USER MANUAL FOR

Profibus DP ENCODER

CERTIFIED

SIEGE SOCIAL / **HEAD OFFICE:** B.P. 70044. F-67013 Strasbourg Cedex
Tél./PHONE +33(0)3 88 20 80 80 Fax : +33(0)3 88 20 87 87

Last update : 10.04.01

Contents

1. INTRODUCTION

1.1 The Absolute Rotary Encoder

Absolute rotary encoders provide a definite value for every possible position. All these values are reflected on one code disc. The beam of an infrared LED is sent through the code disc and detected by an Opto-asic. The output signals are electronically amplified and the resulting value is transferred to the interface.

The absolute rotary encoder has a maximum resolution of 8192 steps per revolution (13 Bit). The multiturn version can detect up to 65536 revolutions (16 Bit). Therefore the largest resulting resolution is 29 Bit = 2^{29} = 536.870.912 steps. The standard singleturn version has 13 Bit, the standard multiturn version has 29 Bit.

The absolute angular encoder meets all specifications according to Profibus-DP, DIN 19245 part 1 and part 3. The integrated Profibus-DP interface of the encoder guarantees the maximum transmission rate of 12 MBaud. The implemented software supports all functions of the encoder profile for Profibus-DP, Class 1 and Class 2. The process data is generally transmitted in binary code.

Following parameters of the absolute rotary encoder can be directly programmed via the Profibus-DP network without any extra device:

- Code sequence (Complement)
- Measuring units per revolution
- Total measuring range in measuring units Preset value

To reduce significantly the installation time, one of the provided type files supports the windows version of the COM PROFIBUS. This software package is supplied by SIEMENS for the master module IM 308 C of the SIMATIC S5 and for a variety of modules for the SIMATIC S7.

The successful conformity and interoperability test at the interface center of SIEMENS guarantees an error-free communication of the encoder in all Profibus-DP systems.

1.2 Profile

This encoder respects the PROFIBUS-DP Profile for encoders, version 1.1, May 1997.

1.3 Definitions

Termination-resistor Resistor for wire adaptation of bus cables; termination resistors are necessary at all cable- and segment-ends.

Baudrate Velocity of the transmission; given in number of transmitted bits per second (Baudrate = Bitrate).

Busdevice Device, which sends, receives or repeats data via the bus network.

Diagnostic Detection, localisation, classification, display, further check of errors, malfunctions and messages.

FREEZE is a master command to the slave. That way the master can freeze the status of inputs to the actual values. The input data will be refreshed when the command UNFREEZE is sent by the master.

GSD-File Device-Specific-File. File, in which the slave specific abilities are stored for the master.

DP Decentral Peripheral

DDLM Direct Data Link Mapper
Interface between Profibus-DP functions and the Encoder Software.

PROFIBUS PROcess Fleldbus, European fieldbus norm, which is manifested in the PROFIBUS-Norm (EN 50170). It sets the functional, electrical and mechanical specifications for the bit-serial field bus system.

Following abbreviations are used in this user manual:

CW Clockwise. Code sequence in clockwise rotation (as seen on shaft side)

CCW Counterclockwise. Code sequence in counterclockwise rotation (as seen on shaft side)

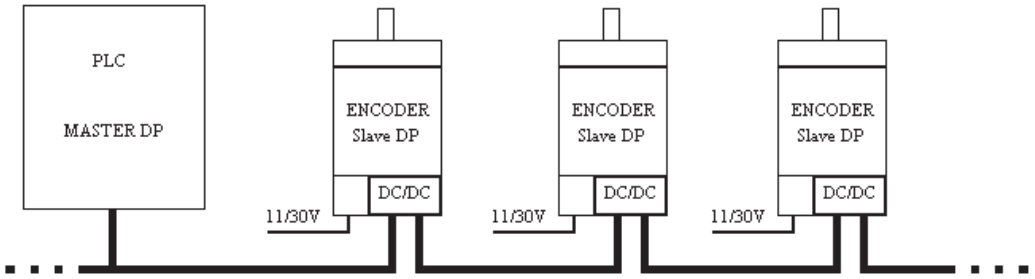
PO Position Value

PR Preset Value

2. NETWORK OF PROFIBUS-DP

The interface of the absolute rotary encoder is based on the regulations of PROFIBUS-DP (DIN 19245, Part 1 and 3). To use the encoder with Profibus-DP interface as a slave in the network, a master module for Profibus-DP is required in a PLC.

Below the connection to the PROFIBUS-DP is shown schematically:



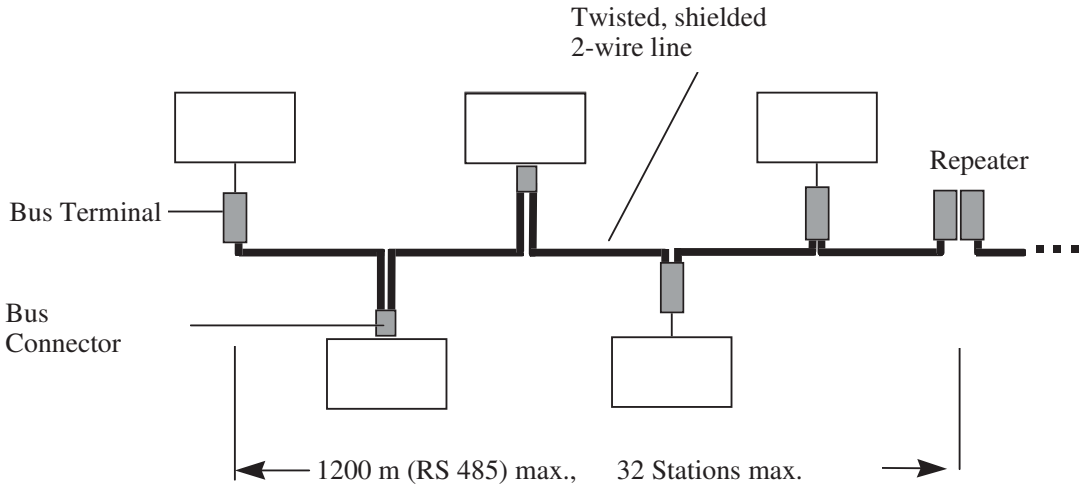
2.1 Wiring on Profibus

For PROFIBUS networks, use normal copper wiring with the following restrictions :

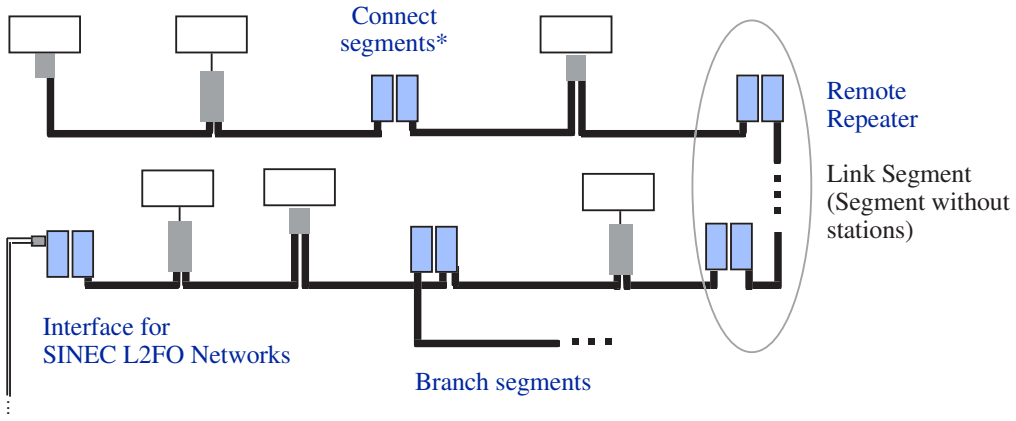
Baudrate kbit/s	max. Segment length	max. Expansion
9.6	1200m / 3943 feet	12000m / 39344 feet
19.2	1200m / 3934 feet	12000m / 39344 feet
93.75	1200m / 3934 feet	12000m / 39344 feet
187.5	1000m / 3278 feet	10000m / 32786 feet
500.0	400m / 1311 feet	4000m / 13114 feet
1500.0	200m / 655 feet	2000m / 6557 feet
3000.0	100m / 327 feet	1000m / 3278 feet
6000.0	100m / 327 feet	1000m / 3278 feet
12000.0	100m / 327 feet	1000m / 3278 feet

To reach the maximum of expansion it is necessary to use repeaters, the repeaters generate the signals in amplitude and time. Up to 9 repeaters can be connected in series.

2.2 Segment structure



2.3 Possible uses for repeater



Max. Number Repeater Cascading: 9

3. ENCODER CLASSIFICATION

The absolute encoders with Profibus-DP interface transmit the position value in binary code. There are two different classes of encoders: the unprogrammable version (Class 1) and the programmable version (Class 2). Four configurations are possible by the implemented software. This way the requirements of a variety of applications can be met by this encoder.

3.1 Class 1 Encoder

The absolute encoders of Class 1 are unprogrammable. Depending on the resolution two configurations can be chosen:

Conf. No.	Type Class	Configuration		Input-Word No.	Output-Word No.	Description
		Length	Byte			
1	1	1	D0	1	0	16 Bit PO
2	1	1	D1	2	0	32 Bit PO

If the resolution of the encoder is less than 16 Bit, configuration 1 can be chosen. The position value (PO) is transmitted to the PROFIBUS-Master according to the hardware side of the resolution of encoder.

3.2 Class 2 Encoder

The absolute encoders of Class 2 are programmable. Depending on the resolution two configurations can be chosen:

Conf. No.	Type Class	Configuration		Input-Word No.	Output-Word No.	Description
		Length	Byte			
3	2	1	F0	1	1	16 Bit PO 16 Bit PR
4	2	1	F1	2	2	32 Bit PO 32 Bit PR

If the resolution of the encoder less than 16 Bit, configuration No.3 can be chosen. Class 2 encoders offer extensive programming possibilities, e.g. preset function and programmable resolution.

The PO is transmitted in the DDLM_Data_Exchange Modus according to following telegram:

Configurations No.: 1 and 3

Octet	1	2
Bit	15 - 8	7 - 0
Data	2^{15} - 2^{8}	2^{7} - 2^{0}
	Data_Exchange - 16 Bits	

Configurations No. : 2 and 4

Octet	1	2	3	4
Bit	31 - 24	23 - 16	15 - 8	7 - 0
Data	2^{31} - 2^{24}	2^{23} - 2^{16}	2^{15} - 2^{8}	2^{7} - 2^{0}
	Data_Exchange - 32 Bits			

4. PROGRAMMABLE ENCODER PARAMETERS

In the following the encoder parameters are described, which can be programmed according to the chosen configuration. The Class 2 parameters use the DDLM_Set_Prm function. Programmable parameters are shown in the table below:

Parameter	Data type	Parameter octet number	Device class
Code Sequence	Bit	9	1
Class 2 functionality	Bit	9	2
Commissioning diag. control	Bit	9	optional
Scaling function control	Bit	9	2
Measuring units per rev.	unsigned 32	10 - 13	2
Total measuring range	unsigned 32	14 - 17	2
Reserved for further use		18 - 25	2
Reserved for manufacturer		26...	optional

Overview Operating Parameter (Octet 9):

Bit	Parameter
0	Code Sequence
1	Class 2 functionality
2	Commissioning diagnostics
3	Scaling function control
4	Reserved
5	Reserved
6	Reserved
7	Reserved

4.1 Code Sequence

The code sequence defines whether increasing position values are output when the encoder shaft rotates clockwise CW or counterclockwise CCW (as seen on shaft). The code sequence bit is set with the code sequence bit 0 in the operating parameters Octet 9.

Bit 0	Code sequence
0	CW
1	CCW

4.2 Class 2 Functionality

This bit enables/disables the device class 2 functionality. The default setting is disabled (0), which means that a DP-Master must set this bit to be able to use the class 2 functions. When the class 2 functionality is disabled, the encoder performs exactly like a class 1 encoder. To use class 2 functionality, set bit 1 in Octet 9.*0

Bit 1	Class 2 Functionality
0	disabled
1	enabled

4.3 Commissioning Diagnostics (optional)

With the commissioning diagnostic function it is possible to check the encoder components responsible for position detection at encoder standstill. In conjunction with the position alarms, this enables an extensive check of the correctness of the position values. The commissioning diagnostics are initiated by the bit 2 in octet 9. If errors are detected it will be announced by the commissioning diagnostic alarm bit in the diagnostic function (see Alarms).

Bit 2	Commissioning Diagnostics
0	disabled
1	enabled

The commission diagnostic function is optional. To find out if the encoder supports commissioning diagnostics, the " Operating Status " should be read with the diagnostic function and the commissioning diagnostic bit checked.

4.4 Scaling Function

With the scaling function the encoder internal numerical value is converted in software to change the physical resolution of the encoder. The parameters " Measuring Units per Revolution " and " Total Measuring Range in Measuring Units " are the scaling parameters set by the scaling function control bit 3 in octet 9.

Bit 3	Scaling Function
0	disabled
1	enabled

4.5 Measuring Units per Revolution

The parameter " Measuring Units per revolution " is used to program the desired number of steps per revolution. Each value between 1 and 8192 can be realised.

Octet	10	11	12	13
Bit	31 - 24	23 - 16	15 - 8	7 - 0
Data	2^{31} - 2^{24}	2^{23} - 2^{16}	2^{15} - 2^{8}	2^{7} - 2^{0}
	Measuring Units per Revolution			

If a value larger than 8192 is set, the process value of the encoder will not be single stepped and values will be skipped while rotating the shaft. So, it is recommended, to keep the measuring units per revolution below 8192 measuring units.

4.6 Total Measuring Range in Measuring Units

This parameter is used to program the desired number of measuring units over the total measuring range. This value must not exceed the total resolution of the encoder with 536870912 steps (29 Bit).

If the encoder is used in a continuous measuring application, the parameter must be programmed in values with powers of 2 (2^x with x<= 29).

Octet	14	15	16	17
Bit	31 - 24	23 - 16	15 - 8	7 - 0
Data	2^{31} - 2^{24}	2^{23} - 2^{16}	2^{15} - 2^{8}	2^{7} - 2^{0}
	Total Measuring Range in Measuring Units			

4.7 Preset Value

The parameter " Preset Value " is the desired position value, which should be reached at a certain physical position of the axis. The position value of the encoder is set to the desired process value by the parameter Preset. The preset value must not exceed the parameter " Total Measuring Range in Measuring Units ". The preset function is used after the scaling function which means that the preset value is given in the current measuring units. The preset value is written to the encoder as output data in the Data_Exchange function.

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 MSB=1 the encoder accepts the transferred value (Bit: 0-28) as a preset value in binary code.

The encoder reads the current position value and calculates an offset value from the preset value and the read position value. The position value is shifted with the calculated offset value. When the output position value equals the preset value the preset mode is ended and the MSB can be set to zero by the master. The offset value can be read with the diagnostic function and is securely stored in case of voltage breakdown in the encoder EEPROM.

Attention:
The preset function should only be used at encoder standstill!

5. DIAGNOSTIC INFORMATION

The encoder supports extensive diagnostic routines. A large number of different parameters can be tested via the network.

Diagnostic function	Data type	Diagnostic octet number	Encoder class
Extended diagnostic header	Octet string	7	1
Alarms	Octet string	8	1
Operating status	Octet string	9	1
Encoder type	Octet string	10	1
Singleturn resolution	Unsigned 32	11 - 14	1
Number of distinguishable revolutions	Unsigned 16	15 - 16	1
Additional alarms	Octet string	17	2
Supported alarms	Octet string	18 - 19	2
Warnings	Octet string	20 - 21	2
Supported warnings	Octet string	22 - 23	2
Profile version	Octet string	24 - 25	2
Software version	Octet string	26 - 27	2
Operating time	Unsigned 32	28 - 31	2
Offset value	Signed 32	32 - 35	2
Manufacturer offset value	Signed 32	36 - 39	2
Measuring units per revolution	Unsigned 32	40 - 43	2
Total measuring range in measuring units	Unsigned 32	44 - 47	2
Serial number	ASCII string	48 - 57	2
Reserved for future use		58 - 59	2
Manufacturer specific diagnostics		60 - 63	Optional

5.1 Extended Diagnostic Header

The diagnostic header byte 7 specifies the length of the encoder diagnostics including the header byte. The format of the length value is hexadecimal. For the encoders with Class 1 configuration the length of the encoder specific diagnostics is 10 bytes (0A hex).

Bit	7	6	5 - 0
Data	0	0	xxh
	Fixed to 00 indicate device related diagnostics		**Length including header**

5.2 Alarms

An alarm is set if malfunction in the encoder could lead to incorrect process values. Octet 8 in the diagnostic function (DDLM_Slave_Diag) shows the status of the alarms. Additional alarms for class 2 encoders are added in diagnostic octet 17.

If an alarm occurs, then the Ext_Diag bit and the Stat_Diag bit in the diagnostic function is set to logical high until the alarm is cleared and the encoder is able to provide an accurate process value. Alarms are cleared when the functionality is within the specification and the process value is correct.

Bit	Definition	= 0	= 1
0	Position error	No	Yes
1	Supply Voltage error	No	Yes
2	Current too high	No	Yes
3	Commissioning diagnostics	OK	Error
4	Memory error	No	Yes

These alarms are not supported today.

5.3 Operating Status

Octet 9 in the diagnostic function gives information on encoder internal parameters.

Bit	Definition	= 0	= 1
0	Code sequence	CW	CCW
1	Class 2 functionality	No	Yes
2	Commissioning diagnostics	No, not supported	Yes
3	Scaling function	Disabled	Enabled

The commissioning diagnostics are not implemented yet.

5.4 Encoder Type

The encoder type can be read in Octet 10 of the hex code.

code	Definition
00 h	Single-Turn absolute rotary encoder
01 h	Multi-Turn absolute rotary encoder

5.5 Single-Turn Resolution

The diagnostic octet 11 to 14 gives the number of measuring steps per revolution that are outputted for the absolute singleturn position value. The value is stored in binary code.

Octet	11	12	13	14
Bit	31 - 24	23 - 16	15 - 8	7 - 0
Data	2^{31} - 2^{24}	2^{23} - 2^{16}	2^{15} - 2^{8}	2^{7} - 2^{0}
	Singleturn resolution			

5.6 Number of Distinguishable Revolutions

The number of distinguishable revolutions that the encoder can output is given in octet 15 and 16 of the diagnostic function. The value is stored in binary code.

Due to the difficulty to store 65536 turns in a 16 bits number, the value stored is 65536-1 turn (FFFFhex).

Octet	15	16
Bit	15 - 8	7 - 0
Data	2^{15} - 2^{8}	2^{7} - 2^{0}
	Number of Distinguishable Revolutions	

5.7 Additional Alarms

Diagnostic octet 17 is reserved for additional alarms, which are currently not assigned.

5.8 Supported Alarms

Information on supported alarms can be read in diagnostic octets 18 and 19.

Bit	Definition	= 0	= 1
0	Position error	Not supported	Supported
1	Supply Voltage error	Not supported	Supported
2	Current too high	Not supported	Supported
3	Commissioning diagnostics	Not supported	Supported
4	Memory error	Not supported	Supported
5-15	Reserved		

The supported alarms are not implemented yet

5.9 Warnings

Warnings indicate that tolerances for certain internal parameters of the encoder have been exceeded. In contrast to alarms warnings do not imply incorrect position values.

Octet 20 and 21 of the diagnostic function shows the status of the warnings. If a warning occurs, then the Ext_Diag bit in the Diagnostic function is set to logical high until the warning is cleared. All warnings are cleared after the diagnostic message is read from the encoder, but if tolerances are still exceeded the warning will be set again. For the operating time limit (Bit 4) the warning is only set again after power-on sequence.

Bit	Definition	= 0	= 1
0	Frequency exceeded	No	Yes
1	Temperature exceeded	No	Yes
2	Light control reserve	Not reached	Reached
3	CPU Watchdog Status	OK	Reset generated
4	Operating time limit warning	No	Yes
5	Battery charge	OK	Too low
6	Reference point	Reached	Not reached
7 - 15	Reserved		

Only bit 5, “ Battery charge ” , is implemented.

No control of this Warning in Class 1 , if case of warning, contact factory.

5.10 Supported Warnings

Information on supported warnings can be read in the diagnostic octets 22 and 23.

Bit	Definition	= 0	= 1
0	Frequency warning	Not supported	Supported
1	Temperature warning	Not supported	Supported
2	Light control reserve warning	Not supported	Supported
3	CPU Watchdog Status	Not supported	Supported
4	Operating time limit warning	Not supported	Supported
5	Battery charge warning	Not supported	Supported
6	Reference point warning	Not supported	Supported
7-15	Reserved		

5.11 Profile Version

Octet 24 and 25 of the diagnostic function gives the DP encoder profile version implemented in the encoder. The octets are combined to a revision number and an index.

Example:
Profile version: 1.40
Octet no.: 24 25
Binary code: 00000001 01000000
Hex: 1 40

Octet	24	25
Bit	15-8	7-0
Data	2^7 - 2^0	2^7 - 2^0
	Revision number	Index
	Profile version	

The profile version of the encoder is 1.10

5.12 Encoder Software Version

Octet 26 and 27 of the DDLM_Slave_Diag function give the encoder software version. The octets are combined to a revision number and an index, like the Profile version.

Octet	26	27
Bit	15-8	7-0
Data	2^7 - 2^0	2^7 - 2^0
	Revision number	Index
	Software version	

5.13 Operating time

The operating time monitor stores the operating time for the Encoder in operating hours. The operating time is stored every 6 minutes in the Encoder non volatile memory as long as the Encoder is power supplied. The operating time value is presented in 0.1 hours as an unsigned 32 binary value of the function DDLM_Slave_Diag.
If the operating time function is not used, the operating time value is set to the maximum value (FFFFFFFF hex) by the Encoder manufacturer.
A maximum operating time limit can be set by the Encoder manufacturer. When this limit is exceeded an operating time limit warning bit is set.

Octet	28	29	30	31
Bit	31 - 24	23 - 16	15 - 8	7 - 0
Data	2^{31} - 2^{24}	2^{23} - 2^{16}	2^{15} - 2^8	2^7 - 2^0
	Operating time			

This function is not implemented yet, until then the value FFFFFFFF hex is permanently stored.

5.14 Offset value

The offset value is calculated in the preset function and shifts the position value with the calculated value. The offset value is stored and can be read from the Encoder in the diagnostic octet 32 to 35. The data type for the offset value is signed binary 32 with an offset value range equal to the measuring range of the Encoder. The preset function is used after the scaling function which means that the offset value is given according to the current measuring resolution.
NOTE! If an offset value is used it must be added to the offset value of the Encoder manufacturer to get the offset value from the physical zero point of the Encoder disk.

Octet	32	33	34	35
Bit	31 - 24	23 - 16	15 - 8	7 - 0
Data	2^{31} - 2^{24}	2^{23} - 2^{16}	2^{15} - 2^{8}	2^{7} - 2^{0}
	Offset value			

5.15 Offset value of the Encoder manufacturer

The Manufacturer offset value indicates the Encoder offset set by the Encoder manufacturer. This value gives information on the shift of the zero point in number of positions from the physical zero point of the Encoder disk. The data type for the offset value is signed binary 32 with an offset value range equal to the measuring range of the Encoder. The Manufacturer offset value is given in number of steps according to the basic resolution of the Encoder and is located in the write protected memory area changeable only by the Encoder manufacturer.

Octet	36	37	38	39
Bit	31 - 24	23 - 16	15 - 8	7 - 0
Data	2^{31} - 2^{24}	2^{23} - 2^{16}	2^{15} - 2^{8}	2^{7} - 2^{0}
	Manufacturer offset value			

5.16 Scaling parameter settings

The Scaling parameters are set in the DDLM_Set_Prm function, the parameters are stored and can be read from the Encoder in octet 40 to 47 of the diagnostic function. The parameters "Measuring units per revolution" and "Total measuring range in measuring units" sets the desired Encoder resolution. The Scaling function status bit in the Operating status indicates if the Scaling function is enabled or disabled.

Default values of the Encoder manufacturer:
Measuring units per revolution = Singleturn resolution
Total measuring range in measuring units = Singleturn resolution * Number of distinguishable revolutions
The data type for both values is unsigned 32.

Octet	40	41	42	43
Bit	31 - 24	23 - 16	15 - 8	7 - 0
Data	2^{31} - 2^{24}	2^{23} - 2^{16}	2^{15} - 2^{8}	2^{7} - 2^{0}
	Measuring units per revolution			

Octet	44	45	46	47
Bit	31 - 24	23 - 16	15 - 8	7 - 0
Data	2^{31} - 2^{24}	2^{23} - 2^{16}	2^{15} - 2^{8}	2^{7} - 2^{0}
	Total measuring range in measuring units			

5.17 Encoder serial number

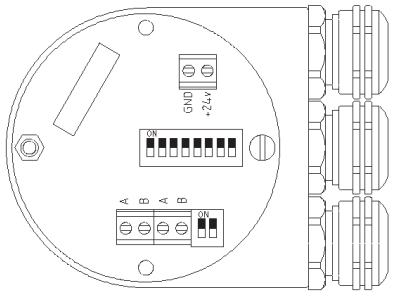
Octet 48 to 57 in the diagnostic function gives the Encoder serial number as an ASCII string of ten characters. If the serial number is not used the ASCII string will contain only stars (**********), hexcode 2A.

Octet	48 - 57
Bit	79 - 0
Data	ASCII
	Serial number

6. ANNEXE

6.1 Installation

6.1.1 Connecting the Connection cap



Connect the Power supply (switched OFF!) on the GND and +24V

Configure the device address

Connect to the BUS (A/B in; A/B out)

Switch ON the Terminator Dip-Switch if the device is the last of the line.

6.1.2 Configuring the device Address

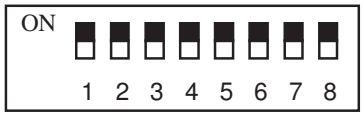
The Master Station sends messages to slaves via their station addresses. It is also possible to send messages as broadcast messages.

It is possible to have 32 Master/Slave stations on one bus in any combination possible. A maximum of 127 stations can be connected using repeater stations. It must be noted that the fewer masters connected on the line the better the performance will be.

The user has two ways to choose the encoder address :
- by dip switches
- by Set_Slave_Address (SAP55)

6.1.3 Dip switches

If the Dip 8 is OFF, the encoder address is defined by dips 1 - 7.
If the Dip 8 is ON, the encoder address is defined by Set_Slave_Address (SAP 55).



Dip 1	Dip 2	Dip 3	Dip 4	Dip 5	Dip 6	Dip 7	Dip 8	Mode
X	X	X	X	X	X	X	ON	Address by SAP55
Encoder Address(0 to 125)							OFF	Address from Switch

Address 126 is reserved for Set Slave Adress

6.1.4 Switch signification

Address	Dip 1	Dip 2	Dip 3	Dip 4	Dip 5	Dip 6	Dip 7	Dip 8
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
...								
124	OFF	OFF	ON	ON	ON	ON	ON	OFF
125	ON	OFF	ON	ON	ON	ON	ON	OFF

6.1.5 Set Slave Address

The master can change the encoder address via the Set_Slave_Address (SAP55) (only accepted in the power-on mode). Once the encoder address is changed, the new address is securely stored in case of voltage breakdown in the encoder EEPROM.

The address by default is 126 (0FEh). To reset the address stored in the encoder EEPROM, just turn off the dip switch 8 end power on the encoder : the new address in the encoder EEPROM will be the default address 126 (FE hex).

6.1.6 Line termination

The last device of the bus has to terminate the line with 3 resistors. To activate them, switch ON to activate them.

6.1.7 Type File

To run the encoder on Profibus-DP Master, A GSD file named IDEA1658.GSD has been written, which is stored on the floppy disk included with the encoder on request.

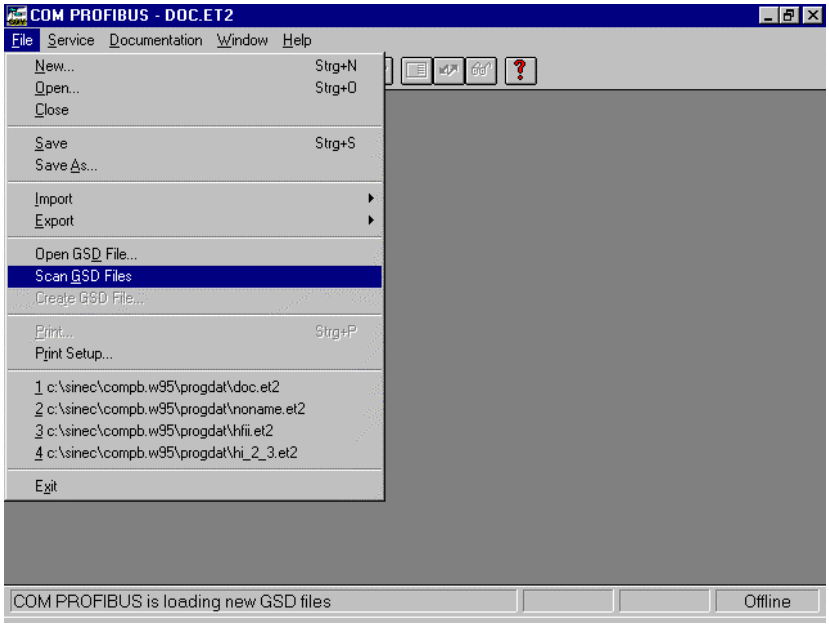
Refer to your Profibus-DP documentation to insert this file in the right place in your configuration device.

For example, location where the files can be copied:

IDEA1658.GSD in C:\SINEC\COMPB.W95\GSD

IDEACOD?.BMP in C:\SINEC\COMPB.W95\BITMAP\

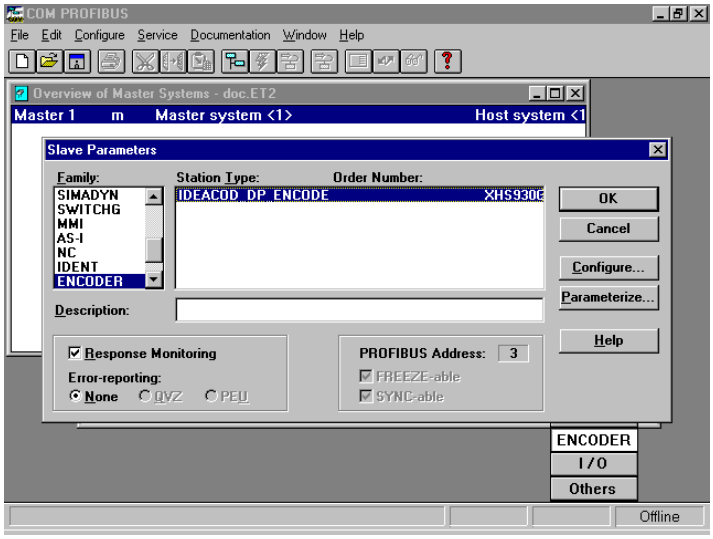
To insert the IDEACOD GSD in the Com Profibus GSD database, after the copy of the files, run “Scan GSD Files” like below.



6.1.8 Configuration of the BUS

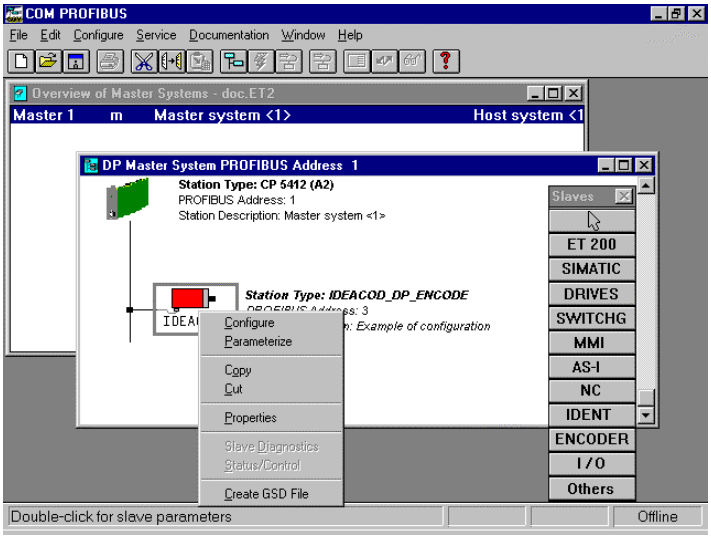
6.1.8.1 Selection of the encoder

Select in the **ENCODER** family "IDEACOD_DP_ENCODER" with the appropriate PROFIBUS Address (3 in the Hardcopy).



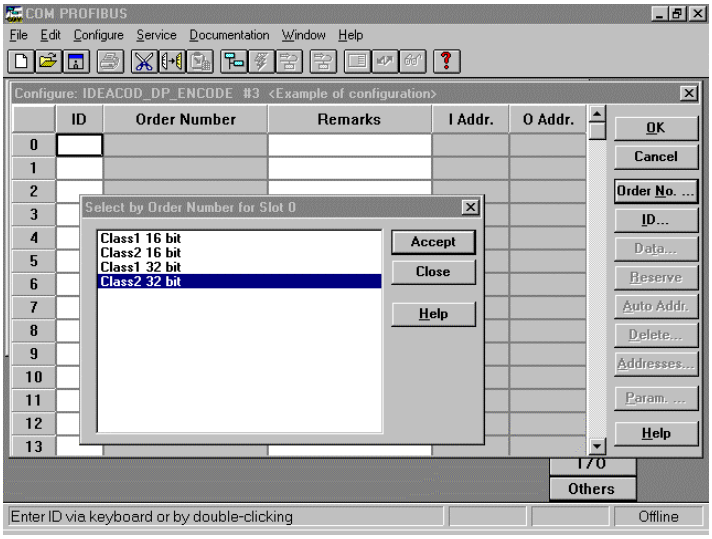
6.1.8.2 Set up of the encoder

With a Right Button Click on the encoder LOGO, you can set up the properties of the encoder, you can configure the encoder and parameterize the device.

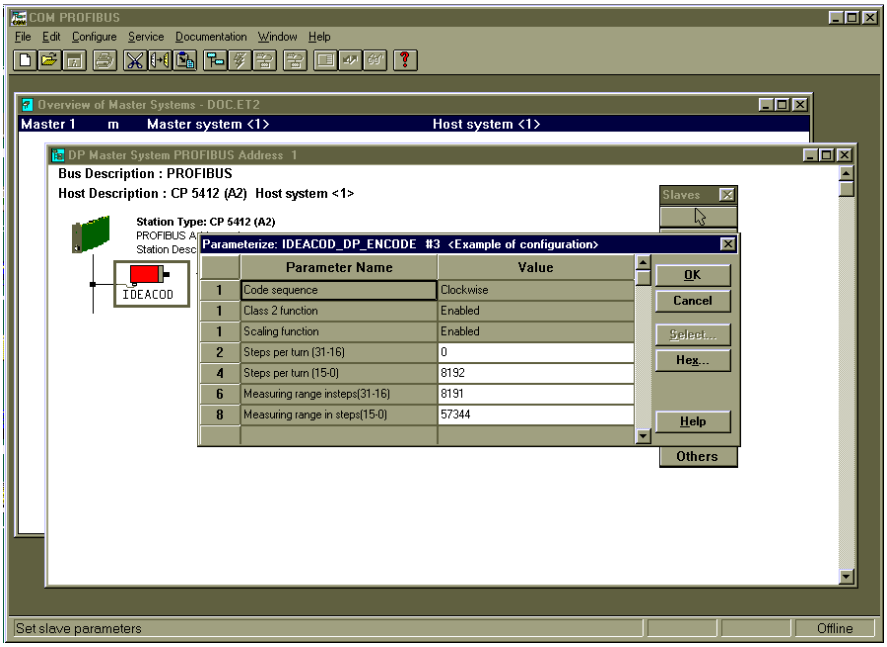


6.1.8.3 Configuration of the encoder

In this windows, select the encoder type , mono or multi turn, class 1 or class2

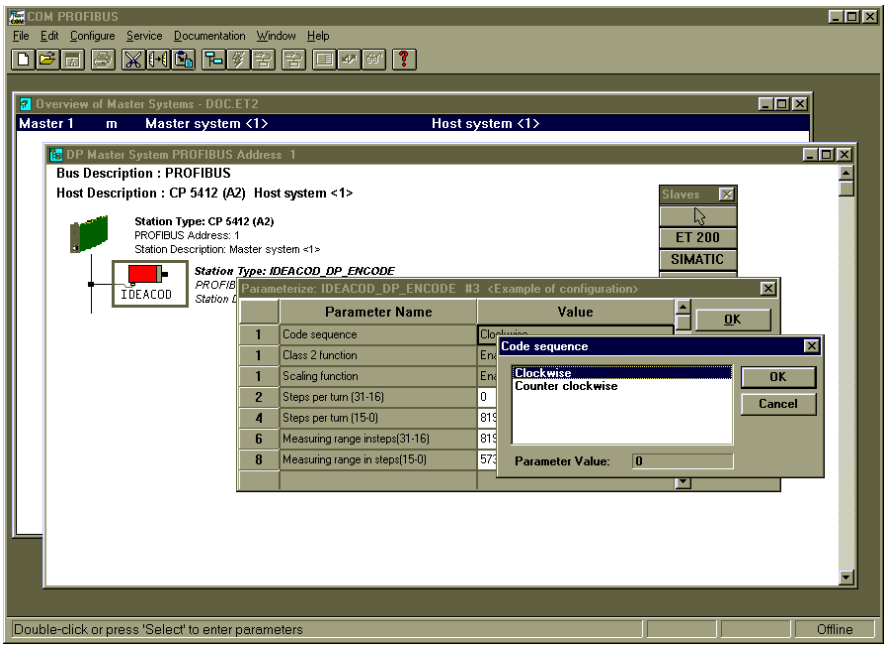


6.1.8.4 Parameterization of the encoder (Only class 2)



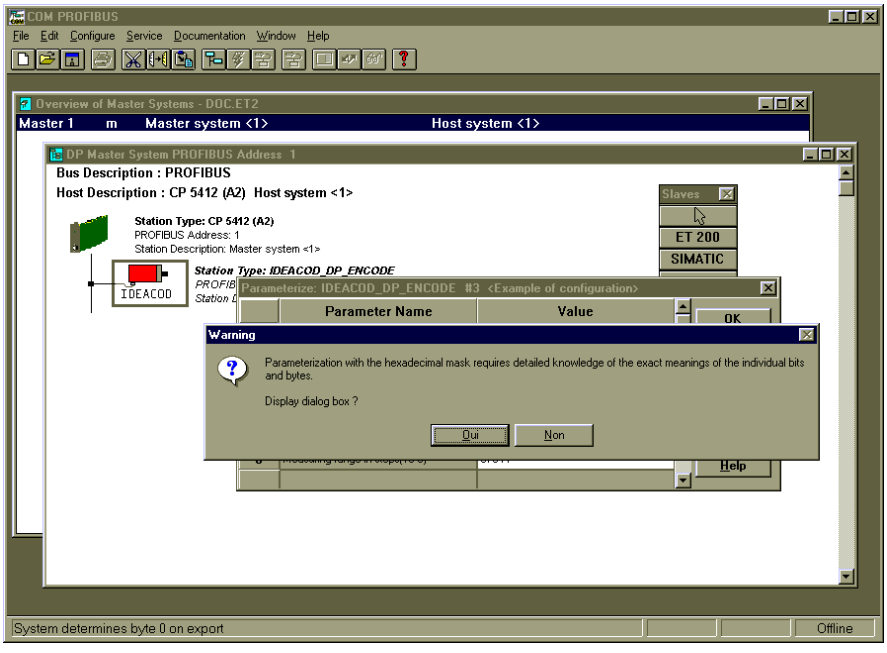
All the items with parameters items are directly available with their possible values, to change an item value, click on its value field and choose the appropriate data.

Some limitations exist, in Class 1 for example, no scaling is available and the encoder can only be 8192 steps per revolution (full resolution) and for a multiturn encoder, the max range is hex 20000000_{16} steps (full resolution)
(noted Measuring range in step (31-16) 8192_{10} (2000_{16}) and Measuring range in step (15-0) 0_{10} (0000_{16}))



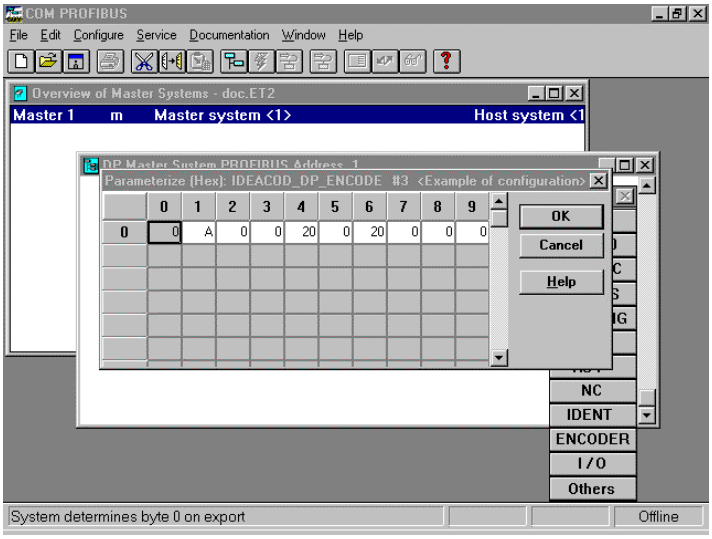
It is possible to change the parameterization with the hex mask, click on HEX button

This kind of configuration is explained in the next chapter.



6.1.8.5 Parameterization of the encoder (Only class 2) In Hex MODE

In this windows, you can define the “Measuring units per revolution”, “Total measuring range” and the “code sequence”.



The different parameters, which can be programmed are explained in chapter 4.

The number of “measuring units per revolution” must be between 1 and 8192

The “Total measuring range” must be between the “measuring units per revolution” and the maximum possible resolution of the encoder (29 bits : 13 X 16 bit = 536 870 912 points).
The maximum value is the “measuring units per revolution” X 65536 turn.

Default values from GSD

User_Prm_Data =	Byte8	Byte9	Byte10	Byte11	Byte12	Byte13	Byte14	Byte15	Byte16	Byte17
Hexa	0x00	0x0A	0x00	0x00	0x20	0x00	0x20	0x00	0x00	0x00

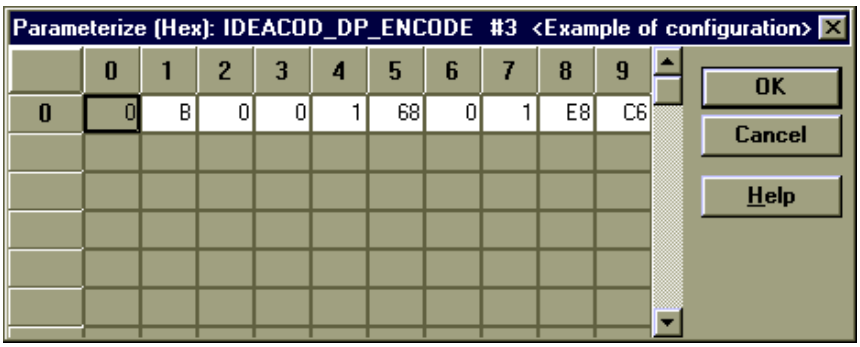
Signification:

		Byte	Value
“Code sequence”	CW	9	xxxx xxx0
“Class 2 functionality”	Y	9	xxxx xx1x
“Scaling function control”	Y	9	xxxx 1xxx
“Measuring units per revolution”	8192	10-13	0x00 0x00 0x20 0x00
“Total measuring range”	536 870 912	14-17	0x20 0x00 0x00 0x00

Example :

		Byte	Value
“Code sequence”	CCW	9	xxxx xxx1
“Class 2 functionality”	Y	9	xxxx xx1x
“Scaling function control”	Y	9	xxxx 1xxx
“Measuring units per revolution”	4 200 (1068_{16})	10-13	0x00 0x00 0x10 0x68
“Total measuring range”	125 126 ($1E8C6_{16}$)	14-17	0x00 0x01 0xE8 0xC6

User_Prm_Data =	Byte8	Byte9	Byte10	Byte11	Byte12	Byte13	Byte14	Byte15	Byte16	Byte17
Hexa	0x00	0x0B	0x00	0x00	0x10	0x68	0x00	0x01	0xE8	0xC6



6.2 TECHNICAL DATA

6.2.1 Electrical Data

Supply Voltage	11/30 V DC
Power consumption (monoturn)	170 mA at 24V
Power consumption (multiturn)	170 mA at 24V
Bus connection	galvanic isolation (opto-couplers and DC/DC)
Interface	Line driver according to RS485
Clock Frequency	9600 to 12 Mbaud
Device addressing	With Dip-switch in cap or EEPROM
Resolution	max 8192 steps/revolution (13 bits) Max 65536 revolutions (16 bits)
Code	Binary
Profibus PNO Certification	done the 11/12/1998 n° Z00463

PNO : Profibus NützerOrganisation
The Profibus Trade Organisation (PNO) is the only institution which is allowed to certificate Profibus components on conformity and interoperability.

6.2.2 Mechanical data

See your specific commercial documentation

6.2.3 Shielding (From WWW.PROFIBUS.COM)

More information about Profibus is available on this WEB site, don't hesitate to consult it.

6.2.3.1 Shielding: Yes or No?

EN 50170 leaves it to the user if a shielded or unshielded cable shall be used. In areas with no disturbances unshielded cable is permitted. The following reasons, however, make it advisable to use a shielded cable:
(a) An area free of disturbances will only exist inside of a shielded cabinet. As soon as a relay is mounted into the cabinet, interference free is no longer ensured.
(b) The use of unshielded cables requires additional protection mechanisms at the bussignal inputs against overvoltage.
Therefore it is recommended to always use shielded cable.
This recommendation is also applicable for eventually needed supply cables from external power supplies to the PROFIBUS devices. (e.g. repeaters). Double shielded lines are

especially suitable for surroundings with heavy electromagnetic interference. In order to guarantee optimal protection the outer shield (shielding braid) and the inner shield (shielding foil) should be connected to ground on both cable ends flatly with a ground termination clip.

6.2.3.2 Shielding Rules

When using a shielded bus cable it is recommended to connect the shield on both sides low inductively with the protective ground in order to achieve optimal electromagnetic compatibility. In case of separate potentials (e.g. refinery) the shield should be connected only at one side of the bus cable to the protective ground.
Preferably the connection between shield and protective ground is made via the metal cases and the screw top of D-sub connector. Should this mechanism not be possible then the connection can be made via pin 1 of the D-sub connector. It should be noticed that this is not the optimal solution. In such a case it is better to bare the cable shield at an appropriate point and to ground with a cable as short as possible to the metallic structure of the cabinet. This could be achieved with a ground bus bar in front of the bus connector.

6.2.3.3 Bus Cable

The PROFIBUS standard defines two variations of the bus cable for PROFIBUS - FMS and PROFIBUS - DP. Type A is especially recommended for high transmission speeds (> 500 kBaud) and permits doubling of the network distance in comparison to Type B. Type B should only be used at low baud rates and low requirements on the network distances.
Therefore it is recommended to use cable Type A.

Cable specification Type A for PROFIBUS - FMS and PROFIBUS - DP

Impedance:	135 up to 165 Ohm at a frequency of 3 to 20 MHz.
Cable capacity:	< 30 pF per Meter
Core diameter:	> 0,34 mm², corresponds to AWG 22
Cable type:	twisted pair cable. 1x2 or 2x2 or 1x4 lines
Resistance:	< 110 Ohm per km
Signal attenuation:	max. 9 dB over total length of line section
Shielding:	CU shielding braid or shielding braid and shielding foil

Cable specification Type B for PROFIBUS - FMS and PROFIBUS - DP

Impedance:	135 up to 165 Ohm at a frequency of > 100 kHz
Cable capacity:	typ. < 60 pF per Meter
Core diameter:	> 0,22 mm², corresponds to AWG 24
Cable type:	twisted pair cable. 1x2 or 2x2 or 1x4 lines
Signal attenuation:	max. 9 dB over total length of line section
Shielding:	CU shielding braid or shielding braid and shielding foil