

# **Quickstart Class 2** WDGA absolute rotary encoders with Profibus interface









Industrie ROBUST



## Imprint



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## 1 General

The following examples are based on the "STEP 7" program (version 5.5). If not already available you need the respective hardware, a DPM1 master, a DPM2 master, a DP slave (WDGA encoder with PROFIBUS) with the corresponding GSD file.



The quickstart guide is only a short basic projecting instruction, further information on the product can be found in the PROFIBUS manual.



- Please note that the contents and programs described in the quickstart guide are only examples. Wachendorff Automation does not assume any liability or warranty for the correctness of the quickstart guide nor for any direct or indirect damage arising from it.
- Please ensure the diagnosis evaluation in order to guarantee the validity of the values.



## 2 Installing the GSD file

The GSD file of the WDGA encoder with PROFIBUS is installed in the "HW Config" hardware configurator (see Figure 2.1).

 The GSD file for class 2 (WDGA0E87.GSD) can be found on our website: download – GSD file



- · Close any open hardware projects.
- Select the required storage location under "Tools", "Install GSD files ... "
- Install GSD file.

🗱 HW Config: Configuring bardware		
Station PLC View Options Help		
	Fug	<u>vi</u> v!
Install GSD Files	Pariller S	Standard
Install GSD Files: Itom the directory	0	FIBUS-PA FINET IO
C-VPROGRAM FILES/SIEMENS/STEP7/S7TMP	Browse	ATIC 300 ATIC 400 ATIC PC Based Control 300/400
File   Release   Version   Languages   WDGA0DD2.GSD Delaut   WDGA0EP7.GSD Delaut		ATIC PC Station
Select WDGA0E87.GSD		
Instal Show Log Select All Deselect All		
Clore	Help	
	PROFIBUS-0 (distributed ra	DP slaves for SIMATIC S7, M7, and C7 sck)
Press F1 to get Help.		

Figure 2.1: GSD file - STEP 7







Then update the "Hardware catalog"

- The WDGA encoder appears in the "Hardware catalog" under "PROFIBUS-DP", "Other field devices", "encoder", "Wachendorff Automation", "WDGA PROFIBUS Class2" (see Figure 2.2).
- The "WDGA PROFIBUS Class2" modules appear here.
- The selectable modules correspond to the configuration data of class 2 (see PROFIBUS manuel or Table 3.1).

변철 HW Config - [SIMATIC 300(1) (Configuration) 01_Klasse 2]	
The second secon	E ×
Stations window	End: End: Profile: Standard PROFIBUS DP PROFIBUS-PA PROFIBUS-PA BIMATIC 300 SIMATIC 400 SIMATIC 400 SIMATIC PC Based Control 300/400 SIMATIC PC Station Hardware catalog
Slot Designation	
Stations properties window	PROFIBUS-DP slaves for SIMATIC S7, M7, and C7 (distributed rack)
Press F1 to get Help.	Chg

Figure 2.2: Hardware configurator - STEP 7

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## **3 Configuration data**

The selectable "WDGA PROFIBUS Class2" modules in "HW Config" after integration of the GSD file for the class 2 WDGA encoder are contained in Table 3.1.

Designation	Word	1	2	3	4
"16bit position,	data output				
no preset"	data input	16-bit position			
"16bit position,	data output	16-bit preset			
with preset"	data input	16-bit position			
"32bit position,	data output				
no preset"	data input	32-bit po	32-bit position		
"32bit position,	data output	32-bit pr	reset		
with preset"	data input	32-bit po	sition		
"32bit position,	data output	32-bit pr	32-bit preset		
preset, speed"	data input	32-bit position		32-bit	speed
"32bit position,	data output	32-bit preset			
preset, debug"	data input	32-bit position		32-bit position debug	



### 4 Integrating the WDGA

If not already available, configure a DPM1 master in the hardware configurator. The different areas of "HW Config" are marked in Figure 4.1.

- Go to the "Hardware catalog", click on the "WDGA PROFIBUS Class2" component and drag it into the "Stations window" to the fieldbus (here: "PROFIBUS(1): DP master system(1)").
- Then click the "WDGA icon" once. The component is displayed in the "Station properties window".
- Drag the required "WDGA PROFIBUS Class2" module from the "Hardware catalog" into the "Station properties window" to "Slot 1".



### Quickstart class 2



WDGA with PROFIBUS interface



Figure 4.1: HW configuration – STEP 7

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### 4.1 Assigning the slave address

The slave address previously set in the WDGA (see PROFIBUS manual) must be assigned in the hardware configuration (see Figure 4.2).

- Double-click on the "WDGA icon".
- Enter the respective slave address under "General", "PROFIBUS...", "Parameters".
- Select your projected PROFIBUS in the "Subnet" and confirm with "OK".



If you have a WDGA encoder with terminal box, please make sure that the indication of the rotary coding switches is consistent with the indication in the "Station window".

Figure 4.2: Address assignment – "HW Konfig" STEP 7





### 4.2 Setting the I/O addresses

The I/O addresses are the S7 addresses via which the encoder is called in the controller. They are used by the controller to access the input and output data of the encoder. The I/O addresses are assigned via the "Properties - DP slave" window (see Figure 4.3).

• Double-click on the line of the added "WDGA module" in the "Station properties window".



- Enter the required I/O address in the "Properties DP slave" window and confirm by pressing "OK".
- Identical addresses are permissible for the I/O addresses.



Figure 4.3: I/O addresses – STEP 7



Depending on the controller type, there can be restrictions for the permissible range of values of the I/O addresses which do not directly result in error messages. If access to the data is not possible via the addresses Ixxx or Oxxx but only via PIxxx and POxxx, you might have set values beyond the permissible range. Avoid overlapping with other slaves!



### 4.3 Parameterizing the WDGA

The parameterization can be effected via the "Properties - DP slave" window (see Figure 4.4).

Click on the parameters for parameterization:

• "code sequence" - changes the direction of rotation



- "class 2 functionality" activates the class 2 functionalities
- "scaling function control" activates the scaling
- "measuring units per revolution" enter the ST resolution
- "total measuring range" enter the total resolution
- "speed measuring unit" sets the speed value unit

Image: Start Configuration - Class 2 demo on RU           Image:	Parameterization class 1
*	Properties - DP slave ZS Genetic Parameter Assignment Parameter Assignment Value Parameter Assignment Cock noise Cock noi
	OK Cancel Help

Figure 4.4: Parameterization – STEP 7





- When the hardware configuration is complete, it can be compiled and loaded into the target system (DPM1).
- Please make sure that you have compiled and not only saved the configuration.



### 4.4 Setting the diagnosis address

The assignment of a diagnosis address is required in order to evaluate diagnosis messages of the encoder (see Figure 4.5).



Enter the diagnosis address in the "Properties – DP slave" window.



Figure 4.5: Diagnosis addresses – STEP 7



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- The diagnosis address can be within the entire peripheral range of the controller.
- The diagnosis address does not occupy an I/O address.
- Assigning the diagnosis address is only required if the diagnosis functions are used (see PROFIBUS manual).
- Reading the diagnosis see section 8.



## **5** Creating the symbol table

Create a symbol table or amend an existing one, if necessary.



Open the symbol table according to Figure 5.1.

🎝 SIMATIC Manager - [Support-Proje	kte C:\Pro	gram Fi	iles\Siemens\Step7\s7	proj\Support-\Su	pport	-]			
🔂 File Edit Insert PLC View	Options V	Vindow	Help						
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🕀 🎒 00_Steurungs-Vorlage	🛅 Quellen			Sourc	e Fol	der		04/29/2013 03:29:22 PM	
⊞-∰j UI_Klasse 2 ⊟-∰i Class2 demo von BU	Bausteir	ne		Block	Fold	er Offline		03/17/2014 02:33:15 PM	
SIMATIC 300(1)	Symbole	)		Symb	ol tab	le	13853	U3/17/2014 U3:25:10 PM	
EPU 313C-2 DP									
Classic dello		Cut		Ctrl+X	h -				
Bausteine		Conv		Ctrl+C	ι.				
⊡ - 🗃 Class4 demo von Ru		Paste		Ctrl+V	ι.				
🗄 🎒 Quick 4		D.L.			Ε.				
		Delete	e	Dei	L				
		Insert	New Object	•		Source Fold	ler		
		PLC		+		Block Folde	r Offline		
		Run-T	Time Properties			STL Source			
		Objec	t Properties	Alt+Return		Organizatio	n Block		
		Specia	al Object Properties	+		Function Bl	ock		
	_					Function			
						Data Block			
						Data Type			
						Variable Tal	ble		
						Text Library	Folder		
						User Text-Li	ibrary		
						Symbol Tab	ole		
						External Sou	urce		
					_				

Figure 5.1: Opening the symbol table – STEP 7



- Enter your own symbol name under "Symbol".
- A
- Enter your determined I/O address range via "Address".
   Please make sure to select the word sizes in accordance with the sizes of the words to be addressed (e.g. 32-bit position value see PROFIBUSmanual or Table 3.1). See example in Figure 5.2.

😪 Symbol Editor - [Class4 demo (Symbole) Class4 demo von Ru\SIMATIC 300(1)\CPU 313C-2 DP] 📃 🖃 📧								
🔄 Symbol Table Edit Insert View Options Window Help 📃 🖃 🗙								
🖆 🖬 🕼 🐇 🛍 🛍 🗠 🖙 🛛 🗛 🖬 🐯								
	Status	Symbol 🛆	Add	ress	Data	type	Comment	
1		BMPAG	FB	6	FB	6	Base Mode Parameter Access - Global	
2		BMPAGDB	DB	11	FB	6		
3		COLD RESTART	OB	102	OB	102	Cold Restart	Ξ
4		Command	MW	100	WOF	۱D		
5		CommandDB	DB	4	FB	3		
6		CommandFB	FB	3	FB	3		
7		COMPLETE RESTART	OB	100	OB	100	Complete Restart	
8		CTU	SFB	0	SFB	0	Count Up	
9		cyclicOB	OB	1	OB	1		
10		DebugcontroIDB	DB	10	FB	5		
11		DebugControlFB	FB	5	FB	5		
12		Diagbuffer	DB	2	DB	2		
13		diagdata	MB	0	BYT	Ξ	64 Bytes (0 - 63)	
14		diagtest	DB	5	DB	5		
15		DPDiagDB	DB	3	FB	2		
16		DPDiagFB	FB	2	FB	2		
17		DPNRM_DG	SFC	13	SFC	13	Read Diagnostic Data of a DP Slave	
18		EncoderDT	UDT	1	UDT	1	contains the data of an encoder	Ŧ
Press F1 to get Help. NUM								

Figure 5.2: Creating a symbol table – STEP 7



### 6 Position & speed

Monitoring position and speed:

• Open the variables table (analogous to Figure 5.1).



- Enter your created symbol names under "Symbol".
- · Select your required "Display format".
- The current values appear under "Status value" (e.g. position and speed) which you can monitor using the "glasses icon".

K	<mark>6 .</mark> v	ar - [VA]	1 @01_Klasse 2\SI	MATIC 300(1)\C	PU 313C-2 DP\S7-Programm(2) ONLINE]	
		Tabelle	Bearbeiten Einfüg	en Zielsystem	Variable Ansicht Extras Fenster Hilfe	_ 8 ×
	-		🔒 🎒 👗 🖻		× 📲 🖁 🕅 🧐 🚱 🖛 🚳 🗤 🕼	
	1	Operar	d Symbol	Anzeigeformat	Statuswert	Steuerwert
		ED 0	"Position_Value"	BIN	2#0000_0000_0000_0011_1111_0111_0110_1111	
	2	ED 4	"Speed_Value"	BIN	2#0000_0000_0000_0000_0000_0000_0000	
	3					
	•			III		4
0	1_Kla	asse 2\SI	MATIC 300(1)\\S7-P	rogramm(2)	🔶 <mark>RU</mark> N Abs	< 5.2

Figure 6.1: Variables table – STEP 7



Loading position and speed into the control program:

• Open your control program ("KOP/AWL/FUP" window).



- Use "L" to load the position/speed with the symbol name assigned and use "T" to transfer it into a flag selected by you.
- See example in Figure 6.2.

KOP/AWL/FUP - [OB1 01_Klasse 2\SIMATIC 300(1)\CPU 313C-2 DP]	
Datei Bearbeiten Einfügen Zielsystem Test Ansicht Extras Fenster	
Image: Solution of the second seco	U         U
Image: Constraint of the second se	Le) "
The Position-Value will be cycl variable MD50	slue ic loaded from the Encoder and transmit into the
L "Position_Value" T MD 50 Wetwerk 2: Load the Speed-Value The Speed-Value will be cyclic	ED0 32-Bit-Position
T     T     Wariable MD54       L     "Speed_Value"       T     MD       MD     54	ED4 32-Bit-Speed
Image: Programm     Image: Second se	► ndeninfo λ 5: Steuem λ 6: Diagnose λ 7: Vergleich /
Drücken Sie F1, um Hilfe zu erhalten.	© offline Abs < 5.2 Einfg Änd //

Figure 6.2: Loading values into a control program - STEP 7

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## 7 Setting the preset value

The "Preset value" format is displayed in Table 7.1.

The "Preset value" can only be entered within the range of values (0 to  $2^{31} - 1$ ).

Output-Data									
Word	1 2								
Octet	1		2	3	4				
Bit	31	30-24	23-16	15-8	7-0				
Data	0/1	$ 2^{30}-2^{24}$	$2^{23} - 2^{16}$	$2^{15} - 2^{8}$	$ 2^7 - 2^0$				
	Preset Control	Control Preset value - max. 31 bits							

#### Table 7.1: Preset value format



A preset must only be carried out when the encoder is at standstill.



Figure 7.1 shows the preset process by means of the variables table.

- Open the variables table (analogous to Figure 5.1).
- Enter your created symbol names for the preset under "Symbol".
- Address bit 31 "Preset control" in order to activate the preset mode (see Table 7.1).
- Enter a "Control value" for your required preset value. (Enter the corresponding value under "Status value".)
- Activate bit 31 by entering 1 ("true") in "Status value".
- The position value is set to the predefined preset value.
- Deactivate bit 31 after the preset process.

 $\overline{\mathcal{A}}$ 



🌃 .Var - [VAT1 -- @01\_Klasse 2\SIMATIC 300(1)\CPU 313C-2 DP\S7-Programm(2) ONLINE] - C X 👪 Tabelle Bearbeiten Einfügen Zielsystem Variable Ansicht Extras Fenster Hilfe \_ 8 × -> D 🗲 🖬 🎒 X 🖻 🖻 🗠 🖂 X 🗣 🎖 📢 Sy 66 47 66 47 ller Coperand Symbol Anzeigeformat Statuswert Steuerwert ED 0 DW#16#00002724 "Position\_Value" HEX AD 0 "Preset\_Value" HEX DW#16#00000000 DW#16#00000000 2 "Set\_Preset" BOOL A 0.7 false 3 false 4 01 Klasse 2\SIMATIC 300(1)\...\S7-Programm(2) 🛈 RUN Abs < 5.2 Var - [VAT1 -- @01\_Klasse 2\SIMATIC 300(1)\CPU 313C-2 DP\S7-Programm(2) ONLINE] - - -Tabelle Bearbeiten Einfügen Zielsystem Variable Ansicht Extras Fenster Hilfe - 8 × 🛥 🗅 🚅 🖬 🎒 👗 🛍 🖻 🗠 🗠  $\mathbf{X}$ º\_a 2 №? 💱 🔐 🗛 🚳 🏘 ller Operand Symbol Anzeigeformat Statuswert Steuerwert 1 ED 0 "Position\_Value HEX DW#16#00000000 DW#16#00000000 2 AD 0 "Preset\_Value" HEX DW#16#80000000 3 А 0.7 "Set\_Preset" BOOL true true 4 01\_Klasse 2\SIMATIC 300(1)\...\S7-Programm(2) 🚯 RUN Abs < 5.2 👪 .Var - [VAT1 -- @01\_Klasse 2\SIMATIC 300(1)\CPU 313C-2 DP\S7-Programm(2) ONLINE] - • **·** 👪 Tabelle Bearbeiten Einfügen Zielsystem Variable Ansicht Extras Fenster Hilfe \_ & × 🐰 🗈 💼 🗠 🗠 9 g 🎯 🔐 🛷 🚳 😽 -> D 🗲 🖬 🎒  $|\mathbf{X}|$ ller 12 Operand Symbol Anzeigeformat Statuswert Steuerwert ED 0 DW#16#0000000 1 "Position\_Value HEX 2 AD 0 "Preset\_Value" HEX DW#16#00000000 DW#16#00000000 BOOL 3 Α 0.7 "Set\_Preset" false false 4 01\_Klasse 2\SIMATIC 300(1)\...\S7-Programm(2) 🔹 RUN Abs < 5.2

Figure 7.1: Preset - STEP 7

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### 8 Reading the diagnosis

The DP master usually retrieves the diagnosis automatically without requiring programming. Processing and recording of occurring errors must, however, be done in the control program. If this is not done, the controller may automatically switch to a safe state.



- We advise against simply discarding the diagnosis data to avoid a stop of the controller. Measures may be necessary to ensure safe operation of a system.
- Please ensure the diagnosis evaluation in order to guarantee the validity of the values.
- For setting the diagnosis address, see section 4.4.



- Further details on the diagnosis within the control program can be seen from the S7 example.
- Further information can be found in the PROFIBUS manual.



## 9 S7 example program



You can download an S7 example program from our website: S7 example