold_Error	Bool tual values eated: 7/6/ Data type Real Real Real Real Bool Bool Bool Struct Real	false CPU_1214 CPU_1214 CPU_1214 Snaps 2017 5:15: Start value 15.0 0.0 15.0 10.0 false false -16.0	FALSE	FALSE III C DC/DC/DC] Copy snapshot Monitor value 15.0 15.12044 15.0 10.0 TRUE TRUE -16.0	Program t S to start value Retain V	Iocks > S s & & . Accessible f	PEED_N Load str	ADTOR [DB] art values as Visible in V V V V V V V V V V V V V V V V V V	2] actual values	Warning limit exceed
43 1-600_G 31-600_G SPEED_N Name 43 43 43 43 44 45 45 45 46 47 48 49 40 41 42 43 44 45	Warning	Bool 57-1200 + tual values eated: 7/6/ Data type Real Real Struct Real Bool Struct Real Bool Struct Real	false CPU_1214 CPU_12	FALSE	FALSE	Program I Program I s to start value Retain Retain V V V V V V V V V V V V V	Cocks > S Accessible f Cocks > S Cocks	PEED N	CTOR [DB art values as visible in V V V V V V V V V V V V V V V V V V	setual values	Warning limit exceed
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7.9 Expand data block and download it without reinitialization

® To enable 'Download without reinitialization' for the "SPEED_MOTOR" [DB2] data block, you

must go offline ' Go offline' and then open the properties of the data block.

(® Go offline ® SPEED_MOTOR [DB2] ® Properties)

Siemens - C:\Us Open		Call structure	600_Global	_Data_Blocks	_ \$7-1200					_ 0
Project Edit View 🗶 Cut	Ctrl+X	Assignment list						Totally	ntegrated A	tomation
📑 📑 🔚 Save proje 💷 Copy	Ctrl+C	Switch programming language 🕨	o offline	2 🖪 🖪 🗶		Search in pro	ject>	h	integrated At	PORTAL
Project tree	Ctrl+V	Know-how protection	CPU 1214C	[CPU 12140] → Program	blocks	► SPEED MO	TOR [DB2]	_ 7 = X
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Devices X Delete	Del	Print preview	1		-					
Rename	F2	Properties Alt+Enter	Snaps	hot 🔤 🖳	Copysnap	shots to start va	lues 🛃	F 🕵 📩		4
Compile	•		/2017 5:15	:16 PM)						
Image: O31-600_Glo Download to device	•		Start value	Snapshot	Retain	Accessible f.	Writa	Visible in Se	tpoint Con	nment
📑 Add new 💋 Go online	Ctrl+K]							
🖥 Devices 8 🔊 Go offline	Ctrl+M		15.0	15.0					Spe Spe	ed setpoint in
CPU_121 Snapshot of the actual value	Jes		0.0	15.12044					Spe	ed actual valu
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😮 Online 🜉 Load start values as actual	values		15.0	15.0	V				Spe Spe	ed limit / if ex
 Progra Copy snapshots to start val 	ues 🕨		10.0	10.0	Image: A start and a start				Spe Spe	ed limit / if ex
Ad Ouick compare	•		false	TRUE	Image: A start and a start				Erro	or limit exceed
He Ma	cel r		false	TRUE					War War	ning limit exc
The MC Search in project	Ctrl+F								Par	ameters for err
MC Benerate source from block	ks 🕨 🕨		-16.0	-16.0	V				Spe Spe	ed limit / if ex
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MC Cross-reference information	n Shift+F11		false	FALSE					Erro	or limit exceed
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PLC tags	/			6 L	1.0				ingitostics	and the second s
<	Genera	Cross-references Con	npile Er	lergy Suite	Syntax	× 🗓				
✓ Details view		Show all messages	9							
	1 Messi	age				Go	to ?	Date	Time	
Name	0	'MOTOR_SPEEDMONITORING' was	oaded succes	sfully.				7/6/2017	4:30:19 PM	^
Speed Satooint	0	'Main' was loaded successfully.						7/6/2017	4:30:19 PM	
Speed_Setpoint	1 S	canning for devices completed for inter	face Intel(R) Et	thernet Conner	ction (4) 121	9-LM. Foun		7/6/2017	4:28:43 PM	
Positive Speed	💙 Li	oading completed (errors: 0; warnings:	0).					7/6/2017	4:30:24 PM	
Negative Speed	💙 0	onnected to CPU_1214C, via address IP	=192.168.0.1.					7/6/2017	4:32:04 PM	
- negouve_speed	💙 C	onnection to CPU_1214C terminated.						7/6/2017	4:50:36 PM	=
	📀 o	onnected to CPU_1214C, via address IP	=192.168.0.1.					7/6/2017	4:50:42 PM	
	✓ 5	setpoint values successfully written to	the PLC.					7/6/2017	4:51:15 PM	
	S	setpoint values successfully written to	the PLC.					7/6/2017	5:28:15 PM	
	C C	onnection to CPU 1214C terminated.						7/6/2017	5:35:43 PM	~
24 J III III	58 UP31 C									

(General Attributes	Optimized block access)
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General		
General	Attributos	
Information	Attributes	
Time stamps		
Compilation	Only store in load memory	
Protection	Data block write-protected in the device	
Attributes	Optimized black access	
Download without reinitialization	opumized block access	
		OK Canc

Resign a 'Retentive memory reserve' to the data block for 'Download without reinitialization'.
 (® Download without reinitialization ® Retentive memory reserve ® 10 bytes ® OK)

General				
Seneral	Download without reinitializat	lon		
nformation	Downoad without remittanzat			
líme stamps				
Compilation	Memory reserve:	100	Bytes	(100 bytes available)
Protection Attributes		Enable retent	e download v ive tags.	vithout reinitialization for
Download without reinitializa	tion Retentive memory reserve	10	Bytes	(10 bytes available)
89				

® Download your "SPEED_MOTOR" [DB] data block to the controller again and select
Go online

(® SPEED_MOTOR [DB] ® 💷 ® 💋 Go online)

iemens - C:\Users\mde\Documents\Autom	ation\031-600_	Global_Data_Blocks_S7	7-1200\031-	600_Global	_Data_Blocks	_\$7-1200					-
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Save project 📃 🖌 🛅 🚡 🗙 🕷	+ (+ 3)	🖪 🕼 🖳 🖾 🍕 Gov	online 🗐 G	o offline			Search in pro	iects	lotally	Integrated	PORT
			4200					Jeeco			
roject tree	•600_G	Download to device	-1200 • 0	LPU_12140	. [CPU 12140		.] > Program	DIOCKS	SPEED_N	IOTOR [DB2]	
Devices											
*		Keep ac	tual values	Snaps	hot 18 18	Copysnap	shots to start v	alues 🖹	- B. •		3
	SPEED	MOTOR			1. 7			-	-		
D 031-600 Global Data Blocks 57-1200	A Nam		Data tune	Start value	Snanchot	Petain	Accessible f	Writa	Visible in	Setnoint (Comment
Add new device	1 1	Static	Doto type		Shipanot					Sciponie	omment
Devices & networks	2	Speed Setpoint	Real	15.0							Speed setpoint
CPU 1214C [CPU 1214C DC/DC/DC]		Speed Actual Value	Real	0.0							Speed actual va
Device configuration	4	Positive Speed	Struct	0.0							Parameters for
Q Online & diagnostics	5 1	Threshold Error	Real	15.0							Speed limit / if e
Program blocks	6 61	Threshold Warning	Real	10.0							Speed limit / if e
Add new block	7 - 1	Error	Bool	false							Error limit exce
Main [OB1]	8 -	Warning	Bool	false							Warning limit e
MOTOR SPEEDCONTROL IF	9	 Negative Speed 	Struct								Parameters for
MOTOR SPEEDMONITORING	10 -	Threshold Error	Real	-16.0							Speed limit / if
MOTOR AUTO [FB1]	11 -	Threshold Warning	Real	-14.0							Speed limit / if
MOTOR AUTO DB [DB1]	12 -	Frror	Bool	false							Error limit exce
SPEED MOTOR [DB2]	13 -	Warning	Bool	false							Warning limit e
Technology objects							-	-			
External source files						101	-				
PLC tags	~						Q Propertie	es 🗓	Info 追 🧏	Diagnostic	s –
	General	Cross-references	Com	oile Er	ergy Suite	Syntax	< 🔒				
Details view		et al and a second			22						
Details view		Show all messages									
										-	
	I Messag		Distant in the		4.0		GO	to ?	Date	Time	
Name Offset		MOTOR_SPEEDMONTIC	KING Was IO	aded succes	stully.				7/6/2017	4:30:19 6	114
Speed_Setpoint		Main was loaded suc	cessiully.						7/6/2017	4:30:191	111
Speed_Actual_Value	Sci Sci	inning for devices comple	ted for intern	sce Intel(K) E	themet Conne	ction (4) 121	9-LM. Foun		7/6/2017	4:28:43 1	STM1
Positive_Speed		ruing completed (errors: c	, warnings: c	102 168 0 1					7/6/2011	4:30:24 1	
Negative_Speed	Con	nected to CPU_1214C, via	minated	192.100.0.1.					7/6/2011	4:52:04 1	-IVI DA.4
		nection to CPU_1214C tel	minated.	102 169 0 1					7/6/2017	4:50:56 P	Ph.4
		mected to cro_1214c, via	audress ir=	192.100.0.1.					7/6/2011	4:50:42 P	DA 4
	55	etpoint values successiuil	y written to t	HE FLC.					7/6/2011	4:51:151	-IVI
	55	expone values successfull	y written to ti	ie ruu.					7/6/2017	7 5.25.424	Ph.4
		inection to CPU 1214C tel	minated.						//6/2017	/ 0:00:40 0	71V1

Then click the [[]ea]['] icon to activate memory reserve and thus activate downloading without reinitialization for keeping actual values. Confirm the safety prompt with 'OK'.
 (® e OK)

10 e	١,	, 🛃 🗮 🖤 Keep ac	tual values	Snap	pshot 🛰 👒	Copysn	hapshots to st	art values	🛃 🛃	Load start va	alues as actual values 🛛 📕 💷
SP	ED_	MOTOR (snapshot cre	eated: 08.	.08 Activa	te memory rese	rve					
	Nam	e	Data type	Start value	Monitor value	Retain	Accessibl	Writabl	Visible in	Setpoint	Comment
-	▼ S	tatic									
		Speed_Setpoint	Real 🔳	15.0	10.0						Speed setpoint in revolution per minute (range:+/-50rpm)
		Speed_Actual_Value	Real	0.0	0.0						Speed actual value in revolution per minute (range:+/-50rp
		Positive_Speed	Struct								Parameters for error / warning positive speed
		Threshold_Error	Real	15.0	15.0						Speed limit / if exceeded an error is displayed
		Threshold_Warning	Real	10.0	10.0						Speed limit / if exceeded an warning is displayed
-		Error	Bool	false	FALSE						Error limit exceeded
		Warning	Bool	false	FALSE						Warning limit exceeded
		Negative_Speed	Struct								Parameters for error / warning negative speed
) 🕣	1	Threshold_Error	Real	-16.0	-16.0						Speed limit / if exceeded an error is displayed
		Threshold_Warning	Real	-14.0	-14.0						Speed limit / if exceeded an warning is displayed
		Error	Bool	false	FALSE						Error limit exceeded
		Warning	Bool	false	FALSE						Warning limit exceeded



Next add any tag in your data block 99.0

(
 Name: Value_test
 Data type: Real
 Start value: 99.0)

SPEE	ED_MOTOR lame					snapsnots	to start valu	es 🔣 🖳	Load start values as actual values 🛛 🖳 🖳
00000	lame								
		Data type	Start value	Retain	Accessibl	Writabl	Visible in	Setpoint	Comment
	 Static 								
	Speed_Setpoint	Real	15.0	 Image: A start of the start of	Image: A start and a start	 Image: A start of the start of	Image: A start and a start		Speed setpoint in revolution per minute (range:+/-50rpm)
6 6	Speed_Actual_Value	Real	0.0						Speed actual value in revolution per minute (range:+/-50
	 Positive_Speed 	Struct					\checkmark		Parameters for error / warning positive speed
-	Threshold_Error	Real	15.0	V	Image: A start and a start		Image: A start and a start		Speed limit / if exceeded an error is displayed
	Threshold_Warning	Real	10.0		V		\checkmark		Speed limit / if exceeded an warning is displayed
	Error	Bool	false						Error limit exceeded
-	 Warning 	Bool	false		V		Image: A start and a start		Warning limit exceeded
-	 Negative_Speed 	Struct			 Image: A start of the start of				Parameters for error / warning negative speed
0 🕣	Threshold_Error	Real	-16.0						Speed limit / if exceeded an error is displayed
1 -00	Threshold_Warning	Real	-14.0				Image: A start and a start		Speed limit / if exceeded an warning is displayed
2 🕣	Error	Bool	false		V		Image: A start and a start		Error limit exceeded
3 🕣	 Warning 	Bool	false		V				Warning limit exceeded
4 🕣 •	Value_test	Real 🔳	99.0						
5 .	<add new=""></add>								

® Download your "SPEED_MOTOR" [DB] data block to the controller again.

® SPEED_MOTOR [DB] ® 💷 ® Download)

				03 -00	o_ Giouai_Data_Blocks								ks ▶ SPEED_MOTOR [DB2] 🖬 🔳 >
Devic	ces												
200		<u>u</u>			🔍 🛃 🗮 🎬 Keepa	ctual values	Snap	shot 🌆	Cop	y snapshot	to start value	s 🖁 - 🖏 -	Load start values as actual values 🛚 🚛 📑
				SPE	ED_MOTOR								
ame					Name	Data type	Start value	Retain	Accessibl.	Writabl	Visible in	Setpoint	Comment
03	1-600_	_Global_Data_Blocks _S7-1200_\	/ 🔽 🜖 🔨	1 🕣	 Static 								
	Add n	new device		2 📶	Speed_Setpoint	Real	15.0		\checkmark		V		Speed setpoint in revolution per minute (range:+/-50r
ណ័	Device	es & networks		3 🐔	Speed_Actual_Value	Real	0.0						Speed actual value in revolution per minute (range:+/
	CPU_1	1214C [CPU 1214C DC/DC/DC]	VO	4	 Positive_Speed 	Struct							Parameters for error / warning positive speed
	De De	evice configuration		5 🕣	Threshold_Error	Real	15.0						Speed limit / if exceeded an error is displayed
-	V Or	niine & diagnostics		0	Inreshold_warning	Real	10.0						Speed limit / if exceeded an warning is displayed
	CO 110	àdd new block		8 47	- Enor	Bool	false						Warning limit exceeded
	-	Main [OB1]		9 57	 Negative Speed 	Struct	laise						Parameters for error / warning negative speed
		MOTOR SPEEDCONTROL [FC10]		10	Threshold Error	Real	-16.0						Speed limit / if exceeded an error is displayed
		MOTOR_SPEEDMONITORING [FC1		11 🕢	Threshold_Warning	Real	-14.0						Speed limit / if exceeded an warning is displayed
		MOTOR AUTO [FB1]	ŏ	12 📶	Error	Bool	false					Ē	Error limit exceeded
		MAGAZINE_PLASTIC [DB3]		13 🕣	Warning	Bool	false					Ā	Warning limit exceeded
		MOTOR_AUTO_DB [DB1]	•	14 🕣	Value_test	Real	99.0						
				1000									
prev Ch	view neck b	SPEED_MOTOR [DB2]	>	15	And news		_				×		
prev Ch	view neck b	sPEED_MOTOR (DE2)	Message	15 (And new> 			A	tion	118	×]
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prev Ch us	view neck b	sreeD_MOTOR [De2]	Message Ready for	loading	<pre><add news<="" pre=""></add></pre>			A	ction		×		
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tus	view neck b	s FFED_MOTOR [082] rehealewe biot Target ▼ CPU_1214C Simulated module ▼ Software ▼ Overwrite onli Main (081)	Message Ready for The down Downloa Objects t	loading load wi d softwa hat exis	Il be performed to a sim re to device t online and are overwrit	ulated PLC		A	ction Consiste	m ent down	× load		
prev Ch Uus	view neck b	sPEED_MOTOR [082] refere loading Target V CPU_1214C Simulated module V Software V Overwrite onli Main [081] SPEED MO	Message Ready for The down Downloa Objects t	loading load wi d softwa	Il be performed to a sim re to device t online and are overwrit	ulated PLC			ction Consiste	ent down te	k		
prev Ch us	View neck b !	sPEED_MOTOR[D82] reading bits Defore loading Target CPU_1214C Simulated module Software Vorewrite onli Main [081] SPEED_MO	Message Ready for The down Downloa Objects t	loading nload wi d softwa	Il be performed to a sim re to device t online and are overwrit	ulated PLC tten.			ction Consiste Overwri Overwri	ent down te	load		
Ch US	View Neck b 1 2 2 2 2 2 2 2 2 2 2 2 2 2	sPEED_MOTOR [B82] reheaden white Target CPU_1214C Simulated module Simulated module Software Overwrite onli Main [OB1] SPEED_MO	Message Ready for The down Downloa Objects t	loading nload wi d softwa	Il be performed to a sim re to device t online and are overwrit	ulated PLC tten.			ction Consista Overwri Overwri	ent down te	load		
Ch us		SPEED_MOTOR [B82] reactions with the second	Message Ready for The down Downloa Objects t	Ioading	Il be performed to a sim re to device t online and are overwrit	ulated PLC			ction Consiste Overwri Overwri	ent down te te	load		

If you click '" to monitor the block again, you will see that the monitored values for the previously existing tags have not been overwritten with the start values.
 (® ")

1	-	8,	🛃 🛅 🏹 Keep ad	tual values	Snaps	shot 🛰 🔍	Copy sna	psh <mark>ots</mark> to sta	irt values	R- R- L	oad start val	ues as actual values 🛛 🔒 📑
	SPE	D_I	MOTOR									
	1	lame		Data type	Start value	Monitor value	Retain	Accessibl	Writabl	Visible in	Setpoint	Comment
	-	• St	tatic									
2	-		Speed_Setpoint	Real	15.0	10.0	Image: A start and a start		 Image: A start of the start of			Speed setpoint in revolution per minut
8	-		Speed_Actual_Value	Real	0.0	0.0	 Image: A start of the start of	\checkmark	Image: A start of the start	V		Speed actual value in revolution per m
R.	-	•	Positive_Speed	Struct			1	\checkmark	V	V		Parameters for error l warning positive
5			Threshold_Error	Real	15.0	15.0			 Image: A start of the start of	V		Speed limit / if exceeded an error is dis
5	-		Threshold_Warning	Real	10.0	10.0	 Image: A start of the start of	\checkmark	 Image: A start of the start of	V		Speed limit / if exceeded an warning is
6	-		Error	Bool	false	FALSE	1		 Image: A start of the start of	Image: A start and a start		Error limit exceeded
ŝ	-		Warning	Bool	false	FALSE	 Image: A start of the start of	\checkmark	V	V		Warning limit exceeded
9	-	-	Negative_Speed	Struct			 Image: A start of the start of					Parameters for error / warning negative
0	-		Threshold_Error	Real	-16.0	-16.0	 Image: A start of the start of	¥	 Image: A start of the start of			Speed limit / if exceeded an error is dis
1			Threshold_Warning	Real	-14.0	-14.0		\checkmark	V	V		Speed limit / if exceeded an warning is
12	-		Error	Bool	false	FALSE		Image: A start and a start		Image: A start of the start		Error limit exceeded
3	-		Warning	Bool	false	FALSE		¥	 Image: A start of the start of	Image: A start and a start		Warning limit exceeded
4	-		Value_test	Real	99.0	99.0		\checkmark	V	V		
5	1		<add new=""></add>									

7.10 Archive the project

As the final step, we want to archive the complete project. Select the
 'Archive ...' command in the
 'Project' menu. Select a folder where you want to archive your project and save it with the file type "TIA Portal project archive".

(® Project ® Archive ® TIA Portal project archive ® 031-600_Global_Data_Blocks_S7-1200.... ® Save)

Siemens - C:\Users\mde\Documents\Autom	nation\031-600_Global_Data_Blocks_	_\$7-1200\031-600_Glo	bal_Data_Blo	cks_\$7-1200			_ - ×
Project Edit View Insert Online Options	Tools Window Help	So online 🖉 Go offline	&2 IB IB	×	Search in project	Т	otally Integrated Automation PORTAL
Open Ctrl+O Migrate project Close Ctrl+W	031-600_Global_Data_Blocks_t	\$7-1200 ► CPU_121	4C [CPU 1214	4C DC/DC/DC] 🕨 Program bloc	ks ▶ SPEE	ED_MOTOR [DB2] _ 🖬 🖬 🗙 📢
Save Ctrl+S Save as Ctrl+Shift+S	SPEED_MOTOR	ctual values 🔒 Snap	shot 🔤 🛤	Copy snapsh	ots to start values	B- B- •	Tasks
Delete project Ctrl+E Archive Retrieve	Name 1 - Variatic 2 - Main - Speed Setpoint	Data type Start value	Retain	Accessible f	Writa Visible in	Setpoint	Comment
Manage multiuser server projects To Card Reader/USB memory	3 🔄 • Speed_Actual_Value 4 🔄 • Vositive_Speed	Real 0.0 Struct	2 2	2			Speed actual value in revolution per. Parameters for error / warning positi.
The Memory card file Start basic integrity check Upgrade	5 C Threshold_Error 6 C Threshold_Warning 7 C Error	Real 15.0 Real 10.0 Bool false	V	8			Speed limit / if exceeded an error is Speed limit / if exceeded an warnin Error limit exceeded
Print Ctrl+P	9 • Negative_Speed	Struct Real -16.0	2	2			Parameters for error / warning negat. Speed limit / if exceeded an error is
C:L1031-600_clobal_Data_Blocks_3/1200 C:L1031-500_Analog_Values_S7-1200_V14 C:Us1031_420_Diagnostics_via_Webserver C:Users\m1031_200_FB-Programming_V14	11 Contraction of the second o	Bool false Bool false Real 99.0	>	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		Speed limit i rexceeded an warnin Error limit exceeded Warning limit exceeded
C:UsersImde031410_Basics_Diagnostics C:UsersImdelDl031-100_FC_Programming C:User031-300_IEC_Timers_Counters_V14 C:UsersImdelDocume011-101_CPU1214C	15 Add new>				Reporties	1 Info	1) Diagnostics
Exit Alt+F4	General Cross-references	Compile E	nergy Suite	Syntax	1	1	
Name Offset Speed_Setpoint Speed_Actual_Value Positive_Speed Negative_Speed	I Message Go to ? Date Time Connected to CPU_1214C, via address IP=192,168.0.1. 7/6/2017 5:52:08 PM C Start downloading to device. 7/6/2017 5:56:00 PM C CPU_1214C 7/6/2017 5:56:00 PM S SFEED_MOTOR' was loaded successfully. 7/6/2017 5:58:01 PM Vibrit/ was loaded successfully. 7/6/2017 5:58:01 PM					Time 1017 5:52:08 PM 1017 5:56:00 PM 1017 5:56:00 PM 1017 5:56:01 PM 1017 5:58:01 PM 1017 5:58:01 PM 1017 5:58:01 PM	
< III >>	Loading completed (errors: 0 Connection to CPU_1214C ter); warnings : 0). rminated.		III		7/6/2	2017 5:58:02 PM 2017 6:02:28 PM
Portal view Overview	SPEED_MOT					Connectie	on to CPU 1214C terminated.

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8 Checklist

No.	Description	Completed
1	Data block SPEED_MOTOR [DB2] successfully created.	
2	Program changes made in Main [OB1].	
3	Compiling successful and without error message	
4	Download successful and without error message	
5	Switch on station (-K0 = 1) Cylinder retracted / Feedback activated (-B1 = 1) EMERGENCY OFF (-A1 = 1) not activated AUTOMATIC mode (-S0 = 1) Pushbutton automatic stop not actuated (-S2 = 1) Briefly press the automatic start pushbutton (-S1 = 1) Sensor part at slide activated (-B4 = 1) then Conveyor motor M1 variable speed (-Q3 = 1) switches on and stays on. The speed corresponds to the speed setpoint in the range +/- 50 rpm	
6	Sensor part at end of conveyor activated (-B7 = 1) $\ensuremath{\mathbb{B}}$ -Q3 = 0 (after 2 seconds)	
7	Briefly press the automatic stop pushbutton $(-S2 = 0)$ ® $-Q3 = 0$	
8	Activate EMERGENCY OFF (-A1 = 0) ® -Q3 = 0	
9	Manual mode (-S0 = 0) ® -Q3 = 0	
10	Switch off station (-K0 = 0) \circledast -Q3 = 0	
11	Cylinder not retracted (-B1 = 0) $\ensuremath{\mathbb{B}}$ -Q3 = 0	
12	Speed > Motor_speed_monitoring_error_max ® -Q3 = 0	
13	Speed < Motor_speed_monitoring_error_min	
14	Project successfully archived	

9 Exercise

9.1 Task – Exercise

In this exercise a global data block "MAGAZINE_PLASTIC" [DB3] will be created additionally.

The setpoint and actual value of the counter for the plastic parts will be specified and displayed in this data block.

A connectable input for the setpoint setting and an output for displaying the actual value will also be added to the "MOTOR_AUTO" [FB1] function block.

9.2 Technology diagram

Here you see the technology diagram for the task.



Figure 5: Technology diagram

Schalter der Sortieranlage Switches of sorting station -P1 ein/on -P1 ein/on -P1 ein/on -P4 aktivient/active -P4 aktivient/active -P2 Hand/manual -P3 Auto/auto -P2 Hand/manual -P3 Auto/auto	Automatikbetrieb Automatic mode -P5 gestarte/started -S1 Start/start	Handbetrieb / Manual mode -S3 Tippbetrieb -M1 vorwärts/ Manual -M1 forwards -S4 Tippbetrieb -M1 rückwärts/ Manual -M1 backwards -P7 ausgefahren/extended -S6 Zylinder -M4 ausfahren/ cylinder -M4 einfahren/ cylinder -M4 retract
--	---	---

Figure 6: Control panel

9.3 Reference list

DI	Туре	Identifier	Function	NC/NO
I 0.0	BOOL	-A1	Return signal emergency stop OK	NC
I 0.1	BOOL	-K0	Main switch "ON"	NO
I 0.2	BOOL	-S0	Mode selector manual (0)/ automatic (1)	Manual = 0 Auto = 1
I 0.3	BOOL	-S1	Pushbutton automatic start	NO
I 0.4	BOOL	-S2	Pushbutton automatic stop	NC
l 0.5	BOOL	-B1	Sensor cylinder -M4 retracted	NO
I 1.0	BOOL	-B4	Sensor part at slide	NO
I 1.3	BOOL	-B7	Sensor part at end of conveyor	NO
IW64	BOOL	-B8	Sensor actual value speed of the motor +/-10V corresponds to +/- 50 rpm	

The following signals are required as global operands for this task.

DO	Туре	Identifier	Function	
Q 0.2	BOOL	-Q3	Conveyor motor -M1 variable speed	
QW 64	BOOL	-U1	Manipulated value speed of the motor in 2 directions +/- 10V corresponds to +/- 50 rpm	

Legend for reference list

- DI Digital Input DO Digital Output
- AI Analog Input AO Analog Output
- I Input Q Output
- NC Normally Closed
- NO Normally Open

9.4 Planning

Plan the implementation of the task on your own.

9.5 Checklist – Exercise

No.	Description	Completed
1	Data block MAGAZINE_PLASTIC [DB3] successfully created.	
2	Program changes made in MOTOR_AUTO [FB1].	
3	Program changes made in Main [OB1].	
4	Compiling successful and without error message	
5	Download successful and without error message	
6	Switch on station (-K0 = 1) Cylinder retracted / Feedback activated (-B1 = 1) EMERGENCY OFF (-A1 = 1) not activated AUTOMATIC mode (-S0 = 1) Pushbutton automatic stop not actuated (-S2 = 1) Briefly press the automatic start pushbutton (-S1 = 1) Sensor part at slide activated (-B4 = 1) then Conveyor motor M1 variable speed (-Q3 = 1) switches on and stays on. The speed corresponds to the speed setpoint in the range +/- 50 rpm	
7	Sensor part at end of conveyor activated (-B7 = 1) \textcircled{B} -Q3 = 0 (after 2 seconds)	
8	Briefly press the automatic stop pushbutton $(-S2 = 0)$ ® $-Q3 = 0$	
9	Activate EMERGENCY OFF (-A1 = 0) ® -Q3 = 0	
10	Manual mode (-S0 = 0) ® -Q3 = 0	
11	Switch off station (-K0 = 0) $\ensuremath{\mathbb{B}}$ -Q3 = 0	
12	Cylinder not retracted (-B1 = 0) \textcircled{B} -Q3 = 0	
13	Speed > Motor_speed_monitoring_error_max ® -Q3 = 0	
14	Speed < Motor_speed_monitoring_error_min	
15	Project successfully archived	

10 Additional information

More information for further practice and consolidation is available as orientation, for example: Getting Started, videos, tutorials, apps, manuals, programming guidelines and trial software / firmware, under the following link:

www.siemens.com/sce/s7-1200

Preview "Additional information"

Getting Started, Videos, Tutorials, Apps, Manuals, Trial-SW/Firmware

- ↗ TIA Portal Videos
- ↗ TIA Portal Tutorial Center
- > Getting Started
- ↗ Programming Guideline
- Easy Entry in SIMATIC S7-1200
- > Download Trial Software/Firmware
- ↗ Technical Documentation SIMATIC Controller
- Industry Online Support App
- TIA Portal, SIMATIC S7-1200/1500 Overview
- ↗ TIA Portal Website
- ↗ SIMATIC S7-1200 Website
- ↗ SIMATIC S7-1500 Website

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