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SIMATIC Easy Motion Control

Parameterization Guide



Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control

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Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control

Foreword

This document is an extension to the document entitled "Closed-Loop Controlled Positioning of an Axis with SIMATIC S7-300 CPU 314C-2 DP, MICROMASTER 440 and SIMATIC Easy Motion Control, Application Description".

The Application Description contains commissioning instructions which are based on saved lists of parameters.

This document, however, contains a step-by-step guide to assigning those parameters.

Structure of the document

This document contains a step-by-step guide to the assignment of parameters to the following components:

- MICROMASTER 440
- CPU 414C- 2 DP
- SIMATIC Easy Motion Control
- SIMATIC NET OPC server

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1 Safety Instructions

Risk of injury

<u>/!</u>\

Warning

The hardware components used as components in plant and systems require compliance with special rules and regulations, depending on the area of application.

Please comply with prevailing safety and accident-prevention regulations, e.g. IEC 204 (emergency STOP devices).

Failure to comply with these regulations may lead to serious injury and to damage to machinery and equipment.



Danger

Risk of injury caused by moving parts.



2

Danger

You may come into contact with live cables. Therefore, you MUST isolate the power before wiring the application setup.

Application Description

This document is an extension to the document entitled "Closed-Loop Controlled Positioning of an Axis with SIMATIC S7-300 CPU 314C-2 DP, MICROMASTER 440 and SIMATIC Easy Motion Control, **Application Description**".

The Application Description contains

- the fundamental principles of the technology used,
- a description of the components used,
- setup and commissioning instructions and
- operating instructions for the application.

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3

Commissioning the MICROMASTER

You MUST follow the safety tips in the Operating Instructions for the MICROMASTER .



Warning

The inverter conducts hazardous voltages and controls rotating mechanical parts which may be dangerous. Failure to heed warnings or to follow the advice given in these instructions may result in death, serious injury or considerable damage to property.

Only personnel with appropriate training may work on this device. They must be familiar with all the safety tips and installation, operation and maintenance procedures which are contained in these instructions. In order to be operated safely and in perfect working order, the device must be transported, installed, operated and maintained properly.

Risk of electric shock. The capacitors in the DC intermediate circuit remain charged for 5 minutes after the power supply has been switched off. Consequently, the device may not be opened for 5 minutes after the power supply has been switched off.



Caution

Children and unauthorized persons must be kept well away from the device!

The device may only be used for the purpose specified by the manufacturer. Unauthorized modifications and the use of spare parts and accessories which are not distributed or recommended by the device manufacturer may cause fires, electric shocks and injuries.



Warning

MICROMASTER inverters work at high voltage. When electrical devices are operated, some of the parts in these devices carry dangerous levels of voltage.

Emergency stop devices conforming to EN 60204 IEC 204 (VDE 0113) must remain functional in all the controller's operating modes. If the emergency stop device is reset, this must not lead to uncontrolled or undefined restarts.

Additional procedures or equipment must be incorporated in situations where short circuits in the controller may lead to considerable damage or even serious injuries (i.e. potentially hazardous short circuits) in order to guarantee or make definite that the system can be operated safely, even if a short circuit occurs (e.g. independent limit switches, mechanical locks, etc.).

Certain parameter settings could cause the inverter to start again automatically after the voltage supply has failed.

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3.1 Preconditions for Configuring the MICROMASTER

The MICROMASTER must be connected to the mains power supply before it can be configured.

There are different ways of assigning parameters to the MICROMASTER:

Operator Panel	Picture	Properties
Basic Operator Panel (BOP)	SIEMENS 150.00 Hz 0 0 0 0	Most basic operator panel, only with a seven segment display, adequate for adjusting some known parameters.
Advanced Operator Panel (AOP)	SIEMENS RINNING fa P000 F=50.0Hz p I=4.8 RPM=1500 p M=100% V=400V V 1 Image: Comparison of the second se	Same as the BOP, but with a multi- line plain text display, 10 sets of parameters can be saved, more reliable parameter input in the form of a plain text display.
PC connection kit + Starter		The MICROMASTER is easy to commission using the Starter PC software.
		The MICROMASTER is connected to the PC by a serial RS232 connection.
PROFIBUS + Starter		The MICROMASTER is easy to commission using the Starter PC software.
		The MICROMASTER is connected to the PC via PROFIBUS.
		This necessitates the PROFIBUS interface on the MICROMASTER. In CPUs with routing capability, the PG/PC can also be connected to the CPU via MPI; the CPU then routes between MPI and PROFIBUS.

Table 3-1 MICROMASTER parameterization options

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Procedure for assigning parameters to the MICROMASTER

As the MICROMASTER is considerably easier to configure using the STARTER PC program (stand-alone or integrated in DriveES), this is the only parameter-assignment method that will be considered below. If you wish to use an operator panel, please refer to the MICROMASTER documentation.

Following installation of the Starter software, go to **Options** and **Set PG/PC Interface** to ensure that you have selected the correct type of access to the MICROMASTER. In the case of USS, also check the baud rate (default is 9600) under Properties.

3.2 Variants of the Starter Program

You can download Starter free of charge or pay for the version integrated in DriveES.

The main difference between the two versions is the file storage. The stand-alone version saves the parameter sets in a separate file, whereas the integrated version saves the parameter sets in the database in the SIMATIC Manager.

DriveES integrates the drives into the SIMATIC Manager, incorporating them completely into the world of Totally Integrated Automation.

If you are using the stand-alone version, follow the instructions in Table 3-2

If you are using DriveES, follow the instructions in Table 3-3



Fig. 3-1

Overview of the table structure for assigning parameters to the MICROMASTER

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3.3 Create a Project with Starter (Stand-alone)

Table 3-2 Create a project with Starter (stand-alone) Step Action 1 Start the Starter software by double clicking on the 🚺 icon. 2 Project Wizard Starter X З. 2. 4. 1. PG/PC - Set Insert drives Introduction Create Summary interface new project. Arrange drive units offline... Find drive units online... Open existing project (offline)... Display Wizard during start Cancel Fig. 3-2 Project Wizard If the Wizard does not start automatically, call it up via Project and New with wizard. 3 Click on Find drive units online... 4 Enter the required project name. If you wish, you may also change the directory and complete the other fields. Click on Continue to end the step.

Step	Action
5	Select the PC/PG interface.
	Set PG/PC Interface
	Access Path
	Access Point of the Application:
	S70NLINE (STEP 7)> PC COM-Port (USS)
	(Standard for STEP 7)
	Interface Parameter Assignment Used:
	PC COM-Port (USS) Properties
	Image: Second
	Copy
	C Adapter(PROFIBUS) Delete
	(Parameterizing your PC COM port for a USS protocol)
	Interfaces
	Add/Remove: Select
	OK Cancel Help
	Fig. 3-3 Set PG/PC Interface
	If you are using the PC connection kit, select PC COM-Port (USS) .
	Test it via Diagnostics
	Click on OK and Continue to end the step.

Step	Action
6	Search for reachable nodes: If communication has been established with the MICROMASTER, it is displayed in the Preview:
	Project Wizard Starter
	1. 2. 3. 4. Introduction Create PG/PC - Set Insert drives Summary new project interface Interface Summary
	Preview MC_EMC Drive_addr0 Search for reachable nodes
	< Back Continue > Cancel
	Fig. 3-4 Insert drives
	Click on Continue and Finish to end the step.



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3.4 Create/Select a Project with DriveES

Table 3-3	Create or se	lect a project with Drive	ES		
Step	Action				
Step 1	Action Start the SIMATI Open the require Insert, Program Paste - SIMOTION driv General Drive Device type: Device version Bus addr.:	C Manager. ed project. Insert a SII , SIMOTION drive). S re MICROMASTER 440 2.0x 0	MOTION drive into t Select the following s	he project (settings:	right-click or via
	Fig. 3-6 [The bus address	Drive selection	Cancel	Help JS.	

Step	Action
2	Open the interface configuration via Options, Set PG/PC Interface.
	Set PG/PC Interface
	Access Path
	Access Point of the Application:
	S70NLINE (STEP 7)> PC COM-Port (USS)
	(Standard for STEP 7)
	Interface Parameter Assignment Used:
	PC COM-Port (USS) Properties
	Diagnostics
	PC Adapter(Auto)
	PC Adapter(PROFIBUS)
	PC COM-Port (USS)
	(Parameterizing your PC COM port for a USS protocol)
	- Interfaces
	Add/Remove: Select
	OK Cancel Help
	Fig. 3-7 Set PG/PC Interface
	If you are using the PC connection kit select PC COM-Port (USS)
	Parameterize access via Properties
	Test it via Diagnostics
	Click on OK and Continue to end the step.



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3.5 Parameterize the Motor Data

Table 3-4	Parameterize the	Motor Data

Step	Action											
1	If you are not usin settings first of all:	g a brar	nd nev	v in	verter, you	are	e advised to r	rest	ore th	ie fact	ory	
	Right-click on Driv to use), Target de	/e_Add evice an	r 0 or l d Re s	MIC stor	ROMASTE	ER_ set	_ 440 (or on th tings.	ne d	device	e that y	/ou v	vish
2	If you only wish to the expert list:	make a	few	quic	k changes	to	existing para	me	ters ir	n a list	, call	up
	Right-click on the indexed parameter	drive de rs, click	vice a on th	and e +	select Exp in the 2nd	ert col	and Expert umn to call u	list p tł	. If yo ne ind	u wisł ices.	i to s	set
	STARTER - MC_EMC - [Drive_Ad	dr0.MICROMAST	ER_440 - E	kpert li	st]							
	Project Target system View Op	itions Window H	Help	1111	antilizztizztilina		a la la la la					
		<u> </u>	<u><u></u></u>	<u>&]] </u>								1
		Î.	1	i	2	- 9	• 🕹 😫 💷					
	nsert single drive		P no.	+ +	Parameter text		Online value Drive_Addr0	Unit	Changea	Acces Min	Max	
	E C MICROMASTER 440		r2		Unive state		Drive ready (1) Standard: Allows access in	-	Operation	2 0	4	
	-> Configuration	pen configuration			Parameter filter		All parameters (0)	-	Operation	1 0	22	
	> Terminals / bu:	xpert	 Exper 	t list	Driv	ve da	21	-	Operation	2 2	2294	
		erminals/bus	Impor	t object			In Ready state alternate bet	-	Operation	3 0	4	
	-> Control panel	mits	Save	oroject	and export object		U Ready (0)	-	Operation Ready to r	3 0	2000	
	Extended	iagnostics			Lock for user defined par	amet	0	-	Operation	3 0	65535	
	> Motor pote	ontroi panei vtended			Key for user defined para	amete	0	-	Operation	3 0	65535	
	> Fixed spee	xcondod	[0]	+	User defined parameter,	1st u	0	-	Operation	3 0	65535	
	> Setpoints	roperties	[0]	+	Store mode, Serial interfai	ice C	volatile (RAM) (0)	-	Operation	3 0	1	
	> Shutdown funct	ions	r19	+	CO/BO: BOP control word	a	2.05 2H	-		3		
	> Speed controlle	·	r20		CO: Act. frequency setpo	pint	0.00	Hz	0	3		
	> Start functions		r21		CO: Act. frequency		0.00	Hz		2		
	> Functions		r22		Act. rotor speed		0	rpm		3		
	y meeningales		r24		CO: Act. output frequency	у	0.00	Hz		3		
			r25 r26		CO: Act. DC-link voltage		309	V		2		
			r27		CO: Act. output current		0.00	A		2		
			r29		CO: Flux gen. current		0.00	A		3		
			r30	_	CO: Torque gen. current		0.00	A		3		
			r31 r32		CO: Act. torque		0.00	INITI -	5	2	-	
			r35[0]	+	CO: Act. motor temperatur	re,1	20	°C	1	2		
			r37[0]	+	CO: Inverter temperature [[°C],	26	°C		3		
			r38		CO: Act. power factor		0.000	-		3		-1
	Project		1/20			star [l/	19.0	INAM		<u> </u>	1 1	
			Drive_A	ddru.Miu	RUMASTER_440							
	× Denies Operation	1-										- 1
	Drive_Addr0 Drive ready: 1	ES, Drive ready to	run: NO, Driv	e runnir	ng: NO, Drive fault active: N	10, OF	F2 active: YES, OFF3 active: Y	YES, ON	l inhibit active	: YES, Drive v	varnin	
	Alarms Target system outp	ut 🔢 Load to P	G output 목	g Diag	nostics overview							
	Opens the expert list.						Online m	ode			NUM	
											, ,	
	Fig. 3-9 Ex	opert list										

Step	Action
3 3	Action If you are working with the PC connection kit, you are highly advised to increase the baud rate: • Double click on Terminals/bus in the tree diagram • Select the USS via RS232 (BOP link) entry in the USS/PROFIBUS page. • Now set USS baud rate, Serial Interface BOP link to 115200 baud. • Follow the instructions that appear on the screen (disconnect, set PG/PC interface, reconnect).
	Image: Second
	Project Drive_Addi0.MICROMASTER_440 x
	Device Operating mode Drive_Addt0 Drive ready: YES, Drive ready to run: NO, Drive running. NO, Drive fault active: NO, OFF2 active: YES, OFF3 active: YES, ON inhibit active: YES, Drive warmin Image:
	If you wish to use the AOP, you need to change the baud rate back to 9600 first. Otherwise, the AOP will not be able to establish a connection!

Step	Action
4	 Double click on Configuration and then select Reconfigure drive. Don't make any changes to data which is not specified in these instructions. Click on Constant torque (0). Enter the motor data according to the motor rating plate. Don't make any changes to data which is not specified on the rating plate. Select Quadrature encoder without zero pulse (2) and indicate the stroke number shown on the encoder's rating plate (e.g. 1000). Select Change to SLVC (1) in the Encoder monitoring page. Set the operating mode to Vector control with sensor (1). Make no changes under Command/Setpoint Source. Click on Yes in response to the question "Change default settings of the relevant binector/connector inputs?". Enter 0 s for the ramp-up time and the ramp-down time.
	Click on Finish to close.
	STANTER-MC_DMC Onlogunation Protect Target system Yew Options Window Help Output System Target system Yew Options Window Help Display all command data sets No CB option board (0) Protect Display all command data sets Display all command data sets Exaction Status cycle: Immediately Cooker Otose Help Dime_Add0 MICRDMASTER_440
	Inve_Addu MICRUMASTER_44U
	Press F1 to open Help display.
	Fig. 3-11 Configure drive data

Step	Action
5	Once you have entered the motor data, you should perform the motor identification. The motor is measured by the MICROMASTER so that the motor model can be adapted more accurately to the prevailing circumstances by Vector Control. Data is also measured which is not shown on the rating plate, such as the cable length.
	Warning: The motor is switched on below and may possibly start turning!
	 For this purpose, click on 1. Motor identification in the configuration.
	Follow the instructions.
	 Call up the control panel by double clicking on Control panel in the tree structure. The panel is then displayed in the detail area.
	 Click on the Assume control priority button, pay attention to it and confirm the instructions.
	Check Enables (bit 1 to bit 6).
	 You can now switch on the MICROMASTER by clicking on the green 1 button. The MICROMASTER will then perform the motor identification and switch itself off again automatically.
	Image: Section of the section of th

Step	Action									
6	 Undo the ON command again by clicking on the red 0 button or by pressing the spacebar. 									
	 Now click on 2. Determ. of the saturation to perform another supplementary measurement of the motor. 									
	Follow the instructions.									
	 Click on Assume control priority, follow and confirm the instructions. 									
	Check Enables (bit 1 to bit 6)									
	 You can now switch on the MICROMASTER by clicking on the green 1 button. The MICROMASTER will then perform the motor identification and switch itself off again automatically. 									
	 Undo the ON command again by clicking on the red 0 or by pressing the spacebar. 									
	 Click on Return to return control priority to the configured source (terminal block). Follow the instructions. 									
	Drive_Addr0 - MICROMASTER_440									
	Return 1 0 1/0 Motor: F(ref) = 50.00 Hz									
	Enables (bit 1 to bit 6) Stop w. space bar - always works!									
	Drive ready Set! /									
	OUN / DEF 1 Output frequency: 0.00									
	ON / OFF 2 Torque 0.00									
	Q ON / OFF 3 Inverter load: 0.0 % Mo									
	Pulse enable Drive data set: 1 Cor									
	Start/stop ramp-function gen									
	Commands=USS on BOP link									
	🛛 🚰 Alarms 💋 Control panel 🔲 Target system output 🔲 Load to PG									
	Press F1 to open Help display.									
	Fig. 3-13 Return control priority									
	The motor identification routine is now complete.									

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3.6 Check the Encoder Connection



Danger

The motor is switched on and starts turning below. Safety devices, such as limit switches, are not active yet because the drive is operated solely by means of closed-loop speed control. Make sure that no injuries or damage occur as a result.

Note

The drive is normally set up to rotate clockwise with a positive setpoint. The direction of rotation is defined looking from the load machine towards the motor shaft.



Fig. 3-14 Motor rotating clockwise

Table 3-5	Check the encoder connection
Step	Action
1	Double click on Terminals/bus in the tree diagram and select the Digital outputs page in the right pane.
2	Parameterize digital output 3 to r52 Bit.12 (Motor holding brake active).
	Fig. 3-15 Parameterize digital output 3

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Step	Action
3	Double click on Extended and Shutdown functions in the tree diagram.
	Scroll down and enable the motor holding brake.
	Shutdown functions Kinetic buffering
	Motor holding brake: Motor holding brake enabled (1) Opening delay time: 1.0 Closing delay time: 1.0 Dynamic deceleration: 5 % duty cycle (1) Superimposed DC current deceleration: 0 Limits -
	 Fig. 3-16 Enable the MHB When selecting the Opening delay time, allow for the fact that the motor is magnetized and for the load to be held when the brake is open. When selecting the Closing delay time, allow for the fact that the brake is closed and for the load to be held when the motor is switched off. When selecting the minimum frequency, make sure that the load can be held securely. If you have a pulsed resistor connected, enable the dynamic deceleration by entering a 5% duty cycle (1).
4	Activate the Expert list (see step 2 in Table 3-4 Parameterize the Motor Data)
5	Set parameter 1300[0] to V/f with linear charac. (0) in the expert list. This causes the drive to move without encoder return, which means that if the encoder is incorrectly wired, this will not cause the drive to overspeed.
6	Scroll down until you can see r61 (rotor speed).
7	Retrieve control priority again and assign the enable bits 1 to 6 .



Step	Action
11	Instructions on troubleshooting:
	If the value is negative and lies between 4 and 5 Hz, switch the motor off again and
	select one of the following measures:
	 Switch two motor phases (Warning! 230 V, wait for the inverter to discharge!)
	 Switch tracks A and B in the encoder (as well as AN and BN, if they are used)
	Switch parameter P 1820[0].
	If the value fluctuates sharply, this probably indicates that some pulses are not being detected. Check the encoder wiring. Use the A and B LEDs in the encoder evaluation in the MICROMASTER for control purposes. (See section 5 of the MICROMASTER, Encoder Module, Operating Instructions)
	The A and B LEDs must exhibit the following sequence of lights when the drive is turned slowly by hand.
	both off
	only LED 1 on
	both on
	only LED 2 on
	 both off (cycle starts again)
	Depending on the direction in which the drive turns, track $A = LED 1$ and track $B = LED 2$ or vice versa.
11 (contd.)	If the value of r61 fluctuates around a value other than 4 to 5 Hz, this probably indicates that you have entered an incorrect stroke number in P408[0].
	Keep repeating the encoder test until the value of r61 is correct.
	If parameter r61 is working properly, switch off again (red 0) and continue with Table 3-6. Optimize the speed controller

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3.7 Optimize the Speed Controller

Table 3-6	Optimize the speed controller
Step	Action
1	In order to optimize the speed controller, the entire load should be connected to the motor. This is the only way of optimizing the speed controller correctly. The drive turns in a positive direction during optimization.
2	Set parameter 1300[0] to Vector control with sensor (21) via the expert list.
3	Double click on Extended and Speed controller in the tree diagram.
4	Click on the Start optimization button and follow the instructions.
5	If necessary, assign the enable bits 1 to 6 again and switch the drive on.
6	Following optimization, the drive switches off automatically. Remove enable bits 1 to 6 and return the control priority.

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3.8 Close the Parameterization

р	Action						
	The MICROMAST output frequency, o voltage, in order to However, as this c switched off for pos For this purpose, s	ER 440 has a V_{DC} condepending on the lepperdender of the lepper transformed to the lepper vent it cutting of an have a bearing consistioning tasks. The P1240[0] to Vdc	ontroller wh evel of the in ff due to a n on positionin controller	ich teri nali ng, dis	influence mediate function it should abled (ces t circ d be 0) in	he uit the
	expert list.						
	STARTER MC_EMIC [Drive_Addro.MICROS Droject Drive Iarget system year Splans DCE B S Start Source A	HASTER_440 - Expert list) Window Help P P X X X 100	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				فلم
	B B MC_EMC	T 1 p1240		_			
	□ Insert single drive	P no. + + Parameter text	Online value Drive_Addr0	Unit	Changeab Acces	Min Ma	*
		p1202(0) + Motor-current: Flying start, 1st	it. 100	%	Operation 3	10 200	
	Configuration	p1203[0] + Search rate: Flying start, 1st.	Dri 100	%	Operation 3	10 200	
	-> Lints	pt210 Automatic restart	Trip reset after power on,	-	Operation 2	0 6	-
	Diagnostics Control panel	p1211 Number of restart attempts	3	-	Operation 3	0 10	
	E-> Extended	p1215 Holding brake release delay	Motor holding brake enabled (1.0	-	Ready to ru 2	0 1 20	-
	 Motor potentiometer (MOP) Event speeds 	p1217 Holding time after ramp down	1.0	τ.	Ready to ru 2	0 20	
	-> PID controller	p1230[0] + Bt Enable DC braking, 1st. Co p1232[0] + DC braking current, 1st. Drive	m 0 da/100	-	Operation 3 Operation 2	0 250	
	-> Setpoints	p1233[0] + Duration of DC braking, 1st. D	wiv 0	8	Operation 2	0 250	1
	> Speed controller	p1234[0] + DC braking start frequency, 1	st. 650.00	Hz	Operation 2	0 650	
	-> Start functions	p12360 + Compound braking current, 18 p1237 Dynamic braking	5% duty cycle (1)	-	Operation 2	0 5	
	> Functions	p1240[0] + Configuration of Vdc controlle	er, Vdc controller disabled (0)	•	Ready to ru 3	0 3	
	7 1100 1100 100	r1242 CO: Switch-on level of Vdc-may 1 pt24300 + Dynamic factor of Vdc-may 1	tet 100	W.	Operation 3	10 200	
		p1245[0] + Switch on level kin, buffering,	,1 76	%	Operation 3	65 115	
		r1246(0) + C0:Switch-on level kin buffer	ing 247.1	V	Counting 2	10 200	
		p1253101 + Vdc-controller output limitation	g, 100 n, 1 12 50	79	Operation 3	0 600	-
		p1254 Auto detect Vdc switch-on let	rvel Enabled (1)	-	Ready to ru 3	0 1	
		p1256[0] + Reaction of kinetic buffering, p1257[0] + Erea and for kinetic buffering.	1st Maintain DC-link until trip (0) 1e 250	-	Ready to ru 3	0 2	
		p1300(0) + Control mode, 1st. Drive data	set Vector control with sensor (Ready to ru 2	0 23	
		p1310[0] + Continuous boost, 1st. Drive d	det 50.0	%	Operation 2	0 250	
		p13110 + Acceleration boost, 1st. Drive	0.0	%	Operation 2	0 250	-
		p1316[0] + Boost end frequency, 1st. Dr	ive 66.8	96	Operation 3	0 100	5
		p1320[0] + Programmable V/f freq, coord	1.1 0.00	HI	Ready to ru 3	0 650	
		p1322101 + Programmable V/I vot. coord	1,000	Hz	Ready to ru 3	0 300	0
	Project	Drive_Add0.MICROMASTER_440	1476				-
	Alama 💋 Control panel Target system	em output Load to PG output Diagnostics over	ervsew.				
	Press F1 to open Help display.	em output.) IIII Load to PG output.) 🖓 Diagnostice ove	Online	mode		NU	м



Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control



Note

If the ON command and the setpoint are transmitted via the PROFIBUS, **CB on COM link (6)** must be specified when entering the drive configuration:

	< <u>B</u> ack Continue >	<u>H</u> elp
	PROFIBUS address 3 Caution: A change of the address will become effective immediately Take care not to interrupt the communications between PC and drive.	
	USS bus address: RS232 RS485 T	
Command/setpoint sou	Source of speed setpoints? CB on COM link (6)	
✓Encoder ✓Encoder monitoring	Source of control signals? CB on COM link (6)	
✔Standard ✔Motor	Interface default values - can be changed later. The setpoint is generated from the main setpoint and additional setpoint.	

Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control

3.9 Save the Parameterization

Step	Action
1	Now disconnect from the target system by clicking on the Disconnect button.
	STARTER - MC_EMC - [Drive_Addr0.MICROMASTER_440 - Configuration] Project Drive Target system View Options Window Help D Image: Start Structure MC_EMC Insert single drive
	Fig. 3-21 Disconnect from target system
	Check Save changes and Copy RAM to ROM in the window below to enable the data/parameters to be saved in the MICROMASTER and in the PC/PG. This may take a few minutes.
	Save data
	Drive_Addr0.MICROMASTER_440 - Configuration has been changed Do you want to save the changes?
	Load changes, i.e.data is loaded from the drive to the RAM of the PG/PC
	Save changes, i.e. data is loaded to the PG/PC and saved in the project on the hard disk Copy RAM to ROM is only possible when the drive is not controlled
	Yes No Cancel
	Fig. 3-22 Save data
2	The commissioning of the MICROMASTER has now been concluded.

Note

If you have completed the commissioning of the MICROMASTER via the serial interface and USS and now wish to configure the S7, you need to switch the PC/PG interface back to MPI or PROFIBUS.

Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control

4 Parameterization of the CPU 314C-2 DP

4.1 Parameterization of the Internal Counter

The following properties should be set in the HW Config for the CPU314C in the Count submodule:

operties - Count - (R0/9	52.4)		
Channel: 0 💌 C	perating mode: Cou	int continuously	
General Addresses Basi	c Parameters Count		
COperating Parameters	-		
Main count direction:	None	Comparison <u>v</u> alue:	0
Gate function:	Cancel count		0
Start value:			
En <u>d</u> value:	1		
_Input			
Signal evaluation:		Characteristics of the output:	_
Rotary encoder quadru		INO COMPARISON	
Hard <u>w</u> are gate		Pulse duration:	ms
	ted		
Hardware Interrupt		Max. frequency	
Hardware gate open	ing	<u>C</u> ounting signals/hardware 30 kHz	-
Hardware gate closir	ig	Latch: 10 kHz	-
On reaching compar	ačor		
OK Default	1	Cancel 1	Help

Fig. 4-1 Parameterization of the counter

Note

If rotary encoder quadruple is activated in the HW Config, enter the quadruple pulse count in the axis DBs for Easy Motion Control!

Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control

4.2 Parameterization of the Analog Interface

Set the analog output to \pm 10V in the properties for the CPU, submodule AI5/AO2 in the HW Config:

	<u> </u>			
Output	0	1		
Output:			-	
Output type:	IV.		_	
Output range:	+/- IU V	1+/- 10 V		

Fig. 4-2

Parameterization of the analog output

Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control

5 Parameterization of the Motion Axis in Easy Motion Control

5.1 Defining the Operating Parameters

The following criteria apply in the storage lift application:

Table 5-1Technical data for the high-bay store

Components	Dimensions	
Cable winch incl. motor:	Diameter: Inertia torque: (relative to the motor spindle)	15 cm 0.0076 kgm ²
	Max. acceleration: Transmission ratio:	0.45 m/s ² 1:10

Encoder:

The sample application involves using gears, which are simulated via settings in Easy Motion Control. As the encoder sits on the motor axis, the correct encoder data is entered in the MICROMASTER, enabling it to activate the motor correctly. In the case of Easy Motion Control however, the transmission ratio is factored in, making it appear to Easy Motion Control as though the encoder is sitting on the load side. MICROMASTER: 1000 pulses per revolution Easy Motion Control: 10000 pulses per revolution

Distance per revolution:

As the maximum counting frequency of the CPU314C is 60 kHz, this yields a maximum encoder speed of 60 rps or 3600 rps in the case of an encoder with a frequency of 1000 pulses per revolution. The maximum speed of the motor is 1500 rpm, thus representing the maximum speed of the system. This means that the maximum speed on the load side of the gearbox is 150 rpm.

Based on a diameter of 15 cm, this works out at a distance of 471.21 mm per revolution.

Maximum velocity:

Rotating at a maximum velocity of 1500 rpm, this yields a maximum positioning velocity of 1178.10 mm/s. The value entered in the axis DB is rounded down to 1000 mm/s.

Maximum acceleration:

The maximum default acceleration is 450 mm/s².

Estimation of the maximum positioning time:

Disregarding the acceleration ramps, it would take approx. 13 s to cover a distance of 125,000 mm.

Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control

5.2 Parameterization of the Axis Parameters

Table 5-2	Parameterization of the axis parameters
Step	Action
1	 Create an axis DB with the aid of the Easy Motion Control parameterization user interface: Start Easy Motion Control. Open the project in which the axis is to be used. Enter the name of the database that you wish to use or create, e.g. DB100, and click on OK to confirm.
	New X Entry point: View: Project Component view Name: Storage path: MC_EMC C:\Program Files\Siemens\Step7\S7Pr Browse E::::::::::::::::::::::::::::::::::::
	Object name: DB100 Object type: Data Block OK Cancel
	Fig. 5-1 Create a new axis DB

icp	Action
	 Enter the configuration: Select the entry CPU314C as the input driver. The module address for inputs and outputs is the address assigned to the CPU314C's counting module in the HW Config. The channel number is the number of the channel being used. Select the entry CPU314C as the input driver. The module address for inputs and outputs is the address assigned to the CPU314C's analog output module in the HW Config. The channel number is the number of the channel being used.
	Easy Motion Control V2 - DB100 File PLC View Window Help MC_EME\CPU 314C (EMC_V2)\CPU 314C-2 DP\\DB100 Commissioning Axis status Axis error Parameter assignment error Configuration Axis Encoders/Controller/Motor Monitors
	Units of length: mm Simulation mode Input driver for module: CPU 314C FB necessary: EncoderCPU314C Module input addresses: 768 Incremental encoder Module output addresses: 768 Absolute encoder Channel number: 0 Incremental encoder
	Output driver for module: CPU 314C Module input addresses: 0 Module output addresses: 752 Channel number: 0

Step	Action		
3	Specify the axis parameters on the next tab:		
Check Linear axis.			
	 Enter –500 and13000 mm for the 'SW limit switch'. 		
	• The 'scan time' is 0.25 s, although this is also entered in the first pass of the OB35.		
	 The 'maximum axis velocity' is 1000 mm/s. 		
	 The 'velocity override' remains at 100%. 		
	• The 'axis accelerations' are to be configured at 450 mm/s ² .		
	File PLC View Window Help		
	■ MC_EMC\CPU 314C (EMC_V2)\CPU 314C-2 DP\\DB100		
	Commissioning Axis status Axis error Parameter assignment error Configuration Axis Encoders/Controller/Motor Monitors		
	Linear axis Botary axis		
	<u>S</u> W limit switch start:		
	S <u>W</u> limit switch end: 13000 mm		
	Scan time: 0.25 sec		
	Maximum axis velocity: 1000 mm/s		
	Velocity override: 100 %		
	Maximum axis acceleration: 450 mm/s ²		
	Ma <u>x</u> imum axis deceleration: 450 mm/s ²		
	Press F1 for help		
	Fig. 5-3 Easy Motion Control: Axis parameters		

Step 4	Action Specify the parameters for the encoder	s, controller and motor on th
	next tab: • The 'steps per encoder allows for the rotary end HW Config, and the qua used. The factor of 10 i simulation.	revolution' is 40000. This coder quadruple enabled in adruple pulse count has bee s also added through the ge
	The 'axis distance per e mm.	encoder revolution' is 471.2
	The 'set encoder polarit commissioning.	y' is defined later on during
	 The 'controller gain' is c commissioning. 	lefined later on during
	The 'manual setpoint ve	elocity' remains at 10 mm/s.
	 The 'reference value fo 10V. 	r maximum axis velocity' is
	The 'offset compensation	on' is 0.
	 The 'set drive polarity' is commissioning. 	s defined later on during
	Easy Motion Control V2 - DB100	
	■ MC_EMC\CPU 314C (EMC_V2)\CPU 314C-2 DP\\DI	3100 - 🗆 🗙
	Commissioning Axis status Axis erro	r Parameter assignment error
	Configuration Axis Encoders	Controller/Motor Monitors
	Steps per encoder revolution:	40000
	Number of encoder revolutions:	1
	Axis distance per encoder revolution:	471.21 mm
	Set encoder polarity:	negative
	<u>Controller</u> gain	18 1/s
	Manual set-point velocity	10 mm/s
	Motor	
	Reference value for 100% speed:	10 Volt
	Reference value for maximum axis velocity	10 Volt
	Offset compensation:	0 Volt
	Set drive polarity:	negative
	2	

Step	Action
5	 Specify the parameters for the monitors on the next tab: The 'target range' is 100 mm. The 'standstill range' is 200 mm. The 'monitoring time for target approach' remains at 1 s. The 'deceleration for hard stop' remains at 1000 mm/s².
The 'max. allowed following distance' is 250 () Easy Motion Control V2 - DB100 File PLC View Window Help D D D D D D D	
	MC_EMC\CPU 314C (EMC_V2)\CPU 314C-2 DP\\DB100 Commissioning Axis status Axis error Parameter assignment error Configuration Axis Encoders/Controller/Motor Monitors Image: Image:
	Press F1 for help. © offline Chg
	Fig. 5-5 Easy Motion Control: Monitors

Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control

5.3 Move the Axis during Commissioning

Once the axis data has been entered and the controller has been loaded, EMC commissioning tools may be used. The motor and encoder polarity are checked, and appropriate switches are made or parameters set in the axis DB.

The configured axis DB must be available in the controller. The input driver must be factored in the CPU, but not the output driver, however.

The MICROMASTER has to be configured and connected to the 230V network. The wiring must be implemented between the controller, the MICROMASTER and the encoder.

5.3.1 Wiring Test

In the wiring test, the motor and encoder polarity are checked, and appropriate switches are made in the axis DB.

Note

The drive is normally set up to rotate clockwise with a positive setpoint. The direction of rotation is defined looking from the load machine.

Fig. 5-6



- Retrieve the application from the SIMATIC Manager and load it into the controller.
- Open the OB35 in the LAD/FBD/STL editor.

Motor rotating clockwise

- Enable the **SPA END** jump command in the 2nd line of network 3 by deleting the comment characters (*II*). Load the changed OB35 into the controller.
- Call up the DB100 axis DB with the Easy Motion Control software by double-clicking on the DB100 in the SIMATIC Manager.
- Select Commissioning and the Wiring test.
- Start the drive with the aid of the **signal_check** variable block by setting "idb_io".Drive_enabled to 1 or true.

Note

The motor may start to turn slowly on account of the analog setpoint transmission!

Closed-Loop Controlled Positioning of an Axis with SIMATIC CPU 314C-2 DP, MICROMASTER and SIMATIC Easy Motion Control

• Follow the wizard's instructions.

asy Motio	on Control Wizard: Wiring Test	×
🧭 м	love Axis	(2/4)
	WARNING:	
	The axis will move at the preset velocity when you click on the 'Move' I The axis will continue to move as long as you activate the 'Move' butto	outton. n.
	- Check to see if the axis moves in the desired direction.	
	Velocitu	<u> </u>
	-10% 0%	10%
	Setpoint output: 0.76 V Actual output:	0.76 V
		<u> </u>
	Zuriick Weiters Abbrechen	Hilfe

Fig. 5-7 Wiring test

- Stop the drive with the aid of the **signal_check** variable block by setting "idb_io".Drive_enabled to 0 or false.
- Save the axis DB and load it into the controller.

Note

If the drive starts turning slowly after being released, define the offset compensation, see section 0 5.3.2 Offset Compensation.

• Disable the **SPA END** jump command in the 2nd line of network 3 by inserting the comment characters (*II*) at the start of the line. Save the changed OB35 und and load it into the controller.

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5.3.2 Offset Compensation

If the drive starts turning slowly after being released, define the offset compensation:

- In order to do this, start the drive once again via the variable table and call up the wiring test, as described in section 0 5.3.1 Wiring Test (disable the command in OB35, etc.)
- Now, slide the elevator bar to select the setpoint until the drive comes to a stop with the move button <u>pressed</u>.
- Take a note this value and stop the wiring test.
- Enter this value into the offset compensation field on the Encoders/Controller/Motor tab of the Easy Motion Control parameterization software.
- Disable the **SPA END** jump command in the 2nd line of network 3 by inserting the comment characters (*II*) at the start of the line. Save the changed OB35 und and load it into the controller.

Note

The offset compensation does not take effect while the output driver is not active, e.g. in the wiring test; consequently, it cannot be checked.

If the output driver is factored in, the closed-loop position control is also activated; it automatically also compensates for an offset, which also means that the offset compensation cannot be checked.

However, if an offset has already been compensated for via the offset compensation, this does not have to be done by the closed-loop position controller, improving the control performance.

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5.3.3 Closed-Loop Position Control Optimization

The optimum controller gain can be determined experimentally at the axis.

- Call up the DB100 axis DB with the Easy Motion Control software by double-clicking on the DB100 in the SIMATIC Manager.
- Select the Encoders/Controller/Motor tab.
- Move the axis with the aid of the HMI, e.g. by jogging.
- Raise the controller gain in increments of 1.0 until the axis starts to fluctuate in motion or at a standstill.
- If this happens, reduce the controller gain until there is no further tendency to fluctuate visible.
- Save the axis DB and load it into the controller.

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6 Parameterization of the SIMATIC NET OPC Server

Requirements

Install SIMATIC NET with the aid of the installation program on the SIMATIC NET CD.

When you select the CD, bear in mind that the version being used is operating system-dependent:

Table 6-1	SIMATIC NET	vorsions
	SIMATIC NET	Versions

Operating system	SIMATIC NET version
Windows 9x, NT, 2000	6.0
Windows XP	6.1

6.1 Test the OPC Configuration with OPC Scout

Table 6-2	Test OP configuration
	rescor coniguration

Step	Action		
1	The precondition for the test is that the S7 program is factored into CPU computations, and that the CPU is connected to the PC/PG via MPI.		
2	Open the OPC Scout via the Start menu (e.g. Start, SIMATIC, SIMATIC NET, PROFIBUS, SOFTNET PROFIBUS, OPC Scout)		
3	Double click on OPC SimaticNET and create a new group, e.g. Test:		
	Fig. 6-1 OPC Scout: Create a new group		

Step	Action
4	Open the Test group by double clicking on it.
	• Expand the S7 area:
	 Add a new variable by right-clicking in the pane on the extreme right: enter the following: S7:[S7 connection_1]DB202,INT0,3 This means that three integer values are read from DB202.
	Click on Add Item and OK to confirm.
	CPC Scout - New Project1 X File View Server Group 7 X Servers and goups X Jervers and goups Items incl. status information Servers and goups X
	Image: Server(s) Image: Server(s) OPC:SimalicHET OPC:SimalicHET Image: Server(s) Image: Server(s) Image: Server(s)
	Eller QK Cancel \S7. is selected 10.09.2003 12.01
	Fig. 6-2 OPC Scout: Insert connection

Step	Action
5	Once the connection has been established, the current values from DB202 are displayed under Value (i.e. values 25, 600, 105 in the screenshot).
	COPC Scout - New Project1
	Servers and groups Items incl. status information
	Cocal Server(s) C
	Item(s) successfully added
	Fig. 6-3 OPC Scout: Value display

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7 Internet Links

This list is by no means complete and only reflects a selection of the suitable Internet links available.

	Topic Area	Link
\1\	Link to this Application	http://support.automation.siemen s.com/WW/view/en/21669390
\2\	Easy Motion Control Manual	www.ad.siemens.de/support
		Select product support
		Open the following directories in the tree:
		Automation technology
		SIMATIC industrial automation systems
		SIMATIC industrial software
		Software for SIMATIC S7/C7/WinAC
		Runtime software
		Easy Motion Control
		Look here under Manuals / Ols
\3\	MM440 Operating Manual	www.ad.siemens.de/support
		Select product support
		Open the following directories in the tree:
		Drive technology
		AC inverter
		Low-voltage inverter
		MICROMASTER 4
		MICROMASTER 440
		Look here under Manuals / Ols

Table 7.1	Internet linke
	Internet links

Link
 www.ad.siemens.de/support Select product support Drive technology (Engineering) software Low-voltage inverter STARTER commissioning tool