

APPLICATION GUIDE

Novolink with Siemens PLC

Connecting Smart Gateway SGWX20-OUA to Siemens PLC using TIA Portal V17





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1. Purpose and basic description

This section describes the basic steps to set up the ABB Novolink modules with the Siemens PLC via Smart Gateway using OPC UA.

1.1. What is Novolink?

The ABB Novolink[™] devices help digitalize motor starting solutions and gain insights into the connected loads. They're easy to design into existing wiring plans and connect to standard AF contactors. Installation is fast and simple, thanks to reduced wiring and fewer components, so engineering efforts are minimized. The Novolink devices enables predictive maintenance to reduce downtime, as well as increasing efficiencies and boosting cost savings. It's fully integrated into the B&R automation system. And the possibilities open up even more as full remote access to your data creates new maintenance service and revenue opportunities.

2. Important disclaimers & recommendations

2.1. Cyber security legal disclaimer

The Smart Gateway and Novolink modules are designed to be connected in the ABB and 3rd party products and communicate information data via network interface. It is the user's sole responsibility to provide and continuously ensure a secure connection between the product and the user's network or any other. The user shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system, and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information. The data, examples and diagrams in this manual are included solely for the concept or product description and are not to be deemed as a statement of guaranteed properties. All people responsible for applying the equipment addressed in this manual must satisfy themselves that each intended application is suitable and acceptable, including that any applicable safety or other operational requirements are complied with. Any risks in applications where a system failure and/or product failure would create a risk for harm to property or persons (including but not limited to personal injuries or death) shall be the sole responsibility of the person or entity applying the equipment, and those so responsible are hereby requested to ensure that all measures are taken to exclude or mitigate such risks. This document has been carefully checked by ABB, but deviations cannot be completely ruled out. In case any errors are detected, the reader is kindly requested to notify the manufacturer. Other than under explicit contractual commitments, in no event shall ABB be responsible or liable for any loss or damage resulting from the use of this manual or the application of the equipment.

2.2. UaExpert

UaExpert is software, provided by Unified Automation. We suggest using this software for monitoring the data as described in chapter "UaExpert".

Important: This software does not belong to ABB, and we do not take any responsibility on its functionality.

2.3. Making your networks more secure

Following points are strongly recommended to make networks more secure:

- Isolate your network separate the OT network (Operation Technology) from the IT network (Information Technology). This helps prevent any attack reaching the IT network from spreading to the OT network.
- Use firewalls Implement firewalls to prevent unauthorized access to the OT network.
- Use access control Implement access controls to restrict the human and device access to the OT/IT network and devices.
- Keep software up to date Make sure all software/firmware of the devices are up to date to have the latest security updates installed.
- Reduce attack surface on devices Disable device functions, services and ports not needed.
- Replace default passwords Replace all default passwords of the devices to prevent attacker from getting access using default credentials.
- Monitor network activity Monitor the OT network for any malicious activities that could be a sign of an attack. Example
 of network monitoring tool is intrusion detection system (IDS).
- Train employees Train operators and service people on IT and OT security best practices.

3. Basic setup

This section describes basic steps required to set up the Smart Gateway SGWX20-OUA with Smart Function Module (SFM) and Smart Current/Voltage modules (SCM /SVM) connected to Siemens PLC over OPC UA.

The setup can be done as shown in the figure below:



The figure shows the main components and how they can be combined for complete motor starting solutions:

- Smart Gateway SGWX20-OUA (1) is connected to Siemens PLC (5) via ethernet switch (6).
- Smart Function Module SFM (3) should be mounted on AF contactors (2).
- SFM are connected to Smart Current/Voltage sensor module SCV (4) over X2X cable.
- All the SFMs are connected to Smart Gateway SGWX20-OUA (1) over X2X cable.

Note: Smart Gateway SGWX20-OUA can be an OPC UA server.

3.1. Hardware used

Following hardware are used.

	Device	Description	Part number	Quantity	
Siemens	PLC	PLC Siemens S7 1500 with firmware v2.6 or higher			
Novolink	SFM-CAB-RJTB.1-500	Connection cable RJ45 - X20 Terminal block of X20BT9400	1SVM823000R0500	2	
Novolink	SFM-CAB-S.1-50	Connection cable SFM to sensor 0.5 m	1SVM811000R0050	2	
Novolink	SCV10-40.1	Smart current/voltage sensor	1SVM320010R0000	1	
Novolink	SFM1-A11.1	Advanced function module with X2X	1SVM120012R0000	2	
Contactor	AF09	Contactors	1SBL137001R1101 AF09-30-01-11	2	
X2X OPC UA Gateway	X2X OPC UA Gateway	B&R controller	X20BT08T	1	
X2X OPC UA Gateway	Power supply for the bus coupler	B&R controller	X20PS9400	1	
X2X OPC UA Gateway	Power supply and interface of the X2X bus	B&R controller	X20BT9400	1	
X2X OPC UA Gateway	Backplane module	B&R controller	X20BB80X	1	

3.2. Architecture used

This section describes basic steps required to set up the Smart Gateway, Novolink modules with Siemens PLC. The setup can be done as shown in the picture below:



Number	Description
1	Smart Gateway SGWX20-OUA
2	AF contactors
3	Novolink Smart function module (SFM)
4	Novolink Smart current/voltage sensor module (SCV)
5	Siemens PLC as OPC UA Client
6	Network cable to TIA Portal (install on a PC)
7	Ethernet switch

3.2.1. Wiring and power up

Refer to the architecture used, please ensure that all wiring is done, and devices are powered up using the schematic shown below.



24 V DC	24VDC is connected to the Smart Gateway, Novolink modules and PLCs
220 V AC	220 V AC is required for power supply. 220 VAC can also be used for power up contactors
OPC UA	For OPC UA: Connect the Smart Gateway and Siemens PLC to the ethernet switch
X2X	Connect Smart Gateway to SFM with cable "SFM-CAB-RJTB.1-500" Connect SFM to Sensors with cable "SFM-CAB-S.1-50"

3.2.2. Software configuration

Configuration of Siemens PLC	 Following software are used to configure the Siemens PLC: Siemens TIA Portal V17 or higher Siemens OPC-UA license
Configuration of B&R Gateway	UaExpert
Reading/writing data from Novolink via B&R controller	UaExpert

4. Siemens client

4.1. Preparation and supplies

This section describes what you need to make the configuration in TIA V17.

Novolink setup:

see manual "SGWX20-OUA Smart Gateway X20 to OPC UA Connecting Novolink devices with OPC UA clients."

- Siemens S7 1500 with firmware v2.6 or higher (example: 1511-1PN 6ES7 511-1AK02-0AB0 with firmware V2.9)
- Siemens TIA Portal V17 or higher
- Siemens OPC-UA license
- The modules are wired to each other.
- IP-address of the server (example: 192.168.2.11)

This example will use the CPU 1511 with Firmware V2.9.

4.2. The properties of the CPU



Figure 1: CPU_IP Address

• Make sure that the IP-address of the server and the client are in the same network



Figure 2: CPU_OPCUA_Client

• Enable the checkbox "Activate OPC UA Client"



• Select the license, Siemens will inform what license you require

The license type is determined by the PLC that is used.

Licensing

An OPC UA Server or OPC UA Client is available on the target systems (CPUs) and is activated using runtime licenses. Runtime licenses are offered in three levels for different target systems:

Target system	OPC UA S7- 1200 Basic	OPC UA S7- 1500 Small	OPC UA S7- 1500 Medium	OPC UA S7- 1500 Large
S7-1200 CPUs	Yes	No	No	No
ET 200SP CPU 1510SP/1512SP/1515SP (Open Controller) S7-1500 CPU 1511/1513 CPU 1504D Drive Controller	No	Yes	Yes	Yes
ET 200pro CPU 1516pro S7-1500 CPU 1515/1516 PLC 1507S software	No	No	Yes	Yes
S7-1500 CPU 1517/1518/1508S CPU 1507D Drive Controller	No	No	No	Yes

The runtime license includes the certificate for OPC UA (Server and Client) and can be run on the respective target systems including F, C and T/TF as from firmware V2.0 (Client V2.6).

You can find more information on the Software Update Service, license types, Online Software Delivery and handling your SW licenses with the Automation License Manager under this link.

https://mall.industry.siemens.com/mall/en/WW/Catalog/Products/10315991

4.3. The client interface

Devices									
1 🖬 🖬	🖳 Consistency check 📃			[Hoport interface	E			3
	Π				Source: Imported in	terface	- 1	Online access	
Novolink_SiemensClient_NoSec	OPC UA client interface	Data access			OPC UA server i	nterface			
📑 Add new device	To Data access	Display Name	Node type	Access	Display Name		Node type	Access level Node	ID
📩 Devices & networks	Read lists	1 <please <="" add="" or="" read="" select="" th=""><th>write</th><th></th><th>bispiley Home</th><th></th><th>nooc ope</th><th></th><th></th></please>	write		bispiley Home		nooc ope		
PLC_1 [CPU 1511-1 PN]	Add new read								
Device configuration	Read list_1								
🛂 Online & diagnostics 📰	🕶 📑 Write lists								
Software units	Add new write								
Program blocks	⇒ Write list_1								
Add new block	🔻 📷 Method lists								
Client interface 1 Da	💕 Add new met								
Sistem blocks	Method list 1								
Technology objects	< m /	N 11		/		111	_		/
External source files	Client interface_1 [OPC UA clier	nt interface]				Properties	🤨 Info 🚺	B Diagnostics	
PLC tags	General Configuration								
PLC data types	Connection parameter								
Watch and force tables	Security	Connection parameter							
Online backups	Languages 🧭	Connection parameter							
🕨 🔀 Traces									
OPC UA communication			Client			Server			
Server interfaces		Session name:	OPC UA Connection 1						
 Client interfaces 		Devices	PLC 1 (CPU 1511 1 PM	1		Unserviced	device		_
Add new client in		Device.		1		onspecified	uevice		
Client interface_1									
Web applications									
Device proxy data									
At Datalla ident		Address:				192,168,2,11	1		
 Details view 		Port				4840			
		- 1 / 1 0				4040			_
		Path (optional):							
Name		Server address:				opc.tcp://192	2.168.2.11:4840		
		Session timeout:	30						s
		Monitoring time:	5						s

Figure 4: ClientInterface_ConnectParameter

- Add a new client interface
- Fill in the IP address of the server

Project tree		Novolink_SiemensClient_NoS	ec → PLC_1 [CPU 1511-1 PN] → (OPC UA communica	tion 🕨 Clien	nt interfaces Client interface_1		_ # =×
Devices								
	•	🖳 Consistency check 🗮			Π	🕒 Import interface 🗮		-
						Source: Imported interface	- Donline access	
Novolink_SiemensClient_NoSec	^	OPC UA client interface	Data access			OPC UA server interface		
Add new device		▼ 😫 Data access	Display Name	Node type	Access I	Display Name	Node type Access level Node II	D
Devices & networks		💌 🙀 Read lists	1 <please add="" or="" read<="" select="" td=""><td>/write.</td><td></td><th></th><td></td><td></td></please>	/write.				
▼ [m PLC_1 [CPU 1511-1 PN]		📫 Add new read			•			
Device configuration		📑 Read list_1	1		-			
Software units	=	💌 📴 Write lists	•		1			
Program blocks		Add new write						
Add new block		➡ Write list_1						
🖀 Main (OB1)		 Method lists 						
🥃 Client interface_1_Da	. –	Method list 1						
System blocks		<	<		>	<		>
Technology objects		Client interface_1 [OPC UA cl	ient interface]			Reporties	L Info 1 Diagnostics	
External source files		Gaparal Configuration						
PLC tags		General Configuration						
Watch and force tables		Connection parameter	Security					^
Online backups		Languages	Parameter for cocura conno	ction				Ē
Traces			ratameter for secure conne	cuon				
 OPC UA communication 			The global security setting	s for the certificate mai	nager are not e	nabled.		
Server interfaces			Only limited functionality is	s available.				
👻 🛄 Client interfaces			The security settings of the	certificate manager ca	an he enabled i	in the properties of the device		
Add new client in			(Protection & Security > Ce	rtificate manager). 🥕				
Client interface_1								
Web applications	~		General					
< III Device proxy data	>							
✓ Details view			Security mode:	No security				-
			Security policy:	No security				-
			Certificates					
Name			c1					_
			Client certificate:					
				Automatically acce	pt server certifi	icates during runtime		
				👤 Trusted part	tner certificates	· /		
			User authentication					
			User authentication:	Liser name and nass	word			-
			User source and the source of	admin				
			User name:	aumin				
			Password:					· ·
								*

Figure 5: ClientInterface_Security

- Make sure "No security" is selected and that "automatically accept server certificates during runtime" is checked
- Fill in the username and the password of the server

					Source: Imported interface	- 2 1	Online access				
Data access			OPC Umported interface								
	Display Name	Node type	Access level	Nod	Display Name	Node type	Access level	Node ID	Description		
1	<please add="" or="" read="" select="" th="" write<=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></please>										
	1	Data access Display Name 1 <please add="" or="" read="" select="" th="" write<=""><th>Data access Display Name Node type Cellease add or select read/write</th><th>Data access Node type Access level 1 <please add="" or="" read="" select="" td="" write<=""></please></th><th>Data access Display Name Node type Access level Nod 1 <please add="" or="" read="" select="" td="" write.<=""></please></th><th>Data access Display Name Node type Access level Nod 1 <please add="" or="" read="" select="" td="" write<=""> Display Name Display Name</please></th><th>Data access Source: Imported interface Display Name Node type Access level Nod Source: Imported interface OPC L Online [] Display Name Node type</th><th>Data access Display Name Node type Access level Node. 1 <please add="" or="" read="" select="" td="" write.<=""> Display Name Node type Access level</please></th><th>Data access Display Name Node type 1 <please add="" or="" read="" select="" td="" write.<=""> 0 0</please></th></please>	Data access Display Name Node type Cellease add or select read/write	Data access Node type Access level 1 <please add="" or="" read="" select="" td="" write<=""></please>	Data access Display Name Node type Access level Nod 1 <please add="" or="" read="" select="" td="" write.<=""></please>	Data access Display Name Node type Access level Nod 1 <please add="" or="" read="" select="" td="" write<=""> Display Name Display Name</please>	Data access Source: Imported interface Display Name Node type Access level Nod Source: Imported interface OPC L Online [] Display Name Node type	Data access Display Name Node type Access level Node. 1 <please add="" or="" read="" select="" td="" write.<=""> Display Name Node type Access level</please>	Data access Display Name Node type 1 <please add="" or="" read="" select="" td="" write.<=""> 0 0</please>		

Figure 6: ClientInterface_OnlineAcces

On the topside of the client interface screen.

- Select "Online []" behind source
- Click the "Online Access" button

Connect to OPC UA set	rver			×
	Access to the OPC UA server			
	OPC UA server address	onc tcp://192.168.2.11		
	Servion name:	um DESKTOP 824CV/ K/Siemens	TA Portal@MAJT/Client interface_1	
	Session nume.	unibeskior-62Acvekistemens	. In A of a lew An client intenace_1	_
			Find selected server	
	Select OPC UA server end point:			
	Application name / Security policy			
	▼ X20BC008T			^
	🚽 No security			
	Basic256Sha256 - Sign & encrypt			=
	Basic256Sha256 - Sign			
	🔒 Aes256_Sha256_RsaPss - Sign & encry	pt		
	Aes256_Sha256_RsaPss - Sign			
	Basic256 - Sign & encrypt			~
TIA Portal cortifica	to	User authentication		
TIA FOItal Certifica	ite	User authentication		
Certificate	e location: None	User authentic	ation: User name and password	-
Certificat	te (client):	Userr	name: admin	
		Pass	word: ******	_
		1000		
Online status information	n:	ſ	Display only error messages	
🚽 Connection establish	ned to the OPC UA server with address opc.tcp://19	2.168.2.11.		~
G Scan completed. Nur	mber of OPC UA server applications found: 1.			
				≡
				~
			Connect Canc	el
			Connect	
				_

Figure 7: PopUp Online Access

The access pop-up popped up.

- Fill in the IP-address of the server
- Click the "Find Selected Server" button

Server with the security protocols will be shown

- Select "No Security"
- Select in User authorisation "User name and Password"
- Fill in the User name of the server
- Fill in the password of the server
- Click the button "Connect"



Figure 8: ClientInterface_ServerTrust

When asked if you trust the server certificate and you trust it.

• Click "yes"

On the right side of the screen, you will get the available objects of the server.

4.4. The Read list

4.4.1. Program read list

🛃 Consistency check 📄						🛃 🛃	mport interface	e 崖			-				
						Sou	rce: Online	[opc.tcp://192.168.2.11] 💌 📝	Online access						
OPC UA client interface	R	ead list_1				C	OPC UA server interface								
▼ 🛅 Data access		Display Name	Node type	Access level	Node ID		Display Nam	e	Node type	Access level	Node ID				
👻 🎇 Read lists	1	- ModuleOk	BOOL	RD	http://	1	🔻 🥥 Objec	cts	Object		http://opcfo				
🗳 Add new read list	2	C RunningForw	BOOL	RD	http://	2	= > 🔷 Se	erver	Object		http://opcfo				
📑 Read list_1	3	ContactorVoltageLow	BOOL	RD	http://	3	🔹 💌 🧇 De	eviceSet	Object		http://opcfo				
🔻 📴 Write lists	4	- OverloadTrip	BOOL	RD	http://	4		DeviceFeatures	Object		http://opcfo				
🚔 Add new write list	5	SensorModulet issing	BOOL	RD	http://	5	💊	X20BC008T	Object		http://br-au				
📑 Write list_1	6	- CurrentTime	LDT	RD	http://	6		Configuration	Object		http://br-au				
🔻 📑 Method lists	7	OSPValid	BOOL	RD/WR	http://	7		- DeviceManual	String	RD	http://br-au				
📑 Add new method	8	h Insert a new element here				8		- DeviceRevision	String	RD	http://br-au				
Method list_1						9		FirmwareUpdate	Object		http://br-au				
						10		- HardwareRevision	String	RD	http://br-au				
						11		Identification	Object		http://br-au				
						12		- Manufacturer	LocalizedText	RD	http://br-au				
						13		- Model	LocalizedText	RD	http://br-au				
	4					14		🔷 ProcessData	Object		http://br-au				
						15		- RevisionCounter	Int32	RD	http://br-au				
						- 16		- SerialNumber	String	RD	http://br-au				
						17		- SoftwareRevision	String	RD	http://br-au				
						18		🔷 Status	Object		http://br-au				
						19		🔷 X2X IF1	Object		http://br-au				
						20		 Configuration 	Object		http://br-au				
						21		🔷 Status	Object		http://br-au				
						22		 SubDevices 	Object		http://br-au				
						23		 SupportedTypes 	Object		http://br-au				
						24		• • • ST001 X20PS9402	Object		http://br-au				
						25		ST002 X20BT9400	Object		http://br-au				
						26		ST003 SFM1-A11_1	Object		http://br-au				
						27		 Image: Image: Second Sec	Object		http://br-au				
						28		ProcessData	Object		http://br-au				
						29		🚩 📲 ModuleOk	Boolean	RD	http://br-au				
						30		SerialNumber	UInt32	RD	http://br-au				
						31		 ModuleID 	UInt16	RD	http://br-au				
						32		 HardwareVariant 	UInt16	RD	http://br-au				

Figure 9: Read_list

- Add a new read-list.
- Select the variables you want to read and drag and drop the variables those you want to the left side into the read-list.
- Compile the software.

Note:

It is possible to add multiple read lists. For each read list you can use different reading intervals.

In this example we will use the next variables:

- ProcessData >> ModuleOk
- ProcessData >> RunningForward
- ProcessData >> ContactorVoltageLow
- ProcessData >> OverloadTrip
- ProcessData >> SensorModuleMissing
- ProcessData >> OSPValid



Figure 10: OB1_Readlist

• Drag and drop the OPC_UA_ReadList_C in OB1



Figure 11: OB1_Readlist_ClientInterface

• Click on the toolbox icon in the upper right corner of the OPC_UA_ReadList_C block

The configuration of the OPC_UA_ReadList_C block will be shown below.

Select the client interface that was made before.





Figure 12: OB1_Readlist_DataAcces

- Select the read-list that was made before
- The rest of the parameters will be set automatically by Siemens



Figure 13: OB1_Readlist_Merkers

- Add a tag to the Request input (REQ). On every positive edge it will make connection with the server and the variables will read from the server
- Add a tag to the Maintain session
- Compile the project with a rebuild all for hardware and software
- Download "hardware configuration"
- Download "Software all"

Note:

The maintain session keeps the connection between server and client. It is not necessary to put this on true, but it will take less time to reconnect every time there is a positive edge on the REQ

When an error occurs it's up to the user to disable the maintain and re-enable it to reconnect to the server.

4.4.2. Check read list

For reading the data from the server:

iđi iđi ⊉ ⊉ ≋, ⊫ ⊟ Main	.X 알 알 밤, 눈 몸 물 > 영 2 : 영 2 : 영 2 : 영 2 : 영 3 : 영 3 : 영 4 : 1 : 1 : 6; 61 & 8 ? 0; 6; Main		₽ : 0	_∂ 8, lient i	n 🎚 🛛 🖩	E 🔛 Keep actual w	alues 🔒 1	inapshot 🔤 I	Copy snapshots to start values	8.8.	Load start value	es as actu	al values	0, 0,		
Name	Data type Default value Comme	ent		Name D		Data type	Start value	Monitor value	Hetain	Accessible f	Writa	Visible in	. Setpoint	S		
1 🚭 🕶 Input		•	÷	1 <	• • s	static										
	+			2 📢	•••	Read	list_1	Struct								
				3 <	•	• • Va	riable	*Client inte.								
 Network 1: Call read list 	L		^	4	•		ModuleOk	Bool	falte	FALSE						
				5 📢			RunningForward	Bool	false	FALSE						
			-	6 📢			ContactorVoltageLow	Bool	false	FALSE						
				2 🔹			OverloadTrip	Bool	false	FALSE						
	5083			8 <			SensorModuleMissing	Bool	false	FALSE						
	"OPC_UA_R	ead		9 📢			CurrentTime	LDT	LDT#1970-01-0	LDT#2023-12-20-11:01:31.475						
	List_C_De	r		10			OSPValid	Bool	talse	FALSE						
	OPC_UA_Read	Liet_C		11 4		P No	odeStatusList	Array[06]							8	
				12 <			nestamps	Amay(06j								
	EN	ENO		13			Eas 1	C 400 40								
3M10.0 %	M0.7	FALSE		16		- write	nst_1	"Client i	n							
"Read_auto" "Clock	k_0.5Hz"	Done - false		16			Mastaturi int	Arrayfe al	U							
	REQ	FALSE		17			idd news	sare flo								
	FAISE	Busy felse		10		. Math	od liet 1	Struct			0					
%M10.2	%M10.1	FALSE		19		M	ethodStatusList	Arravi0 01								
Nead	"Connect_ Maintain	Error		20			ethodResulti ist	Arrayl0 01							Ä	
,	Reading - Session	16#3870_0000		21		1 0	dd new>								i n	
	l'opc.tep://192.16. Collect.interface_ Connection ServerEndpointUrl_ Url	Status - Te#3870_0000		22	•	<add< td=""><td>new></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></add<>	new>									
	*Client interface_ Connection, Connection, Connectinfo Connectinfo *Client interface_		~													



- Open "OB1" and "Client_Interface_Data" and put the screens next to each other
- Open the menu Readlist_1 >> Variable
- Monitor both screens

Main		Client interface_Data									
Name	Data type Default value Comment	Name	Data type	Start value	Monitor value	Retain	Accessible f.	Writa	Visible in	Setpoint	S.,
Input	CM1 271	1 🔁 T Static									
	-1	2 📲 💌 Read list_1	Struct								
		3 📲 🔹 🔻 Variable	*Client inte								
 Notwork 1: Call read 	list	A 4 I ModuleOk	Bool	false	TRUE						
		5 💶 🔹 RunningForward	Bool	false	FALSE						
		ContactorVoltageLov	8001	taise	FALSE						
		7 - Ovenoadinp	5001	taise	PALSE						
	%D83	s - SensorModuleMissin	8001	taise	PALSE						
	"OPC_UA_Read	S Currentime	Deal	LD1#1970-014	LD1#2023-12-20-11:52:51:144						
	List_C_D8"	10 C Sevend	0001	ane	INDE						
	OPC_UA_ReadList_C	12 C . TrueStanno	Arrey[00].							ä	
		13 Add news									
	EN ENO	14 - Wite list 1	Struct								
%M10.0	SM0.7 FALSE	15 - Variable	*Client i	ล			Ä				
Read_auto C	Done Taise	16 - NodeStatusList	Array[0.3]							i iii	
5	FALSE	17 • Add news									
	TRUE	18 - Method list_1	Struct								
"Read"	SM10.1 EALSE	19 💶 🔹 🕨 MethodStatusList	Array(00).								
	Readlist Service	20 - MethodResultList	Array[00].								
	Statur - 168 3870_0000	21 Add new>									
	'opc.tcp://192.16	22 Add news									
	"Client interface_										
	Connection. Connection										
	ServerEndpointUrlUrl										
	Configuration*										
	Connection Session										
	Connectinfo Connectinfo										
	2										

Figure 15: Online_Connect_Reading

- Connect to the server by set the tag "Connect_Readlist (Maintain Session)" on TRUE
- Check the status variable in OB1. The status should be return 16#3870_0400 (2)
- Read the values by setting the tag "Read" or "Read_auto" on TRUE. On Every positive edge of the REQ-signal the data will be reading from the server 3
- The variables on the "Client_Interface_Data" screen have now been read from the server

4.5. The write list

4.5.1. Program write list

🖳 Consistency check 📄					🗄 Ir	mport interface	E			
					Sou	rce: Online [o	pc.tcp	o://192.168.2.11] 🔽 🔝 🚺 Online ac	cess	
OPC UA client interface	Wr	rite list_1			C	PC UA serve	er inte	erface		
🕶 🛅 Data access		Display Name	Node type	Access level		Display Name			Node type	Access level
💌 🙀 Read lists	1	I RunForward	BOOL	RD/WR	37		Sta	itus	Object	
🚔 Add new read list	2	- ResetErrors	BOOL	RD/WR	38		X2>	X IF1	Object	
📑 Read list_1	3	- ResetCounterContactorA	BOOL	RD/WR	39			Configuration	Object	
💌 📴 Write lists	4	- OSPValid	BOOL	RD/WR	40		•	Status	Object	
🚔 Add new write list	5	h Insert a new element here			41		- 🔷	SubDevices	Object	
Write list_1					42			SupportedTypes	Object	
🔻 📷 Method lists					43	1	• •	ST001 X20PS9402	Object	
📑 Add new method					44			\$T002 X20BT9400	Object	
Method list_1					45	1	• •	ST003 SFM1-A11_1	Object	
					46			Configuration	Object	
					47			🔻 🔷 ProcessData	Object	
					48			 ModuleOk 	Boolean	RD
					49			 SerialNumber 	UInt32	RD
					50			 ModuleID 	UInt16	RD
					51			 HardwareVariant 	UInt16	RD
					52			 FirmwareVersion 	UInt16	RD
					53			 DigitalInputX3 	Boolean	RD
					54			 RunningForward 	Boolean	RD
					55			 SumStatusDataReady 	Boolean	RD
					56			 SumFault 	Boolean	RD
					57			ContactorVoltageLow	Boolean	RD
	4				- 58			ParameterOutOfRange	Boolean	RD
	_				• 59			SmartFunctModuleHWFault	Boolean	RD
	•				60			 ContactorOutputShortCircuit 	Boolean	RD
	8				61			SensorModuleReady	Boolean	RD
					62			SensorModuleMissing	Boolean	RD
					63			 CurrentImbalanceTrip 	Boolean	RD
					64			 CurrentPhaseLossTrip 	Boolean	RD
					65			 OverloadTrip 	Boolean	RD
					66			CoolingTimeRunning	Boolean	RD
					67			 StartupTimeRunning 	Boolean	RD
					68			All PhaseSequenceCurrent	Boolean	RD
					69			PhaseSequenceVoltage	Boolean	RD
					70			CurrentPhaseLossTripL1	Boolean	RD
					71			CurrentPhaseLossTripL2	Boolean	RD
					72			CurrentPhaseLossTripL3	Boolean	RD
					73			SensorModuleHWFault	Boolean	RD
					74			 LineFrequencyNotDetected 	Boolean	RD
					75			 NoVoltageMeasurementSupported 	Boolean	RD
					76			- RunForward	Boolean	RD/WR
					77			ResetErrors	Boolean	RD/WR
					78			ResetCounterContactorA	Boolean	RD/WR
					79			ResetMotorRunHours	Boolean	RD/WR
,										

Figure 16: Write_list

- Add a new write-list
- Select the variables you want to write and drag and drop the variables those you want to the left side into the write-list
- Compile the software

Note: It is possible to add multiple write lists.

In this example we will use the next variables:

- ProcessData >> RunForward
- ProcessData >> ResetErrors
- ProcessData >> ResetCounterContactorA
- ProcessData >> OSPValid



Figure 17: OB1_writelist

• Drag and drop the OPC_UA_WriteList_C in OB1

Network 2: Call write list				^
	%DB6 'OPC_UA_Write List_C_DB_1*			
OPC	C_UA_WriteList_C			=
EN	ENO		——	
false — REQ	Done 🛏 false			
false — Session	Busy — false			
50351011	Error — false			
"Client interface_ 1_Configuration". Connection. ServerEndpointUrl Url "Client interface_ 1_Configuration". Connection. Connectinfo "Client interface_ 1_Configuration". Namespaces. Namespaces.	Status — 16#38 fo	70_0000		
NamespaceCount UrisCount	Le la			~
			100%	
OPC_UA_WriteList_C [FB3601]		Q Properties	🗓 Info 🤢 🗓 Diagnosti	cs 📑 🗖 🗖 🤝
General Configuration				
Client interface 🗸	Client interface			
Block parameters 😵	Select client interface for	the OPC UA connecti	ion	
Connection configuration				
	Client interfac	e: Client interface_*	1	-
-				

Figure 18: OB1_writelist_ClientInterface

• Click on the toolbox icon in the upper right corner of the OPC_UA_WriteList_C block

The configuration of the OPC_UA_WriteList_C block will be shown below.

• Select the client interface that was made before



Figure 19: OB1_Writelist_DataAcces

- Select the write-list that was made before.
- The rest of the parameters will be set automatically by Siemens.



Figure 20: OB1_writelist_Merkers

• Add a tag to the Request input (REQ). On every positive edge it will make connection with the server and the variables will write to the server

Add a tag to the Maintain session.

- Compile the project with a rebuild all for hardware and software
- Download "hardware configuration"
- Download "Software all"

Note:

The maintain session keep the connection between server and client. It is not necessary to put this on true, but it will take less time to reconnect every time there is a positive edge on the REQ

When an error occurs it's up to the user to disable the maintain and re-enable it to reconnect to the server.

4.5.2. Check write list

For writing the data in the server:



Figure 21: Online_setup_Writing

- Open "OB1" and "Client_Interface_Data" and put the screens next to each other
- Open the menu Writelist_1 >> Variable
- Monitor both screens.



Figure 22: Online_Connect_Writing

- Check if "OSPValid" is True in the read variable else put the "OSPValid" variable on TRUE in the write list 🚺
- Connect to the server by set the tag "Connect_Writelist (Maintain Session)" on TRUE
- Check the status variable in OB1. The status should be return 16#3870_0400
- Change a value in the "Client_Interface_Data" screen, for example "RunForward" on TRUE
- Write the values by setting the tag "Write" or "Write_auto" on TRUE. On Every positive edge of the REQ-signal the data will be written to the server
- · Check if the contactor makes a click sound

4.6. The method list

4.6.1. Program method list

						Sou	rce: 0	nline	e [opc.tcp://192.168.2.11]	- 🕨 🕅	Online access				
OPC UA client interface		Method list_1				C	PC UA	ser	rver interface						
🕶 📴 Data access		Display Name	Node type	Access level	Node ID		Display	y Nam	me		Node type	Access level	Node ID	Description	
🔻 📴 Read lists	1	ApplyChanges	Method		http://br-au	4			DeviceFeatures		Object		http://opcfoundati		^
💕 Add new read list	2	insert a new elevitive here				5		- (X20BC008T		Object		http://br-automatio		
📑 Read list_1						6			Configuration		Object		http://br-automatio		
🔻 📴 Write lists						7		•	- DeviceManual		String	RD	http://br-automatio	Address (pathname in the file sys	tem
🗳 Add new write list						8		•	C DeviceRevision		String	RD	http://br-automatio	Overall revision level of the device	e
📑 Write list_1						9			🕨 🔷 FirmwareUpdate		Object		http://br-automatio		
 Method lists 						10		•	- HardwareRevision		String	RD	http://br-automatio	Revision level of the hardware of	the d
🚔 Add new method						11			Identification		Object		http://br-automatio		
Method list_1						12			- Manufacturer		LocalizedText	RD	http://br-automatio	Name of the company that manu	factu
						13		•	🚾 Model		LocalizedText	RD	http://br-automatio	Model name of the device	=
						14			ProcessData		Object		http://br-automatio		
						15			- RevisionCounter		Int32	RD	http://br-automatio	An incremental counter indicatin	g the
						16			C SerialNumber		String	RD	http://br-automatio	Identifier that uniquely identifies,	with
	-					17			- SoftwareRevision		String	RD	http://br-automatio	Revision level of the software/firm	ware
	4					18		- +	🕨 🧅 Status		Object		http://br-automatio		
						• 19			🔻 🔷 X2X IF1		Object		http://br-automatio		
	*					20			 Configuration 		Object		http://br-automatio		
						21			🔹 🔻 🧅 Control		Object		http://br-automatio		
						22			AddStation		Method		http://br-automatio		
						23			AddStation	ByName	Method		http://br-automatio		
				_		21	<u> </u>		a ApplyChang	jes	Method		http://br-automatio		
						25			HangeStar	tionNumber	Method		http://br-automatio		
						26			LockStation	Number	Method		http://br-automatio		
						27			MoveStatio	n	Method		http://br-automatio		

Figure 23: Method_list

- Add a new Method-list
- Select ApplyChanges and drag and drop the variable to the left side into the Method-list
- Compile the software



Figure 24: OB1_Methodlist

• Drag and drop the OPC_UA_MethodCall_C in OB1



Figure 25: OB1_Methodlist_ClientInterface

• Click on the toolbox icon in the upper right corner of the OPC_UA_MethodCall_C block

The configuration of the OPC_UA_MethodCall_C block will be shown below.

• Select the client interface that was made before



Figure 26: OB1_Methodelist_DataAcces_AC

- Select the Method-list that was made before
- Select the method "ApplyChanges"
- The rest of the parameters will be set automatically by Siemens



Figure 27: OB1_Methodlist_Merkers_AC

- Add a tag to the Request input (REQ). Every positive edge it will make connection with the server and apply the changes to the server
- Compile the project with a rebuild all for hardware and software
- Download "hardware configuration"
- Download "Software all"

4.7. Set parameters

To adjust the parameter value you must use the method-list.

OPC UA client interface Write list_1 OPC UA server interface	Access leve	
	Access leve	
T Data access Display Name Node type Access level Node ID Display Name Node type		Node ID
▼ 🙀 Read lists 1 📲 RunForward BOOL RD/WR http://brau	D RD/WR	http://br-automatio
💕 Add new read list 2 📲 ResetErrors BOOL RD/WR http://brau	D.,, RD/WR	http://br-automatio
💀 Read list_1 3 📲 ResetCounterContactorA BOOL RD/WR http://breu	D RD/WR	http://br-automatio
▼ 🔄 Write lists 4 🚭 DisplayMechSwitchCountA DINT RD/WR http://brau 67 ■ 🚭 DisplayMatLastTripAbs SFM1-A11	D RD/WR	http://br-automatio
💕 Add new write list 5 💷 OSPValid 🧥 BOOL RD/WR http://br-au 68 = 🖬 Display/imbalance SFM1-A11_	D RD/WR	http://br-automatio
🕒 Write list 1 6 kinsert a new element here 69 🖷 🖬 DisplayMotorStartupTime SFMI-A11	D RD/WR	http://br-automatio
70 • DisplayUrmsUG12 SFM1-A11	D RD/WR	http://br-automatio
💕 Add new method 71 🔹 💶 DisplayUrmsUG23 SFMI-A11	D RD/WR	http://br-automatio
Method list_1	D RD/WR	http://br-automatio
73 ■ di DisplayUrmsL1 SFM1-A11	D RD/WR	http://br-automatio
74 ■ displayUmsL2 SFM1-A11_	D RD/WR	http://br-automatio
75 ■ displayUmsL3 SFM1-A11_	D RD/WR	http://br-automatio
76 ■ JisplayUimbalance SFM1-A11_	D RD/WR	http://br-automatio
. 77 ■ 🔂 DisplayPF_L1 SFM1-A11_	D RD/WR	http://br-automatio
• 78 ■ d⊒ DisplayPF_L2 SFM1+11_	D RD/WR	http://br-automatio
79 ■ d⊒ DisplayPF_L3 SFM1-A11	D RD/WR	http://br-automatio
80 = JDisplayActivePowerL1 SFM1-A11	D RD/WR	http://br-automatio
81 • JDisplayActivePowerL2 SFM1-A11	D RD/WR	http://br-automatio
82 • DisplayActivePowerL3 SFM1-A11	D RD/WR	http://br-automatio
83 • DisplayApparentPowerL1 SFM1-A11	D RD/WR	http://br-automatio
84 • DisplayApparentPowerL2 SFM1-A11	D RD/WR	http://br-automatio
85 • DisplayApparentPowerL3 SFM1-A11	D RD/WR	http://br-automatio
86	D RD/WR	http://br-automatio
87 T DisplayVoltageTHD SFM1-11	D RD/WR	http://br-automatio
88 = displayFreqMeas SFM1-A11_	D RD/WR	http://br-automatio
89 🖷 🕁 DisplayThermalLoad SFM1-A11	D RD/WR	http://br-automatio
90 • Jipper SFM1-A11	D RD/WR	http://br-automatio
91 • DisplayTimeToCool SFM1-A11	D RD/WR	http://br-automatio
92 🖷 📶 DisplayEarthFaultCurrent SFM1-A11_	D RD/WR	http://br-automatio
🥵 👘 👘 👘 👘 👘 👘 👘 👘 👘 👘 👘 👘 👘	D RD/WR	http://br-automatio
94 🔹 📶 DisplayMotorOperationHours SFM1-A11_	D RD/WR	http://br-automatio
95 🔹 📶 DisplayMotorStandStillHours SFM1-A11	D RD/WR	http://br-automatio

Figure 28:Online_Set_Parameter_Writelist

- Drag and drop the parameter in the write list
- Compile the software

In this example we want to know how many time the contactor switched.

To be able to do this, we have to perform the following steps:

- Set the parameter "DisplayMechSwitchCountA" to TRUE
- Write the parameter to the server
- Use the Method "Apply Changes"
- Read the variable in the readlist
- ParameterSet >> DisplayMechSwitchCountA



Figure 29: Online_Set_Parameter_Set

- Open "OB1" and "Client_Interface_Data" and put the screens next to each other
- Open the menu Writelist_1 >> Variable
- Monitor both screens
- Set "DisplayMechSwitchCountA" op 1
- Activate the write tag
- Deactivate the write tag 3



Figure 30: Online_Set_Parameter_ApplyChanges

- Activate the ApplyChanges (REQ)
- Deactivate the Applychanges (REQ) 2

After disconnecting and connect the server again, the variable should be available in the processData of the client interface.

🖳 Consistency check 📄				Import interface	E				-
				Source: Online (op	c.tcp://1	192.168.2.11] 🔻 🕪 🔯 Online acc	ess		
OPC UA client interface	Read list 1			OPC UA server	interfa	ace			
 Data access 	Display Name	Node type	Access level	Display Name			Node type	Access level	Node ID
Read lists	1 stil ModuleOk	BOOL	RD	45	-	ST003 SEM1-A11_1	Object		http://br-au
Add new read list	2 SI RunningEorward	BOOL	RD	46		Configuration	Object		http://br-au
Read list 1	3 SI ContactorVoltageLow	BOOL	RD	47		ProcessData	Object		http://br-au
Vite lists	4 ••• OverloadTrip	BOOL	RD	48		• ModuleOk	Boolean	RD	http://br-au
Add new write list	5 SensorModuleMissing	BOOL	RD	49		SerialNumber	UInt32	RD	http://br-au
🖶 Write list 1	6 GurrentTime	LDT	RD	50		ModuleID	UInt16	RD	http://br-au
Method lists	7 GI OSPValid	BOOL	RD/WR	51		- HardwareVariant	UInt16	RD	http://br-au
Add new method	8 MechSwitchCountA	DINT	RD	52		TirmwareVersion	UInt16	RD	http://br-au
Method list 1	9 Insert a new ement here			53		I DigitalInputX3	Boolean	RD	http://br-au
				54		I RunningForward	Boolean	RD	http://br-au
				55		I SumStatusDataReady	Boolean	RD	http://br-au
				56		• SumFault	Boolean	RD	http://br-au
				57		ContactorVoltageLow	Boolean	RD	http://br-au
				58		1 ParameterOutOfRange	Boolean	RD	http://br-au
				59		I SmartFunctModuleHWFault	Boolean	RD	http://br-au
				60		ContactorOutputShortCircuit	Boolean	RD	http://br-au
				61		SensorModuleReady	Boolean	RD	http://br-au
				62		I SensorModuleMissing	Boolean	RD	http://br-au
				63		CurrentImbalanceTrip	Boolean	RD	http://br-au
				64		CurrentPhaseLossTrip	Boolean	RD	http://br-au
				65		Overload Trip	Boolean	RD	http://br-au
	•			66		CoolingTimeRunning	Boolean	RD	http://br-au
				67		I StartupTimeRunning	Boolean	RD	http://br-au
	<u>}</u>			68		1 PhaseSequenceCurrent	Boolean	RD	http://br-au
				69		- PhaseSequenceVoltage	Boolean	RD	http://br-au
				70		- CurrentPhaseLossTripL1	Boolean	RD	http://br-au
				71		CurrentPhaseLossTripL2	Boolean	RD	http://br-au
				72		- CurrentPhaseLossTripL3	Boolean	RD	http://br-au
				73		- SensorModuleHWFault	Boolean	RD	http://br-au
				74		IneFrequencyNotDetected	Boolean	RD	http://br-au
				75		- NoVoltageMeasurementSupported	Boolean	RD	http://br-au
				76		I RunForward	Boolean	RD/WR	http://br-au
				77		- ResetErrors	Boolean	RD/WR	http://br-au
				78		ResetCounterContactorA	Boolean	RD/WR	http://br-au
				79		I ResetMotorRunHours	Boolean	RD/WR	http://br-au
				80		ResetMotorStandStillHours	Boolean	RD/WR	http://br-au
				81		I ResetNoOfThermalTrips	Boolean	RD/WR	http://br-au
				82		I ResetNoOfAllTrips	Boolean	RD/WR	http://br-au
				83		TestPosition	Boolean	RD/WR	http://br-au
				84		OSPValid	Boolean	RD/WR	http://br-au
				05	-	- MechSwitchCountA	Int32	RD	http://br-au
				86		ConfigChannels	Object		http://br-au

Figure 31: Online_Set_Parameter_Result

Example:

ProcessData >> MechSwitchCountA

5. Configuring Novolink with Smart Gateway

Please use following documents to configure Novolink with Smart Gateway

Document type	Document number	Link					
SFM1 Manual	2CDC100017M0201	link					
User manual for Novolink	1SAC200230M0001	link					

6. Troubleshooting

6.1. No OPC UA Sever application Found

Connect to OPC UA serv	ver		×							
	Access to the OPC UA server									
	OPC UA server address:	opc.tcp://192.168.2.11								
	Session name:	urn:DESKTOP-82ACVLK:Siemens:TIA-Portal@MA-IT:Client interface_1								
a -	Select OPC UA server end point:		Find selected server							
	Application name / Security policy									
TIA Portal certificat Certificate Certificate	te Iocation: None 💌 e (client):	User authentication User authentication: User name: Password:	User name and password							
Online status information	: t to the OPC UA server with address opc.tcp://192. JPC UA server application found.	Disp	lay only error messages ▲ ■ ♥							
			Connect Cancel							

Figure 32: PopUp No_Online Access

- Verify TIA Portal is able to reach the smart-gateway
- Check the IP-address of the server
- Check the IP-address of your Client (TIA Portal)
- Check that you can reach the server using ping
- Reboot the server

6.2. Status 16#3870_0600

Activate the connection and the status is 3870_0600 check the next part:

Devices																
11 II I	1	1	6¥ 1	4 B	/ E **	Keep a	tual values 🔒 S	napshot 🦷 🖳 Copysnapshots to start values 🏾	😨 Load start values as ac	tual val	lues 🔍 🗄	h.				
		C	ient	inter	rface_1_Co	onfigura	tion									
Novolink_SiemensClient_NoSec	^		Nat	me			Data type	Start value	Retain	Ac	ccessible f	Writa	Visible in	Setpoint	Supervision	Comment
Add new device		-0	-	Stati	c											
Devices & networks		2 🐨		• 0	onnection		Struct									
PLC_1 [CPU 1511-1 PN]		3 🐨	1		ConnectInf	0	OPC_UA_SessionCo									
T Device configuration		4 -00			Session	Name	WString[64]	WSTRING#'OPC UA Connection_1'								Defines the name of the session assigned by
😵 Online & diagnostics		5 🐨			Applica	tionNa	WString[64]	WSTRING#"								Defines the readable name of the OPC UA clie
Software units		6 🐨	1		Security	MsgMo.	UDInt	1								ENUM UASecurityMsgMode
🔻 🛃 Program blocks		7 -00			Security	Policy	UDInt	1								ENUM UASecurityPolicy
📫 Add new block		8 🐨			ServerU	Iri	String[254]	'opc.tcp://192.168.2.11:4840'								Defines the URI of the server. Coded in ASCII.
Hain [OB1]		9 🐨	1		CheckS	erverCer	Bool	False								Flag indicating if the server certificate should
Client interface_1_Data [D.	=	10 -0			Transpo	rtProfile	UDInt	1								ENUM UATransportProfile
💌 🔙 System blocks		11 🐨			Useride	ntityTo	UDInt	1								ENUM UAUserIdentityTokenType
 Program resources 		12 🐨	1		UserTok	enPara	WString[64]	WSTRING#'admin'								Meaning according to UserIdentityTokenType,
S OPC_UA_ReadList		13 -0			UserTok	enPara	WString[64]	WSTRING#'admin2023'								Meaning according to UserIdentityTokenType,
CPC_UA_WriteList		14 🐨			Certifica	telD	UDInt	0								Certificate identifier configured in TA portal.
Client interface_1		15 🐨	1		Session	Timeout	Time	T#305								Defines how long the session will survive if th
a OPC_UA_ReadList		16 -0			Monitor	Conne	Time	T# 5S								Defines the interval time to check the connec
OPC_UA_WriteList		17 🐨	1		Localell	Ds	Array[04] of Strin									OPC-UA Part3 / Chapter8.4: (language) is a tw
Technology objects		18 🐨	1	•	Connection	Hdl	DWord	16#0								
External source files		19 -0			ServerEnd	ointUrl	String[254]	'opc.tcp://192.168.2.11:4840'								
PLC tags		20 🐨		► N	lamespaces		Struct									
PLC data types		21 -0		► Re	eadLists		Struct									
 Watch and force tables 		22 🗠	•	► W	WriteLists		Struct									

Figure 33: ClientInterface_Configuration

- Open the Client interface configuration data block
- Check if the ServerEndpointUrl" and "ServerUri" start values are the same
 If this is not?

Copy the "ServerEndpointUrl" to "ServerUri"

- Compile the project with a rebuild all for hardware and software
- Download "hardware configuration"
- Download "Software all"

7. List of related documents/links

Document type	Document number	Link				
SFM1 Manual	2CDC100017M0201	link				
User manual for Novolink	1SAC200230M0001	link				
Siemens Licenses		link				
Siemens PLCs		link				



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You can find the address of your local sales organization on the ABB homepage

abb.com/lowvoltage



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