

User's guide

Ax58, Ax58S

AxC58 PB

CC-PB, CC-PB-C



Profibus-DP Profile for Encoders



..... **lika**

Smart encoders & actuators

This publication was produced by Lika Electronic s.r.l. 2014. All rights reserved. Tutti i diritti riservati. Alle Rechte vorbehalten. Todos los derechos reservados. Tous droits réservés.

This document and information contained herein are the property of Lika Electronic s.r.l. and shall not be reproduced in whole or in part without prior written approval of Lika Electronic s.r.l. Translation, reproduction and total or partial modification (photostat copies, film and microfilm included and any other means) are forbidden without written authorisation of Lika Electronic s.r.l.

The information herein is subject to change without notice and should not be construed as a commitment by Lika Electronic s.r.l. Lika Electronic s.r.l. reserves the right to make all modifications at any moments and without forewarning.

This manual is periodically reviewed and revised. As required we suggest checking if a new or updated edition of this document is available at Lika Electronic s.r.l.'s website. Lika Electronic s.r.l. assumes no responsibility for any errors or omissions in this document. Critical evaluation of this manual by the user is welcomed. Your comments assist us in preparation of future documentation, in order to make it as clear and complete as possible. Please send an e-mail to the following address info@lika.it for submitting your comments, suggestions and criticisms.

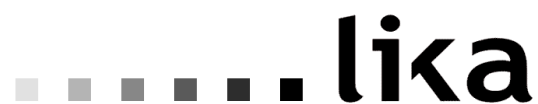


Table of contents

User's guide.....	1
Table of contents.....	3
Subject index.....	5
Typographic and iconographic conventions.....	6
Preliminary information.....	7
1 - Safety summary.....	8
2 - Identification.....	9
3 - Mounting instructions.....	10
3.1 Solid shaft encoders.....	10
3.1.1 Customary installation.....	10
3.1.2 Installation using fixing clamps (optional kit code LKM-386).....	10
3.1.3 Installation using a mounting bell (optional kit code PF4256).....	11
3.2 Hollow shaft encoders.....	12
3.2.1 ASC58, AMC58 installation using the antirotation pin.....	12
3.2.2 ASC59, AMC59 installation using the fixing plate.....	12
3.2.3 ASC60, AMC60 installation using the antirotation pin and the fixing plate.....	13
4 - Electrical connections.....	14
4.1 Connection cap.....	14
4.2 Ground connection.....	15
4.3 Connection cap with PGs -CC-PB- (Figure 1).....	15
4.4 Connection cap with M12 connectors -CC-PB-C- (Figure 2).....	16
4.5 Connection of the shield.....	17
4.6 Node address: DIP A (Figure 1).....	17
4.7 Baud rate.....	18
4.8 Bus termination (Figure 1).....	19
4.9 Diagnostic LEDs (Figure 1).....	20
5 - Quick reference.....	21
5.1 Configuring the encoder via Siemens STEP7.....	21
5.1.1 Importing GSD file.....	21
5.1.2 Adding a node to the project.....	23
5.1.3 Encoder configuration parameters.....	24
5.2 Reading the diagnostic information.....	35
5.3 Setting the Preset value.....	37
6 - Profibus interface.....	38
6.1 GSD file.....	38
6.2 Classes of the Device profile.....	39
6.3 Operating modes.....	39
6.4 DDLM_Set_Prm.....	41
6.4.1 Byte 10 - Operating parameters.....	41
Code sequence.....	42
Class 2 functionality.....	42
Scaling function.....	42
6.4.2 Bytes 11 - 12.....	43
Counts per revolution.....	43
6.4.3 Bytes 13 ... 16.....	44
Total resolution.....	44

6.5 DDLM_Chk_Cfg.....	47
6.6 DDLM_Data_Exchange.....	48
Position	48
Preset	48
6.7 DDLM_Slave_Diag.....	50
6.8 "Red zone".....	51
7 – Default parameters list.....	53

Subject index




C		
Class 2 functionality.....	42	
Code sequence.....	42	
Counts per revolution.....	43	
P		
Position.....	48	
		Preset.....48
		S
		Scaling function.....42
		T
		Total resolution.....44

Typographic and iconographic conventions

In this guide, to make it easier to understand and read the text the following typographic and iconographic conventions are used:

- parameters and objects both of the device and the interface are coloured in **ORANGE**;
- alarms are coloured in **RED**;
- states are coloured in **FUCSIA**.

When scrolling through the text some icons can be found on the side of the page: they are expressly designed to highlight the parts of the text which are of great interest and significance for the user. Sometimes they are used to warn against dangers or potential sources of danger arising from the use of the device. You are advised to follow strictly the instructions given in this guide in order to guarantee the safety of the user and ensure the performance of the device. In this guide the following symbols are used:

	This icon, followed by the word WARNING , is meant to highlight the parts of the text where information of great significance for the user can be found: user must pay the greatest attention to them! Instructions must be followed strictly in order to guarantee the safety of the user and a correct use of the device. Failure to heed a warning or comply with instructions could lead to personal injury and/or damage to the unit or other equipment.
	This icon, followed by the word NOTE , is meant to highlight the parts of the text where important notes needful for a correct and reliable use of the device can be found. User must pay attention to them! Failure to comply with instructions could cause the equipment to be set wrongly: hence a faulty and improper working of the device could be the consequence.
	This icon is meant to highlight the parts of the text where suggestions useful for making it easier to set the device and optimize performance and reliability can be found. Sometimes this symbol is followed by the word EXAMPLE when instructions for setting parameters are accompanied by examples to clarify the explanation.

Preliminary information

This guide is designed to describe the technical characteristics, installation and use of the **Profibus encoders of the Ax58x series**. For any further information please refer to the product datasheet.

To make it easier to read the text, this guide can be divided into two main sections.

In the first section general information concerning the safety, the mechanical installation and the electrical connection as well as tips for setting up and running properly and efficiently the unit are provided.

In the second section, entitled **Profibus Interface**, both general and specific information is given on the Profibus interface. In this section the interface features and the parameters implemented in the unit are fully described.

1 - Safety summary



Safety

- Always adhere to the professional safety and accident prevention regulations applicable to your country during device installation and operation;
- installation and maintenance operations have to be carried out by qualified personnel only, with power supply disconnected and stationary mechanical parts;
- device must be used only for the purpose appropriate to its design: use for purposes other than those for which it has been designed could result in serious personal and/or the environment damage;
- high current, voltage and moving mechanical parts can cause serious or fatal injury;
- warning ! Do not use in explosive or flammable areas;
- failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment;
- Lika Electronic assumes no liability for the customer's failure to comply with these requirements.



Electrical safety

- Turn off power supply before connecting the device;
- connect according to explanation in section "4 - Electrical connections";
- in compliance with the 2004/108/EC norm on electromagnetic compatibility, following precautions must be taken:
 - before handling and installing, discharge electrical charge from your body and tools which may come in touch with the device;
 - power supply must be stabilized without noise, install EMC filters on device power supply if needed;
 - always use shielded cables (twisted pair cables whenever possible);
 - avoid cables runs longer than necessary;
 - avoid running the signal cable near high voltage power cables;
 - mount the device as far as possible from any capacitive or inductive noise source, shield the device from noise source if needed;
 - to guarantee a correct working of the device, avoid using strong magnets on or near by the unit;
 - minimize noise by connecting the shield and/or the connector housing and/or the frame to ground. Make sure that ground is not affected by noise. The connection point to ground can be situated both on the device side and on user's side. The best solution to minimize the interference must be carried out by the user.





Mechanical safety

- Install the device following strictly the information in the section "3 - Mounting instructions";
- mechanical installation has to be carried out with stationary mechanical parts;
- do not disassemble the encoder;
- do not tool the encoder or its shaft;
- delicate electronic equipment: handle with care; do not subject the device and the shaft to knocks or shocks;
- respect the environmental characteristics declared by manufacturer;
- unit with solid shaft: in order to guarantee the maximum reliability over time of the mechanical parts, we recommend a flexible coupling to be installed to connect the encoder and the installation shaft; make sure the misalignment tolerances of the flexible coupling are respected;
- unit with hollow shaft: the encoder can be mounted directly on a shaft whose diameter has to respect the technical characteristics specified in the purchase order and clamped by means of the collar and the fixing plate into which an anti-rotation pin has to be inserted.

2 - Identification

Device can be identified through the **order code** and the **serial number** printed on the label applied to its body. Information is listed in the delivery document too. Please always quote the order code and the serial number when reaching Lika Electronic s.r.l. for purchasing spare parts or needing assistance. For any information on the technical characteristics of the product refer to the technical catalogue.



Warning: encoders having order code ending with "/Sxxx" may have mechanical and electrical characteristics different from standard and be supplied with additional documentation for special connections (Technical info).

3 - Mounting instructions



WARNING

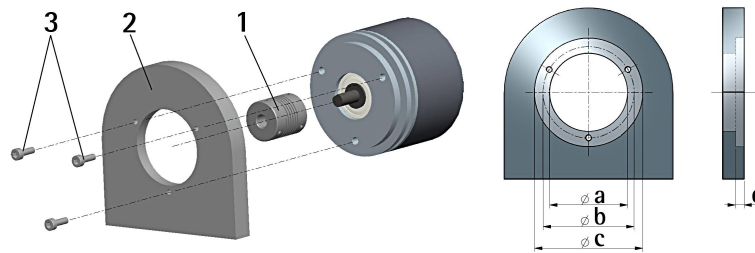
Installation has to be carried out by qualified personnel only, with power supply disconnected and mechanical parts compulsorily in stop.

Never force the rotation of the shaft manually, it could cause irreparable damage!

3.1 Solid shaft encoders

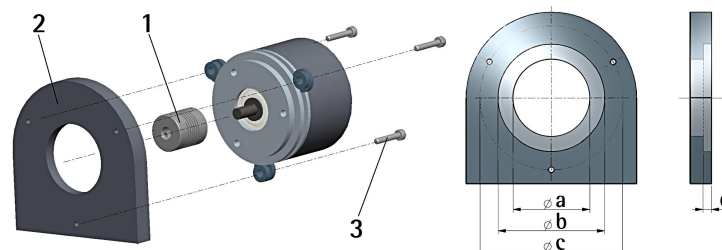
- Mount the flexible coupling **1** on the encoder shaft;
- fix the encoder to the flange **2** (or to the mounting bell) by means of screws **3**;
- secure the flange **2** to the support (or the mounting bell to the motor);
- mount the flexible coupling **1** on the motor shaft;
- make sure the misalignment tolerances of the flexible coupling **1** are respected.

3.1.1 Customary installation



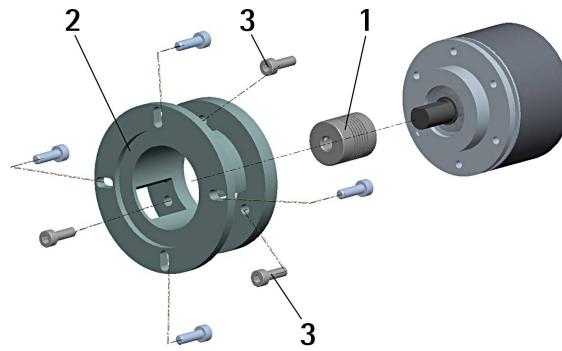
	a [mm]	b [mm]	c [mm]	d [mm]
AS58, AM58	-	42	50 F7	4
AS58S, AM58S	36 H7	48	-	-

3.1.2 Installation using fixing clamps (optional kit code LKM-386)



	a [mm]	b [mm]	c [mm]	d [mm]
AS58, AM58	-	50 F7	67	4
AS58S, AM58S	36 H7	-	67	-

3.1.3 Installation using a mounting bell (optional kit code PF4256)



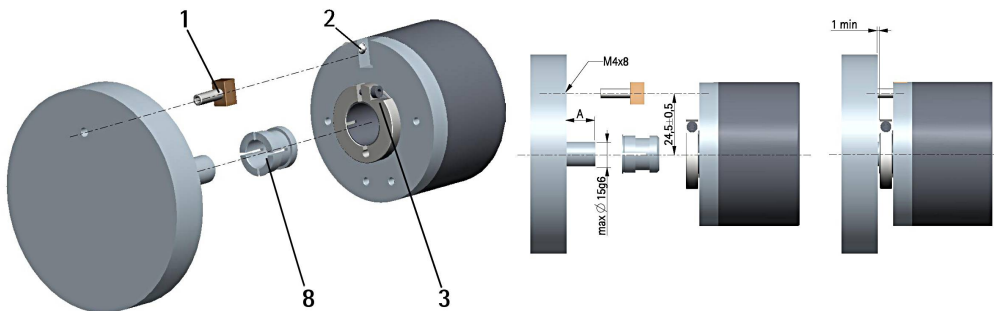
NOTE

In order to guarantee reliability over time of the encoder mechanical parts, we recommend a flexible coupling to be installed between the encoder and the motor shaft. Make sure the misalignment tolerances of the flexible coupling are respected.

3.2 Hollow shaft encoders

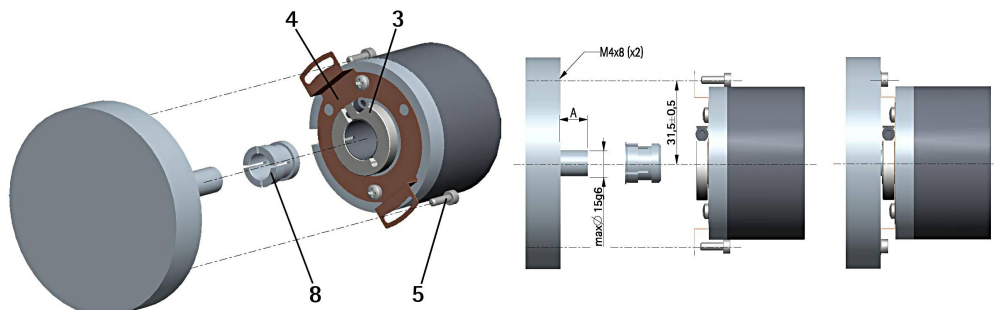
3.2.1 ASC58, AMC58 installation using the antirotation pin

- Fasten the anti-rotation pin **1** to the rear of the motor (secure it using a locknut);
- mount the encoder on the motor shaft using the reducing sleeve **8** (if supplied). Avoid forcing the encoder shaft;
- insert the anti-rotation pin **1** into the slot on the flange of the encoder; this secures it in place by grub screw **2**, preset at Lika;
- fix the collar **3** to the encoder shaft (apply threadlocker to screw **3**).



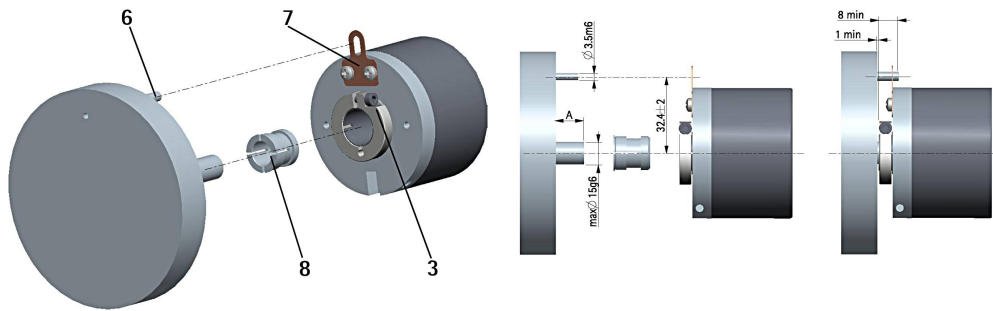
3.2.2 ASC59, AMC59 installation using the fixing plate

- Mount the encoder on the motor shaft using the reducing sleeve **8** (if supplied). Avoid forcing the encoder shaft;
- fasten the fixing plate **4** to the rear of the motor using two M3 cylindrical head screws **5**;
- fix the collar **3** to the encoder shaft (apply threadlocker to screw **3**).



3.2.3 ASC60, AMC60 installation using the antirotation pin and the fixing plate

- Fix the tempered pin **6** to the rear of the motor;
- mount the encoder on the motor shaft using the reducing sleeve **8** (if supplied). Avoid forcing the encoder shaft;
- make sure the anti-rotation pin **6** is inserted properly into the fixing plate **7**;
- fix the collar **3** to the encoder shaft (apply threadlocker to screw **3**).



NOTE

You are strongly advised not to carry out any mechanical operations (drilling, milling, etc.) on the encoder shaft. This could cause serious damages to the internal parts and an immediate warranty loss. Please contact our technical personnel for the complete availability of "custom made" shafts.

4 - Electrical connections



WARNING

Electrical connection has to be carried out by qualified personnel only, with power supply disconnected and mechanical parts compulsorily in stop.

4.1 Connection cap



WARNING

Do not remove or mount the connection cap with power supply switched ON. Damage may be caused to internal components.

The terminal connectors for connecting the power supply and the BUS IN and BUS OUT cables (CC-PB connection cap) as well as the dip-switches meant to set the node ID and activate the termination resistance are located inside the encoder connection cap. Thus you must remove the connection cap to access any of them.



NOTE

Be careful not to damage the internal components when you perform this operation.

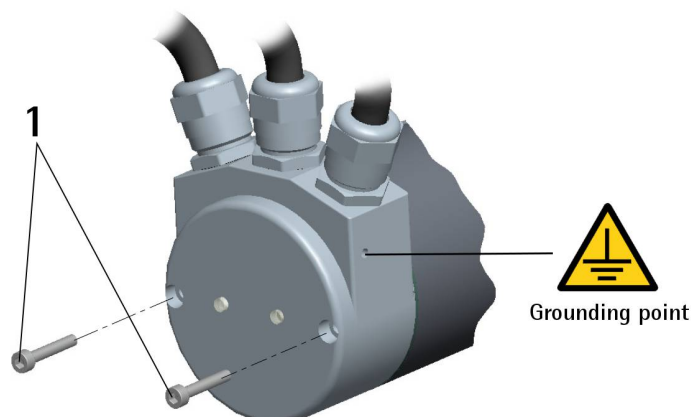
To remove the connection cap loosen the two screws **1**. Please be careful with the internal connector.

Always replace the connection cap at the end of the operation. Take care in re-connecting the internal connector. Tighten the screws **1** using a tightening torque of approx. **2.5 Nm**.



WARNING

You are required to check that the encoder body and the connection cap are at the same potential before replacing the connection cap!



4.2 Ground connection

Minimize noise by connecting the shield and/or the connector housing and/or the frame to ground. Make sure that ground is not affected by noise. The connection point to ground can be situated both on the device side and on user's side. The best solution to minimize the interference must be carried out by the user. You are advised to provide the ground connection as close as possible to the encoder. We suggest using the ground point provided in the cap (see Figure, use 1 TCEI M3 x 6 cylindrical head screw with 2 tooth lock washers).

4.3 Connection cap with PGs -CC-PB- (Figure 1)

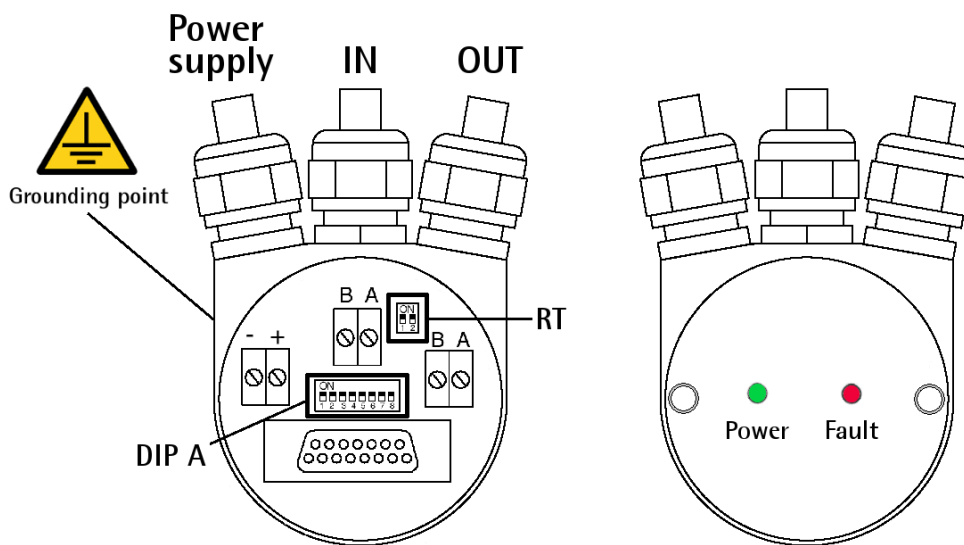


Figure 1

CC-PB connection cap is fitted with three PG9 cable glands for bus-IN, bus-OUT connections as well as power supply connection. The bus cables can be connected directly to the terminal connectors located in front of each cable gland.

We recommend Profibus-DP certificated cables to be used. Core diameter should not exceed Ø 1.5 mm (0.06 inch).

Terminal connector	Description
-	0 VDC Supply voltage
+	+10VDC +30VDC Supply voltage
B	Profibus B (Red)
A	Profibus A (Green)
PG	Shield ¹

¹ Connect the cable shield to cable gland.

4.4 Connection cap with M12 connectors -CC-PB-C- (Figure 2)

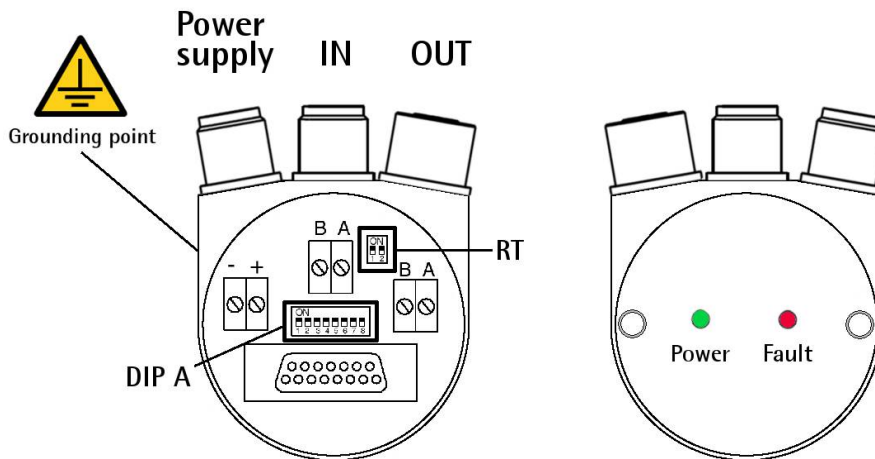
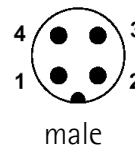


Figure 2

CC-PB-C connection cap is fitted with three M12 connectors with pin-out in compliance with the Profibus standard. Therefore you can use standard Profibus cables commercially available.

Power supply

M12 connector
A coding
(frontal side)



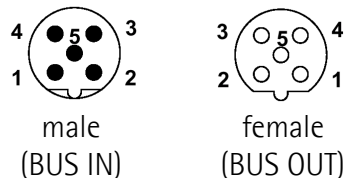
Pin	Function
1	+10VDC +30VDC
2	n.c.
3	0 VDC GND
4 ¹	Shield
Case	

n.c. = not connected

¹ Shield is also connected to pin 4 to allow the connection of the shield even if the plug connector has a plastic case.

Profibus signals

M12 connector
B coding
(frontal side)

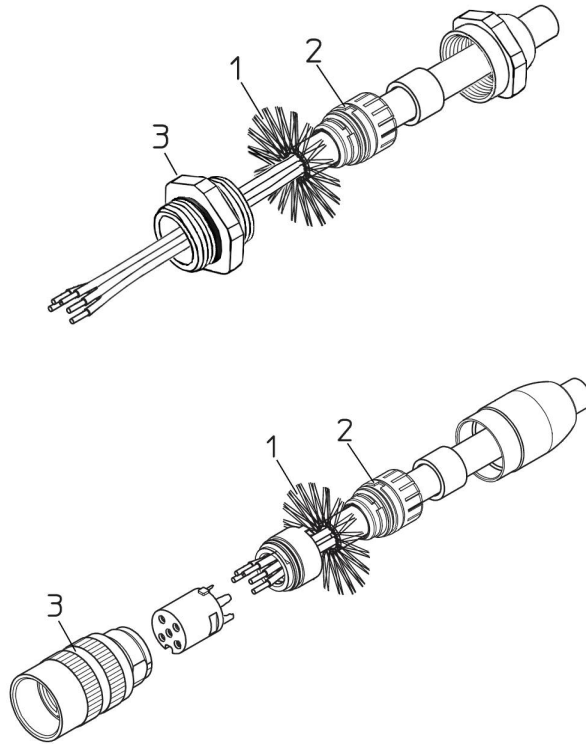


Pin	Function
1	n.c.
2	Profibus A (Green)
3	n.c.
4	Profibus B (Red)
5	n.c.
Case	Shield

n.c. = not connected

4.5 Connection of the shield

Disentangle and shorten the shielding **1** and then bend it over the part **2**; finally place the ring nut **3** of the connector. Be sure that the shielding **1** is in tight contact with the ring nut **3**.

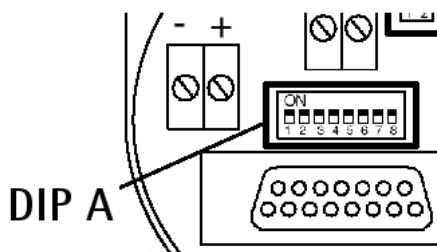


4.6 Node address: DIP A (Figure 1)



WARNING

Power supply must be turned off before performing this operation!



The node address must be set via hardware using the DIP A dip-switches located inside the connection cap.

Allowed addresses are from 0 to 125. The default value is 1.

The node address must be entered also in the software interface, please refer to section "5.1.2 Adding a node to the project" on page 23.

Turn the power supply off and set the node number in binary value: consider that: ON=1, OFF=0

bit	1 LSB	2	3	4	5	6	7 MSB	8 not used
	2^0	2^1	2^2	2^3	2^4	2^5	2^6	

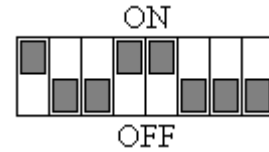


Example

Set node number = 25:

$25_{10} = 0001\ 1001_2$ (binary value)

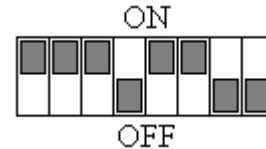
bit	1	2	3	4	5	6	7	8
	2^0	2^1	2^2	2^3	2^4	2^5	2^6	
	ON	OFF	OFF	ON	ON	OFF	OFF	OFF



Set node number = 55:

$55_{10} = 0011\ 0111_2$ (binary value)

bit	1	2	3	4	5	6	7	8
	2^0	2^1	2^2	2^3	2^4	2^5	2^6	
	ON	ON	ON	OFF	ON	ON	OFF	OFF



NOTE

After having set the device address, please check the bus termination switch position (see section "4.8 Bus termination (Figure 1)" on page 19).

4.7 Baud rate

The baud rate is set by the Master via software during the configuration of the node (Slave).

This device supports the following baud rates (they are listed in the .GSD file too):

9.6 kbit/s, 19.2 kbit/s, 93.75 kbit/s, 187.5 kbit/s, 500 kbit/s, 1.5 Mbit/s, 3 Mbit/s, 6 Mbit/s, 12 Mbit/s.

The following table shows the maximum transmission rates in relation to permissible line length:

Baud rate [Kbit/s]	9,6	19,2	93,75	187,5	500	1500	12000
Max. cable length	1200 m 4000 ft	1200 m 4000 ft	1200 m 4000 ft	1000 m 3300 ft	400 m 1300 ft	200 m 660 ft	100 m 330 ft

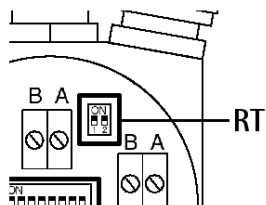
To set the baud rate please refer also to section "5.1.2 Adding a node to the project" on page 23.

4.8 Bus termination (Figure 1)



WARNING

Power supply must be turned off before performing this operation!



A bus termination resistance is provided inside the connection cap. This has to be activated as line termination on the last device in the transmission line.

Use the RT Switch to activate or deactivate the bus termination.

RT	Description
1 = 2 = ON	Activated: if the encoder is the last device in the transmission line
1 = 2 = OFF	Deactivated: if the encoder is not the last device in the transmission line

4.9 Diagnostic LEDs (Figure 1)

Two LEDs located in the rear side of the connection cap are designed to show the operating or fault status of the Profibus-DP interface.

Fault (red)	Power (green)	Event
OFF	OFF	Power supply is turned off or hardware breakdown not recognized
OFF	ON	Correct function (communication is on, the device is sending / receiving messages)
OFF	Flashing	The encoder is operating within the limits of the "Red Zone", for any information see section "6.8 "Red zone""
ON	Flashing	Configuration parameters are not valid
ON	OFF	Transmission time-out error
Flashing	ON	Bus communication failure
Flashing	Flashing	Flash memory error, unrestorable error

5 - Quick reference

5.1 Configuring the encoder via Siemens STEP7

5.1.1 Importing GSD file

Profibus encoders are supplied with their own GSD file **Ax58_Vx.GSx** (see at the address www.lika.biz > **ROTARY ENCODERS** > **ABSOLUTE ENCODERS** > **PROFIBUS**).



WARNING

Install the **AS58_Vx.GSx** in the **ASx58x series singleturn encoders** (order code: ASx58xx/PB-xx).

Install the **AM58_Vx.GSx** in the **AMx58x series multiturn encoders** (order code: AMx58xx/4096PB-xx).

Vx is intended to indicate the GSD file version.

GSD installation files are further available in both Italian (**Ax58_Vx.GSI**) and English (**Ax58_Vx.GSE**) versions (texts and comments are in the supported language).



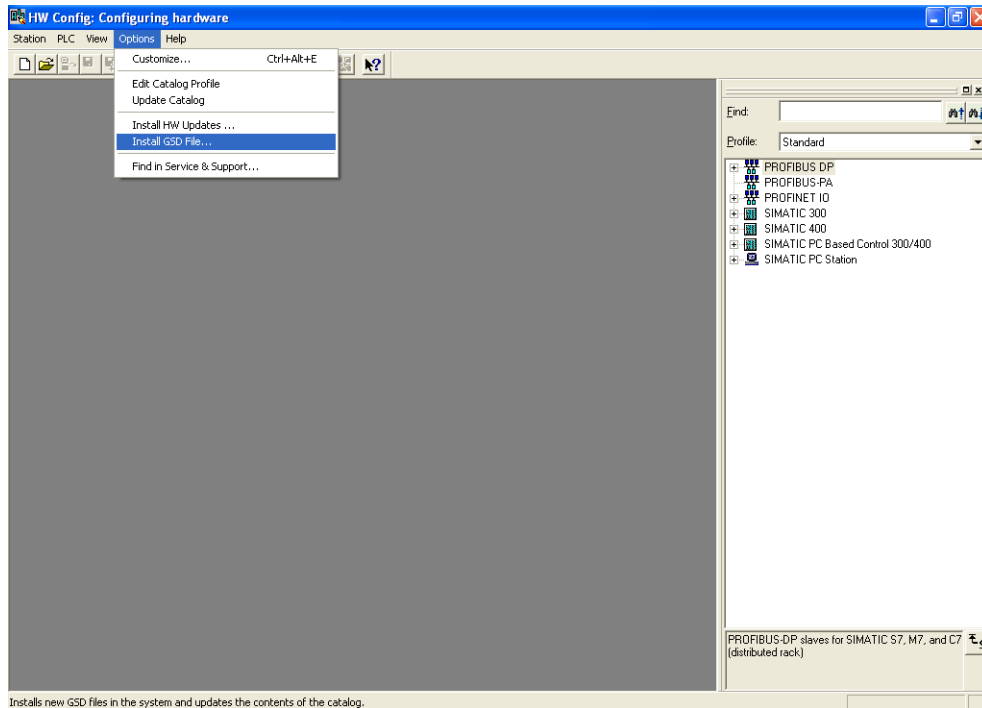
WARNING

For **ASx58x singleturn encoders** (order code: AS58xx/PB-xx): the default value preset by Lika in the **Counts per revolution** item of the **AS58_Vx.GSx** GSD file is 4096 (12 bits); for this reason, if you have a 13-bit singleturn encoder (order code: AS58**13**/PB-xx) and you want to use the overall resolution, you must set the **Counts per revolution** item to 8192 (13 bits). See EXAMPLE 2 on page 27.

For **AMx58x multiturn encoders** (order code: AM58xx/4096-PB-xx): the default value preset by Lika in the **Counts per revolution** item of the **AM58_Vx.GSx** GSD file is 4096 (12 bits); for this reason, if you have a 25-bit multiturn encoder (order code: AM58**13/4096**PB-xx) and you want to use the overall resolution, you must set the **Counts per revolution** item to 8192 (13 bits). See EXAMPLE 4 on page 29.

In the main window **HW Config** of STEP7 select **Install GSD File...** command from **Options** menu bar.

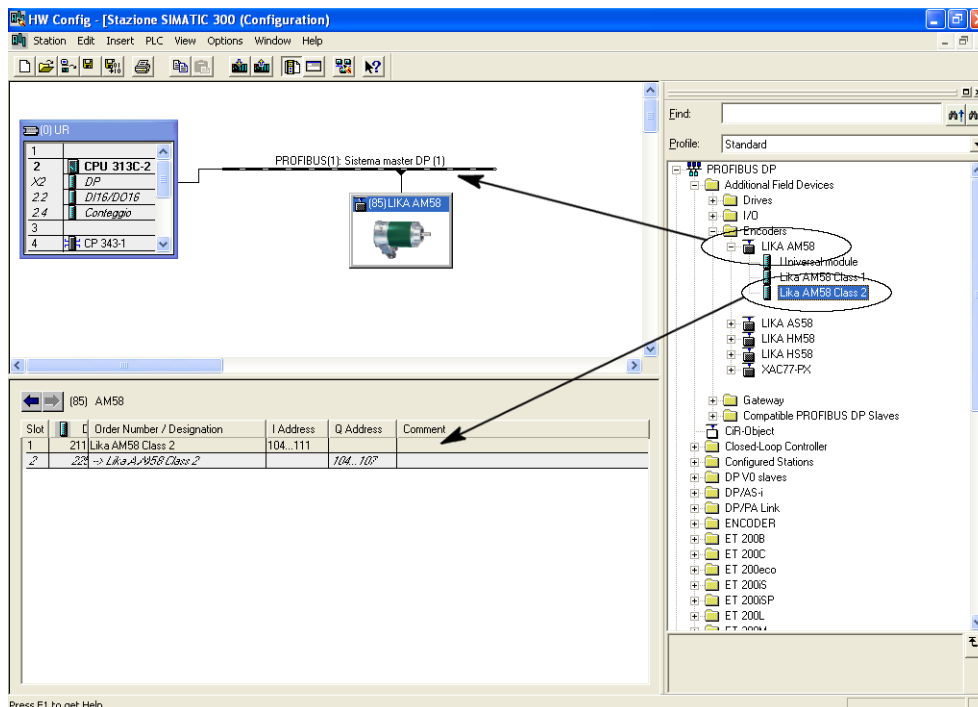
In the window that appears you can select the GSD file specific to the unit you need to install in your Siemens control system. Choose among the available files the one you need: GSD file for AS58 singleturn encoder or GSD file for AM58 multiturn encoder, in either Italian or English language.



5.1.2 Adding a node to the project

To add a node to the project, extend the directory tree in the right pane of the STEP7 **HW Config** main window and select either the **LIKA AS58** module (when you have to install a singleturn encoder) or the **LIKA AM58** module (when you have to install a multiturn encoder) available in **Catalog > PROFIBUS-DP > Additional Field Devices > Encoders** (if both GSD files have been installed); drag the required module to the pane on the left and drop it on the "BUS". For instance, drag the **LIKA AM58** module.

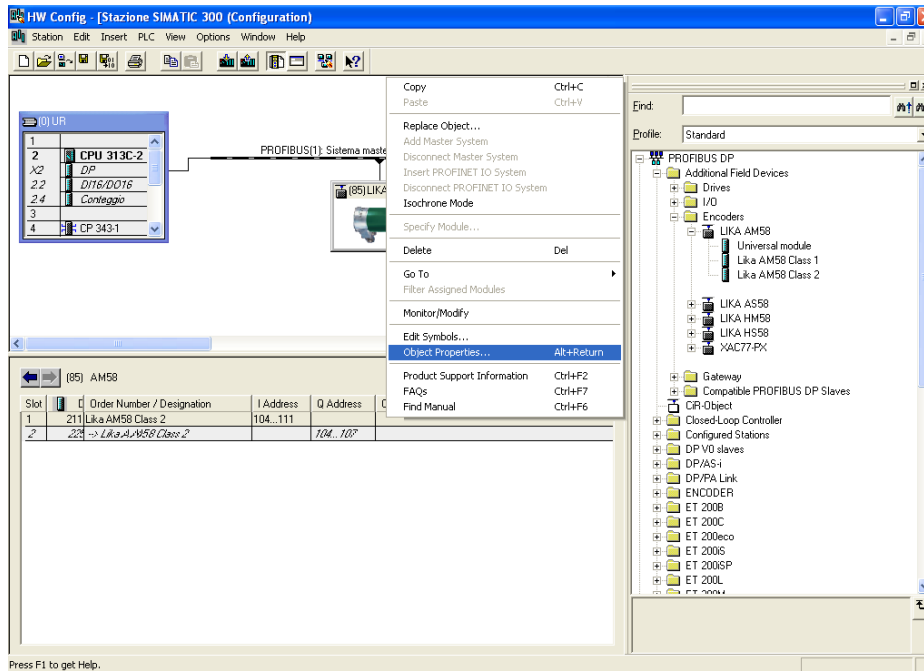
Then drag the **Lika AM58 Class 1** or the **Lika AM58 Class 2** submodule to the variables table in the bottom left; for instance, install the **Lika Lika AM58 Class 2** submodule. In this way you set the class of the device (for further details on available classes see section "6.2 Classes of the Device profile" on page 39).



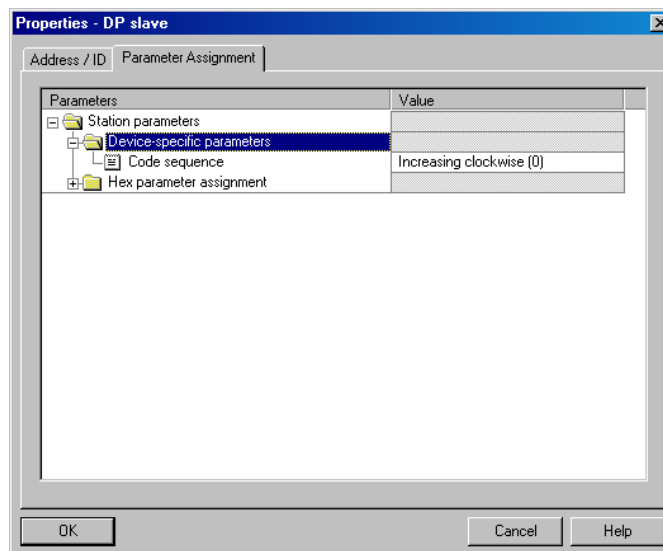
After having installed the node, by double-clicking on the graphic icon of the unit you have just installed you enter the page designed to configure the bus properties. In this page you can both enter the node address configured via hardware and set the bus transmission rate. For any information on setting the node address via hardware please refer to the section "4.6 Node address: DIP A (Figure 1)" on page 17. For any information on setting the baud rate please refer to the section "4.7 Baud rate" on page 18.

5.1.3 Encoder configuration parameters

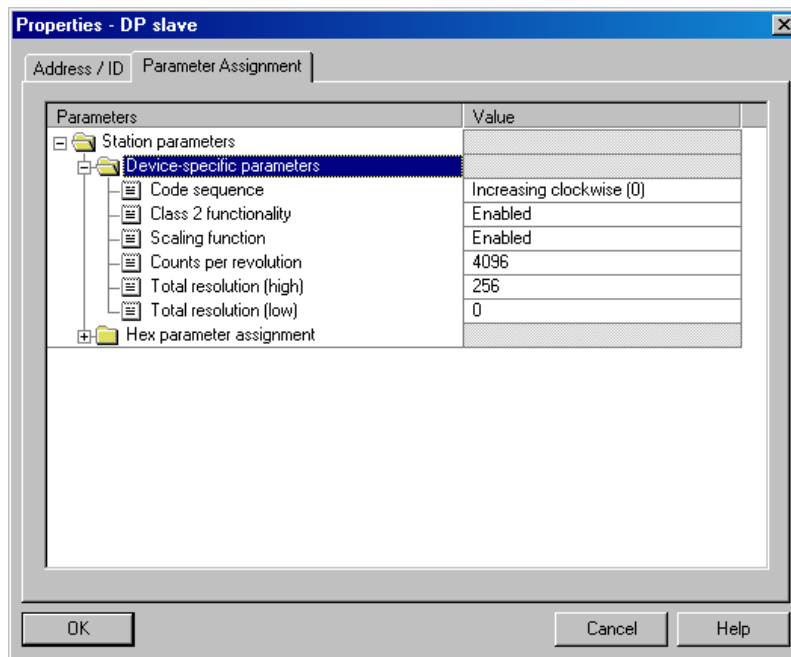
To access the parameters configuration window, first enter the STEP7 **HW Config** main window and select the **LIKA AM58** item just installed (**Lika AM58 Class 2** in the example) available in the variables table in the bottom left; then right-click the item and press the **Object Properties...** command in the shortcut menu.



The **Properties - DP slave** window will appear. In the **Parameter Assignment** page all **configuration data** parameters available for the device are listed. For a comprehensive description of the parameters and how to set them properly refer to the specific explanation in section "6.4 DDLM_Set_Prm" on page 41.



Class 1 example



Class 2 example

In the **Parameter Assignment** page, some items (**Code sequence**, **Class 2 functionality**, **Scaling function**) are to be set by scrolling through the available options in the drop-down box. While the parameters concerning the resolution must be entered in decimal notation. Please note that the **Total resolution** value has to be split into two separate fields, namely **Total resolution (high)** and **Total resolution (low)**. This value in fact must be entered in two words. Please refer to the following examples to understand how the **Total resolution** value has to be divided into two parts: a high part and a low part.



WARNING

You can set new values next to the **Counts per revolution** and **Total resolution** items only if **Class 2 functionality** = ENABLED; if **Scaling function** = ENABLED the set resolution values are enabled and used by the encoder; on the contrary, if **Scaling function** = DISABLED you are allowed to set new resolution values, however they are not enabled even if sent to the encoder: the encoder still goes on using the default values uploaded from the GSD file, NOT the new entered values, until you enable the **Scaling function**.



EXAMPLE 1

Let's suppose we need to program the following encoder:
 "AS5812/PB-xx" 12-bit singleturn encoder.

- **Hardware counts per revolution** = 12 bits/rev. (4096 cpr)
- **Hardware number of revolutions** = 1 rev.
- **Hardware total resolution** = 12 bits (4096 * 1 = 4096)

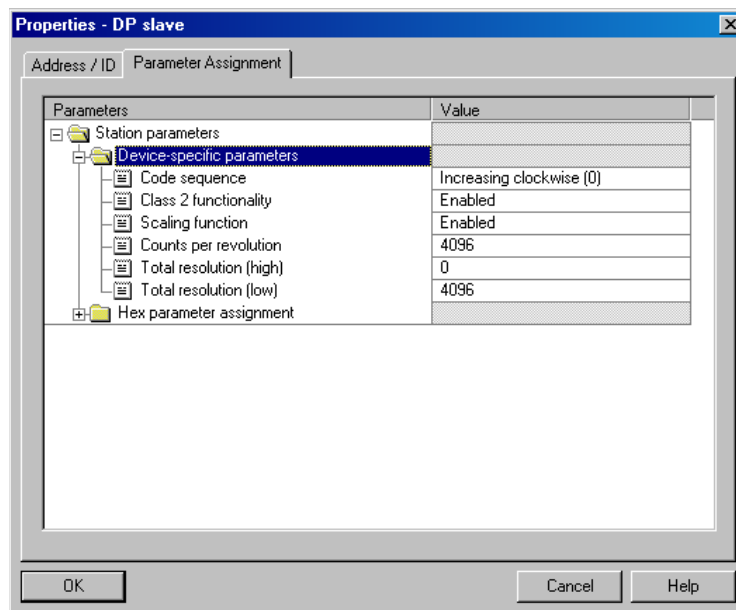
We want to set: **4096 counts per revolution**.

Thus we will set 4096 next to the **Counts per revolution** item.

The **Total resolution** value will be: $4096 \text{ (cpr)} * 1 \text{ (rev.)} = 4096_{10} = 0x1000$

The value to be set in the **Total resolution** items will be as follows:

Total resolution (high)	Total resolution (low)	Value
0000	1000	hexadecimal
0	4096	decimal





EXAMPLE 2

Let's suppose we need to program the following encoder:
 "AS5813/PB-xx" 13-bit singleturn encoder.

- **Hardware counts per revolution** = 13 bits/rev. (8192 cpr)
- **Hardware number of revolutions** = 1 rev.
- **Hardware total resolution** = 13 bits (8192 * 1 = 8192)

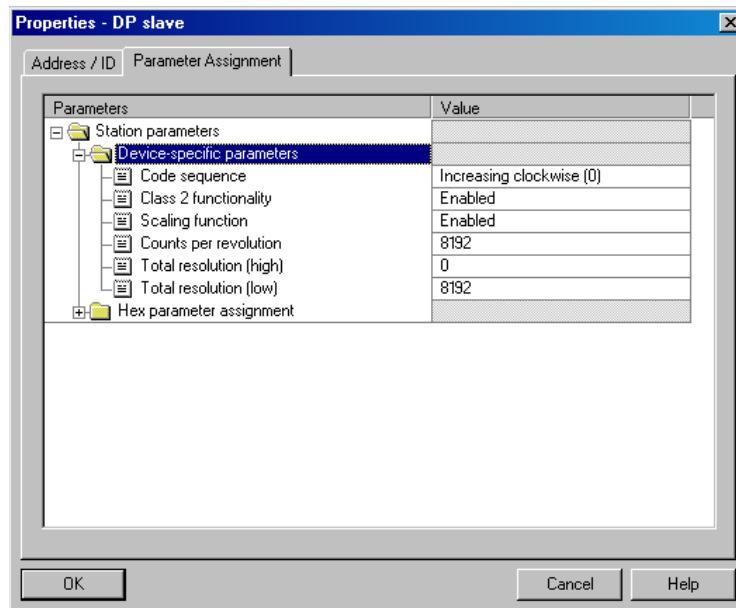
We want to set: **8192 counts per revolution**.

Thus we will set 8192 next to the **Counts per revolution** item.

The **Total resolution** value will be: $8192 \text{ (cpr)} * 1 \text{ (rev.)} = 8192_{10} = 0x2000$

The value to be set in the **Total resolution** items will be as follows:

Total resolution (high)	Total resolution (low)	Value
0000	2000	hexadecimal
0	8192	decimal





EXAMPLE 3

Let's suppose we need to program the following encoder:
 "AM5812/4096PB-xx" 24-bit multiturm encoder.

- **Hardware counts per revolution** = 12 bits/rev. (4096 cpr)
- **Hardware number of revolutions** = 12 bits (4096 rev.)
- **Hardware total resolution** = 24 bits (4096 * 4096 = 16777216)

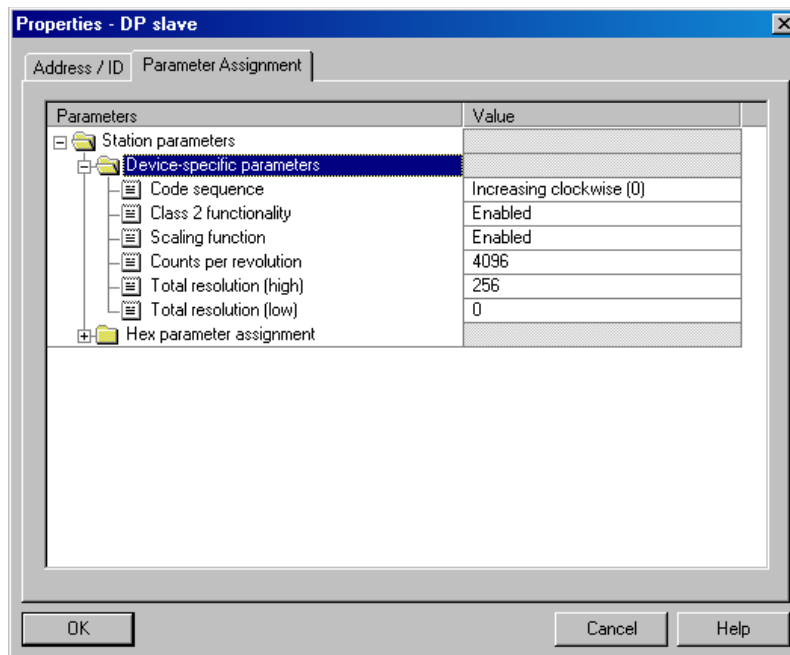
We want to set: **4096 counts per revolution** and **4096 revolutions**.

Thus we will set 4096 next to the **Counts per revolution** item.

The **Total resolution** value will be: $4096 \text{ (cpr)} * 4096 \text{ (rev.)} = 16777216_{10} = 0x1000000$

The value to be set in the **Total resolution** items will be as follows:

Total resolution (high)	Total resolution (low)	Value
0100	0000	hexadecimal
256	0	decimal





EXAMPLE 4

Let's suppose we need to program the following encoder:
 "AM5813/4096PB-xx" 25-bit multiturn encoder.

- **Hardware counts per revolution** = 13 bits/rev. (8192 cpr)
- **Hardware number of revolutions** = 12 bits (4096 rev.)
- **Hardware total resolution** = 25 bits (8192 * 4096 = 33554432)

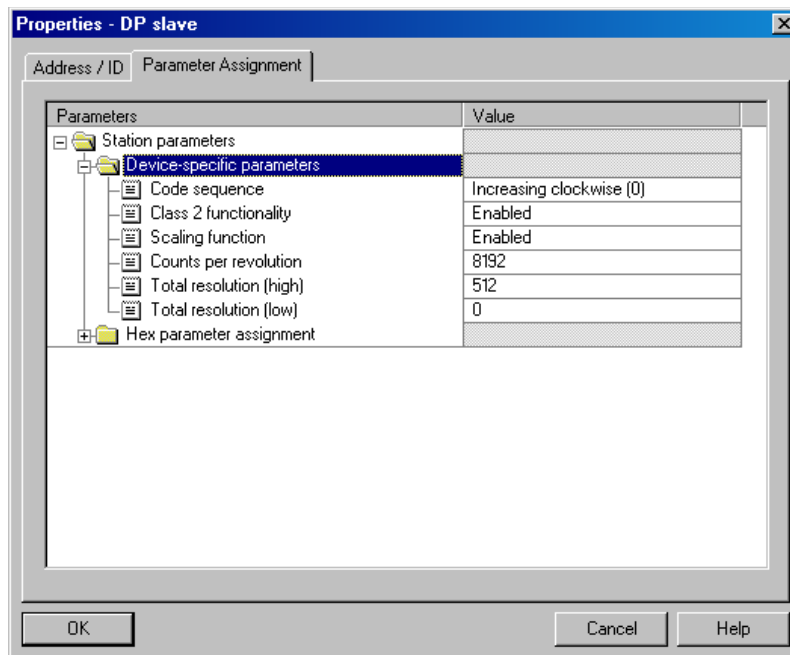
We want to set: **8192 counts per revolution** and **4096 revolutions**.

Thus we will set 8192 next to the **Counts per revolution** item.

The **Total resolution** value will be: $8192 \text{ (cpr)} * 4096 \text{ (rev.)} = 33554432_{10} = 0x2000000$

The value to be set in the **Total resolution** items will be as follows:

Total resolution (high)	Total resolution (low)	Value
0200	0000	hexadecimal
512	0	decimal



WARNING

When you set a new value next to the **Counts per revolution** item, please always check also the **Total resolution** items value and be sure that the resulting number of revolution complies with the **Hardware number of revolutions** of the device.

The same when you set a new value next to the **Total resolution** items, please always check also the **Counts per revolution** item and be sure that the

resulting number of revolution complies with the **Hardware number of revolutions** of the device.

Let's say our encoder is programmed as in EXAMPLE 4:

Counts per revolution: 8192

Total resolution = $33554432_{10} = 8192 \text{ (cpr)} * 4096 \text{ (rev.)}$, so: **Total resolution (high)** = 512; **Total resolution (low)** = 0

Let's set a new singleturn resolution, for instance: **Counts per revolution** = 360.

If we do not change the **Total resolution** value at the same time, we will get the following result:

$$\text{Number of revolutions} = \frac{33554432 \text{ (Total resolution)}}{360 \text{ (Counts per revolution)}} = 93206.755\dots$$

As you can see, the encoder is required to carry out more than 93000 revolutions, this cannot be as the hardware number of revolutions is, as stated, 4096. When this happens, the encoder falls into an error signalling the faulty condition through the diagnostic LEDs (see on page 20).

You are allowed to set any integer value less than or equal to the **Hardware counts per revolution** in the **Counts per revolution** item; while you are allowed to set any integer value less than or equal to the **Hardware counts per revolution** in the **Counts per revolution** item; however we suggest always setting values that are a power of 2 (1, 2, 4, ...2048, 4096, ...).



EXAMPLE 5

Let's suppose we need to program the following encoder:
 "AS5813/PB-xx" 13-bit singleturn encoder.

- **Hardware counts per revolution** = 13 bits/rev. (8192 cpr)
- **Hardware number of revolutions** = 1 rev.
- **Hardware total resolution** = 13 bits (8192 * 1 = 8192)

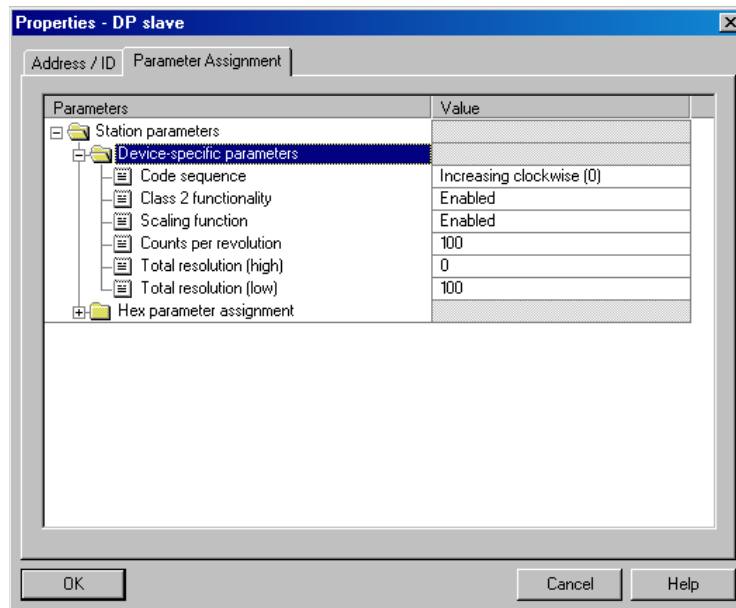
We want to set: **100 counts per revolution**.

Thus we will set 100 next to the **Counts per revolution** item.

The **Total resolution** value will be: $100 \text{ (cpr)} * 1 \text{ (rev.)} = 100_{10} = 0x0064$

The value to be set in the **Total resolution** items will be as follows:

Total resolution (high)	Total resolution (low)	Value
0000	0064	hexadecimal
0	100	decimal





EXAMPLE 6

Let's suppose we need to program the following encoder:
 "AM5813/4096PB-xx" 25-bit multiturn encoder.

- **Hardware counts per revolution** = 13 bits/rev. (8192 cpr)
- **Hardware number of revolutions** = 12 bits (4096 rev.)
- **Hardware total resolution** = 25 bits (8192 * 4096 = 33554432)

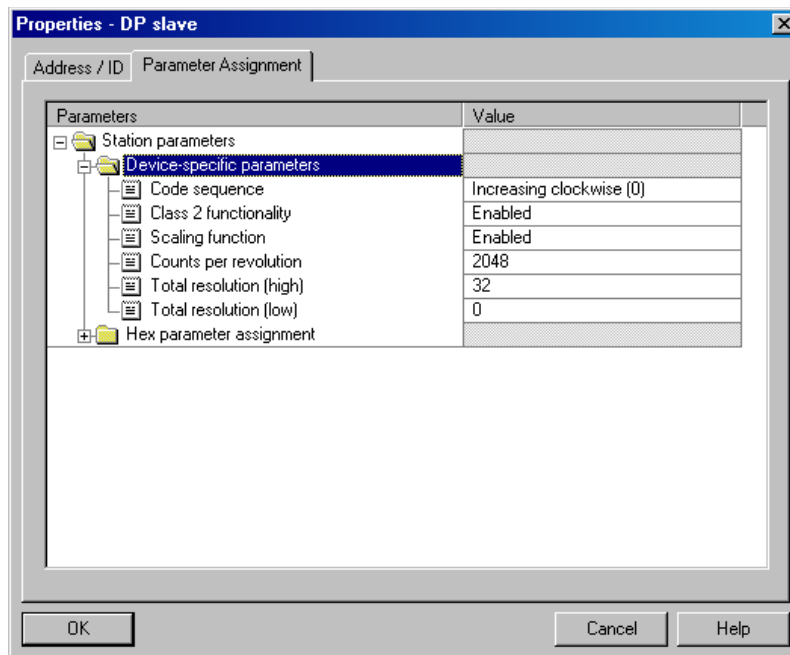
We want to set: **2048 counts per revolution** and **1024 revolutions**.

Thus we will set 2048 next to the **Counts per revolution** item.

The **Total resolution** value will be: 2048 (cpr) * 1024 (rev.) = 2097152₁₀ = 0x200000

The value to be set in the **Total resolution** items will be as follows:

Total resolution (high)	Total resolution (low)	Value
0020	0000	hexadecimal
32	0	decimal





WARNING

We recommend the **Number of revolutions** to be set to a value that is a power of 2. If the set number of revolutions is not a power of 2, the so-called "Red Zone" will be created and the encoder will necessarily work inside its limits. For any information on the "Red Zone" refer to section "6.8 "Red zone"" on page 51.



EXAMPLE 7

Let's suppose we need to program the following encoder:
"AM5812/4096PB-xx" 24-bit multiturn encoder.

- **Hardware counts per revolution** = 12 bits/rev. (4096 cpr)
- **Hardware number of revolutions** = 12 bits (4096 rev.)
- **Hardware total resolution** = 24 bits (4096 * 4096 = 16777216)

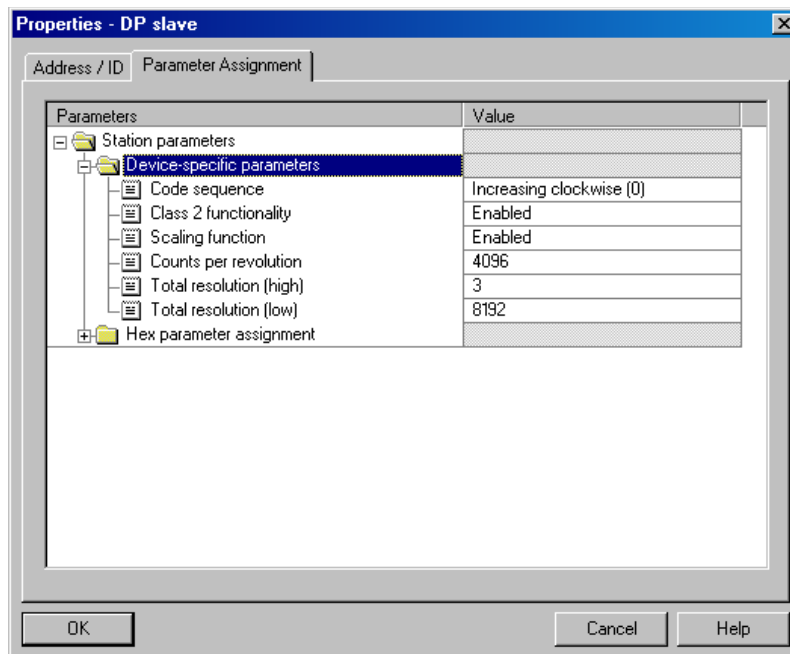
We want to set: **4096 counts per revolution** and **50 revolutions**.
50 is NOT a power of 2.

Thus we will set 4096 next to the **Counts per revolution** item.

The **Total resolution** value will be: $4096 \text{ (cpr)} * 50 \text{ (rev.)} = 204800_{10} = 0x32000$

The value to be set in the **Total resolution** items will be as follows:

Total resolution (high)	Total resolution (low)	Value
0003	2000	hexadecimal
3	8192	decimal





EXAMPLE 8

Let's suppose we need to program the following encoder:
 "AM5813/4096PB-xx" 25-bit multiturn encoder.

- **Hardware counts per revolution** = 13 bits/rev. (8192 cpr)
- **Hardware number of revolutions** = 12 bits (4096 rev.)
- **Hardware total resolution** = 25 bits (8192 * 4096 = 33554432)

We want to set: **360 counts per revolution** and **4000 revolutions**.

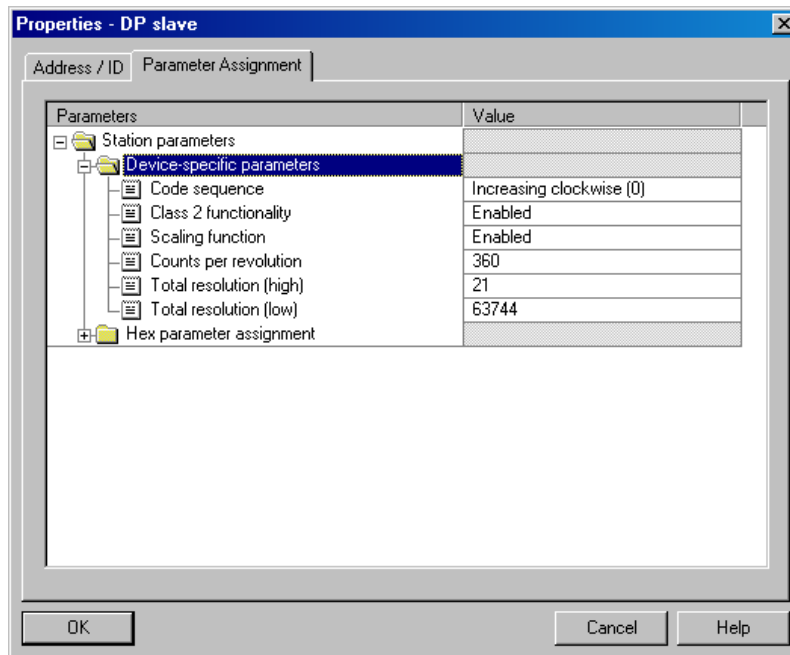
Neither 360 nor 4000 is a power of 2.

Thus we will set 360 next to the **Counts per revolution** item.

The **Total resolution** value will be: $360 \text{ (cpr)} * 4000 \text{ (rev.)} = 1440000_{10} = 0x15F900$

The value to be set in the **Total resolution** items will be as follows:

Total resolution (high)	Total resolution (low)	Value
0015	F900	hexadecimal
21	63744	decimal



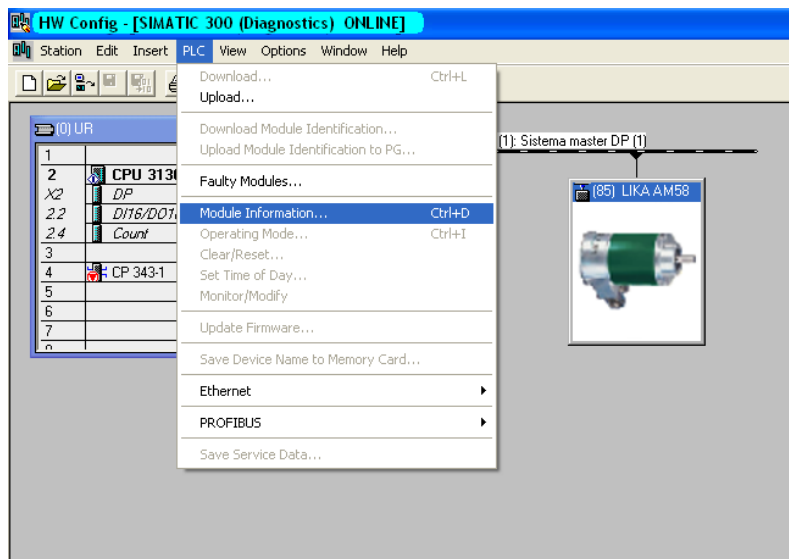
After having set new parameter values, click the **OK** button to close the **Properties – DP Slave** window and then the **Download** button (see icon on the left) in the toolbar of the **HW Config** window to download the set parameters.

5.2 Reading the diagnostic information

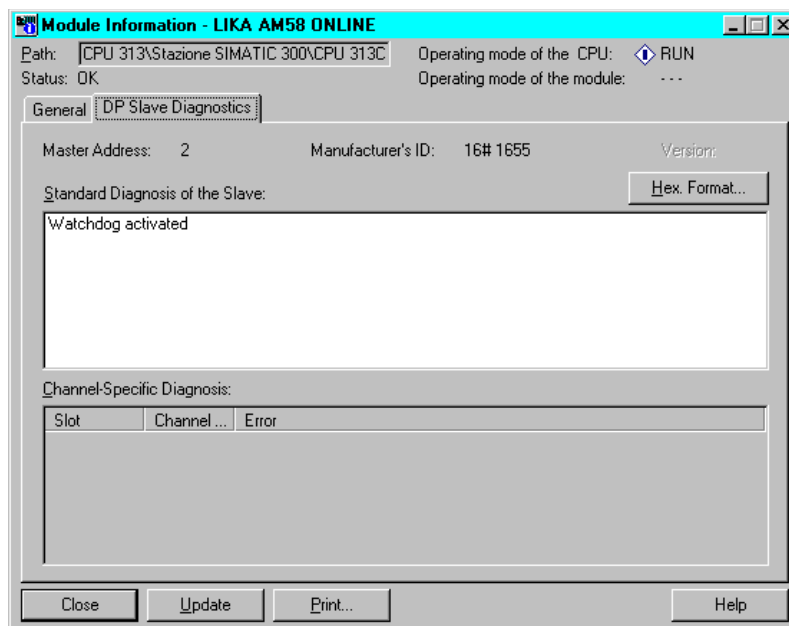
Lika encoder provides the standard diagnostic information. The diagnostic information message is 6-byte long. For any information on the DP Slave diagnostics please refer to the "Profibus Specification" document.



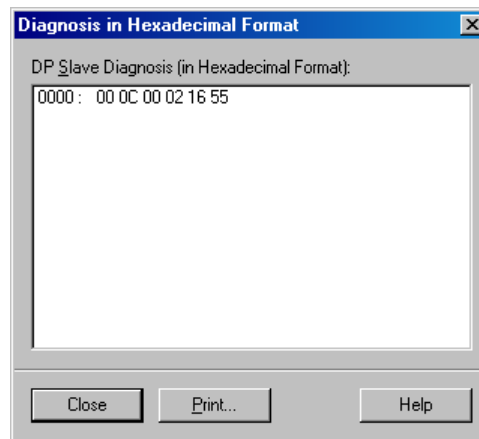
Before entering the diagnostic page, it is necessary to connect to the unit (i.e. enter the online status). To do this, select **Station\Open online** in the **HW Config** window or click the **Online<->Offline** button (see the icon on the left). When the unit is online, select the LIKA AM58 module first and then the **PLC\Module Information...** command to enter the **Module Information** window. Finally open the **DP Slave Diagnostics** page.



Click the **Hex Format...** button to display the diagnostic information:



6-byte diagnostics



Byte	Description
0	status 1
1	status 2
2	status 3
3	Master ID
4	manufacturer ID
5	

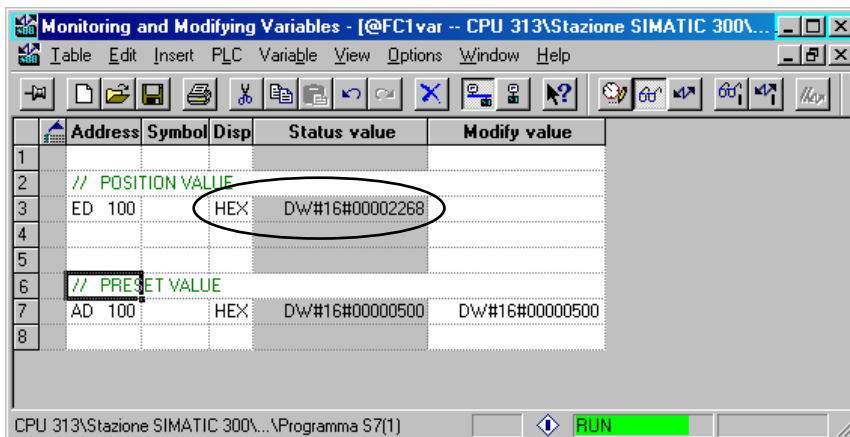
5.3 Setting the Preset value



Example

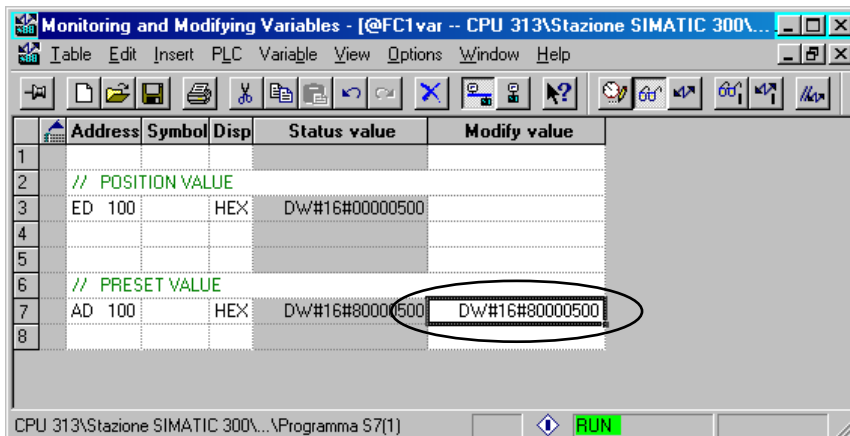
The encoder having device address 1 transmits the **Position** value to the Master. It is loaded into variables ED 100 ... ED103 (4 bytes).

The **Preset** value is sent to the encoder by using the variables AD 100 ... AD103 (4 bytes).



The current position of the encoder is 0000 2268hex.

To set the **Preset** value = 0000 0500hex, set the bit 31 of the variable AD 100 = "1" (8000 0500hex). See also the example in the paragraph "Preset" on page 48.



Finally click the **Command variables** button in the Toolbar (see the right icon).

Now the position of the encoder is 0000 0500hex.

To close the "Preset" procedure set the bit 31 of the variable AD 100 back to "0" and then click the **Command variables** button again.



NOTE

It may occur that some data variables having index higher than 127 or data greater than 4 bytes are not treated properly in STEP7 software. Should this happen, we recommend "MD" reference operators (pointers) to be used for encoder position and Preset value.

6 - Profibus interface

Lika units are slave devices and comply with the "Profibus-DP Profile for Encoders"; they can be set to either Class 1 or Class 2 devices (see section "6.2 Classes of the Device profile" on page 39).

Refer to the official Profibus website for any information not reported in this manual (www.profibus.com).

6.1 GSD file

Profibus encoders are supplied with their own GSD file **Ax58_Vx.GSx** (see at the address www.lika.biz > **ROTARY ENCODERS** > **ABSOLUTE ENCODERS** > **PROFIBUS**).



WARNING

Install the **AS58_Vx.GSx** in the **ASx58x series singleturn encoders** (order code: ASx58xx/PB-xx).

Install the **AM58_Vx.GSx** in the **AMx58x series multiturn encoders** (order code: AMx58xx/4096PB-xx).

Vx is intended to indicate the GSD file version.

GSD installation files are further available in both Italian (**Ax58_Vx.GSI**) and English (**Ax58_Vx.GSE**) versions (texts and comments are in the supported language).



WARNING

For **ASx58x singleturn encoders** (order code: AS58xx/PB-xx): the default value preset by Lika in the **Counts per revolution** item of the **AS58_Vx.GSx** GSD file is 4096 (12 bits); for this reason, if you have a 13-bit singleturn encoder (order code: AS58**13**/PB-xx) and you want to use the overall resolution, you must set the **Counts per revolution** item to 8192 (13 bits). See EXAMPLE 2 on page 27.

For **AMx58x multiturn encoders** (order code: AM58xx/4096-PB-xx): the default value preset by Lika in the **Counts per revolution** item of the **AM58_Vx.GSx** GSD file is 4096 (12 bits); for this reason, if you have a 25-bit multiturn encoder (order code: AM58**13/4096**PB-xx) and you want to use the overall resolution, you must set the **Counts per revolution** item to 8192 (13 bits). See EXAMPLE 4 on page 29.

6.2 Classes of the Device profile

The encoder class must be set when you configure the device. See also the **Class 2 functionality** operating parameter on page 42.

Class 1 allows basic functions of the device and can be used:

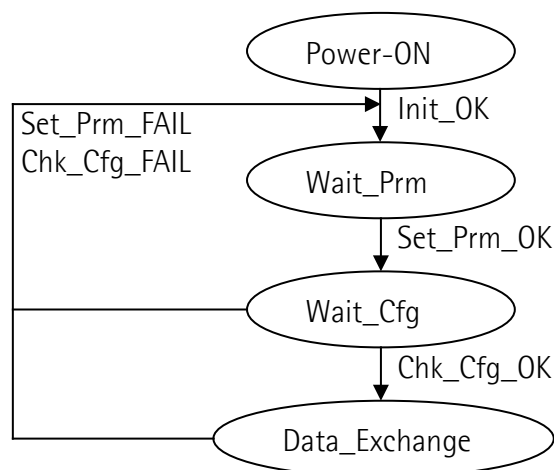
- to send the position information (see the **Position** parameter);
- to change the counting direction (see the **Code sequence** parameter);
- to set the preset value (see the **Preset** parameter).

Class 2 allows to use all Class 1 functions and further extended functions, they are:

- scaling function (see the **Scaling function** parameter).

6.3 Operating modes

Profibus-DP devices allow operation using different communication modes (see Figure below):



NOTE

All parameters are transmitted when the **Set_Prm** mode is active with the exception of the **Preset** value.

Preset value is transmitted only when the unit is in **Data_Exchange** mode.

Types of communication messages

Transmission of data between Master and Slave is carried out using the following types of messages:

- **DDL_M_Set_Prm:**
Used for configuring the Slave. This communication mode is active immediately after power is turned ON and is used to send parameters from the Master to the Slave (see the section "6.4 DDL_M_Set_Prm" on page 41).

- **DDLML_Chk_Cfg:**
It sets the number of bytes used for data transmission in **Data_Exchange** mode (see section "6.5 DDLML_Chk_Cfg" on page 47).
- **DDLML_Data_Exchange:**
This is the "standard operation mode".
It is used either by the Master to send the **Preset** value and by the Slave to transmit the **Position** value (see the section "6.6 DDLML_Data_Exchange" on page 48).
- **DDLML_Slave_Diag:**
It is used when the power is turned on and whenever the Master needs to know diagnostic information from the Slave device (see the section "6.7 DDLML_Slave_Diag" on page 50).

6.4 DDLM_Set_Prm

When the system is turned on, configuration data set by the operator is sent to the absolute encoder by the controller (DDLM_Set_Prm mode). Parameters transmission depends on the configuration chosen by the operator. Customarily data is sent automatically while data setting is carried out through a user's interface available in the controller's software (for instance, STEP7, see section "5.1 Configuring the encoder via Siemens STEP7" on page 21).

However sometimes it is necessary to set some bits and bytes according to the working specifications you want to set.

Data transmission is carried out according to the specifications of the encoder profile, as shown in the following tables.

DDLM_Set_Prm:

Byte	Parameter	
0 ... 9	Reserved for PROFIBUS network	
10	Operating parameters	
	bit 0	Code sequence
	bit 1	Class 2 functionality
	bit 2	Reserved
	bit 3	Scaling function
Bits 4 ... 7	Reserved	
11 ... 12	Counts per revolution	
13 ... 16	Total resolution	
17 ... 20	Reserved	

6.4.1 Byte 10 - Operating parameters

Bit	Function	bit = 0	bit = 1
0	Code sequence	CW	CCW
1	Class 2 functionality	disabled	enabled
2	Reserved		
3	Scaling function	disabled	enabled
4, 5, 6, 7	Reserved		

Default values are highlighted in **bold**.

Code sequence

The **Code sequence** parameter defines whether increasing position values are output when the encoder shaft rotates clockwise (CW) or when the encoder shaft rotates counter-clockwise (CCW). When **Code sequence** = CW (0) the position information increases as the encoder shaft rotates clockwise; on the contrary, when **Code sequence** = CCW (1) the position information increases as the encoder shaft rotates counter-clockwise CW and CCW rotations are viewed from the shaft end.

If **Class 2 functionality** = DISABLED, this is the only parameter which can be set.

Default = 0 (min. = 0, max. = 1)

Class 2 functionality

Two device classes are defined in the encoder profile, one mandatory class (Class 1) and one class with optional functions (Class 2). This encoder implements functions of both Class 1 and Class 2. For any information on the available encoder classes see the section "6.2 Classes of the Device profile" on page 39.

0 = Disabled = Encoder Class 1 is set.

1 = Enabled = Encoder Class 2 is set.

Default = 1 (min. = 0, max. = 1)

Scaling function

When this option is disabled (**Scaling function** = 0), the device uses the hardware resolution, i.e. the hardware counts per revolution and the hardware number of revolutions, see the encoder data on the label applied to the device; when the option is enabled (**Scaling function** = 1), the device uses the resolution set in the bytes 11 ... 16 (**Counts per revolution** and **Total resolution**).

For a correct use of this function see sections "6.4.2 Bytes 11 - 12" and "6.4.3 Bytes 13 ... 16" below in the page.

Default = 1 (min. = 0, max. = 1)



WARNING

You can set new values next to the **Counts per revolution** and **Total resolution** items only if **Class 2 functionality** = ENABLED; if **Scaling function** = ENABLED the set resolution values are enabled and used by the encoder; on the contrary, if **Scaling function** = DISABLED you are allowed to set new resolution values, however they are not enabled even if sent to the encoder: the encoder still goes on using the default values uploaded from the GSD file, NOT the new entered values, until you enable the **Scaling function**.

6.4.2 Bytes 11 - 12

Counts per revolution



WARNING

You can set a new value next to this **Counts per revolution** item only if **Class 2 functionality** = ENABLED; if **Scaling function** = ENABLED the set resolution value is enabled and used by the encoder; on the contrary, if **Scaling function** = DISABLED you are allowed to set a new resolution value, however it is not enabled even if sent to the encoder: the encoder still goes on using the default value uploaded from the GSD file, NOT the new entered value, until you enable the **Scaling function**. See the section "6.4.1 Byte 10 - Operating parameters" on page 41.

Counts per revolution parameter allows to program a user specific singleturn resolution (i.e. the desired number of information per revolution).

Byte	11	12
Bits	15-8	7-0
Data	2^{15} to 2^8	2^7 to 2^0

You are allowed to set any integer value less than or equal to the **Hardware counts per revolution**. However we suggest setting a value that is a power of 2 (1, 2, 4, ... 2048, 4096, ...).

Default = 4096 (min. = 1, max. = 8192) for AS58 singleturn encoder

Default = 4096 (min. = 1, max. = 8192) for AM58 multiturn encoder



WARNING

If you set a value greater than the maximum allowed value (i.e. greater than the **Hardware counts per revolution** value), the encoder falls into an error signalling the faulty condition through the diagnostic LEDs (see on page 20).



WARNING

When you set a new value next to the **Counts per revolution** item, please always check also the **Total resolution** item value and be sure that the resulting number of revolution complies with the **Hardware number of revolutions** of the device.

Let's say our encoder is programmed as follows:

Counts per revolution: 8192

Total resolution = $33554432_{10} = 8192 \text{ (cpr)} * 4096 \text{ (rev.)}$

Let's set a new singleturn resolution, for instance: **Counts per revolution** = 360.

If we do not change the **Total resolution** value at the same time, we will get the following result:

$$\text{Number of revolutions} = \frac{33554432 \text{ (Total resolution)}}{360 \text{ (Counts per revolution)}} = 93206.755\dots$$

As you can see, the encoder is required to carry out more than 93000 revolutions, this cannot be as the hardware number of revolutions is, as stated, 4096. When this happens, the encoder falls into an error signalling the faulty condition through the diagnostic LEDs (see on page 20).

6.4.3 Bytes 13 ... 16

Total resolution



WARNING

You can set a new values next to this **Total resolution** item only if **Class 2 functionality** = ENABLED; if **Scaling function** = ENABLED the set resolution value is enabled and used by the encoder; on the contrary, if **Scaling function** = DISABLED you are allowed to set a new resolution value, however it is not enabled even if sent to the encoder: the encoder still goes on using the default value uploaded from the GSD file, NOT the new entered value, until you enable the **Scaling function**. See the section "6.4.1 Byte 10 - Operating parameters" on page 41.

This parameter is intended to set the number of distinguishable steps over the total measuring range. The total resolution of the encoder results from the product of **Counts per revolution** by **Number of revolutions**.

Byte	13	14	15	16
Bit	31-24	23-16	15-8	7-0
Data	2^{31} to 2^{24}	2^{23} to 2^{16}	2^{15} to 2^8	2^7 to 2^0

You are allowed to set any integer value less than or equal to the **Hardware total resolution**. However we suggest setting a value that is a power of 2.

Default = 4096 (min. = 1, max. = 8192) for AS58 singleturn encoder

Default = 16777216 (min. = 1, max. = 33554432) for AM58 multiturn encoder



NOTE

Please note that

Number of revolutions is:
$$\frac{\text{Total resolution}}{\text{Counts per revolution}}$$



WARNING

If you set a value greater than the maximum allowed value (i.e. greater than the **Hardware total resolution** value), the encoder falls into an error signalling the faulty condition through the diagnostic LEDs (see on page 20).



WARNING

When you set a new value next to the **Total resolution** item, please always check also the **Counts per revolution** item value and be sure that the resulting

number of revolution complies with the **Hardware number of revolutions** of the device.

Let's say our encoder is programmed as follows:

Counts per revolution: 8192

Total resolution = $33554432_{10} = 8192 \text{ (cpr)} * 4096 \text{ (rev.)}$

Let's set a new total resolution, for instance: **Total resolution** = 360.

As the **Total resolution** must be greater than or equal to the **Counts per revolution**, the above setting is not allowed. When this happens, the encoder falls into an error signalling the faulty condition through the diagnostic LEDs (see on page 20).



WARNING

We recommend the **Number of revolutions** to be set to a value that is a power of 2. If the set number of revolutions is not a power of 2, the so-called "Red Zone" will be created and the encoder will necessarily work inside its limits. For any information on the "Red Zone" refer to section "6.8 "Red zone"" on page 51.



WARNING

The AM58 multiturn encoder (order code: AM58xx/4096PB-xx) can be configured so that it works exactly as the singleturn encoder. This is achieved by setting **Total resolution** = **Counts per revolution**. Let's suppose the encoder is set as follows:

Counts per revolution = 8192

Total resolution = 8192

So it follows that:

$$\text{Number of revolutions} = \frac{8192 \text{ (Total resolution)}}{8192 \text{ (Counts per revolution)}} = 1$$

This is exactly the configuration of the singleturn encoder.

It is of course obvious that the contrary is not possible.



Example

"AS5812/PB-xx": single-turn encoder with 12-bit resolution

- **Hardware counts per revolution** = 12 bit/turn (4096 cpr)
- **Hardware number of revolutions** = 1 rev.
- **Hardware total resolution** = 12 bit (4096 * 1 = 4096)

"AS5813/PB-xx": single-turn encoder with 12-bit resolution

- **Hardware counts per revolution** = 13 bit/turn (8192 cpr)
- **Hardware number of revolutions** = 1 rev.
- **Hardware total resolution** = 13 bit (8192 * 1 = 8192)

"AM5812/4096PB-xx": multi-turn encoder with 24-bit resolution

- **Hardware counts per revolution** = 12 bit/turn (4096 cpr)
- **Hardware number of revolutions** = 12 bit (4096 rev.)
- **Hardware total resolution** = 24 bit (4096 * 4096 = 16777216)

"AM5813/4096PB-xx": multi-turn encoder with 25-bit resolution

- **Hardware counts per revolution** = 13 bit/turn (8192 cpr)
- **Hardware number of revolutions** = 12 bit (4096 rev.)
- **Hardware total resolution** = 25 bit (8192 * 4096 = 33554432)



Example

Multiturn encoder "AM5812/4096PB-6" with "CC-PB-C" connection cap.

The hardware resolution is:

- **Hardware counts per revolution** = 4096 (2^{12})
- **Hardware number of revolutions** = 4096 (2^{12})
- **Hardware total resolution** = 16777216 (2^{24})

We need to set the following custom resolution: 2048 counts per revolution * 1024 revolutions.

To do this proceed as follows:

- Enable **Class 2 functionality**: byte 10 = 0A hex (bit 1 = bit 3 = "1")
- Enable **Scaling function**:
- **Counts per revolution** = 2048: bytes 11-12 = 0800 hex
- **Total resolution** = 2048 * 1024 = 2097152: bytes 13 ... 16 = 0020 0000 hex.



NOTE

When new values are set next to the **Counts per revolution** and/or **Total resolution** items, also a new **Preset** value is required. It has to comply with the new resolution you have set.



WARNING

Please note that the in Step 7 the **Total resolution** value has to be split into two separate fields, namely **Total resolution (high)** and **Total resolution (low)**. This value in fact must be entered in two words. Please refer to the examples on page 26 to understand how the **Total resolution** value has to be divided into two parts: a high part and a low part.

The following values are allowed:

AS singleturn model

Total resolution (high): default = 0 (min. = 0, max. = 0)

Total resolution (low): default = 4096 (min. = 1, max. = 8192)

AM multiturn model

Total resolution (high): default = 256 (min. = 0, max. = 512)

Total resolution (low): default = 0 (min. = 0, max. = 65535)

6.5 DDLM_Chk_Cfg

The configuration function allows the Master to send the configuration data to the Slave for any check operation. The main purpose of this function is to define the number of bytes used for the Data_Exchange as viewed from the Master side.

Chk_Cfg message structure (1 byte):

- bit 7 = Consistency (= "1")
- bit 6 = Word format ("0" = byte, "1" = word = 4 bytes)
- bits 5 - 4 = In/out data ("01" = Input, "10" = Output)
- bits 3 ... 0 = Length code



Example

bit	7	6	5	4	3	2	1	0	
Data	1	1	0	1	0	0	0	1	D1h
	1	1	1	0	0	0	0	1	E1h

D1hex = 4-byte input

E1hex = 4-byte output

6.6 DDLM_Data_Exchange

This is the normal operational status of the system. The Slave (no matter if set to Class 1 or Class 2) can both transmit the **Position** value to the Master and receive the **Preset** value from the Master.

Position

(Encoder → Master)

Byte	1	2	3	4
Bit	31-24	23-16	15-8	7-0
Data	2^{31} to 2^{24}	2^{23} to 2^{16}	2^{15} to 2^8	2^7 to 2^0

This is the position information output by the encoder. The value is right aligned in the data field.

Preset

(Master → Slave)

Byte	1	2	3	4
Bit	31-24	23-16	15-8	7-0
Data	2^{31} to 2^{24}	2^{23} to 2^{16}	2^{15} to 2^8	2^7 to 2^0

The Preset function is meant to assign a desired value to a physical position of the encoder. The chosen physical position will get the value set next to this item and all the previous and following positions will get a value according to it. This function is useful, for example, when the zero position of the encoder and the zero position of the axis need to match. The preset value will be set for the position of the encoder in the moment when the preset value is sent. The **Preset** value is sent by the Master to the Slave in **Data_Exchange** mode by setting bit 31 = "1" for 3 cycles.

The MSB of the preset value controls the preset function in the following way:
 Normal operating mode: MSB = 0 (bit 31): the encoder will make no change in preset value.

Preset mode: MSB = 1 (bit 31): with the MSB = 1 the encoder accepts the transferred value (bits 0 ... 30) as a preset value in binary code.

- If **Scaling function** = DISABLED, then **Preset** must be less than the **Hardware total resolution**.
- If **Scaling function** = ENABLED, then **Preset** must be less than the **Total resolution**.



Example

Preset value to be set = 0000 0500hex

Current encoder **Position** = 0000 2267hex

	Byte	1	2	3	4
Cycle	Bit	31-24	23-16	15-8	7-0
1°	M→S	80hex	00hex	05hex	00hex
		10000000 ₂	00000000 ₂	00000101 ₂	00000000 ₂
	S→M	00hex	00hex	22hex	67hex
		00000000 ₂	00000000 ₂	00100010 ₂	01100111 ₂
2°	M→S	80	00	05	00
	S→M	00	00	22	67
3°	M→S	80	00	05	00
	S→M	00	00	05	00



WARNING

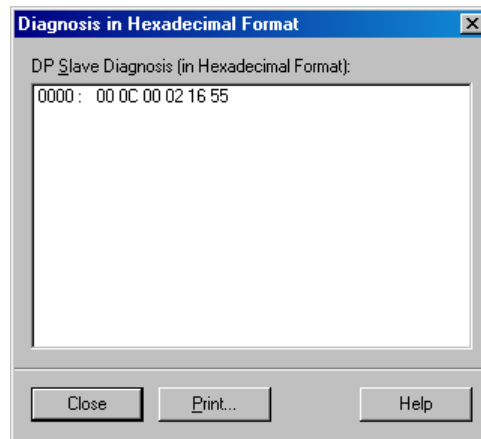
Always set the **Preset** value when the encoder shaft is in stop. The new **Preset** value is saved immediately after receipt.

Please refer also to the example for setting the preset value via Step7; refer to the section "5.3 Setting the Preset value" on page 37.

6.7 DDLM_Slave_Diag

The Master device can send a request for diagnostic information at any time to the Slave device. Lika encoders implement the standard diagnostic information (6 bytes). For any information on the DP Slave diagnostics please refer to the "Profibus Specification" document.

6-byte Diagnostic:



Byte	Description
0	status 1
1	status 2
2	status 3
3	Master ID
4	manufacturer ID
5	

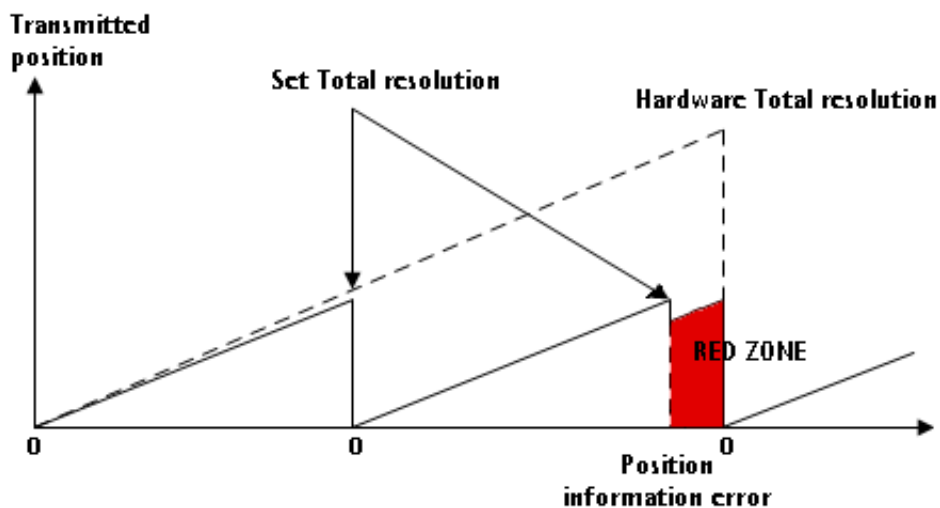
6.8 "Red zone"

The so-called "red zone" occurs when:

$$\text{Number of revolutions} = \frac{\text{Total resolution}}{\text{Counts per revolution}}$$

is NOT a power of 2.

When this problem arises, the device must operate within the "red zone" for a certain number of positions. The size of the "red zone" is variable. To calculate it we must subtract the **Total resolution** value from the **Hardware total resolution** of the device as many times as until the difference is less than the the set **Total resolution** value. When the encoder crosses the limit of the last **Total resolution** section thus entering the "red zone", a counting error occurs, i.e. a jump in the position count. The problem can be represented graphically in the Figure below.



Example

"M5813/4096PB-xx: 25-bit resolution multiturn encoder

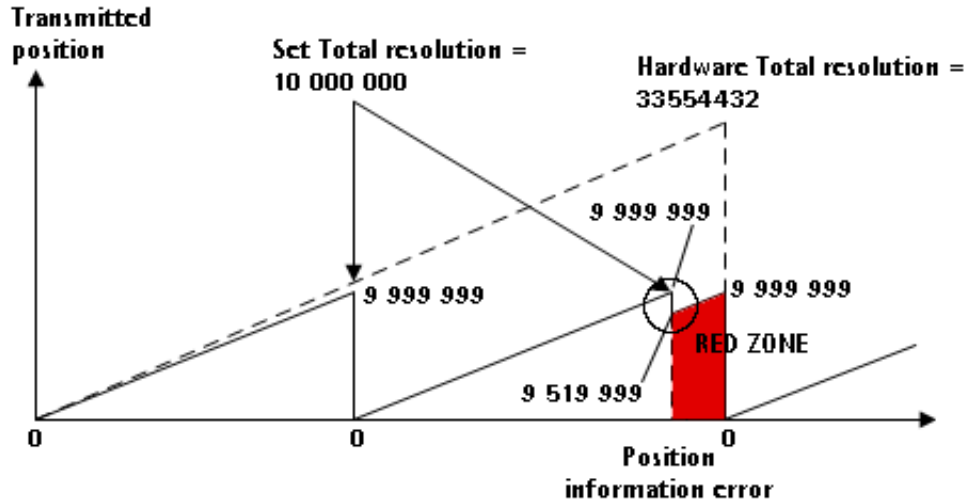
- **Hardware counts per revolution** = 8192 (2^{13})
- **Hardware number of revolutions** = 4096 (2^{12})
- **Hardware total resolution** = 33554432 (2^{25})

Set parameters values:

- **Counts per revolution** = 5000
- **Total resolution** = 10000000
- **Number of revolutions** = 2000

$$\frac{\text{Hardware number of revolutions}}{\text{Set number of revolutions}} = \frac{4096}{2000} = 2.048$$

It follows that the encoder will work within the limits of the "read zone" for 96 revolutions ($4096 - 2 * 2000 = 96$), i.e. for 480000 counts ($96 * 5000$). The problem can be explained graphically:



NOTE

- When the encoder is operating within the limits of the "red zone", the status is indicated by the green LED flashing while the red LED is OFF (see the section "6.8 "Red zone"" on page 51).
- When the encoder is operating within the limits of the "red zone" (i.e. for $5000 \text{ cpr} * 96 \text{ revolutions} = 480000 \text{ counts}$: 9519999 ... 9999999), the transmitted position is consistent with the set resolution: it is calculated so that the last position within the "red zone" before crossing the zero position is "**Total resolution - 1**".
- Please be careful using the position information sent by the encoder when it is operating within the limits of the "red zone". When the encoder crosses from the normal status to the "red zone" status (and vice versa), a position information error occurs. See the Figure above: when entering the "red zone" the position information jumps from 9999999 to 9519999!

7 – Default parameters list

Default values preset in the GSD file for **AS58 singleturn encoder** (AS58_Vx.GSx)


Parameters list	Default value		
Code sequence	0		
Class 2 functionality	1		
Scaling function	1		
Counts per revolution	4096		
Total resolution	4096		

Default values preset in the GSD file for **AM58 multiturn encoder** (AM58_Vx.GSx)

Parameters list	Default value		
Code sequence	0		
Class 2 functionality	1		
Scaling function	1		
Counts per revolution	4096		
Total resolution	16777216		



Document release	Description
1.0	1 st issue
2.0	General revision
2.1	Section 4 updated
2.2	General revision, section 3 added, section 4 updated
2.3	Step7 examples, section 7, general revision
2.4	General revision, table of contents and index, Italian / English separate editions
2.5	Section "4 - Electrical connections" updated

	This device is to be supplied by a Class 2 Circuit or Low-Voltage Limited Energy or Energy Source not exceeding 30 VDC. Refer to the product datasheet for supply voltage rate.
---	---



Dispose separately



LIKA Electronic

Via S. Lorenzo, 25 - 36010 Carrè (VI) - Italy

Tel. +39 0445 806600

Fax +39 0445 806699

Italy: eMail info@lika.it - www.lika.it

World: eMail info@lika.biz - www.lika.biz