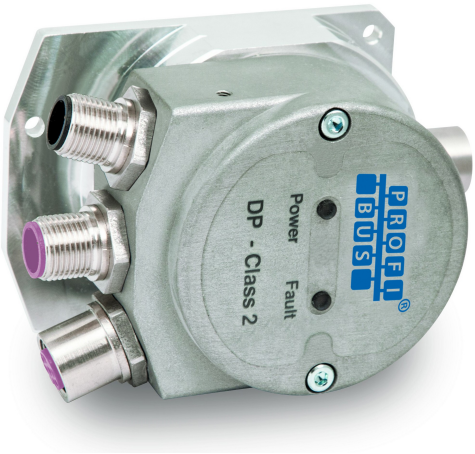
Smart encoders & actuators

User's guide

IF55 ROT PB



Profibus-DP profile for encoders

- SSI to Profibus converter
- Suitable for SSI rotary encoders
- Accepts MSB & LSB Aligned protocols up to 30 bits
- Cable and M12 connector outputs
- Profibus DP configurable as Class 1 or Class 2 Slave

Suitable for the following models:

- IF55 ROT PB
- IF55 ROT PB-C

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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 GREEN;
- 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 **SSI to Profibus gateways of the IF55 series**.

IF55 series gateways allow the **integration of SSI encoders**, both rotary and linear, **into conventional fieldbuses or industrial Ethernet networks**.
The present manual is specifically designed to describe the SSI to Profibus IF55 model for rotary encoders (order code IF55 ROT PB). For information on the SSI to Profibus IF55 model for linear encoders (order code IF55 LIN PB) refer to the specific documentation.
For information on the gateways designed for the integration of other fieldbus/Ethernet encoders (for example: SSI to CANopen: order codes IF55 ROT CB and IF55 LIN CB; and SSI to EtherCAT: order codes IF55 ROT EC and IF55 LIN EC), refer to the specific documentation.

Please note that the present manual does not prescind from the user's guide of the SSI encoder it has to be connected to. Please read carefully the encoder's documentation before installing, connecting and operating the measuring system.
For detailed technical specifications please refer also 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.

Glossary of Profibus terms

Profibus, like many other networking systems, has a set of unique terminology. Table below contains a few of the technical terms used in this guide to describe the Profibus interface. They are listed in alphabetical order.

Address (Station)	IEC 61158-2: Medium attachment unit identification - unique number of a station connected to a segment (participant).
Address Space	Within PROFIBUS DP the maximum possible number of addressable network nodes per segment, e.g. 127.
Alarm	Notification of an abnormal or unexpected event within a system. Alarms in PROFIBUS DP require in addition to the standard diagnosis event mechanism within the cyclic data exchange a separate acyclic acknowledgement procedure between a host and a Slave application. Since DP-V1, "Device related diagnosis" is the basis for the "Alarm" and "Status" types of diagnosis events (GSD: "DPV1"=1). PROFIBUS DP defines the following alarm types: Diagnosis, Status, Process, Update, Pull and Plug Alarm. See "Device Related Diagnosis". The PNO maintains a Profile Guideline, Part3: Diagnosis, Alarms and Time Stamping, order no. 3.522.
Alert	Alert is a generic term for two different types of notifications within a PROFIBUS DP/PA network especially arranged but not exclusively for the process automation: • alarm; • event. Both alert types may be used with or without a user acknowledgement mechanism. The PNO maintains a PROFIBUS guideline "Time Stamp", order no. 2.192.
Application Profile	Within PROFIBUS a specified agreement within families of field devices on how to use the general PROFIBUS communication platform and its subsystems (e.g. device integration via GSD, EDD, FDT/DTM and Communication Function Blocks). Communication profiles are not a part of the PROFIBUS DP application profiles. See "Profile".
Baud rate (Data Rate)	Other common terms are "data transfer rate" and "transmission rate". Within PROFIBUS DP this is the amount of data transferred across a fieldbus segment per second. A data rate is measured in units of bits per second ("b/s" or "bps"), or baud.
Bus Cycle	The period of time the bus Master needs to poll every participant (Slave) once. More bus Masters can be activated by using the token principle which consequently prolong the bus cycle.

Class	See "DP Master", "DP Master Class 1 (DPM1)" and "DP Master Class 2 (DPM2)".
Class 1 encoder	Encoder class must be set when you configure the device. Mandatory Class 1 provides the basic functions of the device and can be used for: • sending the position value (see **Position value** parameter); • changing the counting direction (see **Code sequence** parameter); • setting the preset value (see **Preset value** parameter); • acquiring reduced diagnostic information (see **Diagnostic type (16- or 63-byte)** parameter = "16 bytes fixed (6+10)").
Class 2 (+VEL) encoder	Encoder class must be set when you configure the device. Class 2 (+VEL) provides all the Class 1 and Class 2 functions and additional velocity-related functions: • transmission of the velocity value (see **Position and velocity values** parameter); • setting of the velocity measuring unit (see **Velocity unit of measurement** parameter).
Class 2 encoder	Encoder class must be set when you configure the device. Class 2 provides all the Class 1 functions and additional advanced functions such as: • scaling function (see **Scaling function control**, **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters); • extended diagnostic information (see **Diagnostic type (16- or 63-byte)** parameter = "16 bytes (6+10)" or "63 bytes (6+57)").
Communication Function Block (Comm FB)	A basic function block defined for PROFIBUS DP and supplied by the PLC manufacturer for the standardized access of user programs to field devices. The standardization is based on IEC 61131-3. The PNO maintains a guideline "PROFIBUS Communication and Proxy Function Blocks acc. to IEC 61131-3", order no. 2.182.
Communication Parameter	Communication parameters are parameters, which adjust the communication protocol function to the current net configuration. Communication parameters exist for all phases of the communication protocols. Examples are bus address, token rotation time, idle time. See "Slave parametrization" and "Device parametrization".
Communication Profile	IEC 61158 comprises a summary of layer stacks of several different fieldbusses. IEC 61784 defines the useful combinations of these stacks via communication profiles CPF3/1 up to CPF3/3 (PROFINET). One of these is PROFIBUS DP. Within this communication profile three different physical profiles are defined: • RS 485 (RS 485-IS);

	• MBP-IS (MBP-LP, MBP); • Fibre Optics.
Cyclic Data Exchange	IEC 61158-3: Term used to describe events which repeat in a regular and repetitive manner. The MS0 services of PROFIBUS DP are based on cyclic data exchange. See "State machine".
Cyclic Redundancy Check (CRC)	Error-checking technique in which the frame recipient calculates a remainder by dividing frame contents by a prime binary divisor and compares the calculated remainder to a value stored in the frame by the sending node.
Data Rate (Baud rate)	Other common terms are "data transfer rate" and "transmission rate". Within PROFIBUS DP this is the amount of data transferred across a fieldbus segment per second. A data rate is measured in units of bits per second ("b/s" or "bps"), or baud.
Decentralized Peripherals (DP)	The term "Decentralized Peripherals" and the acronym "DP" stand for the simple, fast, cyclic and deterministic I/O data exchange between a bus Master and its assigned Slave devices. The corresponding PROFIBUS communication protocol is called PROFIBUS DP.
Device Identifier	Ident number: The primary device identification is an ident number of data type Unsigned16. This number is unique and assigned by the PNO business office upon application. It is stored within the device and defined in the corresponding GSD file via keyword. In addition it is part of the GSD file name. At runtime the ident number is used within: • the set Slave address procedure; • the parametrization telegram (octet 5 + 6); • the standard part of a diagnosis message (octet 5 + 6). The ident number explicitly cannot be retrieved from a device. Its main purpose is to make sure that a GSD file and configuration/parametrization data between Master Class 1 and its Slave are matching. The PNO maintains a technical guideline "Specification for PROFIBUS device description and device integration, Volume 1: GSD", Version 5.0, order no. 2.122. For a secondary identification possibility see the identification & maintenance functions (I&M). See "Ident Number".
Device Parametrization	The device parametrization within PROFIBUS DP consists of three phases. The first phase takes place during start-up of the communication system and provides basic communication parametrization and simple additional device parameters. Both are defined within the GSD file of a device, stored within a Master Class 1 after configuration in an engineering tool, and transmitted to the Slave at start-up time. Most of the automation cases in factory automation are covered by this method. More complex devices such as drives, laser scanners, scales, robots, transmitters, etc. require further individual parametrization before final production start. This is done in a

	second phase. In process automation certain device parameters such as value limits, value range, gain, etc. need to be adjusted even at run-time. For this second and third phase PROFIBUS DP provides two ways to accomplish the task: DTM/FDT and EDD. See "Slave parametrization" and "Communication parameter".
Device Profile	See "Profile".
DP Master	IEC 61158-5: Within PROFIBUS DP a fieldbus node that can be either Master Class 1 or Master Class 2. A Master Class 1 is a controlling device which controls several DP Slaves (field devices). NOTE: This is usually hosted by a programmable controller or a process controller. A Master Class 2 is a controlling device which manages configuration data (parameter sets) and diagnosis data of a DP Master Class 1, and that additionally can perform all communication capabilities of a DP Master Class 1.
DP Master Class1 (DPM1)	IEC 61158-5: A controlling device which controls several DP-Slaves (field devices). Usually programmable (logic) controllers or process control systems are hosts for Master Class 1.
DP Master Class2 (DPM2)	IEC 61158-5: A controlling device which manages configuration data (parameter sets) and diagnosis data of a DP-Master (Class 1). Additionally the DP-Master (Class 2) can perform all communication capabilities of a DP-Master (Class 1). Usually personal computers are hosts for DP Master Class 2 for programming, parametrizing, diagnosing and monitoring purposes.
DP Slave	IEC 61158-5: A field device that is assigned to one DP Master Class 1 as a provider for cyclic I/O data exchange. In addition acyclic functions and alarms could be supported.
Event	Within PROFIBUS DP/PA this is a signal or I/O data or process value within a certain field device at that point in time where a trigger condition arises. The values are associated with a time stamp and stored in a buffer. The time-stamped sample values are used to archive and visualize significant changes over the course of the production process. Such an event mechanism does not prevent from the cyclic transmission of these signals. A separate event alarm is requesting the transfer of the events to the main system.
Frame	A single set of data transmission from a device.
General Station Description (GSD)	A GSD is an electronically readable ASCII text file and contains both general and device-specific parameters for communication and network configuration. By means of keywords, a configuration tool allows to: • read device information (manufacturer, type, versions, bitmaps, etc.); • read texts for comfortable and easy to use configuration;

	• select transmission rates; • select modules and their I/O data length (configuration identifier); • read texts to assign diagnosis IDs to HMI displays; • select supported services (freeze, sync, etc.); from the GSD for the configuration of the device. A GSD replaces the previously conventional manuals or data sheets and thus already supports plausibility checks during the configuration phase. Distinction is made between a device GSD (for an individual device only) and a profile GSD, which may be used for devices that comply exactly with a profile such as a "PA device". GSDs for different languages may be provided in separate files with corresponding file extensions (*.gse for English, *.gsg for German, etc.) or altogether in one file (*.gsd). The device manufacturers are responsible for the scope and quality of the GSD of their devices.
Ident Number	See "Device Identifier". Notes: • the ident number is necessary for all DP devices except for Master Class 2; • the same ident number may be used for modular devices as long as the device can be described in the GSD file as a modular device.
Identifier	In general: a symbol that establishes the identity of the one bearing it. Within this context here it represents an absolute value of a parameter such as a physical address. It is intended for systematic and performance handling capabilities within computer systems, e.g. sorting, consistency checking, physical localization and alike. Usually an absolute value is associated with a logical value to represent the particular deployment of the identifier. Typical abbreviation for identifier is ID. IEC 61131-3: A combination of letters, numbers and underline characters, which begins with a letter or underline and which names a language element. Some of the major identifiers within PROFIBUS DP are: - Data type numeric identifier; - Configuration identifier (Cfg); - Device identifier (ident number); - Manufacturer identifier (MANUFACTURER ID); - Profile ident number (PROFILE ID).
Index	IEC 61158-5: Address of an object within an application process. The permitted range in PROFIBUS DP is 0 - 255. Indexes are used to address records of data (parameters, variables, state information, commands, etc.) within modules of a field device.
PDU (Protocol Data Unit)	A packet of data passed across a network via telegrams. The term implies a specific layer of the OSI seven layer model and a specific protocol. Each layer has its own PDU that is extended subsequently from the physical layer up to the

	application layer: • Physical layer protocol data unit (PhPDU); • Data link protocol data unit (DLPDU); • Application protocol data unit (APDU).
PI	The *PROFIBUS Nutzerorganisation e.V.* (PROFIBUS User Organisation, or PNO) was created in 1989. This group was composed mainly of manufacturers and users from Europe. In 1992, the first regional PROFIBUS organization was founded (PROFIBUS Schweiz in Switzerland). In the following years, additional Regional PROFIBUS & PROFINET Associations (RPAs) were added. In 1995, all the RPAs joined together under the international umbrella association PROFIBUS & PROFINET International (PI). Today, PROFIBUS is represented by 25 RPAs around the world (including PNO) with over 1400 members, including most if not all major automation vendors and service suppliers, along with many end users.
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PROFIBUS	PROcess FIeldBUS. PROFIBUS is a manufacturer independent fieldbus standard for applications in manufacturing, process and building automation. The PROFIBUS family is composed of three types of protocol, each of which is used for different tasks. The three types of protocols are: PROFIBUS FMS, DP and PA. IEC 61784-1: Communication network according to communication profile family 3 (CPF3); incorporating application profiles and system integration aspects like interfaces and languages for engineering tools and HMI. PROFIBUS is an open, digital communication system with a wide range of applications, particularly in the fields of factory and process automation. PROFIBUS is suitable for both fast, time-critical applications and complex communication tasks. The PROFIBUS logo is a registered trademark.
PROFIBUS DP	Acronym for "PROFIBUS for Decentralized Peripherals". Specification of an open fieldbus system with the following characteristics: • polling Master-Slave-system (cyclic communications, MS0); • flying Masters with robin round token passing

	coordination (MM); • connection based (MS1) and connectionless (MS2, MS3) acyclic communication between Masters and Slaves. Options (e.g.): • Data exchange broadcast (DXB), i.e. Slave to Slaves communication; • isochronous mode of Slaves; • clock synchronization; • redundancy. PROFIBUS DP is standardized within IEC 61158 and IEC 61784, communication profile families 3/1 and 3/2. The term "PROFIBUS DP" is also a synonym for the RS-485 based deployments within factory automation.
PROFIdrive	Communication technology especially adopted to the requirements of position and speed controlled drive applications (e.g. speed synchronized axis). Within the scope of PROFIBUS, "PROFIdrive" is used for the application of the PROFIBUS DP protocol (DP-V2) in motion control automation together with the corresponding application profiles ("PROFIdrive - Profile for variable speed drives" and "PROFIdrive - Profile drive technology") for the transmission technology RS-485.
Profile	Besides other things profiles in common define agreements on how to use communication means in a standardized manner. Within the context of fieldbusses several types of profiles are known: • communication profiles (e.g. IEC 61784); • physical profiles (MBP-IS, RS-485); • application profiles (see PROFIBUS TC3); • device profiles (e.g. robots); • branch profiles (e.g. extruder).
Profile Ident Number	Identifier of a particular profile definition. The profile ident number is taken from the pool of ident numbers handled by the PNO. It plays a role within the following scenarios. (1) In cases where the device of a manufacturer A should be replaceable by an equivalent device, the PNO is assigning number ranges to dedicated device types (Profile specific IDs) in combination with certain "Profile GSDs". Profiles using this methodology are e.g. "PA Devices" and "PROFIdrive". (2) Usually these Slave devices are designed to communicate with a Master Class 2 application (e.g. profile application or profile DTM). In order to ensure a Master application is communicating with an appropriate Slave, it is sending a profile specific ID during the establishment of the connection (MS2 Initiate Service). The Slave may answer with the same profile specific ID (if it is supporting this profile), with another ID (if it is supporting another profile) or with "0000h" if it is not supporting any profile.

	(3) I&M functions: Besides its basic I&M information devices - following a certain profile - are enabled to provide more detailed profile specific information.
Protocol Data Unit (PDU)	A packet of data passed across a network via telegrams. The term implies a specific layer of the OSI seven layer model and a specific protocol. Each layer has its own PDU that is extended subsequently from the physical layer up to the application layer: • Physical layer protocol data unit (PhPDU); • Data link protocol data unit (DLPDU); • Application protocol data unit (APDU).
Slave Parametrization	For a DP Slave several levels of parametrization exist. (1) The parameters on the DP communication level can be defined via a GSD file and comprise features such as baud rates, timing constraints, identification, options, transferable data structures, publisher subscriber links, etc. This level supports parametrization of simple modular Slaves and also special common additional communication layers such as PROFIsafe. This parametrization is fixed for a given operational life cycle after start-up. (2) More complex devices may be parametrized via EDD and/or FDT/DTM technology via an acyclic communication service (MS2). (3) For parameter changes at run-time such as batch operation (recipes) or motion control, special "parameter channels" associated with the cyclic data structures may be added or the MS1 services together with proxy function blocks may be used.
State Machine (DP)	An abstract machine consisting of a set of states (including the initial state), a set of input events, a set of output events, and a state transition function. A state machine describes the behaviour of a field device how to react in different situations. The state machine for DP Slaves comprises the following states/actions: - Power_On_Reset --> Set Slave address --> if successful, a transition follows to: - Wait_Prm --> Parametrization, diagnosis (optional) --> if successful, a transition follows to: - Wait_Cfg --> Configuration, diagnosis (optional) --> if successful, a transition follows to: - Data_Exch --> Normal operation: cyclic data exchange. On top of this basic communication layer state machine application profiles are defining their own additional state machines, e.g. PA devices, PROFIdrive, PROFIsafe, Ident Systems, Weighing and Dosage Systems. State machines are best modelled and documented with the help of the "Unified Modelling Language (UML)".
Station Address	Within PROFIBUS DP the address of a communication participant (Master or Slave). The permitted range is 0 to 127,

	with: - 126 intended to be used for the "soft" addressing of Slave devices; - 127 intended to be used for broadcast messages to all the Slaves.
Topology	In a communication network, the pattern of interconnection between network nodes; e.g. bus, ring, star configuration.
Transmission Rate (Baud rate)	The signalling rate of a digital communication line. It is the switching speed, or number of transitions (voltage or frequency changes) that are made per second. Within PROFIBUS DP the possible transmission rates depend on the MAU (Medium Attachment Unit) in use.
Watchdog Control	IEC 61158-6: This timer is part of the DP layer within a Slave. It is restarted by received requests from the bus Master and will set the outputs of a Slave to a fail-safe state after the expiration of the timer.
Watchdog Time (Twd)	IEC 61158-5: The watchdog timer is part of the DP layer within a Slave. The watchdog time is set by parametrization at run-up and consists of a watchdog time base (1 or 10 ms) and 2 factors. A selection can be made during configuration via the GSD file of a Slave. This is a Slave parameter. See "Watchdog control".

1 - Safety summary

1.1 Safety

- Always adhere to the professional safety and accident prevention regulations applicable to your country during device installation and operation;
- installation and maintenance operations must 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.

1.2 Electrical safety

- Turn off the power supply before connecting the device;
- connect according to explanation in the "4 - Electrical connections" section on page 23;
- in compliance with the 2014/30/EU 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. Provide the ground connection as close as possible to the encoder. We suggest using the ground point provided in the cap, use one TCEI M3 x 6 cylindrical head screw with two tooth lock washers.

1.3 Mechanical safety

- Install the device following strictly the information in the "3 - Mechanical installation" section on page 20;
- mechanical installation has to be carried out with stationary mechanical parts;
- do not disassemble the device unless otherwise indicated;
- do not tool the device;
- delicate electronic equipment: handle with care;
- do not subject the device to knocks or shocks;
- respect the environmental characteristics declared by manufacturer.

2 - Identification

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

Warning: devices 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 - Mechanical installation

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

3.1 Overall dimensions

(values are expressed in mm)

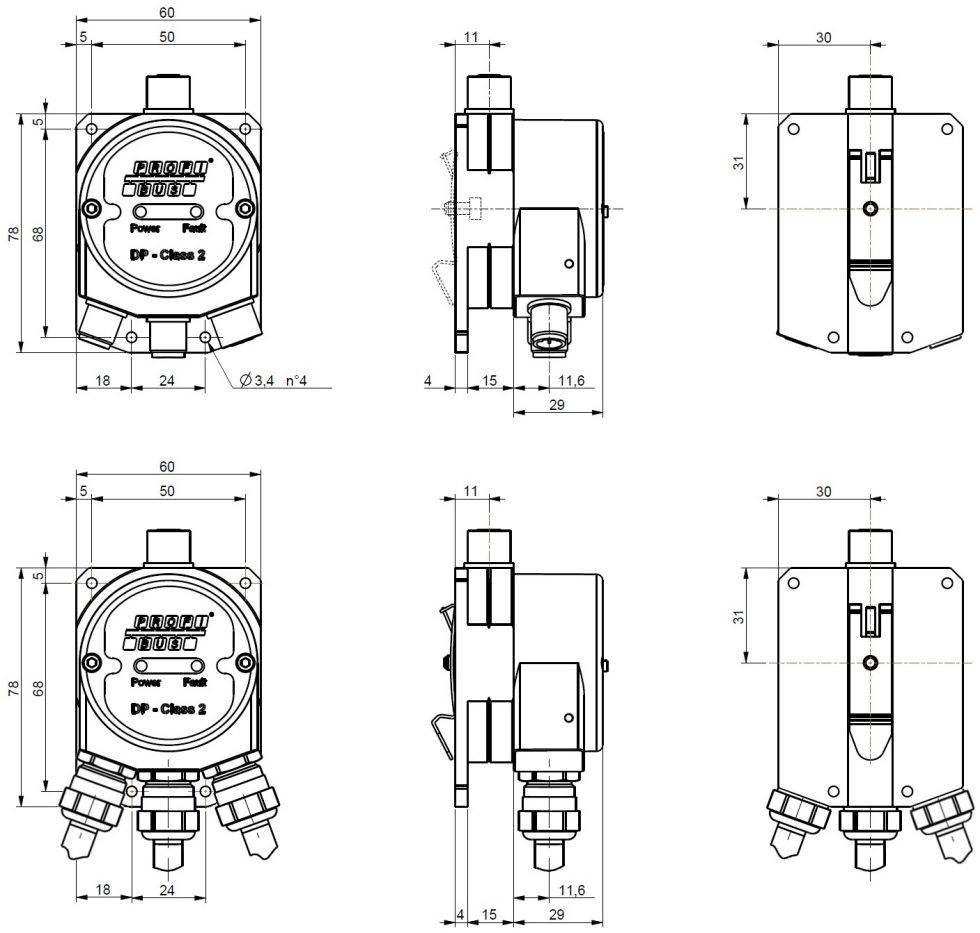


Figure 1

3.2 Installation on panel (Figure 2)

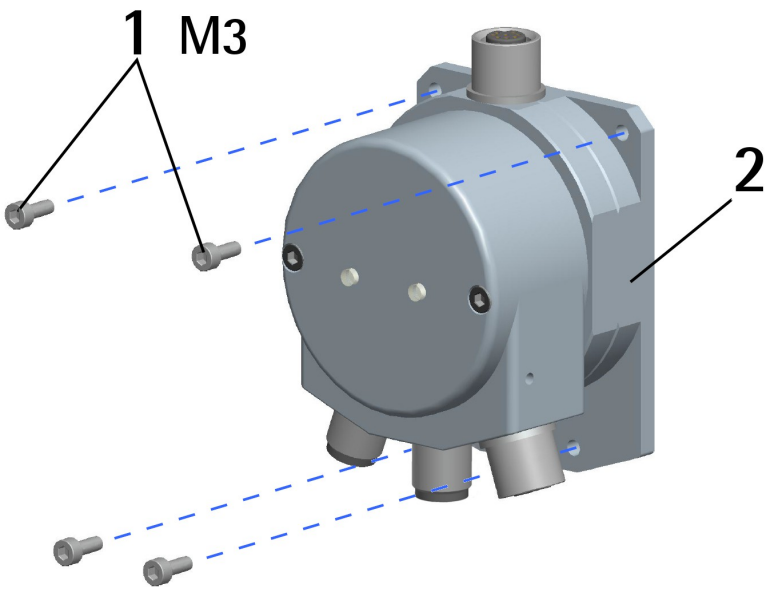


Figure 2

The unit is designed for installation on the even surface of a panel.
The back flange **2** is fitted with four holes for inserting the fixing screws **1**. Tighten the four fixing screws **1** until the unit is properly fastened to the support. Use **four M3 8 mm min. long cylinder head screws**. The recommended tightening torque is **1.1 Nm**.

3.3 Installation with DIN rail clip (Figure 3)

The unit can be installed on DIN profiles inside a rack. A clip **3** for direct fitting on DIN TS35 rails is supplied for free. It has to be fixed on the back of the flange **2** by means of the provided screw **4**.

WARNING
To mount the clip **3** you need to remove the cap **5** and drill a hole **A** in the back flange **2**. Delicate electronic circuits and wirings are located inside the cap **5**. Thus this operation has to be accomplished by skilled personnel only. Please pay careful attention and observe great precaution when carrying out this operation.

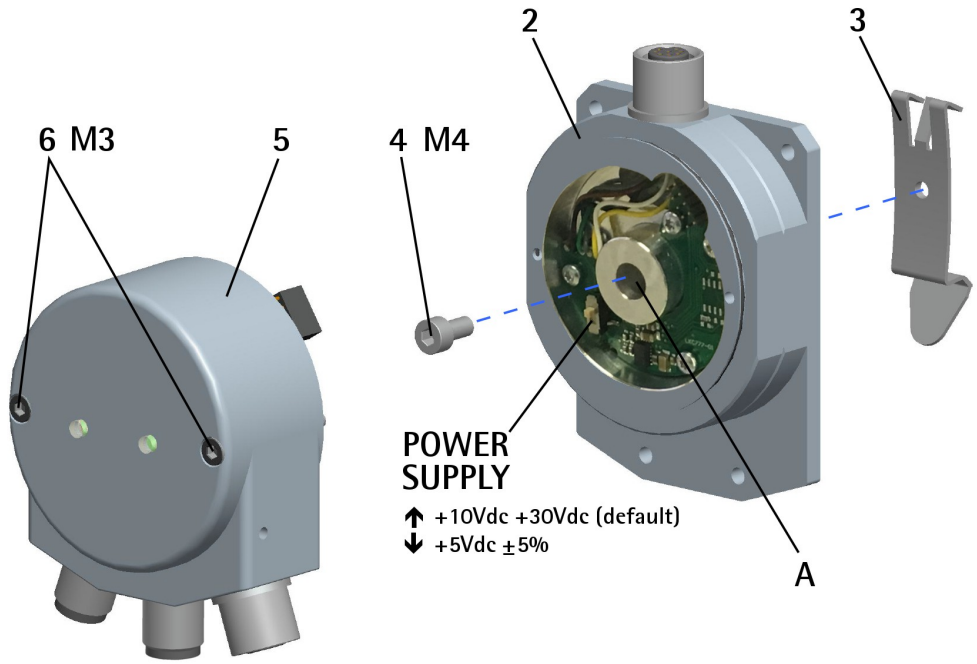


Figure 3

- Loosen the two screws **6** that fasten the cap **5** to the back flange **2**;
- open the cap **5** and separate it from the flange **2**; please pay attention to the internal wirings and connectors;
- drill a 4.5 mm diameter hole **A** in the flange **2**; use the notch in the inside of the flange **2** to guide the drill bit;

WARNING
Carefully remove the scrap material after drilling.

- mount the clip **3** on the back of the flange **2** and fix it by means of the provided M4 x 8 screw **4**; it has to be screwed on the inner side of the flange **2**;
- replace the cap **5** and fix it by means of the screws **6**.

4 - Electrical connections

WARNING
Power supply must be turned off before performing any electrical connection!

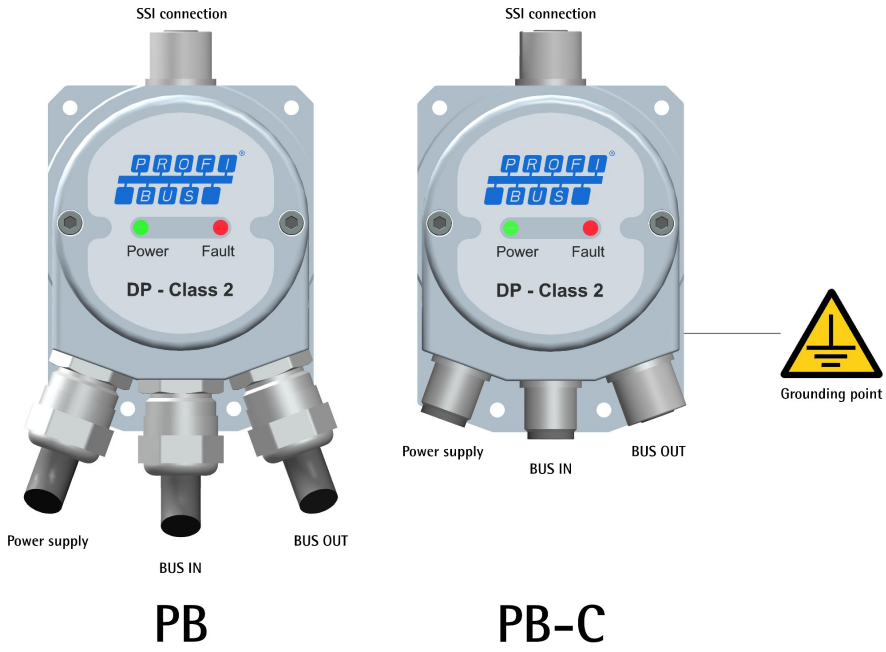


Figure 4

4.1 Connection cap of the converter (Figure 5)

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 (PB connection cap) as well as the DIP switches meant to set the power supply and the node ID and activate the termination resistance (PB and PB-C connection caps) are located inside the converter 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 M3 screws **1** (Figure 5). 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 converter back flange and the connection cap are at the same potential before replacing the connection cap!

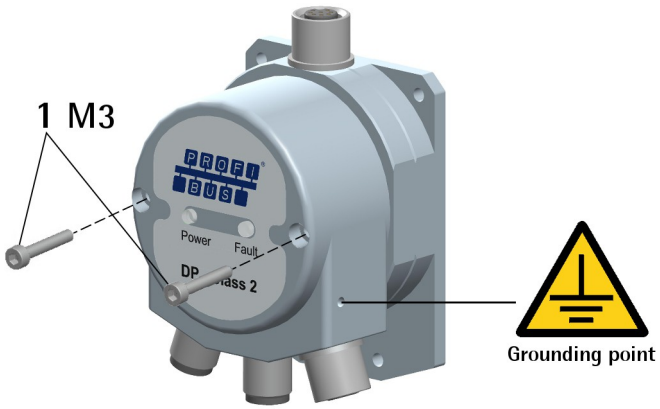
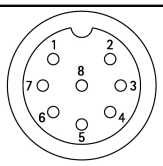


Figure 5

4.2 SSI connection (Figure 4)

The converter is fitted with one M12 8-pin female connector to network the IF55 gateway and the SSI encoder.

M12 8-pin	SSI connection
(frontal side)	 A coding female

Pin	Description
1	0Vdc power supply voltage
2	+Vdc power supply voltage *
3	Clock IN +
4	Clock IN -
5	Data OUT +
6	Data OUT -
7 and 8	not connected

* The power supply voltage level must be set through the POWER SUPPLY DIP switch located inside the enclosure of the converter, see the "4.7 POWER SUPPLY DIP switch (Figure 8)" section on page 28.

WARNING
The max. length of the SSI cable must not exceed 30 m / 98.425 ft.

4.3 Profibus converter with PGs: PB version (Figure 4 and Figure 6)

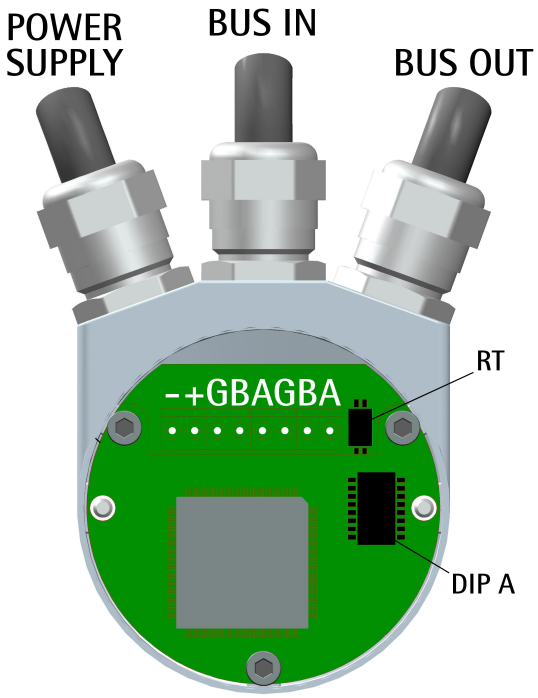


Figure 6

The converter is fitted with three PG9 cable glands for Power Supply, BUS IN and BUS OUT connections. The bus cables can be connected directly to the terminal connectors in front of each cable gland. We recommend Profibus certificated cables to be used. Core diameter should not exceed Ø 1.5 mm (0.06 inches).

Terminal connector	Description
-	0Vdc power supply voltage
+	+10Vdc +30Vdc power supply voltage
G	Profibus GND [1]
B	Profibus B (Red)
A	Profibus A (Green)
PG	Shield [2]

[1] Profibus GND is the 0V reference of Profibus signals, it is not connected to 0Vdc supply voltage.
[2] Connect the cable shield to cable gland.

4.4 Profibus converter with M12 connectors: PB-C version (Figure 4 and Figure 7)

The converter is fitted with three M12 connectors with pin-out in compliance with the Profibus standard. Therefore you can use standard Profibus cables commercially available.

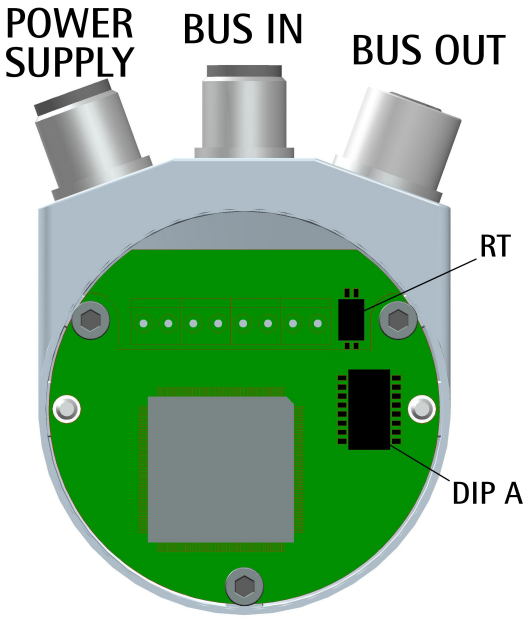
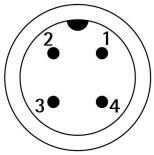


Figure 7

Power supply
M12 connector

A coding

(frontal side)



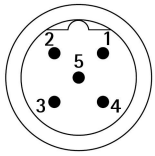
male

Pin	Function
1	+10Vdc +30Vdc power supply voltage
2	not connected
3	0Vdc power supply voltage
4 [1]	Shield
Case	

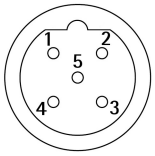
[1] Shield is also connected to pin 4 to allow the connection of the shield even if the plug connector has a plastic case.

Profibus signals
M12 connector
B coding

(frontal side)



male
(BUS IN)



female
(BUS OUT)

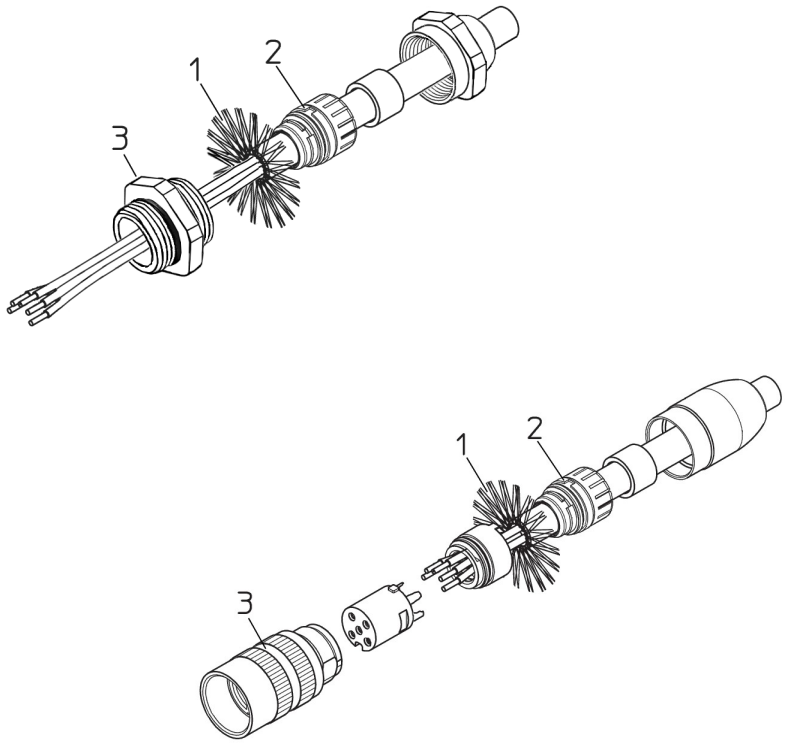
Pin	Function
1	not connected
2	Profibus A (Green)
3	not connected
4	Profibus B (Red)
5	not connected
Case	Shield

4.5 Ground connection (Figure 5)

Minimize noise by connecting the shield and/or the connector housing and/or the enclosure 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 unit. We suggest using the ground point provided in the connection cap (see Figure 5, use one TCEI M3 x 6 cylindrical head screw with two tooth lock washers).

4.6 Shield connection

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**.



4.7 POWER SUPPLY DIP switch (Figure 8)

WARNING
Power supply must be turned off before performing this operation!

The power supply voltage level to be provided to the connected encoder must be set through the POWER SUPPLY DIP switch located inside the enclosure of the converter. It must be according to the power supply voltage level required by the connected SSI encoder. To access the POWER SUPPLY DIP switch refer to the "4.1 Connection cap of the converter (Figure 5)" section on page 23.

Set the POWER SUPPLY DIP switch to UP position to provide +10Vdc +30Vdc power supply voltage level to the encoder (default setting); set the POWER SUPPLY DIP switch to DOWN position to provide +5Vdc ±5% power supply voltage level to the encoder.

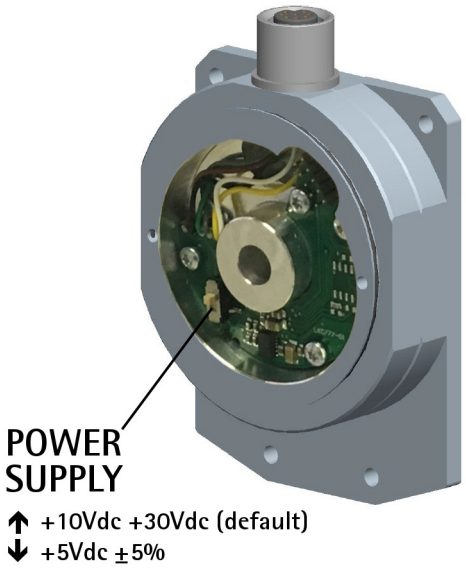
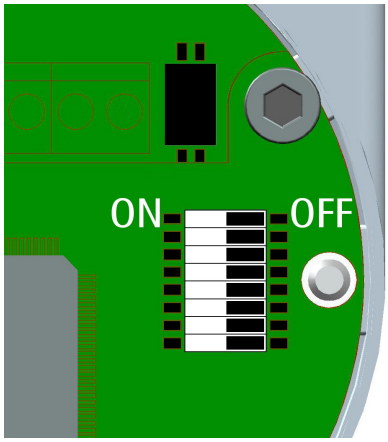


Figure 8

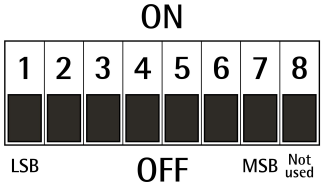
4.8 Node Address: DIP A (Figure 6 and Figure 7)

WARNING
Power supply must be turned off before performing this operation!

The node number must be set via hardware using the DIP A DIP switch.
Allowed addresses are from 0 to 125. The default value is 1.



DIP A:



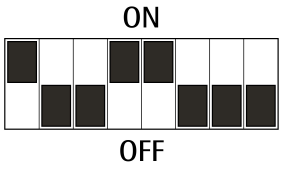
Turn the power supply off and set the node address in binary value; consider that: ON = 1, OFF = 0

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

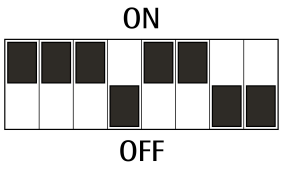
Set node address = 25:
25_{10} = 0001 1001$_2$ (binary value)

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 address = 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 the "4.10 RT Bus termination (Figure 6 and Figure 7)" section on page 31).

4.9 Baud rate

The baud rate is set by the Master via software at 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:

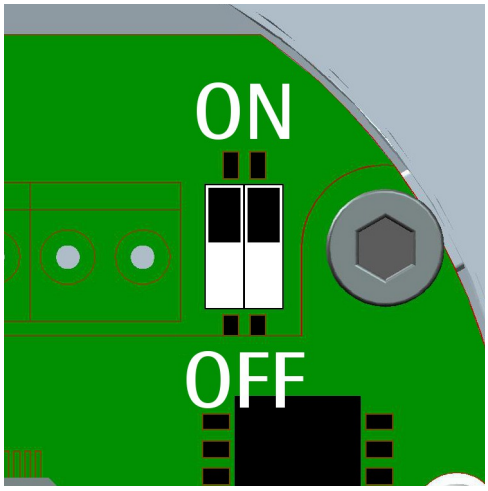
Baud rate [Kbit/s]	9.6	19.2	93.75	187.5	500	1500	12000
Max. cable length	1200 m 4000 ft	1200 m 4000 ft	1200 m 4000 ft	1000 m 3300 ft	400 m 1300 ft	200 m 660 ft	100 m 330 ft

4.10 RT Bus termination (Figure 6 and Figure 7)

WARNING
Power supply must be turned off before performing this operation!

A bus termination resistance is provided inside the encoder enclosure and must be activated as line termination if the encoder is at the ends of the transmission line (i.e. it is either the first or the last device in the transmission line).
Use RT Switch to activate or deactivate the bus termination.

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



4.11 Diagnostic LEDs (Figure 4)

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

Fault (red)	Power (green)	Event
OFF	OFF	No power supply or hardware fault
OFF	ON	Correct operation (correct communication)
ON	Flashing	Configuration parameters not valid
Flashing	ON	Bus communication failure
Flashing	Flashing	Flash memory error

5 - Getting started

The following instructions allow the operator to quickly and safely set up the converter in a standard operational mode and to execute its main functions. For complete and detailed information please read the mentioned pages thoroughly.

- Mechanically install the device, see on page 20 ff;
- execute the electrical and network connections, see on page 23 ff;
- if required, set the power supply voltage level of the connected encoder, see on page 28;
- set the node address, see on page 29;
- set the line termination if required, see on page 31;
- switch on the +10Vdc +30Vdc power supply;
- in the software tool install the GSD file, see on page 36;
- set the characteristics of the connected SSI encoder:
  - set the number of SSI clocks next to the **Number of SSI clocks** parameter;
  - set the output code used by the SSI encoder to arrange the output information next to the **Code Type (BINARY/GRAY)** parameter;
  - set the protocol used by the SSI encoder to arrange the absolute information next to the **SSI Protocol** parameter;
  - set the physical singleturn resolution of the SSI encoder next to the **Physical Singleturn Res. [bits]** parameter;
  - set the physical multiturn resolution of the SSI encoder next to the **Physical Multiturn Res. [bits]** parameter;
- if you want to use the physical resolution (see the **Physical Singleturn Res. [bits]** parameter and the **Physical Multiturn Res. [bits]** parameter), please check that the **Scaling function control** parameter is disabled (the bit 3 in the byte 10 = 0; see on page 47); the scaling function is available only for Class 2 devices (IF55-R Class 2 submodule);
- otherwise, if you need a custom resolution, enable the **Scaling function control** parameter (the bit 3 in the byte 10 = 1; see on page 47) and then set the resolution you need for your application next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters (see on page 54 ff); the scaling function is available only for Class 2 devices (IF55-R Class 2 submodule);
- if you need you can enter the Preset value next to the **Preset value** parameter and then set it in the desired position; see on page 59.

NOTE

Please consider that if the **Bypass** parameter (see on page 50) is set to "0" = disabled, the position value read by the encoder can be processed according to needs, so the user can scale the value, set a preset, and change the counting direction. On the contrary, if the **Bypass** parameter (see on page 50) is set to "1" = enabled, the information from the encoder is transmitted "as it is" and not processed in any way. The preset, scaling and counting direction functions -even if set and enabled- are ignored; also the output code setting is ignored. If, for example, the user sets a preset while the bypass mode is enabled, the value is accepted, but not activated. As soon as the bypass mode is disabled, the preset, scaling and counting direction functions -if set and enabled- become active and the **Position value** will be accordingly.

EXAMPLE 1

We need to connect the **MM36 12/8192 BB** rotary encoder.

The main features of the rotary encoder are:
Singleturn Resolution: **12 bits = 4,096 cpr** ("12", see the order code in the product datasheet).
Multiturn Resolution: **13 bits = 8,192 rev.** ("8192", see the order code in the product datasheet).
Total resolution = **25 bits** = 4,096 x 8,192 = 33 554 432
Output code: **Binary code** ("BB", see the order code in the product datasheet).
SSI protocol: **25-bit "LSB Right Aligned" protocol** ("BB", see the order code in the product datasheet, see the "User's manual").

Code Type (BINARY/GRAY) = 0h = Binary code
SSI Protocol = 0h = 25-bit "LSB Right Aligned" protocol
Number of SSI clocks = 19h = 25 dec
Physical Singleturn Res. [bits] = 0Ch = 12 bits = 4,096 cpr
Physical Multiturn Res. [bits] = 0Dh = 13 bits = 8,192 rev.

If you want to use the physical resolution:
Scaling function control bit 3 in the byte 10 = 0

If you need a custom resolution (Class 2 devices only):
Scaling function control bit 3 in the byte 10 = 1
Now set the resolution you need for your application next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters.

EXAMPLE 2
We need to connect the **AS58 13/BB** rotary encoder.

The main features of the rotary encoder are:
Singleturn Resolution: **13 bits = 8,192 cpr** ("13", see the order code in the product datasheet).
Output code: **Binary code** ("BB", see the order code in the product datasheet).
SSI protocol: **13-bit "LSB Right Aligned" protocol** ("BB", see the order code in the product datasheet, see the "User's manual").

Code Type (BINARY/GRAY) = 0h = Binary code
SSI Protocol = 0h = 13-bit "LSB Right Aligned" protocol
Number of SSI clocks = 0Dh = 13 dec
Physical Singleturn Res. [bits] = 0Dh = 13 bits = 8,192 cpr
Physical Multiturn Res. [bits] = 0h = 2^0 bits = 1 rev.)

If you want to use the physical resolution:
Scaling function control bit 3 in the byte 10 = 0

If you need a custom resolution (Class 2 devices only):
Scaling function control bit 3 in the byte 10 = 1
Now set the resolution you need for your application next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters.

EXAMPLE 3
We need to connect the **AM58 13/4096 GA** rotary encoder.

The main features of the rotary encoder are:
Singleturn Resolution: **13 bits = 8,192 cpr** ("13", see the order code in the product datasheet).
Multiturn Resolution: **12 bits = 4,096 rev.** ("4096", see the order code in the product datasheet).
Output code: **Gray code** ("GA", see the order code in the product datasheet).
SSI protocol: **25-bit "LSB Right Aligned" protocol** ("GA", see the order code in the product datasheet, see the "User's manual").

Code Type (BINARY/GRAY) = 1h = Gray code
SSI Protocol = 0h = 25-bit "LSB Right Aligned" protocol
Number of SSI clocks = 19h = 25 dec
Physical Singleturn Res. [bits] = 0Dh = 13 bits = 8192 cpr
Physical Multiturn Res. [bits] = 0Ch = 12 bits = 4096 rev.

If you want to use the physical resolution:
Scaling function control bit 3 in the byte 10 = 0

If you need a custom resolution (Class 2 devices only):
Scaling function control bit 3 in the byte 10 = 1
Now set the resolution you need for your application next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters.

EXAMPLE 4
We need to connect the **HM58 16/16384 GA** rotary encoder.

The main features of the rotary encoder are:
Singleturn Resolution: **16 bits = 65,536 cpr** ("16", see the order code in the product datasheet).
Multiturn Resolution: **14 bits = 16,384 rev.** ("16384", see the order code in the product datasheet).
Output code: **Gray code** ("GA", see the order code in the product datasheet).
SSI protocol: **32-bit "LSB Right Aligned" protocol** ("GA", see the order code in the product datasheet, see the "User's manual").

Code Type (BINARY/GRAY) = 1h = Gray code
SSI Protocol = 0h = 32-bit "LSB Right Aligned" protocol
Number of SSI clocks = 20h = 32 dec
Physical Singleturn Res. [bits] = 10h = 16 bits = 65,536 cpr
Physical Multiturn Res. [bits] = 0Eh = 14 bits = 16,384 rev.

If you want to use the physical resolution:
Scaling function control bit 3 in the byte 10 = 0

If you need a custom resolution (Class 2 devices only):
Scaling function control bit 3 in the byte 10 = 1
Now set the resolution you need for your application next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters.

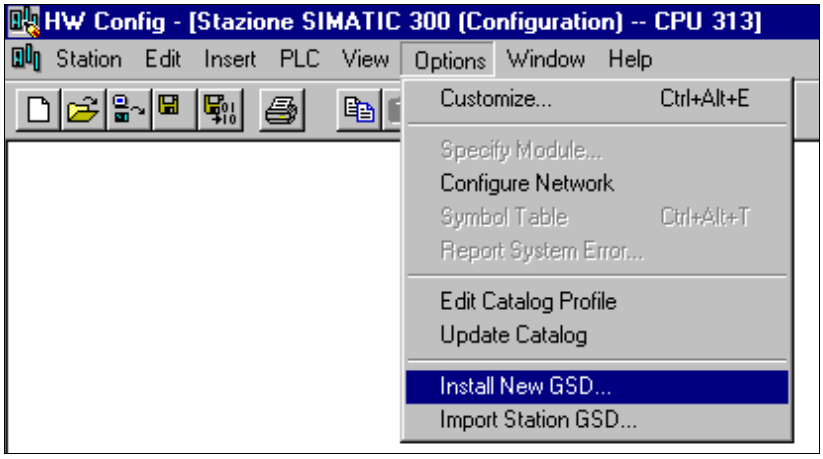
6 - Quick reference

6.1 STEP7 configuration

6.1.1 Importing the GSD file

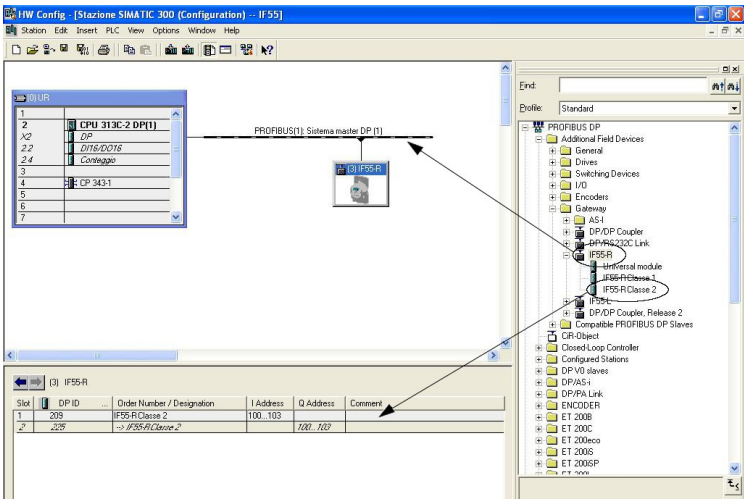
Profibus converters are supplied with their own GSD file **IFR_Vx.GSD** (see at the address **www.lika.biz > DISPLAYS & INTERFACES > SIGNAL CONVERTERS & INTERFACES (POSICONTROL)**.
GSD file is available in both English version (**IFR_Vx.GSE**) and Italian version (**IFR_Vx.GSI**).
GSD file has to be installed in the Profibus Master device.
Vx is intended to indicate the file version.
Please note that the rotary encoder converters and the linear encoder converters have different GSD files. Files for rotary encoders are marked with IFR- in the file name; while files for linear encoders are marked with IFL- in the file name.

In the menu bar of the **HW Config** window, press **Options** and then **Install New GSD...** command.
Select the correct GSD file in the installation window and install it.



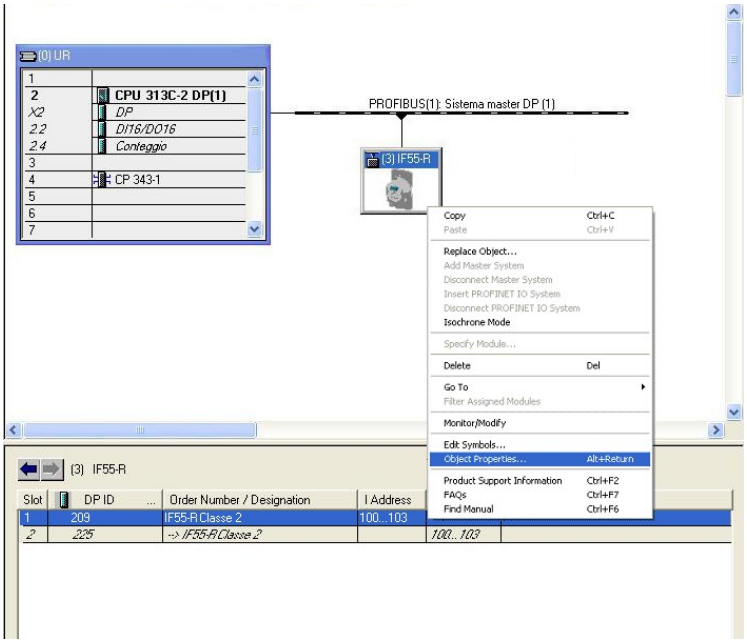
6.1.2 Adding a node to the project

In the side pane of the **HW Config** window, open the directory tree and select **Catalog\PROFIBUS_DP\Additional Field Devices\Gateway**; drag the "IF55-R" module to the main window and drop it on the bus line.
Then drag the desired submodule (Class 1 or Class 2) to the variables table in the bottom; in this way you set the class of the device (for further details on the available classes see the "7.2 Classes of the Device profile" section on page 43).

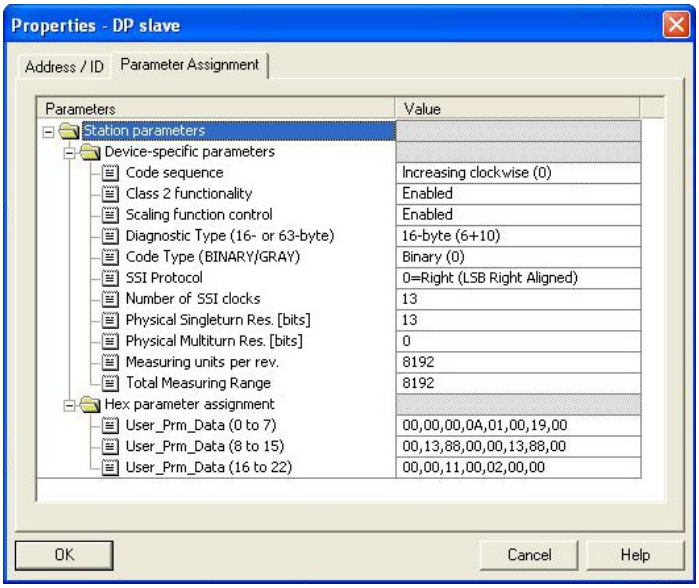


6.1.3 Converter configuration parameters

To enter the converter configuration parameters window, select the device in the submodule page in the bottom of the **HW Config** window and right-click to open the menu; then choose the **Object Properties...** command.



The **Properties – DP slave** window will appear; in the **Parameter Assignment** page the list of all converter parameters is available.
For any information on using and setting each parameter refer to the "7.4 DDLM_Set_Prm" section on page 45.



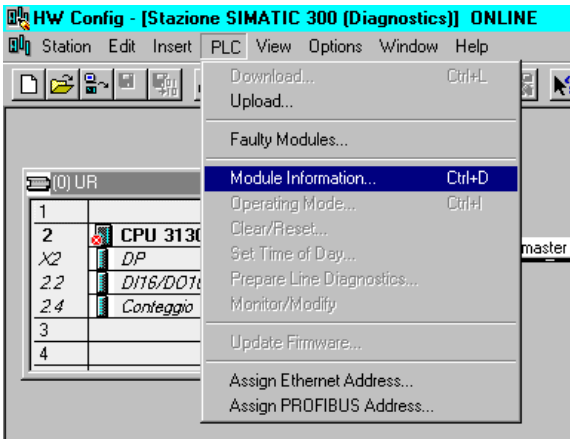
Example of parametrization of a Class 2 device

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

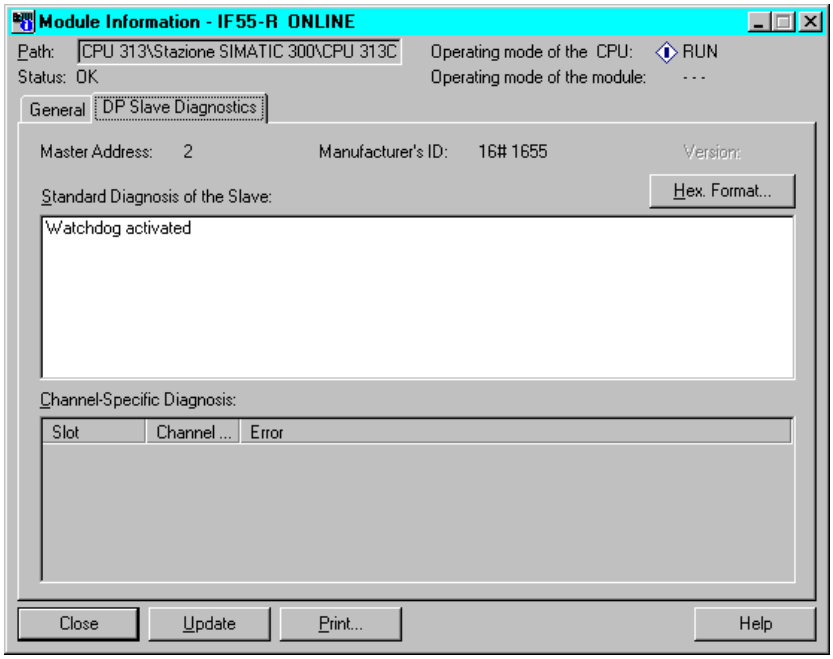
6.2 Reading the diagnostic information

The diagnostic information message can be set to either 16 or 63 bytes, see the **Diagnostic type (16- or 63-byte)**.

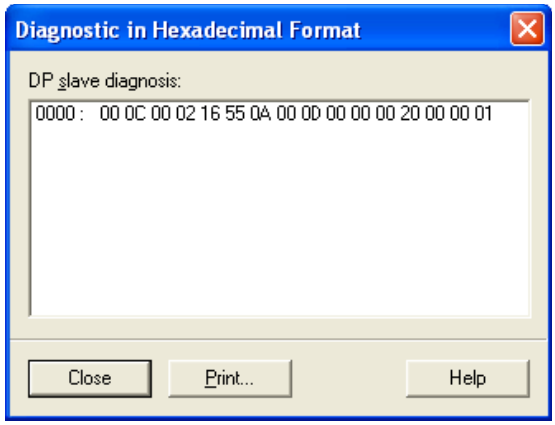
Before entering the diagnostic page, it is necessary to connect to the unit (enter online status). To do this, select **Station\Open online** in the **HW Config** window or click the **Online<->Offline** button (see the icon on the left). Then select **PLC\Module information...** to enter the **Module information** window. Finally open the **DP Slave Diagnostic** page.



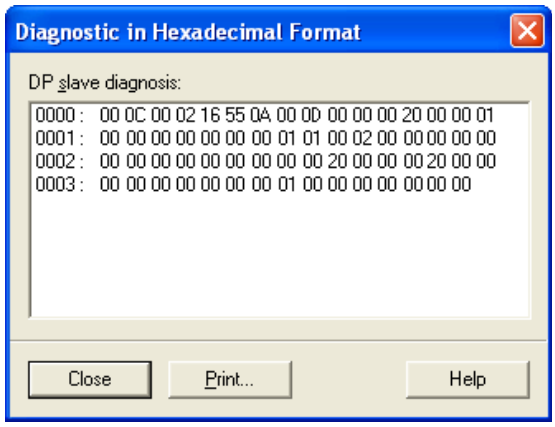
Click the **Hex. Format...** button to display the diagnostic information:



16-byte reduced diagnostics:



63-byte extended diagnostics:



NOTE

If the 63-byte diagnostics does not work properly with STEP7 software we suggest setting the 16-byte diagnostics.

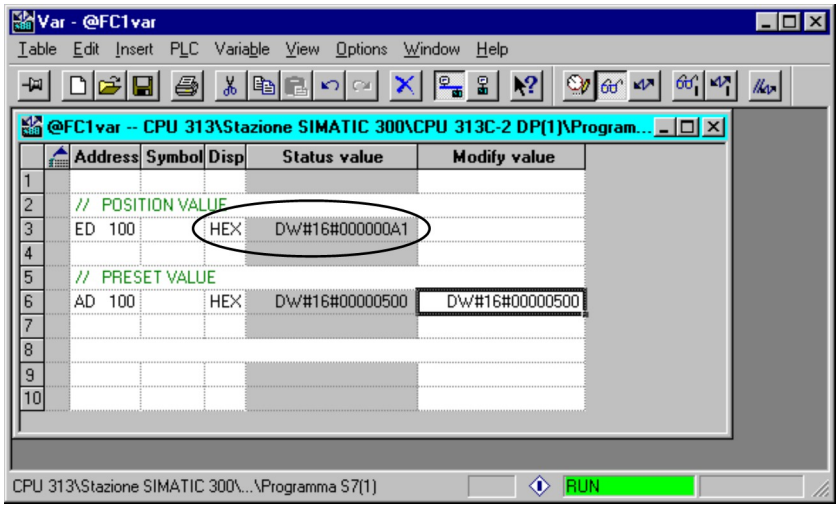
If the diagnostic information is not used, we recommend the 16-byte diagnostics to be set (see the "6.1.3 Converter configuration parameters" section on page 37).

See the "7.7 DDLM_Slave_Diag" section on page 60 for a complete list and meaning of each diagnostic byte.

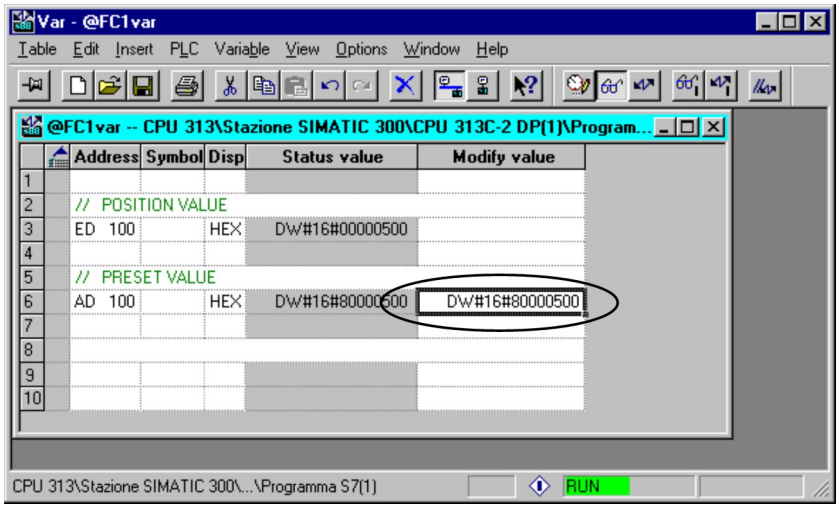
6.3 Setting the Preset value

EXAMPLE

The encoder having device address 1 transmits the **Position value** to the Master.
The **Position value** is loaded into variables ED 100...103 (4 bytes).
The **Preset value** is sent to the encoder using variables AD 100...103 (4 bytes).



The current position of the encoder is 0000 00A1hex.
To set the **Preset value** = 0000 0500hex, set the bit 31 in the variable AD 100 = "1" (8000 0500hex).



Finally press the **Command variables** button in the Toolbar (see the icon here on the right).

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 press the **Command variables** button again.

NOTE

It may occur that 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) for encoder position and Preset to be used.

7 - Profibus® interface

Lika encoders with IF55 converters are Slave devices and comply with the "Profibus-DP Profile for Encoders"; they can be set as Class 1 or Class 2 devices (see the "7.2 Classes of the Device profile" section on page 43).
For any omitted information refer to the official Profibus website **www.profibus.com**.

7.1 GSD file

Profibus converters are supplied with their own GSD file **IFR_Vx.GSD** (see at **www.lika.biz > DISPLAYS & INTERFACES > SIGNAL CONVERTERS & INTERFACES (POSICONTROL)**.
GSD file is available in both English version (**IFR_Vx.GSE**) and Italian version (**IFR_Vx.GSI**).
GSD file has to be installed in the Profibus Master device.
Vx is intended to indicate the file version.
Please note that the rotary encoder converters and the linear encoder converters have different GSD files. Files for rotary encoders are marked with IFR- in the file name; while files for linear encoders are marked with IFL- in the file name.

7.2 Classes of the Device profile

Encoder class must be set when configuring the device.

Both Class 1 and Class 2 provide the parameters for setting the connected SSI encoder features, such as:

- SSI code type (see **Code Type (BINARY/GRAY)** parameter);
- SSI protocol (see **SSI Protocol** parameter);
- number of SSI clocks (see **Number of SSI clocks** parameter);
- encoder resolution (see **Physical Singleturn Res. [bits]** and **Physical Multiturn Res. [bits]** parameters).

Mandatory **Class 1** provides the basic functions of the device and can be used for:

- sending the position value (see **Position value** parameter);
- changing the counting direction (see **Code sequence** parameter);
- setting the preset value (see **Preset value** parameter);
- acquiring reduced diagnostic information (see **16-byte reduced diagnostics** parameter).

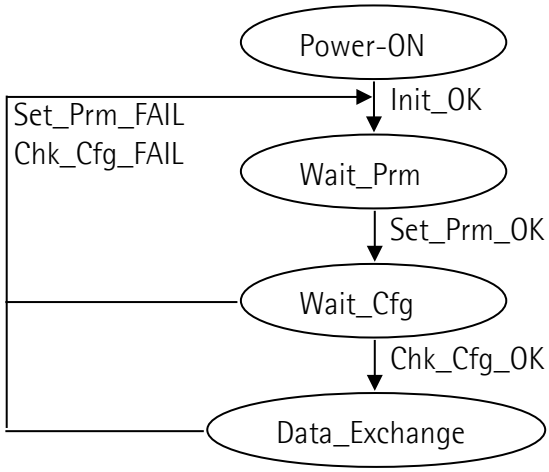
Class 2 provides all the Class 1 functions and additional advanced functions such as:

- scaling function (see **Scaling function control**, **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters);

- extended diagnostic information (see **Diagnostic type (16- or 63-byte)** parameter).

7.3 Modes of operation

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



NOTE
All parameters -except for the **Preset value**- are transmitted in **Set_Prm** mode. **Preset value** is transmitted only in **Data_Exchange** mode.

Types of communication

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

- **DDLM_Set_Prm:**
  it is used for configuring the Slave. This communication mode is active immediately after the power is turned ON and used to send parameters from the Master to the Slave (see the "7.4 DDLM_Set_Prm" section on page 45).

- **DDLM_Chk_Cfg:**
  it sets the number of bytes used for data transmission in **Data_Exchange** mode (see the "7.5 DDLM_Chk_Cfg" section on page 58).

- **DDLM_Data_Exchange:**
  it is used as "standard operation mode".
  Used by the Master to send the **Preset value**; used by the Slave to transmit the position value (see the "7.6 DDLM_Data_Exchange" section on page 59).

- **DDLM_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 "7.7 DDLM_Slave_Diag" section on page 60).

7.4 DDLM_Set_Prm

When the system is turned on, configuration data set by the operator is sent to the absolute encoder by the controller. 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 the "6.1 STEP7 configuration" section on page 36).
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 in compliance with the values set for the encoder profile and shown in the following tables.

DDLM_Set_Prm with Class 1 (IF55-R Class 1 submodule):

Byte	Parameter	
0 ... 9	Reserved for PROFIBUS network	
10	Operating parameters	
	bit 0	Code sequence
	bits 1 ... 5	Reserved
	bit 6	16-byte reduced diagnostics
	bit 7	Reserved
11	bit 0	Code Type (BINARY/GRAY)
	bit 1	SSI Protocol
	bit 2	Bypass
	bits 3 ... 7	Reserved
12	Number of SSI clocks	
13	Physical Singleturn Res. [bits]	
14	Physical Multiturn Res. [bits]	

DDLM_Set_Prm with Class 2 (IF55-R Class 2 submodule):

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 control
	bits 4 and 5	Reserved
	bit 6	Diagnostic type (16- or 63-byte)
	bit 7	Reserved
11	bit 0	Code Type (BINARY/GRAY)
	bit 1	SSI Protocol
	bit 2	Bypass
	bits 3 ... 7	Reserved
12	Number of SSI clocks	
13	Physical Singleturn Res. [bits]	
14	Physical Multiturn Res. [bits]	
15 ... 18	Programmable pulse/rev [pulse]	
19 ... 22	Programmable total range [pulse]	

7.4.1 Byte 10 - Operating parameters 1

Bit	Function	bit = 0	bit = 1
0	Code sequence	**CW (clockwise)**	CCW (counter clockwise)
1	Class 2 functionality	Disabled	**Enabled**
2	Reserved		
3	Scaling function control	Disabled	**Enabled**
4 and 5	Reserved		
6	Diagnostic type (16- or 63-byte)	**16-byte (6+10)**	63-byte (6+57)
7	Reserved		

Default values are highlighted in **bold**.

Code sequence

This is intended to set whether the position value output by the transducer increases (count up information) when the encoder shaft rotates clockwise (CW) or counter-clockwise (CCW). When the bit 0 Code sequence = 0 = CW the position value increases when the encoder shaft rotates clockwise; on the

contrary, when the bit 0 **Code sequence** = 1 = CCW the position value increases when the encoder shaft rotates counter-clockwise. CW and CCW rotations are viewed from the shaft end.
Default = 0 (min. = 0, max. = 1)

WARNING
Changing this value causes also the position calculated by the controller to be necessarily affected. Every time you change the **Code sequence**, then you are required to set a new preset value (see the **Preset value** parameter).

NOTE
Please consider that if the **Bypass** parameter (see on page 50) is set to "1" = enabled, the counting direction function -if set differently from default- is ignored.

Class 2 functionality

This is only available when the encoder Class 2 is installed (IF55-R Class 2 submodule).
Two device classes are defined in the encoder profile, one mandatory class (Class 1) and an optional class with advanced functions (Class 2). This converter implements functions of both Class 1 and Class 2 for encoders. For any information on the available encoder classes see the "7.2 Classes of the Device profile" section on page 43.
0 = Disabled = Encoder Class 1 is set.
1 = Enabled = Encoder Class 2 is set.
Default = 1 (min. = 0, max. = 1)

Scaling function control

This is only available when the encoder Class 2 is installed (IF55-R Class 2 submodule).
When this option is disabled (bit 3 **Scaling function control** = 0 = DISABLED), the device uses the physical singleturn resolution and the physical multiturn resolution to arrange the absolute position information (see **Physical Singleturn Res. [bits]** and **Physical Multiturn Res. [bits]** parameters; **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters are forced to the physical singleturn resolution and total physical resolution respectively).
On the contrary, if it is enabled (bit 3 **Scaling function control** = 1 = ENABLED), the custom resolution set in the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters is used to calculate the position information.
Default = 1 (min. = 0, max. = 1)

WARNING

When you enable the scaling function (**Scaling function control** = 1), please enter scaled values next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters that are consistent with the physical values. In the case of inconsistent values, the system does not go online and visually warns about the wrong parametrization and fault condition by means of the diagnostic LEDS.

WARNING

Every time you enable the scaling function and/or change the scaling values (see the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters) then you are required to set a new preset value (see the **Preset value** parameter).

WARNING

You can activate the custom values set next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters only if **Class 2 functionality** = ENABLED; if **Scaling function control** = ENABLED the set custom resolution values are enabled and used by the encoder; on the contrary, if **Scaling function control** = 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 physical values, NOT the new entered values, until you enable the **Scaling function control**.

NOTE

Please consider that if the **Bypass** parameter (see on page 50) is set to "1" = enabled, the scaling function -if set differently from default- is ignored.

16-byte reduced diagnostics

This is only available when the encoder Class 1 is installed (IF55-R Class 1 submodule).
Class 1 devices only provide reduced 16-byte diagnostics.
The meaning of each diagnostic byte is detailed in the "7.7 DDLM_Slave_Diag" section on page 60.
Default = 0 (min. = 0, max. = 0)

Diagnostic type (16- or 63-byte)

This is only available when the encoder Class 2 is installed (IF55-R Class 2 submodule).
It allows to set either reduced or extended diagnostics.
0 = Reduced = 16-byte diagnostic information
1 = Extended = 63-byte diagnostic information

The meaning of each diagnostic byte is detailed in the "7.7 DDLM_Slave_Diag" section on page 60.
Default = 0 (min. = 0, max. = 1)

7.4.2 Byte 11 - Operating parameters 2

Bit	Function	bit = 0	bit = 1
0	Code Type (BINARY/GRAY)	**Binary**	Gray
1	SSI Protocol	**Right (LSB Right Aligned)**	Left (MSB Left Aligned)
2	Bypass	**Disabled**	Enabled
3 ... 7	Reserved		

Default values are highlighted in **bold**.

Code Type (BINARY/GRAY)

It sets the output code used by the SSI encoder to output the absolute position information. The output code can be Binary (bit 0 Code Type (BINARY/GRAY) = 0) or Gray (bit 0 Code Type (BINARY/GRAY) = 1). For any information on the output code please refer to the "User's manual" of the connected encoder.
Default = 0 (min. = 0, max. = 1)

EXAMPLE
We need to connect the following rotary encoder: **MM36 12/8192 BB**.
MM36 ... BB encoder uses the Binary code to output the absolute position information. Thus you have to set the value 0 = Binary in this bit. For further information refer to the "User's manual" of the connected encoder.

EXAMPLE
We need to connect the following rotary encoder: **AM58 13/4096 GA**.
"GA" in the order code means that "LSB Right Aligned" protocol and Gray code are used to arrange the absolute position information. Thus you have to set the value 1 = Gray in this bit. For further information refer to the "User's manual" of the connected encoder.

SSI Protocol

It sets the SSI protocol used by the SSI encoder to arrange the absolute position information. The SSI protocol can be the "LSB Right Aligned" protocol (bit 1 SSI Protocol = 0) or the "MSB Left Aligned" protocol (bit 1 SSI Protocol = 1). For

any information on the SSI protocol please refer to the "User's manual" of the connected encoder.
Default = 0 (min. = 0, max. = 1)

NOTE
If the bit 1 **SSI Protocol** = 1 = "MSB Left Aligned" protocol, the **Number of SSI clocks** (see on page 51) must be equal to the number of bits of the total physical resolution (**Physical Singleturn Res. [bits]** + **Physical Multiturn Res. [bits]**).

EXAMPLE
We need to connect the following rotary encoder: **MM36 12/8192 BB**.
MM36 encoder uses the 25-bit "LSB Right Aligned" protocol to arrange the absolute position information. Thus you have to set the value 0 in this bit. For further information refer to the "User's manual" of the connected encoder.

EXAMPLE
We need to connect the following rotary encoder: **AM36 19/4096 BG**.
AM36 encoder implements the "MSB Left Aligned" protocol and requires 31 clocks (the length of the word is 31 bits: total physical resolution = 19 bit singleturn + 12 bit multiturn). Thus you have to set 1 in this entry and 31 in the **Number of SSI clocks** parameter. For further information refer to the encoder's "User's manual".

Bypass

If the bit 2 **Bypass** = 0 = disabled, the "Bypass mode" is disabled, that is: the position value (refer to the **Position value** parameter on page 59) read by the encoder can be processed according to needs, so the user can scale the value, set a preset and change the counting direction.
If the bit 2 **Bypass** = 1 = enabled, the "Bypass mode" is enabled, that is: the information from the encoder is transmitted "as it is" and not processed in any way. The preset, scaling and counting direction functions -even if set and enabled- are ignored. If, for example, the user sets a preset while the "Bypass mode" is enabled, the value is accepted, but not activated. As soon as the "Bypass mode" is disabled, the preset, scaling and counting direction functions -if set and enabled- become active and the **Position value** will be accordingly.
Default = 0 (min. = 0, max. = 1)

7.4.3 Byte 12

Number of SSI clocks

It sets the number of SSI clocks required by the SSI encoder to send the complete data word. The number of clocks depends on the resolution of the encoder and the type of SSI protocol. The value has to be comprised between 1 and 32. For any information on the SSI clocks required please refer to the "User's manual" of the connected encoder.
Default = 32 (min. = 1, max. = 32)

EXAMPLE
We need to connect the following rotary encoder: **AS58 13/BB**.
AS58 uses the 13-bit "LSB Right Aligned" protocol to arrange the absolute position information as its overall resolution is ≤ 13 bits (13 bits). It always requires 13 clocks (the length of the word is always 13 bits, regardless of the max. number of information to provide). Thus you have to set 13 here. For further information refer to the "User's manual" of the connected encoder.

EXAMPLE
We need to connect the following rotary encoder: **AM36 19/4096 BG**.
AM36 encoder implements the "MSB Left Aligned" protocol and requires 31 clocks (the length of the word is 31 bits). Thus you have to set 31 in this entry. For further information refer to the encoder's "User's manual".

EXAMPLE
We need to connect the following rotary encoder: **MM36 12/8192 BB**.
MM36 uses the 25-bit "LSB Right Aligned" protocol to arrange the absolute position information as its overall resolution is ≤ 25 bits (12 + 13 bits). It always requires 25 clocks (the length of the word is always 25 bits, regardless of the max. number of information to provide). Thus you have to set 25 here. For further information refer to the "User's manual" of the connected encoder.

EXAMPLE
We need to connect the following rotary encoder: **HM58 16/16384 BA**.
HM58 uses the 32-bit "LSB Right Aligned" protocol to arrange the absolute position information as its overall resolution is ≤ 32 bits (16 + 14 bits). It always requires 32 clocks (the length of the word is always 32 bits, regardless of the max. number of information to provide). Thus you have to set 32 here. For further information refer to the "User's manual" of the connected encoder.

7.4.4 Byte 13

Physical Singleturn Res. [bits]

WARNING

This parameter is active only if the **Scaling function control** parameter is set to "=0"; otherwise it is ignored and the system uses the custom values (**Programmable pulse/rev [pulse]** and **Programmable total range [pulse]**) to calculate the position information.
Furthermore, if the **Bypass** parameter (see on page 50) is set to "1" = enabled, the scaling function -even if enabled- is ignored and the position information is outputted as it is.

It sets the physical singleturn resolution (the number of physical distinguishable steps per each revolution) of the SSI encoder expressed in bits.
The value has to be comprised between 1 and 18. Usually the physical resolution can be read in the order code (see the product datasheet).
Default = 16 (min. = 1, max. = 18)

NOTE

If **Physical Singleturn Res. [bits]** > 16, **Physical Multiturn Res. [bits]** is forced to 0 automatically. If **Physical Singleturn Res. [bits]** ≤ 16, the total physical resolution will be ≤ 30.

EXAMPLE

We need to connect the following rotary encoder: **MM36 12/8192**.
As you can see in the product datasheet, "12" in the order code means a physical singleturn resolution of 12 bits (4,096 cpr). Thus you have to set the value 12 here. For further information refer also to the "User's manual" of the connected encoder.

EXAMPLE

We need to connect the following rotary encoder: **HM58 16/16384**.
As you can see in the product datasheet, "16" in the order code means a physical singleturn resolution of 16 bits (65,536 cpr). Thus you have to set the value 16 here. For further information refer also to the "User's manual" of the connected encoder.

7.4.5 Byte 14
Physical Multiturn Res. [bits]

WARNING
This parameter is active only if the **Scaling function control** parameter is set to "=0"; otherwise it is ignored and the system uses the custom values (**Programmable pulse/rev [pulse]** and **Programmable total range [pulse]**) to calculate the position information.
Furthermore, if the **Bypass** parameter (see on page 50) is set to "1" = enabled, the scaling function -even if enabled- is ignored and the position information is outputted as it is.

It sets the physical multiturn resolution (the number of physical revolutions) of the SSI encoder expressed in bits.
The value has to be comprised between 0 and 14. Usually the physical resolution can be read in the order code (see the product datasheet).
Default = 14 (min. = 0, max. = 14)

NOTE
If **Physical Singleturn Res. [bits]** > 16, **Physical Multiturn Res. [bits]** is forced to 0 automatically. If **Physical Singleturn Res. [bits]** ≤ 16, the total physical resolution will be ≤ 30.

EXAMPLE
We need to connect the following rotary encoder: **AS58 13**.
AS58 is a singleturn encoder, thus its physical number of revolutions is 1. To translate the number of revolutions into bits, you must calculate the power of 2 of the value: $1 = 2^0$. Thus the value to be set here is 0. For further information refer also to the "User's manual" of the connected encoder.

EXAMPLE
We need to connect the following rotary encoder: **MM36 12/8192**.
In the order code, the hardware multiturn resolution is usually expressed in number of revolutions. To translate the number of revolutions into bits, you must calculate the power of 2 of the value: $8,192 = 2^{13}$. Thus the value to be set here is 13. For further information refer also to the "User's manual" of the connected encoder.

EXAMPLE
We need to connect the following rotary encoder: **HM58 16/16384**.
In the order code, the hardware multiturn resolution is usually expressed in number of revolutions. To translate the number of revolutions into bits, you must calculate the power of 2 of the value: $16,384 = 2^{14}$. Thus the value to be set here is 14. For further information refer also to the "User's manual" of the connected encoder.

7.4.6 Bytes 15 ... 18

Programmable pulse/rev [pulse]

Byte	15	16	17	18
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}
	MSbyte	...	...	LSbyte

WARNING
This is only available when the encoder Class 2 is installed (IF55-R Class 2 submodule).
You can activate a new value next to the **Programmable pulse/rev [pulse]** parameter only if **Class 2 functionality** = ENABLED; if **Scaling function control** = ENABLED the set resolution values are enabled and used by the encoder; on the contrary, if **Scaling function control** = DISABLED you are allowed to set new resolution values and they are accepted, however the encoder still goes on using the physical values, NOT the new entered values, until you enable the **Scaling function control**. See the "7.4.1 Byte 10 - Operating parameters 1" section on page 46.
Furthermore, if the **Bypass** parameter (see on page 50) is set to "1" = enabled, the scaling function -even if enabled- is ignored and the position information is outputted as it is.

If **Class 2 functionality** = DISABLED or **Scaling function control** = DISABLED, then the system uses the **Physical Singleturn Res. [bits]**. That is: **Programmable pulse/rev [pulse]** = $2^{\text{Physical Singleturn Res. [bits]}}$.

This parameter is used to set a custom number of distinguishable steps per revolution (singleturn resolution).
The custom singleturn resolution value must be less than or equal to the physical singleturn resolution of the connected encoder:

$$\text{Programmable pulse/rev [pulse]} \leq 2^{\text{Physical Singleturn Res. [bits]}}$$

Setting a value greater than allowed causes the encoder to fall into an error signalling the faulty condition through the diagnostic LEDs (see on page 31).

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. This is meant to avoid counting errors.

Default = 65536 (min. = 1, max. = 262144)

WARNING
When you set a new value next to the **Programmable pulse/rev [pulse]** item, please always check also the **Programmable total range [pulse]** item value

and be sure that the resulting number of revolutions complies with the **Hardware number of revolutions** of the device.
Let's suppose that our HM58 16/16384 encoder is programmed as follows:
Programmable pulse/rev [pulse]: 8,192
Programmable total range [pulse] = $33{,}554{,}432_{10}$ = 8,192 (cpr) * 4,096 (rev.)
Let's set a new singleturn resolution, for instance: **Programmable pulse/rev [pulse]** = 360.

If we do not change the **Programmable total range [pulse]** value at the same time, we will get the following result:

$$\text{Number of revolutions} = \frac{33{,}554{,}432\ (\text{Programmable total range [pulse]})}{360\ (\text{Programmable pulse/rev [pulse]})} = 93{,}206.755...$$

As you can see, the encoder is required to carry out more than 93,000 revolutions, this cannot be as the hardware number of revolutions is, as stated, 16,384. When this happens, the encoder falls into an error signalling the faulty condition through the diagnostic LEDs (see on page 31).

WARNING
When you enable the scaling function (**Scaling function control** = 1), please enter scaled values next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters that are consistent with the physical values. In the case of inconsistent values, the system does not go online and visually warns about the wrong parametrization and fault condition by means of the diagnostic LEDS.

WARNING
Every time you change the value in this parameter then you are required to set a new preset value (see the **Preset value** parameter).

7.4.7 Bytes 19 ... 22

Programmable total range [pulse]

Byte	19	20	21	22
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}
	MSbyte	...	...	LSbyte

WARNING
This is only available when the encoder Class 2 is installed (IF55-R Class 2 submodule).
You can activate a new value next to the **Programmable total range [pulse]** parameter only if **Class 2 functionality** = ENABLED; if **Scaling function control** = ENABLED the set resolution values are enabled and used by the encoder; on the contrary, if **Scaling function control** = DISABLED you are allowed to set new resolution values and they are accepted, however the encoder still goes on using the physical values, NOT the new entered values, until you enable the **Scaling function control**. See the "7.4.1 Byte 10 - Operating parameters 1" section on page 46.
Furthermore, if the **Bypass** parameter (see on page 50) is set to "1" = enabled, the scaling function -even if enabled- is ignored and the position information is outputted as it is.

If **Class 2 functionality** = DISABLED or **Scaling function control** = DISABLED, then the system uses the **Total physical resolution** (= $2^{\text{Physical Singleturn Res. [bits]} + \text{Physical Multiturn Res. [bits]}}$). That is: **Programmable total range [pulse]** = **Total physical resolution**.

This parameter sets a custom number of distinguishable steps over the total measuring range. The **Programmable total range [pulse]** (total resolution of the encoder) results from the product of **Programmable pulse/rev [pulse]** by the required **Number of revolutions**: **Programmable total range [pulse]** = **Programmable pulse/rev [pulse]** * **Number of revolutions**.

Allowed values are less than or equal to the **Total physical resolution** of the connected encoder:

Programmable total range [pulse] ≤ **Total physical resolution**

Setting a value greater than allowed causes the encoder to fall into an error signalling the faulty condition through the diagnostic LEDs (see on page 31).
We recommend the **Programmable total range [pulse]** to be set to a power of 2. This is meant to avoid counting errors.

Default = 1 073 741 824 (min. = 1, max. = 1 073 741 824)

WARNING
When you set a new value next to the **Programmable total range [pulse]** item, please always check also the **Programmable pulse/rev [pulse]** item value and be sure that the resulting number of revolutions complies with the **Hardware number of revolutions** (**Physical Multiturn Res. [bits]**) of the device.
Let's suppose that our HM58 16/16384 encoder is programmed as follows:
Programmable pulse/rev [pulse]: 8,192
Programmable total range [pulse] = $33{,}554{,}432_{10}$ = 8,192 (cpr) * 4,096 (rev.)

Let's set a new total resolution, for instance: **Programmable total range [pulse]** = 360.
As the **Programmable total range [pulse]** must be greater than or equal to the **Programmable pulse/rev [pulse]**, 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 31).

WARNING
When you enable the scaling function (**Scaling function control** = 1), please enter scaled values next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters that are consistent with the physical values. In the case of inconsistent values, the system does not go online and visually warns about the wrong parametrization and fault condition by means of the diagnostic LEDS.

WARNING
Every time you change the value in this parameter then you are required to set a new preset value (see the **Preset value** parameter).

EXAMPLE
We connect the HM58 **16/16384** rotary encoder.

The physical resolution is as follows:

- Hardware counts per revolution: 65,536 cpr = 16 bits; **Physical Singleturn Res. [bits]** = 16
- Hardware number of revolutions: 16,384 rev. = 14 bits; **Physical Multiturn Res. [bits]** = 14
- Total hardware resolution: **Physical Singleturn Res. [bits]** + **Physical Multiturn Res. [bits]** = 16 + 14 = 30 bits (2^{30} = 1 073 741 824 information)

In the specific installation 2,048 counts/rev. * 1,024 revolutions are required:

- be sure that: **Bypass** = 0 = DISABLED
- enable the scaling function: **Scaling function control** = 1 = ENABLED
- set the counts per revolution: **Programmable pulse/rev [pulse]** = 2,048
- set the total resolution: **Programmable total range [pulse]** = **Programmable pulse/rev [pulse]** * **Custom number of revolutions** = 2,048 * 1,024 = 2 097 152

NOTE

We suggest setting values which are power of 2 (2^n: 1, 2, 4, ..., 2048, 4096, 8192, ...) next to the **Programmable pulse/rev [pulse]** and **Programmable total range [pulse]** parameters to avoid counting errors.

NOTE

Any multiturn encoder can be configured so that it works exactly as a singleturn encoder. This is achieved by setting **Programmable total range [pulse]** = **Programmable pulse/rev [pulse]** (furthermore the **Physical Multiturn Res. [bits]** has to be set to 0). Let's suppose the encoder is set as follows:
Programmable pulse/rev [pulse] = 8,192
Programmable total range [pulse] = 8,192

So it follows that:

$$\textbf{Number of revolutions} = \frac{8192\ (\textbf{Programmable total range [pulse]})}{8192\ (\textbf{Programmable pulse/rev [pulse]})} = 1$$

This is exactly the configuration of the singleturn encoder.
Of course the contrary is not possible.

7.5 DDLM_Chk_Cfg

The Configuration function allows the Master to send configuration data to the Slave for any check operation. The main purpose of this function is to set 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=4bytes)
bits 5 and 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

Class 1 and Class 2:
D1hex = 4 byte input
E1hex = 4 byte output

7.6 DDLM_Data_Exchange

This is the normal operation status of the system. The Slave (for both Class 1 and Class 2) can transmit the **Position value** to the Master and receive the **Preset value** from the Master.

Position value

when either Class 1 or Class 2 is set (Encoder → Master)

Byte	1	2	3	4
Bit	31-24	23-16	15-8	7-0
	MSbyte	...	...	LSbyte

It has a mandatory length of 32 bits and is right aligned in the data field.
This parameter contains the current position value of the encoder.
If the scaling function is enabled, the output value is scaled according to the scaling parameters (see **Scaling function control** on page 47).

Preset value

when either Class 1 or Class 2 is set (Master → Slave)

Byte	1	2	3	4
Bit	31-24	23-16	15-8	7-0
	MSbyte	...	...	LSbyte

This parameter allows to set the encoder position to a Preset value. The Preset function is meant to assign a desired value to a physical position of the encoder shaft. The chosen physical position will get the value set next to this parameter 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** value is sent by the Master to the Slave in **Data_Exchange** mode by setting the 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 the 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 control** = DISABLED,
  then the **Preset value** must be less than or equal to the **total physical resolution** – 1 (for instance: total physical resolution **Physical Singleturn Res. [bits]** + **Physical Multiturn Res. [bits]** = 13 bits; $2^{13} - 1 = 8191$).
- If **Scaling function control** = ENABLED,
  then the **Preset value** must be less than or equal to **Programmable total range [pulse]** - 1.

EXAMPLE

Preset value to be set = 0000 1000hex
Current Position value = 0005 5000hex

	Byte	1	2	3	4
Cycle	Bit	31-24	23-16	15-8	7-0
1°	M→S	80	00	10	00
	S→M	00	05	50	00
2°	M→S	80	00	10	00
	S→M	00	05	50	00
3°	M→S	80	00	10	00
	S→M	00	00	10	00

NOTE

We suggest setting the Preset value when the encoder is at a standstill.
The new Preset value is saved immediately after receipt.

WARNING

Check the value in the Preset value parameter and perform the preset operation every time you change the value next to Code sequence, Programmable pulse/rev [pulse] or Programmable total range [pulse] parameters.

NOTE

Please consider that if the Bypass parameter (see on page 50) is set to "1" = enabled, the preset function -even if set and activated- is ignored. If the user sets a preset while the "Bypass mode" is enabled, the operation is not carried out.

7.7 DDLM_Slave_Diag

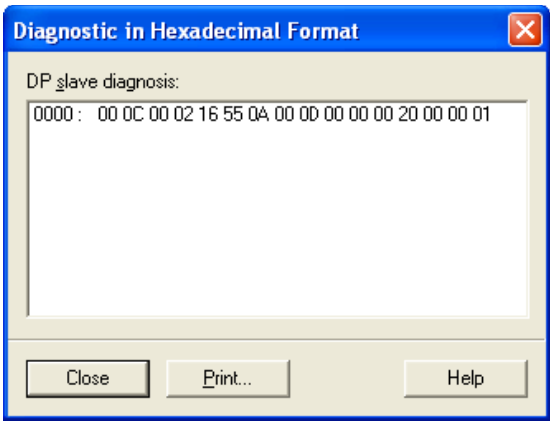
The Master device can send a request for diagnostic information at any time to the Slave device.
Lika devices can provide two types of diagnostics (see the Diagnostic type (16- or 63-byte) parameter on page 48):

- reduced diagnostics (16-byte diagnostics);
- extended diagnostics (63-byte diagnostics).

Class 1 devices only provides 16-byte reduced diagnostics (see the 16-byte reduced diagnostics parameter on page 48).

Set the diagnostic type during DDLM_Set_Prm, operating parameters (byte 10), see the "7.4.1 Byte 10 - Operating parameters 1" section on page 46.

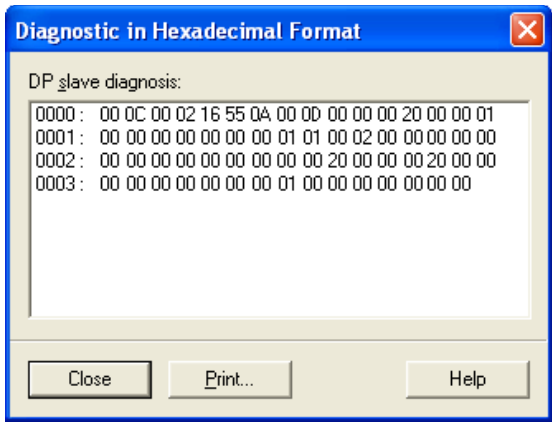
16-byte Diagnostics:



Byte	Description
0	Status 1
1	Status 2
2	Status 3
3	Master ID
4	Manufacturer ID
5	
6	Extended diagnostic header
7	Alarms

Byte	Description
8	Operating status
9	Encoder type
10	Physical singleturn resolution
11	
12	
13	
14	Number of physical distinguishable revolutions
15	

63-byte Diagnostics:



Byte	Description
0	Status 1
1	Status 2
2	Status 3
3	Master ID
4	Manufacturer ID
5	
6	Extended diagnostic header
7	Alarms
8	Operating status
9	Encoder type
10	Physical singleturn resolution
11	
12	
13	
14	Number of physical distinguishable revolutions
15	
16	Additional alarms
17	Supported alarms
18	
19	Warnings
20	
21	Supported warnings
22	
23	Profile version
24	
25	Software version
26	
27	Operating time
28	
29	
30	

Byte	Description
31	Offset value
32	
33	
34	
35	Manufacturer offset value
36	
37	
38	
39	Programmed measuring units per revolution
40	
41	
42	
43	Programmed Total Measuring Range in measuring units
44	
45	
46	
47	Serial number
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	Reserved
58	Reserved
59	Reserved
60	Reserved
61	Reserved
62	Reserved

8 - Default parameters list

Parameters list	Default values		
Code sequence	0 = CW		
Class 2 functionality	1 = Enabled		
Scaling function control	1 = Enabled		
Diagnostic type (16- or 63-byte)	0 = 16-byte diagn.		
Code Type (BINARY/GRAY)	0 = Binary		
SSI Protocol	0 = LSB Right Aligned		
Bypass	0 = Disabled		
Number of SSI clocks	32		
Physical Singleturn Res. [bits]	16		
Physical Multiturn Res. [bits]	14		
Programmable pulse/rev [pulse]	65536		
Programmable total range [pulse]	1073741824		
Preset value	0		

Document release	Release date	Description	HW	SW	GSD file version
1.0	21.10.2015	1st issue	1.0	1.0	1655
1.1	18.09.2019	New firmware, new GSD files, bypass function added and related parameters updated, setting range updated in some parameters, new POWER SUPPLY DIP switch	1.0	2.0	V2

Dispose separately

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