

SINAMICS G115D

Praktická ukázka uvedení do provozu

Siemens Drives Days 2021, Dolní Morava

I Kdo prezentuje

Adam Koncer

Application engineer
Siemens, s.r.o.
RC-CZ DI MC GMC

Budova A3, 5.NP
Škrobárenská 511/5
602 00 Brno, Česká republika

Mobile +420 721 560 462
E-mail adam.koncer@siemens.com



Democase G115D

Užitečné odkazy:

SINAMICS G: Speed Control of a G120 (StartDrive) with S7-1200 via PROFINET/PROFIBUS DP with Safety Integrated (via Terminal) and HMI

<https://support.industry.siemens.com/cs/cz/en/view/70155469>

Controlling a SINAMICS G120 via PROFIsafe with a SIMATIC S7-1200 F-CPU

<https://support.industry.siemens.com/cs/cz/en/view/109746271>

SINAMICS Blocks DriveLib for the control in the TIA Portal

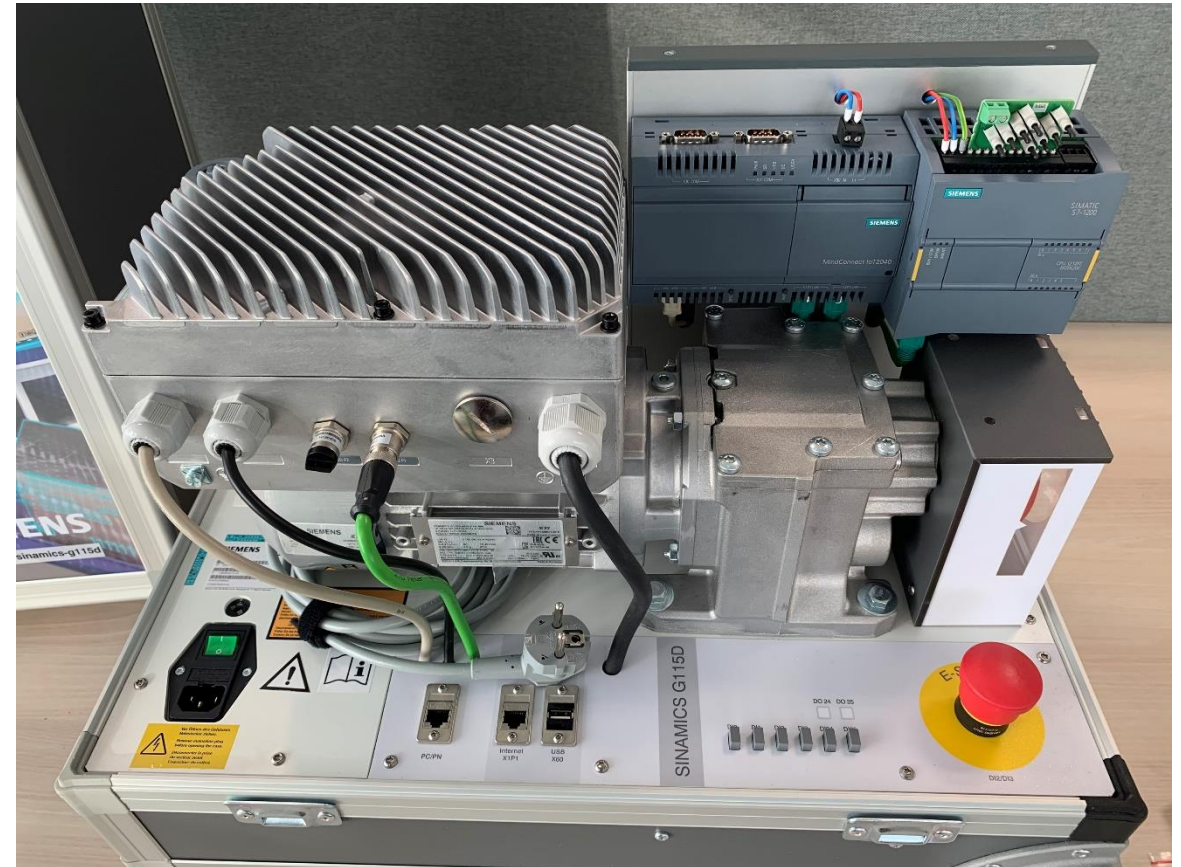
<https://support.industry.siemens.com/cs/cz/en/view/109746271>

Function block for the SINAMICS G115D additional telegram

<https://support.industry.siemens.com/cs/ww/en/view/109799886>

SIMATIC S7-1200 / 1500: Encoderless Positioning with SINAMICS G

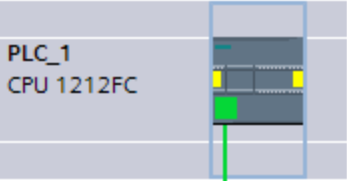
<https://support.industry.siemens.com/cs/ww/en/view/109767951>



SINAMICS G115D training case 6AG1067-1AA38-0AA0



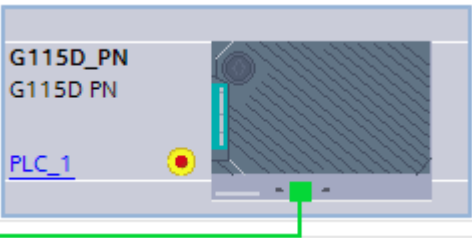
SIMATIC S7-1212FC



SIMATIC IOT2040



SINAMICS G115D PN



2KJ8102-2CF10-3GX1-Z D0X

<https://mall.industry.siemens.com/mall/en/hu/Catalog/Product/6AG1067-1AA38-0AA0>

Vytvoření nového projektu

Ukázka provedena v TIA Portal V16 & Startdrive V16

1. Vytvoření nového projektu.

2. Zadáme jméno projektu a cestu, kde bude projekt uložen.

3. Vytvoříme projekt.

4. Přejdeme do projektového zobrazení.

Nastavení IP adresy PC, připojení se k demokufru

1. Nastavíme IP vlastního PC tak, abychom byli ve stejném adresovém rozsahu jako zařízení, které oživujeme, např. 192.168.1.77.

2. Připojíme se kabelem k demokufru. Pod síťovou kartou, kterou jsme k zařízením připojení zvolíme možnost Update accessible devices, zobazí se zařízení, které jsou na síti dostupná.

Internet Protocol Version 4 (TCP/IPv4) – vlastnosti

Obecné

Podporuje-li síť automatickou konfiguraci IP, je možné získat nastavení protokolu IP automaticky. V opačném případě vám správné nastavení poradí správce sítě.

Získat IP adresu ze serveru DHCP automaticky

Použít následující IP adresu:

IP adresa: 192 . 168 . 1 . 77

Maska podsítě: 255 . 255 . 255 . 0

Výchozí brána: . . .

Získat adresu serveru DNS automaticky

Použít následující adresy serverů DNS:

Upřednostňovaný server DNS: . . .

Alternativní server DNS: . . .

Při ukončení ověřit platnost nastavení

Upřesnit...

OK Zrušit

Message	Go to	Date	Time
Project G115D_Commissioning created.		7/19/2021	7:58:38 AM
Scanning for devices: on interface Intel(R) Ethernet Connection (7) I219-LM was started.		7/19/2021	8:02:41 AM
Scanning for devices: completed for interface Intel(R) Ethernet Connection (7) I219-LM. Found 1 device.		7/19/2021	8:02:51 AM
Start upload from device		7/19/2021	8:03:13 AM
Upload from device finished (errors: 0; warnings: 0).		7/19/2021	8:05:02 AM

Nastavení IP adresy PC, připojení se k demokufru

1. U PLC pod záložkou Online & Diagnostics nastavíme IP např. na 192.168.1.51 a PN jméno *plc_1*.

2. Obdobně nastavíme IP a jméno na G115D, např. 192.168.1.51 a PN jméno *g115d*.

The screenshot shows the Siemens TIA Portal software interface. The main window displays the 'Diagnostics general' configuration for a device. The 'Manufacturer' is set to 'SIEMENS AG', 'Short designation' is 'G115D PN', and 'Order number' is 'XAMD04-022741 5AF0'. The 'Serial number' is 'SXAMD07-021223Z', 'Hardware' is 'A-01', 'Firmware' is 'V4.7 SP13 HF1', 'Profile' is 'PROFdrive', and 'Profile details' is '00000'. The 'Build' is 'V04.71.52.05'. The 'Details view' at the bottom shows a message log with the following entries:

Name	Message	Go to	Date	Time
	Project G115D_Commissioning created.		7/19/2021	7:58:38 AM
	Scanning for devices: on interface Intel(R) Ethernet Connection (7) I219-LM was started.		7/19/2021	8:02:41 AM
	Scanning for devices: completed for interface Intel(R) Ethernet Connection (7) I219-LM. Found...		7/19/2021	8:02:51 AM
	Start upload from device		7/19/2021	8:03:13 AM
	Upload from device finished (errors: 0; warnings: 0).		7/19/2021	8:05:02 AM

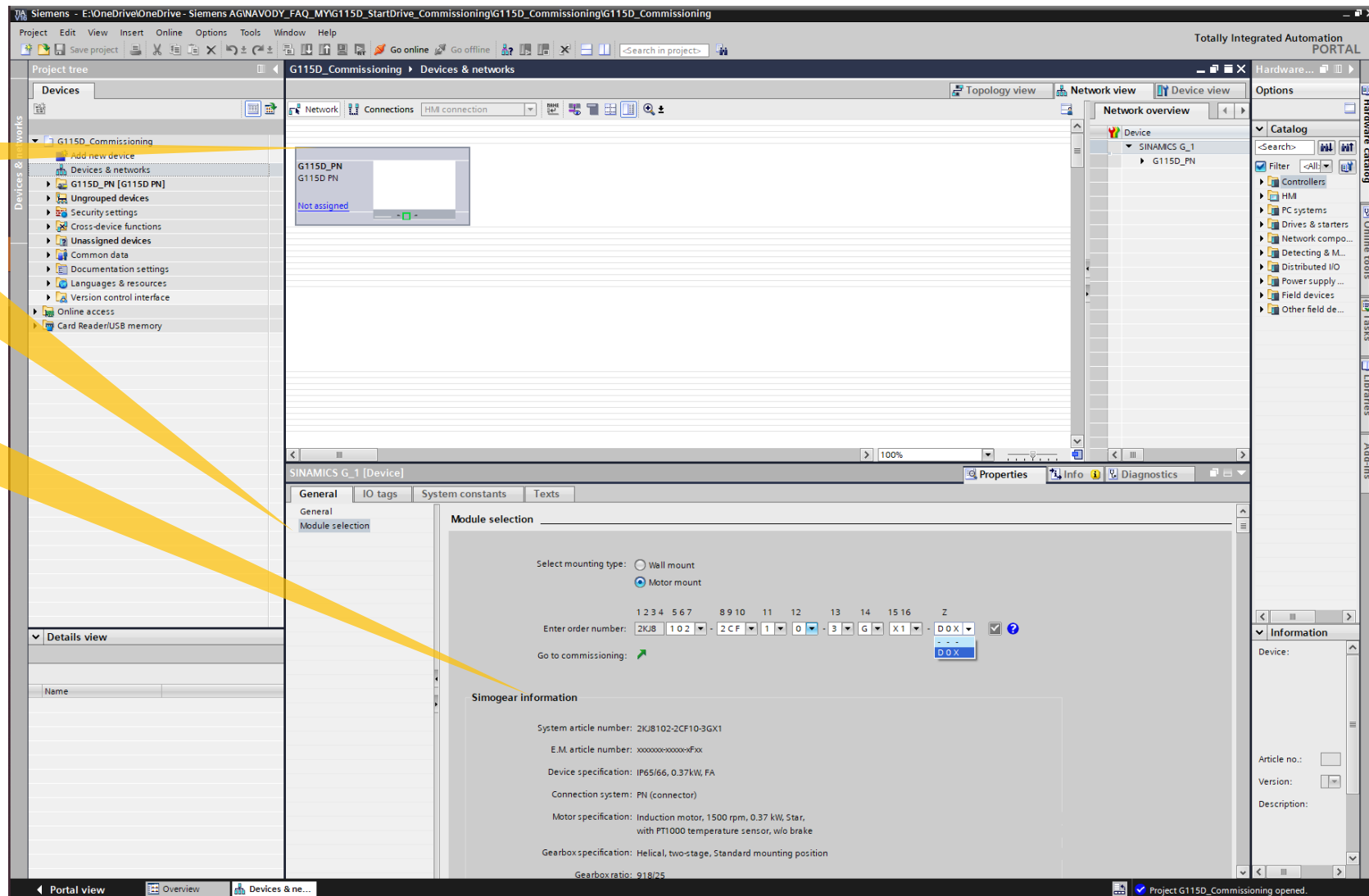
3. Po nastavení IP a PN jmen opět vyhledáme zařízení na síti, pokud mají zařízení IP a PN jméno a jsme s vlastním PC ve stejném subnetu – můžeme zobrazit typ zařízení, MLFB číslo, FW verzi atd. (tak je to mu u PLC i u pohonu).

1. varianta – stažení měniče do projektu

1. Měnič se stáhnul do projektu. Klikneme na měnič.

2. Záložka *Module selection*.

3. Objednací číslo se stáhnulo správně. Je však nutno v čísle udělat změnu a poté ji vrátit zprátky (chyba v SW).



1. varianta – stažení měniče do projektu

1. Nyní můžeme akceptovat
objednací číslo měniče.

2. V HW configu se poté
změní grafika měniče, takto:

The screenshot displays the Siemens TIA Portal software interface. The top menu bar includes Project, Edit, View, Insert, Online, Options, Tools, Window, and Help. The main workspace shows a network diagram with a device labeled 'G115D_PN' and 'G115D PN' marked as 'Not assigned'. The Properties window at the bottom is open to the 'Module selection' tab, showing the following information:

- General**
 - Catalog information
 - Module selection
 - PROFINET interface [X...]
- General**
 - Select mounting type: Wall mount, Motor mount
 - Enter order number: 2KJ8 1.02 - 2CF 1 0 - 3 6 X 1 - 00X
 - Go to commissioning:
 - Accept article number
- Simogear information**
 - System article number: 2KJ8102-2CF10-3GX1
 - E.M. article number: xxxxxxxxxx9Fxx
 - Device specification: IP65/66, 0.37kW, FA
 - Connection system: PN (connector)
 - Motor specification: Induction motor, 1500 rpm, 0.37 kW, Star, with PTT1000 temperature sensor, w/o brake
 - Gearbox specification: Helical, two-stage, Standard mounting position
 - Gearbox ratio: 918/75

1. varianta – stažení CPU do projektu

1. Otevřeme HW katalog.

2. Do projektu vložíme *Unspecified CPU 1200*.

The screenshot displays the Siemens TIA Portal interface. The 'Hardware catalog' is open on the right, showing a tree view of SIMATIC 57-1200 components. The 'Unspecified CPU 1200' is selected. The 'Network overview' shows a network diagram with a PLC_1 device. The 'Project tree' on the left shows the project structure. The 'Messages' window at the bottom shows a log of events.

Message	Go to	Date	Time
Project G115D_Commissioning opened.		7/19/2021	10:11:52 AM
Scanning for devices: on interface Intel(R) Ethernet Connection (7) I219-LM was started.		7/19/2021	10:27:12 AM
SINAMICS drive: Communication: Failed to connect to target!		7/19/2021	10:28:18 AM
SINAMICS drive: Communication: Failed to connect to target!		7/19/2021	10:28:46 AM
Scanning for devices: completed for interface Intel(R) Ethernet Connection (7) I219-LM. Found 1 device.		7/19/2021	10:28:46 AM
g115d: Communication: Failed to connect to target!		7/19/2021	10:29:08 AM
Scanning for devices: on interface Intel(R) Ethernet Connection (7) I219-LM was started.		7/19/2021	10:29:25 AM
g115d: Communication: Connection request actively refused by target device or a network ...		7/19/2021	10:29:25 AM
Scanning for devices: completed for interface Intel(R) Ethernet Connection (7) I219-LM. Found 1 device.		7/19/2021	10:29:32 AM
Start upload from device		7/19/2021	10:29:34 AM
Upload from device finished (errors: 0; warnings: 0).		7/19/2021	10:30:47 AM
The device was reset.		7/19/2021	10:34:35 AM
Scanning for devices: on interface Intel(R) Ethernet Connection (7) I219-LM was started.		7/19/2021	10:34:46 AM
Scanning for devices: completed for interface Intel(R) Ethernet Connection (7) I219-LM. Found 1 device.		7/19/2021	10:34:52 AM

1. varianta – stažení CPU do projektu

1. Klikneme na CPU a přepneme se do *Device view*.

2. Zvolíme možnost detekce zařízení.

3. Zvolíme PC interface, vyhledáme zařízení na síti.

4. Nalezené zařízení zvolíme jako odpovídající a potvrdíme.

The screenshot displays the Siemens TIA Portal software interface. The main window shows the 'Device view' for a PLC_1 [Unspecific CPU 1200]. A 'Hardware detection for PLC_1' dialog box is open, showing the 'Compatible accessible nodes of the selected interface' table. The table lists the following data:

Device	Device type	Interface type	Address	MAC address
plc_1	CPU 1212FC DCU...	PN/IE	192.168.1.51	E0-DC-A0-EC-D2-6F

The dialog box also includes a 'Flash LED' checkbox and a 'Start search' button. Below the dialog box, a message box shows the following log entries:

- Project G115D_Commissioning opened.
- Scanning for devices on interface Intel(R) Ethernet Connection (7) I219-LM was started.
- SINAMCS drive: Communication: Failed to connect to target!
- SINAMCS drive: Communication: Failed to connect to target!
- Scanning for devices completed for interface Intel(R) Ethernet Connection (7) I219-LM. Four...
- g115d: Communication: Failed to connect to target!
- Scanning for devices on interface Intel(R) Ethernet Connection (7) I219-LM was started.
- g115d: Communication: Connection request actively refused by target device or a network ...
- Scanning for devices completed for interface Intel(R) Ethernet Connection (7) I219-LM. Foun...
- Start upload from device
- Upload from device finished (errors: 0; warnings: 0).
- The device was reset.
- Scanning for devices on interface Intel(R) Ethernet Connection (7) I219-LM was started.
- Scanning for devices completed for interface Intel(R) Ethernet Connection (7) I219-LM. Foun...

The 'Information' panel at the bottom right shows the device details:

- Device: 57-1200 CPU
- Article no.:
- Version:
- Description: 57-1200 CPU

1. varianta – měnič i CPU staženy v projektu

1. V projektu je aktuálně stažen měnič i PLC.

2. Klikneme na zařízení, v dolní části můžeme procházet jeho vlastnosti – FW, typ, IP i PN jméno sedí s údaji, které jsme v online nastavili.

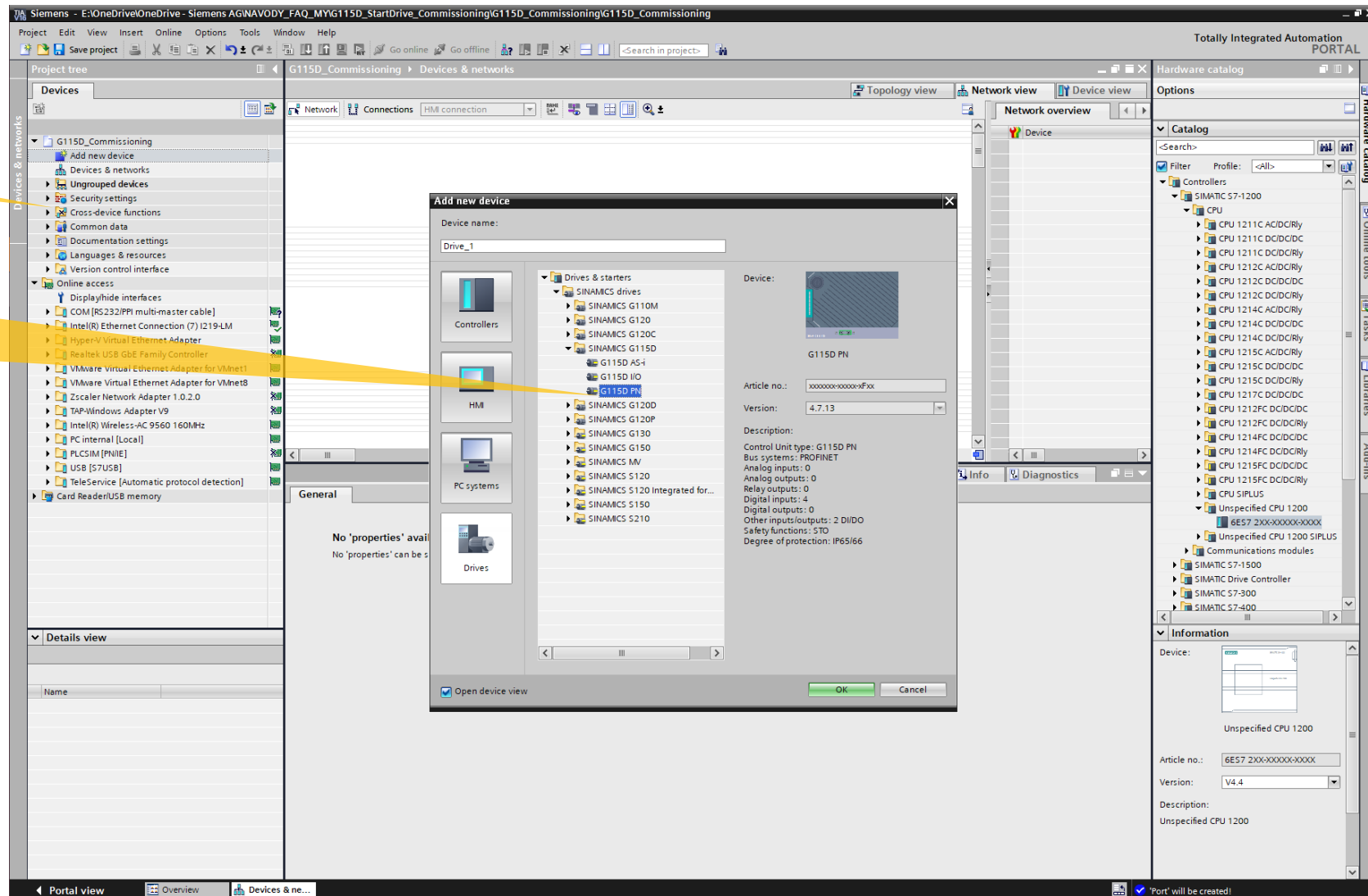
The screenshot displays the Siemens TIA Portal interface for a project named 'G115D_Commissioning'. The 'Project tree' on the left shows the project structure, including 'Devices & networks' and 'Online access'. The 'Network overview' in the center shows a network diagram with two devices: 'G115D_PN' (G115D PN) and 'PLC_1' (CPU 1212FC). The 'Hardware catalog' on the right shows a list of devices, including 'SINAMICS G_1' and 'S7-1200 station_1'. The 'Properties' window at the bottom is open for the 'G115D_PN' device, showing the following details:

Field	Value
Name	G115D_PN
Author	z00398zb
Comment	
Short designation	G115D_PN
Description	Safety functions: STO Voltage range: 380-480 V Power (HO): 0.37 kW Power (LO): 0.37 kW Regenerative feedback (to the supply system): no Braking function: motor holding brake, DC braking, compound braking, dynamic braking Degree of protection: IP65/66
Article number	6ES7 2XX-0XXE50-3FAx
Firmware version	4.7.13

2. varianta – vložení měniče do projektu (z HW katalogu)

1. V projektovém stromu zvolíme možnost *Add new device*

2. Vybereme zařízení, které chceme vložit, v našem případě je to *SINAMICS G115D – G115D PN FW 4.7.13*



2. varianta – vložení měniče do projektu (z HW katalogu)

1. Kliknem na měnič, *device view*.

2. Vyplníme montážní typ měniče a objednáací číslo.

3. Potvrdíme.

The screenshot displays the Siemens AGNAVODY software interface for configuring a drive. The main window is titled "G115D_Commissioning" and shows a "Drive_1 [G115D PN]" configuration. The interface is divided into several panes:

- Project tree (left):** Shows a hierarchical view of the project structure, including "Devices", "G115D_Commissioning", and "Drive_1 [G115D PN]".
- Device overview (top right):** A table showing the configuration of the drive modules. The table has columns for "Module", "Slot", "Type", and "Ar...". The data shown is:

Module	Slot	Type	Ar...
Drive_1	0	G115D PN	xx...
PROFINET interface	0 X150	PROFINET interface	
	0 3		
- Hardware catalog (right):** Shows the "Options" and "Catalog" sections, with a search bar and filter options.
- Properties (bottom):** A "Module selection" dialog box is open, showing the "General" tab. It includes options for "Select mounting type" (Wall mount or Motor mount), "Enter order number" (2KJ8 102 2CF 1 0 3 G X1 00X), and "Go to commissioning".

Yellow callout boxes point to specific actions: 1. Clicking on the converter in the project tree. 2. Filling in the mounting type and order number in the module selection dialog. 3. Confirming the selection.

2. varianta – vložení měniče do projektu (z HW katalogu) nastavení IP a PN jména

1. Klikneme na měnič, tím se nám ve spodní části zobrazí jeho vlastnosti.

2. V záložce general můžeme zařízení přejmenovat.

3. Pod záložkou *PROFINET Interface [X150]* nastavíme IP adresu a PN jméno (totožnou se skutečností).

The screenshot displays the Siemens TIA Portal software interface. The top menu bar includes Project, Edit, View, Insert, Online, Options, Tools, Window, and Help. The main workspace shows a network diagram with a drive labeled 'Drive_1' and 'G115D PN'. The Properties window at the bottom is open to the 'General' tab, showing the 'Ethernet addresses' section with 'Subnet: Not networked' and 'IP address: 192.168.1.52'. The 'PROFINET' section shows 'PROFINET device name: G115D' and 'Converted name: g115d'. The hardware catalog on the right shows the selected device 'Unspecified CPU 1200'.

2. varianta – vložení CPU do projektu (z HW katalogu)

1. V projektovém stromu zvolíme možnost *Add new device*.

2. Vybereme zařízení, které chceme vložit, v našem případě je to *CPU 1212FC DC/DC/DC 6ES7 212-1AF40-0XB0 V4.4*.

The screenshot displays the Siemens TIA Portal interface. The 'Project tree' on the left shows the project structure under 'G115D_Commissioning'. The 'Add new device' dialog box is open, showing a list of controllers and CPUs. The selected device is 'CPU 1212FC DC/DC/DC 6ES7 212-1AF40-0XB0 V4.4'. The background shows the project tree and hardware catalog.

2. varianta – vložení CPU do projektu (z HW katalogu) nastavení IP a PN jména

1. Klikneme na CPU, tím se nám ve spodní části zobrazí jeho vlastnosti.

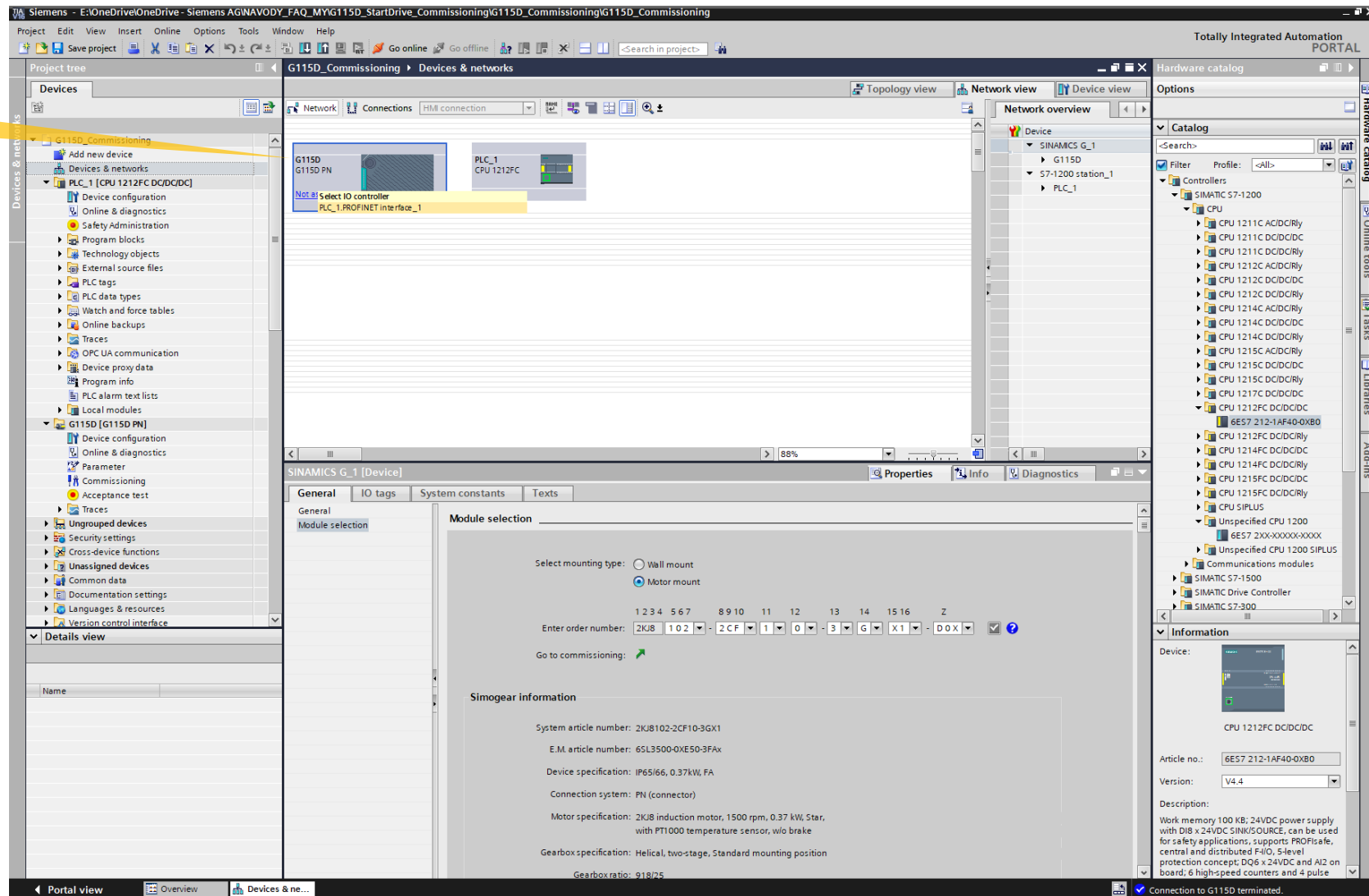
2. V záložce general můžeme zařízení přejmenovat.

3. Pod záložkou *PROFINET Interface [X1]* nastavíme IP adresu a PN jméno (totožnou se skutečností).

The screenshot displays the Siemens TIA Portal software interface. The main window shows a network diagram with a CPU 1212FC device. The 'Properties' window is open, showing the 'General' tab. Under 'Ethernet addresses', the 'Interface networked with' is set to 'Not networked'. The 'IP protocol' section has 'Set IP address in the project' selected, with an IP address of 192.168.0.51 and a subnet mask of 255.255.255.0. The 'PROFINET' section has 'Generate PROFINET device name automatically' checked, resulting in a device name of 'plc_1'. The hardware catalog on the right shows the selected CPU model: CPU 1212FC DC/DC/DC.

Nastavení IO controlleru

1. Jako IO controller měniče zvolíme *PLC_1*.



Nastavení telegramu

1. Klikneme na měnič

2. Ve spodní části se objeví vlastnosti měniče, pod záložkou *PROFINET interface [X150]* – *Telegram configuration* nastavíme telegram, kterým budeme přenášet data mezi měničem a PLC. Ukázka provedena pomocí telegramu 1.

Dále je u G115D komunikace rozšířena o 1/1 Word – přídavné slovo G115D. Význam slova popsán v následujícím slidu.

The screenshot displays the Siemens TIA Portal software interface. The main window shows a network diagram with a G115D inverter and a PLC_1 (CPU 1212FC) connected via a PROFINET IO system. The 'Properties' window for the G115D is open, showing the 'Telegram configuration' tab. The table below is a representation of the data shown in the software:

Name	Item	Link	Telegram	Length	Extension	Type	Partner
Send (Actual value)	1	Standard telegram 1		2 words	0 words	CD	PLC_1
Receive (Setpoint)		Standard telegram 1		2 words	0 words	CD	PLC_1
Send Extension (Actual va...)		Free telegram		1 words	—	CD	PLC_1
Receive Extension (Setpoi...)		Free telegram		1 words	—	CD	PLC_1
<Add telegram>							

The 'Details view' on the left shows the 'PROFINET interface [X150]' section, which is highlighted by a yellow callout. The 'Hardware catalog' on the right shows the selected device, CPU 1212FC DC/DC, with its article number (6ES7 212-1AF40-0XB0) and version (V4.4).

Nastavení telegramu

6.5.2 Telegrams

Telegrams that are available

The user data of the telegrams that are available are described in the following.

Telegram 1

PZD01	PZD02	PZD03 *	
STW1	NSOLL_A	STW_G115D	Receive user data
ZSW1	NIST_A	ZSW_G115D	Send user data

* PZD03 is valid only for Macro 67.

16-bit speed setpoint

Pozn. Sinamics G115D Operating instructions, kap. 6.5.

<https://support.industry.siemens.com/cs/ww/en/view/109782708>

Function block for the SINAMICS G115D additional telegram

<https://support.industry.siemens.com/cs/ww/en/view/109799886>

Zde je možno stáhnout FB pro tento telegram. Jeho použití bude ukázáno v další části prezentace.

6.5.5 Control and status word G115D

Control word G115D (STW_G115D)

Bit	Meaning	Description	Signal interconnection in the converter
0	1 = DO 24	Control via bidirectional DIO 24	p0738 = r2094.0
1	1 = DO 25	Control via bidirectional DIO 25	p0739 = r2094.1
2	1 = Stop/low speed sensor bypass	Activate or deactivate the stop/low speed sensor bypass for conveyor control	p3390 = r2094.2
6	Not used		
... 15			

Status word G115D (ZSW_G115D)

Bit	Meaning	Description	Signal interconnection in the converter
0	1 = DI 0	Status of the digital input 0	p2084[0] = r0722.0
1	1 = DI 1	Status of the digital input 1	p2084[1] = r0722.1
2	1 = DI 2	Status of the digital input 2	p2084[2] = r0722.2
3	1 = DI 3	Status of the digital input 3	p2084[3] = r0722.3
4	1 = DI 24	Status of the bidirectional digital input/output 24	p2084[4] = r0722.24
5	1 = DI 25	Status of the bidirectional digital input/output 25	p2084[5] = r0722.25
6	Not used		
7	Not used		
8	1 = Repair switch OFF	Repair switch is set to OFF and all power to the motor is terminated.	p2084[8] = r8559.12
9	1 = Remote control active	Remote control mode is activated via the LRC panel.	p2084[9] = r8559.2
10	1 = Manual mode active	Local control mode is activated via the LRC panel.	p2084[10] = r8559.3
11	1 = Sensor bypass activated	Stop/low speed sensor bypass is activated for the conveyor control.	p2084[11] = r8559.4
12	1 = Continuous motion activated	Continuous motion is activated via the LRC panel.	p2084[12] = r8559.5
13	1 = Jog left active	Motor Jogs to the left.	p2084[13] = r8559.6
14	1 = Jog right active	Motor Jogs to the right.	p2084[14] = r8559.7
15	Not used		

Význam jednotlivých bitů v komunikovaných wordech.

Průvodce pro uvedení do provozu měniče

1. V projektovém stromu – měnič – uvedení do provozu.

2. Spustíme průvodce při uvedení do provozu.

3. Zvolíme typ řízení

[0] U/f linární

[2] U/f parabolická char.

...

Vybereme:

[20] Vektorové řízení bez encoderu.

The screenshot shows the Siemens Commissioning Wizard interface. The 'Open-loop/closed-loop control type' dialog box is open, displaying a list of control types. The selected option is '[20] Speed control (encoderless)'. A yellow callout points to the 'Next >>' button at the bottom of the dialog box.

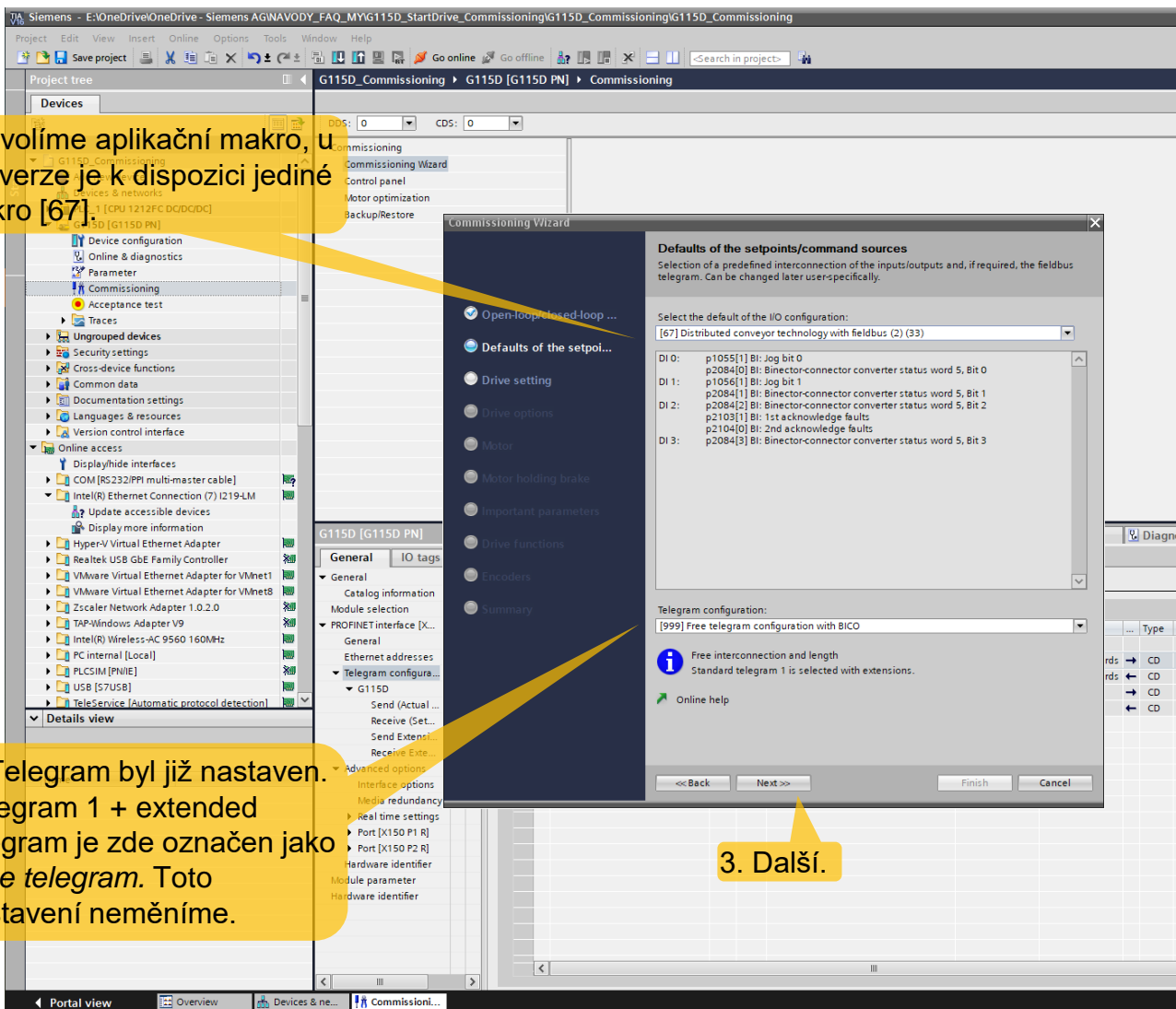
4. Další.

Průvodce pro uvedení do provozu měniče

1. Zvolíme aplikační makro, u PN verze je k dispozici jediné makro [67]

2. Telegram byl již nastaven. Telegram 1 + extended telegram je zde označen jako *Free telegram*. Toto nastavení neměníme.

3. Další.



4.12.2

Factory interface setting

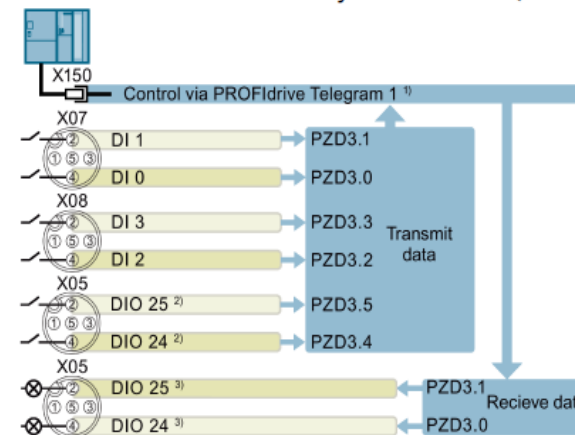
To ensure that the factory setting of the interfaces can be used, you must wire your drive as shown in the following examples.

See below for default macros for different communication variants of the G115D:

G115D communication variant	Default macro
PROFINET	Macro 67
AS-i	Macro 30
I/O	Macro 65

Macros for SINAMICS G115D PROFINET variant

Macro 67 - 4-DI decentral conveyor with fieldbus (default for the PROFINET variant)



¹⁾ Telegram 1 is extended to provide extra PZD bits (PZD3.x) for signal interconnections in the converter. For more information about the extended telegram 1, refer to Section "Drive control via PROFINET (Page 134)".

²⁾ Parameterized as digital inputs via p0728.

³⁾ Parameterized as digital outputs via p0728.

SINAMICS G115D distributed drive

Operating Instructions, 12/2020, FW V4.7 SP13, A5E48681219B-002

77

Průvodce pro uvedení do provozu měniče

The screenshot displays the Siemens TIA Portal interface during the commissioning of a G115D inverter. The 'Commissioning Wizard' dialog box is open, showing the 'Drive setting' step. The wizard includes a sidebar with options like 'Open-loop/closed-loop...', 'Defaults of the setpoint...', 'Drive setting', 'Drive options', 'Motor', 'Motor holding brake', 'Important parameters', 'Drive functions', 'Encoders', and 'Summary'. The main area shows 'Drive setting' with a dropdown for 'Standard' set to '[0] IEC (50 Hz line, SI units)'. Below it, 'Drive unit line supply voltage' is set to 400 V. A graph titled 'Permissible overload at high overload (HO)' shows a base load of 100% for 240s, with 150% overload for 57s and 200% overload for 3s. The 'Pulse frequency setpoint' is set to 4 kHz. A callout points to the 'Next' button.

1. Vstupní napětí měniče.

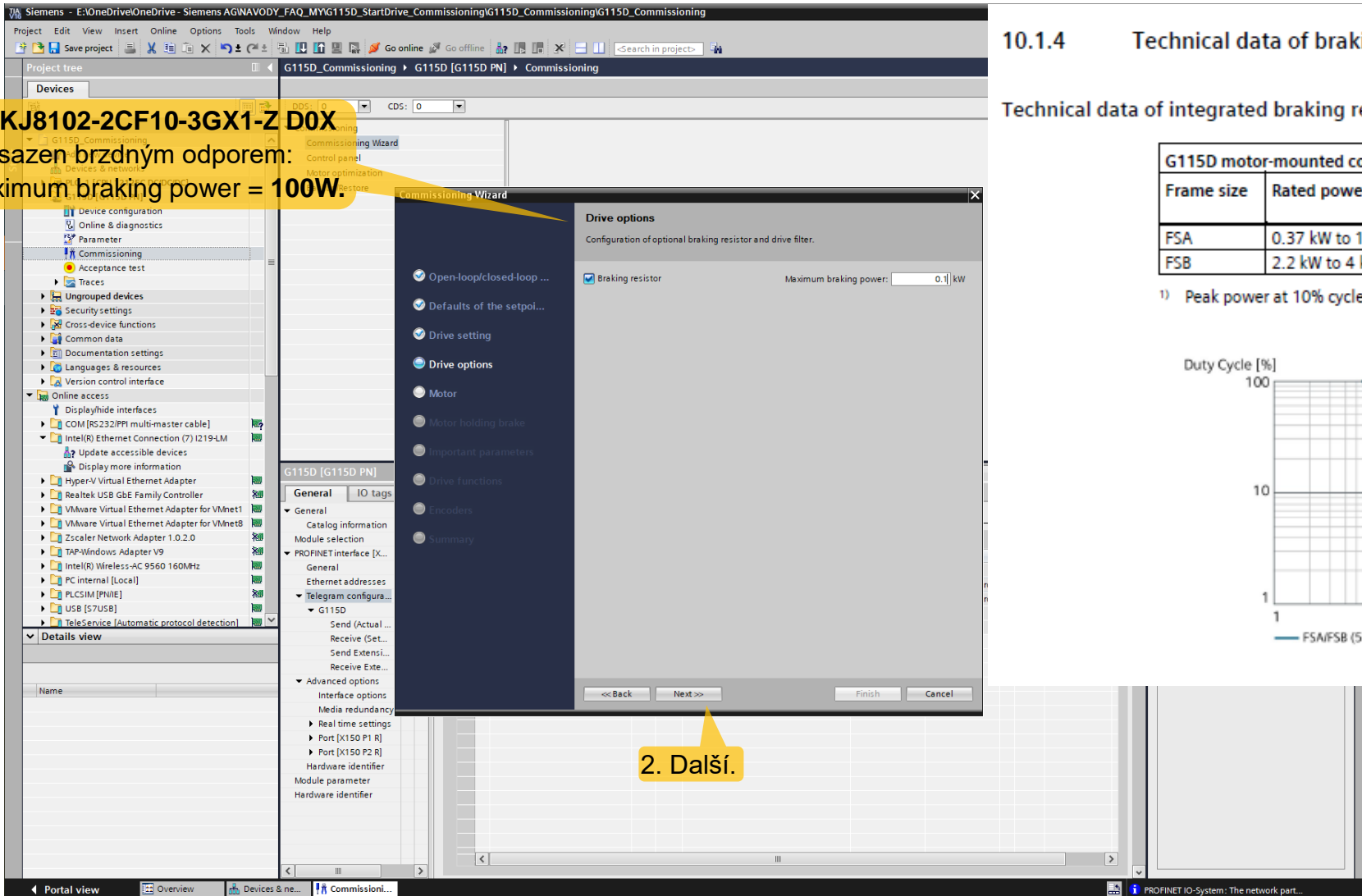
2. Zvolíme přetžitelnost měniče.

3. Nosná frekvence PWM.

4. Další

Průvodce pro uvedení do provozu měniče

1. 2KJ8102-2CF10-3GX1-Z D0X
je osazen brzdným odporem:
Maximum braking power = 100W.



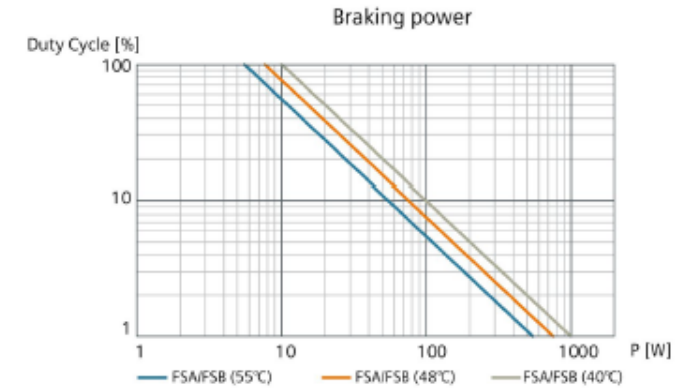
2. Další.

10.1.4 Technical data of braking resistors

Technical data of integrated braking resistor

G115D motor-mounted converter	Rated power	Integrated braking resistor		
		Resistance	Continuous braking power	Peak braking power ¹⁾
FSA	0.37 kW to 1.5 kW	350 Ω	10 W	100 W
FSB	2.2 kW to 4 kW	175 Ω	10 W	100 W

¹⁾ Peak power at 10% cycle time of a 120s cycle.



Průvodce pro uvedení do provozu měniče

The screenshot shows the Siemens TIA Portal interface during the commissioning of a G115D inverter. The 'Commissioning Wizard' is open, and the 'Motor' step is active. The wizard's sidebar on the left lists various configuration options, with 'Motor' selected. The main window displays the 'Motor' configuration page, which includes fields for 'Motor configuration', 'Select motor type', 'Motor information', 'Gear information', and 'Temperature sensor'. A table of motor information is visible:

Order number	Rated speed	Rated power	Code Number
2KJ8xxx-2CFxx-3xxx	1500 rpm	0.37 kW	18103

Below this, another table shows gear information:

Order number	Maximum speed	Maximum torque	Code Number	Gear ratio
2KJ8102-xxxxxxxX1	4500	4.25	102231	918/25

The 'Reverse the output phase sequence' is set to '[0] OFF'. At the bottom of the wizard, the 'Next >>' button is highlighted with a yellow callout. The 'Next >>' button in the wizard's footer is also highlighted with a yellow callout.

1. Typ motoru je dán objednacím číslem G115D. Štítkové parametry motoru proto není nutno zadávat.

2. Zde je možno změnit sled fází na výstupu měniče.

3. Další.

Průvodce pro uvedení do provozu měniče

The screenshot shows the Siemens SIMATIC Manager interface. The main window displays the 'Commissioning Wizard' for a G115D inverter. The wizard is currently at the 'Motor holding brake' step. The sidebar of the wizard shows a list of options, with 'Motor holding brake' selected. A yellow callout points to this option. The main area of the wizard shows the 'Motor holding brake configuration' dropdown menu, which is currently set to '[0] No motor holding brake available'. Another yellow callout points to the 'Next >>' button at the bottom of the wizard. The background shows the project tree on the left and the 'Options' and 'Languages & resources' panels on the right.

1. Osazení brzdy je dáno objednacím číslem G115D. Tento motor brzdou osazen není.

2. Další.

Průvodce pro uvedení do provozu měniče

The screenshot shows the Siemens TIA Portal interface during the commissioning of a G115D inverter. The 'Commissioning Wizard' is active, and the 'Important parameters' dialog box is open. The dialog box contains the following sections:

- Important parameters:** Specification of the most important dynamic response data.
- Synchronization of the speed of the drive with the speed of the PLC:**
 - Reference speed: 1500.000 rpm
 - Maximum speed: 1800.000 rpm
 - Increased Max.speed (120%)
- Configuration of ramp-up and ramp-down time:**
 - Ramp-up time: 1.000 s
 - OFF1 ramp-down time: 1.000 s
 - OFF3 (quick stop) ramp-down time: 0.000 s
- Configuration of the current limit:**
 - Current limit: 2.40 Arms

Informational text: "These OFF1 and OFF3 ramp-down times apply for faults or a Safe Stop."

Buttons: <<< Back, Next >>, Finish, Cancel

Callout 1: "1. Důležité parametry měniče." points to the 'Important parameters' option in the left sidebar.

Callout 2: "2. Další." points to the 'Next >>' button.

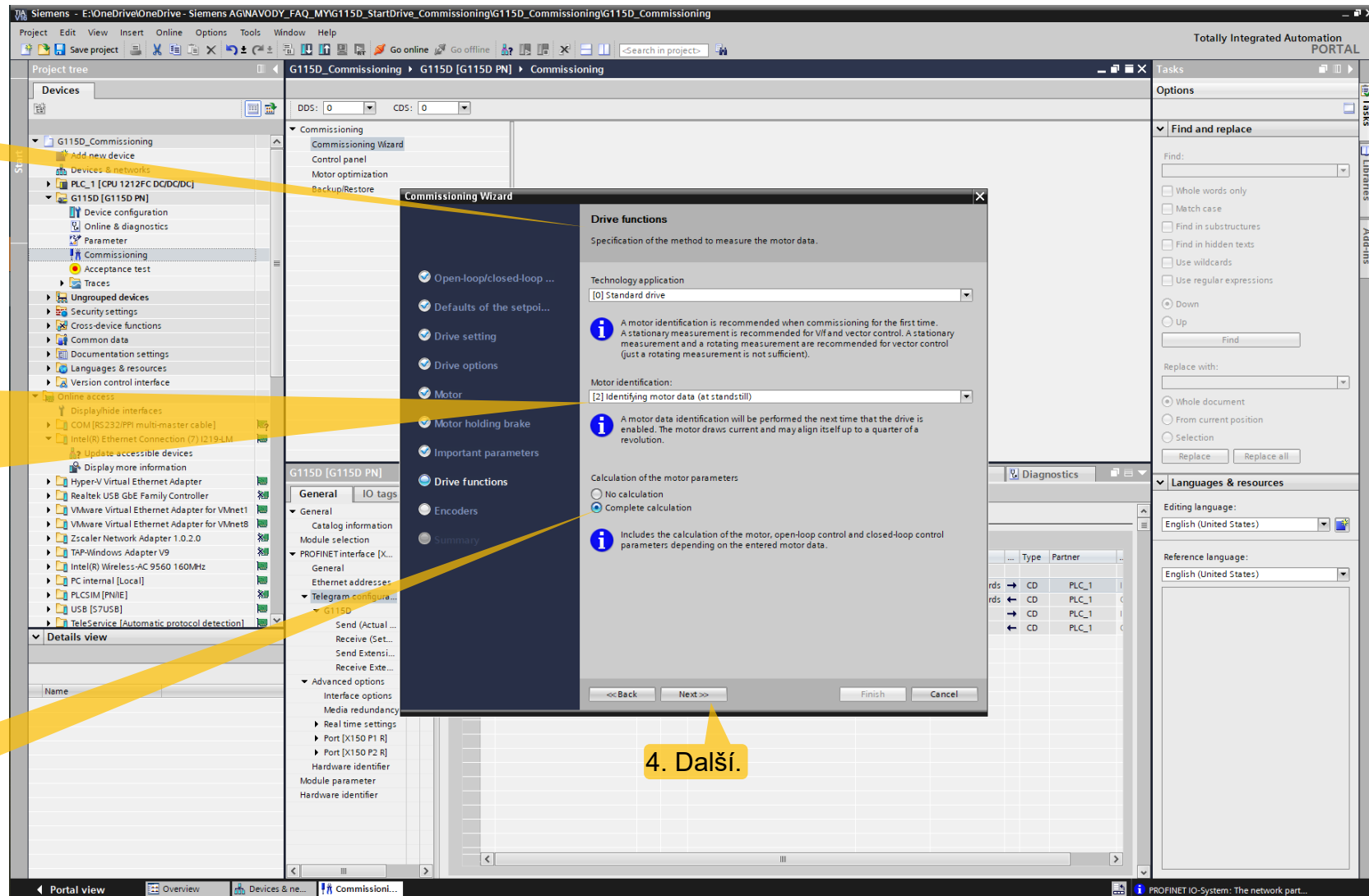
Průvodce pro uvedení do provozu měniče

1. Technologická aplikace – zvolíme dle typu zátěže.

2. Identifikace motoru zvolíme [2] *Identifying motor data (at standstill)* – statické měření na motoru, při prvním požadavku na chod budou proměřena vinutí motoru, při dalším požadavku na chod se již motor roztočí.

3. Provedeme kompletní kalkulaci motorových dat – dostačuje při prvním nastavení.

4. Další.



Průvodce pro uvedení do provozu měniče

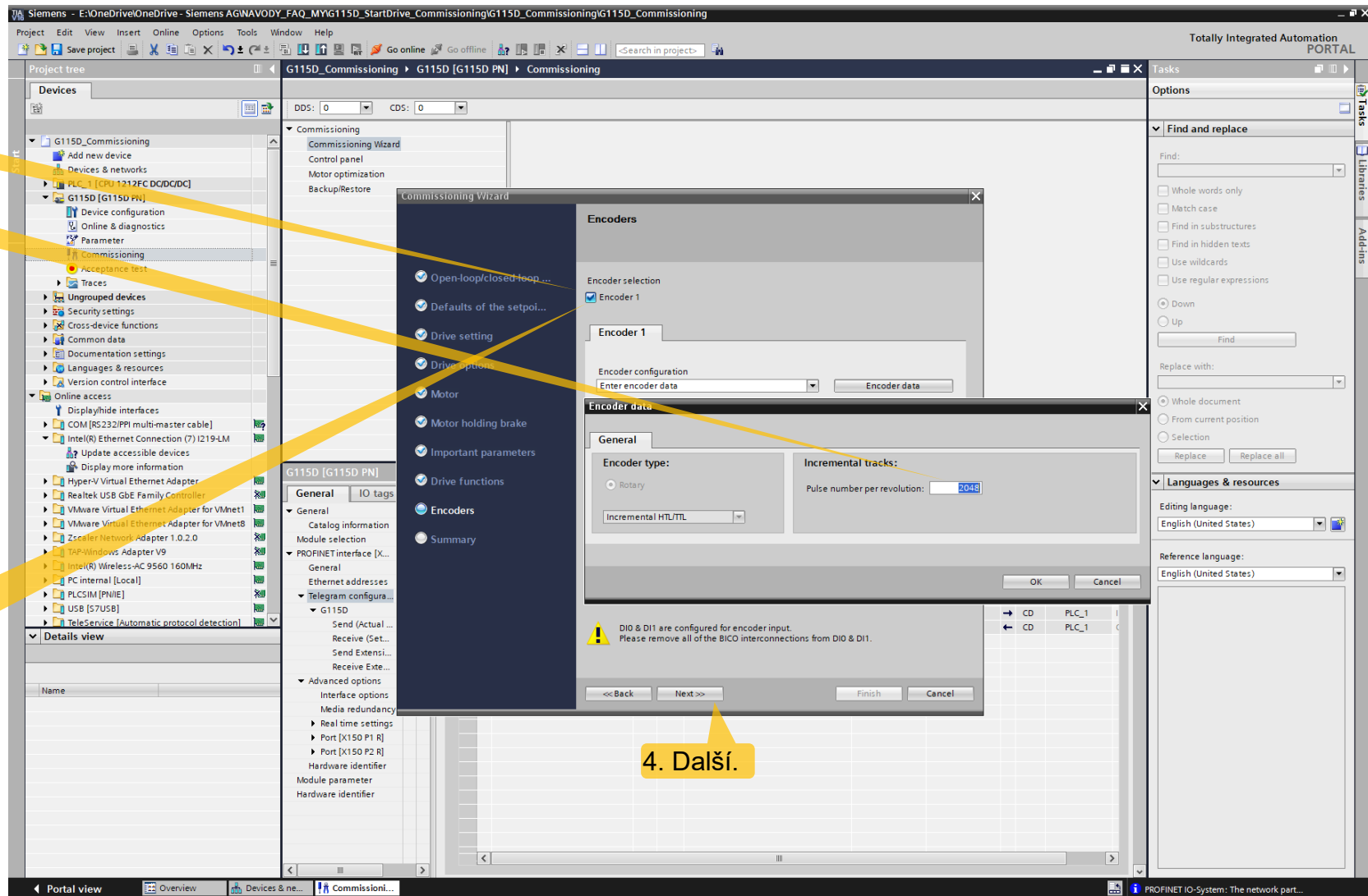
1. Připojení encoderu.

2. Typ encoderu, rozlišení.

Pozn. K měniči SINAMICS G115D může být připojen HTL encoder. Encoder ale není použit pro otáčkovou regulaci. Je možno jej sdílet s PLC (telegram 3) a následně polohovat dle tohoto encoderu (ot. regulace ale zůstává bez encoderu).

3. Demokufr ale encoderem osazen není. **Možnost nezvolíme.**

4. Další.



Průvodce pro uvedení do provozu měniče

1. Nyní vidíme, co jsem nastavili.

The screenshot shows the Siemens TIA Portal interface during the commissioning of a G115D inverter. The 'Commissioning Wizard' dialog box is open, displaying the 'Summary' step. The wizard lists the following drive data:

- Open-loop/closed-loop control type: Open-loop/closed-loop control operating mode: [20] Speed control (encoderless)
- Defaults of the setpoints/command sources: Macro drive unit: [67] Distributed conveyor technology with fieldbus (2) (33) Telegram configuration: [999] Free telegram configuration with BICO
- Drive setting: IEC/NEMA Standards: [0] IEC (50 Hz line, 51 units) Drive unit line supply voltage: 400 V Power unit application: [0] Load duty cycle with high overload for vector drives Pulse frequency setpoint: 4.000 kHz
- Drive options: Braking resistor active: Yes Braking resistor braking power: 0.10 kW
- Motor: Motor type selection: [181] 2KJ8 induction motor Order number: 2KJ8xxx-2CFix-3xxx Motor connection type: Star Motor 67/104 Hz operation: No Rated motor voltage: 330 Vrms Rated motor current: 1.20 Arms Rated motor power: 0.37 kW Rated motor power factor: 0.740 Rated motor frequency: 54.40 Hz Rated motor speed: 1500.0 rpm Motor cooling type: [0] Natural ventilation Motor temperature sensor type: [6] PT1000 Motor direction reversal: [0] OFF

The 'Finish' button at the bottom right of the wizard is highlighted with a yellow callout, indicating the completion of the setup.

2. Hotovo.

Nahrání konfigurace do měniče

5. Po nahrání parametrizace přejdeme do ONLINE

1. V projektovém stromě označíme měnič.

2. Klikneme na tlačítko pro nahrání konfigurace do měniče..

3. Zahájíme nahrávání.

4. Konfigurace je nahrána do RAM paměti, ta se po vypnutí měniče smaže a při zapnutí je nahrána z EEPROM paměti. Abychom zachovali parametrizaci pohonu i po zapnutí, zvolíme uložení parametrizace i do EEPROM paměti.

The screenshot displays the Siemens AGNAVODY software interface for commissioning a G115D inverter. The project tree on the left shows the hierarchy: G115D_Commissioning > Devices & networks > PLC_1 [CPU 1212FC DC/DC/DC] > G115D [G115D PN]. The central area shows the 'Commissioning Wizard' with options for 'Control panel' and 'Motor optimization'. A 'Load preview' dialog box is open, showing a table with the following data:

Status	Target	Message	Action
✓	G115D	Ready for loading.	Load 'G115D'
✓	Parameter assign...	Please note: Save the parameterization in the EEPROM after the download	<input checked="" type="checkbox"/> Save the parameterization in the EEPROM

The 'Load' button is highlighted in blue, indicating the next step in the process. The bottom status bar shows 'Connection to G115D terminated.'

Statické měření na pohonu

The screenshot shows the Siemens AGVAVODY software interface for drive commissioning. The main window is titled 'Totally Integrated Automation PORTAL'. The left sidebar shows a project tree with 'G115D [G115D PN]' selected. The central 'Control panel' displays drive status and control options. The 'Alarm display' section at the bottom shows a table of current alarms.

Source	Date	Time	Status	Acknowledge	Alarm class name	Event text
G115D [G1...	7/19/2021	1:07:42:493 PM	Incoming			A07991: Drive: Motor data identification activated
G115D [G1...	7/19/2021	1:07:42:493 PM	Incoming			A08526: PROFINET: No cyclic connection

1. Symbol u měniče vyjadřuje přítomnost alarmu.

2. Pod záložkou *Online & Diagnostics* -> *Active alarms* vidíme, jaké alarmy jsou přítomny. Aktuálně je to *A7991 Drive: Motor data identification activated + A08526: PROFINET: No cyclic connection*

3. Abychom se prvního alarmu zbavili, je nutno proměřit vinutí motoru – to uděláme po záložkou *Commissionig* -> *Control panel*

4. Převezneme řídicí právo na naše PC, aktivujeme *Drives enables*

5. Spustíme měření

Spuštění pohonu z řídicího panelu

1. Po úspěšném měření zmizí alarm jeden z alarmů. Ještě je nutné navázat komunikaci s PLC.

The screenshot displays the Siemens SIMATIC Manager interface for drive commissioning. The main window is titled 'Totally Integrated Automation PORTAL' and shows a 'Control panel' for a drive. The 'Control panel' includes sections for 'Master control' (with 'Activate' and 'Deactivate' buttons), 'Drive enables' (with 'Set' and 'Reset' buttons), and 'Operating mode' (set to 'Speed specification'). Below this is a 'Modify' section with a speed set to 100 rpm and buttons for 'Off', 'Stop', 'Backward', 'Forward', 'Jog backward', and 'Jog forward'. The 'Drive status' section shows 'Ready for switching on' and 'Operation enabled' indicators. The 'Actual values' section displays 'Speed' and 'M. current'. At the bottom, the 'Alarm display' table shows a current alarm:

Source	Date	Time	Status	Acknowledge	Alarm class na...	Event text	Help	Info text
G115D [G1...	7/19/2021	1:07:42:493 PM	Incoming	--	--	A08526: PROFINET: No cyclic connection	?	

Two yellow callout boxes provide instructions: the first points to the 'Commissioning' folder in the project tree, and the second points to the 'Control panel' buttons.

2. Otestujeme pohon spuštěním přes řídicí panel.

Vložení FB Sina_Speed z Drive_Lib knihovny

2. Zvolíme možnost *Help – Show help*, tím otevřeme nápovědu TIAportalu

1. V pravé části TIAportalu otevřeme záložku knihovny a do projektu přetáhneme *FB SINA_SPEED*, tento blok je určen pro řízení pohonu po telegramu 1.

Pozn. Drive_Lib knihovna je nainstalována současně se Startdrive. Je možno ji stáhnout ze stránek tech. podpory.

<https://support.industry.siemens.com/cs/cz/en/view/109746271>

Zde je možné stáhnout i popis bloků v pdf. Bloky jsou popsány i v nápovědě TIAportalu.

Popis bloku SINA_SPEED

1. Otevře se okno s nápovědou, hledáme výraz *SINASPEED*.

2. SINAMICS Instructions.

3. Přečteme si nápovědu.

The screenshot shows the Siemens Information System interface. At the top, the title bar reads 'Information system' and 'Totally Integrated Automation Information system'. The breadcrumb navigation path is 'Information System > Programming a PLC > Instructions > Instructions (S7-1200, S7-1500) > Optional packages: (S7-1200, S7-1500)'. The search bar contains 'SINASPEED' and shows 6 results. The search results table is as follows:

Title	Position
Function block SinaSpeed	SINAMICS Instructions
SINAMICS Instructions	SINAMICS Instructions
Input interface of the SinaSpeed	SINAMICS Instructions
Output interface of the SinaSpeed	SINAMICS Instructions
Error handling of the SinaSpeed function block	SINAMICS Instructions
Description	SINAMICS Instructions

The 'Content' pane on the left shows a tree view of the 'Information System' with various topics listed. The 'Function block SinaSpeed' page is displayed on the right, containing the following information:

Function block SinaSpeed

This section contains information on the following topics:

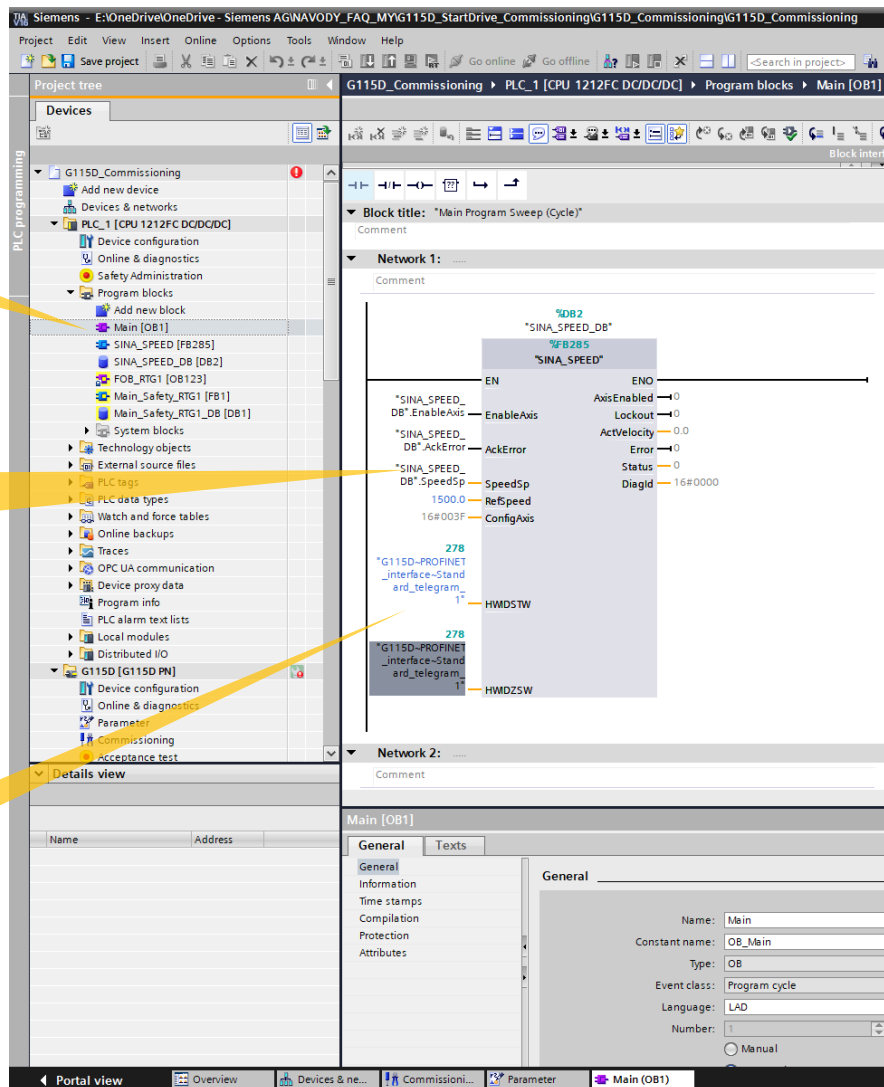
- [Description](#)
- [Calling OBs](#)
- [Called blocks](#)
- [Function description - general](#)
- [Input interface of the SinaSpeed](#)
- [Pre-assignment of the ConfigAxis input](#)
- [Output interface of the SinaSpeed](#)
- [Error handling of the SinaSpeed function block](#)
- [Standard telegram 1](#)

Parametrizace bloku SINA_SPEED

1. Blok SINA_SPEED vložíme do cyklu OB1, vytvoří se ne jeho instance.

2. Pro ukázkou jsou na vstupy a výstupy bloku navázány totožné proměnné z instančního DB.

5. Zde vložíme HW_ID telegramu 1, se kterým bude blok cyklicky komunikovat.



3. Význam vstupů bloku.

I/O bar

Input interface SINA_SPEED

Input signal	Type	Default	Meaning
EnableAxis	BOOL	0	"EnableAxis" = 1 -> switches on the drive
AckError	BOOL	0	Acknowledgment of axis fault -> "AckFit" = 1
SpeedSp	REAL	0.0[rpm]	Speed setpoint
RefSpeed	REAL	0.0[rpm]	Rated speed of the drive -> p2000
ConfigAxis	WORD	3	For more information, see below.
HMDZSW	HW_IO	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1500 of the setpoint slot.
HMDZSW	HW_IO	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1500/300/400 of the actual value slot.

4. Význam výstupů bloku.

Output interface SINA_SPEED

Output signal	Type	Default	Meaning
AxisEnabled	BOOL	0	Operating mode is executed or enabled
Lockout	BOOL	0	1 = switch-on inhibit active
ActVelocity	REAL	0.0[rpm]	Actual speed -> depending on the normalization factor RefSpeed
Error	BOOL	0	1 = group fault present
Status	INT	0	16#7002: No error - block is being processed 16#8401: Error in drive 16#8402: Switching on inhibited 16#8600: Error DPRD_DAT 16#8601: Error DPWR_DAT
DiagID	WORD	0	Expanded communication error -> SFB call error

Vložení FB G115D_AdditionalTelegram do projektu

1. FB G115D_AdditionalTelegram je možno stáhnout v projektu pod odkazem níže.

<https://support.industry.siemens.com/cs/ww/en/view/109799886>

Blok je potom možné vykopírovat z projektu nebo FB převést do uživatelské knihovny. Tak jsem to udělal i já.

The screenshot shows the Siemens TIA Portal interface. The main workspace displays a ladder logic network with a function block call for 'G115D-PROFINET_interface-Stand_and_telegram_1'. The left sidebar shows the project tree with 'G115D [G115D PN]' selected. The right sidebar shows the 'Global libraries' pane with 'G115D_AdditionalTelegram' selected. A yellow callout box points to the selected block in the library pane.

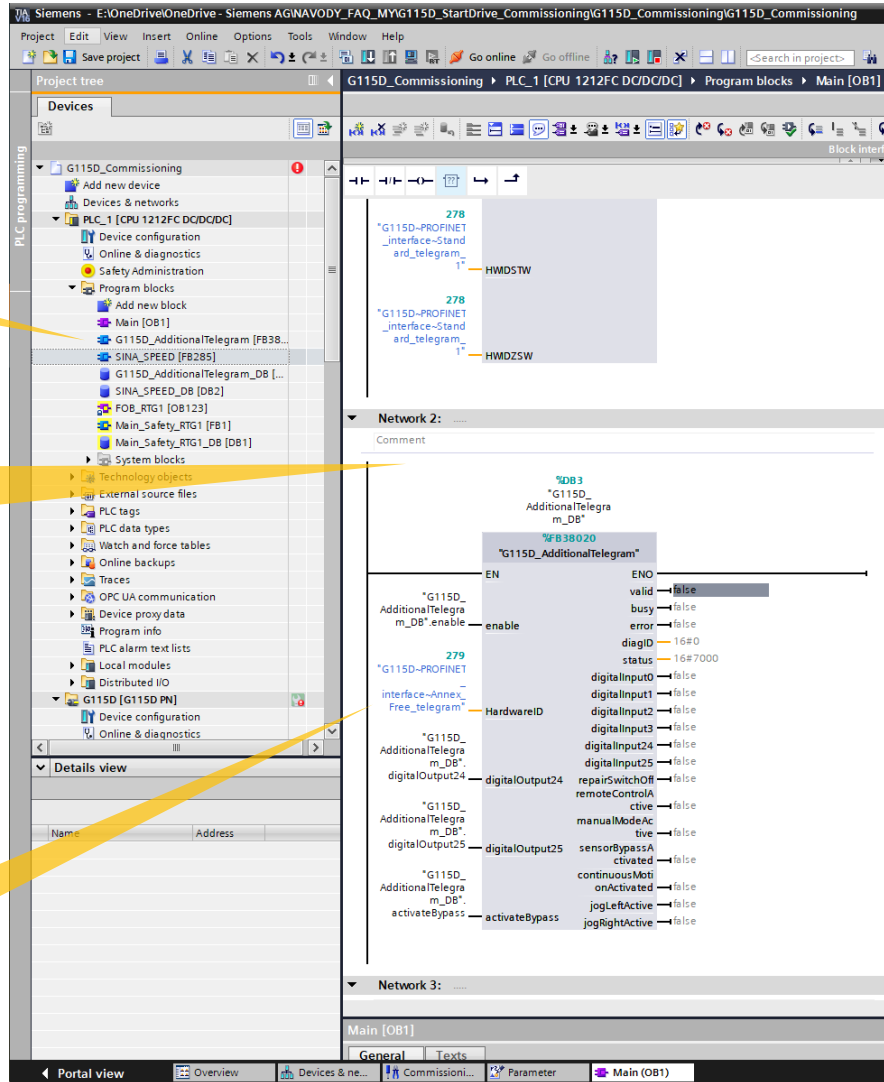
2. Z uživatelské knihovny / nebo staženého projektu přetáhneme FB do OB Main.

Parametrizace bloku FB G115D_AdditionalTelegram

1. Blok G115D_AdditionalTelegram vložíme do cyklu OB1, vytvoří se jeho instance.

2. Pro ukázkou jsou na vstupy a výstupy bloku navázány totožné proměnné z instančního DB.

5. Zde vložíme HW_ID Free telegramu 1/1, se kterým bude blok cyklicky komunikovat.



2.1.2 Input and output parameters of the function block

Table 2-1: Input parameters of the G115D_AdditionalTelegram function block

Name	Data type	Default value	Comments
enable	Bool	false	Enable functionality of FB.
HardwareID	HW_IO	0	Hardware ID of drive's additional telegram.
digitalOutput24	Bool	false	Control bi-directional digital input/output 24.
digitalOutput25	Bool	false	Control bi-directional digital input/output 25.
activateBypass	Bool	false	Activate or deactivate the stop/low speed sensor bypass for conveyor control

3. Význam vstupů bloku.

4. Význam výstupů bloku.

Function block for a SINAMICS G115D additional telegram
Entry-ID: 109799888, V1.0, 07/2021

7

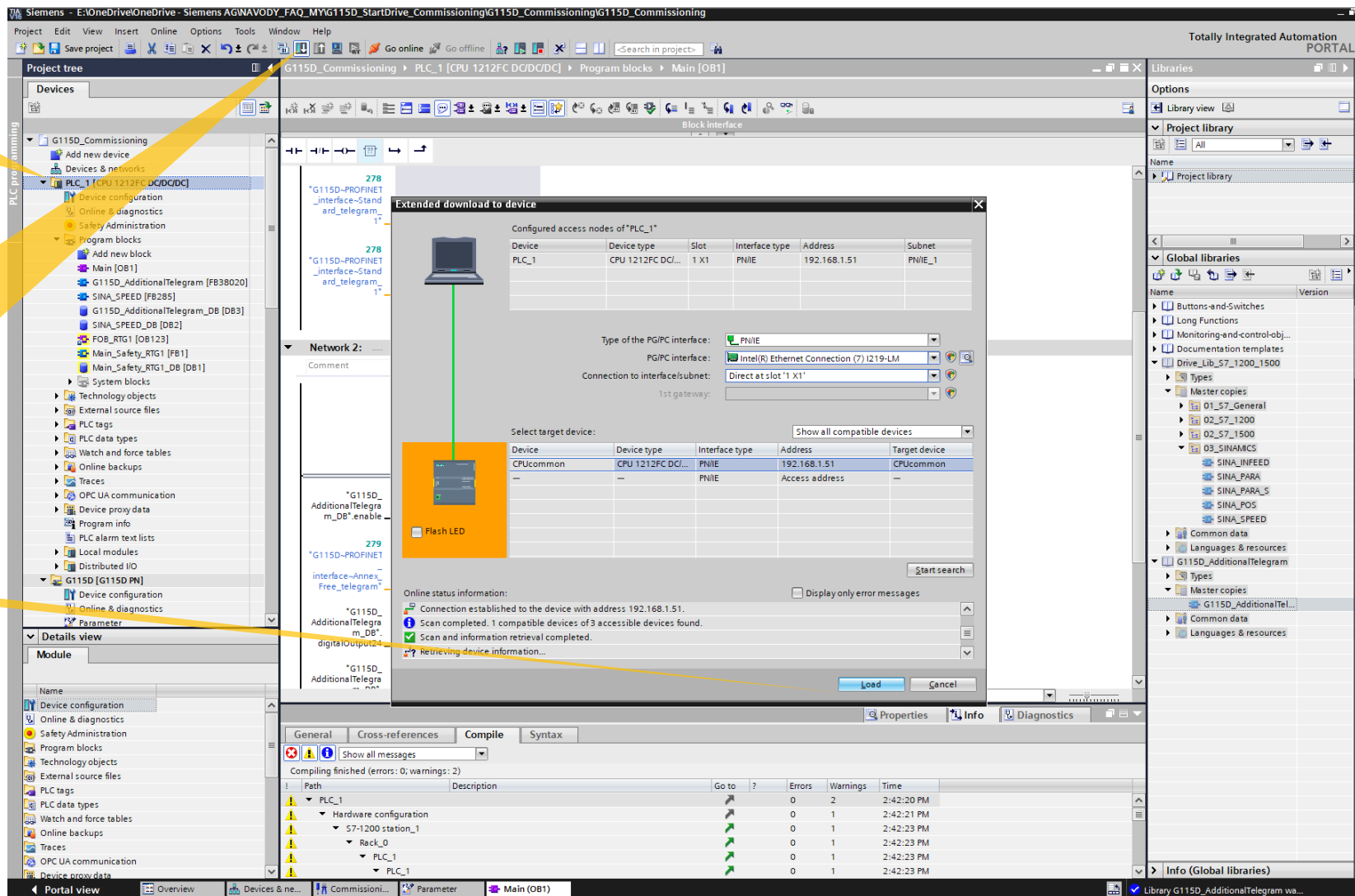
busy	Bool	false	TRUE: function block is enabled.
error	Bool	false	TRUE: An error occurred during the execution of the function block.
diagID	Word	16#0	Error identification of internal function. See chapter 2.4 for more detailed information
status	Word	16#0	16#0000 - 16#7FFF: Status of the FB. 16#8000 - 16#FFFF: Error identification. See Table 2-3 for more detailed information.
digitalInput0	Bool	false	Status of digital input 0.
digitalInput1	Bool	false	Status of digital input 1.
digitalInput2	Bool	false	Status of digital input 2.
digitalInput3	Bool	false	Status of digital input 3.
digitalInput24	Bool	false	Status of bi-directional digital input/output 24.
digitalInput25	Bool	false	Status of bi-directional digital input/output 25.
repairSwitchOff	Bool	false	TRUE: Repair switch is set to OFF and all power to the motor is terminated.
remoteControlActive	Bool	false	Remote control mode is (de)activated via the LRC panel.
manualModeActive	Bool	false	Local control mode is (de)activated via the LRC panel.
sensorBypassActivated	Bool	false	Stop/low speed sensor bypass is (de)activated for the conveyor control.
continuousMotionActivated	Bool	false	Continuous motion is (de)activated via the LRC panel.
jogLeftActive	Bool	false	Motor Jogs to the left.
jogRightActive	Bool	false	Motor Jogs to the right.

Nahrání konfigurace do PLC

1. V projektovém stromu označíme PLC.

2. Zvolíme možnost nahrát konfiguraci do PLC, vzhledem k tomu, že nahráváme PLC v offline, nahrání proběhne včetně HW configu (pokud nahrajeme PLC v online – přehraje se pouze SW část, nikoli HW konfigurace).

3. Konfigurace nahrajeme.



Spuštění pohonu pomocí bloku SINA_SPEED

1. Po nahrání přejdeme do Online.

2. Zapneme monitoring bloku.

3. Zde můžeme nastavovat hodnoty proměnných – klikneme pravým na proměnnou – *modify* – *nastavíme hodnotu* – setpoint nastavíme např. Na 1000rpm.

4. Pokud není na FB / měniči žádná chyba – pohon se dle nastavených ramp rozjede na definovanou rychlost – nahozením bitu *EnableAxis*.

The screenshot displays the Siemens TIA Portal software interface. The main window shows the Network 1 editor with the SINA_SPEED block. The block is connected to a variable '%OB2' and a variable '%B2B5'. A context menu is open over the 'EnableAxis' input, showing options like 'Modify', 'Monitor', and 'Display format'. The 'Modify' option is selected, and a dialog box is open to change the value to 1000. The interface also shows the Project tree on the left, the CPU operator panel on the right, and a message log at the bottom.

Zapnutí bloku G115D_AdditionalTelegram

1. Zapneme enable bit na FB.

2. Pomocí vstupů a výstupů bloku máme možnost ovládat a diagnostikovat proměnné, které jsou *free telegramem* komunikovány.

The screenshot displays the Siemens TIA Portal interface for configuring the G115D_AdditionalTelegram block. The left pane shows the project tree with the 'G115D_AdditionalTelegram' block selected. The central pane shows the block diagram with the 'enable' input set to TRUE. The right pane shows the 'CPU operator panel' with RUN/STOP and ERROR/STOP buttons, and a 'Call environment' section with a 'Change...' button. The 'Breakpoints' section indicates that the device does not support breakpoints. The 'Call hierarchy' section shows 'No call path available'.

Monitoring na měniči

1. Připojíme se k měniči –
Online & Diagnostics.

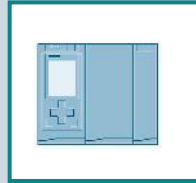
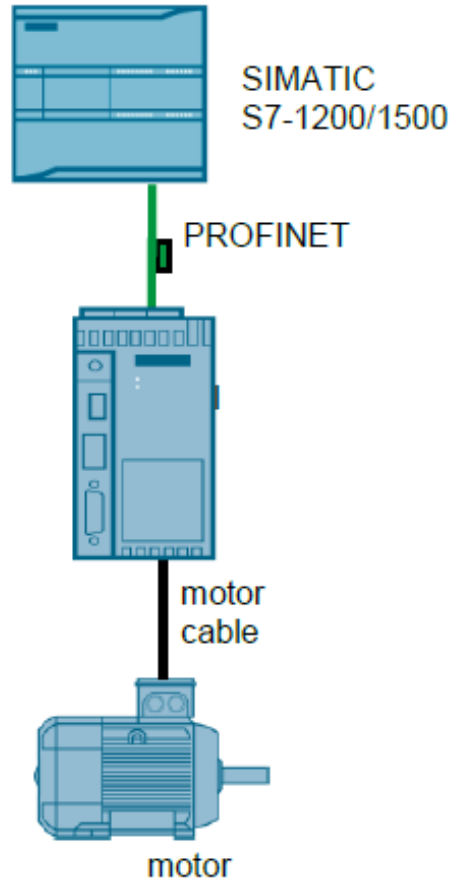
2. Zde vidíme, které bity jsou
pomocí bloku FB Sina Speed
komunikovány.

The screenshot displays the Siemens TIA Portal interface for monitoring a G115D inverter. The main window is titled 'G115D [G115D PN] > Online & diagnostics'. The left-hand 'Project tree' shows the hierarchy of the project, with 'G115D [G115D PN]' selected. The central pane shows the 'Control/status words' section, which lists 15 bits and their corresponding descriptions. The right-hand pane contains search and language options.

Bit	Description
0	ON/OFF1 [0=No, 1=Yes]
1	OC / OFF2 [0=No, 1=Yes]
2	OC / OFF3 [0=No, 1=Yes]
3	Enable operation [0=No, 1=Yes]
4	Enable ramp-function generator [0=No, 1=Yes]
5	Continue ramp-function generator [0=No, 1=Yes]
6	Enable speed setpoint [0=No, 1=Yes]
7	Acknowledge fault [0=No, 1=Yes]
8	Jog bit 0 [0=No, 1=Yes]
9	Jog bit 1 [0=No, 1=Yes]
10	Master control by PLC [0=No, 1=Yes]
11	Direction reversal (setpoint) [0=No, 1=Yes]
13	Motorized potentiometer raise [0=No, 1=Yes]
14	Motorized potentiometer lower [0=No, 1=Yes]
15	CDS bit 0 [0=No, 1=Yes]

TIP 1: SIMATIC S7-1200 / 1500: Encoderless Positioning with SINAMICS G

Dále existuje možnost polohování bez encoderu. To bude dále popsáno. Detailní návod a knihovna je zde:
<https://support.industry.siemens.com/cs/ww/en/view/109767951>



- **SIMATIC S7-1200 and S7-1500** automation systems support the controlled positioning of electrically driven axes. **Technology objects** are used for this purpose.



- Communications to the SINAMICS drive system is established via standard telegrams according to the **PROFIdrive profile**.



- There are **many applications** where high-resolution encoders are not necessary when it comes to achieving positioning accuracy - and in fact, in some cases, **an encoder is not required at all**.

Princip funkce

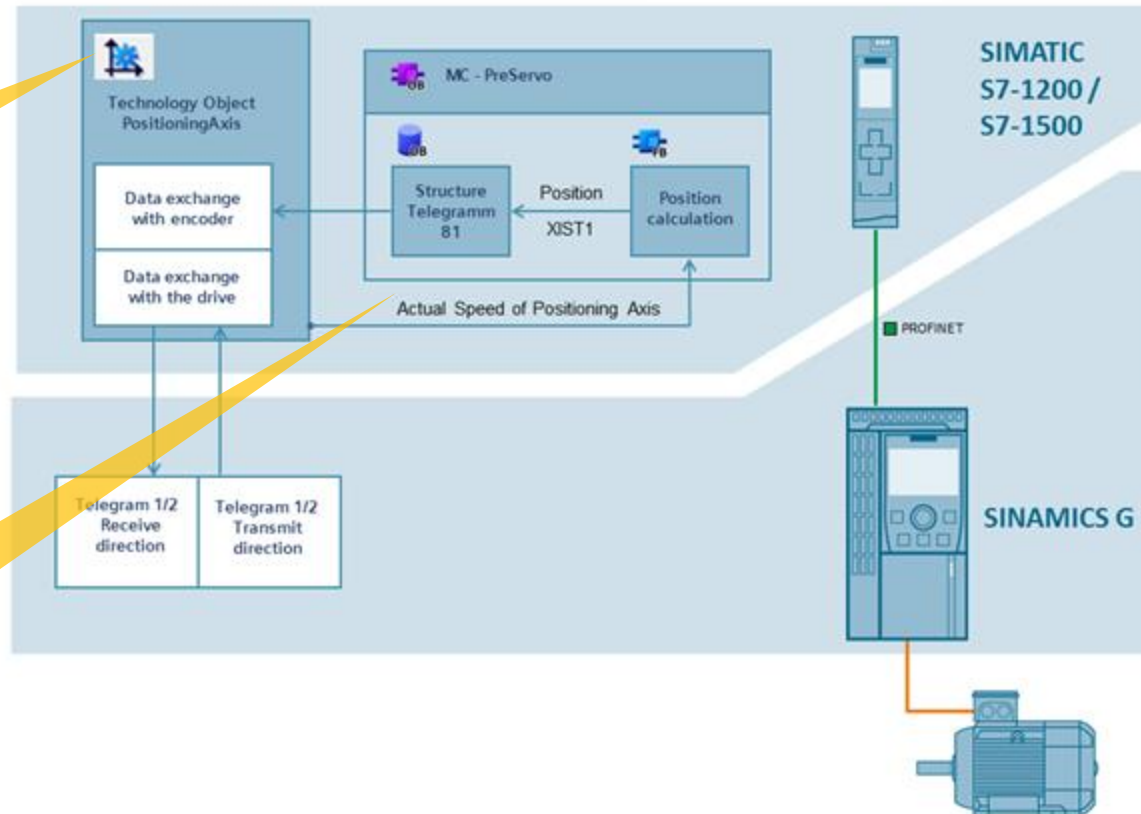
The **position actual** value is determined by **integrating the actual speed** (drive parameter r63).

Aktuální pozice je dána integrací aktuální rychlosti – parametru r63.

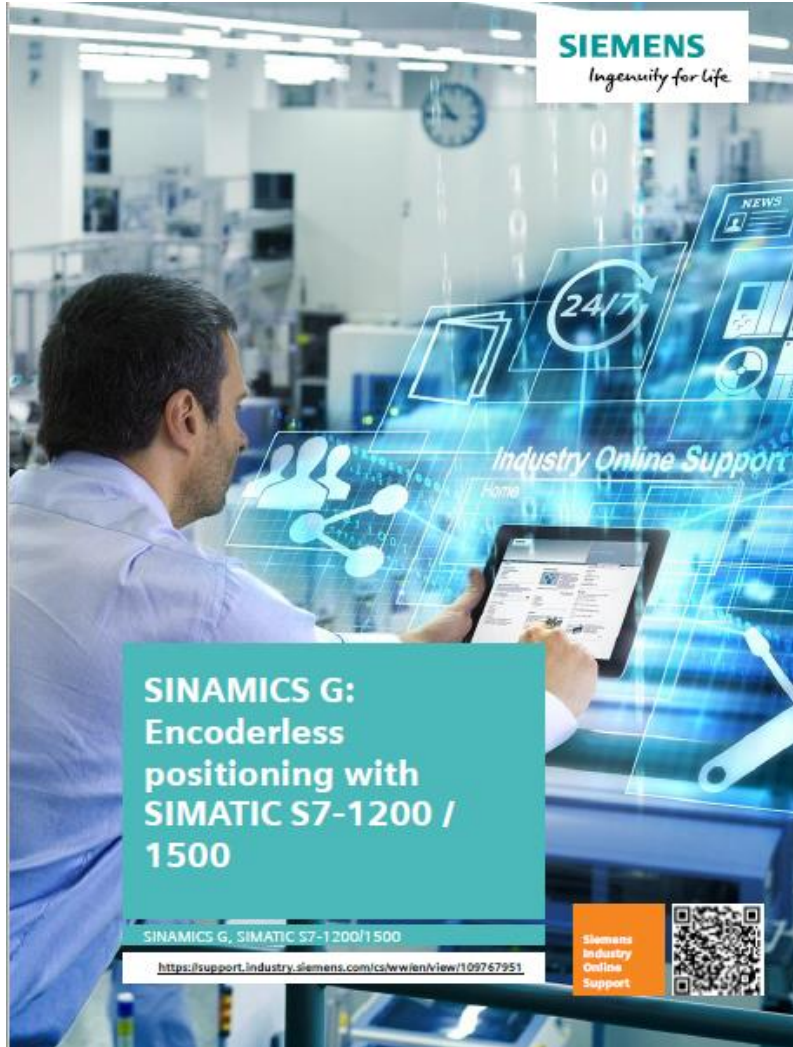
$$x = \int v_x(t) dt$$

V PLC je vytvořen TO_PosAxis. Na objekt jsou napojeny dva telegramy – telegram 1 pro zadání setpointu a telegram 81 s pozicí od virtuálního encoderu.

Integrace pozice z rychlosti probíhá v bloku MC-PreServo. Výsledkem tohoto bloku je zápis do DB, které má strukturu telegramu 81.



Přesnost polohování, odkaz k dokumentaci






	Induction motor operated with U/f control ¹	Induction motor in VECTOR control ²	Synchronous reluctance motor ³	Synchronous-reluctance motor with SINAMICS S120 Booksize and test signal technique ⁴ (not part of this application example)
Positioning accuracy	< 20 mm	< 3 mm	< 0.2 mm	< 0.01 mm

<https://support.industry.siemens.com/cs/ww/en/view/109767951>



Downloads

 **Manual Encoderless Positioning (2,9 MB)**

  **Software Encoderless Positioning (251,5 KB)**

Podrobný návod je ke stažení pod tímto odkazem.

TIP 2: SIMATIC - Failsafe library LDrvSafe to control the Safety Integrated functions of the SINAMICS drive family

Pokud budete ovládat Safety na měniči pomocí rozhraní Progisafe, doporučuji použít LDrvSafe knihovnu, obsahuje předpřipravené FB pro safety telegramy.
<https://support.industry.siemens.com/cs/ww/en/view/109485794>

Entry type: Application example Entry ID: 109485794, Entry date: 12/17/2020

★★★★☆ (95)
> Rate

SIMATIC - Failsafe library LDrvSafe to control the Safety Integrated functions of the SINAMICS drive family

Entry Associated product(s)

The library includes fail-safe SIMATIC S7 blocks to implement various Safety applications in conjunction with a S7-1200F, S7-1500F, failsafe Open/Software Controller, SINUMERIK ONE and SINAMICS drives coupled through PROFIsafe.

This library is intended to realize different Safety application, e.g. simple control of SINAMICS Safety Functions via PROFIsafe as well as failsafe diameter detection, up to Safety Integrity Level 2 (EN 62061) and Performance Level d, Category 3 (EN ISO 13849-1).

Solution

Overview about realized function blocks:

- PROFIsafe control words (telegrams 30 to 903 with SINAMICS G and S)
- PROFIsafe status words (telegrams 30 to 903 with SINAMICS G and S)
- Safety Info and Control Channel (telegrams 700 and 701 with SINAMICS G and S)
- Safe Referencing to use Safety Functions SLP, SP and SCA
- Acknowledge changed hardware to adapt hardware checksums, e.g. after changing safety-relevant hardware
- Failsafe calculation of the velocity
- Safe diameter calculation and adaption of the SLS limit at winding application
 - Calculation of average value
 - Monitoring of discrepancy
 - Unmasking sensor values
 - Calculation of radius
 - Calculation of Safely-Limited Speed as a function of the radius

Further application about winding application:

- SIMATIC Converting Toolbox > 58565043
- SIMOTION Winder > 35818687
- DCC Winder > 39043750



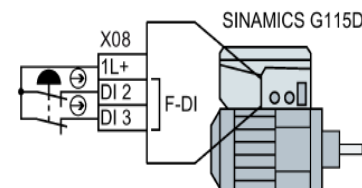
4.12.3 Fail-safe digital input

To enable a safety function via the terminal strip of the converter, you need a fail-safe digital input. The digital inputs DI 2 and DI 3 can be used for the safety functions.

In the factory setting of the converter, the fail-safe digital input is not assigned to the integrated safety functions. Only when commissioning do you define as to whether, for example, you use digital inputs for the standard functions, or you create a fail-safe digital input by combining them.

Wiring examples

An example for wiring the fail-safe digital input corresponding to PL d according to EN 13849-1 and SIL 2 according to IEC 61508 is given below:



F-DI je možno s F-CPU sdílet pomocí telegramu 900

Further information

➡ Safe Torque Off (STO) safety function (Page 217)

Additional configurations of the safety functions are described in the "Safety Integrated" Function Manual.

➡ Overview of the manuals (Page 542)

I Díky za pozornost

Adam Koncer

Application engineer
Siemens, s.r.o.
RC-CZ DI MC GMC

Budova A3, 5.NP
Škrobářenská 511/5
602 00 Brno, Česká republika

Mobile +420 721 560 462
E-mail adam.koncer@siemens.com