

# Learn-/Training Document

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

**TIA Portal Module 062-101** Frequency converter G120 on PROFINET with SIMATIC S7-1500

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## Suitable SCE trainer packages for this Learn-/Training Document

#### SINAMICS drive systems

- SINAMICS G120 standard drive for 1-phase 230 VAC network Order no. 6SL3200-3AX00-0UL1
- SINAMICS G120 standard drive for 3-phase 400 VAC network Order no. 6SL3200-3AX00-0UL2

#### SIMATIC Controllers

- SIMATIC ET 200SP Open Controller CPU 1515SP PC F and HMI RT SW Order no.: 6ES7677-2FA41-4AB1
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- SIMATIC CPU 1516F PN/DP Safety Order no.: 6ES7516-3FN00-4AB2
- SIMATIC S7 CPU 1516-3 PN/DP Order no.: 6ES7516-3AN00-4AB3
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# Frequency Converter G120 with Control Unit CU250S-2 PN Vector on PROFINET with SIMATIC S7-1500

# 1 Objective

In this chapter you learn how a frequency converter SINAMICS G120 with the Control Unit CU250S-2 PN Vector and together with a CPU1516F-3 PN/DP on PROFINET is put into operation.

The module explains the basic commissioning of the frequency converter SINAMICS G120 with the SINAMICS Startdrive software in the TIA Portal.

Subsequently we show step-by-step how the frequency converter SINAMICS G120 can be controlled and monitored from the program of the CPU1516F-3 PN/DP.

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

# 2 Requirement

This chapter is based on chapter "Global data blocks for SIMATIC S7 CPU1516F-3 PN/DP". In order to carry out this chapter you can for example, use the following project: "SCE\_EN\_032-600\_Globale\_Datenbausteine \_R1508.zap13".

# 3 Required hardware and software

- **1** Engineering station: requirements include hardware and operating system (for additional information, see Readme on the TIA Portal Installation DVDs)
- 2 SIMATIC STEP 7 Professional software in TIA Portal as of V13
- **3** SINAMICS Startdrive software in TIA Portal as of V13
- 4 SIMATIC S7-1500/S7-1200/S7-300 controller, CPU 1516F-3 PN/DP e.g. Firmware of V1.6 with and 16DI/16DO as memory card Note: The digital inputs should be fed out to a control panel.
- 5 SINAMICS G120 frequency converter with:
  - Control Unit CU250S-2 PN as of Firmware 4.6
  - Power Module PM240-2
  - IOP Intelligent Operator Panel
  - Induction motor
- **6** Ethernet connection between engineering station and controller and between controller and frequency converter



# 4 Theory

# 4.1 SINAMICS G120 frequency converter

Each SINAMICS G120 converter consists of a Control Unit (CU) and a Power Module (PM).

- The Control Unit controls and monitors the Power Module and the connected motor.
- The Power Modules contain rectifiers and converters for motors in a power range of 0.37 kW to 250 kW.



Note:

 More detailed information about the frequency converter G120 with Control Unit CU250S-2 PN Vector is available in the manuals. In this module the frequency converter SINAMICS G120 is used as a PROFINET IO device.

# 4.2 Components for configuring a frequency converter SINAMICS G120

# 4.2.1 Control Units CU250S-2



The Control Units CU250S-2 differ with regard to their type of fieldbus connections. There are Control Units CU250S-2 with:

- RS485 interface for USS, Modbus RTU
- PROFIBUS interface
- RS485 interface for PROFINET, Ethernet/IP
- CANopen interface

All the Control Units have an **EEPROM** in order for power-failure-proof storage of the configuration data.

The used Control Unit CU250S-2 Vector has a **PROFINET interface** with two ports that supports the **PROFIdrive**, **PROFIsafe** and **PROFIenergy** profiles.

In addition, for example, **HTL or TTL encoders and temperature sensors** can be connected directly to a 15-pin encoder interface and **DRIVE-CLiQ-compatible encoders** as well as sensor modules to a DRIVE-CLiQ interface of the Control Unit.

The Control Unit supports the following functions of Safety Integrated (SIL 3, PL e, Cat. 3):

- Safe Torque Off (STO)
- Safe Stop 1 (SS1) with and without speed monitoring
- Safe Brake Control (SBC)
- Safely Limited Speed (SLS)
- Safe Direction (SDI)

Safe Speed Monitor (SSM)

• PROFIsafe communication to a higher-level control unit

Various **control methods** are available in order to meet the wide range of requirements in drive technology:

- U/f characteristic curves
- Flux current control
- Vector regulation with and without encoders

The following **special functions** can be used with this Control Unit:

• Basic positioning function with EPOS

• Energy recovery capability through Efficient Infeed Technology (only PM250 Power Modules)

Terminals with digital and analog as well as safe inputs and outputs are available.

#### 4.2.2 Operator Panels

The Operator Panels are used to commission, diagnose and control the converter as well as to back up and transfer the converter settings.



The **Intelligent Operator Panel (IOP)** is available for snapping onto the Control Unit or as a hand-held unit with a connecting line to the Control Unit. The IOP enables operator control and diagnostics of the converter.



The **BOP-2** is an Operator Panel for snapping onto the Control Unit. The BOP-2 has a two-line display for diagnostics and operator control of the converter.

#### Note:

- For further information on the Operator Panels, please refer to the manuals:

#### 4.2.3 Memory cards for Control Unit (optional)

The SD or MMC memory cards can be optionally used to back up the converter settings.

It is possible to store up to 100 parameter sets. This can be done by using the SINAMICS Startdrive software.

A firmware update/downgrade is only possible by using a memory card.

If you use the "Basic positioner" function or the extended safety functions, a memory card with a valid license has to be inserted into the Control Unit.

#### Note:

A memory card is not required during operation.

# 4.2.4 Brake Relay



The Brake Relay provides a switch contact (NO contact) to control the motor brake solenoid.

#### 4.2.5 Safe Brake Relay



The Safe Brake Relay controls a 24-V motor brake and monitors the brake control for shortcircuits and wire breaks.

#### 4.2.6 PM240-2 Power Modules

PM240-2 Power Modules have a brake chopper (four-quadrant applications) and are suitable for a wide range of applications in general mechanical engineering. The PM240-2 Power Modules are available without a filter or with integrated Class A line filter.



The PM240-2 Power Module is available for the following voltage and power range:

- 1-phase/3-phase 200 VAC ... 240 VAC 0.55 kW ... 4.0 kW
- 3-phase 200 VAC ... 240 VAC 5.5 kW ... 7.5 kW
- 3-phase 380 VAC ... 480 V 0.55 kW ... 250 kW
- 3-phase 500 VAC ... 690 VAC 11 kW ... 132 kW

#### Note:

 If frequency converters are not put into operation for a longer period, the DC link capacitors have to be formed in accordance with the specifications in the operating instructions.

## 4.2.7 PM250 Power Modules

PM250 Power Modules are suitable for identical applications as the PM240 Power Modules. Any brake energy occurring can be fed back directly into the power network (four-quadrant applications – no brake chopper required). The PM250 Power Modules are available without a filter or with integrated Class A line filter.



The PM250 Power Module is available for the following voltage and power range:

• 3-phase 380 VAC - 480 VAC ±10% 7.5 kW to 90 kW

#### Note:

 If frequency converters are not put into operation for a longer period, the DC link capacitors have to be formed in accordance with the specifications in the operating instructions.

#### 4.2.8 Line filter



A line filter allows the converter to reach a higher radio interference category. An external filter is not required for converters with built-in line filter.

#### 4.2.9 Line reactor



The line reactor supports overvoltage protection, flattens the harmonics in the power network and bridges commutation notches.

# 4.2.10 Output reactor



Output reactors reduce the voltage load of the motor windings as well as the load of the converter through capacitive charge/discharge currents in the lines. An output reactor is required for shielded motor lines greater than 50 m or unshielded motor lines greater than 100 m.

## 4.2.11 Sine-wave filter



The sine-wave filter at the output of the converter limits the voltage gradient and the peak voltages at the motor motor winding. The maximum permissible motor supply line length increases to 300 m. An output reactor becomes superfluous.

# 4.2.12 Braking resistor



The braking resistor allows rapid braking of loads with a high moment of inertia.

The Power Module controls the braking resistor through its integrated brake chopper.

# 4.3 Safety measures and warnings

The following safety information and warnings are to be observed before the installation and commissioning of the SINAMICS G120.

# 4.3.1 General

## 

This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with the warnings or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury or serious damage to property.

Protection in case of direct contact by means of SELV / PELV is only permissible in areas with equipotential bonding and in dry indoor rooms. If these conditions are not fulfilled, other protective measures against electric shock must be applied e.g. protective insulation.

Only suitably qualified personnel should work on this equipment, and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual. The successful and safe operation of this equipment is dependent upon its proper handling, installation, operation and maintenance.

The power supply, DC and motor terminals, the brake and thermistor cables can carry dangerous voltages even if the inverter is inoperative. Wait at least five minutes to allow the unit to discharge after switching off the line supply before carrying out any installation work.

It is strictly prohibited for any mains disconnection to be performed on the motor-side of the system; any disconnection of the mains must be performed on the mains-side of the Inverter.

When connecting the line supply to the Inverter, make sure that the terminal case of the motor is closed.

When changing from the ON to OFF-state of an operation if an LED or other similar display is not lit or active; this does not indicate that the unit is switched-off or powered-down.

The inverter must always be grounded.

Isolate the line supply before making or changing connections to the unit.

Ensure that the inverter is configured for the correct supply voltage. The inverter must not be connected to a higher voltage supply.



Static discharges on surfaces or interfaces that are not generally accessible (e.g. terminal or connector pins) can cause malfunctions or defects. Therefore, when working with inverters or inverter components, ESD protective measures should be observed.

Take particular notice of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. EN 50178) as well as the relevant regulations regarding the correct use of tools and personal protective equipment (PPE).

# 

Children and the general public must be prevented from accessing or approaching the equipment!

This equipment may only be used for the purpose specified by the manufacturer. Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer of the equipment can cause fires, electric shocks and injuries.

## NOTICE

Keep this manual within easy reach of the equipment and make it available to all users.

Whenever measuring or testing has to be performed on live equipment, the regulations of Safety Code BGV A2 must be observed, in particular § 8 "Permissible Deviations when Working on Live Parts". Suitable electronic tools should be used.

Before installing and commissioning, please read these safety instructions and warnings carefully and all the warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.

# 4.3.2 Transport and storage

#### 

Correct transport, storage as well as careful operation and maintenance are essential for the proper and safe operation of the equipment.

# 

Protect the equipment against physical shocks and vibration during transport and storage. It is important that the equipment is protected from water (rainfall) and excessive temperatures.

# 4.3.3 Commissioning

## 

Working on the equipment by unqualified personnel or failure to comply with warnings can result in severe personal injury or serious damage to material. Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the equipment.

# 

#### Cable connection

The control cables must be laid separately from the power cables. Carry out the connections as shown in the installation section in this manual, to prevent inductive and capacitive interference from affecting the correct function of the system.

# 4.3.4 During operation

#### 

The SINAMICS G120 inverters operate at high voltages.

When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.

Emergency Stop facilities according to EN 60204, IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to an uncontrolled or an undefined restart of the equipment.

Certain parameter settings may cause the SINAMICS G120 inverter to restart automatically after an input power failure, for example, the automatic restart function.

Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (that is, potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).

Motor parameters must be accurately configured for motor overload protection to operate correctly.

This equipment is capable of providing internal motor overload protection according to UL508C.

Only Control Units with fail-safe functions can be used as an "Emergency Stop Mechanism" (see EN 60204, section 9.2.5.4).

# 4.3.5 Repair

### 

Repairs on equipment may only be carried out by Siemens Service, by repair centers authorized by Siemens or by authorized personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.

Any defective parts or components must be replaced using parts contained in the relevant spare parts list.

Disconnect the power supply before opening the equipment for access.

# 4.3.6 Disassembly and disposal

#### CAUTION

The packaging of the inverter is re-usable. Retain the packaging for future use.

Easy-to-release screw and snap connectors allow you to break the unit down into its component parts. You can recycle these component parts, dispose of them in accordance with local requirements or return them to the manufacturer.

#### Note:

It is assumed that a ready pre-assembled converter unit with induction motor is being used for the following operating steps and tasks. Observe the safety regulations and warnings of the manufacturers when carrying out the electrical installation. Instructions and directives for mounting and electrical installation can be found in the manuals of the SINAMICS G120.

# 4.4 Parameter assignment of the SINAMICS G120 frequency converter

There are two main types of parameters:

- Display parameters
- Adjustable parameters

#### 4.4.1 Display parameters

Display parameters allow the reading of the internal measured quantities of the converter and motor. The Operator Panel and SINAMICS Startdrive represent the display parameters with a preceding "r". For example, r0027 is the parameter for the output current of the converter.

#### 4.4.2 Adjustable parameters

Adjustable parameters are the parameters that you use to adjust the converter to your application. When you change the value of an adjustable parameter, you also change the behavior of the converter. Adjustable parameters are represented with a preceding "p". For example, p1082 is the parameter for adjusting the maximum speed of the motor.

The following section displays some particularly important adjustable parameters.

#### Note:

- Further information on the parameters is available in the list manual.

#### 4.4.3 P0010 Drive commissioning parameter filter

Parameter P0010 filters parameters so that only the parameters assigned to a specific function group can be selected. This means, for example, that the parameters required for quick commissioning are displayed in order. The following settings are available:

• P0010 = 0: Ready

In order to start up the converter, the P0010 has to be set to 0.

- P0010 = 1: Quick commissioning
- P0010 = 2: Power unit startup
- P0010 = 3: Motor startup
- P0010 = 4: Encoder startup
- P0010 = 5: Technological application/units
- P0010 = 11: Function modules
- P0010 = 15: Data records
- P0010 = 17: Basic positioning startup
- P0010 = 25: Position control startup
- P0010 = 29: Only Siemens-internal
- P0010 = 30: Parameter reset
- P0010 = 39: Only Siemens-internal
- P0010 = 49: Only Siemens-internal
- P0010 = 95: Safety Integrated startup

By setting p3900 unequal to 0, the quick commissioning is complete, and this parameter is set automatically to 0.

### 4.4.4 P0015 Macro drive unit

With the parameter P0015 you select command and setpoint sources of the converter by executing the corresponding macro files.

After the value has changed, the further changing of parameters is blocked as long as the macro is being executed. The status is displayed in r3996. Changing is not possible until r3996 = 0 again.

When a specific macro is executed, the correspondingly programmed settings are carried out and become effective.



For example, Macro 7: "Fieldbus with data record changeover"

#### Note:

 Information about further macros is available in the operating instructions of the respective Control Unit.

#### 4.4.5 Changeability depending on the converter state

"P"-parameters can furthermore only be changed depending on the status of the converter.

For example, the parameter p1120 Ramp-function generator ramp-up time (with the attribute "C(1), U, T" in the parameter list) can only be changed in the quick commissioning "C", when P0010 = 1, in the ready state "T" or during operation "U".

Status	Description
C(*)	Quick commissioning (P0010 = *)
U	Operation (drive running)
Т	Drive ready-to-start

#### 4.4.6 BICO technology

A converter corresponding to the latest state-of-the-art has to offer the possibility to freely interconnect internal and external signals (setpoints or actual values as well as control and status signals).

This interconnection has to offer a high degree of flexibility so that the converter can be easily adapted to new applications.

The BICO technology and macros are used to meet these requirements.

By using the BICO technology the process data can be interconnected freely while using the "default" parameter assignment of the converter.

Here all the values that can be interconnected freely are defined as "connectors", for example, frequency setpoint, actual frequency value, actual current value, etc.

All the digital signals that can be interconnected freely are defined as "binectors", for example, status of a digital input, ON/OFF, message function at limit violations, etc.

A converter contains numerous input and output variables as well as variables within the control system that can be interconnected. Therefore, it is possible to adapt the converter to the various requirements by using the BICO technology.

#### **Binectors**

A binector is a digital (binary) signal without any units that can have either the value 0 or 1. Binectors always reference functions. They are divided into binector inputs (BI) and binector outputs (BO).

The binector input is always identified with a "P"-parameter (for example, P0840 BI: ON/OFF1), whereas the binector output is always represented with an "r"-parameter (for example, r1025 BO: FF status).

#### Example

Combination of the command ON/OFF1 with selection of a fixed frequency.



Binector output (BO)  $\rightarrow$  Binector input (BI)

When a fixed frequency is selected, the fixed frequency status bit (r1025) is changed internally from 0 to 1.

The source for the command ON/OFF1 is the parameter P0840 (default DI0). When the fixed frequency status bit is connected as the source for P0840 (P0840 = 1025), the converter starts by activating a fixed frequency and stops with OFF1 for deactivation of the fixed frequency.

#### Connectors

A connector (16 or 32 bits) has a value that can contain a normalized variable (dimensionless) or also a variable with assigned units.

Connectors always reference functions. They are divided into connector inputs (CI) and connector outputs (CO). In essence the same applies as for binectors: The connector inputs are identified by a "P"-parameter (for example P0771 CI: AO (analog output)), whereas the connector outputs are always represented with an "r"-parameter (for example r0021 CO: Actual frequency).

#### Example

Interconnection of the parameter r0755 (display analog input) with an internal value (main frequency setpoint). To this purpose the CO parameter r0755 (scaled analog input) has to be interconnected with the CI parameter P1070 (main setpoint).



Note:

- For further details please refer to the list manual.

# 4.4.7 Control Data Set (CDS) and Drive Data Set (DDS)

Drive engineering has applications in which simutaneous changeover of multiple parameters with external signals is needed during operation.

To enable this, certain parameters have been organized into groups. These so-called data sets are:

- Control Data Set (CDS)
- Drive Data Set (DDS)

Note:

- For more details, refer to the list manual and the operating instructions.

# 4.5 Commissioning of the SINAMICS G120 frequency converter

A converter of the type G120 always consists of the Power Module and the Control Unit. After the initial latching in of the Control Unit at the Power Module and switching on of the supply voltage, the Power Module is recognized by the Control Unit. If it is a compatible Power Module, the data are stored in the Control Unit.

Commissioning of the converter G120 is usually carried out in the following steps:

- Resetting to factory settings
- Basic commissioning
- Quick commissioning
- Calculation of the motor/control data
- Optimization of the speed control
- Further settings for commissioning
- Optional: Motor data identification
- Startup of the application
- Commissioning of fail-safe functions (only with fail-safe applications)

#### 4.5.1 Restoring factory settings through a parameter reset

The factory setting can be effected via the SINAMICS Startdrive software, via a menu function in the Intelligent Operator Panel (IOP) or via a direct parameter input.

Procedure for "Reset parameters":

p0010 = 30

p0970 = 1

P0970 = 0 is automatically set at the end of the calculations.

Through a factory setting via P0970, the original values of all the converter parameters can be restored. These values are designated with "Factory Setting" in the list manual.

The following parameters remain unchanged after a reset to factory settings:

- P0014 Storage mode
- Communication parameters (for example PROFIBUS and PROFINET settings)
- Power-Module-dependent data

#### 4.5.2 Basic commissioning

Basic commissioning should always be carried out by using the commissioning wizard via the SINAMICS Startdrive software or the Intelligent Operator Panel (IOP).

Alternatively, quick commissioning (P0010 = 1) can also be carried out by direct entry of the parameters. However, this procedure is not advisable.

#### Notes:

- Commissioning by using the commissioning wizard via the SINAMICS Startdrive software is described in Chapter 6 of this document.
- For information about carrying out commissioning by using the commissioning wizard via the Intelligent Operator Panel (IOP) please refer to the operating instructions of the IOP.

# 4.6 PROFINET interface of the SINAMICS G120, CU250S-2 PN Vector



The frequency converter can be integrated into an Ethernet network at the PROFINET interface X150 with the two ports P1 and P2. Now:

• The parameter assignment and diagnostics of the frequency converter via Ethernet can be carried out by using the SINAMICS Startdrive software in the TIA Portal.

• The converter can be integrated into a PROFINET network.

In PROFINET IO operation, the converter supports the following functions:

- IO-RT: Real-time communication (as used in this document.)
- IO-IRT: Isochronous real-time communication
- MRP: Media redundancy when used in a network with ring topology
- MRPD: Media redundancy requirement: IRT when used in a network with ring topology
- Diagnostic interrupts in accordance with the error classes specified in the PROFIdrive profile

#### 4.6.1 Telegrams

Various telegrams, whose process data lengths and contents differ, are available for selection for IO-RT communication with the frequency converter.

The simplest telegram, set as the standard, is the Standard Telegram 1.

# 4.6.2 Assignment of the process data (PZD) for the SINAMICS G120 with Standard Telegram 1

Control words and setpoints (PLC -> SINAMICS) and status words and actual values (SINAMICS -> PLC) can be transferred with the process data. The structure of the PZD area is as follows for Telegram 1, for a coupling via PROFINET:

	PZD1	PZD2
Request telegram	Control word	Main setpoint
(PLC -> SINAMICS)	(STW1)	(NSOLL_A)
Response telegram	Status word	Main actual value
(SINAMICS -> PLC)	(ZSW1)	(NIST_A)

# 4.6.3 Control word 1 (STW1)

STW HSW

#### Bit Nr. 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Bit	Significance		Comments	Signal inter						
	Telegram 20	All other telegrams		connection in the inverter						
0	0 = OFF1		The motor brakes with the ramp-down time p1121 of the ramp-function generator. The inverter switches off the motor at standstill.	P0840[0] = r2090.0						
	0 → 1 = ON		The inverter goes into the "ready" state. If, in addition bit $3 = 1$ , then the inverter switches on the motor.							
1	0 = OFF2		Switch off the motor immediately, the motor then coasts down to a standstill.	P0844[0] = r2090.1						
	1 = No OFF2		The motor can be switched od (ON command).							
2	0 = Quick stop	) (OFF3)	Quick Stopp: The motor brakes with the OFF3 rampdown time p1135 don to standstill.	P0848[0] = r2090.2						
	1 = No Quick S	Stopp (OFF3)	The motor can be switched on (ON command).							
3	0 = Inhibit ope		Immediately switch-off motor (cancel Pulses).	P0852[0] =r2090.3						
	1 = Enable op	eration	Switch-on motor (pulses can be enabled).	1						
4		Disable RFG sperren The inverter immediately sets ist ramp-function generator output to 0.								
	1 = Do not dis	able RFG	The ramp-function generator can be enabled.							
5	0 = Stop RFG		The output of the ramp-function generator Stopps at the actual value.	P1141[0]= r2090.5						
	1 = Enable RF	G	The output of the ramp-function generator follows the setpoint.							
6	0 = Inhibit setp	The inverter brakes the motor with the ramp- down time p1121 of the ramp-function generator.								
	1 = Enable set	tpoint	Motor accelerates with the ramp-up time p1120 to the setpoint.							
7	0 → 1 = Ackno	owledge faults	Acknowledge fault. If the ON command is still active, the inverter switches to "closing lockout" state.	p2103[0] = r2139.7						
8, 9	Reserved									
10	0 = No control	via PLC	Inverter ignores the process data from the fieldbus.	P0854[0]= r2090.10						
	1 = Control via	a PLC	Control via fieldbus, inverter accepts the process data from the fieldbus.							
11	1 = Direction r	eversal	Invert setpoint in the inverter.	p1113[0] = r2090.11						
12	Not used									
13	1)	1 = MOP up	Increase the setpoint saved in the motorized potentiometer.	P1035[0] = r2090.13						
14	1)	1 = MOP down	Reduce the setpoint saved in the motorized potentiometer.	P1036[0]= r2090.14						
15	CDS bit 0	Reserved	Changes over between settings for different operation interfaces (command data sets).	P0810 = r2090.15						

of the previous telegram is kept.

# 4.6.4 Status word 1 (ZSW1)

ZSW HIW

#### Bit Nr. 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Bit	Significance		Comments	Signal inter-
	Telegram 20	All other telegrams		connection in the inverter
0	1 = Ready to start		Power supply switched on; electronics initialized; pulses locked.	P2080[0] = r0899.0
1	1 = Ready		Motor is switched on (ON/OFF1 = 1), no fault is active. With the command "Enable operation" (STW1.3), the inverter switches on the motor	p2080[1] = r0899.1
2	1 = Operation ena	bled	Motor follows setpoint. See control word 1, bit 3	p2080[2] = r0899.2
3	1 = Fault active		The inverter has a fault. Acknowledge fault using STW1.7.	p2080[3] = r2139.3
4	1 = OFF2 inactive		Coast down to standstill is not active.	p2080[4] = r0899.4
5	1 = OFF3 inactive		Quick Stopp is not active	p2080[5] = r0899.5
6	1 = Closing lockou	it active	It is only possible to switch on the motor after an OFF1 followed by ON.	p2080[6] = r0899.6
7	1 = alarm active		Motor remains switched on; no acknowledgement is necessary.	p2080[7] = r2139.7
8	1 = Speed de tolerance range	eviation within the	Setpoint/actual value deviation within the tolerance range.	p2080[8] = r2197.7
9	1 = Master control	requested	The automation system is requested to accept the inverter control.	p2080[9] = r0899.9
10	1 = Comparison exceeded	speed reached or	Speed is greater than or equal to the corresponding maximum speed.	p2080[10] = r2199.1
11	1 = current or torque limit reached	1 = torque limit reached	Comparison value for current or torque has been reached or exceeded.	p2080[11] = r0056.13/ r1407.7
12	1)	1 = Holding brake open	Signal to open and close a motor holding brake.	p2080[12] = r0899.12
13	0 = Alarm, motor o	overtemperature	_	p2080[13] = r2135.14
14	1 = Motor rotates clockwise	0 = Motor rotates counterclockwise	Internal inverter actual value > 0 Internal inverter actual value < 0	p2080[14] = r2197.3
15	1 = CDS display	0 = Alarm, inverter thermal overload		p2080[15] = r0836.0/ r2135.15

2) If you change over from another telegram to telegram 20, then the assignment of the previous telegram is kept.

## 4.6.5 Main setpoint (HSW/NSOLL\_A; 16-bit)



The main setpoint is a 16-bit word in which the required speed is transferred to the converter.

The setpoint is transferred as an integer with preceding sign (-32768 to 32767). The value 16384 (4000 Hex) corresponds to +100%.

The value 100% is defined at a particular rotary speed by means of the parameter P2000 (reference speed). The speed that is to correspond to a setpoint of 100% via the interface is entered in this parameter.

The speed of the converter is calculated as follows:

n= (HSW x P2000)/16384

#### Note:

 The parameter P2000 (reference speed) is automatically calculated for Drive Data Set 0 during motor startup and set to the value of parameter P1082 (maximum speed).

#### 4.6.6 The main actual value (HIW/NIST\_A; 16-bit)



The main actual value is a 16-bit word through which the actual speed of the converter is transferred. The normalization of this value corresponds to that of the setpoint.

n= (HIW x P2000)/16384

#### Note:

 The parameter P2000 (reference speed) is automatically calculated for Drive Data Set 0 during motor startup and set to the value of parameter P1082 (maximum speed).

## 4.6.7 Layout of the request telegram in double-word format

The request telegram is sent to the SINAMICS G120 in double-word format.

The layout of the bits is shown in the table.

	Control word										Main setpoint																				
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	QB 256 QB 257									QB 258 QB 259																					
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

## 4.6.8 Layout of the response telegram in double-word format

The response telegram is returned by the SINAMICS G120 in double-word format.

The layout of the bits is shown in the table.

	Status word										Main actual value																				
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	IB 256 IB 257							IB 258 IB 259																							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

#### Note:

 A data block in which the data are stored temporarily is used for the request telegram and for the response telegram in the control program. The telegrams are mapped there respectively in a structure that is created by means of the PLC data types.

# 4.7 SINAMICS Startdrive commissioning tool for SINAMICS G120

The most recent version of the SINAMICS Startdrive commissioning software can be downloaded from the Website:

support.industry.siemens.com .

SINAMICS Startdrive is a tool integrated in TIA Portal and corresponds to the familiar TIA Portal in its structure and handling.

The SINAMICS Startdrive extension contains the data and views for the SINAMICS G120 frequency converters already supported there.

This enables easy parameter assignment and commissioning of the frequency converters. A wide range of functions and aids are available for diagnostics and troubleshooting.

#### 4.7.1 Resetting frequency converters and setting the IP address

A new IP address can be directly assigned to the Control Unit of the frequency converter with SINAMICS Startdrive in TIA Portal. The Control Unit can now be reset.

 $\rightarrow$  To do so select the Totally Integrated Automation Portal, which is opened with a double-click. ( $\rightarrow$  TIA Portal V13)



 $\rightarrow$  Then select the item  $\rightarrow$  "Online & Diagnostics" and open the  $\rightarrow$  "Project view".



→ In the project tree select the network card of your computer under → "Online access". When you click → "Update accessible devices", you see the IP address (if already set) or the MAC address (if the IP address has not yet been assigned) of the Control Unit of the connected SINAMICS G120 frequency converter→. Select → "Online & diagnostics".



→ Before you reassign the IP address, we recommend that you first reset the PROFINET interface parameters. To do so select the function → "Resetting the PROFINET interface parameters" and click → "Reset".

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 $\rightarrow$  Answer the prompt whether you really want to reset with  $\rightarrow$  "Yes".



 $\rightarrow$  Successful resetting can be checked in the messages in the  $\rightarrow$  "Info" window  $\rightarrow$  "General".

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	The device was reset.			8/31/2016	1:04:09 PM	
						*
< .	III.					>

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→ Then once again select → "Update accessible devices" and then → "Online & diagnostics" of your frequency converter. To assign the IP address, select the function → "Assign IP address". Enter the following IP address at this point: → IP address: 192.168.0.6 → Subnet mask: 255.255.255.0. Click → "Assign IP address" and this new address is assigned to the Control Unit of your frequency converter.

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Accessible device [00-1F-F8-E0-4E-5E]			Subnet mask: 255.255.255.0
Conline & diagnostics			Subret mask: 255.255.255.9
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PLCSIM [PN/IE]	-2		Assign IP address
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USB [S7USB]	1		
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→ The successful assignment of the IP address is shown again as a message in the window → "Info" → "General".

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→ Before you can now carry out resetting of the frequency converter to the factory setting you have to once again select → "Update accessible devices" and the → "Online & Diagnostics" of your frequency converter. In order to reset the frequency converter to factory settings, select → "Restore factory resetting" under → "Backing up/reset" and click → "Start".

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→ Select the option I "Save factory setting in EEPROM" so that the parameters of the factory setting are loaded from the EEPROM into the RAM of the device after switching off and on - and not the data of an old project. Confirm the prompt whether you really want to reset with → "OK".



#### Note:

 The communication settings such as the IP address and the subnet mask are retained when the frequency converter is set to the factory setting.

# 5 Task

In the following section the project from the chapter "SCE\_EN\_032-600\_Global\_Data\_Blocks" is to be supplemented by a frequency converter G120 with Control Unit CU250S-2 PN.

Controlling of the belt motor via analog values is now replaced by the controlling of the frequency converter via PROFINET. Monitoring of the actual speed value is also effected via PROFINET.

# 6 Planning

The conveyor belt driven by an induction motor will now be controlled via a frequency converter with a variable speed.

This frequency converter has to be created, configured and commissioned in the project.

The parameter assignment of the frequency converter is done offline with the SINAMICS Startdrive software, whereby the commissioning wizard is used.

Here the motor data of the induction motor are taken from the rating plate of the motor and entered manually.

In this project the following induction motor is wired in Delta mode and operated single-phase with 230V.



Figure 1: Rating plate of induction motor

A diagram of the two connection types can be found on the inside of the terminal box cover of most motors:

- Star connection (Y)
- Delta connection (Δ)



Figure 2: Star connection/delta connection

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The frequency converter SINAMICS G120 receives the start command and speed specification in the following via PROFINET from the SIMATIC S7-1500. The actual speed value is also read out of the SINAMICS G120 frequency converter via PROFINET and is monitored for the high and low limits in the SIMATIC S7-1500.

A "Frequency converter" data block [DB4] is created in the control program in which the data are stored temporarily for the request telegram and the response telegram. The telegrams are created there by means of the PLC data types and are mapped respectively in a structure.

In the "Main" organization block [OB1] you copy the actual values from the converter into the "Frequency converter" data block [DB4] and the setpoints from the data into the converter.

Finally, the data created in the "Frequency converter" data block [DB4] can be accessed when calling up the functions and function blocks.

# 6.1 Technology schematic diagram

At this point you see the technology schematic diagram for the task.



Figure 3: Technology schematic diagram

Schalter der Sortieranlage		Automatikbetrieb		Handbetrieb / Manual mode
Switches of sorting station		Automatic mode		-S3 Tippbetrieb -M1 vorwärts/
-P1 ein/on		-P5 gestartet/started		— Manual -M1 forwards
-Q0 Hauptschalter/Main switch		-S1 Start/start		-S4 Tippbetrieb -M1 rückwärts/
-P4 aktiviert/active				Manual -M1 backwards
-A1 NOTHALT/Emergency stop		-S2 Stopp/stop		-P7 ausgefahren/extended
-P2 Hand/manual -P3 Auto/auto				-S6 Zylinder -M4 ausfahren/
-S0 Betriebsart/operating mode				-P6 eingefahren/retracted
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Figure 4: Operator panel

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# 6.2 Reference table

DI	Туре	ID	Function	NC/NO
I 0.0	BOOL	-A1	Return signal emergency stop ok	NC
I 0.1	BOOL	-K0	Main switch "ON"	NO
I 0.2	BOOL	-S0	Mode selector manual (0)/automatic (1)	Manual = 0
I 0.3	BOOL	-S1	Pushbutton automatic start	NO
I 0.4	BOOL	-S2	Pushbutton automatic stop	NC
I 0.5	BOOL	-B1	Sensor cylinder -M4 retracted	NO
l 1.0	BOOL	-B4	Sensor part at slide	NO
l 1.3	BOOL	-B7	Sensor part at end of conveyor	NO
ID256	STRUCT	PZD_IN_G120_01	Telegram 1 receive process data from G120 conveyor1	

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

DO	Туре	ID	Function	
OD256	STRUCT	PZD_OUT_G120_01	Telegram 1 send process data to G120 conveyor1	

#### Legend for reference list

AI

- DI Digital input DO Digital output
  - Analog input AO Analog output
- I Input O Output
- NC Normally Closed
- NO Normally Open
# 7 Structured step-by-step instructions

You can find instructions on how to perform planning below. If you already have a good understanding of everything, it is sufficient to focus on the numbered steps. Otherwise, simply follow the steps of the instructions illustrated below.

## 7.1 Retrieving an existing project

→ Before we can extend the project "SCE\_EN\_032-600\_Global\_Data\_Blocks\_R1508.zap13" from the chapter "SCE\_EN\_032-600\_Global\_Data\_Blocks", we have to retrieve it. To retrieve an existing project, you have to select the respective archive in the project view under → Project → Retrieve. Confirm your selection with Open. ( → Project → Retrieve → Selection of a .zap archive → Open )

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→ Next, the target directory in which the retrieved project is to be stored can be selected. Confirm your selection with "OK". ( → Target directory → OK ) → Save the opened project under the name 062-101 Frequency converter G120 and S7-1500. ( → Project → Save as ... → 062-101 Frequency converter G120 and S7-1500 → Save )

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#### Creating a frequency converter in the TIA Portal 7.2

→ In order to network the Control Unit of the SINAMICS G120 with the CPU1516F-3 PN/DP you have to change to the 'Network view'. At this point the desired 'CU250S-2 PN Vector' dragged-and-dropped into can be the network view. (  $\rightarrow$  Devices & networks  $\rightarrow$  Network view  $\rightarrow$  Drives & starters  $\rightarrow$  SINAMICS drives  $\rightarrow$ SINAMICS G120  $\rightarrow$  Control units $\rightarrow$  CU250S-2 PN Vector  $\rightarrow$  Article No.:  $6SL3246-0BA22-1FA0 \rightarrow Version 4.7$ ).

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→ Connect the Ethernet interfaces of the Control Unit of the G120 and the CPU1516F-3 PN

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*				✓ Catalog	
062-101FrequencyConverter G120 F					
Add new device					
Devices & networks	CPU1516F	Drive 1	=	🗹 Filter	<u>a</u>
CPU1516F [CPU 1516F-3 PN/DP]	CPU 1516F	G120 CU25		PC systems	~ <mark>6</mark>
Device configuration				🕶 🚂 Drives & starters	
Online & diagnostics		Not assigned		<ul> <li>Image: Similar Si</li></ul>	- 🛛
Program blocks				<ul> <li>SINAMICS drives</li> </ul>	Online tools
Technology objects	PN/IE 1			SINAMICS G110M	
External source files				<ul> <li>SINAMICS G120</li> </ul>	let
PLC tags				🗕 🕁 Control units	= 0
PLC data types				a CU240B-2	~ ~
Watch and force tables			- 2	CU240B-2 DP	
Online backups			<ul> <li>Image: A second s</li></ul>	a CU240E-2	Tasks
Traces			- 2	a CU240E-2 PN	Tas
Program info			- 6	a CU240E-2 DP	S
Device proxy data				a CU240E-2 F	
PLC alarms				CU240E-2 PN-F	
Text lists				CU240E-2 DP-F	- E
Local modules				CU250S-2 Vector	Libraries
Drive_1 [G120 CU250S-2 PN Ve				E CU2505-2 CAN Vector	r les
Unassigned devices				E CU250S-2 PN Vector	~
Common data				<	>
Documentation settings				✓ Information	
Languages & resources				Device:	~
Online access				Device:	-
Card Reader/USB memory				- <u>-</u> 2	
			~		
<	< III	> 100%			
> Details view		🔍 Properties 🚺 Info 😩 🗓 Diag			~
Portal view     Overview	Devices & ne			CU250S-2 PN Vector  Project D:00 TIA Portal\032-600 Glob	

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→ an IP address suitable for the CPU in the properties of the 'PROFINET interface [X1]' of the 'G120'. ( → G120 CU250S-2 PN Vector → PROFINET interface [X1] → Properties → Ethernet addresses → IP protocol → IP address: 192.168.0.6 )



 $\rightarrow$  The device name is entered under 'General'. ( $\rightarrow$  General  $\rightarrow$  Name: Drive\_G120\_conveyor)

Ma Siemens - D:\00_TIA_Portal\062-101 Frequ	encyConverter G120 PN S7-1500\062-10	1 Frequeny Converter G120 PN S7-15	00			_ 🗆 >
Project Edit View Insert Online Option	ns Tools Window Help				Totally Integrated Automat	lion
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B O O E E E E E E E E E E E E E E E E E	Network	ection 🔻 🔃 📆 🗄 🔍 ±				Hardware catalog
*			1: CPU1516F.PROFINET IO-System (100)	_	✓ Catalog	
• 1 062-101FrequencyConverter G120 F		+ 10 system	1. CPUTSTOP.PROFINET IO-System (100)			
Add new device					<search></search>	
Devices & networks	CPU1516F	Drive		Z	🗹 Filter	1
CPU1516F [CPU 1516F-3 PN/DP]	CPU 1516F	G120 (	CU25	1 8	PC systems	~ G
Device configuration				Ξ¥		
Online & diagnostics		CPU15	165		SIRIUS motor starters	s 🛛 😺
Program blocks		CFUIS			- 🔜 SINAMICS drives	ő
Technology objects		CPU1516F.PROFINE		- 11	SINAMICS G110M	A 📑
External source files		er er brief internite		1.0	<ul> <li>SINAMICS G120</li> </ul>	ne
PLC tags	<		> 100%	Ť	👻 🌄 Control units	S Online tools
PLC data types				-	CU240B-2	
Watch and force tables	Drive_1 [G120 CU250S-2 PN Vector]	🖳 Proj	perties 🗓 Info 📱 Diagnostics		4 CU240B-2 C	DP
Online backups	General				CU240E-2	
Traces	▼ General	Π		•	CU240E-2 F	PN asks
Program info	Catalog information	General			- CU240E-2 D	
Device proxy data	<ul> <li>PROFINET interface [X1]</li> </ul>				CU240E-2 F	
PLC alarms	General	Name:	Drive_G120_conveyor		■ CU240E-2	
Text lists	Ethernet addresses			_	₩ CU240E-2	
Local modules	Cyclic data exchange	Author:	Michael Dziallas	_	40 CU250S-2 \	V   Tar
Distributed I/O	Actual value	Comment:		^	a CU2505-2 CU250-2 CU250-2 CU2505-2 CU250-2 CU250-2 CU2505-2 CU250-2 CU2505-2 CU2505-2 CU2505-2 CU2505-2 CU2505-2 CU2505-2 CU250-2 CU2505-2 CU2505-2 CU250-2 CU250-	C 0
Drive_1 [G120 CU250S-2 PN Ve	Setpoint				40 CU250S-2 F	P 🗸
Common data	<ul> <li>Advanced options</li> </ul>				<	>
Documentation settings	Media redundancy	•			✓ Information	
Languages & resources	<ul> <li>Real time settings</li> </ul>				Device:	~
Online access	IO cycle	•		$\sim$	Device:	
Card Reader/USB memory	Synchronization				-9-	=
	Port [X1 P1]	Catalog information		_		
	Port [X1 P2]					
	Diagnostics addresses					
	Module parameter		CU250S-2 PN Vector		CU2505-2 PN	Vec
	HW identifier	Description:	Control Unit type: CU250S-2 PN Vector Bus systems: PROFINET	^		
< III >			Analog inputs: 2		Article no.: 6SL3246-0BA2	22-1F
> Details view	1	<		>	<	>
Portal view     Overview	Bevices & ne			Project D	):\00_TIA_Portal\032-600_Glob	
				a sequence		

#### Note:

 This name is applied automatically as the PROFINET device name under the 'PROFINET' point for the 'PROFINET interface' of the 'G120 CU250S-2 PN-Vector'. → Settings for the 'IO cycle' such as the 'Update time' and 'Watchdog time' can also be set for this device. (→ Advanced options → Real time settings → IO cycle → Update time → Watchdog time)



→ The 'Standard Telegram 1' is specified for the 'Cyclic data exchange' between the PLC and the frequency converter. ( → PROFINET interface [X1] → Cyclic data exchange → Actual value: Standard Telegram 1→ Setpoint: Standard Telegram 1 )

M Siemens - D:\00_TIA_Portal\062-101 Freque	encyConverter G120 PN S7-1500\062	-101 Frequeny Converter G120 PN S7-1500		_ 6	⊐×
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Project tree 🔲 🖣	062-101 FrequencyConverter G	120 PN S7-1500 Devices & networks		_ <b>- - - - - - - -</b>	
Devices			🚽 Topology view	h Network view	
	Network Connections	connection 🔻 🕎 👯 🛄 🔍 ±			Hardware catalog
ž	,		# IO system: CPU15	16F.PROFINET IO-System (100)	R.
💈 💌 🗋 062-101FrequencyConverter G120 F					a l
🚔 Add new device	CPU1516F	Drive G120		2	
Devices & networks	CPU 1516F	G120 CU25		letw	log
Device configuration				- Creation - Creatio - Creation - Creation - Creation - Creation - Creation -	
Online & diagnostics		CPU1516F		iata -	2
Program blocks					online tools
Technology objects		CPU1516F.PROFINE			line
External source files     A PLC tags				✓	to
PLC tags      Dra PLC data types	<		> 1009	6 🔹 —	s
Watch and force tables	Drive_G120_conveyor [G120 CU	250S-2 PN Vector]	Sector Properties	🗓 Info 📱 Diagnostics 💿 🖃 🥆	
Online backups	General				
Traces	▼ General			^	Tasks
Program info	Catalog information	Cyclic data exchange			ŝ
Device proxy data	▼ PROFINET interface [X1]				
PLC alarms     Text lists	General	Drive object Link Telegram	Length Extension	Partner Partner data	🗎 Libraries
Local modules	Ethernet addresses	🗌 Actual value 🧪 Standard Teleg		→ CD CPU1516F 147	bra
Distributed I/O	Cyclic data exchange     Actual value	Setpoint 🎽 Standard Teleg	ramm 1 2 words 0 words	← CD CPU1516F Q 47	ries
Drive_G120_conveyor [G120 C.	Setpoint	<add td="" telegra<=""><td></td><td></td><td></td></add>			
Common data	Advanced options				
<ul> <li>Documentation settings</li> </ul>	Media redundancy				
Languages & resources	<ul> <li>Real time settings</li> </ul>				
Gard Reader/USB memory	IO cycle				
Card Reader/USB memory	Synchronization				
	Port [X1 P1]     Port [X1 P2]	*	III	>	
	Diagnostics addresses				
< III >	Module parameter	Actual value			
> Details view	HW identifier				
Portal view     Overview	h Devices & ne			Project D:\00 TIA Portal\032-600 Glob	

→ For the address ranges, select 'I 256...259' and 'O 256 ... 259'. (  $\rightarrow$  PROFINET interface [X1]  $\rightarrow$  Cyclic data exchange  $\rightarrow$  Actual value  $\rightarrow$  Start address I 256  $\rightarrow$  Setpoint  $\rightarrow$  Start address O 256 )



→ Change to the 'Device view' from 'Drive\_G120\_conveyor'. There the used Power Module, for example 'PM240-2 IP20 FSA U 1/3 AC200 0.75kW', is selected and assigned to the 'Drive\_G120\_conveyor'.



(  $\rightarrow$  Device view  $\rightarrow$  Drive\_G120\_conveyor  $\rightarrow$  PM 240-2 IP20 FSA U 1/3 AC200 0.75kW )

 $\rightarrow$  Save the project with the existing settings. (  $\rightarrow$ 



→ Download the device configuration with the frequency converter G120 as the device to the 'CPU\_1516F [CPU1516F-3 PN/DP]' by clicking the Download to device' icon.  $(\rightarrow$ CPU\_1516F [CPU1516F-3 PN/DP]  $\rightarrow$  III )



→ The device name still has to be assigned to the frequency converter G120 as an IO device of the CPU\_1516F. To do so, select the 'PN/IE\_1' network and select 'Assign device name'.
 ( → PN/IE\_1 → Assign device name )

M Siemens - D:\00_TIA_Portal\062-101Frequ	ency Converter G120 PN S7-1500\062-101 Frequer	ny Converter G120 PN S7-1500		_ 🗆 ×
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1 to 1		# IO system: CPU1516F.PROFINET IO-Sy	ystem (100) \land	✓ Catalog
💈 🔻 🗋 062-101FrequencyConverter G12 🛛 🔺			=	6SL3210-1PB13-8UL
Add new device		Delve of an		Filter
🖹 📩 Devices & networks	CPU1516F CPU1516F	Drive_G120 G120 CU25		Priver     PC systems
CPU1516F [CPU 1516F-3 PN/		0120 0025		PC systems     PC systems     Drives & starters
Device configuration				
Online & diagnostics		CPU1516F		
<ul> <li>Program blocks</li> </ul>			Z	
Technology objects	CPU1	516F.PROFINE	1 × 0	▼ SINAMICS G120
External source files		iii Copy Ctrl+C		Control units
PLC tags		Paste Ctrl+V		a≣ CU2408-2
PLC data types				€ CU2408-2 DP
Watch and force tables		X Delete Del		CU2405-2 DF
Online backups		Rename F2		€ CU240E-2 PN
Traces		Cross-reference information Shift+F11		€ CU240E-2 € CU240E-2 PN € CU240E-2 PN € CU240E-2 DP
Program info		Properties     Alt+Enter		45 CU240E-2 F
Device proxy data				CU240E-2 PN-F
PLC alarms		Assign device name  Assign F-destination address		
Text lists				
Local modules     Distributed I/O	< III	> 100%		CU240E-2 DP-F V CU240E-2 DP-F V Information
<ul> <li>Distributed I/O</li> <li>Drive_G120_conveyor [G12.</li> </ul>		🖳 Properties 🚺 Info 🖳 Diag	nostics 🔰 🗖 🗖 🥆	Device:
Common data	General Cross-references Compi	le		Device:
Documentation settings	Show all messages			1 🔛 🗒
Languages & resources	Show all messages			
Online access				
Card Reader/USB memory	! Message	Go to ?	Date Time	
< III >	Project D:\00_TIA_Portal\032-600_Global_I	Data_Blocks\032-600_Global_Dat	8/31/2016 1:28: ^	CU250S-2 PN Vector
> Details view	<	m	>	< III >
Portal view     Overview	Devices & ne		😪 Projec	ct D:\00_TIA_Portal\032-600_Glob

→ In the subsequent dialog, the "PG/PC interface' can be selected, before we select the 'Drive\_G120\_conveyor' and 'Assign name'. ( → PROFINET device name: Drive\_G120\_conveyor → SINAMICS G120 CU250S → Assign device name )

Assign PROFINET device	e name.						×
		Configured	PROFIN	IET dev			
		PROFINET devic		drive_g120_c	convevor		-
			ice type:	CU250S-2 PN \			
		Online acce					
		Type of the PG/PC i		PN/IE			
		PG/PC i	nterface:	Intel(R) Ethe	ernet Connec	tion I217-LM	• •
		Device filter					
		🛃 Only show	devices of	the same type			
		Only show	devices wi	th bad paramete	er settings		
		Only show	devices wi	thout names			
	Accessible devi	ces in the network:					
	IP address	MAC address	Device	PROFINET dev	vice name	Status	
	192.168.0.6	00-1F-F8-E0-4E-5	SINAMICS	5	4	No device r	name assigned
L 🗆							
Flash LED							
	<						>
					Upc	late list	Assign name
Online status information	:						
<ol> <li>Search completed.</li> </ol>							
<ol> <li>Search completed.</li> </ol>	. 1 of 2 devices we	ere tound.					
<							>
							Class
							Close
							Close
Assign PROFINET device	e name.						Close
Assign PROFINET device	e name.	Configured	PROFIN	ET dev			
Assign PROFINET device	e name.	Configured			CODVEVOr		×
Assign PROFINET device	e name.	PROFINET devic		ET dev drive_g120_c (202505-2 PN V		_	
Assign PROFINET device	e name.	PROFINET devic Dev	e name: ice type:	drive_g120_c		_	×
Assign PROFINET device	e name.	PROFINET devic	e name: ice type: <b>SS</b>	drive_g120_c			×
Assign PROFINET device	e name.	PROFINET device Dev Online access Type of the PG/PC in	e name: ice type: <b>SS</b>	drive_g120_c	Vector	tion I217-LM	×
Assign PROFINET device	e name.	PROFINET devic Dev Online acces Type of the PG/PC in PG/PC in	e name: ice type: SS nterface: nterface:	drive_g120_c	Vector	ion I217-LM	×
Assign PROFINET device	e name.	PROFINET device Dev Online access Type of the PG/PC in	e name: ice type: SS nterface: nterface:	drive_g120_c	Vector	tion 1217-LM	×
Assign PROFINET device	e name.	PROFINET devic Dev Online acces Type of the PG/PC in PG/PC in	e name: ice type: SS nterface: nterface:	drive_g120_c CU250S-2 PN V	Vector	iion I217-LM	×
Assign PROFINET device	e name.	PROFINET device Dev Online accee Type of the PG/PC in PG/PC in Device filter I Only show	e name: ice type: <b>SS</b> nterface: nterface: devices of	drive_g120_c CU250S-2 PN V	Vector	tion I217-LM	×
Assign PROFINET device	e name.	PROFINET device Dev Online accee Type of the PG/PC in PG/PC in Device filter I Only show	te name: ice type: SS nterface: nterface: devices of devices wi	drive_g120_c CU250S-2 PN V PN/IE Intel(R) Ethe the same type th bad parameter	Vector	iion I217-LM	×
Assign PROFINET device		PROFINET devic Dev Online acce Type of the PG/PC in PG/PC in Only show Only show Only show	te name: ice type: SS nterface: nterface: devices of devices wi	drive_g120_c CU250S-2 PN V PN/IE Intel(R) Ethe the same type th bad parameter	Vector	tion I217-LM	×
Assign PROFINET device		PROFINET devic Dev Online acce Type of the PG/PC in PG/PC in Device filter I only show	te name: ice type: SS nterface: nterface: devices of devices wi	drive_g120_c CU250S-2 PN V PN/IE Intel(R) Ethe the same type th bad parameter	Vector		×
Assign PROFINET device	Accessible devia	PROFINET devic Dev Online acce: Type of the PG/PC in PG/PC in Device filter @ Only show @ Only show @ Only show ces in the network:	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/IE intel(R) Ethe the same type th bad paramete thout names	ernet Connect er settings PROFINET de	evice name	
Assign PROFINET device	Accessible devid IP address	PROFINET devic Dev Online acce: Type of the PG/PC i PG/PC i Device filter Only show Only show Only show Conly show Conly show Conly show	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/IE intel(R) Ethe the same type th bad paramete thout names	ernet Connect er settings PROFINET de	evice name	V V V V V V V V V V V V V V V V V V V
Assign PROFINET device	Accessible devid IP address	PROFINET devic Dev Online acce: Type of the PG/PC i PG/PC i Device filter Only show Only show Only show Conly show Conly show Conly show	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/IE intel(R) Ethe the same type th bad paramete thout names	ernet Connect er settings PROFINET de	evice name	V V V V V V V V V V V V V V V V V V V
	Accessible devid IP address	PROFINET devic Dev Online acce: Type of the PG/PC i PG/PC i Device filter Only show Only show Only show Conly show Conly show Conly show	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/IE intel(R) Ethe the same type th bad paramete thout names	ernet Connect er settings PROFINET de	evice name	V V V V V V V V V V V V V V V V V V V
Assign PROFINET device	Accessible devic IP address 192.168.0.6	PROFINET devic Dev Online acce: Type of the PG/PC i PG/PC i Device filter Only show Only show Only show Conly show Conly show Conly show	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	ernet Connect er settings PROFINET de	evice name	Status No device name assi
	Accessible devid IP address	PROFINET devic Dev Online acce: Type of the PG/PC i PG/PC i Device filter Only show Only show Only show Conly show Conly show Conly show	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/IE intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi
	Accessible devic IP address 192.168.0.6	PROFINET devic Dev Online acce: Type of the PG/PC i PG/PC i Device filter Only show Only show Only show Conly show Conly show Conly show	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi
	Accessible devic IP address 192.168.0.6	PROFINET devic Dev Online acce: Type of the PG/PC i PG/PC i Device filter Only show Only show Only show Conly show Conly show Conly show	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi
Fish LED	Accessible devia IP address 192.168.0.6	PROFINET devic Dev Online acce: Type of the PG/PC i PG/PC i Device filter Only show Only show Only show Conly show Conly show Conly show	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi
	Accessible devia	PROFINET devic Dev Online acce Type of the PG/PC i PG/PC i Only show Only show Only show Only show Only show Only show Only show Only show	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi
Flash LED	Accessible devic IP address 192.168.0.6 <	PROFINET devic Dev Online acce: Type of the PG/PC ii PG/PC ii Device filter Only show Only show Only show Only show Ces in the network: MAC address 00-1F-F8-E0-4E-5	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi
Plash LED Online status information:  Search completed. Search completed. Search completed.	Accessible devic IP address 192.168.0.6 <	PROFINET devic Dev Online acce: Type of the PG/PC ii PG/PC ii Device filter Only show Only show Only show Only show Ces in the network: MAC address 00-1F-F8-E0-4E-5	e name: ice type: SS nterface: nterface: devices of devices wi devices wi Device SINAMICS	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi
Flash LED	Accessible devic IP address 192.168.0.6 <	PROFINET devic Dev Online acce: Type of the PG/PC ii PG/PC ii Device filter Only show Only show Only show Only show Ces in the network: MAC address 00-1F-F8-E0-4E-5	ie name: ice type: SS nterface: nterface: devices of devices wi devices wi Device	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi
Plash LED Online status information:  Search completed. Search completed. Search completed.	Accessible devic IP address 192.168.0.6 <	PROFINET devic Dev Online acce: Type of the PG/PC ii PG/PC ii Device filter Only show Only show Only show Only show Ces in the network: MAC address 00-1F-F8-E0-4E-5	e name: ice type: SS nterface: nterface: devices of devices wi devices wi Device SINAMICS	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi
Plash LED Online status information:  Search completed. Search completed. Search completed.	Accessible devic IP address 192.168.0.6 <	PROFINET devic Dev Online acce: Type of the PG/PC ii PG/PC ii Device filter Only show Only show Only show Only show Ces in the network: MAC address 00-1F-F8-E0-4E-5	e name: ice type: SS nterface: nterface: devices of devices wi devices wi Device SINAMICS	drive_g120_c CU2505-2 PN V PN/E Intel(R) Ethe the same type th bad paramete thout names	PROFINET de	evice name	Status No device name assi

Note:

 If several IO devices exist in the network, the device can be identified on the basis of the imprinted MAC address. → If too many components are displayed, the view can be filtered by clicking on 'Only show devices of the same type'. If the device name was assigned successfully, this is indicated by 'OK' in the status. ( → Close )

Assign PROFINET device name.				×
-	Configured Pl	ROFINET dev		
	PROFINET device	name: drive_g120_c	onvevor	•
		e type: CU250S-2 PN V		
	Online access Type of the PG/PC inte	· · · · · · · · · · · · · · · · · · ·		
	PG/PC inte	erface: 🚺 Intel(R) Ethe	ernet Connection I217-LM	- 💿 💽
	Device filter			
	🗹 Only show de	evices of the same type		
	Only show de	evices with bad paramete	er settings	
	Only show de	evices without names		
ACCESSIBLE IP address	devices in the network: MAC address D	Device	PROFINET device name	Chattan
192.168.		SINAMICS G120 CU250	drive_g120_conveyor	Status
152.100.		114/10/10/120 C0250	unve_grzo_conveyor	
Flash LED				
				>
			Update list	
			Opdate list	Assign name
Online status information:				
Search completed. 1 of 2 device				
<ol> <li>Search completed. 1 of 2 device</li> </ol>				
The PROFINET device name "d	rive_g120_conveyor" was su	ccessfully assigned to M	AC address "00-1F-F8-E0	
<				>
				Close
				Close

- 7.3 Assigning parameters of the frequency converter with the commissioning wizard
  - → To assign the parameters of the frequency converter, double-click 'Parameter' of 'Drive\_G120\_conveyor' to open the parameters and start the 'Commissioning Wizard'.
     ( → Drive\_G120\_conveyor → Parameter → Commissioning Wizard )

Project Edit View Insert Online Options Tools	rter G120 PN \$7-1500/062-101 Frequeny Converter G120 PN \$7-1500 Window Help Totally Integr	ated Automation PORTAL
Project tree 🔲 🖣	/ Converter G120 PN \$7-1500 🔸 Drive_G120_conveyor [G120 CU250S-2 PN Vector] 🔸 Parameter 💦 🗖 🖬 🗙	Tasks 🔳 🗈 🕨
Devices	Wizards Functional View Parameter View	Options 📑
B 0 0 B B B B B B B B B B B B B B B B B		Tas Tas
	✓ Commissioning	✓ Find and re <sup>6</sup>
	Drive connected to a SIMATIC motion control Commussioning Witard	Find: Whole words Match case Find in substr Find in hidder Use regular e Whole docum
Canguages & resources		From current
Card Reader/USB memory	Drive_G120_conveyor [G120 CU250S-2 PN Vector]  General General	Selection Down
<      m     Details view     Portal view     Portal view	Advanced options     Advanced options     Advanced options     Advanced options     Advanced options     Advanced options     Pretailine settings     Io Cycle     Drive     Partner     Drive     Partner     Port [X1 P1]     V     Drive     CPU1516F     V	Up       Fir       Replace with:       ✓       Im       > Languages

→ In the subsequent dialog, select 'U/f control with linear characteristic' as the control type.
 Keep the default selection for the function modules. ( → U/f control with linear characteristic
 → Next )

Commissioning Wizard	? ×
	Open-loop/closed-loop control type Specification of the open-loop/closed-loop control type according to the load characteristic and open-loop/closed-loop control task
<ul> <li>Open-loop/closed-lo</li> <li>Defaults of the setpo</li> <li>Drive setting</li> <li>Motor</li> <li>Important parameters</li> <li>Drive functions</li> <li>Encoders</li> <li>Summary</li> </ul>	Function modules:         Techn controller         Basic positioner         Extended messages/monitoring         Free function blocks         Setpoint       Control type:         [0] Ulf control with linear characteristic         Image: Control with linear characteristic         Image: Control with linear characteristic         Image: Control with linear characteristic
	<< Back Next >> Finish Cancel

→ For selection of the setpoint and command source, select the macro 7 'Fieldbus with data set changeover'. ( $\rightarrow$ [7] Fieldbus with data set changeover)

Commissioning Wizard		? ×
	<b>Defaults of the setpoints/command sources</b> Selection of a predefined interconnection of the inputs/outputs and, if required, the field telegram. Can be changed later user-specifically.	bus
𝕺 Open-loop/closed-lo	Current I/O configuration:	
Defaults of the setpo	[7] Fieldbus with data set changeover Select the default of the I/O configuration:	
Drive setting	[7] Fieldbus with data set changeover [1] Convevor technology with 2 fixed frequencies	-
Motor	22 Conveyer technology with Basic Safety 33 Conveyor technology with 4 fixed frequencies 44 Conveyor technology with fieldbus	
<ul> <li>Important parameters</li> <li>Drive functions</li> </ul>	[5] Conveyor technology with fieldbus and Basic Safety [7] Fieldbus with data set changeover [8] MOP with Basic Safety [9] Standard I/O with MOP	
Encoders	[12] Standard I/O with analog setpoint [13] Standard I/O with analog setpoint and safety [14] Process industry with fieldbus	
Summary	[15] Process industry         DO 0:       r52.3 CO/BO: Status word 1::Fault present         D0 1:       r52.7 CO/BO: Status word 1::Alarm present         AO 0:       r21 CO: Actual speed smoothed         AO 1:       r27 CO: Absolute actual current smoothed	~
	Selected telegram configuration: [1] Standard telegram 1, PZD-2/2	~
	<< Back Next>> Finish Canc	el

→ The selection of the macro '[7] Fieldbus with data set changeover' still has to be confirmed with 'Accept'. ( → Accept )



 $\rightarrow$  The current interconnections of the IO terminals for the Macro 7 are now displayed. ( $\rightarrow$  Next)

Commissioning Wizard	? X
	<b>Defaults of the setpoints/command sources</b> Selection of a predefined interconnection of the inputs/outputs and, if required, the fieldbus telegram. Can be changed later user-specifically.
Open-loop/closed-lo Defaults of the setpo	Current I/O configuration: [7] Fieldbus with data set changeover Select the default of the I/O configuration:
Drive setting	No change
Motor	Note: If changed, all the existing drive-internal interconnections to the I/O terminals are deleted and reconnected in accordance with the selected I/O configuration.
Important parameters	Accept
	Current interconnections of the I/O terminals:
<ul> <li>Drive functions</li> <li>Encoders</li> <li>Summary</li> </ul>	D10: p1055[1] B1:Jog bit 0 D11: p1056[1] B1:Jog bit 1 D12: p2103[1] B1: 1. Acknowledge faults p2104[0] B1: 2. Acknowledge faults D13: p810 B1: Command data set selection CDS bit 0 D14: - D15: - D16: - D111: - D112: - D116: - D117: -
	DO 0: r52.3 CO/BO: Status word 1::Fault present DO 1: r52.7 CO/BO: Status word 1::Alarm present
	DO 2: r52.2 CO/BO: Status word 1::Operation enabled
	Current telegram configuration:       [1] Standard telegram 1, PZD-2/2       << Back     Next >>       Finish     Cancel

→ For the drive settings, select the 'IEC-Motor (50 Hz, SI units)' and 'Load duty cycle with high overload for vector drives'. ( → IEC-Motor (50 Hz, SI units) → Load duty cycle with high overload for vector drives → Next )

Commissioning Wizard	?	×
	Drive setting Selection of motor standard and load cycle	
<ul> <li>Open-loop/closed-lo</li> <li>Defaults of the setpo</li> <li>Drive setting</li> </ul>	Standard: [0] IEC-Motor (50 Hz, SI units) Drive unit line supply voltage: 230 V	
Motor	Power unit application:	
Important parameters	[0] Load duty cycle with high overload for vector drives ▼ p205: Power unit application	
<ul> <li>Drive functions</li> <li>Encoders</li> <li>Summary</li> </ul>	The duty cycles can be overloaded provided that the drive converter is operated with its base load current before and after the overload. This is % J based on a load duty cycle of 300 s. 200- Default value: [0] Load duty cycle with 150- high overload for vector drives 100- Options:	
	50-       • [0] Load duty cycle with high overload for vector drives         • [1] Load duty cycle with low overload for vector drives       0         • Help for the parameter       0	
	<< Back Next >> Finish Cancel	

Note:

 Further information about the settings is available in the tool tip text, the online help or in the list manual.  → In the subsequent dialog, select 'Induction motor' as the motor type and enter the motor data in accordance with the specifications of the rating plate of the motor ( → Enter motor data → Induction motor → Connection type: Delta → ... → Next )

Commissioning Wizard				? X		
	<b>Motor</b> Specification of motor type and motor data					
<ul> <li>Open-loop/closed-lo</li> <li>Defaults of the setpo</li> <li>Drive setting</li> </ul>	Motor configuration Enter motor data Select motor type [1] Induction motor					
Motor	Select the conn Delta	ection type for your motor and 87 Hz oper	ation:	z operation		
Important parameters	Motor data					
<ul> <li>Drive functions</li> <li>Encoders</li> <li>Summary</li> </ul>	Parameter p304[0] p305[0] p307[0] p308[0] p310[0] p311[0] p335[0]	Parameter text Rated motor voltage Rated motor current Rated motor power Rated motor power factor Rated motor frequency Rated motor speed Motor cooling type		Hz		
	Parallel moto	or connection	N Finish	umber: 1		

Note:

- Alternatively, SIEMENS motors can also be selected directly via the order numbers.
- $\rightarrow$  The following screenshot shows an example for the parameters for the current/speed limiting and for the ramp-function generator.( $\rightarrow$  Next)

Commissioning Wizard		? >				
	Important parameters Specification of the most important dynamic response data					
𝞯 Open-loop/closed-lo	Set the values for the most important parame	eters:				
Defaults of the setpo	Current limit:	1.10 Arms				
	Minimum speed:	0.000 rpm				
🥯 Motor	Maximum speed: Ramp-function generator	500.000 rpm				
Important parameters	ramp-up time: Ramp-function generator	3.000 s				
Orive functions	ramp-down time:	3.000 s				
Encoders	OFF3 ramp-down time:	1  s				
Summary						
	<< Back Next >>	Finish Cancel				

→ Select 'Standard drive' for the Technology application. Set the motor identification to 'Inhibited', and select 'Complete calculation' for calculating the motor parameters based on parameter values from before. ( → Standard drive → Motor identification: Inhibited → Complete calculation → Next )

Commissioning Wizard		? X
	<b>Drive functions</b> Specification of the method to measure the motor data	
<ul> <li>Open-loop/closed-lo</li> <li>Defaults of the setpo</li> <li>Drive setting</li> <li>Motor</li> <li>Important parameters</li> <li>Drive functions</li> <li>Encoders</li> <li>Summary</li> </ul>	Technology application         [0] Standard drive         A motor identification is recommended for the first commissioning, Stationary measurement is recommended for V/f and vector control. Stationary measurement and rotating measurement are recommended for vector control (only rotating measurement is not sufficient).         Motor identification:         [0] Inhibited         Calculation of the motor parameters         No calculation         Image: Complete calculation         Image: Complete calculation         Image: Complete calculation of the motor, open-loop control and closed-loop control parameters depending on the entered motor data.	Tancel
		uncer

 $\rightarrow~$  Do not select an encoder at this point. (  $\rightarrow$  Next )

Commissioning Wizard		? X
	Encoders	
	Encoder selection	
	Encoder 1 Encoder 2	
🮯 Motor		
Important parameters		
Orive functions		
Encoders		
Summary		
	<< Back Next>> Finish Cancel	

 $\rightarrow$  In the subsequent summary, all the settings are shown once more for checking. These are applied by using the 'Finish' button. ( $\rightarrow$  Finish)



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sce-062-101-frequency-converter-g120-pn-s7-1500-r0909-en.docx

→ In the subsequent dialog, select 'PN/IE' as the PG/PC interface type, select the previously set network adapters as the PG/PC interface and select 'PN/IE\_1' as the connection of the CPU to the subnet. Click 'Start search'. ( → Type of the PG/PC interface: PN/IE → PG/PC interface: ...... → Connection to interface/subnet: PN/IE\_1 → Start search )

	Configured access nod		-			
	Device	Device type	Slot	Туре	Address	Subnet
	Drive_G120_conveyo			S7USB		
		CU250S-2 PN Vec.	0 X1	PN/IE	192.168.0.6	PN/IE_1
		pe of the PG/PC inte	da sa .	PN/IE		
	ı y					
		PG/PC inte			hernet Connection I217-	
	Conne	ection to interface/su	ibnet:	PN/IE_1		• 💎
		1st gate	eway:			- 💎 💎
	Compatible devices in Device	Device type	Туре		Address	Target device
		Device type	PN/IE		Access address	
100						
Flash LED						
Flash LED						
Flash LED						<u>S</u> tart search
Flash LED	ation:					<u>Start search</u>
	ation:					<u>S</u> tart search
	ation:					<u>S</u> tart search
Online status informa						<u>S</u> tart search
						<u>S</u> tart search

→ You should now see your 'SINAMICS drive' and be able to select it as the target device. Click 'Load''. (  $\rightarrow$  SINAMICS drive  $\rightarrow$  Load )

	Device		Device type	Slot	Туре	Address	Subnet
	Drive_G120_		bence type	Jiot	S7USB		Subrice
	51110_0120_	conrego	CU250S-2 PN Vec	0 X1	PN/IE	192.168.0.6	PN/IE_1
		Ту	pe of the PG/PC inte	rface:	PN/IE		•
			PG/PC inte	rface:	💹 Intel(R) Eth	ernet Connection I217-LN	1 💌 🤅
		Conne	ction to interface/su	ubnet:	PN/IE_1		- (
			1st gat	eway:			-
	Compatible de	evices in Device ty	-		Туре 🔺	Show all compatible	e devices Target dev
	-		-				
	Device	Device ty	-		Type 🔺		
	Device	Device ty	pe			Address	Target dev
	Device Antrieb_G1	Device ty G120 C	pe		PN/IE	Address 192.168.0.6	Target dev
	Device Antrieb_G1	Device ty G120 C	pe		PN/IE	Address 192.168.0.6	Target dev
sh LED	Device Antrieb_G1	Device ty G120 C	pe		PN/IE	Address 192.168.0.6	Target dev
ish LED	Device Antrieb_G1	Device ty G120 C	pe		PN/IE	Address 192.168.0.6	Target dev
ash LED	Device Antrieb_G1	Device ty G120 C	pe		PN/IE	Address 192.168.0.6	Target dev
ash LED	Device Antrieb_G1	Device ty G120 C	pe		PN/IE	Address 192.168.0.6	Target dev
status informatio	Device Antrieb_G1	Device ty G120 C	pe	V4.7	PN/IE	Address 192.168.0.6	Target dev
tatus informatio n completed. 1 ieving device ir	Device Antrieb_G1	Device ty G120 Cl 	pe J2505-2 PN Vector	V4.7	PN/IE	Address 192.168.0.6	Target dev
status informatio n completed. 1 rieving device ir	Device Antrieb_G1	Device ty G120 Cl 	pe J2505-2 PN Vector	V4.7	PN/IE	Address 192.168.0.6	Target dev

→ The configuration is compiled automatically and is displayed once more in an overview so that you can check the steps to be carried out before loading. Now select ' $\blacksquare$  Save the parameterization in the EEPROM' and click 'Load'. ( →  $\blacksquare$  Save the parameterization in the EEPROM → Load )

oad pr	evie	w		
<b>?</b> 0	Check	before loading		
Status	1	Target	Message	Action
<b>+</b> ∎	0	<ul> <li>Drive_G120_conveyor</li> </ul>	Ready for loading.	
	0	<ul> <li>Parameter assign</li> </ul>	Please note the following information:	
	•	EEPROM	Save the parameterization in the EEPROM after the download	Save the parameterization in the EEPROM
	Ŭ			the EE Now
<			III	
				Refresh
			Finish	Load Cancel

#### Note:

 It is advisable to back up the parameters in the EEPROM as well, so that these are retained in the case of a voltage drop

# 7.4 Testing and commissioning of frequency converters with control panel

→ In order to test the current parameter assignment without PLC program, open the 'Control panel' from the 'Commissioning' menu of the 'Drive\_G120\_conveyor'. Finally, click '
✓ Go online'. ( → Drive\_G120\_conveyor → Commissioning → Control panel) (→ ✓ Go online).

M Siemens - D:100_TIA_Portal1062-101 Frequency Converter G	120 PN \$7-1500\062-1	01 Frequeny Converter G120 PN S7-1500		_ ¤ ×
Project Edit View Insert Online Options Tools Wind				Totally Integrated Automation
📑 🎦 🔚 Save project 📇 🐰 🗐 🗐 🗙 🍤 🛨 (주 🗄 🎚	🗓 🌆 🖳 🖾 🂋 Go	online 🖋 Go offline 🔥 🖪 🖪 🗶 📇 🛄		PORTAL
Project tree 🔲 🖣	062-101 Frequence	nine verter G120 PN S7-1500 > Drive_G120_conveyor [G120 Cl	U250S-2 PN Vector] > Commissioning	_ # # × 📢
Devices				a
				🔁 Tasks
US 062-101FrequencyConveter G120 PN 57-1500 Add new device Device & networks G120 CPU 5167 (PU 15167-3 PNVP) Curl 5167 (PU 15167-3 PNVP) Device configuration Parameter H Commissioning Online & diagnostics Curl 2 Common data Curl 2 Comm	Commissioning Commissioni Control panel Motor opt Backing up/	Modify: Speed: 0 = = s	Preset     Operating mode:     Operating	M. current: Arms
	< III >	Fault Active fault: Actrowledge faults		Hz Vms 2
> Details view			Properties	Info 🛛 Diagnostics 📄 = 🔶
Portal view     Dverview     Parameter	R Commissioni		🔥 Act	tion canceled before download.

→ The first step is to 'Activate master control' in the control panel. The communication between the PC and the converter will then be monitored It is necessary that successful communication takes place at least every 10000 ms. Otherwise the motor stops and the enables are reset. ( →Master control: <sup>®</sup> Activated → 10000 ms → <sup>Continue</sup>)



→ The drive enables first have to be set in order to start the motor Set. As a rule, this happens automatically. The drive can then be switched on . (→ Switch on .)

M Siemens - D:100_TIA_Portal1062-101 Frequency Converter G120 PN S	S7-1500/062-101 Frequeny Converter G120 PN S7-1500	_ 🗆 X
Project Edit View Insert Online Options Tools Window He	telp	Totally Integrated Automation
📑 🎦 🔜 Save project 🚐 🐰 🕮 🗊 🗙 🏷 ± (주 ± 📆 🛄 🖬	🖳 🙀 🖉 Go online 💋 Go offline b 👖 📭 🗶 🖃 🛄	PORTAL
Project tree II 4 062-10	101FrequencyConverter G120 PN S7-1500 → Drive_G120_conveyor [G120 CU250S-	2 PN Vector] 🔸 Commissioning 🛛 📃 🖬 🖬 🗙 📢
Devices		9
B 0 0 B B		- Tasks
Com     Concept Add new device     Add new device     Devices & networks     M	missioning Commissioni Kotor opti acking upl Master control: Master control: Control panel activity Master control: Control panel activity Control panel a	Ver Stop with spacebar Ver Stop with spacebar Operating mode: Switch on: Beckward Forward Forward
Garding and a resolution	Drive status: Act Ready for switching on Operation enabled	aal values: Speed: 0.0 rpm M. current: 0.00 Arms
	Acknowledge faults Out	out frequency smoothed
< III > < I		
> Details view		🖳 Properties 🛛 🔝 Info 🕦 🔛 Diagnostics 👘 💷 📥
Portal view 🖾 Overview 💥 Parameter 👫	Commissioni	Connected to Drive_G120_conveyor, a

→ Now the motor can be run at the selected speed Forward or Backward  $(\rightarrow \text{Speed: } 44 \rightarrow \text{Forward})$ 

ct Edit View Insert Online Options Tools Wind C Edit View Insert 🗐 💥 🗐 🏦 🗙 🔊 ± 🎮 🖬			Totally Integrated Automation PORT/
roject tree 🔲 🖣			)
Devices			
062-101FrequencyConveter G120 PN 57-1500     062-101FrequencyConveter G120 PN 57-1500     074 Convetor G120 CONVERSE     074 CONVERSE     074 CONVERSE     074 Conveyor [G120 CU2205-2 PN C     074 Conveyor [G120 CU2205-2 PN C	mmissioning Control panel Control panel Motor opul Backing up/ Master control:	A. Control panel active: Stop with spacebar      Drive enables:     Ories enables:     Sector Specified      Sector Specified	e: Switch on:
Mark     Parameter       ↑     Commissioning       W     Online & diagnostics       >     Sat Traces       >     Sat Traces       >     Sat Common data       >     Documentation settings       >     Traces       >     Darguages & resources       >     Online access	Modify: Speed: 44 💽 rpm	■ Stop ■ Backward ► Forward	3
en Card Reader/USB memory	Drive status: Ready for switching on	Actual values: Operation enabled Speed: 0.0 rpm	M.current: 0.28 Arms
	Fault     Active fault:     Active fault:     Active fault:     Active fault:	Output frequency smoothed Output voltage smoothed Output voltage smoothed	▼ 0.0 Hz ▼ 16.7 Vrms
	III > <		

→ The drive can be switched off by clicking ' $\Box$ '. After completion of the test, it is necessary to  $\Box$  Deactivate the master control. (→  $\Box$  →  $\Box$  Deactivate)

062-101Frequenc	зуCo	onverter G120 PN S7-1500 🔸 Drive_G120_conveyor [G120 CU250S-2 PN Vector] 🔸 Commissioning
✓ Commissioning	Π	
Commissioning	С	control panel
Control panel		Control panel active: Stop with spacebar
Motor opti Backing up/		A Control panel active: stop with spacebar
backing up		Master control: Drive enables: Operating mode: Switch on:
		Activated Deactivate Speed specification
		Modify:
		Speed: 44 🗢 rpm 🔳 Stop ┥ Backward 🕨 Forward
	-	Drive status: Actual values:
		Ready for switching on Operation enabled Speed: 0.0 rpm M. current: 0.28 Arms
		C Fault
		Active fault: - Output frequency smoothed    Output frequency smoothed    Output frequency smoothed    Output frequency smoothed    Output frequency smoothed    Output frequency smoothed    Output frequency smoothed     Output frequency smoothed     Output frequency smoothed     Output frequency smoothed     Output frequency smoothed       Output frequency smoothed
		Acknowledge faults Output voltage smoothed
< III >	<	

 $\rightarrow$  Confirm the prompt for deactivation with 'Continue'. ( $\rightarrow$ Continue)

Má Siemens - D:\00_TIA_Portal\062-101 FrequencyConverter	120 PN \$7-1500/062-	101 Frequeny Converter G120 PN 57-1500	_ ¤ ×
Project Edit View Insert Online Options Tools Wir		Tot	tally Integrated Automation
📑 🛅 🔚 Save project 📇 🐰 🗉 🖹 🗙 🏷 2 (4 ± 🗟			PORTAL
Project tree 🔲 🖣	062-101Frequenc		_ # = × <
Devices			<b></b>
B 0 0 E E E E E E E E E E E E E E E E E			Tasks
UG2-101FrequencyConverter G120 PM 57-1500     ■       M Add new device     ■       Device & networks     ■       UTUS 16F [CPU 1516F-3 PMDP]     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU2505 2 PM)     ■       ● Drive G120, conveyor (G120 CU250 2 PM)     ■       ● Drive G120, conveyor (G120 CU250 2 PM)     ■       ● Drive G120, conveyor (G120 CU250 2 PM)     ■       ● Drive G120, conveyor (G120 CU250 2 PM)     ■       ● Drive G120, conveyor (G120 CU250 2 PM)     ■       ● Drive G120, conveyor (G120 CU250 2 PM)     ■       ● Drive G120, conveyor (G120 CU250 2 PM)     ■       ● Drive G120, conveyor (G120 CU250 2 PM)     ■ <td>Commissioning Commissionine Commissionine Motor opti Backing up/</td> <td></td> <td></td>	Commissioning Commissionine Commissionine Motor opti Backing up/		
> Details view	10.0.000		Blaghostics
Portal view     Portal view     Portal view	R Commissioni	Connected	to Drive_G120_conveyor, a

 $\rightarrow$  Finally, ' Go offline' and save the project again ' Save project'. (  $\rightarrow$  Go offline'  $\rightarrow$  Save project )

14	Siemens - D:\00_TIA_Portal\062-101 FrequencyConver	ter G	20 PN \$7-1500\062-10	11 Frequeny Converter G120 PN S7-1500	_ = ×
	Project Edit View Insert Online Options Tools			Tota	Ily Integrated Automation
	🥂 🎦 🖬 Save project 🚐 🐰 通 🗎 🗶 🏷 ± (여 ±	₽.	🛛 🗓 🗒 🗛 💋 Go o	inline 🖉 Gooffline  🚠 🔚 🛄	PORTAL
	Project tree [		062-101 Frequency	Converter G120 PN S7-1500  Drive_G120 conveyor [G120 CU250S-2 PN Vector]  Commissioning Gooffline	_ # = × 4
	Devices			do onime	9
	B 0 0	•			Tasks
Start	✓ O62-101FrequencyConverter G120 PN 57-1500	×	Commissioning Commissioni Control panel Motor opti Backing up/	Control panel Master control:	Switch on:
	Common data     Common da			Speed:	=
				Ready for switching on     Operation enabled     Speed:     0.0 rpm     M. current:	0.00 Arms
				Fault Active fault: Acknowledge faults Output frequency smoothed	0.0 Vrms
		>	< II > -	Jeil,	Diagnostics
	Details view     Portal view     Portal view     Portal view		Commissioni		a blaghosaes
	<ul> <li>Portal view</li> <li>Overview</li> <li>Parame</li> </ul>	ter	TH Commissioni	✓ Connected to	Drive_G120_conveyor, a IIIIII

## 7.5 Creating a program for controlling the frequency converter

→ Before you adapt the program so that it can control the frequency converter, two 'PLC data types' have to be created that correspond to the structure of the send and receive Telegram
 1. ( → PLC data types → Add new data type )



→ Change the name of the PLC data type to 'FU\_Receive\_Telegram1' and open it by doubleclicking it. ( → FU\_Receive\_Telegram1 )



 $\rightarrow$  Create the tags shown below the same as in a data block. ( $\rightarrow$  FU\_Receive\_Telegram1)

P 🕈	🎭 🍢 🕅 🖬 🗛 🖻	6 🖹 🞚	00h ⊳				
FU_F	RECEIVE_Telegram1						
N	ame	Data type	Default value	Accessible f		 Comment	
	Speed_OK	Bool 🔳	false			Setpoint / actual speed deviation within the tolerance range (1)	
	Control_requested	Bool	false			The automation system is requested to accept the inverter control(1)	
	Max_speed_reached	Bool	false			Speed is greater than or equal to the maximum speed (1)	
-	Warn_torque_limit	Bool	false			Comparison value for current torque has been reached or exceeded (1)	
	Holding_brake	Bool	false			Holding brake open(1)	
	Motor_temperature	Bool	false			Alarm motor overtemperature(0)	
	Direction	Bool	false			Motor rotates clockwise(1) / counterclockwise(0)	
-	PM_overload	Bool	false			Alarm inverter PM thermal overload (0)	
	Ready_to_Start	Bool	false			Power supply switched on; electronics initialized; pulses locked(1)	
0 🕣	Ready	Bool	false			Motor is switched on (ON/OFF1 = 1), no fault is active(1)	
1 📶	Operation_EN	Bool	false			Operation enabled Motor follows setpoint(1)	
2 🕣	Fault	Bool	false		<b></b>	Fault active(1)	
3 🕣	No_OFF2	Bool	false	<b></b>		Coast down to standstill is not active(1)	
4 🕣	No_OFF3	Bool	false			Quick stop is not active(1)	
5 🕣	Lockout	Bool	false	<b></b>		Closing lockout active(1)	
5 🕣	Alarm	Bool	false	<b></b>		Alarm active(1)	
7 🕣	XIST A	Int	0			Actual speed value process data (PZD) word2	

 $\rightarrow~$  Create an additional PLC data type called 'FU\_Send\_Telegram1' and the tags shown below.

 $(\rightarrow FU\_Send\_Telegram1)$ 



¢ 🔮		• 🗈 🖻				Ē
	SEND_Telegram1		D (		No. 11. 1	
	Name	Data type	Default value	Accessible	Visible in	 Comment
	reserved_8	Bool	false			not in use
	reserved_9	Bool	false			not in use
	Control_via_PLC	Bool	TRUE			Control via fieldbus, inverter accepts the process data from fieldbus(1)
	Rev_direction	Bool	false			Invert setpoint in the inverter(1)
-	reserved_12	Bool	false			not in use
	MOP_up	Bool	false			Increase the setpoint saved in the motorized potentiometer(1)
	MoP_down	Bool	false			Reduce the setpoint saved in the motorized potentiometer(1)
-	reserved_15	Bool	false			not in use
	ON_OFF1	Bool	false		<b></b>	ON(1) / OFF(0) with the ramp-function generator
0 📶	ON_OFF2	Bool	TRUE	<b></b>	<b></b>	Switch OFF (0); Switch off the motor immediately, the motor coasts down to standstil
1 📶	ON_OFF3	Bool	TRUE		<b></b>	Switch OFF (0); Quick stop, the motor brakes with the OFF3 ramp-down time
2 🕣	EN_operation	Bool	TRUE		<b></b>	Enable operation; Switch-on motor (pulses can be enabled) (1)
3 🕣	EN_ramp	Bool	TRUE		<b></b>	Enable ramp-function (1) / Reset ramp-function generator output to 0 (0)
4 🕣	Continue_freeze_ramp	Bool	TRUE		<b></b>	Enable ramp-function (1) / Freeze ramp-function generator (0)
5 🕣	Enable_setpoint	Bool	TRUE		<b>~</b>	Enable setpoint(1) / Inhibit setpoint(0)
6 🕣	Acknowledge	Bool 🔳	false		<b></b>	Acknowledge faults (1)
7 🕣	NSOLL A	Int	0			Setpointl speed process data (PZD) word2

Note:

 For some enable bits, the start value is already set to TRUE so that these do not have to be set additionally in the program.

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→ Create the global data block 'FREQUENCY\_CONVERTER' for the request and response telegram. ( → Add new block → DB → Global DB → FREQUENCY\_CONVERTER → OK )



 $\rightarrow$  Create the tag 'Send\_G120\_01' and select 'FU\_SEND\_Telegram1' as the data type. ( $\rightarrow$  Send\_G120\_01  $\rightarrow$  "FU\_SEND\_Telegram1")

M Siemens - D:\00_TIA_Portal\062-101 Frequency C	Converter G12	20 PN \$7-1500\062-101 Fre	equency Converter G120 PM	N \$7-1500					_ 🗆 X
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MOTOR_SPEEDCONTROL [FC10]	_			=					
MOTOR_SPEEDMONITORING [FC11				<b>~</b>					
MOTOR_AUTO [FB1]									
FREQUENCY_CONVERTER [DB4]									
MAGAZINE_PLASTIC [DB3]									
MOTOR_AUTO_DB [DB1]									
SPEED_MOTOR [DB2]									
Technology objects									
External source files									
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→ Create an additional tag 'Receive\_G120\_01' and select 'FU\_RECEIVE\_Telegram1' as the data type. Provide comments for the two tags. ( → Receive\_G120\_01 → 'FU\_ RECEIVE\_Telegram1')

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062-101 Frequency Converter G120 F			Data type	Start value	Retain	Accessible f	Visible in	Setpoint	Comment
Add new device	1	Static							
h Devices & networks	2	Send_G120_01	"FU_SEND_Telegram1"						Send telegram frequency converter G120 conveyor 1
CPU1516F [CPU 1516F-3 PN/DP]	3	Receive_G120_01	"FU_RECEIVE_Telegram1"						Receive telegram frequency converter G120 conveyor 1
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MAGAZINE_PLASTIC [DB3]									
MOTOR_AUTO_DB [DB1]									
SPEED_MOTOR [DB2]									
Technology objects									
<ul> <li>External source files</li> </ul>									
PLC tags									
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 $\rightarrow$  The data block can be created quickly and efficiently by using the PLC data types 'FU\_SEND\_Telegram1' and 'FU\_RECEIVE\_Telegram1', see representation.

	■→ IR ■→ ■→ ■ NCY CONVERTER	6 🖿 🔢 😤						1
Name	-	Data type	Start value	Retain	Accessible f	Visible in	Setpoint	Comment
🕣 🔻 Sta	tic							
	Send_G120_01	"FU_SEND_Telegram1"			<b></b>			Send telegram frequency converter G120 conveyor 1
	reserved_8	Bool	false		<b>V</b>	Image: A start of the start		not in use
	reserved_9	Bool	false		<b>~</b>	Image: A start of the start		not in use
	Control_via_PLC	Bool	TRUE			Image: A start and a start		Control via fieldbus, inverter accepts the process data from fieldbus(1)
	Rev_direction	Bool	false			Image: A start and a start		Invert setpoint in the inverter(1)
	reserved_12	Bool	false			Image: A start and a start		not in use
	MOP_up	Bool	false		$\checkmark$	Image: A start of the start		Increase the setpoint saved in the motorized potentiometer(1)
	MoP_down	Bool	false		$\checkmark$			Reduce the setpoint saved in the motorized potentiometer(1)
••••	reserved_15	Bool	false		<b>v</b>	Image: A start and a start		not in use
	ON_OFF1	Bool	false		<b>V</b>	Image: A start and a start		ON(1) / OFF(0) with the ramp-function generator
. 🚥 🔹	ON_OFF2	Bool	TRUE		<b>V</b>			Switch OFF (0); Switch off the motor immediately, the motor coasts down to sta
- 🗠	ON_OFF3	Bool	TRUE		<b>V</b>			Switch OFF (0); Quick stop, the motor brakes with the OFF3 ramp-down time
	EN_operation	Bool	TRUE		<b>V</b>	Image: A start and a start		Enable operation; Switch-on motor (pulses can be enabled) (1)
• \cdots	EN_ramp	Bool	TRUE		<b>V</b>	Image: A start of the start		Enable ramp-function (1) / Reset ramp-function generator output to 0 (0)
i 🕣 🔹	Continue_freez	Bool	TRUE					Enable ramp-function (1) / Freeze ramp-function generator (0)
• 🚥 🔹	Enable_setpoint	Bool	TRUE			Image: A start and a start		Enable setpoint(1) / Inhibit setpoint(0)
3 🕣 🔹	Acknowledge	Bool	false			Image: A start and a start		Acknowledge faults (1)
• •	NSOLL_A	Int	0		<b>V</b>	Image: A start and a start		Setpointl speed process data (PZD) word2
) 🕣 🔹 🔻	Receive_G120_01	"FU_RECEIVE_Telegram1			<b></b>			Receive telegram frequency converter G120 conveyor 1
	Speed_OK	Bool	false		<b>v</b>	Image: A start and a start		Setpoint / actual speed deviation within the tolerance range (1)
2 📲 🔹	Control_reques	Bool	false		<b>V</b>	Image: A start and a start		The automation system is requested to accept the inverter control(1)
3 📲 🔹	Max_speed_rea.	Bool	false		<b>V</b>	Image: A start and a start		Speed is greater than or equal to the maximum speed (1)
• 🗠 •	Warn_torque_li	Bool	false		<b>V</b>	Image: A start of the start		Comparison value for current torque has been reached or exceeded (1)
5 📲 🔹	Holding_brake	Bool	false		<ul> <li>Image: A start of the start of</li></ul>			Holding brake open(1)
5 -00 =	Motor_tempera	Bool	false		<ul> <li>Image: A start of the start of</li></ul>			Alarm motor overtemperature(0)
7 - 💷 🔹	Direction	Bool	false		<ul> <li>Image: A start of the start of</li></ul>			Motor rotates clockwise(1) / counterclockwise(0)
3 - 💶 🔹	PM_overload	Bool	false		<ul> <li>Image: A start of the start of</li></ul>			Alarm inverter PM thermal overload (0)
	Ready_to_Start	Bool	false		<b>V</b>	Image: A start and a start		Power supply switched on; electronics initialized; pulses locked(1)
) 🕣 🔹	Ready	Bool	false		<ul> <li>Image: A start of the start of</li></ul>			Motor is switched on (ON/OFF1 = 1), no fault is active(1)
	Operation_EN	Bool	false		<ul> <li>Image: A start of the start of</li></ul>			Operation enabled Motor follows setpoint(1)
2	Fault	Bool	false					Fault active(1)
	No_OFF2	Bool	false		<ul> <li>Image: A start of the start of</li></ul>			Coast down to standstill is not active(1)
• •	No_OFF3	Bool	false					Quick stop is not active(1)
5	Lockout	Bool	false					Closing lockout active(1)
5 -00 =	Alarm	Bool	false					Alarm active(1)
7 - <b>11</b> -	XIST A	Int	0					Actual speed value process data (PZD) word2

→ The global PLC tags are created in a new tag table for the communication with the frequency converter. ( → Add new tag table )



→ Change the name of the tag table to 'Tag\_table\_G120' and specify, as shown, two structure tags 'PZD\_IN\_G120\_01' and 'PZD\_OUT\_G120\_01' using the PLC data types 'FU\_RECEIVE\_Telegram1' and 'FU\_SEND\_Telegram1'. ( → PZD\_IN\_G120\_01 → 'FU\_RECEIVE\_Telegram1' → PZD\_OUT\_G120\_01 → 'FU\_SEND\_Telegram1')



 $\rightarrow$  The tags have been created in accordance with their structures by the use of the PLC data types 'FU\_SEND\_Telegram1' and 'FU\_RECEIVE\_Telegram1'. Open the 'Main' block [OB1].  $(\rightarrow Main [OB1])$ 

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roject tree	06	2-101 Fre	quency Converter G12	20 PN \$7-1500  CPU1516	5F [CPU 1516	-3 PN/DI	] 🕨 PLO	C tags 🔸	Tag table_G120 [2] 🛛 🗕 🗖 🗖
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Add new device	1	- B	ZD_IN_G120_01	"FU_RECEIVE_Telegram1"	%1256.0				
Devices & networks	2	-00	Speed OK	Bool	%1256.0				Setpoint / actual speed deviation within the tolerance ra
CPU1516F [CPU 1516F-3 PN/DP]	3	-0	Control_requested	Bool	%1256.1				The automation system is requested to accept the inve
Device configuration	- 4	-0	Max speed reached	Bool	%1256.2				Speed is greater than or equal to the maximum speed (
Q Online & diagnostics	= 5	-00	Warn torque limit	Bool	%1256.3				Comparison value for current torque has been reached
<ul> <li>B Program blocks</li> </ul>	6	-00	Holding brake	Bool	%1256.4				Holding brake open(1)
Add new block	7	-00	Motor temperature	Bool	%1256.5				Alarm motor overtemperature(0)
Main [OB1]	8	-00	Direction	Bool	%1256.6				Motor rotates clockwise(1) / counterclockwise(0)
MOTOR_SPEEDCONTROL [F.	9	-00	PM overload	Bool	%1256.7				Alarm inverter PM thermal overload (0)
MOTOR_SPEEDMONITORIN.	10	-00	Ready_to_Start	Bool	%1257.0				Power supply switched on; electronics initialized; pulses
MOTOR_AUTO [FB1]	11	-00	Ready	Bool	%1257.1		<b>V</b>		Motor is switched on (ON/OFF1 = 1), no fault is active(1
FREQUENCY_CONVERTER [[	12	-00	Operation_EN	Bool	%1257.2		<b>V</b>	Image: A start and a start	Operation enabled Motor follows setpoint(1)
MAGAZINE_PLASTIC [DB3]	13	-00	Fault	Bool	%1257.3			Image: A start and a start	Fault active(1)
MOTOR_AUTO_DB [DB1]	14	-00	No_OFF2	Bool	%1257.4				Coast down to standstill is not active(1)
SPEED_MOTOR [DB2]	15	-00	No_OFF3	Bool	%1257.5				Quick stop is not active(1)
Technology objects	16	-00	Lockout	Bool	%1257.6			<b>V</b>	Closing lockout active(1)
External source files	17	-00	Alarm	Bool	%1257.7		Image: A start and a start	¥	Alarm active(1)
▼ □ PLC tags	18	-00	XIST_A	Int	%IW258		Image: A start and a start	<b>V</b>	Actual speed value process data (PZD) word2
🖏 Show all tags	19		ZD_OUT_G120_01	"FU_SEND_Telegram1"	%Q256.0			<b></b>	
📑 Add new tag table	20	-00	reserved_8	Bool	%Q256.0		<ul> <li>Image: A start of the start of</li></ul>	<b>V</b>	not in use
💥 Default tag table [61]	21	-00	reserved_9	Bool	%Q256.1		<b>V</b>	<b>V</b>	not in use
🔩 Tag table_G120 [2]	22	-00	Control_via_PLC	Bool	%Q256.2		<b>V</b>	<b>V</b>	Control via fieldbus, inverter accepts the process data f
Tag table sorting station [30	×	<	Boy direction	Pool	N 0756 7	Ш			Invest consist in the investor(1)
Details view		( )					_	les l	roperties 🗓 Info 🕕 🕄 Diagnostics 📄 🗖

→ Insert two new networks at the beginning of the Main [OB1]. Drag-&-drop the 'Move' command from the "Instructions' under the 'Move operations' item into these networks. . 💥 (

$\rightarrow \mathbb{N} \rightarrow \mathbb{N} \rightarrow \mathbb{N}$ $\rightarrow \mathbb{N}$ Instructions $\rightarrow \mathbb{N}$ Move operations $\rightarrow \mathbb{N}$	ove)
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roject tree	rter G120 PN S7-1500 + CPU1516F [CPU 1516F-3 PN/DP] + Program blocks + Main [OB1] 🛛 🗕 🗖	■× Instructions ■ □
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n Devices & networks	Block title: "Main Program Sweep (Cycle)"	↑ General
CPU1516F [CPU 1516F-3 PN/DP]	Comment	Bit logic operations
Device configuration		= • O Timer operations
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<ul> <li>Program blocks</li> </ul>	Comment	Comparator operations
💣 Add new block		t Math functions
🖶 Main [OB1]	MOVE	Move operations
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MOTOR_AUTO [FB1]		🗉 Serialize Seriali
FREQUENCY_CONVERTER [DB4]		MOVE BLK Move
MAGAZINE_PLASTIC [DB3]		MOVE_BLK_VARIANT Move
MOTOR_AUTO_DB [DB1]		UMOVE_BLK Move
SPEED_MOTOR [DB2]	Network 2: Send process data to frequency converter G120 conveyor1 (telegram1)	FILL BLK Fill blo
Technology objects	Comment	UFILL_BLK Fill blo
External source files		E SWAP Swap
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Tag table_G120 [2]		Technology
Tag table_sorting station [30]	< Ⅲ > 100% ▼	Communication
Details view	🖾 Properties 🔂 Info 🚯 😨 Diagnostics	Optional packages

 $\rightarrow$  Select the 'Tag\_table\_G120' in the project navigation. Now you can drag-&-drop the two tags 'PZD\_IN\_G120\_01' and 'PZD\_OUT\_G120\_01' directly from the details view onto the connections of the Move instructions. (  $\rightarrow$  Tag\_table\_G120  $\rightarrow$  PZD\_IN\_G120\_01  $\rightarrow$ PZD\_OUT\_G120\_01)

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Online & diagnostics	Comment	Generations     Generations     Generations     Generations     Generations     Generations     Generations
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Aain [OB1]	Comment	Comparator operatio
MOTOR_SPEEDCONTROL [FC10]		• 1 Math functions =
MOTOR_SPEEDMONITORING [FC11]	MOVE	Math functions     Move operations     Move operations     MOVE     Move va      Move va.
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Tag table sorting station [30]	P#Q256.0	Egacy
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	EN - OUT1 - G120_01"	Program control ope     V
Name Data type Details Comme	?? — IN ENO	> Extended instructions
Name         Data type         Details         Comme           Image: PZD_IN_G120_01         "FU_RECEIVE_T. %I256.0         %I256.0		> Technology
PZD_IN_G120_01 FU_RECEIVE_1. %0256.0	✓ IIII > 100%	
<pre></pre>	Info      Diagnostics     Info	Communication     Optional packages
🖣 Portal view 🔠 Overview 🔩 Tag table_G 🔹	Main 🗸 The	project 062-101 Frequency Conver

→ Select the "FREQUENCY\_CONVERTER [DB4]' data block in the project tree. You can again drag-&-drop the two structure tags 'Send\_G120\_01' and 'Receive\_G120\_01' directly from the details view onto the connections of the Move instructions. (→ Send\_IN\_G120\_01 → Receive\_OUT\_G120\_01)

M Siemens - D:\00_TIA_Portal\062-101 Frequency Converter G120 P	N \$7-1500\062-101 Frequency Converter G120 PN \$7-1500	_ = ×
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📩 Devices & networks		✓ Basic instructions
CPU1516F [CPU 1516F-3 PN/DP]	& >=1 1 → <b>-01 → -[=]</b>	Name Descript
P Device configuration	▼ Block title: "Main Program Sweep (Cycle)"	Conoral
Online & diagnostics	Comment	Bit logic operations
Program blocks		General     G
Add new block	Network 1: Receive process data from frequency converter G120 conveyor1 (telegram1)	Counter operations
🖶 Main (OB1)	Comment	<ul> <li>Comparator operatio</li> </ul>
MOTOR_SPEEDCONTROL [FC10]		Lath functions
MOTOR_SPEEDMONITORING [FC11]	MOVE	Math functions     Move operations     MOVE Move va      Deserialize Deseriali
MOTOR_AUTO [FB1]		🖭 MOVE Move va 💈
FREQUENCY_CONVERTER [DB4]		
MOTOR_AUTO_DB [DB1]	Pereire G120	Serialize Serialize
SPEED MOTOR [DB2]	P#256.0 01	MOVE_BLK Move bl
Technology objects	PZD_INOUTI	MOVE_BLK Move bl     MOVE_BLK_VARI Move bl     MOVE_BLK_Move bl     UMOVE_BLK Move bl     FILL_BLK Fill block
External source files	G120_01" IN LENO	UMOVE_BLK Move bl 9
✓ La PLC tags		
Show all tags		UFILL_BLK Fill bloc
Add new tag table	<ul> <li>Network 2: Send process data to frequency converter G120 conveyor1 (telegram1)</li> </ul>	E SWAP Swap
S Default tag table [61]	Comment	Array DB     Dariant
🖏 Tag table_G120 [2]		Legacy
Tag table_sorting station [30]	MOVE	Conversion operation:
PLC data types	— EN	Program control ope
📑 Add new data type	Disarc o	Word logic operations
✓ Details view	"FREQUENCY P#Q256.0 CONVERTER" "PZD_OUT	Shift and rotate
Details view	CONVERTER", "PZD_OUT Send_G120OUT1 — G120_01"	< III >
there offer Deriver Associate	01	> Extended instructions
Name Offset Data type Accessible ≪DI > Send G120 01 "FU SEN := True		> Technology
		Communication
<		Optional packages
		project 062-101 Frequency Conver

→ Open the structure of the tag 'Receive\_G120\_01' in the details view and from there drag-&drop the tag 'Receive\_G120\_01.XIST\_A' to the connection 'Actual\_speed\_Al' of the block 'MOTOR\_SPEED\_MONITORING'. ( → Receive\_G120\_01.XIST\_A )

🕼 Siem	ens - D:\00_TIA_Portal\	062-101 Frequenc	cy Converter G1	20 PN S7-1500\062-101	Frequency Converter	G120 PN S7-1500				_ 0
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Proj	ect tree		□ ◀	G120 PN \$7-1500	• CPU1516F [CPU 1	516F-3 PN/DP] 🕨 I	Program blocks 🔸 Main [OB1]	_ <b>_ </b>	Instructions	- I I
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5						Block interface			> Favorites	MT 🛄
é 👘	<ul> <li>Program blocks</li> </ul>		^						✓ Basic instructions	
Ę	Add new block			& >=1 ??? <b>-1</b>	-•I ↦ -[=]				Name	Descript
	💶 Main [OB1]		=					~		A P
	MOTOR_SPEED	CONTROL [FC10]		<ul> <li>Network 3: Spe</li> </ul>	eed monitoring conveyor n	notor			Bit logic operations	_
2	MOTOR_SPEED	MONITORING [FC1	1]	Comment				_	O Timer operations	
	MOTOR_AUTO	[FB1]						_	Counter operations	
	FREQUENCY_C				%	C11			<ul> <li>Comparator operatio.</li> </ul>	
		ACTIC [DDD]	v		"MOTOR SPEE	DMONITORING"			E Math functions	
V L	etails view				— EN				<ul> <li>Move operations</li> </ul>	≡ Move va Deseriali
					LIN				I MOVE	Move va.,
N	ame	Offset Data	type Acc	"FREQUENCY	<mark>/  </mark>			=	Deserialize	Deseriali
	Send_G120_01	"FU_	_SEND_T. True	CONVERTER					Serialize	Serialize
	Receive_G120_01	"FU_	_RECEIV True	Receive_G120			"SPEED		MOVE BLK	
-00	Speed_OK	Bool	l True	01.XIST_	A AI		MOTOR".		MOVE_BLK_VARI.	
	Control_requested	Bool	l True		-		Positive_Speed.		UMOVE BLK	Move bl
-01	Max_speed_reached			"SPEED		-	Error		FILL BLK	Fill block
-01	Warn_torque_limit	Bool		MOTOR		Error_max			UFILL BLK	Fill bloc
	Holding_brake	Bool		Positive_Spee			"SPEED		E SWAP	Swap
	Motor_temperature	Bool		Threshold_Err	or <u> </u>		MOTOR".		Array DB	
-	Direction	Bool					Positive_Speed.		Variant	
-	PM_overload	Bool		"SPEED		Warning max	Marcina		Legacy	
	Ready_to_Start	Bool		MOTOR		warning_max			Conversion operation	u l
-	Ready	Bool		Positive_Spee			"SPEED		Program control ope	
-	Operation_EN	Bool		Threshold Warnir	Speed_limit_		MOTOR".		Word logic operations	
-	Fault	Bool		warriir	<sup>ig</sup> — warning_max		Negative_Speed.		Shift and rotate	~
	No_OFF2	Bool				Warning min	Warning		< m	>
	No_OFF3	Bool		"SPEED					> Extended instruction	ins
-01	Lockout	Bool		MOTOR			"SPEED_		> Technology	
	Alarm	Bool		Negative_Spee	ed.		MOTOR".	<u></u>	Communication	
-0	XIST_A	Int	🗄 True							
<			>			🖳 Propertie	es 🛛 🗓 Info 追 🗓 Diagnostic	s – –	> Optional packages	
(	Portal view 🛛 🚟	Overview	Tag table_G	🔁 Main				🗸 The	project 062-101 Frequency Co	onver

 $\rightarrow$  Drag the tag 'Send\_G120\_01.NSOLL\_A' to the connection 'Setpoint\_speed' of the block 'MOTOR\_SPEEDCONTROL'. ( $\rightarrow$  Send\_G120\_01.NSOLL\_A)

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Proje	ct tree			□ 4	G	120 PN S7-1500 + CPU1516F [CPU 1516F-3 PN/DP] + Program blocks + Main [OB1] 🛛 🗕 🖬 🔳	×	Instructions	<b>n</b> 11
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	<ul> <li>Program blocks</li> </ul>			•					
	Add new bloc	k			۵.	>=1 177	. P	<ul> <li>Basic instructions</li> </ul>	
	Main [OB1]			=		lock title: "Main Program Sweep (Cycle)"	_	Name General	Descript
	MOTOR_SPEE	EDCONTROL [F	C10]			mment		General     General     General     General     General	
	MOTOR_SPEE	EDMONITORIN	G (FC11)			innen		Gill Timer operations	
	MOTOR_AUT	O [FB1]			•	Network 1: Receive process data from frequency converter G120 conveyor1 (telegram1)		Counter operations	
	FREQUENCY_	CONVERTER [	DB4]			Network 2: Send process data to frequency converter G120 conveyor1 (telegram1)		<ul> <li>Comparator operations</li> <li>Comparator operatio.</li> </ul>	
	tails view	ACTIC (DDD)		v	1.			<ul> <li>Math functions</li> </ul>	
De	etalls view				P	Network 3: Speed monitoring conveyor motor		<ul> <li>Move operations</li> </ul>	
					<b>-</b>	Network 4: Speed control analog oputput conveyor motor		I MOVE	Move va
Nan		Offset	Data type			Comment		Deserialize	Deseriali
	Send_G120_01		"FU_SENI	-	1.2			Serialize	Serialize
	reserved_8		Bool	True		%FC10		MOVE_BLK	Move bl
	reserved_9		Bool	True		"MOTOR SPEEDCONTROL"		MOVE_BLK_VARI	. Move bl
	Control_via_PLC		Bool	True True				UMOVE_BLK	Move bl
3	Rev_direction reserved 12		Bool	True		#Motor_speed_		FILL_BLK	Fill block
	MOP up		Bool	True		monitoring_Ret_		UFILL_BLK	Fill bloc
	MoP down		Bool	True		Ret_Val — Val		SWAP	Swap
	reserved 15		Bool	True		"FREQUENCY		Array DB     Variant	
	ON OFF1		Bool	True		EN Manipulated CONVERTER".		<ul> <li>Variant</li> <li>Legacy</li> </ul>	
	ON_OFF2		Bool	True		"SPEED variable_ Send_G120_		<ul> <li>Conversion operation</li> </ul>	
	ON_OFF3		Bool	True		MOTOR".Speed speed_AO01.NSOLL_A		<ul> <li>Conversion operation</li> <li>Program control ope</li> </ul>	
	EN_operation		Bool	True	1	Setpoint Setpoint speed ENO		<ul> <li>Word logic operations</li> </ul>	
3	EN_ramp		Bool	True		Schoul Shore End		Shift and rotate	
3	Continue_freeze_ra		Bool	True				< III	>
	Enable_setpoint		Bool	True	-	Network 5: Control conveyor motor forwards in automatic mode		> Extended instructio	ns
	Acknowledge		Bool	True		Comment		> Technology	
	NSOLL_A		Int	🗄 True			_		
•	Receive_G120_01		"FU_RECE	IV True				Communication	
1		11		>		🔍 Properties 🚯 Info 🕦 🕅 Diagnostics 👘 🖃	$\simeq$	> Optional packages	

→ As the activation command, drag the tag 'Send\_G120\_01.ON\_OFF1' to the connection 'Conveyor\_motor\_automatic\_mode' of the block 'MOTOR\_AUTO'. (  $\rightarrow$  Send\_G120\_01.ON\_OFF1 )

sce-062-101-frequency-converter-g120-pn-s7-1500-r0909-en.docx

10		ns - D:\00_TIA_Port Edit View Insert		<u> </u>			101 Fre	quency Converter G1	20 PN S7-1500					_ 🗆 X
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<u>a</u>		MOTOR_SPE	EDCONTROL	[FC10]		0.5		"-S2" -	-• Stop				Bit logic operation	ns 😳
Ĕ.		MOTOR_SPE	EDMONITORI	NG [FC11]	=	31" — *			Enable_OK				Timer operations	
		AUTOR_AUT											Counter operatio	ns ti
		FREQUENCY						>=1					Comparator oper	ratio.
		MAGAZINE_		1				2-1					E Math functions	
		MOTOR_AU					6.0						<ul> <li>Move operations</li> </ul>	Tasks
		SPEED_MOT					"-A1"	D					E MOVE	as
		🕨 🙀 Technology obje				#Motor sp	eed						Deserialize	ks
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		📑 Add new tag	table		~	#Motor_sp							UMOVE_BLK	Tar.
~	De	tails view				monito			Safety_				FILL_BLK	es
						erro	_min	*	<ul> <li>shutoff_active</li> </ul>				UFILL_BLK	
	Nam	e	Offset	Data type								=	E SWAP	
-	i • :	5end G120 01		FU SEN	D T 🔨			%1.0					🕨 🚞 Array DB	
-		reserved_8		Bool					- Sensor_slide	Conveyor_	FREQUENCY_		🕨 🚞 Variant	
-		reserved_9		Bool	=					motor_	CONVERTER". Send G120		🕨 🚞 Legacy	
-	1	Control_via_PLC		Bool				%1.3		automatic_ mode	01.ON OFF1		🕨 😽 Conversion opera	
-	1	Rev_direction		Bool	🖵			"-B7" <b>-</b>	<ul> <li>of_conveyor</li> </ul>	mode_			Program control of the second seco	
-	1	reserved_12		Bool						Actual Value	"MAGAZINE		🕨 🔛 Word logic opera	tions
-	1	MOP_up		Bool				"MAGAZINE	Setpoint_ Capacity	Magazine	PLASTIC".Plastic		🕨 🖼 Shift and rotate	~
-	3	MoP_down		Bool				PLASTIC".Plastic	Magazine	plastic -	_ Parts_Actual		<	>
-		reserved_15		Bool				Parts_Setpoint_			_		> Extended instru	ictions
	0	ON_OFF1		Bool	Ξ					ENO -	_	~	> Technology	
•	1	ON_OFF2		Bool		<		Ш		> 100%	<b>•</b>		Communication	
	<b>.</b>	ON OFF3		Bool	🗸				- CO 1		Diagnostics		<ul> <li>Optional packad</li> </ul>	
<				-	>				3	roperties   Info				
	Po	rtal view	🔛 Overview	🛂 Tag	table_G	🖀 Main					Sector 100 Sector 1	The project 062	2-101 Frequency Conver	

### 7.6 Loading the program in SIMATIC S7 CPU 1516F-3 PN/DP

→ Save the project once more before downloading the modified and created 'Program blocks' to

the CPU 1516F  $\cdot^{\textcircled{III}}$ . (  $\rightarrow^{\textcircled{III}}$  Save project  $\rightarrow$  Program blocks  $\rightarrow^{\textcircled{III}}$  )



# 7.7 Diagnostics of SIMATIC S7 CPU 1516F-3 PN/DP

→ The block Main [OB1] can be monitored to diagnose the control of the converter from the program. Monitoring is activated and deactivated by clicking the icon.
 (→ Main [OB1] → )

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Project tree		0	PN \$7-1500 + CPU15	16F [CPU 1516	F-3 PN/DP] 🕨 Prog	ram blocks	Main [OB1] -	- 🖻 🖹 X	Testing	7 11
Devices									Options	
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		100			Block interface	1			✓ CPU operator panel	_
O62-101 Frequency Converter G120 PN S:     Add new device     Devices & networks     OPU1516F ICPU 1516F-3 PN/DPI	<ul> <li></li> <li><td></td><td>&gt;=1 ?? •I Network 3: Speed mo</td><td>→ -{=] nitoring conveyor</td><td>motor</td><td></td><td></td><td>^</td><td>CPU1516F [CPU 1516F-3 PN/DP] RUN / STOP RUN ERROR STOP</td><td>]</td></li></ul>		>=1 ?? •I Network 3: Speed mo	→ -{=] nitoring conveyor	motor			^	CPU1516F [CPU 1516F-3 PN/DP] RUN / STOP RUN ERROR STOP	]
Device configuration     Online & diagnostics     Rogram blocks     Add new block	•	-	Comment		FC11 Edmonitoring"			=	MAINT MRES	j
<ul> <li>Main (081)</li> <li>MOTOR_SPEEDCONTROL [FC10]</li> <li>MOTOR_SPEEDMONITORING [FC</li> <li>MOTOR_AUTO [F81]</li> <li>FREQUENCY_CONVERTER [D84]</li> <li>MAGAZINE_PLASTC [D83]</li> <li>MOTOR_AUTO_D8 [D81]</li> <li>SPEED_MOTOR [D82]</li> <li>Technology objects</li> <li>Some External source files</li> </ul>			0 "FREQUENCY_ CONVERTER". Receive_G120_ 01.XIST_A_ 16.0 "SPEED_	EN Actual_speed_ Al	Error_max	FALSE "SPEED_ MOTOR". Positive_S Error	peed.		Call environment No condition defined. Change	
PLC tags	~	<	MOTOR".		>	EALCE	·	~	> Breakpoints	

→ The complete send and receive data of the communication with the converter ( control words/status words/setpoint/actual value) are visible in the 'FREQUENCY\_CONVERTER [DB4]' data block. Monitoring can be activated and deactivated at this point as well by clicking the <sup>IIII</sup> icon. ( → FREQUENCY\_CONVERTER [DB4] → <sup>IIII</sup>)

🔁 🔚 Save project 📕 🐰 🗎 🗎 🗙 🏷	± (°ª±	a 🛛 🕻	🖥 🖳 🞵 Go online	🛃 Go offline 🛛 🛔 🕴	N 🖪 🗶 🗄			Totally Integrated Automation PORTA
		J1516F	[CPU 1516F-3 PN/DP]	Program block	s → FREQU	ENCY_CONVERTER	R [DB4] 💫 🖬 🖬 🖊	Tasks 🗐 🔟
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		FREOL	JENCY CONVERTER					✓ Find and replace
062-101 Frequency Converter G120 PN S	<b>×</b>		-	Data type Mor	itor all ilue	Monitor value	Retain Ac	r ind dird replace
Add new device		1 🕣 🔻	Static	//-				Find:
h Devices & networks			<ul> <li>Send G120 01</li> </ul>	"FU_SEND_Teleg	1		i o i	•
CPU1516F [CPU 1516F-3 PN/DP]	<b>V</b>	3 🕣	reserved 8	Bool	false	FALSE		Whole words only
Device configuration		4 📲	reserved_9	Bool	false	FALSE		
S Online & diagnostics		5 📲	Control_via_PLC	Bool	TRUE	TRUE		Match case
<ul> <li>Program blocks</li> </ul>	•	6 📲	<ul> <li>Rev_direction</li> </ul>	Bool	false	FALSE		Find in substructures
Add new block		7 📲	reserved_12	Bool	false	FALSE		Find in hidden texts
📲 Main [OB1]		8 📶	MOP_up	Bool	false	FALSE		Use wildcards
MOTOR_SPEEDCONTROL [FC10]		9 📲	MoP_down	Bool	false	FALSE		
MOTOR_SPEEDMONITORING [FC		10 📶	reserved_15	Bool	false	FALSE		Use regular expressions
MOTOR_AUTO [FB1]		11 📲	ON_OFF1	Bool	false	FALSE		Whole document
FREQUENCY_CONVERTER [DB4]		12 📲	ON_OFF2	Bool	TRUE	TRUE		From current position
MAGAZINE_PLASTIC [DB3]	•	13 📶	ON_OFF3	Bool	TRUE	TRUE		
MOTOR_AUTO_DB [DB1]	•	14 📲	<ul> <li>EN_operation</li> </ul>	Bool	TRUE	TRUE		<ul> <li>Selection</li> </ul>
SPEED_MOTOR [DB2]	•	15 🕣	<ul> <li>EN_ramp</li> </ul>	Bool	TRUE	TRUE		Down
Technology objects		16 📶	<ul> <li>Continue_freeze_r</li> </ul>	Bool	TRUE	TRUE		
External source files		17 📲	Enable_setpoint	Bool	TRUE	TRUE		Oup
PLC tags	•		<ul> <li>Acknowledge</li> </ul>	Bool	false	FALSE		Find
PLC data types	•	19 🕣	NSOLL_A	Int	0	7741		Deale as with
Watch and force tables			<ul> <li>Receive_G120_01</li> </ul>	"FU_RECEIVE_Teleg				Replace with:
Online backups		~ ~	Speed_OK	Bool	false	TRUE		·
Traces			<ul> <li>Control_requested</li> </ul>	Bool	false	TRUE		Replace Replace all
Program info		1.0	<ul> <li>Max_speed_reache</li> </ul>		false	FALSE		
Device proxy data			<ul> <li>Warn_torque_limit</li> </ul>		false	TRUE		
PLC alarms			<ul> <li>Holding_brake</li> </ul>	Bool	false	FALSE		
Text lists		26 📶	<ul> <li>Motor_temperature</li> </ul>	Bool	false	TRUE		,
Localmoduloc	>	<					>	

→ The online network view lends itself to diagnostics of the PROFINET connection between the CPU 1516F controller and the frequency converter. ( → Devices & networks → Network view → Ø Go online)

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Project tree		062-101 Frequency Converter G120 PN S7-1500 → Devices & networks	_ # = ×
Devices			Network view 🕅 Device view
<b>₫00</b>	• <b>•</b>	💦 Network 🔡 Connections 🛛 HMI connection 🔍 🕎 📆 🖽 🔍 ±	4
Go2-101 Frequency Converter G120 PN S     Add new device     Devices & networks     CPU1516F [CPU 1516F-3 PWDP]     Device configuration	••	CPU1516F CPU 1516F	Netwo
Online & diagnostics     Grine & diagnostics	•	PN/IE_1	- K da 2 da
Cell PLC data types     Cell PLC data types     Cell PLC data types	•	< III > 100%	
Say Watch and Otce tables      Say Watch and Otce tables      Say Traces      Program info      Say Device proxy data      Collemans		General Cross-references Compile	
Text lists     Text lists     Text lists	•	Message Go to ?     Connected to Drive_G120_conveyor, address IP=192.168.0.6.	Date         Time           8/31/2016         5:04:37 PM

# 7.8 Diagnostics with SINAMICS Startdrive for frequency converter G120

→ The "Control/status words' can also be monitored in the frequency converter. This is available under 'Online & Diagnostics' ( → Drive\_G120\_conveyor → Online & diagnostics → Diagnostics → Control/status word → <sup>G</sup> Go online )

ect Edit View Insert Online Options 🎦 🔒 Save project 📇 💥 🛅 🗎 🗙 🏹		🖡 Go online 🖉 Go offline 🛔 🕼 🎼 🥂 🖃 🛄	Totally Integrated Automation PORT
Project tree	● 062-101 Frequency Cor	verter G120_PN S7-1500  Drive_G120_conveyor [G120_CU250S-2 PN Vector]  Onlin	e & diagnostics 🛛 🗕 🖬 🔳
Devices			
300 III	-	0 (Active •	
062-101 Frequency Converter G120 PN	Online access  Diagnostics	Control/status word	
Add new device	Diagnostics general		
h Devices & networks	Active messages	The signals actually evaluated or used by the controller are displayed here.	
<ul> <li>CPU1516F [CPU 1516F-3 PN/DP]</li> <li>Drive_G120_conveyor [G120 CU;</li> </ul>	Message history	Where the signals come from, can be seen in the individual parameter screen forms.	
Device configuration	Control/status word Drive enable signals	The communication screen forms show the communication interconnections.	
2 Parameter	Safety diagnostics	Show/hide texts	Showhide texts
Commissioning     Online & diagnostics	Functions	Control word 1	Supplementary control word
Traces	Backing up/reset		
Common data		0 🚇 ON/OFF1 [0=No, 1=Yes]	0
Documentation settings		1 OC / OFF2 [0=No, 1=Yes]	1 Fixed setp bit 1 [0=No, 1=Yes]
Canguages & resources     Online access		2 🔒 OC / OFF3 [0=No, 1=Yes]	2 Fixed setp bit 2 [0=No, 1=Yes]
Card Reader/USB memory		3	3 Fixed setp bit 3 [0=No, 1=Yes]
		4 🥥 Ramp-function generator enable [0=No, 1=Yes]	4 ODS select. bit 0 [0=No, 1=Yes]
		5 🥥 Continue ramp-function generator [0=No, 1=Yes]	5 ODS select. bit 1 [0=No, 1=Yes]
		6 🥥 Speed setpoint enable [0=No, 1=Yes]	8 _ Technology controller enable [0–No, 1–
		7 O Acknowledge fault [0=No, 1=Yes]	9 OC braking enable [0=No, 1=Yes]
		8 🕥 Jog bit 0 [0=No, 1=Yes]	11 O Droop enable [0=No, 1=Yes]
		9 🕒 Jog bit 1 [0=No, 1=Yes]	12 O Torque control active [0=No, 1=Yes]
		10 🥥 Master ctrl by PLC [0=No, 1=Yes]	13 🥥 External fault 1 (F07860) [0=Yes, 1=No
		11 O Direction reversal (setpoint) [0=No, 1=Yes]	15 _ CDS bit 1 [0=No, 1=Yes]
		13 O Motorized potentiometer raise [0=No, 1=Yes]	
		14 O Motorized potentiometer lower [0=No, 1=Yes]	
		15 _ CDS bit 0 [0=No, 1=Yes]	
	>	K	>
Details view			Properties 🚯 Info 🚯 🖏 Diagnostics 👘 🖃 🚍

 $\rightarrow$  Under 'Drive enable signals' you also see the missing enables in order to be able to start the motor. (  $\rightarrow$  Drive enable signals )

Magnetic Siemens - D:\00_TIA_Portal\062-101 Frequency (	Converter G120 PN S7-1500\0	62-101 Frequency Converter G120 PN \$7-1500	_ 🗆 X
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Project tree	rter G120 PN S7-1500 🕨	Drive_G120_conveyor [G120 CU250S-2 PN Vector] > Online & diagnostics	_ <b>- -</b> × (
Devices	DDS: 0 (Active CDS: Online access		Tasks
Obs2-101 Frequency Converter G120 Ph     Add new device     Add new device     Drives & networks     GrU1516F (CPU 1516F-3 PWDP)     Orive G120_conveyor [G120_CU2     Drive G120_conveyor [G120_CU2     C120_conveyor [G120_CU2     Drive G120_conveyor [G120_CU2     Drive G120	<ul> <li>Diagnostics general Active messages Message history Controllstatus word</li> <li>Drive enable signals Safety diagnostics</li> <li>Functions Backing up/reset</li> </ul>	Drive enable signals         If the setpoint is specified via p1070 (main setpoint), the drive can only be traversed when all enables are available. If an additional setpoint input is used, the drive can already be traversed even when certain enables are missing.         The following enables are missing:         0	3 Libraries
> Details view		🖳 Properties 🚺 Info 🔒 🗓 Diagnostics	
◆ Portal view	Online & dia	Connected to CPU1516F, address	; IP=1 IIIIII

→ Under 'Active messages' you see pending faults and warnings. You can click the ' $\checkmark$ ' icon to acknowledge these. ( → Active messages →  $\checkmark$  )

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Project tree 🔲 🖣	Converter G120 PN S7-150	0 🕨 Di	ive_G120_convey	or [G120 CU2505	-2 PN Vector	r] > Online & diagnostics	_ 🖬 🖬 🗙
Devices       Image: Converter G120 PN 57-1         Image: Add new device       Image: Converter G120 PN 57-1         Image: Add new device       Image: Converter G120 PN 57-1         Image: Add new device       Image: Converter G120 PN 57-1         Image: Add new device       Image: Converter G120 PN 57-1         Image: Converter G120 CU250s-1       Image: Cu250s-1         Image: Converter G120 CU250s-1       Image: Converter G120 Cu250s-1	DDS:     0 (Active)     CDS:     CD       Online access     Diagnostics general       Active messages       Message history       Controlisatus word       Drive enable signals       Safety diagnostics       Functions       Backing up/reset	Activ Fau 1 2 3 4 5 6 7 8 8 Ala	e messages Fault buffer Fault 1 Fault 2 Fault 3	Fault code 8501 8501 8501	PROFINET: Se	etpoint timeout etpoint timeout etpoint timeout	
¢ III >		<			Properties	Linfo Diagnostics	

 $\rightarrow$  The values can also be monitored online in the 'Functional View' of 'Parameter'. (  $\rightarrow$  Parameter  $\rightarrow$  Functional View )

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## 7.9 Archiving the project

→ Finally, the complete project will be archived. In the menu item → 'Project', select → 'Archive...'. Open a folder in which you want to archive your project and save your project as the file type 'TIA Portal project archive'. ( → Project → Archive → TIA Portal project archives → SCE\_EN\_062-101 Frequency Converter G120 and S7-1500.... → Save )

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# 7.10 Checklist – step-by-step instructions

The following checklist helps trainees/students to independently check whether all steps of the step-by-step instruction have been carefully completed and enables them to successfully complete the module on their own.

No.	Description	Checked
1	Frequency converter SINAMICS G120 with Control Unit CU250S-PN Vector created as distributed IO of the CPU1516F- 3 PN/DP.	
2	Device configuration with the frequency converter G120 as device loaded successfully into the CPU1516F-3 PN/DP.	
3	Device name of the Control Unit CU250S-PN Vector assigned.	
4	SINAMICS G120 frequency converter with induction motor parameterized in SINAMICS Startdrive.	
5	Parameter assignment successfully loaded from SINAMICS Startdrive into the SINAMICS G120 frequency converter.	
6	Induction motor tested successfully in operation with SINAMICS G120 frequency converter via control panel.	
7	Data block 'FREQUENCY_CONVERTER' [DB4] created.	
8	Program changes carried out in Main [OB1].	
9	Compiling and downloading of the program blocks is successful and without error message.	
10	Switch on system (-K0 = 1) Cylinder retracted/feedback activated (-B1 = 1) EMERGENCY STOP (-A1 = 1) not activated AUTOMATIC mode (-S0 = 1) Automatic stop pushbutton not actuated (-S2 = 1) Briefly actuate automatic start pushbutton (-S1 = 1) Sensor part at slide activated (-B4 = 1) Then the induction motor is switched on via the frequency converter and remains active $\rightarrow$ Motor ON	
11	Sensor at conveyor end activated (-B7 = 1) $\rightarrow$ Motor OFF (after 2 seconds)	
12	Briefly actuate automatic stop pushbutton (-S2 = 0) $\rightarrow$ Motor OFF	
13	Activate EMERGENCY STOP (-A1 = 0) $\rightarrow$ Motor OFF	
14	Operating mode manual (-S0 = 0) $\rightarrow$ Motor OFF	
15	Switch off system (-K0 = 0) $\rightarrow$ Motor OFF	
16	Cylinder not retracted (-B1 = 0) $\rightarrow$ Motor OFF	
17	Project archived successfully.	

# 8 Exercise

### 8.1 Task - exercise

The maximum speed of the motor was limited to 500.00 1/min by the parameter assignment Adjust the normalization in both blocks "MOTOR\_ SPEEDCONTROL" [FC10] and "MOTOR\_SPEEDMONITORING" [FC11] correspondingly so that calculation can be carried out with the suitable physical values.

## 8.2 Technology schematic diagram

At this point you see the technology schematic diagram for the task.



Figure 5: Technology schematic diagram

Schalter der Sortieranlage Switches of sorting station	Automatikbetrieb Automatic mode -P5 gestante/started	Handbetrieb / Manual mode -S3 Tippbetrieb -M1 vorwärts/ Manual -M1 forwards
-Q0 Hauptschalter/Main switch	S1 Start/start	-S4 Tippbetrieb -M1 rückwärts/ Manual -M1 backwards
-P4 aktiviert/active -P4 aktive -P4 aktiv	-S2 Stopp/stop	-P7 ausgefahren/extended -S6 Zylinder -M4 ausfahren/ cylinder -M4 extend -S5 Zylinder -M4 einfahren/ cylinder -M4 retract

Figure 6: Operator panel

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# 8.3 Reference table

DI	Туре	ID	Function	NC/NO
I 0.0	BOOL	-A1	Return signal emergency stop ok	NC
I 0.1	BOOL	-K0	Main switch "ON"	NO
l 0.2	BOOL	-S0	Mode selector manual (0)/automatic (1)	Manual = 0
I 0.3	BOOL	-S1	Pushbutton automatic start	NO
I 0.4	BOOL	-S2	Pushbutton automatic stop	NC
I 0.5	BOOL	-B1	Sensor cylinder -M4 retracted	NO
I 1.0	BOOL	-B4	Sensor part at slide	NO
I 1.3	BOOL	-B7	Sensor part at end of conveyor	NO
ID256	STRUCT	PZD_IN_G120_01	Telegram 1 receive process data from G120 conveyor1	

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

DO	Туре	ID	Function	
OD256	STRUCT	PZD_OUT_G120_01	Telegram 1 send process data to G120 conveyor1	

#### Legend for reference list

- DI Digital input DO Digital output
- AI Analog input AO Analog output
- I Input O Output
- NC Normally Closed
- NO Normally Open

# 8.4 Planning

Plan the implementation of the task by yourself

# 8.5 Checklist – exercise

The following checklist helps trainees/students to independently check whether all steps of the exercise have been carefully completed and enables them to successfully complete the module on their own.

No.	Description	Checked
1	Program changes carried out in MOTOR_SPEEDCONTROL" [FC10].	
2	Program changes carried out in MOTOR_ SPEED_MONITORING" [FC11].	
3	Compiling and downloading of the program blocks is successful and without error message.	
4	Switch on system (-K0 = 1) Cylinder retracted/feedback activated (-B1 = 1) EMERGENCY STOP (-A1 = 1) not activated AUTOMATIC mode (-S0 = 1) Automatic stop pushbutton not actuated (-S2 = 1) Briefly actuate automatic start pushbutton (-S1 = 1) Sensor part at slide activated (-B4 = 1) Then the induction motor is switched on via the frequency converter and remains active. $\rightarrow$ Motor ON The speed corresponds to the speed setpoint in the range of +/- 50 1/min	
5	Sensor at conveyor end activated (-B7 = 1) $\rightarrow$ Motor OFF (after 2 seconds).	
6	Briefly actuate automatic stop pushbutton (-S2 = 0) $\rightarrow$ Motor OFF	
7	Activate EMERGENCY STOP (-A1 = 0) $\rightarrow$ Motor OFF	
8	Operating mode manual (-S0 = 0) $\rightarrow$ Motor OFF	
9	Switch off system (-K0 = 0) $\rightarrow$ Motor OFF	
10	Cylinder not retracted (-B1 = 0) $\rightarrow$ Motor OFF	
11	Speed > Speed limit fault max. $\rightarrow$ Motor OFF	
12	Speed < Speed limit fault min. $\rightarrow$ Motor OFF	
13	Project archived successfully.	

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# 9 Additional information

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

siemens.com/sce/drives

Preview "Additional information" - In preparation

## **Further information**

Siemens Automation Cooperates with Education siemens.com/sce

SCE Learn-/Training Documents siemens.com/sce/documents

SCE Trainer Packages siemens.com/sce/tp

SCE Contact Partners siemens.com/sce/contact

Digital Enterprise siemens.com/digital-enterprise

Industrie 4.0 siemens.com/future-of-manufacturing

Totally Integrated Automation (TIA) siemens.com/tia

TIA Portal siemens.com/tia-portal

SIMATIC Controller siemens.com/controller

SIMATIC Technical Documentation siemens.com/simatic-docu

Industry Online Support support.industry.siemens.com

Product catalogue and online ordering system Industry Mall **mall.industry.siemens.com** 

Siemens Digital Industries, FA P.O. Box 4848 90026 Nuremberg Germany

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