

# Technical Manual

## WDGA absolute rotary encoders

### Universal Industrial Ethernet



**EnDra**<sup>®</sup>  
Technology

**PROFI**<sup>®</sup>  
**NET**

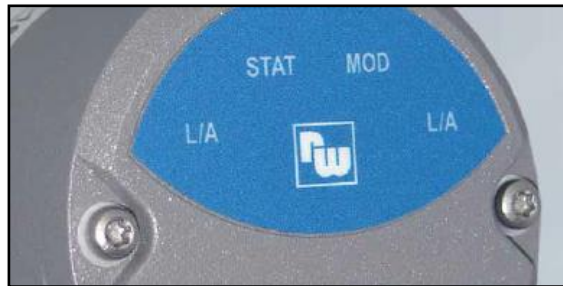
**EtherCAT**<sup>®</sup>

**EtherNet/IP**<sup>®</sup>



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## Legal information



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### Comments:

Should you have any corrections, notes or requests for changes, please send them to us. Send your comments to: [support-wa@wachendorff.de](mailto:support-wa@wachendorff.de)

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# 1 Introduction

## 1.1 About this manual

This technical manual describes the configuration and installation options for Wachendorff Automation absolute encoders with the Universal IE interface. It is a supplement to the other public Wachendorff Automation documents, such as the data sheets, mounting instructions, supplements, catalogs 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 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.



- The contents of this manual are arranged in a practice-oriented manner.
- For optimum use of the device, all information in the following sections is important and should be read.

### 1.1.1 Symbols

	<ul style="list-style-type: none"><li>• The INFO symbol indicates a section that contains particularly important information for advanced use of the device.</li></ul>
	<ul style="list-style-type: none"><li>• The IMPORTANT symbol is shown next to a section of text that describes a method for solving a particular problem.</li></ul>
	<ul style="list-style-type: none"><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 Universal IE (BI2) — (with bus cover)
- WDGA 58B Universal IE (BI2) — (with bus cover)
- WDGA 58D Universal IE (BI2) — (with bus cover)
- WDGA 58F Universal IE (BI2) — (with bus cover)

### Hollow shaft absolute encoders:

- WDGA 58E Universal IE (BI2) — (with bus cover)



- Wachendorff's Universal IE product range can be found on our website: [www.wachendorff-automation.com](http://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.

## 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 Universal IE interface includes the following items:


- WDGA Universal IE (with bus cover)
- Assembly instructions



- The corresponding Assembly instruction can be downloaded from the internet: [www.wachendorff-automation.com](http://www.wachendorff-automation.com)

## 2 Safety information


### 2.1 General safety information

	<ul style="list-style-type: none"><li>• When commissioning the encoder, ensure that you observe the assembly instructions, manual and data sheet.</li><li>• Failure to observe the safety instructions may lead to malfunctions, property damage and personal injury!</li><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.


	<ul style="list-style-type: none"><li>• The encoder must not be operated outside the specified limit parameters (see data sheet).</li></ul>
---	---

## 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.

	<ul style="list-style-type: none"><li>• All electrical connections must be tested before commissioning.</li><li>• Appropriate safety measures must be taken to ensure that no persons are harmed and no damage to the system or operating equipment occurs in the event of a failure or malfunction.</li></ul>
---	--

## 2.4 Disposal

Devices that are no longer needed or are defective must be disposed of 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 Universal IE 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 Universal IE.

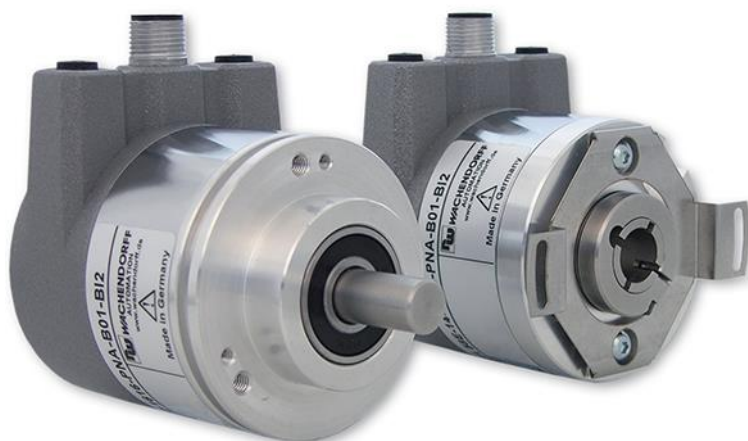


Figure 3.1: WDGA with Universal IE bus cover

The solid or hollow shaft is connected to the rotating component whose angular position or rotational speed is to be measured. 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 Universal IE

The Universal IE encoder is characterized by the fact that it is delivered without a specific fieldbus protocol. This gives you the opportunity to install the protocol you need in your application flexibly and easily on site. There are several protocols to choose from. You can either carry out the installation in a simple one-click procedure, in this case you need an Internet connection, or you can carry out the installation manually without an Internet connection, using the file we send you for your protocol.

### 3.3 Connection assignments for Universal IE encoders

#### 3.3.1 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 Table 3.1.

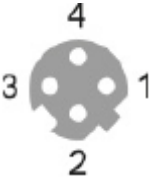
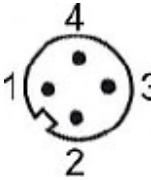
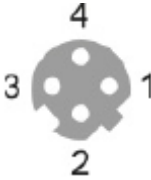
Pin assignment		Pin assignment		Pin assignment	
BI2		BI2.		BI2.	
					
Port (Port1)	M12x1, 4-pole, D-coded	Connector (Power)	M12x1, 4-pole, A-coded	Port (Port2)	M12x1, 4-pole, D-coded
Tx+	1	UB+	1	Tx+	1
Rx+	2	n. c.	2	Rx+	2
Tx-	3	UB-	3	Tx-	3
Rx-	4	n. c.	4	Rx-	4

Table 3.1: Connection assignment — BI2

### 3.4 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 a network device and data is being exchanged. The STAT LED signals the status of the fieldbus and the MOD LED signals the status of the encoder.

STAT LED bicolour	MOD LED bicolour	Meaning	Cause
○	○	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:

○ LED off    ●/● LED on    ✱/✱ LED flashing

### 3.5 MAC-Adress and IP-Adress

The Wachendorff Universal IE encoder has 3 MAC addresses. These always start with D4-90-E0-xx-xx-xx. The number of MAC addresses is determined by the number of ports of the built-in 3-port switch. One MAC address each for port 1 and port 2, as well as a MAC address for the "internal port" to which the encoder itself is connected.

At delivery, the Universal IE encoder has the IP address 192.168.1.127.

## 4 Protocol selection

### 4.1 One-Click installation

Connect the encoder to a network interface of your computer. Be aware that the IP address of the Universal IE encoder is 192.168.1.127 at delivery. Make sure that the network interface to which the encoder is connected has an IP address in the same address range (e.g. 192.168.1.10). Now open the IP address of the encoder in the browser of your choice. This will take you to the web interface of the device.

To install the desired protocol, go to the One-Click Installation page via the upper menu, item Configuration -> Protocol selection (Figure 4.1).

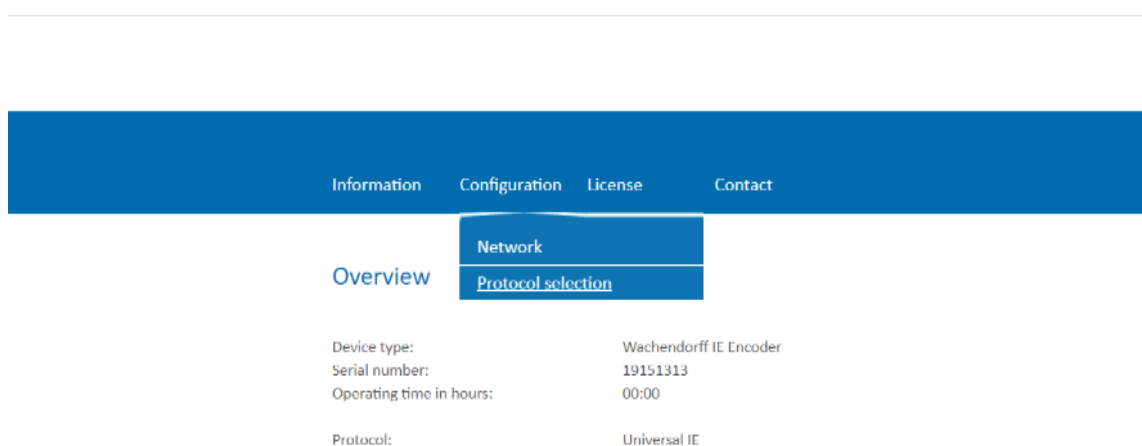



Figure 4.1: Website of Universal IE

	<ul style="list-style-type: none"> <li>• The default IP address of the Universal-IE encoder is 192.168.1.127</li> <li>• Make sure that the connected computer is in the same address range.</li> <li>• For the One-Click installation the computer must have an active Internet connection.</li> </ul>
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You will be taken to the One-Click Installation page (Figure 4.2).

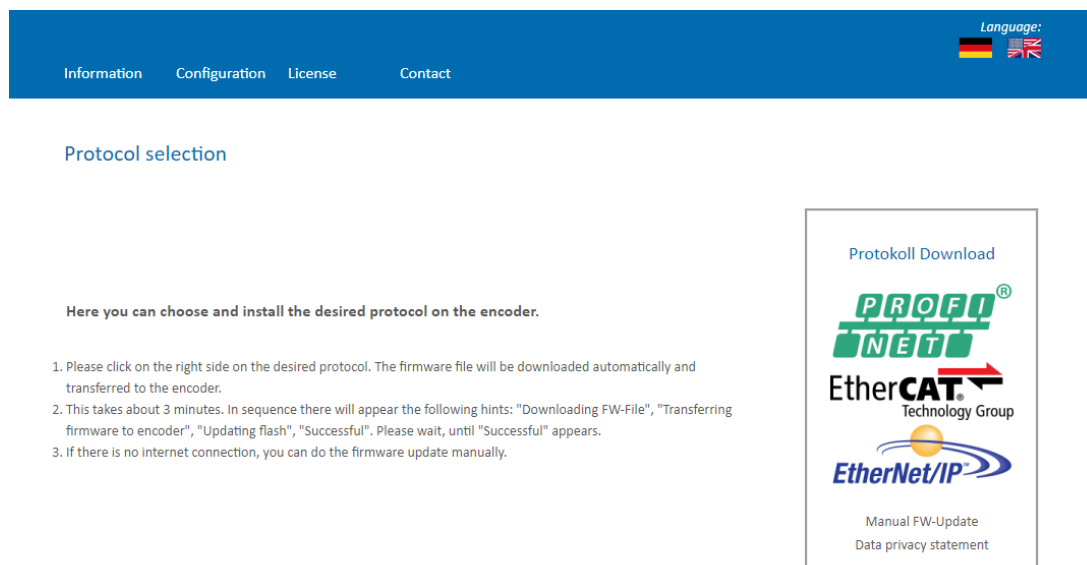
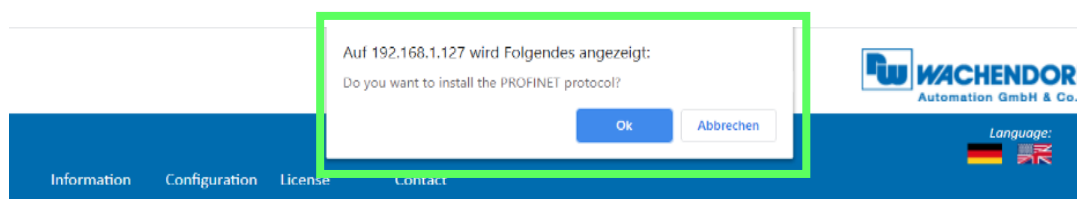


Figure 4.2: One-Click Installation

On the right hand side of the website you will find an overview of which protocols are currently available for selection. In the middle section you have a short instruction how the installation works.

To install the desired protocol, click on the logo of the protocol in the right area.

A pop-up window will ask you if you really want to install the selected protocol (Figure 4.3). Please check carefully if it is the protocol you want to use, it is not possible to change it after installation.



### Protocol selection

Here you can choose and install the desired protocol on the encoder.

1. Please click on the right side on the desired protocol. The firmware file will be downloaded automatically and transferred to the encoder.
2. This takes about 3 minutes. In sequence there will appear the following hints: "Downloading FW File", "Transferring firmware to encoder", "Updating flash", "Successful". Please wait, until "Successful" appears.
3. If there is no internet connection, you can do the firmware update manually.

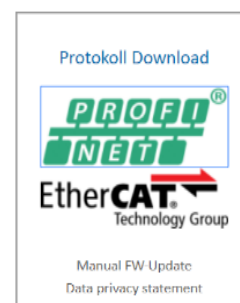


Figure 4.3: Confirmation of the protocol



The device now loads the required installation file directly onto the encoder and then automatically starts the installation. During this time, it is particularly important that the power supply is not interrupted. An interruption can cause the encoder to fail and cannot be fixed by the customer.

During installation, the encoder runs through the following sequences, which are displayed in the lower part of the web page with a rotating circle in front of it (Figure 4.4)

- FW file is downloaded
- Firmware is transferred to the encoder
- Updating Flash, do not switch of the device
- Successful

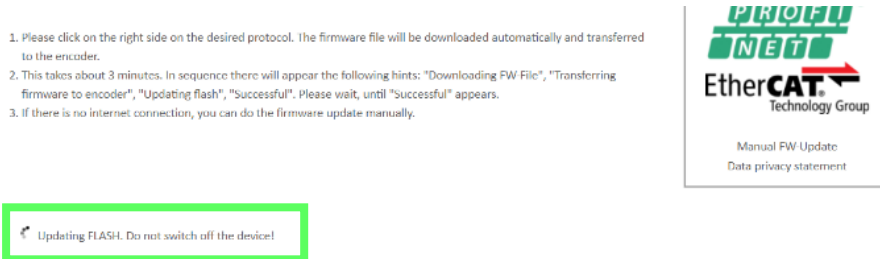


Figure 4.4: Progress bar

Wait until the encoder displays "Successful" (Figure 4.5). If an error message is displayed, start again by accessing the encoder web page. If the web page is no longer available due to an error, please contact our support.

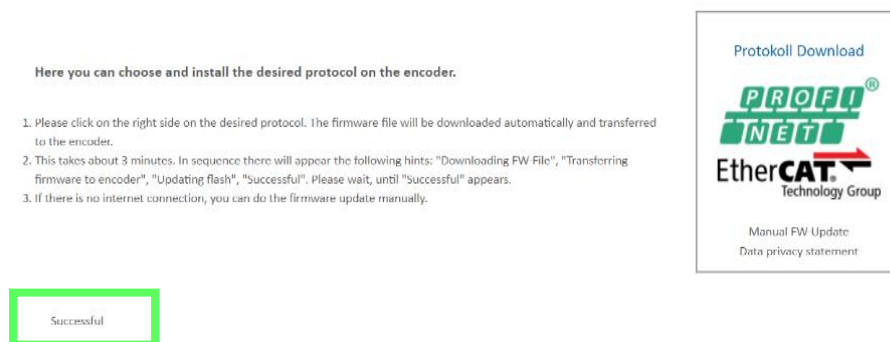




Figure 4.5: Successful

Now, after a voltage reset of the encoder, you may start up the encoder as usual with your project engineering tool. Please note that the encoder now behaves as specified in the respective manual of the encoder with the protocol now installed (e.g. in the case of PROFINET, the encoder now no longer has an IP address, as this is required by a PROFINET-device in the delivery state).

	<ul style="list-style-type: none"><li>• Once a protocol has been installed, it can no longer be changed.</li><li>• During the installation process, the power supply must not be interrupted; this may result in the encoder no longer being usable.</li><li>• Do not reset the power supply until the message "Successful" is displayed.</li></ul>
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	<ul style="list-style-type: none"><li>• After the protocol installation, the encoder behaves like the corresponding device in the delivery state. For further setup steps, please read the manual of the corresponding encoder. (e.g. PROFINET, EtherCAT, EtherNet/IP)</li></ul>
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## 4.2 Manual installation

In case you do not have an Internet connection, it is necessary to install the firmware manually. You will receive this on request from us by email in advance.

Connect the encoder to a network interface of your computer. Be aware that the IP address of the Universal IE encoder is 192.168.1.127 at delivery. Make sure that the network interface to which the encoder is connected has an IP address in the same address range (e.g. 192.168.1.10). Now open the IP address of the encoder in the browser of your choice. This will take you to the web interface of the device.

To install the desired protocol, go to the One-Click Installation page via the upper menu, item Configuration -> Protocol selection (Figure 4.6).

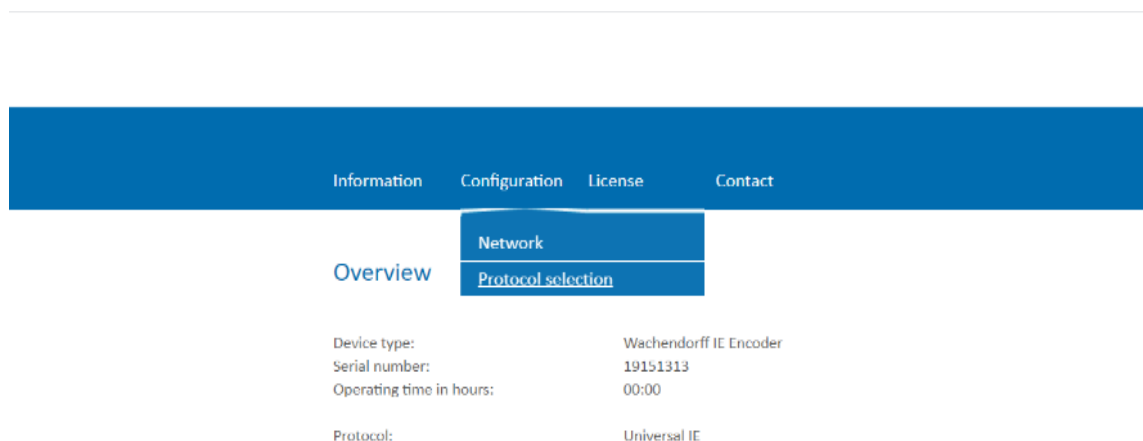



Figure 4.6: Website of Universal IE

	<ul style="list-style-type: none"> <li>• The default IP address of the Universal-IE encoder is 192.168.1.127</li> <li>• Make sure that the connected computer is in the same address range.</li> <li>• For the One-Click installation the computer must have an active Internet connection.</li> </ul>
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You will be taken to the One-Click Installation page (Figure 4.7).

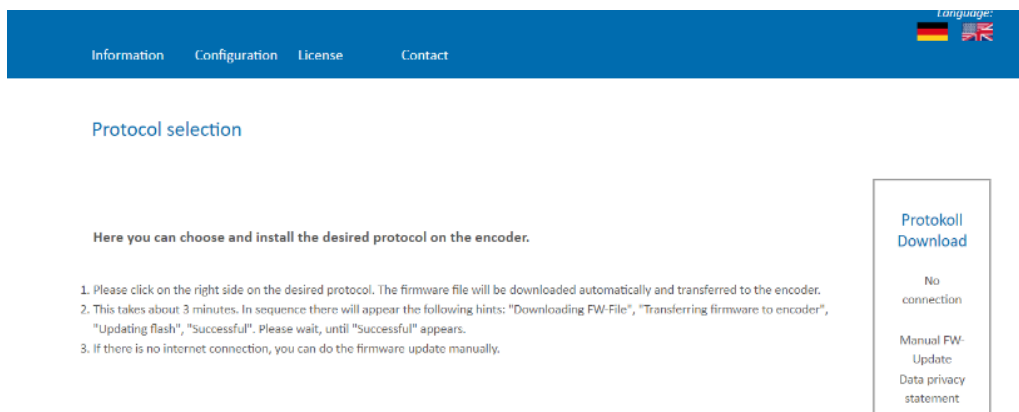


Figure 4.7: One-Click Installation

On the right hand side of the website you will find an overview of which protocols are currently available for selection. In the middle section you have a short instruction how the installation works.

To install the desired protocol, click on the logo of the protocol in the right area.

To install the desired protocol manually, click "Manual FW Update" in the right pane. A selection box appears below the quick guide for selecting the locally available firmware file. (Figure 4.8)

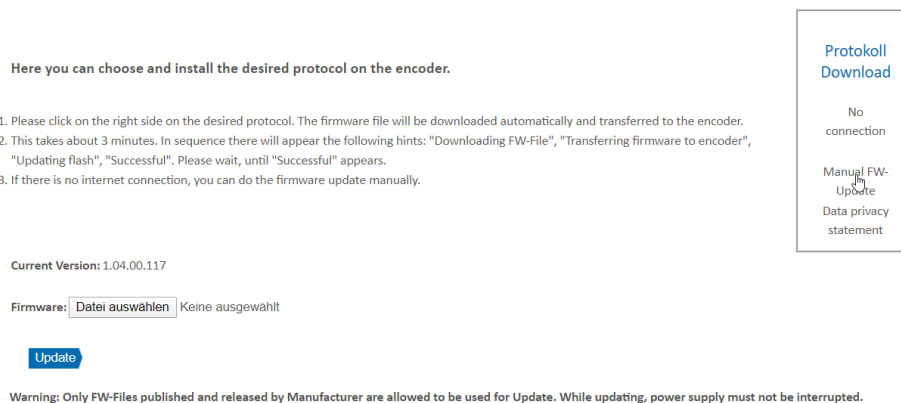


Figure 4.8: Choose file

Click on "Select file" and select the file sent by us in the Explorer that appears. (Figure 4.9)

#### Protocol selection

Here you can choose and install the desired protocol on the encoder.

1. Please click on the right side on the desired protocol. The firmware file will be downloaded automatically and transferred to the encoder.
2. This takes about 3 minutes. In sequence there will appear the following hints: "Downloading FW-File", "Transferring firmware to encoder", "Updating flash", "Successful". Please wait, until "Successful" appears.
3. If there is no internet connection, you can do the firmware update manually.

Current Version: 1.04.00.117

Firmware:  wdga\_ie\_p...0\_54.bin

Warning: Only FW-Files published and released by Manufacturer are allowed to be used for Update. While updating, power supply must not be interrupted.

Protokoll  
Download

No  
connection

Manual FW-  
Update  
Data privacy  
statement

Figure 4.9: File chosen

Now click on "Update". The device now loads the required installation file directly onto the device and then automatically starts the installation. During this time, it is particularly important that the power supply is not interrupted. An interruption can lead to a failure of the encoder and cannot be remedied by the customer.

During installation, the encoder runs through the following sequences, which are displayed in the lower part of the web page with a rotating circle in front of it (Figure 4.10).

- Firmware is transferred to the encoder
- Updating Flash, do not switch of the device
- Successful

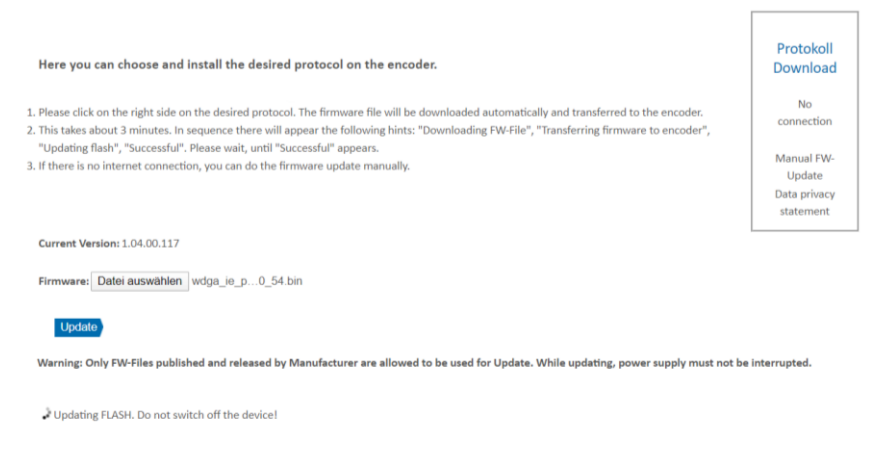


Figure 4.10: Progress bar

Wait until the encoder displays "Successful" (Figure 4.11). If an error message is displayed, start again by accessing the encoder web page. If the web page is no longer available due to an error, please contact our support.

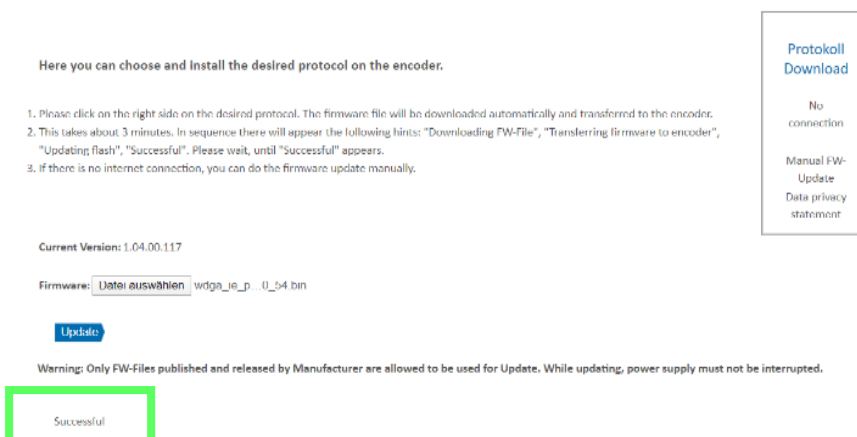




Figure 4.11: Successful

Now, after a voltage reset of the encoder, you may start up the encoder as usual with your project engineering tool. Please note that the encoder now behaves as specified in the respective manual of the encoder with the protocol now installed (e.g. in the case of PROFINET, the encoder now no longer has an IP address, as this is required by a PROFINET-device in the delivery state).

	<ul style="list-style-type: none"><li>• Once a protocol has been installed, it can no longer be changed.</li><li>• During the installation process, the power supply must not be interrupted; this may result in the encoder no longer being usable.</li><li>• Do not reset the power supply until the message "Successful" is displayed.</li></ul>
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	<ul style="list-style-type: none"><li>• After the protocol installation, the encoder behaves like the corresponding device in the delivery state. For further setup steps, please read the manual of the corresponding encoder. (e.g. PROFINET, EtherCAT, EtherNet/IP)</li></ul>
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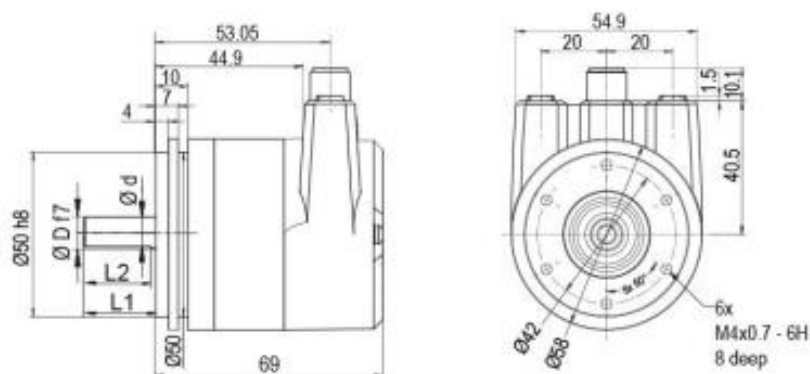
## 5 Technical data

### 5.1 Properties

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

### 5.2 Dimensions

#### 5.2.1 WDGA 58A



D = 6,	L1 = 12,	d = 5.3,	L2 = 10	shaft with flat
D = 8,	L1 = 19,	d = 7.5,	L2 = 15	shaft with flat
D = 10,	L1 = 20			shaft with out flat*
D = 3/8",	L1 = 20,	d = 8.3,	L2 = 10	shaft with flat

\* Option full IP67 version: (only D = Ø 10 mm)  
D = 10, L1 = 20, d = 9, L2 = 15 shaft with flat

Option AIX:  
D = 6, L1 = 10, d = 5.3, L2 = 8 shaft with flat

Figure 5.1: Dimensions WDGA 58A





### 5.2.4 WDGA 58F

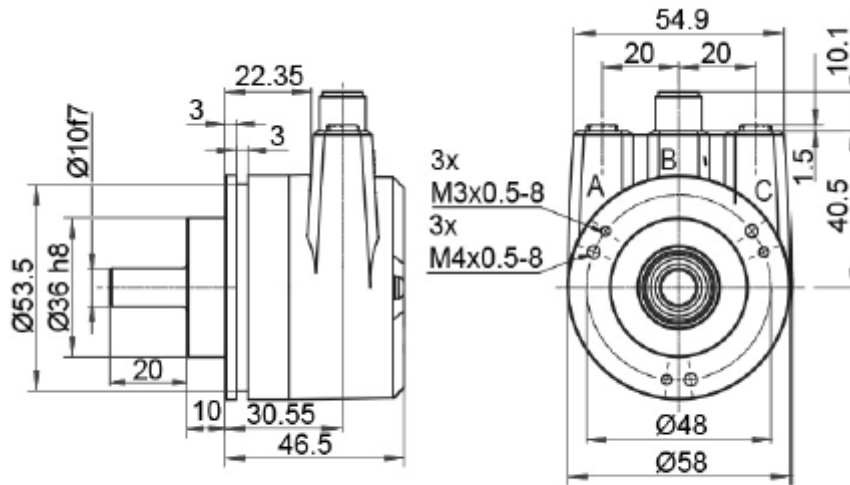


Figure 5.4: Dimensions WDGA 58F

### 5.2.5 WDGA 58E

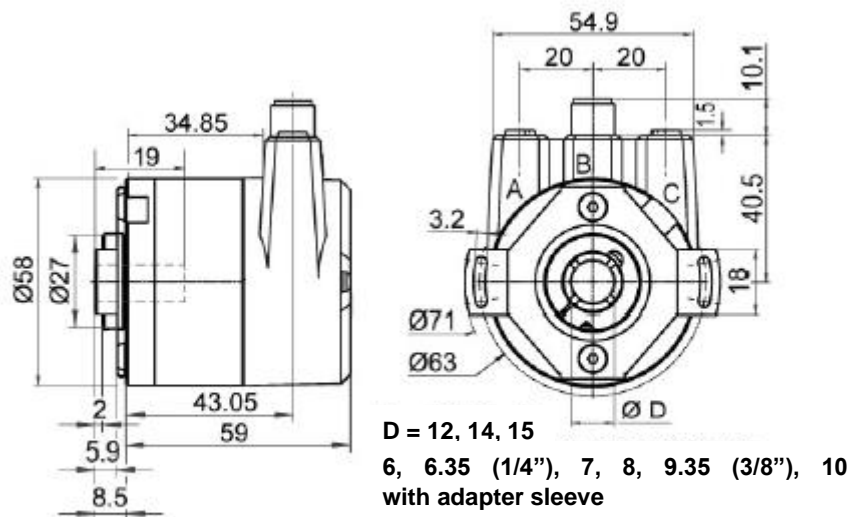


Figure 5.5: Dimensions WDGA 58E

## 6 Technical advice

### Technical applications advisers

Do you have any questions about this product?

Your technical applications advisers will be happy to help you.

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

Notes: