Migration of CU240E/S to CU240B/E-2 and CU250S-2 (firmware V4.5)

SINAMICS G120

FAQ • March 2013

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Question

What do I have to observe if I wish to replace a Control Unit CU240E or a member of the CU240S family (CU240S, CU240S DP, CU240S DP-F, CU240S PN or CU240S PN-F) of the SINAMICS G120 by a Control Unit from the 2nd generation (Firmware V4.5)?

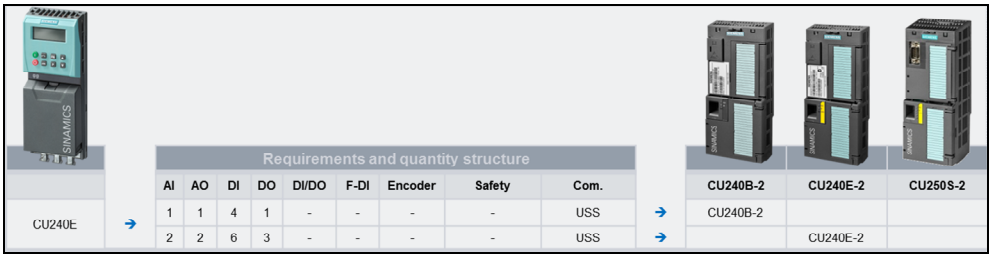
Answer

The instructions and notes listed in this document provide a detailed answer to this question.

Table of content

1 Migrating the CU240E/S Control Unit to the CU240B/E-2 and CU250S-2 Control Units

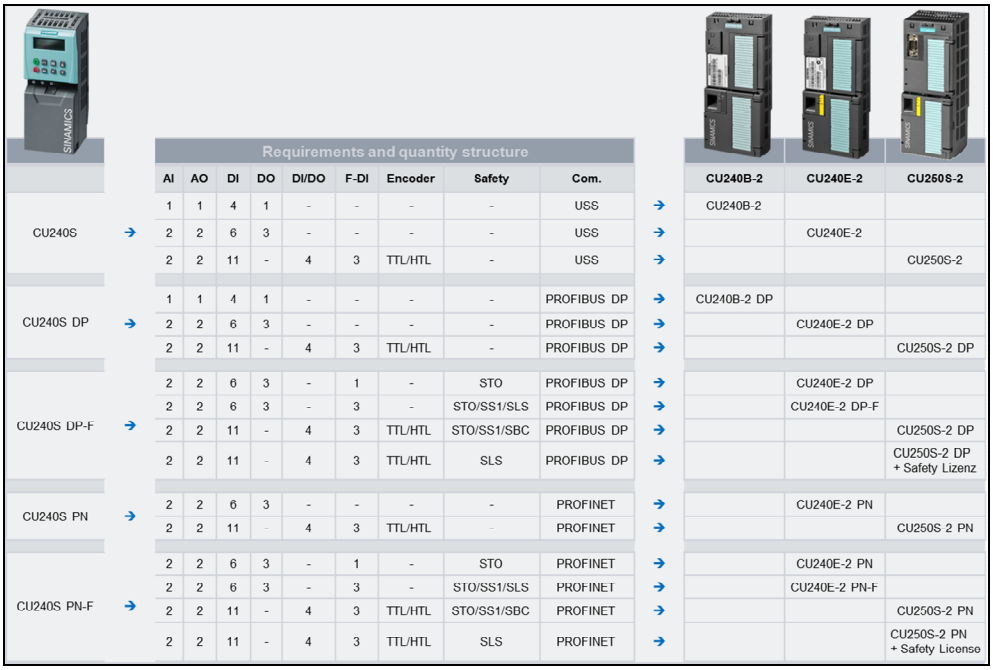
The CU240E Control Unit can be migrated to 2nd generation Control Units without any significant problems. Depending on the scope of the inputs and outputs used, either the CU240B-2 or the CU240E-2 is used.



	Requirements and quantity structure											
	AI	AO	DI	DO	DI/DO	F-DI	Encoder	Safety	Com.		CU240B-2	CU240E-2	CU250S-2
CU240E →	1	1	4	1	-	-	-	-	USS	→	CU240B-2		
	2	2	6	3	-	-	-	-	USS	→		CU240E-2	

Diagram 1-1: Migrating CU240E to 2nd generation Control Units

With the new CU250S-2 Control Unit, it is now also possible to replace all of the CU240S Control Unit applications. Depending on the required number of analog inputs and outputs, the digital inputs and outputs, the fail-safe digital inputs, the encoder used, the safety functionality and the bus communication, one of the three basic versions of the 2nd generation Control Units can be used.



	Requirements and quantity structure											
	AI	AO	DI	DO	DI/DO	F-DI	Encoder	Safety	Com.		CU240B-2	CU240E-2	CU250S-2
CU240S →	1	1	4	1	-	-	-	-	USS	→	CU240B-2		
	2	2	6	3	-	-	-	-	USS	→		CU240E-2	
	2	2	11	-	4	3	TTL/HTL	-	USS	→			CU250S-2
CU240S DP →	1	1	4	1	-	-	-	-	PROFIBUS DP	→	CU240B-2 DP		
	2	2	6	3	-	-	-	-	PROFIBUS DP	→		CU240E-2 DP	
	2	2	11	-	4	3	TTL/HTL	-	PROFIBUS DP	→			CU250S-2 DP
CU240S DP-F →	2	2	6	3	-	1	-	STO	PROFIBUS DP	→		CU240E-2 DP	
	2	2	6	3	-	3	-	STO/SS1/SLS	PROFIBUS DP	→		CU240E-2 DP-F	
	2	2	11	-	4	3	TTL/HTL	STO/SS1/SBC	PROFIBUS DP	→			CU250S-2 DP
	2	2	11	-	4	3	TTL/HTL	SLS	PROFIBUS DP	→			CU250S-2 DP + Safety Lizenz
CU240S PN →	2	2	6	3	-	-	-	-	PROFINET	→		CU240E-2 PN	
	2	2	11	-	4	3	TTL/HTL	-	PROFINET	→			CU250S 2 PN
CU240S PN-F →	2	2	6	3	-	1	-	STO	PROFINET	→		CU240E-2 PN	
	2	2	6	3	-	3	-	STO/SS1/SLS	PROFINET	→		CU240E-2 PN-F	
	2	2	11	-	4	3	TTL/HTL	STO/SS1/SBC	PROFINET	→			CU250S-2 PN
	2	2	11	-	4	3	TTL/HTL	SLS	PROFINET	→			CU250S-2 PN + Safety License

Diagram 1-2: Migrating CU240S to 2nd generation Control Units

2 Hardware

2.1 Comparison of the dimensions

	CU240E	CU240S	CU240B-2	CU240E-2	CU250S-2
Height	195mm	177mm	199mm	199mm	199mm
Width	73mm	73mm	73mm	73mm	73mm
Depth with BOP	31mm	63mm	53mm	53mm	68mm
Depth with IOP	-	-	63mm	63mm	78mm

Diagram 2-1: Dimensions of the Control Units

2.2 Number of inputs and outputs

2.2.1 CU240B-2 Control Unit

The CU240B-2 Control Unit has the following inputs and outputs:

- digital inputs, isolated, PNP/NPN switching
- 1 digital output (relay, 30V DC/0.5A)
- 1 analog input 0 – 10V, 0/4 – 20mA
- 1 analog output 0 – 10V, 0/4 – 20mA
- 1 motor temperature sensor input for PTC, KTY, Thermo-Click
- +24V connection, external, output +24V/200mA, output +10V/10mA

Die CU240B-2 Control Unit is available with two different communication types:

- RS485 with USS protocol, Modbus/RTU
- PROFIBUS DP

2.2.2 CU240E-2 Control Unit

The CU240B-2 Control Unit has the following inputs and outputs:

- 6 digital inputs, isolated, PNP/NPN switching
- Optionally 2 digital inputs as F-DI

- digital outputs (two relays, 30V DC/0.5A, 1 transistor 30V DC/0.5A)
- 2 analog inputs 0 – 10V, 0/4 – 20mA
- 2 analog outputs 0 – 10V, 0/4 – 20mA
- 1 motor temperature sensor input for PTC, KTY, Thermo-Click
- +24V connection, external, output +24V/200mA, output +10V/10mA

Die CU240E-2 Control Unit is available with three different communication types:

- RS485 with USS protocol, Modbus/RTU
- PROFIBUS DP
- PROFINET

2.2.3 CU240E-2 F Control Unit

The CU240E-2 F Control Unit has the following inputs and outputs:

- 6 digital inputs, isolated, PNP/NPN switching
- Optionally 6 digital inputs as F-DI
- digital outputs (two relays, 30V DC/0.5A, 1 transistor 30V DC/0.5A)
- 2 analog inputs 0 – 10V, 0/4 – 20mA
- 2 analog outputs 0 – 10V, 0/4 – 20mA
- 1 motor temperature sensor input for PTC, KTY, Thermo-Click
- +24V connection, external, output +24V/200mA, output +10V/10mA

The CU240E-2 F Control Unit is available with three different communication types:

- RS485 with USS protocol, Modbus/RTU
- PROFIBUS DP
- PROFINET

2.2.4 CU250S-2 Control Unit

The CU250S-2 Control Unit has the following inputs and outputs:

- 11 digital inputs, isolated, PNP/NPN switching
- Optionally 6 digital inputs as F-DI
- 2 digital outputs as F-DO, relay NO/NC, 30V DC 0.5A
- 1 digital output as open collector 30V DC 0.5A
- 2 analog inputs 0 – 10V, 0/4 – 20mA
- 2 analog outputs 0 – 10V, 0/4 – 20mA
- 1 motor temperature sensor input for PTC, KTY, Thermo-Click
- +24V connection, external, output +24V/200mA, output +10V/10mA

Die CU250S-2 F Control Unit is available with four different communication types:

- RS485 with USS protocol, Modbus/RTU
- PROFIBUS DP
- PROFINET
- CANopen

2.3 Overview of the terminals

The 2nd generation modules are equipped with pluggable terminals. The terminal designation is identical to the CU240E and CU240S. The following diagram shows the difference between the terminal arrangement of the CU240S and the CU250S-2.

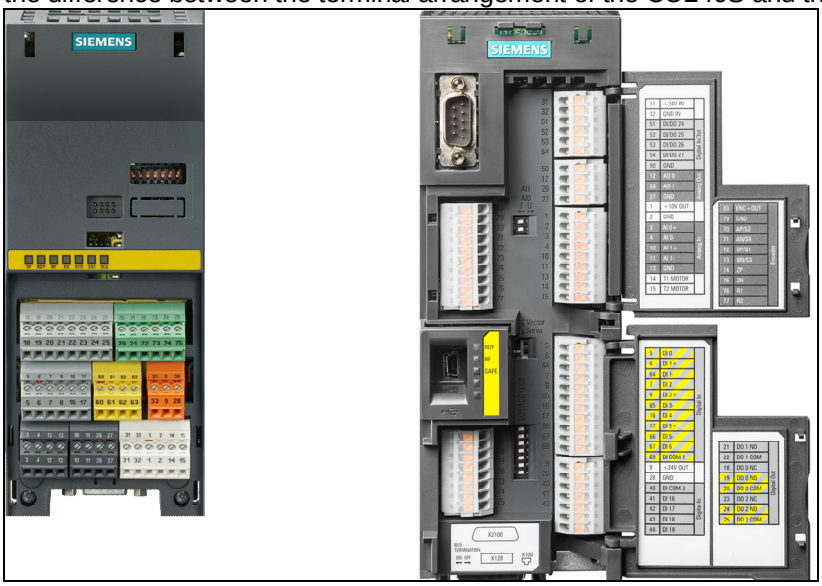


Diagram 2-2: Comparison of the terminal arrangement

	CU240E		CU240B-2		CU240E-2		
Function	**Terminal**	**Designation**	**Terminal**	**Designation**	**Terminal**	**Designation**	**Notes**
Power supply AI	1	+10V	1	+10V Out	1	+10V Out	
	2	0V	2	GND	2	GND	
Analog input AI0	3	AI0+	3	AI0+	3	AI0+	Can also be used as additional digital input (DI11)
	4	AI0-	4	AI0-	4	AI0-	
Digital input 0	5	DI0	5	DI0	5	DI0	
Digital input 1	6	DI1	6	DI1	6	DI1	
Digital input 2	7	DI2	7	DI2	7	DI2	
Digital input 3	8	DI3	8	DI3	8	DI3	
Power supply DI´s	9	U24V	9	+24V Out	9	+24V Out	
Analog input AI1	10	AI1+			10	AI1+	CU240E-2: Can also be used as additional digital input (DI12)
	11	AI1-			11	AI1-	
Analogausgang AO0	12	AO0+			12	AO0+	
	13	AO0-			13	GND	
Thermal sensor	14	PTC+	14	T1 Motor	14	T1 Motor	
	15	PTC-	15	T2 Motor	15	T2 Motor	
Digital input 4	16	DI4			16	DI4	
Digital input 5	17	DI5			17	DI5	
Relay output DO0	18	DO0 NC	18	DO0 NC	18	DO0 NC	
	19	DO0 NO	19	DO0 NO	19	DO0 NO	
	20	DO0 COM	20	DO0 COM	20	DO0 COM	
Relay / digital DO1	21	DO1 NO			21	DO1+	CU240E-2: Transistor output
	22	DO1 COM			22	DO1-	
Relay output DO2	23	DO2 NC			23	DO2 NC	
	24	DO2 NO			24	DO2 NO	
	25	DO2 COM			25	DO2 COM	
Analog output AO1	26	AO1+			26	AO1+	
	27	AO1-			27	GND	
Reference potential for +24V	28	U0V	28	GND	28	GND	
RS485 interface			X128: 1	0V	X128: 1	0V	RS485 interface via separate connector plug X128
	29	RS485 -A	X128: 2	RS485P	X128: 2	RS485P	
	30	RS485 -B	X128: 3	RS485N	X128: 3	RS485N	
			X128: 4	Shield	X128: 4	Shield	
External 24V supply of the CU instead of supply by the power module			31	+24V IN	31	+24V IN	
			32	GND IN	32	GND IN	
Reference potential for DI					34	DI COM2	CU240B/E-2: NPN logic connect terminal 34/69 with terminal 28
Reference potential for DI			69	DI COM1	69	DI COM1	CU240B/E-2: PNP logic connect terminal 34/69 with terminal 9

Diagram 2-1: Comparison terminals CU240E against CU240B/E-2

	CU240S		CU240B-2		CU240E-2		CU250S-2			
Function	Terminal	Designation	Terminal	Designation	Terminal	Designation	Terminal	Designation	Note	
Power supply AI	1	+10V OUT	1	+10V Out	1	+10V Out	1	+10V Out		
	2	0V OUT	2	GND OUT	2	GND OUT	2	GND OUT		
Analog input AI0	3	AI0+	3	AI0+	3	AI0+	3	AI0+	Can also be used as additional digital input (DI11)	
	4	AI0-	4	AI0-	4	AI0-	4	AI0-		
Digital input 0	5	DI0	5	DI0	5	DI0	5	DI0	CU240E-2/CU250S-2: Can be used as F-DI0	
Digital input 1	6	DI1	6	DI1	6	DI1	6	DI1+		
							64	DI1-		
Digital input 2	7	DI2	7	DI2	7	DI2	7	DI2	CU240E-2 F/CU250S-2: Can be used as F-DI1	
Digital input 3	8	DI3	8	DI3	8	DI3	8	DI3+		
							65	DI3-		
Power supply DI´s	9	U24V	9	+24V Out	9	+24V Out	9	+24V Out		
Analog input AI1	10	AI1+			10	AI1+	10	AI1+	CU240E-2/CU250S-2: Auch als zusätzlicher digitaler Eingang (DI12) nutzbar	
	11	AI1-			11	AI1-	11	AI1-		
Analog output AO0	12	AO0+	12	AO0+	12	AO0+	12	AO0+		
	13	AO0-	13	GND	13	GND	13	GND		
Thermal protection	14	PTC+	14	T1 Motor	14	T1 Motor	14	T1 Motor		
	15	PTC-	15	T2 Motor	15	T2 Motor	15	T2 Motor		
Digital input 4	16	DI4			16	DI4	16	DI4	CU240E-2 F/CU250S-2: Can be used as F-DI2	
Digital input 5	17	DI5			17	DI5	17	DI5+		
							66	DI5-		
Relay output DO0	18	DO0 NC	18	DO0 NC	18	DO0 NC	18	DO0 NC		
	19	DO0 NO	19	DO0 NO	19	DO0 NO	19	DO0 NO		
	20	DO0 COM	20	DO0 COM	20	DO0 COM	20	DO0 COM		
Relay / Digital output DO1	21	DO1 NO			21	DO1+	21	DO1 NO	CU240E-2: Transistor output	
	22	DO1 COM			22	DO1-	22	DO1 COM		
Relay output DO2	23	DO2 NC			23	DO2 NC	23	DO2 NC		
	24	DO2 NO			24	DO2 NO	24	DO2 NO		
	25	DO2 COM			25	DO2 COM	25	DO2 COM		
Analog output AO1	26	AO1+			26	AO1+	26	AO1+		
	27	AO1-			27	GND	27	GND		
Reference potential for +24V	28	U0V	28	GND	28	GND	28	GND		
RS485 interface			X128: 1	0V	X128: 1	0V	X128: 1	0V	RS485 interface via separate connector plug X128	
	29	RS485 -A	X128: 2	RS485P	X128: 2	RS485P	X128: 2	RS485P		
	30	RS485 -B	X128: 3	RS485N	X128: 3	RS485N	X128: 3	RS485N		
			X128: 4	Shield	X128: 4	Shield	X128: 4	Shield		
External 24V supply of the CU instead of supply by the power module	31	+24V IN	31	+24V IN	31	+24V IN	31	+24V IN		
	32	0V IN	32	GND IN	32	GND IN	32	GND IN		
Power supply encoder	33	ENC+ Supply					33	ENC+ Supply		
Reference potential for DI					34	DI COM2			CU240B/E-2: NPN logic connect terminal 34/69 with terminal 28 CU240B/E-2: PNP logic connect terminal 34/69 with terminal 9 CU250S-2: NPN logic connect terminal 40/69 with Terminal 28	
Reference potential for DI							40	DI COM3		
Reference potential for DI			69	DI COM1	69	DI COM1	69	DI COM1		
Digital input 6	40	DI6					67	DI6		
Digital input 7	41	DI7					41	DI16		
Digital input 8	42	DI8					42	DI17		
Fail-safe digital input 0	60	FDI0A							CU240E-2/CU250S-2: The control units do not have separate F-DIs, these can be realized by the standard DI0 to DI5	
	61	FDI0B								
Fail-safe digital input 1	62	FDI1A								
	63	FDI1B								
Encoder interface	70	ENC AP					70	HTL Track A+	X2100: 15	TTL Track A+
	71	ENC AN					71	HTL Track A-	X2100: 14	TTL Track A-
	72	ENC BP					72	HTL Track B+	X2100: 13	TTL Track B+
	73	ENC BN					73	HTL Track -	X2100: 12	TTL Track B-
	74	ENC ZP					74	HTL zero signal+	X2100: 10	TTL zero signal+
	75	ENC ZN					75	HTL zero signal-	X2100: 11	TTL zero signal-

CU250S-2: Connection TTL encoder only via SUB D plug

Diagram 2-2: Comparison terminals CU240S against CU240B/E-2 and CU250S-2

3 Encoder connection

The CU250S-2 Control Unit allows up to two encoders to be connected for speed and position sensing.

3.1 Connection at the terminal strip

Incremental encoders with HTL signal and resolver can be connected at the terminal strip.

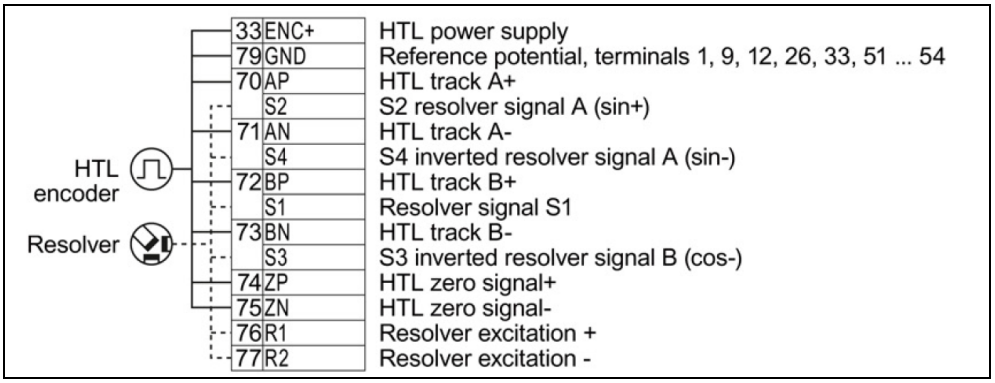


Diagram 3-1: Encoder connection at the terminal strip of the CU250S-2 Control Unit

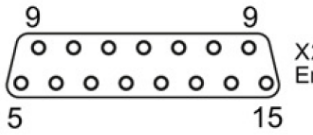
The maximum cable length for HTL encoders with unipolar signals is 100 m; when using the differential signals, 300 meters can be reached.

For resolvers, the maximum cable length is 100 meters.

3.2 Connection at Sub-D connectors

Incremental encoders with TTL or HTL signal or SSI absolute encoders can be connected at Sub-D connectors.

Interfaces at the lower side of the Control Unit



		Motor tempera-ture, KTY84 or PTC	HTL	TTL	SSI (RS422 standard)
1	Positive	X	---	---	---
2	Clock +	---	---	---	X
3	Clock -	---	---	---	X
4	Power supply, referred to pin 7	---	X	X	X
5	Power supply, referred to pin 7	---	X	X	X
6	P_Sense, sense input for the power supply	---	---	X	---
7	GND, reference potential for pins 4 and 5	---	X	X	X
8	Negative	X	---	---	---
9	M_Sense, sense input, GND	---	---	X	---
10	Z +	---	X	X	---
11	Z -	---	X	X	---
12	B -	---	X	X	---
13	B +	---	X	X	---
14	A - / data -	---	A -	A -	Data -
15	A + / data +	---	A +	A +	Data +

Diagram 3-2: Encoder connection at the Sub-D connector of the CU250S-2 Control Unit

The maximum cable length for HTL encoders with unipolar signals is 100 m; when using the differential signals, 300 meters can be reached.

When using TTL encoders, a maximum cable length of 100 meters is possible.

SSI absolute encoders can be connected with cables up to 100 meters long.

3.3 Connection with Drive-CLiQ

The CU250S-2 Control Unit has a Drive-CLiQ connection, to which all Drive-CLiQ encoders and encoder modules can be connected. Possible encoder types:

- Resolver
- HTL/TTL incremental encoder
- SIN/COS incremental encoder
- Endat absolute encoder
- SSI absolute encoder
- Drive-CLiQ encoder

Drive-CLiQ modules that can be connected:

- SMC10 for 2 and multi-pole resolvers
- SMC20 for SIN/COS incremental encoders, Endat absolute encoders, SSI absolute encoders with SIN/COS incremental signal
- SMC30 for TTL/HTL incremental encoders, SSI absolute encoders with/without TTL/HTL signals
- SME20 for incremental measuring systems
- SME25 for absolute measuring systems
- SME120 for incremental measuring systems
- SME125 for absolute measuring systems

3.4 Combination of encoders for speed and position control

For the CU250S-2 Control Unit in the vector control mode, one encoder can be used for speed control, and a second encoder for position control.

			Position control								
Speed control			Sub-D		Terminals		Drive-CLiQ				
		Without encoder	TTL/ HTL	SSI	Resolver	HTL	TTL/HTL	SSI	Resolver	EnDat	DQ encoder
	Without encoder	-	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sub-D	TTL/HTL	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓
	SSI	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Terminals	Resolver	✓	✗	✗	✓	✗	✗	✗	✗	✗	✗
	HTL	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓
Drive-CLiQ	TTL/HTL	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗
	SSI	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
	Resolver	✓	✓	✓	✗	✓	✗	✗	✓	✗	✗
	EnDat	✓	✓	✓	✗	✓	✗	✗	✗	✓	
	DQ encoder	✓	✓	✓	✗	✓	✗	✗	✗	✗	✓

Diagram 3-3: Possibility of combining encoders for speed and position sensing

4 BOP-2 and IOP operator panels

The BOP used for the CU240E and CU240S has been replaced by the BOP-2 (successor device).

BOP

BOP-2

In addition, IOP can be used for user-friendly operating control and commissioning navigated by wizards.

IOP

4.1 Manual operation with BOP-2 / IOP

For the CU240E and CU240S Control Units, the manual mode is realized by switching over command data sets.

For the Control Units of the 2nd generation, switchover to the manual mode is realized using the manual button on the BOP-2 / IOP. When the manual mode is activated, the BOP-2 / IOP assumes master control, the parameterized/active command and setpoint sources are therefore decoupled.

Note Manual operation from the IOP / BOP-2 can be inhibited using parameter p0806. This inhibit can be permanent, or also selected via a digital input or a fieldbus signal.

Note Manual operation via BOP-2 / IOP is not continuously active, it must be reactivated after power on.

4.2 Status signals of the BOP-2 / IOP operating elements

The BOP-2 and IOP operator panels behave, from the control side, just the same as a computer with the STARTER operating control software. BiCo linking to control words is no longer available.

Note The BOP-2 / IOP operating elements can no longer be used via the BOP control word r0019 as BICO sources as for the CU240E and CU240S.

5 Parameterization

A direct migration from projects with CU240E and CU240S to 2nd generation Control Units is not possible as a result of the modified parameter structure.

Note The drive must be recommissioned using BOP-2, IOP or STARTER.

5.1 Quick commissioning

The functional scope of parameter p0010 "Drive commissioning filter" has been expanded.

Parameter	Action
P0010	0: Ready 1: Quick commissioning 2. Power unit commissioning 3. Motor commissioning 4: Encoder commissioning 5: Technological applications/units 11: Function modules 15: Data sets 17. Basic positioning commissioning 25: Closed-loop position control commissioning 29: Only internal Siemens 30: Parameter reset 95: Safety Integrated commissioning

Diagram 5-1: Versions of the quick commissioning

5.2 User-defined parameters

The "user-defined parameters" function with 20 freely-definable customer parameters has been replaced by the know-how protection function.

The know-how protection is used, for example, so that a machine manufacturer can encrypt his configuration know-how and protect it against changes or copying. The know-how protection is available in the following versions:

- Know-how protection without copy protection (possible with or without memory card)
- Know-how protection with copy protection (possible only with Siemens memory card)

A password is required for the know-how protection.

In case of active know-how protection, the STARTER dialog screens are locked. You can, however, read the values of the display parameters from the expert list. The values of the adjustment parameters are not displayed and cannot be changed.

Actions listed below can be executed even when know-how protection is active:

- Restoring factory settings
- Confirming messages
- Displaying messages

- Displaying the alarm history
- Reading out diagnostic buffer
- Switching to the control panel (complete control panel functionality: Fetch master control, all buttons and setting parameters)
- Upload (only parameters that are accessible even though know-how protection is active)

Actions listed below cannot be executed when know-how protection is active:

- Download
- Export/Import
- Trace
- Function generator
- Measuring functions
- Automatic controller setting
- Stationary/rotating measurement
- Deleting the alarm history

5.3 Macro drive unit

The pre-assignment of Control Unit terminals using macro parameter p0700 "Select command source", p1000 "Select frequency setpoint and combination parameter p0719" and "Select command and setpoint source" is replaced by the macro saved in parameter p0015.

5.3.1 CU240B-2 Control Unit

The CU240B-2 and CU240B-2 DP Control Units offer the following default settings for its interfaces:

Macro 7: Switch over between fieldbus and jogging via DI 3 Factory setting for inverters with PROFIBUS interface		Macro 9: Motorized potentiometer (MOP)
PROFIdrive telegram 1		
5 DI 0 --- 6 DI 1 --- 7 DI 2 Acknowledge 8 DI 3 LOW	5 DI 0 Jog 1 6 DI 1 Jog 2 7 DI 2 Acknowledge 8 DI 3 HIGH	5 DI 0 ON/OFF1 6 DI 1 MOP raise 7 DI 2 MOP lower 8 DI 3 Acknowledge
3 AI 0 --- 4	3 AI 0 --- 4	3 AI 0 --- 4
18 DO 0 Fault 19 20	18 DO 0 Fault 19 20	18 DO 0 Fault 19 20
12 AO 0 Speed 13 0 V ... 10 V	12 AO 0 Speed 13 0 V ... 10 V	12 AO 0 Speed 13 0 V ... 10 V

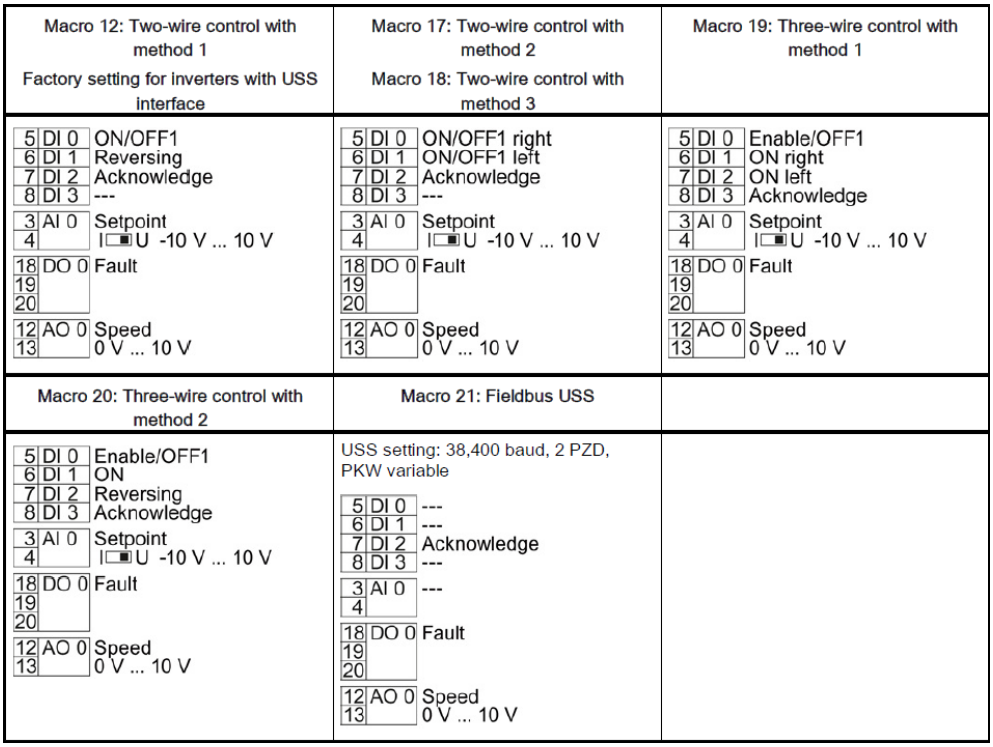
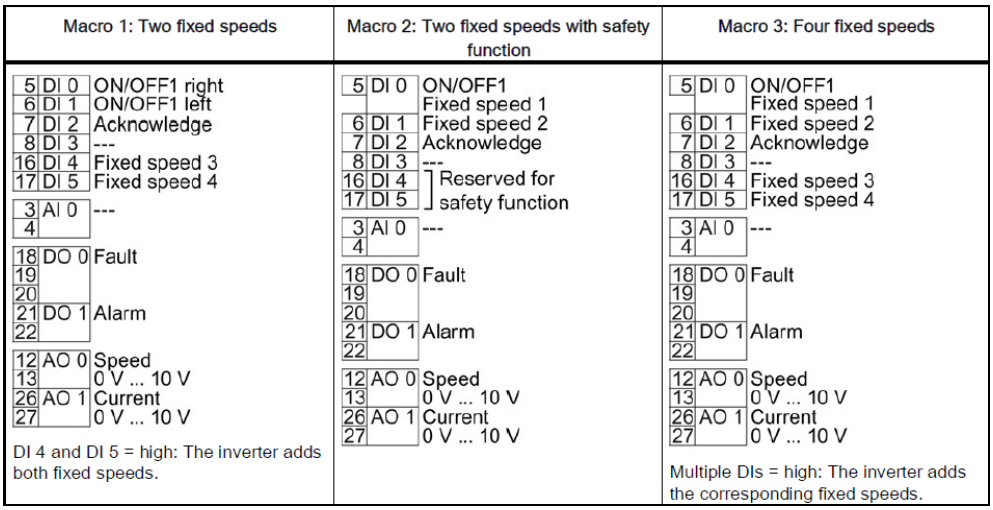


Diagram 5-2: Overview of the connection macros of the CU240B-2 Control Unit

For the CU240B-2, the factory setting includes macro 12 "Two-wire control according to method 1", and for the CU240B-2 DP, macro 7 "Fieldbus/jog mode.

5.3.2 CU240E-2 Control Unit

The family of CU240E-2 Control Units offers the following default settings for the interfaces:



<table>
<tr><th>Macro 4: PROFIBUS or PROFINET</th><th>Macro 5: PROFIBUS or PROFINET with safety function</th><th>Macro 6: PROFIBUS or PROFINET with two safety functions</th></tr>
<tr><td>PROFIdrive telegram 352
5 DI 0 ---
6 DI 1 ---
7 DI 2 Acknowledge
8 DI 3 ---
16 DI 4 ---
17 DI 5 ---
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td>PROFIdrive telegram 1
5 DI 0 ---
6 DI 1 ---
7 DI 2 Acknowledge
8 DI 3 ---
16 DI 4] Reserved for
17 DI 5] safety function
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td>PROFIdrive telegram 1
5 DI 0] Reserved for
6 DI 1] Safety function 1
7 DI 2 ---
8 DI 3 Acknowledge
16 DI 4] Reserved for
17 DI 5] Safety function 2
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V
Only with Control Units CU240E-2 F, CU240E-2 DP-F, and CU240E-2 PN-F.</td></tr>
<tr><th colspan="2">Macro 7: Switch over between fieldbus and jogging via DI 3
Factory setting for inverters with PROFIBUS or PROFINET interface</th><th>Macro 8: Motorized potentiometer (MOP) with safety function</th></tr>
<tr><td>PROFIdrive telegram 1
5 DI 0 ---
6 DI 1 ---
7 DI 2 Acknowledge
8 DI 3 LOW
16 DI 4 ---
17 DI 5 ---
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td>5 DI 0 Jog 1
6 DI 1 Jog 2
7 DI 2 Acknowledge
8 DI 3 HIGH
16 DI 4 ---
17 DI 5 ---
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td>5 DI 0 ON/OFF1
6 DI 1 MOP raise
7 DI 2 MOP lower
8 DI 3 Acknowledge
16 DI 4] Reserved for
17 DI 5] safety function
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td></tr>
<tr><th>Macro 9: Motorized potentiometer (MOP)</th><th>Macro 12: Two-wire control with method 1
Factory setting for inverters without PROFIBUS or PROFINET interface.</th><th>Macro 13: Setpoint via analog input with safety function</th></tr>
<tr><td>5 DI 0 ON/OFF1
6 DI 1 MOP raise
7 DI 2 MOP lower
8 DI 3 Acknowledge
16 DI 4 ---
17 DI 5 ---
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td>5 DI 0 ON/OFF1
6 DI 1 Reversing
7 DI 2 Acknowledge
8 DI 3 ---
16 DI 4 ---
17 DI 5 ---
3 AI 0 Setpoint
4 I◻■U -10 V ... 10 V
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td>5 DI 0 ON/OFF1
6 DI 1 Reversing
7 DI 2 Acknowledge
8 DI 3 ---
16 DI 4] Reserved for
17 DI 5] safety function
3 AI 0 Setpoint
4 I◻■U -10 V ... 10 V
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td></tr>
</table>

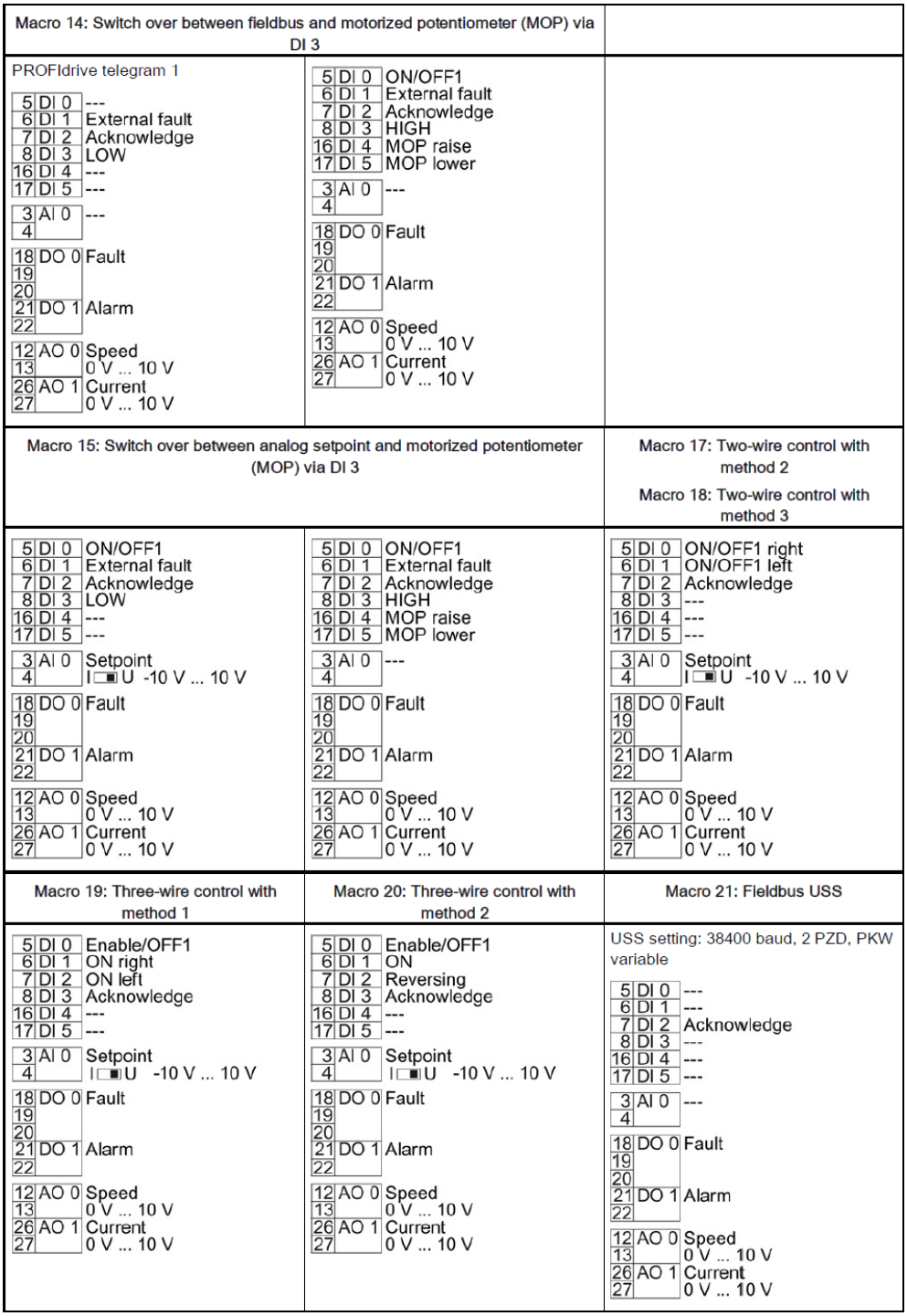


Diagram 5-3: Overview of the connection macros of the CU240E-2 Control Unit

The following factory settings are preassigned:

CU240E-2	Macro 12 "Two wire control according to method 1"
CU240E-2 F	Macro 12 "Two wire control according to method 1"
CU240E-2 DP	Macro 7 "Fieldbus/jog mode"
CU240E-2 PN	Macro 7 "Fieldbus/jog mode"
CU240E-2 DP-F	Macro 7 "Fieldbus/jog mode"

CU240E-2 PN-F Macro 7 "Fieldbus/jog mode"

5.3.3 CU250S-2 Control Unit

<table>
<tr><th>Macro 1: Two fixed speeds</th><th>Macro 2: Two fixed speeds with safety function</th><th>Macro 3: Four fixed speeds</th></tr>
<tr><td>5 DI 0 ON/OFF1 right
6 DI 1 ON/OFF1 left
7 DI 2 Acknowledge
8 DI 3 ---
16 DI 4 Fixed speed 3
17 DI 5 Fixed speed 4
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V
DI 4 and DI 5 = high: The inverter adds both fixed speeds.</td><td>5 DI 0 ON/OFF1
Fixed speed 1
6 DI 1 Fixed speed 2
7 DI 2 Acknowledge
8 DI 3 ---
16 DI 4] Reserved for
17 DI 5] safety function
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td>5 DI 0 ON/OFF1
Fixed speed 1
6 DI 1 Fixed speed 2
7 DI 2 Acknowledge
8 DI 3 ---
16 DI 4 Fixed speed 3
17 DI 5 Fixed speed 4
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V
Multiple DIs = high: The inverter adds the corresponding fixed speeds.</td></tr>
<tr><th>Macro 4: PROFIBUS or PROFINET</th><th>Macro 5: PROFIBUS or PROFINET with safety function</th><th></th></tr>
<tr><td>PROFIdrive telegram 352
5 DI 0 ---
6 DI 1 ---
7 DI 2 Acknowledge
8 DI 3 ---
16 DI 4 ---
17 DI 5 ---
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td>PROFIdrive telegram 1
5 DI 0 ---
6 DI 1 ---
7 DI 2 Acknowledge
8 DI 3 ---
16 DI 4] Reserved for
17 DI 5] safety function
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td></td></tr>
<tr><th colspan="2">Macro 7: Switch over between fieldbus and jogging via DI 3
Factory setting for inverters with PROFIBUS or PROFINET interface</th><th>Macro 8: Motorized potentiometer (MOP) with safety function</th></tr>
<tr><td colspan="2">PROFIdrive telegram 1
5 DI 0 ---
6 DI 1 ---
7 DI 2 Acknowledge
8 DI 3 LOW
16 DI 4 ---
17 DI 5 ---
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V

5 DI 0 Jog 1
6 DI 1 Jog 2
7 DI 2 Acknowledge
8 DI 3 HIGH
16 DI 4 ---
17 DI 5 ---
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td><td>5 DI 0 ON/OFF1
6 DI 1 MOP raise
7 DI 2 MOP lower
8 DI 3 Acknowledge
16 DI 4] Reserved for
17 DI 5] safety function
3 AI 0 ---
4
18 DO 0 Fault
19
20
21 DO 1 Alarm
22
12 AO 0 Speed
13 0 V ... 10 V
26 AO 1 Current
27 0 V ... 10 V</td></tr>
</table>

Macro 9: Motorized potentiometer (MOP)	Macro 12: Two-wire control with method 1 Factory setting for inverters without PROFIBUS or PROFINET interface.	Macro 13: Setpoint via analog input with safety function
5 DI 0 ON/OFF1 6 DI 1 MOP raise 7 DI 2 MOP lower 8 DI 3 Acknowledge 16 DI 4 --- 17 DI 5 --- 3 AI 0 --- 4 18 DO 0 Fault 19 20 21 DO 1 Alarm 22 12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	5 DI 0 ON/OFF1 6 DI 1 Reversing 7 DI 2 Acknowledge 8 DI 3 --- 16 DI 4 --- 17 DI 5 --- 3 AI 0 Setpoint 4 I⊏■U -10 V ... 10 V 18 DO 0 Fault 19 20 21 DO 1 Alarm 22 12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	5 DI 0 ON/OFF1 6 DI 1 Reversing 7 DI 2 Acknowledge 8 DI 3 --- 16 DI 4] Reserved for 17 DI 5] safety function 3 AI 0 Setpoint 4 I⊏■U -10 V ... 10 V 18 DO 0 Fault 19 20 21 DO 1 Alarm 22 12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V
Macro 14: Switch over between fieldbus and motorized potentiometer (MOP) via DI 3		
PROFIdrive telegram 1 5 DI 0 --- 6 DI 1 External fault 7 DI 2 Acknowledge 8 DI 3 LOW 16 DI 4 --- 17 DI 5 --- 3 AI 0 --- 4 18 DO 0 Fault 19 20 21 DO 1 Alarm 22 12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	5 DI 0 ON/OFF1 6 DI 1 External fault 7 DI 2 Acknowledge 8 DI 3 HIGH 16 DI 4 MOP raise 17 DI 5 MOP lower 3 AI 0 --- 4 18 DO 0 Fault 19 20 21 DO 1 Alarm 22 12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	
Macro 15: Switch over between analog setpoint and motorized potentiometer (MOP) via DI 3		Macro 17: Two-wire control with method 2 Macro 18: Two-wire control with method 3
5 DI 0 ON/OFF1 6 DI 1 External fault 7 DI 2 Acknowledge 8 DI 3 LOW 16 DI 4 --- 17 DI 5 --- 3 AI 0 Setpoint 4 I⊏■U -10 V ... 10 V 18 DO 0 Fault 19 20 21 DO 1 Alarm 22 12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	5 DI 0 ON/OFF1 6 DI 1 External fault 7 DI 2 Acknowledge 8 DI 3 HIGH 16 DI 4 MOP raise 17 DI 5 MOP lower 3 AI 0 --- 4 18 DO 0 Fault 19 20 21 DO 1 Alarm 22 12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V	5 DI 0 ON/OFF1 right 6 DI 1 ON/OFF1 left 7 DI 2 Acknowledge 8 DI 3 --- 16 DI 4 --- 17 DI 5 --- 3 AI 0 Setpoint 4 I⊏■U -10 V ... 10 V 18 DO 0 Fault 19 20 21 DO 1 Alarm 22 12 AO 0 Speed 13 0 V ... 10 V 26 AO 1 Current 27 0 V ... 10 V

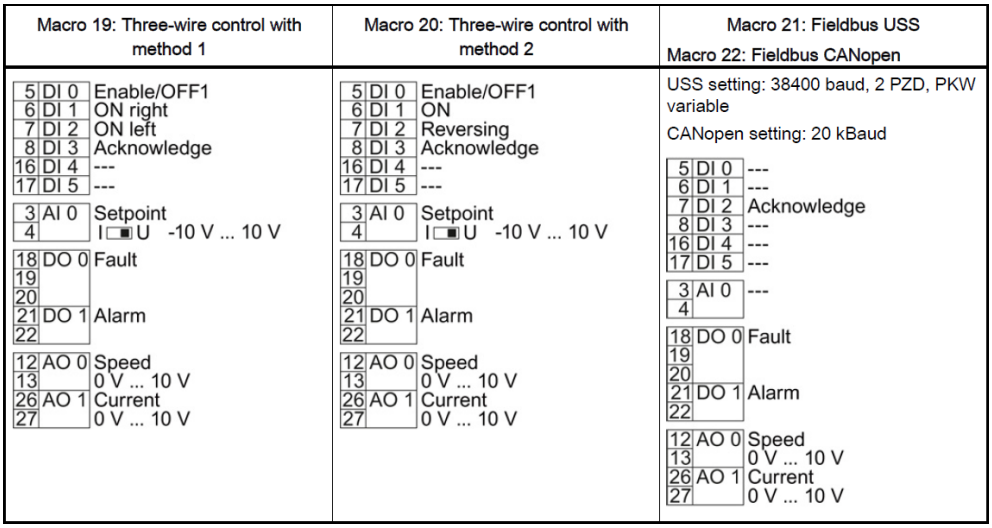


Diagram 5-4: Overview of the connection macros of the CU250S-2 Control Unit

The following factory settings are preassigned:

CU250S-2 USS	Macro 12 "Two wire control according to method 1"
CU250S-2 DP	Macro 7 "Fieldbus/jog mode"
CU250S-2 PN	Macro 7 "Fieldbus/jog mode"
CU250S-2 CAN	Macro 22 "Fieldbus/CANopen"

5.4 Expanded command/drive data sets

For the 2nd generation Control units, up to 4 command data sets (CDS) and up to 4 drive data sets (DDS) are available. However, contrary to the CU240E and CU240S, these must first be enabled using parameter p0170 (CDS) or p0180 (DDS).

5.5 Selecting the motor type

Parameter p0300 "Select motor type" has been expanded by the function for certain motor types to read in the motor data via code numbers.

5.5.1 CU240B-2 and CU240E-2 Control Units

Parameter	Action
p0300	0: No motor 1: Induction motor (the rotary) 2: Synchronous motor (rotary, permanent magnet) 10: 1LE1 standard induction motor 13: 1LG6 standard induction motor 17: 1LA7 standard induction motor 19: 1LA9 standard induction motor 204: 1LE4 synchronous motor

Diagram 5-5: Versions of connectable motors

A motor can be selected from the motor parameter list using parameter p0300. When changing the code number (exception, to a value of zero), all motor parameters are preassigned from the parameter lists internally available.

Note Only code numbers of motors can be set, which correspond to the motor type selected in p0300.

5.5.2 CU250S-2 Control Unit

Parameter	Action
p0300	0: No motor 1: Induction motor (the rotary) 2: Synchronous motor (rotary, permanent magnet) 10: 1LE1 standard induction motor series 13: 1LG6 standard induction motor series 17: 1LA7 standard induction motor series 19: 1LA9 standard induction motor series 100: 1LE1 standard induction motor 104: 1PH4 induction motor 107: 1PH7 induction motor 108: 1PH8 induction motor

Diagram 5-6: Versions of connectable motors

A motor can be selected from the motor parameter list using parameter p0300. When changing the code number (exception, to a value of zero), all motor parameters are preassigned from the parameter lists internally available.

Note Only code numbers of motors can be set, which correspond to the motor type selected in p0300.

5.6 Selecting the encoder type

For the CU250S-2 Control Unit, various encoder types can be connected. When connecting TTL and HTL incremental encoders usual for the CU240S Control Unit, new settings must be observed.

Parameter	Action
p0400	3001: 1024 HTL A/B R 3002: 1024 TTL A/B R 3003: 2048 HTL A/B R 3005: 1024 HTL A/B 3006: 1024 TTL A/B 3007: 2048 HTL A/B 3008: 2048 TTL A/B 3009: 1024 HTL A/B unipolar 3011: 2048 HTL A/B unipolar 9999: user-defined

Diagram 5-7: Selecting incremental encoders that can be connected

Different incremental encoders can be entered, user-defined using parameters p0401 to p0487.

5.7 Selecting technological units

Using parameter p0595, technological units can be selected, to which the technology controller is referenced.

Parameter	Action
p0595	1: % 2: 1 referred (per unit), no dimensions 3: bar 4: °C 5: Pa 6: ltr/s 7: m³/s 8: ltr/min 9: m³/min 10: ltr/h 11: m³/h 12: kg/s 13: kg/min 14: kg/h 15: t/min 16: t/h 17: N 18: kN 19: Nm 20: psi 21: °F 22: gallon/s 23: inch³/s 24: gallon/min 25: inch³/min 26: gallon/h 27: inch³/h 28: lb/s 29: lb/min 30: lb/h 31: lbf 32: lbf ft 33: K 34: 1/min 35: parts/min 36: m/s 37: ft³/s 38: ft³/min 39: BTU/min 40: BTU/h 41: mbar 42: inch wg 43: ft wg 44: m wg 45: % r.h. 46: g/kg

Diagram 5-8: Dimensions that can be set for the technology controller

Technological values can be internally scaled to 100% using parameter p0596.

5.8 Operating hours counter

Using p0650, the actual operating hours can be read out and a maintenance interval activated in p0651. Alarm A1590 is activated after the time in p0651 elapses.

5.9 Digital inputs

5.9.1 CU240B/E-2 Control Unit

The potential of the digital inputs of the control unit CU240B-2 and CU240E-2 can be defined by the wiring of the inputs.

For internal power supply

- P-switching (PNP logic): Connect terminals 34 and 69 with terminal 28
- M-switching (NPN logic): Connect terminals 34 and 69 with terminal 9

For an external power supply

- P-switching (PNP logic: Connect terminals 34 and 69 with the system ground (GND)
- M-switching (NPN logic): Connect terminals 34 and 69 with the 24 V supply.

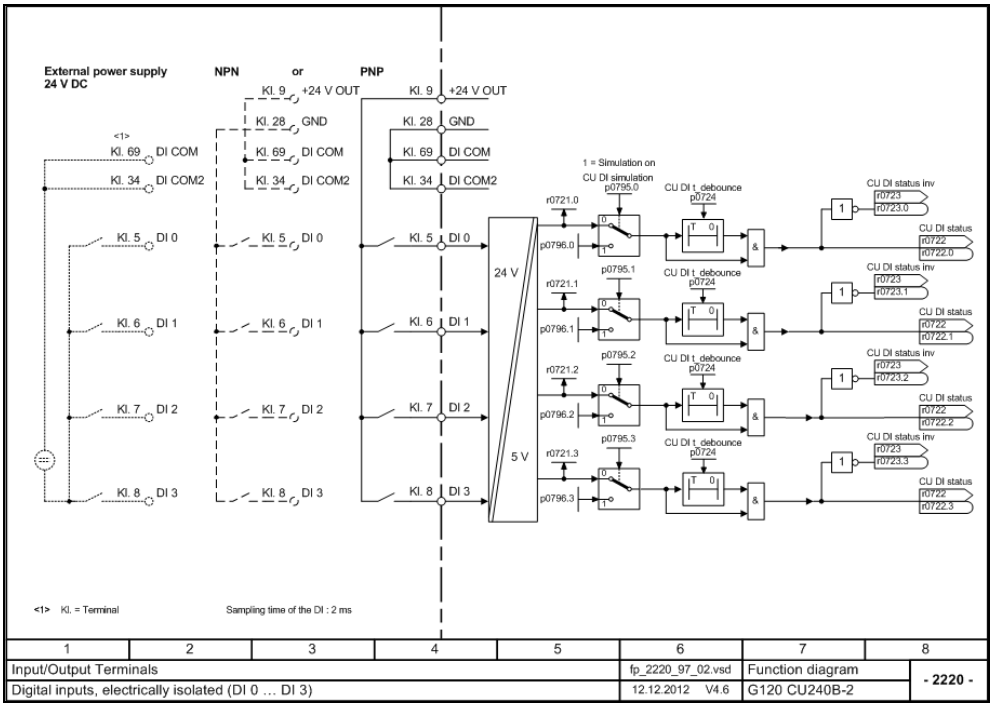


Diagram 5-9: Function diagram, digital inputs of the CU240B-2 Control Unit

For the CU240E-2 Control Unit, in addition, the reference potential is divided into two terminals (DI COM and DI COM2).

- Terminal 69 (DI COM): Reference potential for DI0, DI2 and DI4

- Terminal 34 (DI COM2): Reference potential for DI1, DI3 and DI5

With this configuration fail-safe digital inputs (F-DI) of the control unit CU240E-2 and CU240E-2 F can be realized both p-switching or p- and m-switching.

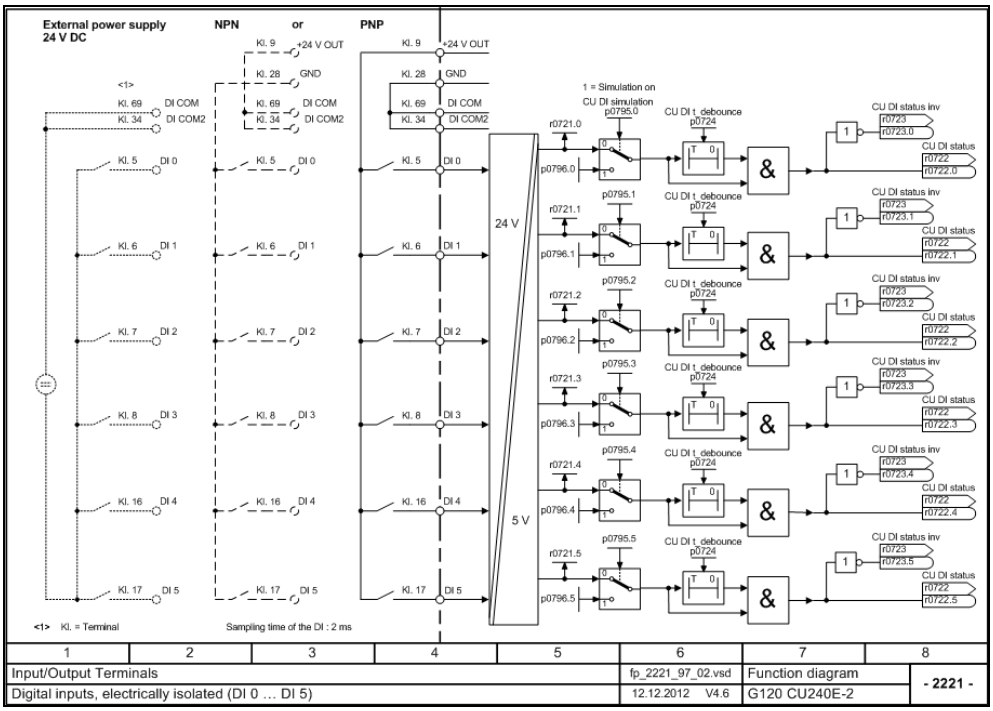


Diagram 5-10: Function diagram, digital inputs of the CU240E-2 Control Unit

5.9.2 CU250S-2 Control Unit

The digital inputs of the control unit CU250S-2 are divided into two potential sections:
- DI0 to DI6 with reference potential DI COM 1
- DI16 to DI19 with reference potential DI COM 3.

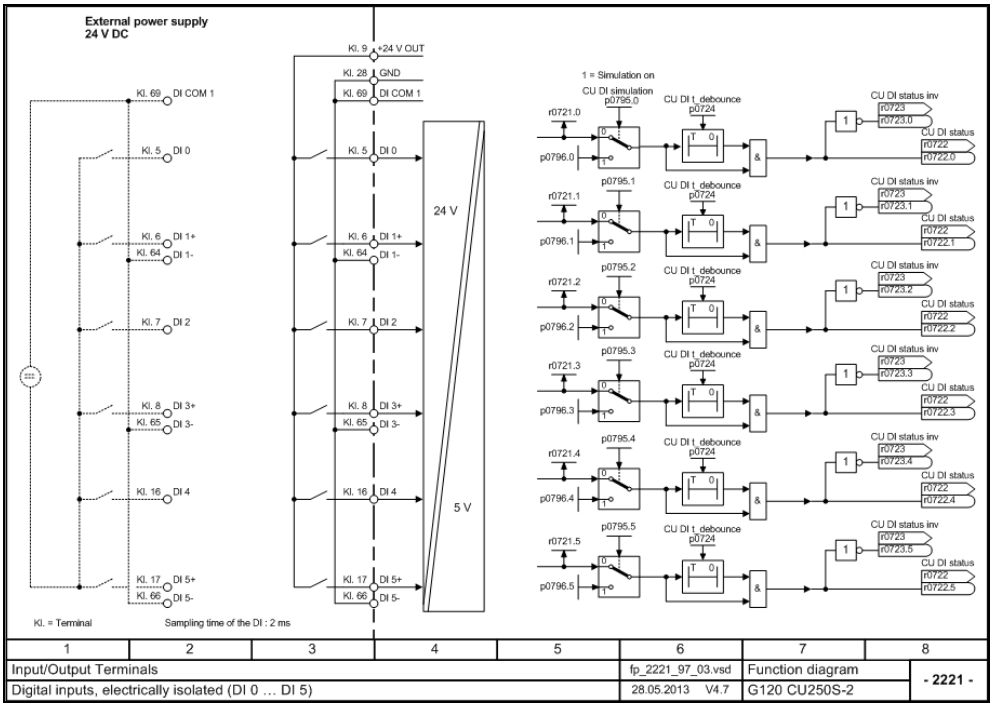


Diagram 5-11: Function diagram, digital inputs DI0 to DI6 of the CU250S-2 Control Unit

The digital inputs DI1, DI3, and DI5 have separate lead through (-) inputs. Using the digital inputs as fail-safe inputs switching to P24V (p-switching) the wiring according diagram 5-11 must be taken. If the fail-safe input shall be designed with one input switching to P24V (p-switching) and the other digital input switching to ground (m-switching), the positive inputs (+) inputs of DI1, DI3, and DI5 have to be connected to P24V, the negative (-) input of DI1, DI3, and DI5 is switched against DI COM 1.

Besides the 7 digital inputs DI0 to DI6 with the potential DI COM1 there are another 4 digital inputs DI16 to DI19 with an own potential DI COM3. These digital inputs can be used as the digital inputs of the control units CU240B-2 and CU240E-2 as well as p-switching and also m-switching.

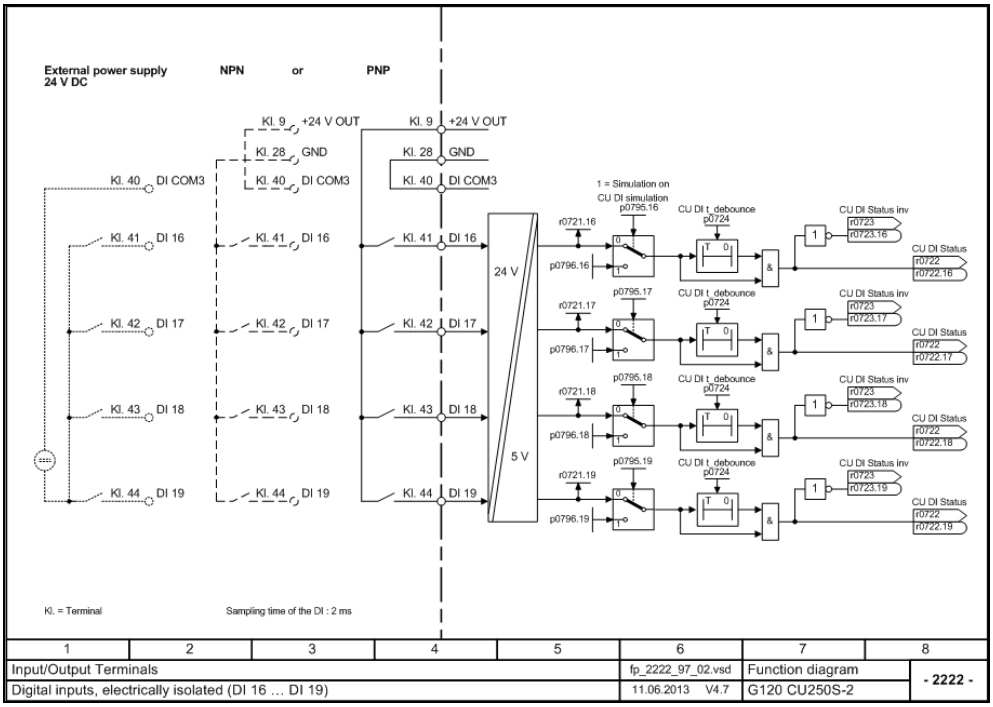


Diagram 5-12: Function diagram, digital inputs DI16 to DI19 of the CU250S-2 Control Unit

5.9.3 Forward/backward parameterization

For CU240E and CU240S Control Units, it was possible to wire the digital inputs directly via parameter p0701 to p0706 to specified functions forwards, and on the other side, using the BiCo wiring (selection p0701… p0706 = 99) to wire them backwards as required.

For 2nd generation modules, forwards wiring is no longer possible; the digital inputs are wired in the required functions using display parameters r0722.0 … 27. In addition, the inverted inputs are available in parameters r0723.0 … 27.

5.9.4 Change relating to fail-safe inputs (F-DI)

Contrary to the CU240S family, 2nd generation Control units have no separate fail-safe inputs. For 2nd generation Control Units, the F-DI are formed from two standard DI

- CU240E-2: 2 standard inputs as 1 F-DI
- CU240E-2 F: 6 standard inputs as 3 F-DI
- CU250S-2: 6 standard inputs as 3 F-DI

5.9.5 Transferring the status of F-DI via PROFIsafe

When using PROFIsafe, for 2nd generation Control Units, the status of the F-DI can be transferred fail-safe to the F-CPU, which means that they are available as distributed F I/O. This applies both for Control Units with PROFBUS, PROFINET **and** Safety Integrated as well as also the CU240E-2 DP Control Unit.

5.9.6 Simulation Mode

The digital inputs and outputs can be simulated using parameter p0795.x.

STARTER

The digital inputs and outputs can be set to the simulation state in the STARTER operating software.

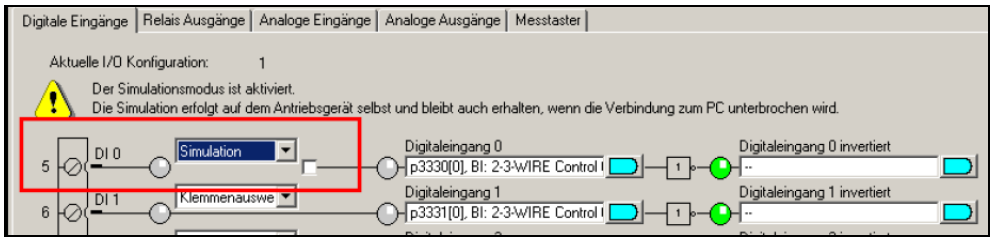


Diagram 5-13: Simulation of the digital inputs/outputs using STARTER

Operator panel IOP

The digital inputs and outputs can also be simulated using the IOP operator panel. Only two DI's are displayed; however, by rotating the selector wheel, all of the existing digital inputs and outputs can be selected.

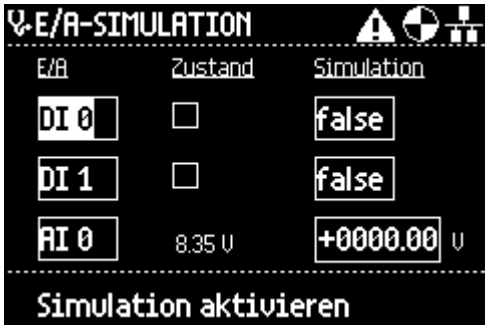


Diagram 5-14: Simulation of the digital inputs/outputs using the IOP

The actual state of the DI is displayed at the center; by entering "true" for the simulation, the DI is set as soon as "Activate simulation" was pressed.

5.9.7 Monitoring the load/speed via digital input

The function monitors the speed or velocity of a machine component, e.g.:

- Gearbox monitoring for traction drives and hoisting gear
- Drive belt monitoring for fans and conveyor belts
- Blocking protection (stall protection)

Monitoring

There are two ways of directly monitoring speed or velocity in the application:

- Load failure: The converter evaluates whether an encoder signal is present.

- Speed deviation: The converter calculates a speed from the signal of the connected encoder and compares it with the motor speed.

A sensor (e.g. a proximity switch) is required for speed monitoring. The converter evaluates the sensor signal via a digital input.

Load failure

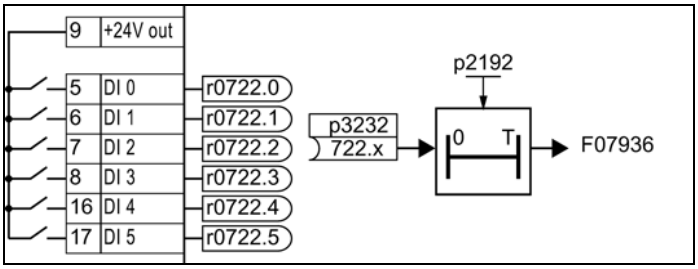


Diagram 5-15: Load failure monitoring using a digital input

Parameter	Description
p2192	**Load monitoring delay time** (factory setting 10 s) After the motor is switched on, if the "LOW" signal is present on the associated digital input for longer than this time, the inverter signals a load failure (F07936).
p2193 = 1 to 3	**Load monitoring configuration** (factory setting: 1) 0: Monitoring is deactivated 1: Torque monitoring (see Monitor the load torque (system protection) (Page 245)) and load failure 2: Speed deviation monitoring (see below) and load failure 3: Load failure monitoring
p3232 = 722.x	**Load monitoring failure detection** (factory setting: 1) Interconnect the load monitoring with a digital input of your choice.

Diagram 5-16: Parameterization of the load monitoring via digital input

Speed deviation

This function is only available for CU240E-2… Control Units. The monitoring sensor must be connected to digital input 3. The converter can process a pulse sequence of up to 32 kHz.

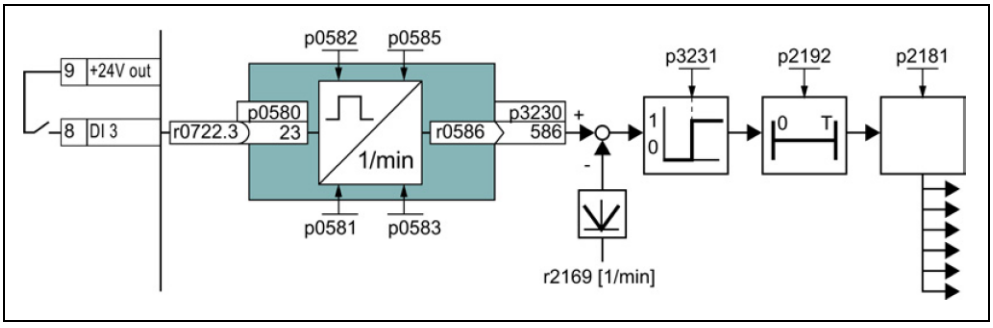


Diagram 5-17: Speed deviation monitoring

The speed is calculated from the pulse signal of the digital input in the "probe". The converter compares the calculated speed with the speed actual value r2169. The converter response if the deviation is too high, can be adjusted using p2181.

Parameter	Description	
p0490	**Invert probe** (factory setting 0000bin) The 3rd bit of the parameter value inverts the input signals of digital input 3 for the probe.	
p0580 = 23	**Probe input terminal** (factory setting 0) Interconnect the probe input with DI 3.	
p0581	**Probe edge** (factory setting 0) Edge for evaluation of the probe signal to measure actual speed value 0: 0/1 edge 1: 1/0 edge	
p0582	**Probe pulses per revolution** (factory setting 1) Number of pulses per revolution.	
p0583	**Maximum probe measuring time** (factory setting 10 s) Maximum measuring time for the probe. If there is no new pulse before the maximum measuring time elapses, the inverter sets the actual speed value in r0586 to zero. The time is restarted with the next pulse.	
p0585	**Probe gear factor** (factory setting 1) The inverter multiplies the measured speed by the gear factor and then displays it in r0586.	
p2181	**Load monitoring response** (factory setting 0) Response for evaluating load monitoring.	
	0	Load monitoring disabled
	1	A07920 for speed too low
	2	A07921 for speed too high
	3	A07922 for speed outside tolerance
	4	F07923 for speed too low
	5	F07924 for speed too high
	6	F07925 for speed outside tolerance
p2192	**Load monitoring delay time** (factory setting 10 s) Delay time for evaluating load monitoring.	
p2193 = 2	**Load monitoring configuration** (factory setting: 1) 2: Speed deviation and load failure monitoring.	
p3230 = 586	**Load monitoring actual speed value** (factory setting 0) Result of the speed calculation with the evaluation of the speed monitoring.	
p3231	**Load monitoring speed deviation** (factory setting 150 rpm) Permissible speed deviation of load monitoring.	

Diagram 5-18: Parameterization of the speed monitoring via digital input

5.10 Digital outputs

5.10.1 Changed parameter numbers

The parameter numbers of the DOs have been shifted by one position in the expert list (e.g. DO0: CU240S = p731, CU240E-2 = p730).

5.10.2 Hardware change

The CU240E and CU240S Control Units have three relay outputs, each of which has a resistor load capability of 30V DC, 0.5A. Digital outputs DO0 and DO2 have NO and NC contacts, DO1 only an NO contact.

2nd generation Control Units are equipped as follows:

- CU240B-2: DO0, NO and NC contacts, 30V DC, 0.5A

- CU240E-2: DO0, NO and NC contacts, 30 V DC, 0.5A
  DO1, transistor output positive, 30 V DC, 0.5A
  DO2, NO and NC contacts, 30 V DC, 0.5A
- CU250S-2: DO0, NO and NC contacts, 30 V DC, 0.5A
  DO1, NO contact, 30 V DC, 0.5A
  DO2, NO and NC contacts, 30 V DC, 0.5A

5.11 Analog inputs

5.11.1 Simulation mode

The analog inputs can be simulated using parameter p0797.x.

STARTER

The analog inputs can be set to the simulation state in the STARTER operating software.

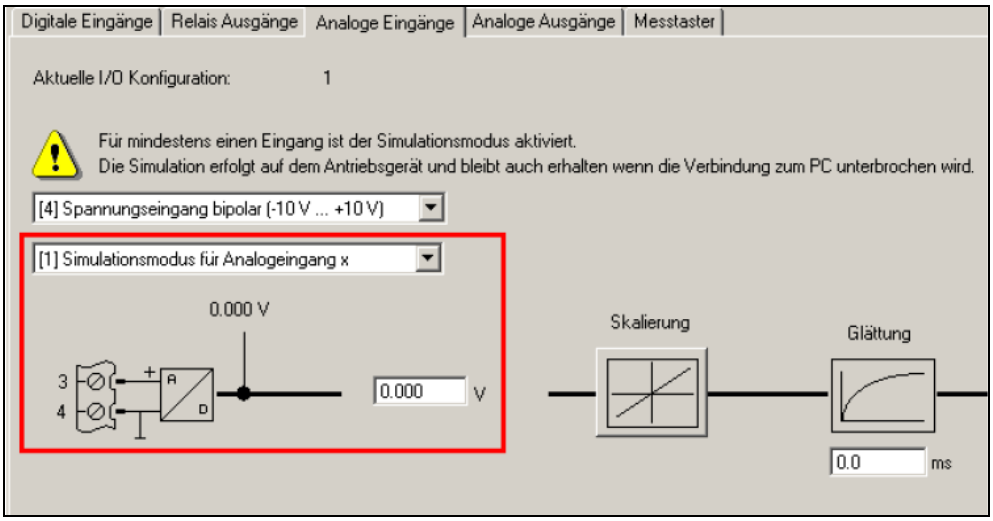


Diagram 5-19: Simulation of the analog inputs using STARTER

Operator panel IOP

The analog inputs can also be simulated using the IOP operator panel. Only one DI is displayed; however, by rotating the selector wheel, all of the existing analog inputs can be selected.

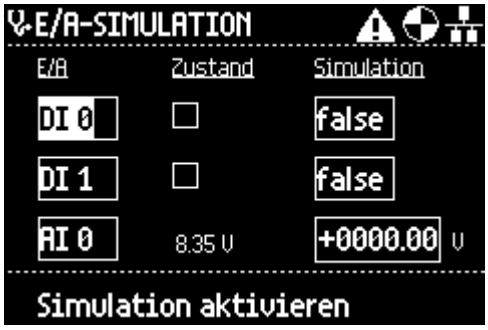


Diagram 5-20: Simulation of the analog inputs using the IOP

The actual state of the AI is displayed at the center; by entering a voltage value for the simulation, the AI is set to this value as soon as "Activate simulation" was pressed.

5.11.2 Dead band

For the CU240E and CU240S Control Units, when using analog inputs with 2 … 10V and/or 4 … 20mA, in addition to selecting the analog input via p0756.x, a dead zone can also be entered using p0761, so that the setpoint with values less than 2V/4mA does not run in the negative direction.

For 2nd generation Control Units, this is no longer necessary; the response threshold for wire breakage monitoring can now be set using the parameter p0761.

Note

For applications, where the dead zone was used to suppress interference voltages on the analog signal for example, from SINAMICS firmware version V4.6 and higher, it is now possible to parameterize a dead zone at the analog input using parameter p0764.x.

5.12 Scaling of the setpoint channel

Contrary to the CU240E and CU240S Control Units, the setpoint channel is no longer scaled in Hz, but in rpm. This assumes that the rated speed and rated frequency were correctly entered during quick commissioning.

5.13 Motorized potentiometer

The motorized potentiometer now provides the option of saving analog setpoints. For example when an analog value fails as a result of wire breakage, the last setpoint can be directly accessed; an additional change is realized using the raise/lower keys.

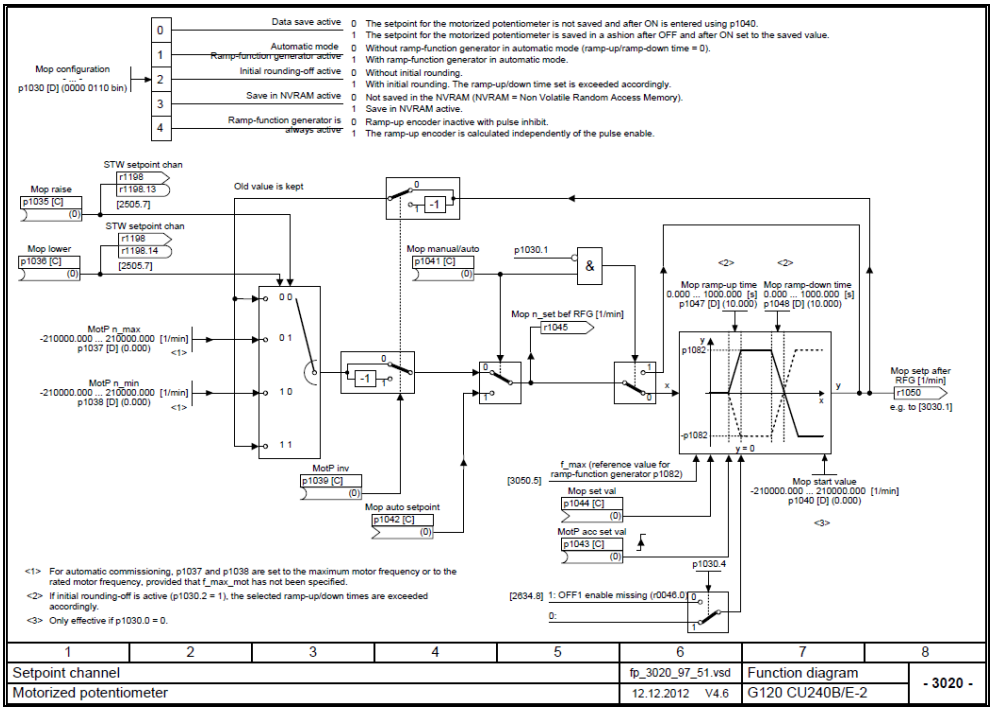


Diagram 5-21: Function diagram of the motorized potentiometer

5.14 Second ramp function via the JOG ramp-function generator changed

It is no longer possible to implement a second ramp function by using the JOG ramp-function generator.

Note

When using the data set changeover (DDS), up to 4 different parameterizable ramp functions are available. In operation, data sets can be changed over using digital inputs or also via the fieldbus. For details, refer to the operating instructions **Link**

5.15 Flying restart

Selection option regarding flying restart has been reduced.

Parameter	Action
p1200	0: Flying restart inactive 1: Flying restart always active (start in the setpoint direction) 4: Flying restart always active (start only in the setpoint direction)

Diagram 5-22: Parametrization of the flying restart

5.16 Automatic restart

New functions have been implemented for the automatic restart.

Parameter	Action
p1210	0: Inhibited automatic restart 1: Acknowledge all faults without restarting 4: Restart after line supply failure, without additional start attempts 6: Restart after fault with additional start attempts 14: Restart after line failure after manual acknowledgment 16: Restart after fault after manual acknowledgment 26: Acknowledging all faults and restarting for an ON command

Diagram 5-23: Setting options for automatic restart

Up to 10 fault messages can be set using parameter p1206, where the automatic restart is not started.

5.17 Expanded motor holding brake function

The parameterization of the motor holding brake has been expanded. Now, there are various modes available where the brake can be opened and closed as before from the process, however also permanently or depending on an external signal.

Note Only the CU250S-2 Control Unit supports the SBC safety function (Safe Brake Control).

5.18 Setting dynamic braking

For 2nd generation Control units, the braking module is automatically activated when using a PM240. The braking resistor must be externally protected against overload.

- Thermo sensors of the braking resistor are wired to a DI of the converter, and this input is interconnected with parameter p2106 "External fault 1". As a consequence, for an overtemperature, fault F07860 "External fault 1" is activated.

Note When using a braking resistor, the VDCmax controller should be deactivated (for vector control: p1240 = 0, for U/f: p1280 = 0).

From firmware version V4.6 and higher, parameter p0219 is available, which can be used to define the maximum permissible braking power. This parameter automatically sets the regenerative power and the down ramp, further, it inhibits the Vdcmax controller.

5.19 Control modes

Control modes

Selecting the control modes using parameter p1300 has been supplemented by ECO versions with flux reduction.

Parameter	Action
p1300	0: U/f control with linear characteristic 1: U/f control with linear characteristic and FCC 2: U/f control with parabolic characteristic 3: U/f control with parameterizable characteristic 4: U/f control with linear characteristic and ECO 5: U/f control for drives requiring a precise frequency (e.g. textiles) 6: U/f control for drives requiring a precise frequency and FCC 7: U/f control with parabolic characteristic and ECO 19: U/f control with independent voltage setpoint 20: Speed control (without encoder) 21: Speed control (with encoder) 22: Torque control (without encoder) 23: Torque control (with encoder)

Diagram 5-24: Selectable control modes

Note Control modes 21 with encoder (speed control with encoder) and 23 (torque control with encoder) are only possible when using the CU250S-2 Control Unit.

Parameterizable v/f characteristic

The CU240E and CU240S Control Units each have 3 voltage/frequency points along a characteristic. Contrary to this, 2nd generation Control units have 4 voltage/frequency points, which means that the characteristic can be more finely parameterized.

- If the additional points are not required, points 3 and 4 can be set the same value.

5.20 Voltage boost

The set voltage boost for V/f characteristics with linear or square law characteristic are extended up to the rated operating point, depending on the characteristic selected. The final boost frequency, which was able to be set using parameter p1316, is no longer available.

Note As a result of the different voltage boost version, the settings should be checked in order to avoid an unnecessary motor temperature rise.

5.21 Speed-dependent controller adaptation

For 2nd generation Control Units, the Kp and Tn components of the speed controller can be adapted depending on the speed or a freely selectable value.

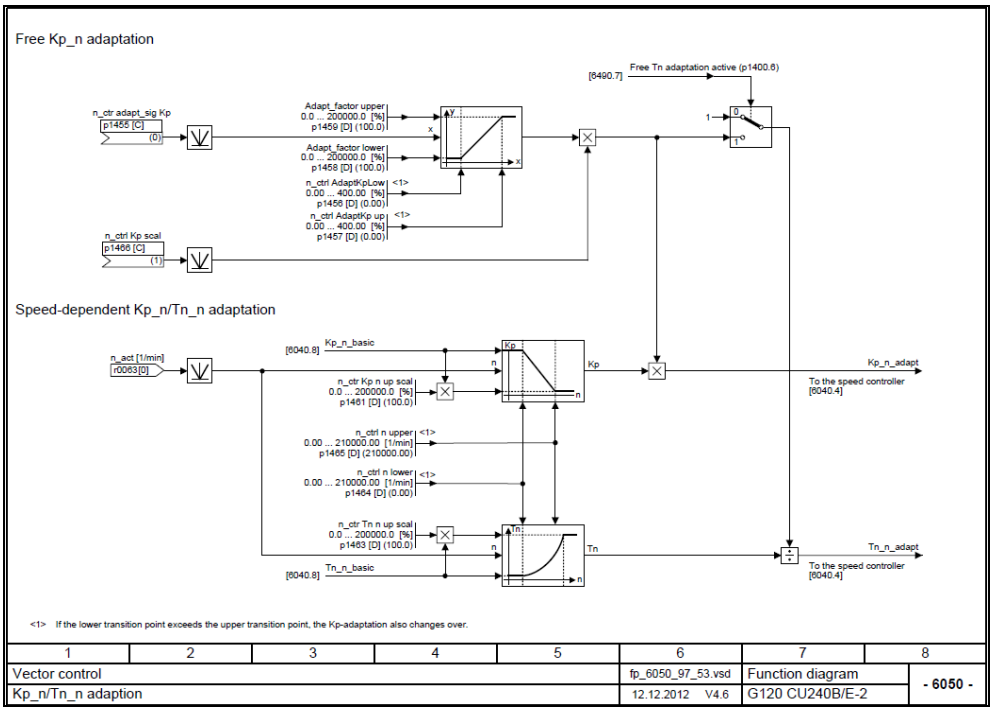


Diagram 5-25: Function diagram Kp and Tn adaptation of the speed controller

5.22 Motor data identification

Motor data identification under parameter p1900, was supplemented to include a selectable rotating measurement.

5.23 Change for reference quantities

The reference quantities (p2000 … 2004) are valid for 2nd generation Control Units as standard for all data sets. In addition, the reference quantities have been expanded to include the reference temperature (p2006).

In the CU240E-2, the speed setpoint and actual value is no longer referred to Hz but to rpm; this means that the required speed no longer has to be converted into a frequency.

5.24 Free function blocks

The scope and functionality of the free function blocks has been significantly expanded with respect to the CU240E and the CU240S. As a consequence, it was necessary to shift the parameter numbers.

Function diagrams	
7200 – Sampling times of the runtime groups	2-644
7210 – AND (AND function blocks with 4 inputs)	2-645
7212 – OR (OR function blocks with 4 inputs)	2-646
7214 – XOR (XOR function blocks with 4 inputs)	2-647
7216 – NOT (inverter)	2-648
7220 – ADD (adder with 4 inputs), SUB (subtracter)	2-649
7222 – MUL (multiplier), DIV (divider)	2-650
7224 – AVA (absolute value generator)	2-651
7225 – NCM (numeric comparator)	2-652
7226 – PLI (polyline scaling)	2-653
7230 – MFP (pulse generator), PCL (pulse contractor)	2-654
7232 – PDE (ON delay)	2-655
7233 – PDF (OFF delay)	2-656
7234 – PST (pulse stretcher)	2-657
7240 – RSR (RS flip-flop), DFR (D flip-flop)	2-658
7250 – BSW (binary change-over switch), NSW (numeric change-over switch)	2-659
7260 – LIM (limiter)	2-660
7262 – PT1 (smoothing element)	2-661
7264 – INT (integrator), DIF (derivative-action element)	2-662
7270 – LVM (double-sided limit monitor with hysteresis)	2-663

Diagram 5-26: Scope of the free function blocks

In the specified time slices (runtime groups), the free function blocks can be parameterized with a defined execution sequence.

5.25 Technology controller

The technology controller was expanded to implement normal as well as inverse control operations.

- Normal control sense: As long as the actual value is **less than** the setpoint, a positive system deviation results in a positive drive speed.
- Inverse control sense: As long as the actual value is **greater than** the setpoint, a positive system deviation results in a positive drive speed.

Parameter p2306 is used to change over the control sense.

5.26 Fixed setpoints that can be freely used

Using parameters p2900 and p2901, fixed setpoints that can be freely used, can be defined in the range +/- 100.00%. Further, permanently defined fixed setpoints are already available in r2902 [0 … 14].

5.27 Change, deactivating the BF-LED

If a fieldbus is not being used, then the BF-LED can be deactivated using parameter p2030 ➔ 0. For more detailed information, see **Link**

5.28 Wobbulation generator has been eliminated

The wobbulation generator available in the CU240E and CU240S is no longer available.

5.29 Positioning down ramp has been eliminated

The positioning down ramp available in the CU240E and CU240S (parameters p2480 ... p2488) is no longer available.

- Implemented using rapid traverse/crawl changeover based on free function blocks.

5.30 Memory card

Contrary to the CU240S, where only MMC cards were able to be used, MMC and SD cards can now be used.

5.30.1 Transferring projects using a memory card

CU240S projects on an MMC card can no longer be transferred to a CU240B/E-2 or CU250S-2 as a result of the modified parameter structure.

5.30.2 Handling memory cards

Writing to MMC / SD cards has been significantly simplified. Parameter changes are automatically saved on the memory card.

For details, see operating instructions in Chapter 4.6 **Link** and FAQ **Link**

6 Performance vector control

6.1 Vector control without encoder SLVC (sensorless)

	CU240S with PM240	CU250S-2 Vector with PM240
Task Performance		
Speed/current control loop	2 / 0,5 ms	2 / 0,5 ms
Reaction time setpoint	3,5 ms	2 ms
Torque/frequency/setpoint calculation	Floating Point 15 Bit + Vz	Floating Point 31 Bit + Vz
Current resolution	ca. 8 Bit + Vz	approx. 10 Bit + Vz
Voltage Modulator		
Pulse frequency	Standard 4kHz Max. 16kHz (<=90kW)	Standard 4kHz Max. 16kHz (<=90kW)
Voltage resolution	approx. 9 Bit	approx. 11 Bit
Max. output frequency/voltage	200 Hz / 90..92% U_N	200 Hz / 91..93% U_N
Basic Control Data		
Speed control range	10% ... 200% x n_N	10% ... 200% x n_N
Torque control range	Not recommended	Not recommended
Rise time torque/speed	10 / 80 ms	6 / 60 ms
Accuracy torque/speed	approx. +/- 5% M_N/0,1% f_{slip}	approx. +/- 5% M_N/0,1% f_{slip}
Ripple torque/speed	approx.4…6% M_N /+/- 4rpm	approx. 3…4% M_N/+/- 3rpm

Diagram 6-1: Comparison of the control performance for CU240S and CU240B/E-2, CU250S-2 for vector control without encoder

We do not recommend using torque control without encoder, instead, speed control can be used with torque limiting.

6.2 Vector control with encoder

	CU240S with PM240	CU250S-2 Vector with PM240
Task Performance		
Epos/position/speed/current control loop	- / - / 2 / 0,5 ms	8 / 4 / 2 / 0,5 ms
Reaction time setpoint	3,5 ms	2 ms
Torque/frequency/setpoint calculation	Floating Point 15 Bit + Vz	Floating Point 31 Bit + Vz
Current resolution	ca. 8 Bit + Vz	approx. 10 Bit + Vz
Voltage Modulator		
Pulse frequency	Standard 4kHz Max. 16kHz (<=90kW)	Standard 4kHz Max. 16kHz (<=90kW)
Voltage resolution	approx. 9 Bit	approx. 11 Bit
Max. output frequency/voltage	200 Hz / 90..92% U_N	200 Hz / 91..93% U_N
Basic Control Data		
Speed control range	0% ... 200% x n_N	0% ... 200% x n_N
Torque control range	10% ... 200% x n_N	10% ... 200% x n_N
Rise time torque/speed	7 / 35 ms	4 / 30 ms
Accuracy torque/speed	approx. +/- 5% M_N/< 0,01%n_N	approx. +/- 5% M_N / < 0,001% n_N
Ripple torque/speed	approx.4…6% M_N /+/- 4rpm	approx. 3…4% M_N/+/- 3rpm

Diagram 6-2: Comparison of the control performance for CU240S and CU250S-2 for vector control with encoder

6.3 Increased ruggedness of the vector control

For encoderless vector control of the CU240S, for critical applications, such as raising and lowering, the motor data had to be optimized a multiple number of times, taking into account equivalent circuit diagram data. Tests carried out on gantry cranes indicated that the equivalent circuit diagram data for the CU240E-2 Control Units were precisely determined with the first MotID, so that post optimization was no longer required. This indicated that the vector control of the SINAMICS pool is significantly more stable than the vector control of the old software pool.

7 Communication

Existing programs to control a SINAMICS G120 with CU240S via fieldbus from a PLC, can, in most cases, be reused for 2nd generation Control Units. Adaptation using changed parameter numbers may be required, only if parameters are accessed via cyclic or acyclic communication.

Safety programs in an F-CPU must be appropriately adapted to use the new extended safety functions (see Chapter 8)

7.1 GSD files

New GSG files are required for the 2nd generation Control Units. These can be downloaded at the following link **Link**

7.2 Routing through a CPU

For routing across network boundaries (IE to Profibus DP), the CPU must support the data set routing protocol. In addition, as before DriveES Basic is required, also STARTER from version V4.3 with Service Pack SP2.

The following CPUs support data set routing:

- ET200S
  - IM151-8 PN/DP CPU in conjunction with DP master module
- SIMATIC S7-300
  - CPU313C-2 DP from version V3.3
  - CPU314C-2 DP from version V3.3
  - CPU314C-2 PN/DP from version V3.3
  - CPU315-2 DP from version V3.0
  - CPU315-2 PN/DP from version V3.1
  - CPU317-2 DP from version V3.3
  - CPU317-2 PN/DP from version V3.1
  - CPU319-3 PN/DP from version V2.7
- SIMATIC S7-400 CPUs from version V5.1
- WinAC RTX from version 2010, update 1 with CP5603, CP5613 or CP5623

Presently, the following systems do not support data set routing:

- SIMATIC S7-1200
- WinAC MP
- SIMOTION

7.3 Teleservice

7.3.1 Teleservice via a CPU

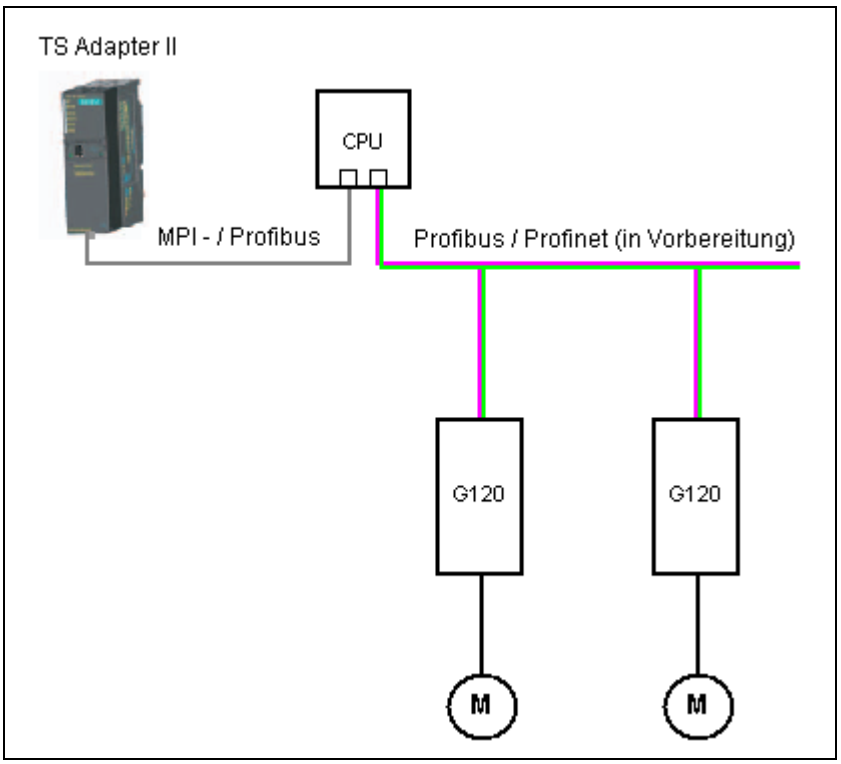


Diagram 7-1: Teleservice via a SIMATIC CPU

For this, a Teleservice Adapter II and a CPU listed under **routing** (see Chapter 7.2), which supports data set routing, are required.

7.3.2 Teleservice directly via the fieldbus

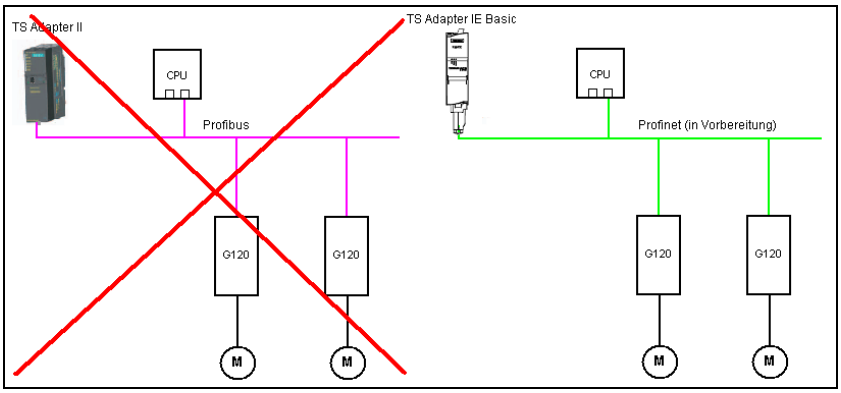


Diagram 7-1: Teleservice via fieldbus

For this configuration, the Teleservice Adapter is directly connected at the fieldbus. In this case, it is of no significance whether the CPU supports data set routing.

- For Control Units with PROFINET connection CU240E-2 PN and CU250S-2 PN, Teleservice is possible via Teleservice Adapter IE Basic.

Note

For PROFIBUS, teleservice is presently not possible, as Teleservice Adapter II does not support the functionality.

7.4 Slave-to-slave communication (direct data exchange)

New function

With "Slave-slave communication" (also called "Data Exchange Broadcast") it is possible to quickly exchange data between converters (slaves) without the master being directly involved, for instance, to use the actual value of one converter as setpoint for other converters (for more detailed information, see the operating instructions (Chapter 6.1.4.4) **Link**.

7.5 Direct HMI connection

Directly connecting an HMI to read out and change drive parameters, without intermediate CPU, is not supported.

Note

The parameters must be read out of the converter by the CPU, and from there, transferred to the HMI.

8 Safety functions

The safety functions known from the CU240S have been expanded. The following table provides an overview of the safety functions available, and the type of control that is possible.

Safety Functionality SINAMICS V4.6			
Drive	G120		
CU type	CU240E-2 USS CU240E-2 DP CU240E-2 PN	CU240E-2 F USS CU240E-2 DP-F CU240E-2 PN-F	CU250S-2 USS CU250S-2 CAN CU250S-2 DP CU250S-2 PN
Firmware version	V4.6	V4.6	V4.6
Standards			
EN 954-1 resp. EN ISO 13849-1: 2006	Cat. 3	Cat. 3	Cat. 3
IEC 61508: 2010	SIL 2	SIL 2	SIL 2
EN ISO 13849-1: 2006	PLd	PLd	PLd
Functions (according IEC 61800-5-2, 2007):			
STO	X	X	X
SS1	-	X(1)	X(1) (4)
SS2	-	-	-
SOS	-	-	-
SLS	-	X (1) (2)	X(1) (5) (6)
SLP	-	-	-
SP (1)	-	-	-
SDI	-	X (1)	X (1) (5)
SBC	-	-	X (2)
SBT (1)	-	-	
SSM	-	X (1) (4)	X (1) (5)
F-DI	1 (1)	3 (3)	3 (3)
F-DO	-	-	1
Notes (1) The functionality of SLP and SBT exceed the requirements of the standards.	**(1)** Fail-safe F-DI are parametrized by 2 standard DI´s	**(1)** Safety functionality for asynchronous motors without encoder **(2)** CU240E-2 F: 1 SLS limit to be selected by terminal; CU240E-2 DP/PN-F: 4 SLS limits to be selected by PROFIsafe (davon 1 Grenzwert variabel) **(3)** Fail-safe F-DI are parametrized by 2 standard DI´s **(4)** only via PROFIsafe (no F-DO available)	**(1)** Safety functionality for asynchronous motors without encoder **(2)** mit Safe Brake Relay **(3)** Fail-safe F-DI are parametrized by 2 standard DI´s **(4)** for SS1 with monitoring of the braking ramp the extended safety license is required; SS1 with delay time works without extended safety license **(5)** extended safety license required **(6)** CU250S-2/CU250S-2 CAN: 1 SLS limit to be selected via terminal; CU250S-2 DP/PN: 4 SLS limits to be selected via PROFIsafe (1 limit variable)
Control			
Safety via PROFIBUS by PROFIsafe	CU240E-2 DP	CU240E-2 DP -F	CU250S-2 DP
Safety via PROFINET by PROFIsafe	CU240E-2 PN	CU240E-2 PN -F	CU250S-2 PN
Onboard terminals	X (1) (2)	X (1) (2)	X (1) (2)
Notes (1) The functionality of SLP and SBT exceed the requirements of the standards .	**(1)** Direct coonection of the safety device (e.g. emergency stop pushbutton) at the F-DI of the converter, no separat safety module required **(2)** STO: with CU240E-2 DP combination of F-DI and PROFIsafe possible	**(1)** Direct coonection of the safety device (e.g. emergency stop pushbutton) at the F-DI of the converter, no separat safety module required **(2)** STO: with CU240E-2 DP combination of F-DI and PROFIsafe possible	**(1)** Direct coonection of the safety device (e.g. emergency stop pushbutton) at the F-DI of the converter, no separat safety module required **(2)** STO: with CU250-2 DP-F combination of F-DI and PROFIsafe possible
Feedback signal			
Safe feedback of the status of the safety functions by PROFIsafe	X	X	X
Safe feedback of the status of the safety functions by terminals	-	-	-
Safe transfer of the status of the F-DI Status by PROFIsafe	-	X	X
Power modules			
PM230	-	-	-
PM240/PM240-2	X	X	X
PM250	X	X	X
PM260	X	X	X
PM340	X	X (1)	X (1)
Notes		(1) Power modules PM240 FS GX do not support extended safety functions (STO extended, SS1, SLS, SDI, SSM)	(1) Power modules PM240 FS GX do not support extended safety functions (STO extended, SS1, SLS, SDI, SSM)

Diagram 8-1: Safety functionality of the firmware V4.6

You can find more detailed information on the safety functions in the Safety Integrated Function Manual, **Link** or on the following Internet page **Link**

Note

As before, for the safety functions speed sensing using a speed encoder is not required.

STO is permissible for all applications, where Emergency Stop functionality is stipulated.

SS1, SLS, SSM and SDI are not permissible for pulling and continuously regenerative loads (also refer to the Safety Integrated Function Manual, Chapter 2.2 **Link**).

The F-DIs are formed by combining 2 standard DIs per parameterization.

8.1 New and extended safety functions

8.1.1 Extended SS1 (Safe Stop 1)

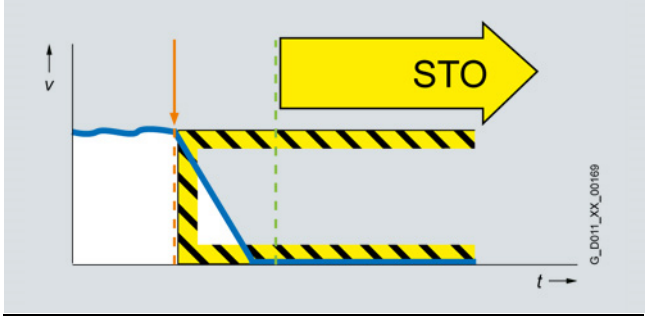


Diagram 8-1: Function diagram of Safe Stop 1

When compared to the CU240S family, the SS1 safety function has been extended. Braking a motor after activating SS1 can now be set as follows using the appropriate parameterization:

- Brake ramp monitoring:
  After selecting SS1, the drive automatically decelerates along the OFF3 ramp. The deceleration is monitored using the SBR ramp (Safe Brake Ramp). STO is activated when standstill is reached.
- Acceleration monitoring:
  After selecting SS1, the drive does not decelerate along the OFF3 ramp, but can be independently decelerated.
  The speed is safely monitored for acceleration
  When the "shutdown speed SS1" is reached – or after the "SS1 delay time" has expired – then STO is activated

Additional changes:

- The SS1 ramp time (brake ramp monitoring mode) was increased from 99 seconds (referred to 200Hz) to 1000 seconds (referred to the reference speed, e.g. 1500 rpm).
  ➔ Safely stopping high inertia masses.
- For the CU240S family it was possible to interrupt SS1 by withdrawing the SS1 request before reaching the SS1 standstill identification frequency.

This is no longer possible for CU240E-2 and CU250S-2. The SS1 request remains until STO is internally activated.

8.1.2 Extension of SLS (Safely Limited Speed)

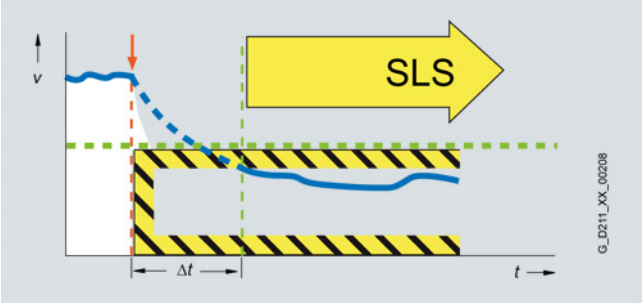


Diagram 8-2: Function diagram, safely limited speed

When compared to the CU240S family, the SLS safety function has been extended as follows:

- The various SLS modes of the CU240S family have, for the CU240E-2 and the CU250S-2, been integrated to form one "mode". ➔ This simplifies commissioning and allows new safety concepts to be implemented.
- With the CU240E-2 DP F, CU240E-2 PN-F, CU250S-2 DP and the CU250S-2 PN, when controlled via PROFIsafe, 4 parameterizable SLS limit values are available. ➔ New safety concepts can be implemented.
- When activating SLS at standstill, the motor must be fed with current within 5 seconds. Reaching a minimum speed during this 5s, as was the case for the CU240S family, is no longer required. ➔ This simplifies the control.
- The drive response when activating SLS (automatic or manual deceleration) can be set using the SS1 brake ramp or acceleration monitoring.
- When SLS is active, the response to a limit value violation can be selected to either be STOP A (STO) and STOP B (SS1) (for CU240S, only STO is possible) ➔ In the case of a fault, the motor can now be safely braked and no longer coasts down unbraked.

8.1.3 New safety function SDI (Safe Direction)

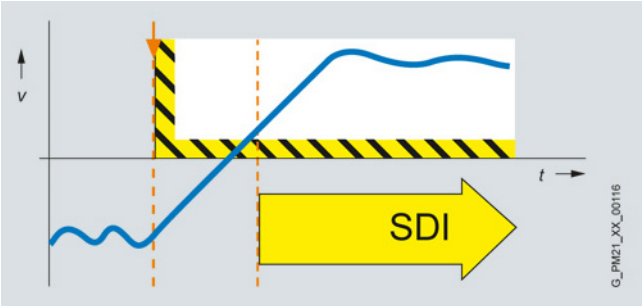


Diagram 8-3: Function diagram, safe direction

The safety function prevents the motor operating in an unsafe direction of rotation. An encoder is not required for this safety function.

➔ New safety concepts can be implemented, e.g. remaining in a hazardous area while a system part is moved out of this dangerous area – or setting-up operation with a safely inhibited direction of rotation.

8.1.4 New safety function SSM (Safe Speed Monitor)

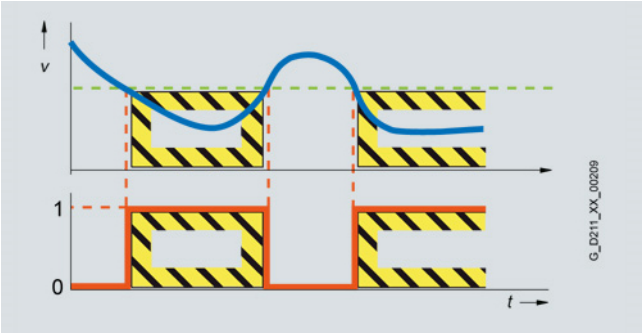


Diagram 8-4: Function diagram, safe speed monitor

A PROFIsafe signal is used to indicate that the motor speed lies below a parameterized speed limit. When the speed limit is exceeded, this signal is deactivated; however, there is no converter response. An encoder is not required for this safety function.

➔ Using the signal, for example, an F-CPU can release a protective door. As long as the parameterized SSM speed limit has not been reached, the door is released. After the door has been opened and the motor speed increases above the SSM speed limit, the F-CPU activates safe shutdown of the SINAMICS G120 via STO or SS1

You can find more detailed information on the safety functions in the Safety Integrated Function Manual, **Link** or on the following Internet page **Link**

8.2 Standard STARTER parameterizing screen forms

The STARTER parameterizing screens for the described safety functionality of the SINAMICS G120 are now the same as the parameterizing screen forms of the SINAMICS S110 and S120.

➔ Training is not required when changing over to other SINAMICS converters

8.3 Simplified parameterization

The same as for the SINAMICS S110 and S120, parameterizing of the SINAMICS G120 is realized through one channel, and is only duplicated to the second channel at the end of commissioning by pressing a key. As a consequence, it is no longer necessary to enter the safety parameters in two channels (e.g. Hz and kHz). Further, it is no longer necessary to confirm the checksum.

➔ This simplifies commissioning and avoids incorrect parameter assignments

8.4 Offline safety parameter assignment

Just the same as for SINAMICS S110 and S120, safety functions can now also be parameterized offline.

➔ The safety parameterization can now already be prepared in an office environment.

8.5 Acceptance report

Using the STARTER parameterizing software, an acceptance report of the safety functions can be generated, in which all of the relevant parameter values are automatically entered

➔ Can be found in STARTER under the drive unit in the **documentation** folder

The text for the acceptance report is based on an application by scripting, see **Link**.

8.6 Changing the reference quantity

Speed-related safety values no longer refer to Hz but to rpm. In addition, a gearbox factor can be parameterized

➔ Therefore, it is no longer necessary to convert the parameterization to the resulting motor speed.

8.7 Group drives

The STO, SS1, SLS, SDI and SSM safety functions can be used in conjunction with group drives (where more than one motor is fed from one converter).

8.8 Changes to the PROFIsafe telegram

The PROFIsafe telegram has been extended as a result of the more extensive safety functions of the CU240E-2 family.

The safety program of the F-CPU must be appropriately extended in order to be able to use these functions.

8.8.1 Previous CU240E/S PROFIsafe telegram 30

Control word															
Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
							SLS *				SLS *			SS1	STO
Status word															
Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
							SLS active *				SLS active *			SS1 active	Power removed

* Selects whether byte 0 / bit 4 or byte 1 / bit 0 should be used for the SLS control, is realized via the parameterization

8.8.2 New CU240B/E-2, CU250S-2 PROFIsafe telegram 30

Control word															
Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
		SDI negative *	SDI positive *		SLS-Limit Selection * 00 = Level 1 01 = Level 2 10 = Level 3 11 = Level 4			ACK			SLS *			SS1 *	STO
Status word															
Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Status SSM *		SDI negative active *	SDI positive active *		active SLS-Limit * 00 = Level 1 active 01 = Level 2 active 10 = Level 3 active 11 = Level 4 active			Internal event			SLS active *			SS1 active *	Power removed

* Extended Safety functions (CU240E-2 –F, CU240E-2 DP-F and CU240E-2 PN-F)

Changes to the CU240S PROFIsafe telegram (control word)

- Byte 0 / bit 4 ➔ SLS control exclusively via this bit
- New: Byte 0 / bit 7 ➔ Acknowledgment signal for safety error messages
- New: Byte 1 / bit 1 and 2 ➔ Selects SLS limit value 1..4
- New: Byte 1 / bit 4 and 4 ➔ Selects the appropriate safe direction of rotation

Changes to the CU240S PROFIsafe telegram (status word)

- Byte 0 / bit 4 ➔ Speed below SLS limit value, exclusively via this bit
- New: Byte 0 / bit 7 ➔ Safety function error
- New: Byte 1 / bit 1 and 2 ➔ Feedback signal, active SLS limit value 1..4
- New: Byte 1 / bit 4 and 4 ➔ Feedback signal activation of safe direction of rotation
- New: Byte 1 / bit 7 ➔ Feedback signal status SSM

8.8.3 New CU240B/E-2, CU250S-2 PROFIsafe telegram 900

Control word

Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
		SDI negative *	SDI positive *		SLS-Limit Selection * 00 = Level 1 01 = Level 2 10 = Level 3 11 = Level 4			ACK			SLS *			SS1 *	STO
Byte 3								Byte 3							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Status word

Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Status SSM *		SDI negative active *	SDI positive active *		active SLS-Limit * 00 = Level 1 active 01 = Level 2 active 10 = Level 3 active 11 = Level 4 active			Internal event			SLS active *			SS1 active *	Power removed
Byte 3								Byte 2							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
					Status FDI2 *	Status FDI1 *	Status FDI0 *								

* Extended Safety functions (CU240E-2 –F, CU240E-2 DP-F and CU240E-2 PN-F)

PROFIsafe telegram 900 differs from the PROFIsafe telegram 30 in so much that for this telegram, the status of the fail-safe digital inputs is also transferred (byte 3, bit 0…2)

8.9 Transferring the status of F-DI via PROFIsafe

New function

When using PROFIsafe, for the CU240E-2 DP-F, CU240E-2 PN-F, CU250S-2 DP and the CU250S-2 PN, the status of the F-DIs can be transferred to the F-CPU in a fail-safe fashion; they are therefore available to this as distributed F I/O.

9 Drive fault messages

The fault messages of the 2nd generation Control Units have changed with respect to the CU240E and CU240S. If these are to be displayed at an HMI for diagnostic purposes, then the corresponding fault texts can be downloaded from the following link **Link**.

In addition, it is now possible to hide certain fault messages or convert them into alarms. The acknowledgment mode can also be adapted.

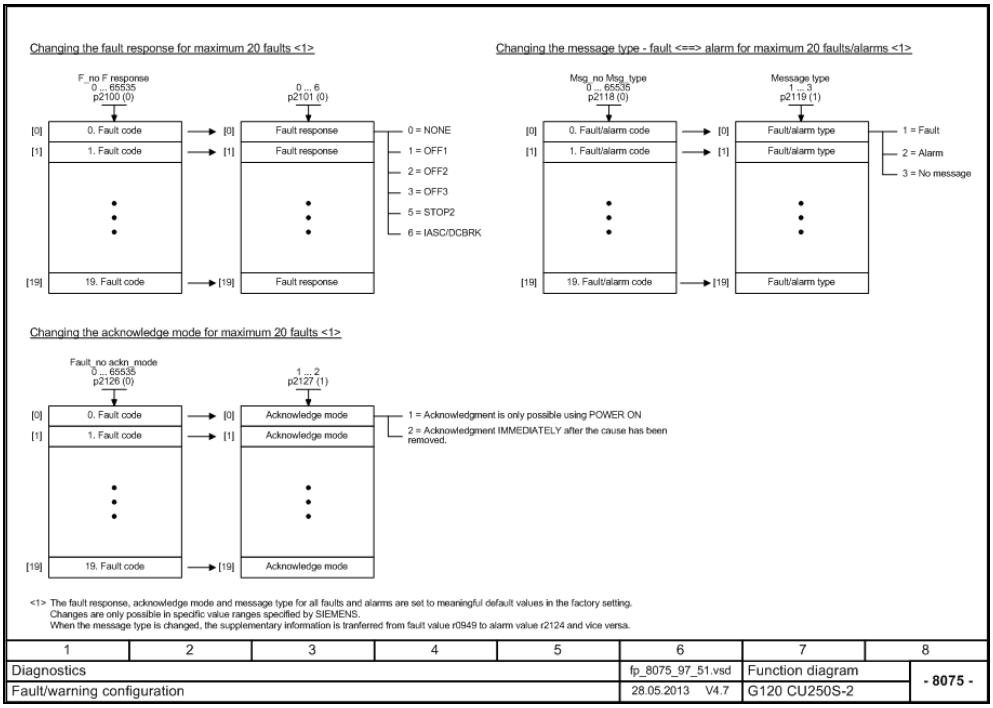


Diagram 9-1: Function diagram, fault/alarm configuration