# **Technical Manual** WDGA absolute rotary encoders with Profinet interface

For Firmware < 1.99









# Impressum





### Wachendorff Automation GmbH & Co. KG

Industriestrasse 7 D-65366 Geisenheim Tel: +49 (0) 67 22 / 99 65 25 E-Mail: support-wa@wachendorff.de Homepage: www.wachendorff-automation.de Wiesbaden District Court HRA 8377, VAT ID: DE 814567094 Managing Director: Robert Wachendorff

#### Guarantee waiver, right of amendment, copyright protection:

The company Wachendorff Automation assumes no liability and provides no guarantee for the correctness of this manual's contents or for any resulting direct or indirect damages. In the interests of continuous innovation and cooperation with our customers, we reserve the right to change technical data or content at any time.

The company Wachendorff Automation claims copyright protection for this manual. It may not be modified, extended, reproduced, or forwarded to third parties without our prior written consent.

#### Comments:

Should you have any suggested corrections, comments or requests for change, we invite you to submit them to us. Please send your comments to: support-wa@wachendorff.de



1	Int	rod	uction1
	1.1	Abo	put this manual1
	1.1	.1	Symbols
	1.1	.2	You will not find the following in this manual:
	1.2	Pro	duct assignment
	1.3	Spe	ecifications 4
	1.4	Sco	ppe of delivery
2	Sa	fety	information5
	2.1	Ger	neral safety information5
	2.2	Inte	nded use
	2.3	Saf	e working6
	2.4	Dis	posal6
3	De	vice	e description7
	3.1	Ger	neral information7
	3.2	Pro	finet7
	3.3	WD	GA — basic principles
	3.3	.1	Singleturn — ST (QuattroMag®) 8
	3.3	.2	Multiturn — MT (EnDra®) 9
	3.3	.3	Direction of rotation9
	3.3	.4	Preset9
	3.3	.5	Scaling9
	3.4	Cor	nnection assignments for Profinet encoders
	3.4	.1	BI2 — bus cover with 3x M12x1 11
	3.5	LE	Ds and signalling 12
	3.6	MA	C address and IP address13
4	Pro	ofin	et14
4	4.1	Ove	erview of functions 14
	4.2	GS	DML modules
	4.3	Sig	nals15
4	4.4	Stru	acture of the signals
4	4.5	Tel	egrams
4	4.6	Par	ameters
	4.6	.1	Description of the most important parameters
4	4.7	Wa	rnings and errors

	4.7.	1	Errors 2	26
	4.7.	2	Warnings 2	26
	4.7.3		G1_XIST2 error codes	26
5	We	b s	erver2	7
ļ	5.1	Ger	neral information	27
ļ	5.2	Info	rmation 2	27
	5.2.	1	Overview	27
	5.2.	2	Diagnosis 2	29
	5.2.	3	Versions	30
ļ	5.3	Con	figuration	31
	5.3.	1	Network	31
	5.3.	2	Encoder	31
	5.3.	3	Firmware Update 3	32
ļ	5.4	Lice	ence information	34
ļ	5.5	Con	ntact	35
6	Со	mm	issioning3	6
(	6.1	Ger	neral information	36
(	6.2	Inte	gration into a TIA project	36
(	6.3	Sca	ling function	4
	6.3.	1	Example scaling function singleturn 16-bit to 12-bit 4	4
	6.3.	2	Example scaling function multiturn 4	6
	6.3.	3	Executing a preset 4	8
	6.3	4	Resetting a preset5	50
(	6.4	Inte	gration into a Step 7 project5	51
7	Те	chn	ical data5	7
-	7.1	Pro	perties5	57
-	7.2	Dim	ensions5	57
	7.2.	1	WDGA 58B	57
	7.2.	2	WDGA 58F 5	58
	7.2.	3	WDGA 58E 5	58
8	Те	chn	ical support5	9



# Index of figures

Figure 3.1: WDGA with PROFINET-IRT bus cover	7
Figure 5.1: Web server — overview	27
Figure 5.2: Diagnostic page	29
Figure 5.3: Versions	30
Figure 5.4: Network settings	31
Figure 5.5: Encoder information	31
Figure 5.6: Firmware update	32
Figure 5.7: Firmware update - choose file	32
Figure 5.8: Firmware update - Transferring file	33
Figure 5.9: Firmware update - Successful	33
Figure 5.10: Firmware update - Failed	34
Figure 5.11: Licence information	34
Figure 5.12: Contact information	35
Figure 6.1: Switching to project view	36
Figure 6.2: Manage device description file (GSD)	37
Figure 6.3: Installing GSDML	37
Figure 6.4: Switch to Devices & Networks	38
Figure 6.5: Hardware catalogue	38
Figure 6.6: Network view	38
Figure 6.7: Change device name	39
Figure 6.8: Select module	39
Figure 6.9: Select telegram	40
Figure 6.10: Change the I/O addresses	40
Figure 6.11: Download to device	40
Figure 6.12: Assigning device names	41
Figure 6.13: Name and PG interface	41
Figure 6.14: Accessible nodes	42
Figure 6.15: Online status information	42
Figure 6.16: PLC variables	43
Figure 6.17: Show all	43
Figure 6.18: Default tag table	43
Figure 6.19: Example of commissioning	44
Figure 6.20: Device overview - MAP	44
Figure 6.21: Assembly parameters	45
Figure 6.22: Default assembly parameters 16-Bit Singleturn	45
Figure 6.23: Configuration of 12-Bit Singleturn with scaling	40
Figure 6.24: Example of commissioning	40
Figure 6.25: Device overview - MAP	47
Figure 6.27: Configuration of 200 Stone/revelution and 40 revelutions	4/
Figure 6.29: act STM2 ENC bit 40 to TDUE	48 40
FIGURE 0.20: SET ST W2_ENU DIT 10 TO TRUE	49
FIGURE 6.20: C1_STW DIT 13 TO TRUE	49 40
Figure 0.30: $G1_{0}1$ W Bit 11 default $U = absolute$	49 50
Figure 0.31: Set and reset G1_S1W Bit 12	5U
Figure 6.32: SIMATIC Manager	51

Figure 6.33: Installing the GSDML file	51
Figure 6.34: Installing GSDML	52
Figure 6.35: Hardware catalogue	52
Figure 6.36: Hardware view	53
Figure 6.37: Assign a device name	53
Figure 6.38: Select via single mouse click	54
Figure 6.39: Select the properties and the telegram	54
Figure 6.40: Slot 1, highlighted green	54
Figure 6.41: Slot 1.2 with inserted telegram 81	54
Figure 6.42: Change the I/O addresses	55
Figure 6.43: "Addresses" tab	55
Figure 6.44: Save and transmit — Download to module	55
Figure 6.45: Variable table	55
Figure 6.46: HEX position value	56
Figure 7.1: Dimensions WDGA 58B	57
Figure 7.2: Dimensions WDGA 58F	58
Figure 7.3: Dimensions WDGA 58E	58



# Index of tables

Table 3.1: Connection assignment — BI2	11
Table 3.2: LED signal	12
Table 4.1: Functions	14
Table 4.2: GSDML modules	14
Table 4.3: Signals	15
Table 4.4: Structure of signal 6 NIST_A	16
Table 4.5: Structure of signal 8 NIST_B	16
Table 4.6: Structure of signal 9 G1_STW	16
Table 4.7: Structure of signal 10 G1_ZSW	17
Table 4.8: Structure of signal 11 G1_XIST1	17
Table 4.9: Structure of signal 12 G1_XIST2	18
Table 4.10: Structure of signal 39 G1_XIST3	18
Table 4.11: Structure of signal 80 STW2_ENC	19
Table 4.12: Structure of signal 81 ZSW2_ENC	19
Table 4.13: Structure of signal 238(60000) G1_XIST1_PRESET_A	19
Table 4.14: Structure of signal 60001 DEBUG_STW	20
Table 4.15: Structure of signal 60002 DEBUG_ZSW	20
Table 4.16: Telegrams	21
Table 4.17: Supported parameters	22
Table 4.18: Velocity measuring units	24
Table 4.19: Hysteresis position	24
Table 4.20: Extrapolation position	24
Table 4.21: Filter max. RPM	24
Table 4.22: Filter position	25
Table 4.23: Filter speed	25
Table 4.24: Errors	26
Table 4.25: Warnings	26
Table 4.26: G1_XIST2 error codes	26
Table 6.1: Data content for Example	48

# 1 Introduction

# **1.1 About this manual**

This technical manual describes the configuration and mounting possibilities for absolute-value encoders with a PROFINET interface produced by Wachendorff Automation. It supplements the other publicly available Wachendorff automation documents, e.g. data sheets, assembly instructions, leaflets, catalogues and flyers.

Ensure that you read the manual before commissioning — check beforehand that you have the latest version of the manual.

When reading, pay particular attention to the information, important notices and warnings that are marked with the corresponding symbols (see 1.1.1).

This manual is intended for persons with technical knowledge in the handling of sensors, PROFINET IRT interfaces and automation elements. If you do not have any experience in this field, request the assistance of experienced personnel before proceeding.

Keep the information provided with our product in a safe place so that you can refer to it at a later date as necessary.





# 1.1.1 Symbols

i	<ul> <li>The INFO symbol indicates a section that contains particularly important information for advanced use of the device.</li> </ul>
	<ul> <li>The IMPORTANT symbol is shown next to a section of text that describes a method for solving a particular problem.</li> </ul>
	<ul> <li>The WARNING symbol indicates that the adjacent instructions must be observed to ensure correct use of the device and to protect the user against hazards.</li> </ul>

### **1.1.2** You will not find the following in this manual:

- Basic information about automation technology
- System planning
- Risks (availability, safety)
- Shielding concepts
- Reflections
- Repeaters
- Network configuration
- Bus cycle times
- FMA management services
- Transmission services
- Telegram types



# **1.2 Product assignment**

This manual relates to the following encoder types produced by Wachendorff Automation:

#### Solid shaft absolute encoders:

- WDGA 58A PROFINET-IRT (BI2) (with bus cover)
- WDGA 58B PROFINET-IRT (BI2) (with bus cover)
- WDGA 58D PROFINET-IRT (BI2) (with bus cover)
- WDGA 58F PROFINET-IRT (BI2) (with bus cover)

#### Hollow shaft absolute encoders:

• WDGA 58E PROFINET-IRT (BI2) — (with bus cover)



 Wachendorff's PROFINET product range can be found on our website: www.wachendorff-automation.com



# 1.3 Specifications

An encoder is a sensor that is designed to detect angular positions (singleturn) and revolutions (multiturn). The measured data and variables are processed by the encoder and provided as electrical output signals for the connected peripherals.

The patented technologies QuattroMag® (for singleturn) and EnDra® (for multiturn) are used in the WDGA series. As a result, the WDGA-series encoders from Wachendorff are maintenance-free and very eco-friendly.

The encoders whose article descriptions are listed in section 1.2 communicate via the PROFINET IRT interface.

#### 1.4 Scope of delivery

The scope of delivery depends on the product variants and the details of your order. Before commissioning, check the contents of the delivery for completeness.

As a rule, the WDGA product range with a PROFINET IRT interface includes the following items:

- WDGA with PROFINET-IRT (with bus cover)
- Assembly instructions



The corresponding GSDML file and data sheet can be downloaded from the internet:

www.wachendorff-automation.com

# 2 Safety information

#### 2.1 General safety information

<ul> <li>When commissioning the encoder, ensure that you observe the assembly instructions, manual and data sheet.</li> </ul>
<ul> <li>Failure to observe the safety instructions may lead to malfunctions, property damage and personal injury!</li> </ul>
<ul> <li>Observe the operating instructions provided by the machine's manufacturer.</li> </ul>

#### 2.2 Intended use

Rotary encoders are components that are intended for installation in machines. Before commissioning (operation in accordance with the intended use), it must be determined that the machine as a whole corresponds to the EMC and Machine Directive.

A rotary encoder is a sensor that is designed to detect angular positions and revolutions and must only be used for this purpose! Wachendorff Automation manufactures and distributes encoders for use in non-safety-relevant industrial applications.



• The encoder must not be operated outside the specified limit parameters (see data sheet).



# 2.3 Safe working

The installation and mounting of the encoder must only be carried out by a qualified electrician.

For the construction of electrical installations, all relevant national and international regulations must be strictly observed.

Failure to commission the encoder correctly may result in malfunction or failure.



#### 2.4 Disposal

Devices that are no longer needed or are defective must be disposed by the user in proper compliance with the country-specific laws. It must be taken into consideration that this is a special waste of electronics and that disposal is not permitted via normal household waste.

There is no obligation by the manufacturer to take the device back. If you have any questions regarding proper disposal, contact a disposal specialist in your area.

# **3 Device description**

# 3.1 General information

Various mechanical variants of the WDGA-series encoders with PROFINET-IRT are available. The required variant is determined by the need for a bus cover, the flange design and the shaft type (solid or hollow). The size is specified as 58 mm by the diameter at the flange. The following figure shows examples of WDGA-series encoders with PROFINET IRT.



Figure 3.1: WDGA with PROFINET-IRT bus cover

The solid or hollow shaft is connected to the rotating component whose angular position or rotational speed is to be measured. Cable or plug outlets create the interface for connection to the PROFINET network. The status LEDs mounted in the cover signal the various encoder states during operation. They assist with configuration of the encoder and troubleshooting in the field. The flange holes or supplied spring sheets are used for attachment to the machine and during the respective application.

# 3.2 Profinet

Profinet is distributed by the PROFIBUS User Organization (PNO) as a successor to Profibus. Profinet is the standard interface for industrial Ethernet. Profinet provides similar functionality to Profibus, but extends these by firmware upgrades.

Established IT standards are used for the transfer of information. UDP, IP and XML the basis for this. XML is used а description form as language in the device profile (abbreviated to "GSDML file"). In order for the devices to exchange their data via IP — process data (cyclic) and parameter data (acyclic) — a unique name must be assigned to each Profinet node during configuration. The control can only assign an IP address to the node via this name.



Profinet supports the following three transmission types:

- **PROFINET NRT** (not real time), non-time-critical applications in automation, clock rates of around 100 milliseconds.
- **PROFINET RT** (real time), cyclic data traffic is used to achieve clock rates of 10 milliseconds.
- **PROFINET IRT** (isochronous real time), clock rates of 1 millisecond and jitter of less than 1 microsecond. This is suitable for use in motion-control applications (for example).

Further information about Profinet is available via the homepage of the PROFIBUS User Organization (PNO) at:

http://www.profibus.com/technology/profinet/

#### 3.3 WDGA — basic principles

The following sections describe the basic functions of an absolute encoder.

Unlike incremental encoders, absolute-value encoders output their position value as a digital number via a fieldbus. A distinction is made here between singleturn and multiturn encoders.

In addition to simply outputting the position value, most encoders permit a certain degree of parametrization, such as selecting the positive direction of rotation, setting the position value to a reference value at a fixed physical position, and scaling the position value to an arbitrary resolution and a limited measuring range. This reduces the required complexity of the control program as well as the computational burden on the controller.

#### 3.3.1 Singleturn — ST (QuattroMag®)

Measurement of the angle from 0° to 360° by means of a shaft represents the minimum functionality of a rotary encoder. The sensor system is based on optical or magnetic sampling of a measuring graduation on the encoder shaft.

The WDGA encoders from Wachendorff feature the new QuattroMag® magnetic technology, which provides maximum precision and resolution for a singleturn encoder.

#### 3.3.2 Multiturn — MT (EnDra®)

A multiturn encoder allows the number of revolutions to be recorded. This is achieved via a rotation counter. The WDGA encoders include EnDra® technology, which ensures that the corresponding information is retained, even in a voltage-free state. This means that buffer batteries and gearboxes, which require a comparatively large installation space and a correspondingly high degree of maintenance, are no longer needed.

#### 3.3.3 Direction of rotation

The positive direction of rotation can be reversed by a simple two's complement of the position value (invert every bit and add "1").

#### 3.3.4 Preset

The desired position value can be assigned to the encoder at a specific physical position. This must be within the measuring range so that the position value is correlated with a physical reference position. For this purpose, the difference between the current position value and the desired value is calculated. The result is stored in non-volatile memory and added to the position value as an offset.

#### 3.3.5 Scaling

To ensure that the position value exactly matches the variables to be physically measured, an adjustment can be carried out via the scaling parameters. The scalable parameters are "Measuring units per revolution (MUPR)" and "Total measuring range in measuring units (TMR)".

The scaling parameter "Measuring units per revolution (MUPR)" — increments per revolution — indicates the resolution of the position value per revolution (also: ST-resolution). The value corresponds to 360°. That is, if a value of 3600 Cts is parametrized, the encoder outputs the position in 0.1° steps (see equation (2)).

$$MUPR = ST = 3600 Cts \tag{1}$$

Angular steps = 
$$\frac{Angle \ of \ one \ revolution}{MUPR} = \frac{360^{\circ}}{3600 \ Cts} = 0.1^{\circ}/Cts$$
 (2)

The scaling parameter "Total measuring range in measuring units (TMR)" — the maximum total measuring range of the position value (singleturn and multiturn multiplied) — indicates the total resolution of the encoder. When the position value reaches TMR -1, it jumps back to 0 and vice versa.

As a rule, the selected TMR parameter should be an integer multiple of the "Measuring units per revolution (MUPR)" (see equation (4)), so that the zero point is always at the same position of the encoder shaft.

$$TMR = 36000 Cts \tag{3}$$

$$MT = \frac{TMR}{MUPR} = \frac{36000 \ Cts}{3600 \ Cts} = 10 \tag{4}$$

In exceptional cases, it is suitable that TMR is not an integer multiple of MUPR — for example, in a system in which a gear ratio ensures that the desired measured variable is moving 10% faster relative to the encoder shaft.

In this case, a setting of MUPR = 3960 Cts and TMR = 36000 Cts would ensure that the faster (but not directly measurable) shaft can be measured with a resolution of  $0.1^{\circ}$  and over a range of 10 revolutions. Normally, the number of revolutions would be calculated by dividing the position value by MUPR. In this case, however, it must be divided by 3600 Cts, since the result would otherwise be the number of revolutions of the encoder shaft and not the faster shaft of the system.



• It should be noted that measurement errors will occur if the result of this formula is a decimal.



# 3.4 Connection assignments for Profinet encoders

#### 3.4.1 BI2 — bus cover with 3x M12x1

The string "BI2" in the order code identifies an encoder with a bus cover. The electrical connection is made on the bus cover via 2x M12 connectors and 1x M12 port. The connection assignments for the plugs and sockets are listed in **Fehler! Verweisquelle konnte nicht gefunden werden.** 

Anschluss	sbelegung	Anschlussbelegung		Ans	Anschlussbelegung	
В	12	BI2.			BI2.	
3	4 1 2	1	4 3 <b>1</b> 2			
Port	M12x1,	Connector	M12x1,	Port	:	M12x1,
(Port1)	4-pole,	(Power)	4-pole,	(Por	't2)	4-pole,
D-coded			A-coded			D-coded
Tx+	1	UB+	1	Tx+		1
Rx+	2	n. c.	2	Rx+		2
Tx-	3	UB-	3	Tx-		3
Rx-	4	n. c.	4	Rx-		4

7	ahle	3	1.	Connection	assignment	RI2
'	abic	υ.	1.	CONTRECTION	assignment —	DIZ

# 3.5 LEDs and signalling

Four status LEDs on the bus cover signal the various encoder states and thus support error diagnosis and troubleshooting in the field (see Table 3.2). The two Link Activity LEDs (L/A) light up or flash green when the encoder is connected to another Profinet node (PLC, switch, additional field device...) and data is being exchanged. The STAT LED indicates the status of the fieldbus, the MOD LED the status of the encoder.

STAT LED bicolour	MOD LED bicolour	Meaning	Cause
0	0	No voltage	
		No connection; no data exchange	Bus disconnection or master not accessible or switched off
*		Parametrization error, no data exchange Criterion: Data exchange correct. However, the slave does not switch to the data- exchange mode	Slave is not configured yet. Incorrect station address, but not out of range. The actual configuration of the slave differs from the nominal configuration.
		System error	Diagnosis exists, slave is in data-exchange mode
		Data exchange, slave and operation OK	

Table 3.2: LED signal

Explanation of symbols and asterisks:





### 3.6 MAC address and IP address

Wachendorff Profinet encoders have three MAC addresses. These always start with D4-90-E0-xx-xx-xx. The number depends on the number of ports on the integrated three-port switch. There is one MAC address each for Port1 and Port2, as well as one MAC address for the "internal port" to which the encoder itself is connected.

In the delivered state, the Profinet encoder has no IP address and no name. These are defined during configuration (e.g. TIA Portal).

# 4 **Profinet**

#### 4.1 Overview of functions

Our Profinet encoders support the functions shown in **Fehler! Verweisquelle konnte** nicht gefunden werden.:

Functions	Meaning
Conformance class	CC-C
Profile	Encoder Profile V4.1
Profile class	Encoder Profile Class 4, as well as compatibility with Class 3
Performance	Cycle time 250 µs (with clock synchronisation) and fast start-up of 1 s
Redundancy	MPR and MRPD
Web server	Display and configuration of parameters, firmware updates
Clock synchronisation	RT, IRT and IRT isochronous

Table 4.1: Functions

# 4.2 GSDML modules

The modules from the current GSDML file are listed in **Fehler! Verweisquelle konnte nicht gefunden werden.**:

Designation	Meaning
ST0013	No multiturn, singleturn 13 bit
ST0016	No multiturn, singleturn 16 bit
MT1413	Multiturn 14 bit + singleturn 13 bit = 27 bits in total
MT1416	Multiturn 14 bit + singleturn 16 bit = 30 bits in total
MT1616	Multiturn 16 bit + singleturn 16 bit = 32 bits in total
MT3916	Multiturn 39 bit + singleturn 16 bit = 55 bits in total

Table 4.2: GSDML modules



# 4.3 Signals

**Fehler! Verweisquelle konnte nicht gefunden werden.** shows the signals that are supported by Wachendorff Profinet encoders.

Signal	Description	Name	Length (bits)	Signed
6	Velocity A	NIST_A	16	Y
8	Velocity B	NIST_B	32	Y
9	Sensor 1 control word	G1_STW	16	-
10	Sensor 1 status word	G1_ZSW	16	-
11	Sensor 1 position 1	G1_XIST1	32	N
12	Sensor 1 position 2	G1_XIST2	32	N
39	Sensor 1 position 3	G1_XIST3	64	N
80	Encoder control word 2	STW2_ENC	16	-
81	Encoder status word 2	ZSW2_ENC	16	-
238 (60000)	Sensor position preset control word	G1_XIST_PRESET_A	32	N
60001	Debug control word	DEBUG_STW	16	N
60002	Debug status word	DEBUG_ZSW	16	N

Table 4.3: Signals

# 4.4 Structure of the signals

#### NIST\_A: Velocity value A

This value includes the velocity, has a width of 16 bits and is signed.

Signal	NIST_A								
Bits		15 0							
Contents									
15 0	Velocity value A	Right-aligned, (see <b>Fehler!</b>	output <b>Verweisqu</b>	in I <b>elle</b>	set <b>konnte</b>	unit <b>nicht</b>			

Table 4.4: Structure of signal 6 NIST\_A

#### NIST\_B: Velocity value B

This value includes the velocity, has a width of 32 bits and is signed.

Signal	NIST_B								
Bits		31 0							
Contents									
31 0	Velocity value B	Right-aligned, (see Fehler!	output <b>Verweisqu</b>	in elle	set <b>konnte</b>	unit <b>nicht</b>			

Table 4.5: Structure of signal 8 NIST\_B

#### G1\_STW: Sensor 1 control word

Signal		G1_STW							
Bits	15	14	13	12	11	10 0			
Contents			·		·				
15	Confirm sens	or error	0 = Sen 1 = Sen	0 = Sensor error not confirmed by controller 1 = Sensor error confirmed by controller					
14	Park mode		0 = Norr 1 = Activ	0 = Normal operation 1 = Activate park mode					
13	Cyclically que	ery absolute	0 = Do r 1 = M	ot interrogate aster perform	s query (cyc	ic output of			
12	Activate pres	et	0 = Pres 1 = Pres	0 = Preset not active 1 = Preset active					
11	Preset mode		0 = Set 1 = Mov	0 = Set preset to absolute value 1 = Move preset by value (offset)					
10 0			Reserve	Reserved, currently not used					

Table 4.6: Structure of signal 9 G1\_STW



• To enable the encoder to respond to the requirements in G1\_STW, the controller must set bit 10 to 1 in STW2\_ENC.



#### G1\_ZSW: Sensor 1 status word

Signal		G1_ZSW						
Bits	15	14	13	12	11	10 0		
Contents				·				
15	Sensor error		Signals specific	a sensor er error code in (	ror and outpu G1_XIST2	its a device-		
14	Park mode a	ctive	Confirn transm	Confirms "Park mode". No error messages ar transmitted				
13	Cyclically que	ery absolute	Confirn	ns "cyclically qu	iery absolute p	osition value"		
12	Preset activa	ted	Confirn	ns "activate pre	set"			
11	Sensor error active	acknowledgen	nent Signals acknow	t Signals processing of the requested sensor error acknowledgement				
10 0			Reserv	Reserved, currently not used				

Table 4.7: Structure of signal 10 G1\_ZSW

#### G1\_XIST1: Sensor 1 position 1

Signal		G1_XIST1						
Bits	31 0							
Contents								
31 0	Absolute position value 1	Right-aligned						

#### Table 4.8: Structure of signal 11 G1\_XIST1

Structure of G1\_XIST1 using the example of a 16-bit multiturn and a 16-bit singleturn encoder:

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
M	M	М	M	М	М	М	М	М	М	М	М	М	М	М	М
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

M = multiturn / S = singleturn

This value includes the position, has a width of 32 bits and is unsigned. The encoder parameter settings influence this position value if "Class 4 functionality" is activated. The influence of the preset functionality can be controlled with "G1\_XIST1 Preset Control".

# G1\_XIST2: Sensor 1 position 2

Signal	G1_XIST2					
Bits	31 0					
Contents						
31 0	Absolute position value 2	Right-aligned				

#### Table 4.9: Structure of signal 12 G1\_XIST2

This value includes the position, has a width of 32 bits and is unsigned. The encoder parameter settings influence this position value if "Class 4 functionality" is activated. When activated, the preset functionality always has an influence on G1\_XIST2.



### G1\_XIST3: Sensor 1 position 3

Signal		G1_XIST3						
Bits	63 0							
Contents								
63 0	Absolute position value 3	Right-aligned						

Table 4.10: Structure of signal 39 G1\_XIST3

This value includes the position, has a width of 64 bits and is unsigned. It can be used if the measuring range of the encoder is larger than 32 bits. The encoder parameter settings influence this position value if "Class 4 functionality" is activated.





#### STW2\_ENC: Encoder control word 2

Signal		STW2_ENC						
Bits	15 12	11		10	)		90	
Contents								
15 12	Sign-of-life from the	PLC	PLC Receives a count value from 1 to 15 v isochronous transmission is activated				when	
11			Reserve	d, currently	not used			
10	Control by PLC	0 = No control by PLC						
		1 = Control by PLC						
9 0		Reserved, currently not used						

Table 4.11: Structure of signal 80 STW2\_ENC

#### ZSW2\_ENC: Encoder status word 2

Signal		ZSW2_ENC					
Bits	15 12	11	10	90			
Contents							
15 12	Sign-of-life from the	encoder Sends isochr of-life	a count value of on nous transmission is a nas been received from	1 to 15 when the activated and a sign- the PLC			
11 10		Reser	ed, currently not used				
9	PLC requests contro	0 = No 1 = Co	0 = No control by PLC 1 = Control by PLC				
8 0		Reser	Reserved, currently not used				

Table 4.12: Structure of signal 81 ZSW2\_ENC

#### G1\_XIST1\_PRESET\_A: Sensor position preset control word

Signal	G1_XIST1_PRESET_A					
Bits	31		30 0			
Contents						
31	Trigger bit	Controls	the transmission of the preset value preset			
30 0	Preset value without sign	Includes	the 31-bit-wide preset value			

Table 4.13: Structure of signal 238(60000) G1\_XIST1\_PRESET\_A

• This signal is intended to ensure compatibility with Siemens products. As an alternative to 238, this signal can be assigned the number 60000.



# DEBUG\_STW: Debug control word

Signal	DEBUG_STW			
Bits	15 1 0			
Contents				
15 1	0	Not used		
0	Set test error	Triggers the test error when set to "0"		

Table 4.14: Structure of signal 60001 DEBUG\_STW

#### DEBUG\_ZSW: Debug status word

Signal	DEBUG_ZSW				
Bits	15 1	0			
Contents					
15 1	0	ł			
0	Test error active	Indicates	s that the test error is set		

Table 4.15: Structure of signal 60002 DEBUG\_ZSW

# 4.5 Telegrams

The supported standard telegrams and manufacturer-specific telegrams are described in **Fehler! Verweisquelle konnte nicht gefunden werden.** 



- For telegram 860, the manufacturer signal 238 (alternatively 60000) is used.
- For telegram 59000, the manufacturer signals 60001 and 60002 are used.

Nr Dir						Data	word				
INI.	1 2 3 4 5 6		7	8	9	10					
01	SPS -> ENC	STW2_ ENC	G1_ STW								
01	ENC -> SPS	ZSW2_ ENC	G1_ ZSW	G1_>	G1_XIST1		KIST2				
82	SPS -> ENC	STW2_ ENC	G1_ STW								
02	ENC -> SPS	ZSW2_ ENC	G1_ ZSW	G1_>	KIST1	G1_>	KIST2	NIST_A			
02	SPS -> ENC	STW2_ ENC	G1_ STW								
05	ENC -> SPS	ZSW2_ ENC	G1_ ZSW	G1_>	KIST1	G1_>	KIST2	NIS	T_B		
94	SPS -> ENC	STW2_ ENC	G1_ STW								
04	ENC -> SPS	ZSW2_ ENC	G1_ ZSW		G1_X	KIST3		G1_>	IST2	NIS	T_B
860	SPS -> ENC	G1_> PRES	KIST_ SET_A								
000	ENC -> SPS	G1_>	(IST1	NIS	T_B						
50000	SPS -> ENC	STW2_ ENC	G1_ STW	DEBUG _STW							
33000	ENC -> SPS	ZSW2_ ENC	G1_ ZSW	G1_>	KIST1	G1_>	KIST2	DEBUG _ZSW			

Table 4.16: Telegrams



#### 4.6 Parameters

	PNU	Sub-	Bits	Function						
-		index								
	65000			Preset value						
	65001	1	0	Code sequence						
			1	Class 4 functionality S1_XIST1 preset control						
			2	31_XIST1 preset control Scaling function control						
			3	Scaling function control						
			4	Alarm channel control						
			5	Compatibility mode						
ile		2		Faults						
rof		3		Supported faults						
гp		4		Varnings						
qe		5		Supported warnings						
CO		6		Encoder profile version						
ш		8		Offset value						
		9		Measuring units per revolution						
		10		Total measuring range in measuring units						
		11		Velocity measuring unit						
	65002			Preset value 64 bit						
	65003	1		Offset value 64 bit						
		2		Measuring units per revolution 64 bit						
		3		Total measuring range in measuring units 64 bit						
	922			Telegram selection						
	925			Number of controller sign-of-life failures which may be tolerated						
	964			Device identification						
	965			Encoder profile number						
	970			Load parameter set						
İΥθ	971			Transfer to non-volatile memory						
dr	972			Encoder reset						
E	974			Base mode parameter access service identification						
RC	975			Encoder object identification						
<u>с</u>	976			Load device parameter set						
	977			Transfer in non-volatile memory (global)						
	978			List of all DO-IDs						
	979			Sensor format						
	980989			Number list of defined parameter						
	2000			Hysteresis position						
4 <u>9</u>	2002			Extrapolation position						
vic Scif	2003			Filter max. RPM						
De	2004			Filter position						
	2005			Filter speed						

Table 4.17: Supported parameters

#### 4.6.1 Description of the most important parameters

#### 4.6.1.1 Code sequence

Defines the counting direction of the position value in relation to the encoder shaft. "0" means a positive counting direction of the position value with clockwise rotation of the shaft; "1" means a positive counting direction with counter-clockwise rotation.

#### 4.6.1.2 Class 4 functionality

Switches the scaling, preset and code sequence functionality on and off. When switched on, the position values G1\_XIST1, G1\_XIST2 and G1\_XIST3 are influenced by the scaling and the code sequence, and G1\_XIST2 and G1\_XIST3 by the preset. In addition, if "G1\_XIST1 Preset control" is also activated, G1\_XIST1 is also affected by the preset, otherwise it is not.

#### 4.6.1.3 G1\_XIST1 preset control

Controls whether a preset command affects G1\_XIST1 and is switched on with "0" and off with "1". Has no function unless "Class 4 Functionality" is activated. Only affects G1\_XIST1, i.e. if the preset function is activated and the "G1\_XIST2 Preset control" is switched off, G1\_XIST2 is nevertheless affected by the preset.

4.6.1.4 Scaling function control

This parameter turns the scaling functions on and off. If it is not activated, the position values G1\_XIST1, G1\_XIST2 and G1\_XIST3 are not affected. The scaling of the velocity value is PROFIdrive-specific and is not influenced by the position scale. The current setting can be read by object P65001, sub-index 1, bit 3. To use the scaling functions, "Class 4 functionality" must be activated.

#### 4.6.1.5 Preset value

The preset value is governed by the scaling and can be reset repeatedly and stored in non-volatile memory via P971. By default has the preset value has the value 0.

Setting a preset value has no effect on the position value for the time being. The preset function is only executed by setting bit 12 in G1\_STW.

4.6.1.6 Measuring units per revolution

For encoders, this parameter defines the number of increments required to resolve one 360° rotation of the encoder shaft. This parameter must be set during parametrization (octets 5...8). The current setting can be read by object P65001, sub-index 9.

4.6.1.7 Total measuring range in measuring units

Defines the entire measuring range of the encoder, i.e. after how many increments the position value resets to 0. For example, if "Measuring units per revolution" is 100 and "Total measuring range" is 250, the position value will return to 0 after 2.5 revolutions of the encoder shaft.

4.6.1.8 Velocity measuring units

This parameter defines the unit of the velocity values NIST\_A and NIST\_B. The following units are possible:



Unit	Parameter value
Increments / s	0
Increments / 100 ms	1
Increments / 10 ms	2
Rotations / min	3

Table 4.18: Velocity measuring units

#### 4.6.1.9 Offset value

The offset value is calculated during execution of the preset and is then added to the position value. It is stored in non-volatile memory and can be read by the encoder at any time. The offset value can assume values within the scaled measurement range.

#### 4.6.1.10 Hysteresis position

Parameters	2000
Meaning	Hysteresis position
Data type	Unsigned 8
Access	RW
Values	0 255
Default	10
Explanation	Size of the hysteresis for the position value

#### Table 4.19: Hysteresis position

#### 4.6.1.11 Extrapolation position

Parameters	2002						
Meaning	Extrapola	tion positic	n				
Data type	Unsigned	16					
Access	RW						
Values	0 6553	35					
Default	100						
Explanation	Time	to	be	compensated	for	in	μs
_	"Where will the position value be in X µs?"						

#### Table 4.20: Extrapolation position

#### 4.6.1.12 Filter max. RPM

Parameters	2003						
Meaning	Filter max. RPM						
Data type	Unsigned 16						
Access	RW						
Values	0 65535						
Default	0						
Explanation	0:	Number	of	average	values	is	constant
	> 0: Number of average	ge values de	ecrease	s linearly unt	il the speed	d indica	ated here is
	reached						

Table 4.21: Filter max. RPM



#### 4.6.1.13 Filter position

Parameters	2004
Meaning	Filter position
Data type	Unsigned 8
Access	RW
Values	0 255
Default	5
Explanation	Number of average values for the position value

Table 4.22: Filter position

#### 4.6.1.14 Filter speed

Parameters	2005
Meaning	Filter speed
Data type	Unsigned 8
Access	RW
Values	0 255
Default	5
Explanation	Number of average values for the velocity value

Table 4.23: Filter speed



# 4.7 Warnings and errors

#### 4.7.1 Errors

Bits	Meaning	Sensor system error code
0	Position error	All have invalid position values
5	Memory error	11

Table 4.24: Errors

#### 4.7.2 Warnings

Bits	Meaning	Sensor system error code
0	Frequency exceeded	-

Table 4.25: Warnings

#### 4.7.3 G1\_XIST2 error codes

G1_XIST2	Meaning	Sensor system error code
0x0001	Sensor group error	All have invalid position values
0x0F01	Command not supported	-
0x0F02	PLC sign-of-life error	-
0X0F04	Synchronisation error	13

Table 4.26: G1\_XIST2 error codes



# 5 Web server

#### 5.1 General information

Profinet encoders have a web server that lets you view specific information and configure certain settings. To access the web server, enter its IP address into a browser of your choice (Internet Explorer, Firefox, etc.). To do so, connect the encoder to your computer using an Ethernet cable (M12 connector on the encoder and RJ45 connector on the PC). Ensure that your PC is in the same IP address range as the encoder.

Subnet address of the PC: 255.255.255.0
---

Once this has been done, the encoder's homepage opens (information overview).

The following sub-sections cover the various views within the web server and the available functions.

#### 5.2 Information

#### 5.2.1 Overview

Information Configuration	Licence Contact	Language:
Overview		Refresh (10s)
Device type: Serial number: Operating time in hours:	Wachendorff Encoder 172200107 00:05	
Protocol:	PROFINET IO	
Status device: Status stack:	Running Online	
Device name:		
MAC Device: MAC Port 1: MAC Port 2:	D4:90:E0:00:00:01 D4:90:E0:00:00:02 D4:90:E0:00:00:03	
IP address: Netmask: Gateway:	192.168.0.1 255.255.255.0 0.0.0.0	





The overview displays the following information:

- Device type: name of the encoder
- Serial number: device number of the encoder
- Operating time in hours: number of operating hours
- Protocol: Profinet IO
- Device status: on or off state
- Status stack: Online or offline
- MAC devices: MAC address of the encoder
- MAC Port 1: MAC address of Ethernet port 1
- MAC Port 2: MAC address of Ethernet port 2
- IP address: IP address of your Profinet encoder
- Network mask: the subnet mask of your Profinet encoder
- Gateway: the gateway of your Profinet encoder

The update rate of the web page is fixed at 10 seconds and cannot be changed. The message "Updating Data" in the upper-right corner of the field in which the update time is displayed indicates that the data is being updated.

You can change the language of the web server after accessing it. After switching inside a sub-screen, the web server restarts from the start screen.



## 5.2.2 Diagnosis

				Automation GmbH & Co
Information	Configuration	Licence	Contact	Language:
Diagnosis				Refresh (10s)
Exception				
Code: Channelld: Moduleid: Fileid: Line: Errorld: Parameter: String: Fieldbus		- - - - -		
coursed.				
0.1s: 1s: 10s: Interface		24% 19%		
Type: State:		Ethernet Static IP		
Port 1 Link: Connection: Negotiation: Cable length:		Up 100MBit Successf	/FD ull	
Port 2				
Link: Connection: Negotiation: Cable length:		Down - -		

Figure 5.2: Diagnostic page

#### Exception

Possible causes of errors are displayed here. If you see an error here, please either contact us or refer to the manual for possible causes.

#### Fieldbus

- CPU Load: this shows the CPU utilisation of the encoder during operation.
- Interface:
  - Type: the protocol is displayed here; Ethernet
  - State: the mode is specified here. Only static IP is specified. DHCP mode is not possible.
- Port 1 and Port 2
  - Link: indicates whether the port is active. Link=> up or down
  - Connection: max. speed 100Mbit/FD
  - Negotiation: allows two interconnected Ethernet ports to negotiate independently and configure the maximum possible speed.
  - Cable length: when using IRT mode, the cable length specified in the TIA Portal is displayed.



### 5.2.3 Versions

				Automation GmbH & Co. KG
Information	Configuration	Licence	Contact	Language:
Versions				
Application: SDAI: Stack: MAC: Sensor: U2A:		1.00.00.64 1.80.00.11 2.22.00.11 1.40.1147 1.07 (13) 1.00.00.1	466 470 470 7	

Figure 5.3: Versions

Here you can find information about the individual versions:

- Application
- SDAI
- Stack
- MAC
- Sensor
- U2A



# 5.3 Configuration

#### 5.3.1 Network

Information	Configuration	Licence	Contact
Network			
Device name:		dut	
IP address:		192.168	.0.1
Netmask:		255.255	.255.0
Gateway:		0.0.0	
Warning: Chang	es only at downtime	5	
Save	Cancel		

#### Figure 5.4: Network settings

You can change the device name, IP address, network mask and gateway here.



### 5.3.2 Encoder

		Automation GmbH & Co. KG
Information Configuration Lic	ence Contact	Language:
Encoder		
Resolution singleturn: Total measuring range: Preset value: Code sequence:	1.84467440737096e+19 1.84467440737096e+19 0 clockwise	



You can check the following parametrized values for the encoder here:

- Resolution singleturn
- Total measuring range
- Preset value
- Code sequence



#### 5.3.3 Firmware Update

					Automation GmbH & Co. KG
Information	Configuration	Licence	Contact		Language:
Firmware	Update				
Current version	:1.00.00.6466				
Firmware:				Browse	
Update					
			Figure F. C. Firms	wara undata	

Figure 5.6: Firmware update

The current firmware version of the encoder is displayed. If a new firmware version is available, you can update the encoder's firmware here.



To update the firmware of the encoder, choose the correct .bin file by clicking the "Browse..."-Button (see Figure 5.7: Firmware update - choose file).

	Automation GmbH & Co. KG
Information Configuration Licence Contact	Language:
Firmware Update	
Current version: 1.00.00.5466 Firmware: C:\workspace\wdga_ie_pn_a5-firmware-1_00_00_6466-fixedMAC.bin Browse Update	
Figure 5.7: Firmware update - choose file	



After you have chosen the correct file, click the "Update"- Button to start the firmware update. An animated icon will appear with the additional text: "Transferring file" (see Figure 5.8).

	Automation GmbH & Co. KG
Information Configuration Licence Contact	Language:
Firmware Update	
Current version: 1.00.00.6466	
Firmware: C:\workspace\wdga_ie_pn_a5-firmware-1_00_00_6466-fixedMAC.bin Browse	
Update Transferring file	
Figure 5.8: Firmware undate - Transferring file	
rigale 0.0. rinnware apaate Transferring nie	

After the firmware update is successfully finished, you will see it on the website like in Figure 5.9. Perform now a power reset and check under "Information -> Versions", if the new firmware version is shown.

	Automation GmbH & Co. KG
Information Configuration Licence Contact	Language:
Firmware Update	
Current version: 1.00.00.6466	
Firmware: C:\workspace\wdga_ie_pn_a5-firmware-1_00_00_6466-fixedMAC.bin Browse	
Update Successful	
Figure 5.9: Firmware update - Successful	



In case of a failure during the firmware update process (see Figure 5.10) please double check that you choose the correct firmware file. Do a power reset and repeat the whole firmware update process. In case of a power loss during the update, the encoder may not respond to any request any more. If this happens, please contact our support team.

		Automation GmbH & Co. KG
Information Configuration Licence	Contact	
Firmware Update		
Current version: 1.00.00.6466		
Firmware: C:\workspace\wrong_Firmware.bin	Browse	
Update		
Failed		
	Figure 5.10: Firmware update - Failed	

# 5.4 Licence information

Information Configuration	Licence Cont	ct	Language:
Licence Information			
ATTENTION safety instruction	s:		
For use by technically qualified person environments and NOT for use in safe	nel only. Read the manuative related applications.	before using the product. The products are only desig	ned and produced for use in industrial
Copyright, Wachendorff, Germany			
Packages under a modified ve	ersion of the GPL		
The firmware uses the following pack	ages with modified GPL li	ense	
eCos Operating System			
These components are used on the o The protocol stacks does not use cod	perating system layer of t e under GPL license.	e firmware.	
Download the source code of these p	ackages from: here		

Figure 5.11: Licence information

This view contains the current safety instructions as well as software packages containing firmware. You can download the source code of these packages using the link on this website.



# 5.5 Contact

			Automation GmbH & Co. KG
Information Confi	guration Licence	Contact	Language:
	Č		
Contact			
Product Information	n		
For general information a	bout the product please of	ontact:	
Phone:	+49 67	22 99 65 25	
Fax:	+49 67	22 99 65 70	
Email:	wdg@	vachendorff.de	
www:	www.v	vachendorff-automation.de	
Technical Support			
If you need technical sup	port please contact:		
Phone:	+49 67	22 99 65 414	
Fax:	+49 67	22 99 65 70	
Email:	suppor	t-wdga@wachendorff.de	
Other countries:	www.v	vachendorff-automation.com/contact.html	

Figure 5.12: Contact information

Contact information for additional product information and technical support is listed here.

# 6 Commissioning

# 6.1 General information

This section contains two configuration examples for Wachendorff Profinet encoders. The first example is shown with version 14 of the TIA portal, the second with Step 7 V5.5 SP4.

# 6.2 Integration into a TIA project

Connect the encoder to your controller.

Connect the encoder's power supply.

To integrate the encoder into your TIA portal project, start your TIA portal, open the required project and switch to the project view by pressing the "Project view" button (see Figure 6.1).



Figure 6.1: Switching to project view



Next, install the GSDML file. You can download these from the download area of our website. To do so, open the "Options" tab and select the menu "Manage general station description files (GSD)" (see Figure 6.2).

• The corresponding .bmp file must be located in the same directory as the GSDML file during installation and is included in the download.



Figure 6.2: Manage device description file (GSD)

Now select the path for the GSDML file, activate the checkmark next to the desired GSDML file and confirm the installation via the "Install" button (see Figure 6.3). Then close the installation window.

Manage general station des	cription files			×
Source path: C:\workspace	\TIA\GSDML			
Content of imported path				
File	Version	Language	Status	Info
GSDML-V2.32-Wachendorff-V	VDGA V2.32	English	Already installed	Industrial E
<				
			Delete	stall Cancel

Figure 6.3: Installing GSDML

From the "Project tree" column on the left of the TIA portal, select the "Devices & networks" tab (see Figure 6.4). The hardware view opens and the hardware catalogue is now visible in the right-hand column.

Project tree 🛛 🔲 🖣
Devices
🖻 🗐 🗎
Screenshots
🗳 Add new device
Devices & networks
PLC_1 [CPU 1518-4 PN/DP]
🕨 🔚 Ungrouped devices
🕨 🙀 Common data
Documentation settings
🕨 🐻 Languages & resources

Figure 6.4: Switch to Devices & Networks

Add the encoder to your hardware configuration. To do so, open the following path at the right edge of the screen: "Other field devices / Profinet IO / Encoders / Wachendorff Automation GmbH & Co. KG / WDGA / Wachendorff Encoder" (see Figure 6.5).



Figure 6.5: Hardware catalogue

Now "drag" the encoder onto the "Profinet IO system". This encoder is now displayed in the hardware view. Connect the encoder to the controller by dragging the encoder port onto the appropriate controller port. The result is shown in Figure 6.6.

PLC_1 CPU 1518-4 PN/		wachendorff Wachendorff PR PLC_1	
	PN/IE_1		

Figure 6.6: Network view



Select the encoder and switch to the "Device overview" tab. Enter a meaningful device name by double-clicking the default name (see Figure 6.7).

Device overview											
<b>**</b>	Rack Slot Laddress Qaddress Type										
	▼ WDGA	0	0			Wachendorff Enco					
	<ul> <li>2 Port PN-IRT-Switch</li> </ul>	0	<b>U</b> .A.			WDGA					
	Port 1	0	0 X1 P1			Port 1					
	Port 2	0	0 X1 P2			Port 2					
		0	1								

Figure 6.7: Change device name

Configure the encoder by selecting the corresponding configuration from the hardware catalogue and dragging it onto "Slot 1" (see Figure 6.8).





<ul> <li>If a singleturn encoder is accidentally configured as a multiturn encoder, the STAT LED of the encoder will flash red after starting the CPU.</li> </ul>
• This indicates a configuration error, as a singleturn encoder cannot output multiturn data.
• In this case, please select the appropriate singleturn module.



Now select the desired telegram for communication. To do so, proceed as in the previous step. Select "Slot 1 2". The various telegrams can be found under "Profile" in the "Submodules" tab (see Figure 6.9).

Image: Topology view       Metwork view       Options         Image: Topology view       Metwork view       Image: Topology view       Image: T	Screenshots	→ WDG	iA [Wacl	nendorff E								Hardware catalog	
Image: Searche Sector       Image: Searche Sector         Image: Searche Searche Sector       Image: Searche Se							a To	pology view	A Network vie	ew 🛛 🕅 Device view	N	Options	
Image: Control of the singleture         Image: Control of the s	🔐 🛛 WDGA [Wachendorff Encoder] 💌 🚆	. 🖭 🛛	6 🖽 (	🛛 🔍 ±									
III       > 100%       Image: Standard Telegram 81         Device overview       Image: Standard Telegram 82       Image: Standard Telegram 83         Image: Module       Rack       Slot       I address       Q address       Type         Image: Module       Rack       Slot       I address       Q address       Type       Article no.       Firmware       Comment       Image: Standard Telegram 83       Image: Standard Telegram 83       Image: Standard Telegram 84       Image: Standard Telegram 84 </th <th>-</th> <th></th> <th>it overall it overall it overall it overall it overall</th>	-												it overall it overall it overall it overall it overall
Device overview         Image: Standard Telegram 81           Y         Module         Rack         Stot         I address         Q address         Type         Article no.         Firmware         Comment         Image: Standard Telegram 82         Image: Standard Telegram 83         Image: Standard Telegram 83         Image: Standard Telegram 84         Image: Standard Te	c							>	100%		~	Cim Singleturn     Cim Submodules     Cim Profile	
Wild         Rack         Slot         I address         Q address         Type         Ancicle no.         Firmware         Comment           ▼ WDGA         0         0         Value         National Telegram 83         Isondard Telegram 83           ↓ 2 Port PH4RTSwitch         0         1         WDGA         Value         Value <td>Device overview</td> <td></td> <td>Standard Telegram 81</td> <td></td>	Device overview											Standard Telegram 81	
MAP 0 11 MAP 0 12	Module     WDGA     P Ort PN-IRT-Switch     Multitum 16 Bit + Singletur	Rack O O O	Slot 0 0 X1 1	I address	Q address	Type Wachendorff Enco WDGA Multitum 16 Bit + S	Article no. WDGA58XXXXXXXPNAB0	Firmware V1.00.0	Comment			Standard Telegram 83 Standard Telegram 84 Standard Telegram 84	
	MAP	0	11			MAP							

Figure 6.9: Select telegram

You can also set the corresponding I/O addresses. To do so, double-click on the respective field and change the address (see Figure 6.10).

Device overview										
*		Module	Rack	Slot	I address	Q address	Туре			
		▼ WDGA	0	0			Wachendorff Enco			
		2 Port PN-IRT-Switch	0	0 X1			WDGA			
		<ul> <li>Multiturn 16 Bit + Singletur</li> </ul>	0	1			Multiturn 16 Bit + S			
		MAP	0	11			MAP			
		Standard Telegram 81	0	12	011	03	Standard Telegram			

Figure 6.10: Change the I/O addresses

Click on your PLC in the project navigation window and load the configuration by clicking the "Download to device" button (see Figure 6.11).

TIA V14	Siemens - C:\Users\sne\Documents\Automatisierun	g\Demo3\	Screenshots\Screenshots
Pr	oject Edit View Insert Online Options Tools	Window	Help
E	🖞 🎦 🛃 Save project 📕 🐰 🗎 🗎 🗙 🏹 🛨 (주 🖢	a 🛙	🕼 🖳 🙀 💋 Go online 🖉 Go offline 🛔 🖪 🚺 🛃 🔙 🛄 🤇 Search in
	Project tree	□	eenshots > Ungrouped devices > WDGA [Wachendorff Encoder]
	Devices		
6	2		🔐 🔽 🦗 [Wachendorff Encoder] 🗨 📖 🕎 🔚 🛄 🔍 生
ork			
Ę.	Screenshots		DGIT
Ĕ	💕 Add new device		N.
ŝ	ntworks Devices & networks		
8	PLC_1 [CPU 1518-4 PN/DP]	-	
ev	Ungrouped devices		

Figure 6.11: Download to device

Switch back to the "Devices and networks" view and assign the Profinet device name to the encoder as shown in the configuration on page 39. To do so, select the encoder (single mouse click) and select the "Assign device name" option (see Figure 6.12).

Assign a name to the encoder. Then select your PG/PC interface and the type and click on "Update list" (see Figure 6.13).

All devices are now displayed under "Accessible devices in the network". Select your encoder and click on "Assign name" (see Figure 6.14).



Figure 6.12: Assigning device names

Assign PROFINET device	e name.				×			
	Configured PROFINET device							
		PROFINET dev	ice name:	wdga				
$ \rightarrow$								
		Online access						
		Type of the PG/PC	interface:	PN/IE				
		PG/PC	interface:	ASIX AX88772B USB2.0	to Fast Ethernet Ada 🔻 🛃			
_⊨		Device filter						
		🛃 Only show	w devices of	the same type				
		📃 Only show	w devices wi	th bad parameter settings				
		Only show	w devices wi	thout names				
Accessible devices in the network:								
	IP address	MAC address	Device	PROFINET device name	Status			
L 🗖								

Figure 6.13: Name and PG interface



Assign PROFINET device name.					×
	Configured PRO	FINET dev	ice		
	PROFINET devic	e name:	wdga		•
	Dev	vice type:	Wachendorff Encoder		
	Online access				
	Type of the PG/PC i	interface:	PN/IE		•
	PG/PC i	interface:	ASIX AX88772B USB2	.0 to Fast Ethernet	Ada 💌 🕐 🞑
a.	Device filter				
	Only show	devices of th	ne same type		
	Only show	devices with	n bad parameter settings		
	Only show	devices with	nout names		
Access	ible devices in the network:				
IP addr	ess MAC address	Device	PROFINET device name	Status	
192.10	58.0.2 00-00-00-00-01	Wachend	wdga	💙 ок	
					_
Flash LED					
<					>
			U	pdate list	Assign name
Online status information:					
Search completed. 1 of 2 de	vices were found.				
×		1111			>
					Close

Figure 6.14: Accessible nodes

You will now see the successfully assigned name in the online status information. Click on "close" (see Figure 6.15).

Assign PROFINET device	name.					×
-		Configured PRO	FINET dev	ice		
		PROFINET devi	ce name:	wdga		-
		Dev	vice type:	Wachendorff Encode	r	
				Machendon Encode		
		Online access				
		lype of the PG/PC	interface:	PN/IE		
		PG/PC	interface:	ASIX AX88772B U	SB2.0 to Fast Etherne	et Ada 💌 🐨 🖳
d,		Device filter				
		🛃 Only show	devices of th	ie same type		
		Only show	devices with	bad parameter settin	ngs	
		Only show	devices with	outnames		
	Accessible devi	ces in the network:	Device	PROFINET de lies per	na Chatur	
	192.168.0.2	00-00-00-00-00-01	Wachend	wdga	OK	
Flash LED						
_	<					
					Update list	Assign name
Online status information:	1 of 2 douises we	in found	·			
The PROFINET device	e name "wdga" v	vas successfully assign	ned to MAC a	ddress "00-00-00-00-0	00-01".	
	, j	, ,				
<						>
						Close
Online status information: Search completed. The PROFINET device (	1 of 2 devices we e name "wdga" v	rre found. vas successfully assign	ned to MAC an	ddress *00-00-00-00-00-00-00-00-00-00-00-00-00-	00-01*.	Close

Figure 6.15: Online status information



You can use a variable table to display the encoder's I/O data for test purposes. To do so, open the default tag table (see Figure 6.16) and enter the corresponding address for the position value. You can then click on "Show all" to see the position value (see Figure 6.17 and Figure 6.18).

Example:



Figure 6.16: PLC variables



Figure 6.17: Show all

D	efau	lt tag table	Positio	on in HEX	_		. (		1	
	N	lame	Data type	Address	Retain	Acces		Monitor value	upervision	Comment
1	-	Position DUT	DWord 🔳	%ID4 💌		<b></b>		16#0006_9387		
2		<add new=""></add>				<b>V</b>			)	

Figure 6.18: Default tag table



### 6.3 Scaling function

In order to set a different number of steps / revolutions or revolutions than the one given in the GSDML file, the scaling function must be activated. The following two examples explain this for a singleturn and a multiturn encoder. It is assumed that you have already configured the encoder and your PLC in the TIA portal.

#### 6.3.1 Example scaling function singleturn 16-bit to 12-bit

Double-click on the image of the encoder in the network view of "Devices and Networks". (s. Figure 6.19)

Projekt3 🕨 Geräte & Netze							_ @ =×
					🛃 Topologiesic	ht 🛛 🚠 Netzsicht	Gerätesicht
Vernetzen Verbindungen HM	-Verbindung 💌	🕅 🔒 📰 🛄	€ ±				
					<b>1</b> 10	-System: PLC_1.PROFIN	IET IO-System (100) 🛕
	PLC	C_1 U 315-2 PN/DP		WDGA Wachendorff Dr PLC_1			
			PLC_1.PROF	INET IO-Syste			
<					> 1	00%	▼ <u></u>
Netzühersicht Verbindunge	E LA Kammunik	vation V/DN					
Netzubersicht	EIA-Kommunik	auon ven					
🐈 Gerät	Тур	Adresse im Subn	Subnetz	Master-/IO-System	Gerätenummer	Kommentar	
<ul> <li>\$7300/ET200M-Station_1</li> </ul>	S7300/ET200M-Station						
PLC_1	CPU 315-2 PN/DP						
<ul> <li>GSD-Geraet_1</li> </ul>	GSD-Geraet						
► WDGA	Wachendorff Drehgeber						

Figure 6.19: Example of commissioning

Figure 6.20 now shows a rotary encoder configured as 16-bit singleturn. In the "Device overview" we click on the field "MAP".

VDGA (Vachendorff Deshpeler)     V     V     Q     4       V     Basycpipe     Basyc     Seck     Exdered off Deshpeler     MGGASS0000071080.     VI.0       V     Basycpipe     Basyc     Seck     Exdered off Deshpeler     MGGASS0000071080.     VI.0       V     Basycpipe     Basyc     Seck     Exdered off Deshpeler     MGGASS0000071080.     VI.0       V     Basycpipe     0     1     2014*     Wachendorff Deshpeler     MGGASS0000071080.     VI.0       V     Signifierin 16 Bit, krine Umdrehungszahlung     MGGASS0000071080.     VI.0     Signifierin 16 Bit, krine Umdrehungszahlung       MMP     0     11     203*     MAP       Standard Telegramm 81     0     12     011     03						6	Topologiesicht	Netzsicht	Gerätesich
Image: Contract of the legram B1         0         12         0.11         0.3         Standard Telegram B1         0         0         0         12         0.11         0.3         Standard Telegram B1         0	WDGA [Wachendorff Drehgeb 💌 🔡	12		. •. ±					
III         > 100%         III           erdfeldbersicht	-								
Vision         Stack         Exdension         Antiket-tra- transmission         Firmware         Kommenta           * MOGA         0         2:01*         Wackender/Drinkgeber         MDGA8500000074880         VI.0           * MOGA         0         0:01*         Wackender/Drinkgeber         WDGA8500000074880         VI.0           * Singlewine 168 Like / Unit         0:1         2:01*         WDGA         WDGA         VI.0           * Singlewine 168 Like / Unit         0:1         2:03*         MAP         VI.0         VI.0           Standard Telegramm 81         0         1:2         0.:11         0.:3         Standard Telegramm 81         VI.0         VI.0									
V Executed State         Exdense / Andress / Andress / Andress / Typ         Andreshv.         Pirmware         Komments <ul> <li>Burgings</li> <li>Burgings</li> <li>Burgings</li> <li>State</li> <li>Andress / Andress / Andress / Andress / Andress / Andress / Andress / Machendor/Drehaber</li> <li>WBCA458000000079/080</li> <li>V1.0</li> <li>Singletum 16 Bit, keine Um</li> <li>0</li> <li>1</li> <li>Singletum 16 Bit, keine Um</li> <li>1</li> <li>2039*</li> <li>MAP</li> <li>Standard Telegramm 81</li> <li>1</li> <li>2</li> <li>0.11</li> <li>0.3</li> <li>Standard Telegramm 81</li> <li>1</li> <li>2</li> <li>0.11</li> <li>0.3</li> <li>Standard Telegramm 81</li> <li>1</li> /ul>		_	_	_			> 100%		·
WDGA         Display to the set of	III			_			> 100%		<u></u>
• Societ NH#5 Societ NH         0         0         243 2         Kitchen         Multiple         Multiple <t< td=""><td>m eräteübersicht</td><td></td><td></td><td></td><td></td><td></td><td>&gt; 100%</td><td>1.00</td><td><b>•</b></td></t<>	m eräteübersicht						> 100%	1.00	<b>•</b>
Control         Control <t< td=""><td>II eräteübersicht</td><td>Baugr</td><td>Steck</td><td>E-Adresse</td><td>A-Adres</td><td>Typ</td><td>Artikel-Nr.</td><td>Firmware</td><td>Kommentar</td></t<>	II eräteübersicht	Baugr	Steck	E-Adresse	A-Adres	Typ	Artikel-Nr.	Firmware	Kommentar
1 MeV     0 mit Notes     0     1     2039*     MeV       1 MeV     0     1     2039*     MeV       5 tandard Telegramm 81     0     1     2     011     03	III eräteübersicht 2 Baugruppe • WOGA • WOGA	Baugr 0	Steck 0	E-Adresse 2043*	A-Adres	Typ Wachendoff Drehgeber	Artikel-Nr.	Firmware V1.0	Kommentar
Standard Telegramm 81 0 12 011 03 Standard Telegramm 81	III aräteübersicht Z – Baugruppe V KOGA S – Sindermun 16 Bit keine line	Baugr 0 0	Steck 0 0 X1	E-Adresse 2043* 2042*	A-Adres	Typ Wachendorff Drehgeber WDGA Sicoletum 11 BP Jacine Lindrahusenthiluen	>     100%       Artikel-Nr.     WDGA58XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Firmware V1.0	Kommentar
	II eräteübersicht //Beugruppe // VIDGA // 2 Port PN4RTSwitch // Singletum 16 Bit, keine Um	Baugr 0 0 0	Steck 0 0 X1 1	E-Adresse 2043* 2042* 2039*	A-Adres	Typ Wachendorff Drehgeber WOGA Singitum 16 Bit, keine Umdrehungszählung Mar	Artikel-Nr.	Firmware V1.0	Kommentar
r i i i i i i i i i i i i i i i i i i i	II riteübersicht /Baugruppe ·WOGA ·VOGA ·Singleum 16 Bit, keine UU Mee Singleum 16 Bit, keine UU Mee	Baugr 0 0 0 0 0	Steck 0 0 X1 1 1 1 1 2	E-Adresse 2043* 2042* 2039* 011	A-Adres	Typ Wackendorff Drehgeber WOGA Singletum 16 Bit, keine Umdrehungszählung MAP Sandart Tarkenarum 81	Artikel-Nr. WDGA58X0000000PHXE0	Firmware V1.0	Kommentar

Figure 6.20: Device overview - MAP



The "Assembly parameters" which we click on will then appear in the "Properties" under "Device overview" in the "General" tab. (s. Figure 6.21)

Projekt3	Nicht grup	pierte Geräte	WDG/	A [Wac	hendorff E	ncoder]				_∎≡×
							6	Topologiesicht	h Netzsicht	Gerätesicht
WDG	A [Wachendorff	Drehgeb 🔻 🖽			🛯 🔍 ±					
										^
		3.								
		50 <sup>0</sup>								
	-			20						
1								> 100%		▼ <b>▼</b>
								100.0		· · · · · · · ·
Gerater	ubersicnt				_					
<b>**</b>	Baugruppe		Baugr	Steck	E-Adresse	A-Adres	. Typ	Artikel-Nr.	Firmware	Kommentar
	<ul> <li>WDGA</li> <li>2 Port Pl</li> </ul>	N-IRT-Switch	0	0 X1	2045*		WDGA	WDGASBXXXXXXFIXAD	J VI.U	
	▼ Singleturn	16 Bit, keine Um	0	1			Singleturn 16 Bit, keine Umdrehungszählung			
	MAP	17 1	0	11	2039*		MAP			
	Standar	d Telegramm 81	0	12	011	03	Standard lelegramm 81			
<									14	>
MAP [MA	(P]						S. Ei	genschaften 🛄 🗓	nfo 追 🗓 Dia	ignose
Allgem	ein IO-V	ariablen Sy	ystemko	onstant	en Te	xte				
✓ Allgeme	in aginformation	Bau	grupper	nparam	eter					^
Baugrup	penparameter	He	ersteller	Param	eter					
Diagnos	eadressen									
			Pos	itionswe	ert-Hysterese	± 4				
			Positio	onswert-l	Extrapolation	1: 0				
		-	Gesch	windigk	eitsfilter max Drehzah	c  : 0				
				Posit	ionswertfilter	r: 64				
			e	Seschwir	ndigkeitsfilter	r: 255				
										*

Figure 6.21: Assembly parameters

The default settings of the 16-bit singleturn encoder are shown in Figure 6.22.

MAP [MAP]				🖳 Eigenschafter	n 🗓 Info 🚺 🗓 Diagnose	▎▝▌▖▼
Allgemein IO	)-Variablen	Systemkonstanten Text	e			
<ul> <li>✓ Allgemein</li> <li>Kataloginformatio</li> </ul>	n	Geschwindigkeitsfilter:	255			^
Baugruppenparameter Diagnoseadressen		Drehgeber Parameter				
		Codesequenz:	Im Uhrzeigersinn	▼		
		Klasse 4 Funktionalität:	Freigegeben	▼		
		Preset wirkt auf G1_XIST1:	Gesperrt	▼		Ξ
	-	Skalierungsfunktionalität:	Gesperrt	▼		
	•	Profil-spezifische Diagnosen:	Gesperrt	▼		
		Kompatibilität mit V3.1:	Gesperrt	▼		
		Umdrehungsauflösung:	65536			
		Gesamtauflösung:	65536			
		Max. Master Sign-Of-Life Fehler:	1			
		Geschwindigkeitseinheit:	U/min	•		~



In this example we want to set a resolution of 12-bit. To do this, turn on the scaling function by setting it to "Enabled". In the fields "Rotation resolution" and "Total resolution", enter the value for 12-Bit ( $2^{12} = 4096$ ). (s. Figure 6.23)

MAP [MAP]			🗟 E	igenschaften 🚺 Info 🚺 🗓 Diagnose	
Allgemein IO-Variablen	Systemkonstanten Text	te			
▼ Allgemein	Geschwindigkeitsfilter:	255		Im Uhrzeigersinn	^
Kataloginformation			1	Freienschan	_
Baugruppenparameter	Drehgeber Parameter		lat.	rieigegeben	
Diagnoseadressen			XISTI	Gesperrt	
	Codesequenz:	Im Uhrzeigersinn		despent	
	Klasse 4 Funktionalität:	Freigegeben	nalität:	Freigegeben	
	Preset wirkt auf G1_XIST1:	Gesperrt	anoren:	Gespert	≡
	Skalierungsfunktionalität:	Freigegeben	gnosen.	despent	
•	Profil-spezifische Diagnosen:	Gesperrt	it V3.1:	Gesperrt	
	Kompatibilität mit V3.1:	Gesperrt		Land	
	Umdrehungsauflösung:	4096	sung:	4096	
	Gesamtauflösung:	4096	ng:	4096	
	Max. Master Sign-Of-Life Fehler:	1			
	Geschwindigkeitseinheit:	U/min	•		~

Figure 6.23: Configuration of 12-Bit Singleturn with scaling

	<ul> <li>If a new project is created and the scaling function is set up, a "Load into device" is sufficient to activate this function.</li> </ul>
<u>_!</u> \	<ul> <li>If an existing project is changed in order to add the scaling function, the change must be transferred to the controller with "Load into device" -&gt; "Hardware configuration".</li> </ul>

#### 6.3.2 Example scaling function multiturn

Double-click on the image of the encoder in the network view of "Devices and Networks". (s. Figure 6.24)

Projekto V Gerati	e & Netze							
						🛃 Topologiesich	t 🔒 Netzsicht	Gerätesicht
Vernetzen	erbindungen HM	I-Verbindung 💌	🕮 🖷 🔠 💷	€, ±				<b>-</b>
						<b>џ</b> 10-9	system: PLC_1.PROFIN	IET IO-System (100)
		PL	C_1 U 315-2 PN/DP		WDGA Wachendorff Dr PLC_1	ß		
				PLC_1.PROF	INET IO-Syste			
< III						> 10	0%	•
< III Netzübersicht	Verbindung	en E/A-Kommuni	kation VPN			<b>)</b> 10	0%	▼ÿ
< III Netzübersicht	Verbindunge	en E/A-Kommunil	kation VPN	Subpart	Nartar JC-Surtam	> 10	0%	¥
< III Netzübersicht Y Gerät ~ \$7300/ET2	Verbindunge	en E/A-Kommunil Typ 57300/F1200/#5tation	kation VPN Adresse im Subn	Subnetz	Master-/IO-System	Serätenummer	0% Kommentør	¥
< Netzübersicht	Verbindungs	en E/A-Kommunil Typ 57300/E7200M5tation CrU 315-2 PNIDP	kation VPN Adresse im Subn	Subnetz	Master-IIO-System	Serðtenummer	0% Kommentar	۲
<ul> <li></li> <li>Ketzübersicht     </li> <li>Y Gerät <ul> <li>FLC_1 <li>SD-Gerät         </li> </li></ul> </li> </ul>	Verbindungs	en E/A-Kommunil Typ 57300/ET200M-Station CPU 315-2 PNIDP GSD-Genet	kation VPN Adresse im Subn	Subnetz	Master-IIO-System	► 10 Gerðtenummer	0% Kommentør	•

Figure 6.24: Example of commissioning



Figure 6.25 now shows a rotary encoder configured as 16-bit singleturn and 43-bit multiturn. In the "Device overview" we click on the field "MAP".

Projekt	3 ▶ Nicht gruppierte Geräte	WDG	A [Wach	nendorff E	ncoder]				_ # = X
						ŝ	Topologiesicht	Netzsicht	Gerätesicht
de W	DGA [Wachendorff Drehgeb 💌 🔛		6 🖽 🛛	] 🔍 ±					
Nicht gesteckte Baugruppen	Standard Telegramm 81								
<	1111						> 100%		💌
Gerä									
Junio	teubersicht								
<b>*</b>	. Baugruppe	Baugr	Steck	E-Adresse	A-Adres	Тур	Artikel-Nr.	Firmware	Kommentar
Y .	Baugruppe	Baugr O	Steck 0	E-Adresse 2043*	A-Adres	Typ Wachendorff Drehgeber	Artikel-Nr. WDGA58XXXXXXXXPNXB0	Firmware V1.0	Kommentar
<b>?</b>	Baugruppe     WDGA     2 Port PN-IRT-Switch	Baugr O O	Steck 0 0 X1	E-Adresse 2043* 2042*	A-Adres	Typ Wachendorff Drehgeber WDGA	Artikel-Nr. WDGA58XXXXXXXPNXB0	Firmware V1.0	Kommentar
<b>Y</b>	Baugruppe     WDGA     2 Port PN-IRT-Switch     Multiturn 43 Bit + Singletur	Baugr O O O	Steck 0 0 X1 1	E-Adresse 2043* 2042*	A-Adres	Typ Wachendorff Drehgeber WDGA Multiturn 43 Bit + Singleturn 16 Bit = 59 Bit	Artikel-Nr. WDGA58XXXXXXXPNXB0	Firmware V1.0	Kommentar
<u> </u>	Baugruppe     WDGA     P 2 Port PN-IRT-Switch     Multitum 43 Bit + Singletur     MAP	Baugr 0 0 0 0	Steck 0 0 X1 1 1 1	E-Adresse 2043* 2042* 2039*	A-Adres	Typ Wachendorff Drehgeber WDGA Multiturn 43 Bit + Singleturn 16 Bit = 59 Bit MAP	Artikel-Nr. WDGA58XXXXXXXPNXB0	Firmware V1.0	Kommentar
¥ .	Baugruppe     WDGA     2 Port PN-IRT-Switch     Multiturn 43 Bit + Singletur     MAP     Standard Telegramm 81	Baugr 0 0 0 0 0 0	Steck 0 0 X1 1 1 1 1 2	E-Adresse 2043* 2042* 2039* 011	A-Adres	Typ Wachendorff Drehgeber WDGA Multitum 43 Bit + Singleturn 16 Bit = 59 Bit MAP Standard Telegramm 81	Artikel-Nr. WDGA58XXXXXXXPNXB0	Firmware V1.0	Kommentar
Y .	Baugruppe     WDGA     2 Port PN-IRT-Switch     Multitum 43 Bit + Singletur     MAP     Standard Telegramm 81	Baugr 0 0 0 0 0	Steck 0 0 X1 1 1 1 1 2	E-Adresse 2043* 2042* 2039* 011	A-Adres 03	Typ Wachendorff Drehgeber WDGA Multitum 43 Bit + Singleturn 16 Bit = 59 Bit MAP Standard Telegramm 81	Artikel-Nr. WDGA58XXXXXXXPNXB0	Firmware V1.0	Kommentar

Figure 6.25: Device overview - MAP

The "Assembly parameters" which we click on will then appear in the "Properties" under "Device overview" in the "General" tab. (s. Figure 6.26)

Here you can also see the default settings of a 43-bit multiturn and 16-bit singleturn encoder.

MAP [MAP]				Eigenschaften	🗓 Info 🚺 🗓 Diagnose	
Allgemein	IO-Variablen	Systemkonstanten Text	te			
✓ Allgemein		Geschwindigkeitsfilter:	255			^
Kataloginforr	mation					
Baugruppenpar Diagnoseadress	ameter en	Drehgeber Parameter				
		Codesequenz:	Im Uhrzeigersinn			
		Klasse 4 Funktionalität:	Freigegeben	-		
		Preset wirkt auf G1_XIST1:	Gesperrt	•		≡
	-	Skalierungsfunktionalität:	Gesperrt			
	•	Profil-spezifische Diagnosen:	Gesperrt			
		Kompatibilität mit V3.1:	Gesperrt			
		Umdrehungsauflösung:	65536			
		Gesamtauflösung:	576460752303423488			
		Max. Master Sign-Of-Life Fehler:	1			
		Geschwindigkeitseinheit:	U/min	•		~



In this example we want to set a resolution of 360 steps/revolution and 10 countable revolutions ( $10 \times 360$  steps = 3600 steps total resolution).

To do this, turn on the scaling function by setting it to "Enabled". Enter 360 in the field "Revolution resolution" and 3600 in the field "Total resolution". (s. Figure 6.27)

MAP [MAP]					🗟 Eig	enschaften	🗓 Info 🔒	🞖 Diagnose	▋▋▼
Allgemein	IO-Variablen	Systemkonstanten Te	exte						
		Geschwindigkeitsfilte	r: 255						^
Kataloginforn	nation								
Baugruppenpar	ameter	Drehgeber Parameter			/				
Diagnoseadress	en				at:	Freigegeb	en		
		Codesequen	z: Im Uhi	hrzeigersinn					
		Klasse 4 Funktionalitä	t: Freige	egeben	XIST1:	Gesperrt			
		Preset wirkt auf G1_XIST1	1: Gespe	errt	onalität:	Freigegeb	en		≡
		Skalierungsfunktionalitä	t: Freige	egeben					
	•	Profil-spezifische Diagnoser	n: Gespe	ent	gnosen:	Gesperrt			
		Kompatibilität mit V3.1	1: Gespe	errt	it V3.1:	Gesperrt			
		Umdrehungsauflösung	g: 360						
		Gesamtauflösung	g: 3600		cung:	360			
		Max. Master Sign-Of-Life Fehle	r: 1			3600			
		Geschwindigkeitseinhei	t: U/min	n	-				*

Figure 6.27: Configuration of 360 Steps/revolution and 10 revolutions

<ul> <li>If a new project is created and the scaling function is set up, a "Load into device" is sufficient to activate this function.</li> </ul>
<ul> <li>If an existing project is changed in order to add the scaling function, the change must be transferred to the controller with "Load into device" -&gt; "Hardware configuration".</li> </ul>

### 6.3.3 Executing a preset

First set whether the preset should also act on G1\_XIST1. For the following explanations it is assumed that telegram 81 is used and that the input data (from the view of the controller) are present at input addresses 0...11 and the output data at output addresses 0...3. In this case the following data contents exist:

Data	Туре		Adress	Adressing
STW2_ENC	W	Encoder control word	Q0Q1	QW0
G1_STW	W	Axis control word	Q2Q3	QW2
ZSW2_ENC	W	Status word of the encoder	1011	IW0
G1_ZSW	W	Status word of the axis	1213	IW2
G1_XIST1	DW	Processdata	1417	ID4
G1_XIST2	DW	Processdata or error register	18111	ID8

Table 6.1: Data content for Example

Set the encoder to normal, controlled operation during startup or manually via an observation table. To do this, set STW2\_ENC bit 10 "Control by PLC" to TRUE.

<b>\$7</b>	\$7-1500_Tests_BMPA → cpu1518 [CPU 1518-4 PN/DP] → Beobachtungs- und Forcetabellen → Beobachtungstabelle									
-	<i>≇ ≇ 1≜</i> ⊌ L 9, 8, 27 ™ ™									
	i	Name	Adresse	Anzeigeformat	Beobachtungswert	Steuerwert	9			
1		"TEL81_IN".G1_XIST1	%ID4	Hex						
2		"TEL81_IN".G1_XIST2	%ID8	Hex						
З		"TEL81_IN".G1_ZSW.SensorError	%12.7	BOOL						
4		"TEL81_IN".G1_ZSW.AbsoluteValueCyclicallyExecuted	%12.5	BOOL						
5		"TEL81_IN".G1_ZSW.HomePositionExecuted	%12.4	BOOL						
6		"TEL81_IN".G1_ZSW.ParkingSensorExecuted	%12.6	BOOL						
7		"TEL81_IN".ZSW2_ENC.ControlRequested	%I0.1	BOOL						
8		"TEL8X_OUT".STW2_ENC.ControlByPlc	%Q0.2	BOOL		TRUE	🛛 🔁 🚹			
9		"TEL8X_OUT".G1_STW.RequestAbsoluteValueCyclically	%Q2.5	BOOL		TRUE	🛛 🗹			
10		"TEL8X_OUT".G1_STW.HomePositionMode	%Q2.3	BOOL		FALSE				

Figure 6.28: set STW2\_ENC bit 10 to TRUE

If successful, the encoder sets the flag ZSW2\_ENC Bit 9 "Control requested". Then set G1\_STW bit 13 "Request absolute value cyclically" to TRUE.

<b>\$7</b>	\$7-1500_Tests_BMPA → cpu1518 [CPU 1518-4 PN/DP] → Beobachtungs- und Forcetabellen → Beobachtungstabelle									
Ý	# # IF Io 9, % ₽ " "									
	i	Name	Adresse	Anzeigeformat	Beobachtungswert	Steuerwert	9			
1		"TEL81_IN".G1_XIST1	%ID4	Hex						
2		"TEL81_IN".G1_XIST2	%ID8	Hex						
З		"TEL81_IN".G1_ZSW.SensorError	%12.7	BOOL						
4		"TEL81_IN".G1_ZSW.AbsoluteValueCyclicallyExecuted	%12.5	BOOL						
5		"TEL81_IN".G1_ZSW.HomePositionExecuted	%12.4	BOOL						
6		"TEL81_IN".G1_ZSW.ParkingSensorExecuted	%12.6	BOOL						
7		"TEL81_IN".ZSW2_ENC.ControlRequested	%IO.1	BOOL						
8		"TEL8X_OUT".STW2_ENC.ControlByPlc	%Q0.2	BOOL		TRUE				
9		"TEL8X_OUT".G1_STW.RequestAbsoluteValueCyclically	%Q2.5	BOOL		TRUE				
10		"TEL8X_OUT".G1_STW.HomePositionMode	%Q2.3	BOOL		FALSE				

Figure 6.29: set G1\_STW bit 13 to TRUE

If successful, the encoder sets the flag G1\_ZSW Bit 13 "Transmit absolute value cyclically" and G1\_XIST2 contains the same value as G1\_XIST1.

Finally, you can select the preset mode via G1\_STW Bit 11 "Home position mode" (default 0 = absolute, 1 = relative).

<b>\$7-1</b>	\$7-1500_Tests_BMPA → cpu1518 [CPU 1518-4 PN/DP] → Beobachtungs- und Forcetabellen → Beobachtungstabelle									
<b>*</b>	# # 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1									
	Name	Adresse	Anzeigeformat	Beobachtungswert	Steuerwert	9				
1	"TEL81_IN".G1_XIST1	%ID4	Hex							
2	"TEL81_IN".G1_XIST2	%ID8	Hex							
з	"TEL81_IN".G1_ZSW.SensorError	%12.7	BOOL							
4	"TEL81_IN".G1_ZSW.AbsoluteValueCyclicallyExecuted	%12.5	BOOL							
5	"TEL81_IN".G1_ZSW.HomePositionExecuted	%12.4	BOOL							
6	"TEL81_IN".G1_ZSW.ParkingSensorExecuted	%12.6	BOOL							
7	"TEL81_IN".ZSW2_ENC.ControlRequested	%I0.1	BOOL							
8	"TEL8X_OUT".STW2_ENC.ControlByPic	%Q0.2	BOOL		TRUE	🗹 🔺				
9	"TEL8X_OUT".G1_STW.RequestAbsoluteValueCyclically	%Q2.5	BOOL		TRUE	🗹 🔺				
10	"TEL8X_OUT".G1_STW.HomePositionMode	🔳 %Q2.3	BOOL 💌		FALSE					

Figure 6.30: G1\_STW Bit 11 default 0 = absolute

The preset to the pre-defined preset value (0 by default, adjustable via PNU 65000 or PNU 65002) can now be executed with a pulse to G1\_STW Bit 12 "Request of home position" (set and reset).

<b>\$7</b>	S7-1500_Tests_BMPA → cpu1518 [CPU 1518-4 PN/DP] → Beobachtungs- und Forcetabellen → Beobachtungstabelle										
2	🖸 🔮 🎊 😼 🖧 🌮 🖏 🖤 🕯										
	i	Name	Adresse	Anzeigeformat	Beobachtungswert	Steuerwert	4				
1		"TEL81_IN".G1_XIST1	%ID4	Hex							
2		"TEL81_IN".G1_XIST2	%ID8	Hex							
З		"TEL81_IN".G1_ZSW.SensorError	%12.7	BOOL							
4		"TEL81_IN".G1_ZSW.AbsoluteValueCyclicallyExecuted	%12.5	BOOL							
5		"TEL81_IN".G1_ZSW.HomePositionExecuted	%12.4	BOOL							
6		"TEL81_IN".G1_ZSW.ParkingSensorExecuted	%12.6	BOOL							
7		"TEL81_IN".ZSW2_ENC.ControlRequested	%I0.1	BOOL							
8		"TEL8X_OUT".STW2_ENC.ControlByPlc	%Q0.2	BOOL		TRUE	A 1				
9		"TEL8X_OUT".G1_STW.RequestAbsoluteValueCyclically	%Q2.5	BOOL		TRUE	🗹 🔺				
10		"TEL8X_OUT".G1_STW.HomePositionMode	%Q2.3	BOOL		FALSE					
11		"TEL8X_OUT".G1_STW.RequestParkingEncoder	%Q2.6	BOOL		FALSE					
12		"TEL8X_OUT".G1_STW.RequestHomePosition	%Q2.4	BOOL		FALSE					

Figure 6.31: set and reset G1\_STW Bit 12

G1\_XIST2 then contains the pre-defined preset value. If "Preset affects G1\_XIST1", this also applies to G1\_XIST1.

• When the preset is executed, an offset value is calculated and stored in the rotary encoder. This value is loaded with each reset so that this setting is retained even after a reset. The offset value is reset as soon as the scaling of the encoder changes or another module is selected. This ensures that an offset value is not used that may not match the set scaling.

### 6.3.4 Resetting a preset

To undo or reset the preset, simply set the preset with the preset value 0 and  $G1_STW$  bit 11 "Home position mode" to 1 = relative. This sets the internal offset value to 0.

#### 6.4 Integration into a Step 7 project

Connect the encoder to your controller.

Connect the encoder's power supply.

To integrate the encoder into your SIMATIC Manager project, double-click the "Hardware" button to start the hardware configuration tool (see Figure 6.32).

🔁 Demo_313SC_343Adv_PN -	Aufgaber Ertwicklung	(Tabilarung) Dem		
□ 🗃 Demo_313SC_343Adv_PN	📲 Hardware	CPU 313C-2 DP	CP 343-1 Advanced	+ <b>∏</b> =CP 343-1 PG/OP
E CPU 313C-2 DP				
Erstst Advanced Erstst CP 343-1 PG/OP				

Figure 6.32: SIMATIC Manager

Next, install the GSDML file. You can download this from www.wachendorffautomation.de. To do so, open the "Extras" tab and select "Install GSD file" (see Figure 6.33).



• The corresponding .bmp file must be located in the same directory as the GSDML file during installation and is included in the download.

🖳 HW Config - 313-SC_DP	
Station Edit Insert PLC View	Options Window Help
D 🛎 🔓 🖷 🖷 🎒   🖨 🖻	Customize Ctrl+Alt+E
🛄 313-SC_DP (Configuration) De	Specify Module
(0) UR	Symbol Table Ctrl+Alt+T
2 CPU 313C-2 D X2 DP 22 D/16/D016	Edit Catalog Profile Update Catalog
3	Install HW Updates
4 CP 343-1 AL	Install GSD File
X1 P1 Port 1 X2 PN-IO	Find in Service & Support
X2 P1 R Port 1	Create GSD file for I-Device
5 H CP 343-1 PG/OP 6 7	

Figure 6.33: Installing the GSDML file

Now select the path for the GSDML file, select the desired GSDML file and confirm the installation via the "Install" button (see Figure 6.34). Then close the installation window.



Figure 6.34: Installing GSDML

Add the encoder to your hardware configuration. To do so, open the following path at the right edge of the screen (see Figure 6.35):

"PROFINET IO/Additional Field Devices/Encoders/WDGA/Wachendorff Encoder".



Figure 6.35: Hardware catalogue



Now "drag" the encoder onto the "Profinet IO system". The encoder is then displayed in the hardware view (see Figure 6.36). Enter a meaningful device name for the configured encoder by double-clicking the encoder symbol (see Figure 6.37).



Figure 6.36: Hardware view

General Identification	Shared Access						
Short description:	wachendorff						
	Wachendorff PROFINET IO IRT Device; supports Conformance Class A,B,C	*					
Order no./ firmware:	WDGA58XXXXXXPNAB0XX / V1.0						
Family:	WDGA						
Device name:	Device name: wdga						
GSD file: GSDML-V2.32-Wachendorff-WDGA-IE-20161004.xml							
	Change Release Number						
Node in PROFINET	IO system						
Device number:	1 PROFINET-IO-System (100)						
IP address:	172.20.129.117 Ethemet						
☑ Assign IP address via IO controller							
Comment:							
		*					
		~					
ОК	Cancel	Help					

Figure 6.37: Assign a device name

Now select the encoder's "Properties". To do this, single-click on the encoder (see Figure 6.38) and drag the desired properties (see Figure 6.39 No. 1) via dragand-drop from the hardware catalogue to "Slot 1", which is now highlighted green (see Figure 6.40). Select the desired telegram for communication (see Figure 6.39 No. 2). The various telegrams can be found in the "Profiles" sub-menu. Drag the telegram to slot 1.2 (see Figure 6.41).







Figure 6.38: Select via single mouse click



Figure 6.39: Select the properties and the telegram

(1)	I WDGA					
Slot	Module	Order number	I Address	Q address	Diagnostic Address	Comment
0	🚡 WDGA	WDGA58XXXXXXPNAB8XX			4089*	
X7 [	🚦 2 Port FN-IRT-Switch				4088**	
XTFTR	📕 Port 1				4087×	
X1 F2 R	📕 Port 2				4086*	
1						



(1) WDGA							
Slot		Module	Order number	I Address	Q address	Diagnostic Address	Comment
0	The second secon	WDGA	WDGA58XXXXXXPNAB6XX			4089*	
X7		2 Port FN-IRT-Switch				4088**	
X1 F1 R		Favt 1				4087×	
X1 F2 R		Port 2				4086*	
1		Multiturn 16 Bit + Sing~				4085*	
1.1		MAF				4085*	
1.2		Standard Telegram 81 🛛 🛛 🥌		011	03		

Figure 6.41: Slot 1.2 with inserted telegram 81

You can also set the corresponding I/O addresses. To do so, double-click on the respective field (see Figure 6.42) and change the addresses in the "Addresses" tab (see Figure 6.43).

Slot		Module	Order number	I Address	Q address	Diagnostic Address	Comment
0	ā	WDGA	WDGA58XXXXXXPNAB8XX			119	
X7		2 Port FN-IRT-Switch				88"	
X1 F1 R		Part 1				1087×	
X1 F2 R		Pixt 2				4086*	
1		Multiturn 16 Bit + Sing~				4085*	
7.7		MAP				4085*	
1.2		Standard Telegram 81		011	03		

Figure 6.42: Change the I/O addresses



Figure 6.43: "Addresses" tab

Save the configuration by clicking the "Save and transmit" button and load it into your PLC ("Download to module").



Figure 6.44: Save and transmit — Download to module

You can use a variable table to display the encoder's I/O data for test purposes (see Figure 6.45 and Figure 6.46).

SIMATIC Manager - Demo_313SC_343A	dv_PN						
File Edit Insert PLC View Options Window Help							
] D 😂   🎛 🛲   🌡 🛍 🛍   🔍 🏪   🏪 💬 🏥 🏢 💼   💼   < No Filter > 💽 🍞   🎇 🛞   🖷 🗖   😢							
Demo_313SC_343Adv_PN \\ntsg12\sne\Alt\Aufgaben Entwicklung\Validierung2\Demo							
⊟-월 Demo_313SC_343Adv_PN 금- 313-SC_DP 异- 및 CPU 313C-2 DP	Systemdaten	FC11	5 FC12	🔁 DB1	DB2		
Figure 6.45: Variable table							



5	WAT_1 Demo_313SC_343Adv_PN\313-SC_DP\CPU 313C-2 DP\S7-Programm(1)							
	Address		Symbol	Display format	Status value	Modify valu		
-		1						
4		DB2.DBB	0		HEX	B#16#F2	Position in	HEX
5		DB2.DBB	1		HEX	B#16#00	r oshion m	
6		DB2.DBB	2		HEX	B#16#00		
7		DB2.DBB	3		HEX	B#16#00		
8		DB2.DBB	4		HEX	B#16#FF		
9		DB2.DBB	5		HEX	B#16#B0		
10		DB2.DBB	6		HEX	B#16#25		
11		DB2.DBB	7		HEX	B#16#98		
12		DB2.DBB	8		HEX	B#16#FF		
13		DB2.DBB	9		HEX	B#16#FF		
14		DB2.DBB	10		HEX	B#16#FF		
15		DB2.DBB	11		HEX	B#16#FF		

Figure 6.46: HEX position value



# 7 Technical data

# 7.1 Properties

Interfaces	2x M12 ports 4-pole D-coded				
	1x M12 connector 4-pole A-coded				
Profinet data rate	Max. 100 Base-TX				
Diagnostic LEDs	Data traffic and connection monitoring:	L/A1: Port 1, L/A2: Port 2			
Status LEDs	Status display for encoder and bus	STAT, MOD			
Operating temperature	-40°C to +85°C				
Storage temperature	-40°C to +125 °C				
Operating voltage	10 VDC to 32 VDC				
Current consumption	typ. 125 mA				
Power consumption	typ. 3 W				
Weight	WDGA 58B, 58F:	approx. 700 g			
	WDGA 58E:	approx. 410 g			
Housing	Flange material:	Aluminium			
	Flange material (rear):	Steel housing, chromium- plated, magnetically shielded			
	Connection hood:	Die-cast aluminium, powder- coated			

#### 7.2 Dimensions

#### 7.2.1 WDGA 58B



\*option full IP67 version: D = 10 mmD = 10. L = 20. d = 9 shaft with flat

Figure 7.1: Dimensions WDGA 58B



#### 7.2.2 WDGA 58F



Figure 7.2: Dimensions WDGA 58F

#### 7.2.3 WDGA 58E



Figure 7.3: Dimensions WDGA 58E



# 8 Technical support

#### **Technical application advisor**

Do you have any questions about this product?

Our technical application advisor will be pleased to help you.

Tel.: +49 (0) 67 22 / 99 65 414 E-Mail: support-wa@wachendorff.de

Notes: