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Ingenuity for life

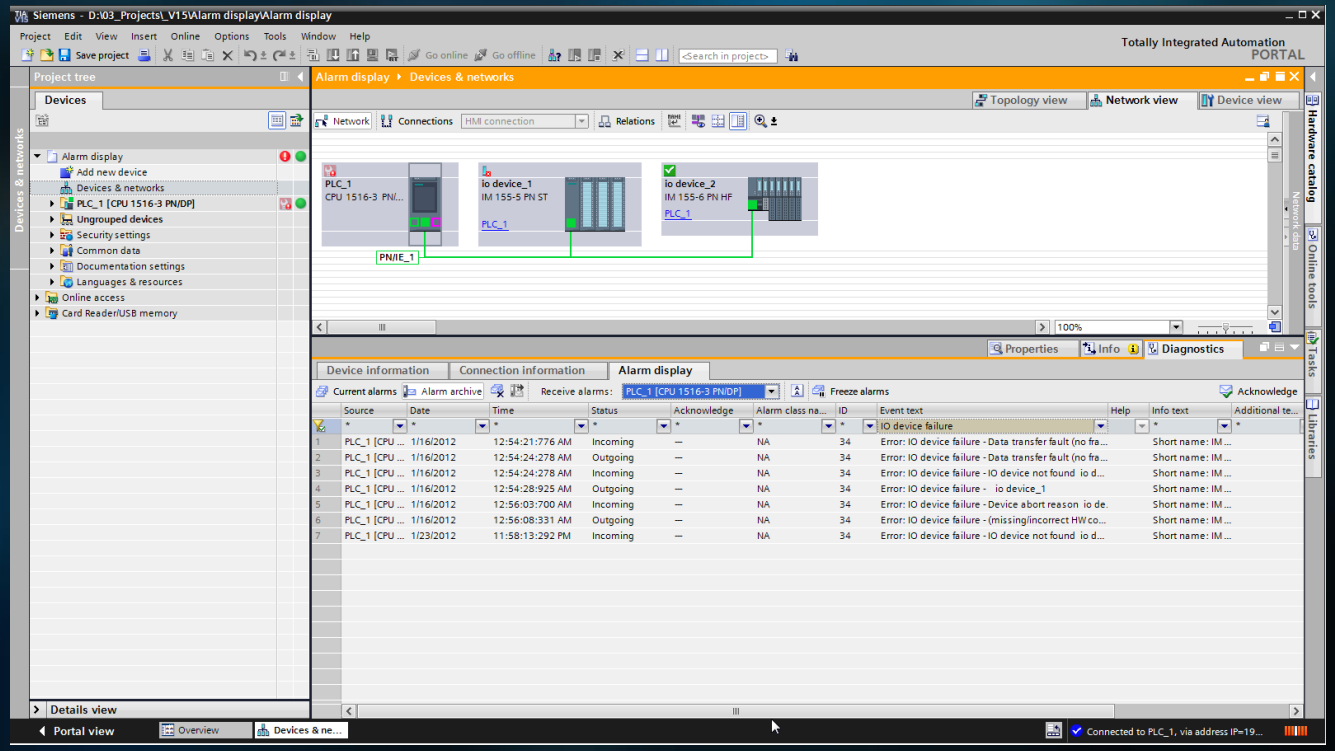
Safe motion control from tools to testing

26.03.2020

Tools

TIA Portal V16

- Step 7 Professional → PLC standard programming
- Step 7 Safety Advanced → Safety programming
- Startdrive Advanced → Drive commissioning and testing



Test setup

SINAMICS G120
CU250S-2PN Vector

SIMATIC 1512SP-F

Switches / G120 inputs

Our mission

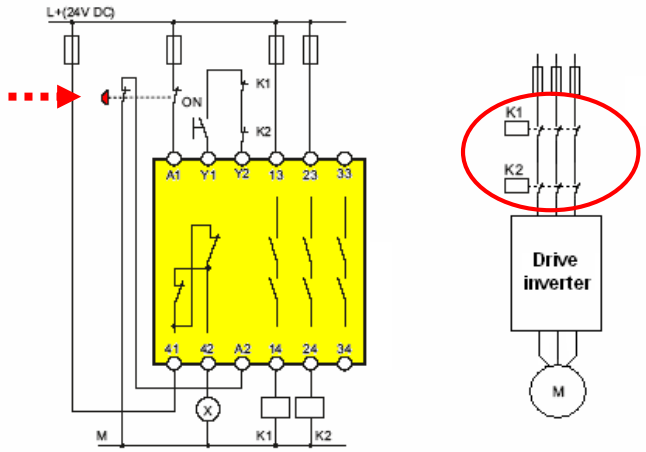
Safety function commissioning and testing

Example how to implement STO (Safe Torque Off)

STO-function in traditional way

Control of the function

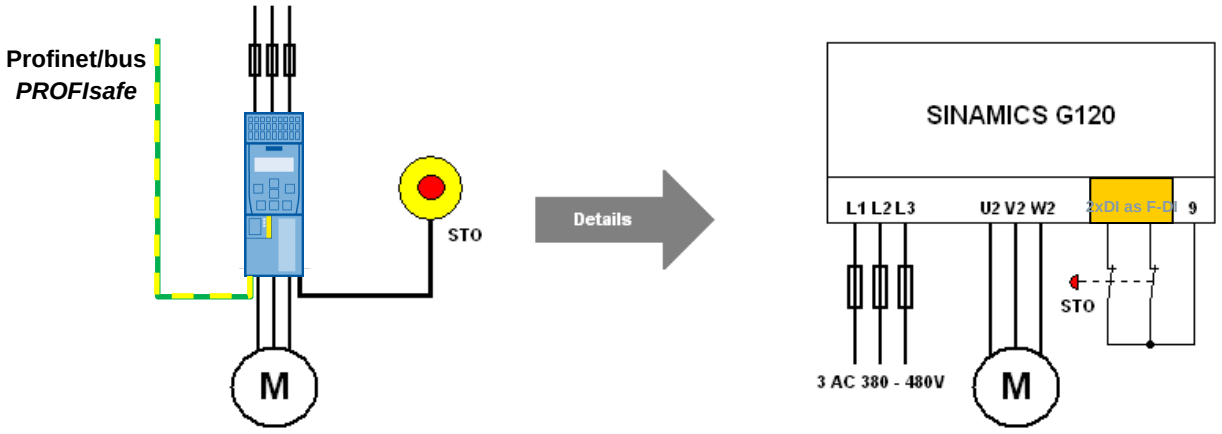
- 2 x contactors
- Safety relay



STO-function with Drive's integrated safety

Several possibilities to control the Drive's safety :

- F-DI
- PROFIsafe
- F-DI and Profisafe



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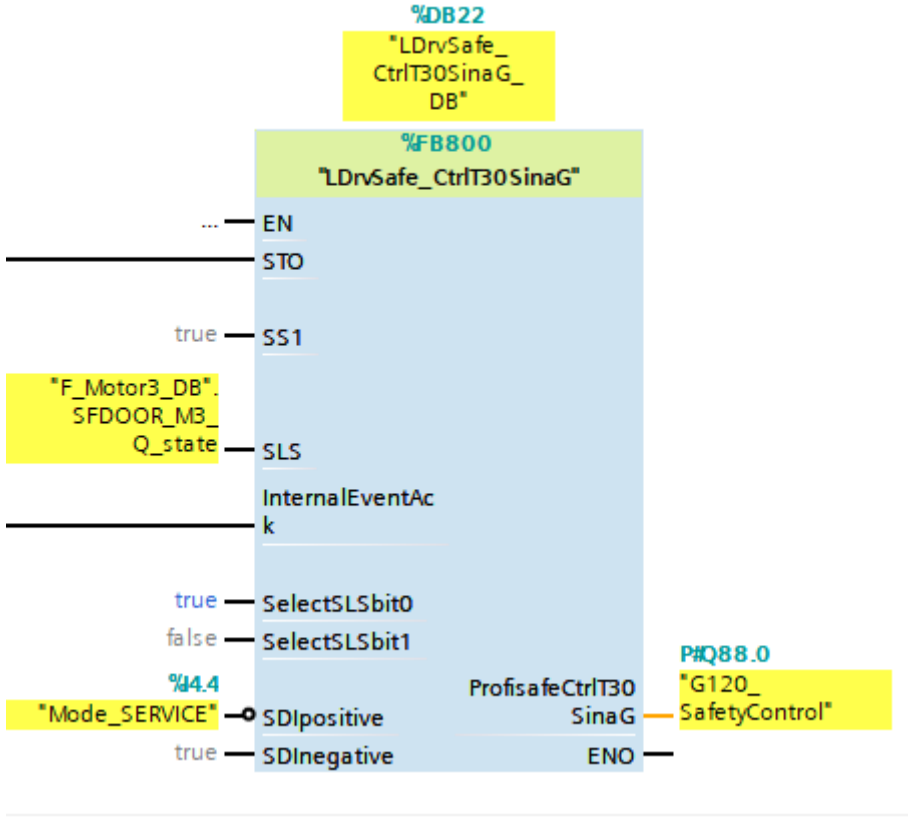
- **SINAMICS control blocks**
  - **LDrvSafe_CtrlT30SinaG / T900**
  - **Sinamics S.. also supported**

LDrvSafe – available from support site:
https://support.industry.siemens.com/cs/us/en/view/109485794



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Safety Integrated
PROFIsafe communication with telegrams 30/900

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Control Word 1

Byte	Bit	Function	Comment				
0	0	STO	0	Select STO			
			1	Deselect STO			
	1	SS1	0	Select SS1			
			1	Deselect SS1			
	2, 3	*Not relevant*					
	4	SLS	0	Select SLS			
			1	Deselect SLS			
	5, 6	*Not relevant*					
	7	Internal event ack	0	Do not acknowledge faults			
			1 → 0	Acknowledge "Internal event" for a 1 → 0 signal change			
1	*0*	*Not relevant*					
	1	SLS level bit 0	Select SLS level			Bit 10	Bit 9
					Level 1	0	0
	2	SLS level bit 1			Level 2	0	1
					Level 3	1	0
					Level 4	1	1
	3	*Not relevant*					
	4	SDI positive	0	Select SDI with positive direction of rotation			
			1	Deselect SDI with positive direction of rotation			
	5	SDI negative	0	Select SDI with negative direction of rotation			
			1	Deselect SDI with negative direction of rotation			
	6, 7	*Not relevant*					

Status Word 1

Byte	Bit	Function	Comment				
0	0	Power removed	0	STO is not active			
			1	STO is active			
	1	SS1 active	0	SS1 is not active			
			1	SS1 is active			
	2, 3	*Not relevant*					
	4	SLS active	0	SLS is not active			
			1	SLS is active			
	5, 6	*Not relevant*					
	7	Internal Event	0	Fault-free operation			
			1	The inverter signals an "internal event"			
1	*0*	*Not relevant*					
	1	SLS level bit 0	SLS level is active			Bit 10	Bit 9
					Level 1	0	0
	2	SLS level bit 1			Level 2	0	1
					Level 3	1	0
					Level 4	1	1
	3	*Not relevant*					
	4	SDI positive active	0	SDI positive direction of rotation is not active			
			1	SDI positive direction of rotation is active			
	5	SDI negative active	0	SDI negative direction of rotation is not active			
			1	SDI negative direction of rotation is active			
	6	*Not relevant*					
	7	Status SSM	0	Absolute value of the speed is greater than the SSM limit value			
			1	Absolute value of the speed is less than the SSM limit value			

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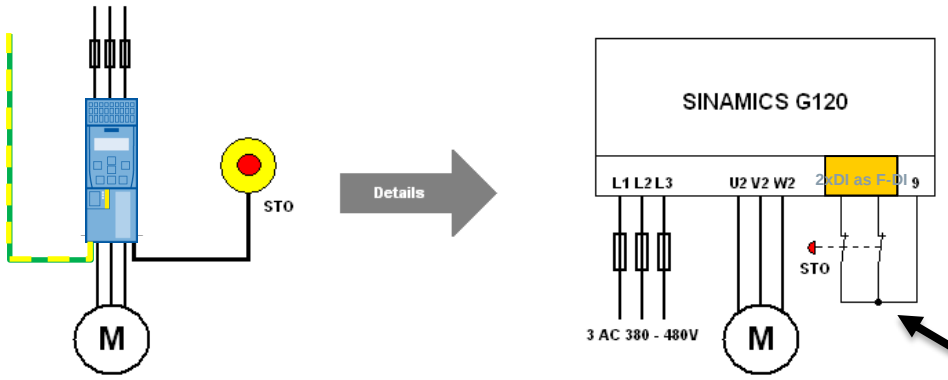

Control word 5 and status word 5

Table 4-6 Control word 5 (bit 0 ... 15)

Byte	Bit	Function	Comment
0 ... 1	0 ... 7	*Reserved*	Assign the value 0 to the reserved bits.

Table 4-7 Status word 5 (bit 0 ... 15)

Byte	Bit	Function	Comment		SINAMICS G120	SINAMICS G120D
0	0 ... 7	*Reserved*	-			
1	**0**	**Status of fail-safe digital inputs F-DI 0 ... F-DI 2**	0	LOW signal (0 V)	At terminals 5 and 6	At pins X7.2 and X7.4
			1	HIGH signal (24 V)		
	1		0	LOW signal (0 V)	At terminals 7 and 8	At pins X8.2 and X8.4
			1	HIGH signal (24 V)		
	2		0	LOW signal (0 V)	At terminals 16 and 17	At pins X9.2 and X9.4
			1	HIGH signal (24 V)		
	3 ... 7	*Reserved*	-			

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Safety Acceptance Test - Startdrive Advanced
Sinamics safety functions testing and report

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Functions

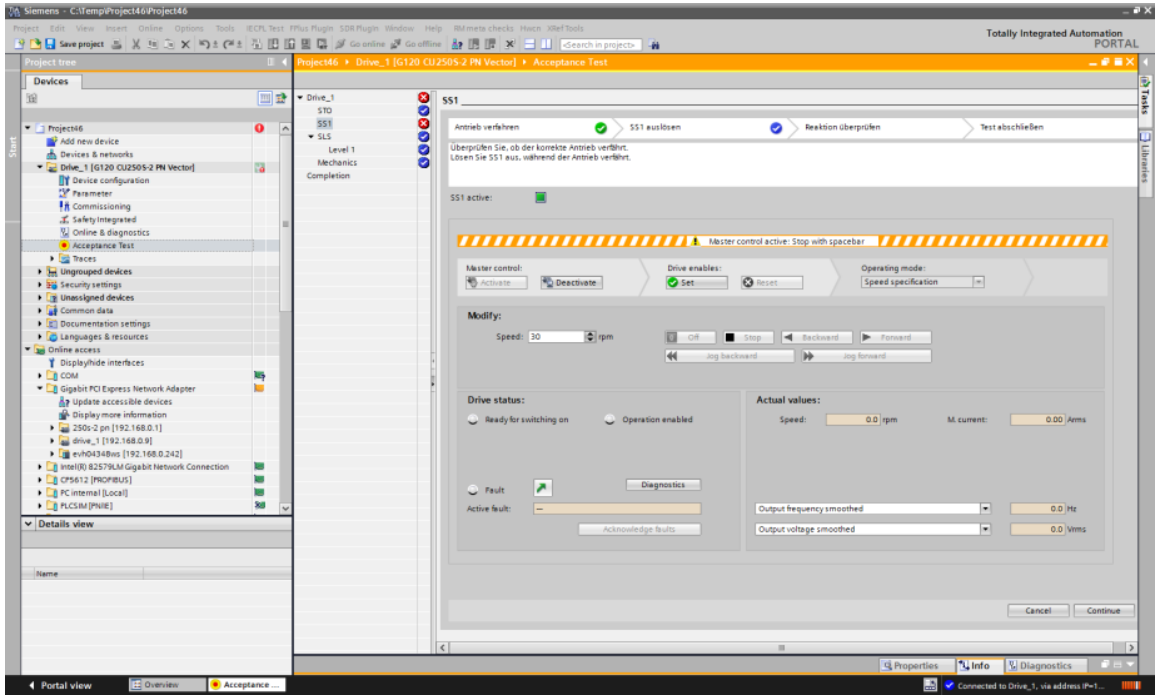
- Testing of Sinamics Basic and Extended safety functions
- Automatic Excel report with trace
- Supports functional safety verification and validation
- Available for G110M, G120, G120C, G120D, G120P, S120, S210

Benefits

→ Easy testing with ready-made functionality

→ Documentation fulfils requirements of the standards

→ Saves time and effort



Startdrive Advanced V16

6SL3072-4GA02-0XA5

List price: 500€

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Useful links

SINAMICS Positioning a G110M/G120 (Startdrive) with S7-1500 (TO) via PROFINET/PROFIBUS with Safety Integrated and HMI
https://support.industry.siemens.com/cs/us/en/view/81666970

SIMATIC - Failsafe library LDrvSafe to control the Safety Integrated functions of the SINAMICS drive family
https://support.industry.siemens.com/cs/us/en/view/109485794

SIMATIC Safe Kinematics – Getting Started
https://support.industry.siemens.com/cs/us/en/view/109762735

Programming Guideline Safety for SIMATIC S7-1200/1500
https://support.industry.siemens.com/cs/ww/en/view/109750255

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- ✓ Please attach files and pictures to support request sent with email
- ✓ How do you wish to be contacted? (we call you or send email)

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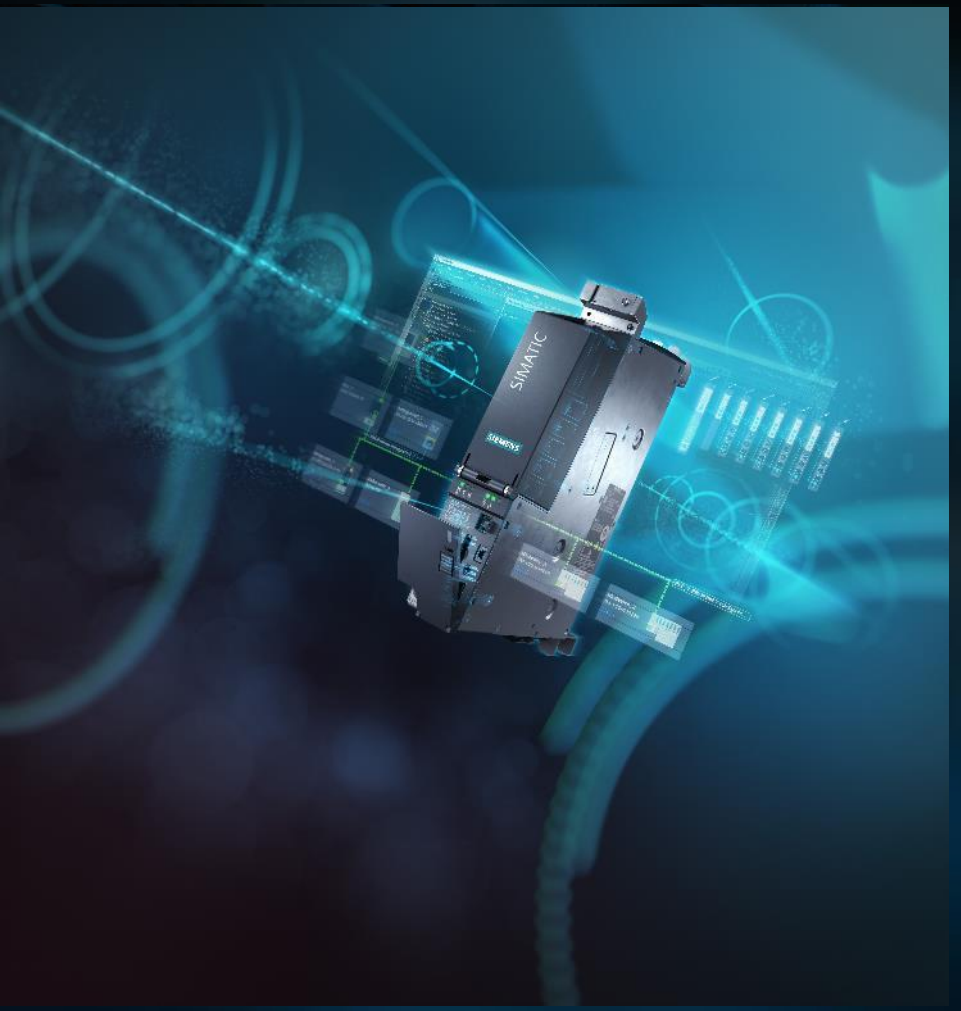

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