Baumer
Passion for Sensors

Description of functions and interfaces

EN580C

Absolute encoder with Profibus DPV0 bus cover

EN-US

V1 | 5/5/2023

Table of contents

1 About this document

1.1 Instruction manual: purpose and scope of application

The present manual describes the functions and configurable parameters/commands of *Baumer* industrial encoders.

This manual applies to the following product families:

- *EN580C*

1.2 Applicable documents

- Download at www.baumer.com:
  - Data sheet
  - EU Declaration of Conformity
- Attached to product:
  - Quickstart Guide
  - General information sheet (11042373)

1.3 Labels in this manual

Identifier	Usage	Example
Dialog element	Indicates dialog elements.	Click the ***OK*** button.
Unique name	Indicates the names of products, files, etc.	*Internet Explorer* is not supported in any version.
`Code`	Indicates entries.	Enter the following IP address: `192.168.0.250`

2 Overview

2.1 General functionality

The sensor is used to detect positions and speed. It provides measured values for the downstream device.

Sensor parameterization is via *Profibus* interface.

2.2 Interfaces

2.2.1 Profibus DP

Profibus is a manufacturer-independent, open communication system applied in manufacturing, process and building automation. There are three *Profibus* variants:

- *Profibus FMS*: Used at production management level and for data communication between controllers.
- *Profibus PA*: Used in process engineering.
- *Profibus DP*: Used in automation technology for fast data communication between controllers and decentralized peripheral devices.

Profibus DP comprises the following device types:

- *DP Master class 1 (DPM1)*: as a control system for cyclic information exchange with a DP slave.
- *DP Master Class 2 (DPM2)*: as programming, configuration or operating devices.
- *DP Slave*: as a peripheral device for output data reading and transmission to PLC.

The *Profibus* system classifies into monomaster and multimaster according to the number of operated masters being active on the bus:

- In monomaster systems, only one master class 1 and DP slaves are active on the bus.
- In multimaster systems, several masters and DP slaves are active on the bus. Masters can optionally be either class 1 or class 2.

Profibus DP characterizes by the following:

- Short response times (1 ms with 32 users and 12 MBaud)
- Reliable transmission (Hamming distance 4)
- Wide range of standardized system components available
- Good diagnostic capabilities
- Easy handling and open architecture
- User-oriented bus system
- Open system

GSD file

The GSD file (device master data file) describes all encoder data required for operation and is required for encoder parameterization. The data is stored in the encoder's internal memory. There are two sorts of data:

- Generic information: manufacturer's name, product code, ident number, Profibus-specific parameters and baud rates
- User-specific information: configuration options, parameters, parameter descriptions, hardware and software version as well as diagnostic options.

The GSD file comes with ident no. **059Bh** for all products described.

2.2.1.1 Data exchange among Profibus-DP devices

2.2.1.1.1 Telegram structure

DP Master	Request telegram			DP Slave
	Footer info	Output data	Header info	
	Response telegram			
	Header info	Input data	Footer info	

2.2.1.1.2 Initialization, restart and user data communication

Prior to user data exchange between master and slave, each slave is being re-initialized. The master is transmitting parameterization and configuration data to the slave. User data exchange is only enabled if both the transmitted and slave-specific configuration are identical.

Process of initialization, restart and user data communication:

Master diagnostic request	Master transmits a *Slave Diagnose Request* (*Slave_Diag*), which is replied a Slave Diagnose Response by the slave. This way, the master verifies whether the slave is accessible on the bus and ready for configuration.
Slave parameterization	Master transmits a *Slave Parameter Request* (*Set_Prm*). In the parameterization data, the Slave is given the current bus parameterization, monitoring times and slave-specific parameters. During projecting, parameterization is adopted directly or indirectly from the GSD file. The slave is cross-checking the data against the own parameterization.
Slave configuration	Master transmits a *Check Configuration Request* (*Chk_Cfg*). The master informs the slave of scope (total of data bytes) and structure (data consistency) of both input and output data range to be exchanged. The slave compares the received parameterization against the own one.

Diagnostic request prior to data exchange	The master transmits another *Slave Diagnose Request* (*Slave_Diag*), which is answered by the slave's *Slave Diagnose Response*. The master verifies whether parameterization and configuration are congruent with the slave's stored data. If the master-requested data are ok and no error is present, the slave responds its readiness for user data transfer in the diagnostic data.
Data_Exchange	From now on, the slave will only reply to the master it has been parameterized and configured by. The master transmits a user data request (*Data_Exchange*), the slave replies by user data response. In the response, the slave reports to the master any diagnostic events that may be present. The detailed diagnostic and status information is only transmitted after receipt of the master's diagnostic telegram.

3 Functions

3.1 Parameterization function

Parameterization means transferring the information the slave requires for process data exchange. The information comprises Profibus-specific data (Octets 1 to 6) and user-specific information. In the projecting phase, any user-specific information can be entered using the input window. The slave cross-checks the data received from master against own parameterization. Important, the slave will only report the result to the master in the diagnostic request after configuration has been completed.

For more detailed information on the following please refer to chapter *Annex [▶ 18]*.

Profibus-DP access: *Set_Prm*

INFO

The smallest *Octet Nr.* of a parameter represents MSB (most significant Byte) of the respective parameter.

Parameter	Device class	Octet Nr.	Description
Station status	1	1	Definition of Profibus-specific data ▪ Sync- Mode/Freeze Mode enabled ▪ Response monitoring time active ▪ Master assigned
Response monitoring time	1	2 to 3	Identification of master failure, master is expected to respond within this time frame
Minimum Station Delay Responder (tsdr)	1	4	Minimum waiting time of slave prior to being allowed to reply to the master request
Ident_Number	1	5 to 6	Device identifier, unambiguous for each device type and defined and reserved by PNO
Group_Ident_Number	1	7	Profibus-specific data
Operating parameters	1	8	Profibus-specific data
Operating parameters	1	9	Definition of application-specific data ▪ Counting direction ▪ Functional scope of the encoder, defined in device class 1 and 2 ▪ Scaling function
Measuring units p.revolution	2	10 to 13 10 | 11 | 12 | 13 high | low MSB | LSB	Defining the number of steps per revolution
Total measuring range (units)	2	14 to 17 14 | 15 | 16 | 17 high | low MSB | LSB	Total resolution in steps = number of steps x number of revolutions
Reserved (system-specific)	2	18 to 25	–

Parameter	Device class	Octet Nr.	Description
Speed Timebase	2	26	Defining the measuring unit for output of speed signal (if selected). (e.g. rpm)
Speed update time	2	27	This parameter defines the cycle time applied to building the internal average using the speed values provided by the speed filter. The number of stored speed values in the speed filter is defined by parameter "Speed - Filter depth".
Speed filter depth	2	28	Defines the number of speed values stored in the speed filter.
Gear factor: activation	2	29	Gear factor activation
Gear factor: multiplier	2	30 to 33 30 | 31 | 32 | 33 high | low MSB | LSB	Gear factor numerator
Gear factor: divider	2	34 to 37 34 | 35 | 36 | 37 high | low MSB | LSB	Gear factor denominator

Multiturn encoder

Encoder automatically supports endless operation, if required. For this reason, during parameterization there is no need observing a specific ratio of the total measuring range towards measuring units per revolution.

NOTICE

In power-off state in endless operation mode, encoder shaft rotation must not exceed ¼ of the maximum possible number of revolutions.

Meaning: 16384 (2^{14}) revolutions for encoders with max. 65536 (2^{16}) revolutions. Exceeding the number of revolutions requires encoder referencing after every encoder power-on cycle (execute preset function).

If endless operation is disabled, encoder shaft rotation in powerless state is not limited (no effect on position values).

Check whether using endless operation with the current parameterization:

- Multiply the encoder's "maximum possible number of revolutions" (variant-specific, 16 bit = 65536 or 13 bit = 8192) by the configured number of "steps per revolution".
- Divide this value by the parameterized total measuring range.
- If the division operation leaves a remainder (decimals) endless mode is used.

Parameterization example without endless operation:

maximum possible number of revolutions	65536	(16 bit multiturn)
Steps per revolution	3600	
Total measuring range	29,491,200	(8192 x 3600)
Calculation	65536 x 3600 / 29,491,200 = 8; no remainder	

Parameterization example in endless operation:

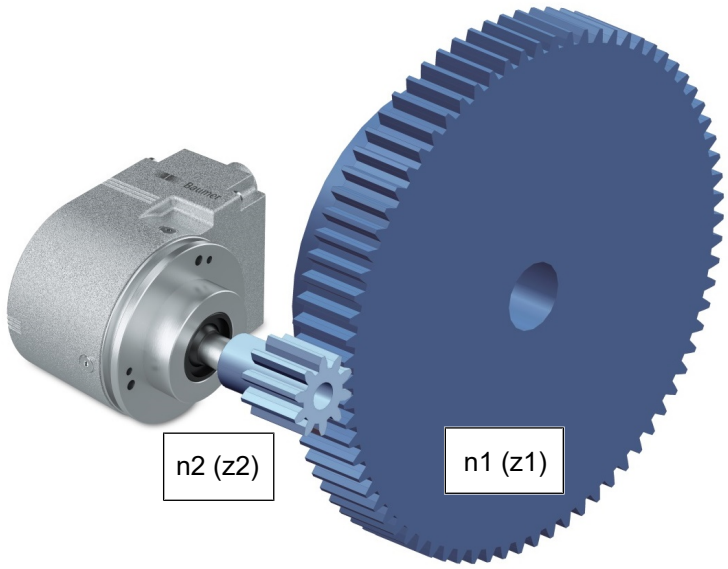
maximum possible number of revolutions	65536	(16 bit multiturn)
Steps per revolution	3600	
Total measuring range	100,000	
Calculation	65536 x 3600 / 100.000 = 2359; remainder 29600	

3.2 Gear Factor

This function is used to configure the electronic gear function.

Enabled gear factor (*Gear factor*) means the encoder mounted to the primary side (gearbox input) will output position data as if mounted to the secondary side (gearbox output).

Parameter *Total measuring range(units)* defines the required number of steps completed within one revolution at the gearbox output (secondary side).



Primary side (drive side)
Denominator

Secondary side (driven side)
Nominator

$$Gear\ factor\ i = \frac{Gear\ factor: multiplier}{Gear\ factor: divider} = \frac{Speed\ at\ drive\ side\ (n2)}{Speed\ at\ driven\ side\ (n1)} = \frac{Number\ of\ teeth\ at\ driven\ side\ (z1)}{Number\ of\ teeth\ at\ drive\ side\ (z2)}$$

Gear factor numerator (*Gear factor: multiplier*) and denominator (*Gear factor: divider*) result from the number of teeth.

Number of teeth in the example:

- Drive side (primary side): 10
- Driven side (secondary side): 75

Parameter *Measuring units p.revolution* results out of total measuring range (*Total measuring range (units)*), numerator and denominator.

$$Measuring\ units\ p.revolution = Total\ measuring\ range\ (units) * \frac{Gear\ factor: divider}{Gear\ factor: multiplier}$$

Example

Required gear factor 75:10 (i.e. 7.5). Required resolution on the secondary side of the gearbox *1 revolution = 10000 steps*. This means:

Gear factor: multiplier: 75

Gear factor: divider: 10

INFO

Both numerator and denominator must be integer values. *Total measuring range* is 10000.

Encoder completes 7.5 revolutions within one revolution on the gearbox secondary side. The encoder value resulting from *Measuring units p.revolution* is 10000 / 7.5 = 1333.3333.

For more detailed information on the following please refer to chapter *Annex [▶ 18]*.

Permitted combinations of *Gear factor: multiplier*, *Gear factor: divider* and *Total measuring range (units)* result from the following formula:

$$Measuring\ units\ p.revolution = Total\ measuring\ range\ (units) * \frac{Gear\ factor:divider}{Gear\ factor:multiplier}$$

INFO

Parameter *Measuring units p.revolution* must not exceed the maximum permitted encoder values.

Gear factor: multiplier

This parameter is only considered with enabled gear factor (*Gear factor: activation*).

When using gear reduction (n2 < n1), the gear factor numerator is bigger than the denominator.

Gear factor: divider

This parameter is only considered with enabled gear factor (*Gear factor: activation*).

When using transmission (n2 > n1), the denominator is bigger than the numerator.

3.3 Configuration

This function defines type, length, data direction and further way of use of the process data.

- Type defines data type and consistency (if any).
- Length defines the number of data bytes available.
- Data direction defines the data transfer from master to slave and the other way round.

The encoder is allowed to read preset or position values and, if required, to transmit speed information. Data length is optionally 1 or 2 words, with consistent data for both.

The transmitted configuration is cross-checked against the slave's own configuration. The slave reports the result to the master in the subsequent diagnostic request.

From the master's point of view, encoder position values are input data while preset values are output data.

Profibus-DP access: *Set_Prm*

Configuration	Device class	Description
D1h	1	2-word input data, consistent, for position values up to 31 bits max.
F1h	2	2-word output data, consistent, for preset values up to 31 bits max. 2-word input data, consistent, for position values up to 31 bits max.
D0h	1	1-word input data, consistent, for position values up to 15 bits max.
F0h	2	1-word output data, consistent, for preset values up to 15 bits max. 1-word input data, consistent, for position values up to 15 bits max.
D1h, D0h	1	2-word input data, consistent, for position values up to 31 bits max. 1-word input data, consistent, for speed values up to 16 bits max.
F1h, D0h	2	2-word output data, consistent, for preset values up to 31 bits max. 2-word input data, consistent, for position values up to 31 bits max. 1-word input data, consistent, for speed values up to 16 bits max.
D0h, D0h	1	1-word input data, consistent, for position values up to 15 bits max. 1-word input data, consistent, for speed values up to 16 bits max.
F0h, D0h	2	1-word output data, consistent, for preset values up to 15 bits max. 1-word input data, consistent, for position values up to 15 bits max. 1-word input data, consistent, for speed values up to 16 bits max.

3.4 Diagnostic function

Diagnostic messages include status-related encoder data. Diagnostic messages consist of Profibus-relevant and device-specific information. Such information is used by master for slave communication or for transmission to higher-level systems. The master requests diagnostic data prior and after slave configuration. This way it is verified that the slave is accessible on the bus and the configuration data in the master's software are identical with those of the slave. The slave reports diagnostic events in Data_Exchange mode. In this case, the master would then transmit a diagnostic data request. User-specific information is defined by standard EN 50170, encoder profile 1.1.

The DUO LED (red/green) integrated in the bus cover provides part of such information.

For more detailed information on the following please refer to chapter *Annex [▶ 18]*.

Profibus-DP access: *Slave_Diag*

INFO

The smallest *Octet Nr.* of a parameter represents MSB (most significant Byte) of the respective parameter.

Parameter	Device class	Octet Nr.	Description
Station status 1	1	1	Status of ▪ Parameterization ▪ Configuration ▪ Diagnostic data Diag.ext(. Bit and Diag.stat. Bit at alarm and warning message)
Station status 2	1	2	Status of ▪ Response monitoring time ▪ Freeze or Sync mode
Station status 3	1	3	Not supported
Diag_Master	1	4	Address of master the slave was initially configured by
Ident_Number	1	5 to 6	Device recognition ▪ unambiguous for every device type ▪ reserved and saved at PNO
Extended diagnostic header	1	7	Length of encoder diagnostic data including diagnostic header byte for extended diagnostics

Parameter	Device class	Octet Nr.	Description
Alarms	1	8	Indicate malfunctions that may entail position errors. Triggered by ▪ Code consistency error or invalid preset value ▪ Preset value outside the permitted limits
Operating state	1	9	Indicates the supported user-specific data ▪ Counting direction ▪ Functional scope of the encoder, defined in device class 1 and 2 ▪ Extended diagnostics ▪ Scaling function
Encoder type	1	10	Encoder type specification
Steps per revolution	1	11 to 14	Maximum resolution [in steps] per encoder revolution
Number of revolutions	1	15 to 16	Maximum number of revolutions
Additional alarms	2	17	Not supported
Supported alarms	2	18 to 19	Indicates the supported alarm ▪ Position value incorrect
Warnings	2	20, 21	Indicates any internal parameters being outside the tolerance window. Unlike alarm messages, such events do not entail position errors. ▪ Voltage of the lithium cell has fallen below the specified value (multiturn encoders only)
Supported warnings	2	22, 23	Indicates the supported warnings ▪ Voltage of the lithium cell has fallen below the specified value (multiturn encoders only)
Profile version	2	24, 25	Encoder profile version in revision number and index
Software version	2	26, 27	Software version
Operation hours counter	2	28 to 31	Time the device was in operation, unit 6min (1/10h)
Offset	2	32 to 35	Indicates the offset saved to EEPROM after preset

Parameter	Device class	Octet Nr.	Description
Manufacturer offset	2	36 to 39	Not supported, reserved for servicing
Measuring units p.revolution	2	40 to 43 40 41 42 43 high low MSB LSB	Indicates the encoder's configured steps per revolution
Total measuring range(units)	2	44 to 47 44 45 46 47 high low MSB LSB	Indicates the encoder's configured total resolution
Serial number	2	48 to 57	Not supported
Reserved		58, 59	Not supported, reserved for servicing

3.4.1 Alarms

Position error

The alarm signal is triggered by two events:

- Code consistency error caused by failure of the optoelectronic/magnetic system
- Preset value outside the permitted limits

Cyclic sampling of the angular shaft position is via the measuring system. Two consecutive position values are compared to each other. The changed parameter exceeding a defined number of steps results in a non-plausible last position value. Bits *Ext_diag.* and 0 in the alarm message are set by encoder.

Automated reset of bit *Ext_diag.* after 2.5 s in the event of code consistency error. Another event occurring during this time will automatically extend time by 2.5 s. In the event of an invalid preset value, bit *Ext_diag.* remains set until the correct value has been transmitted by the master.

Code consistency errors and invalid preset values are signaled by the LED indicator provided at the bus cover.

3.4.2 Warning messages

Lithium cell voltage (multiturn encoders only)

If no operating voltage is applied to the encoder, the integrated lithium cell will supply the circuit required to count and save the number of revolutions to *ASIC*. At encoder power on, the saved value is read out and the position change made within one revolution is detected by the measuring system.

Position changes during power-off may result from the shaft still performing some turns prior to the idle position, or by any manual interference.

The lithium cell voltage is being internally monitored. As soon as voltage drops below the specified value, the encoder will set the error bit *Diag_ext* and indicate the event in bit 5 in the warning message. However, the functions to count and save the number of revolutions will be still ensured for a defined time window. After this time window has elapsed, the encoder must be put out of operation or supplied by external voltage.

How long the encoder will be still operational depends on the event identification. The following applies:

- Status message is already present at power on of the encoder:
  - If the time of the first occurrence is unknown, immediately put the encoder out of operation.
- Status message occurs during operation mode *Data_Exchange*:
  - If the status message is present, proper encoder function will still be maintained for some weeks before the encoder must be replaced.

3.4.3 Preset function

This function will transmit a preset value to set the encoder to a specific value aligned to a specific mechanical position.

The preset function is only accessible in encoder operating mode *Class2*.

The preset value must be within the specified total measuring range.

INFO

To ensure optimally aligned position and preset values, we recommend setting the preset only whilst encoder is idle (at standstill).

For presetting, the encoder is transmitted the preset value twice, first with MSB set and second with MSB reset. In this way, the MSB acts as a sort of "clock" bit. For this reason, the preset is limited to ranging up to 15 bits (encoder class 2,16 bits) respectively 31 bits (encoder class 2, 32 bits). The first transmission is defines the point in time the encoder will adopt the preset.

Example: Zeroing of encoder (preset value = 0, encoder Class2, 32 bit)

Step 1: Controller transmits 80000000h (adopt preset)

Step 2: Controller transmits 00000000h (reset control bit)

The encoder calculates the internal offset out of the difference between current position value and preset value. Usually, it is not relevant in the application, but enables readout together with diagnostic data, if required.

INFO

The offset is stored non-volatile to EEPROM. The EEPROM allows for at least 1 million writing cycles. Nevertheless, very frequent presetting will reach the lifetime limit which should be taken into account in control software design.

3.5 Transmission/reception of user data

This function is used to receive/send user data between master and slave.

Unlike diagnostic data, user data refer directly to the process under control or monitoring. From the encoder's point of view, such data is the position and, if required, speed information transmitted by Profibus to the controller (master), and in opposite direction a preset value for setting the encoder (slave) to a specific position value.

User data exchange is in mode *Data_Exchange*. The general conditions for data exchange (e.g. encoder resolution, word length) have been previously defined by configuration.

The slave reports any diagnostic event in data exchange mode. The master would then transmit a diagnostic request to obtain the actual diagnostic and status information.

In order to set a preset, the master transmits the preset value (according to configuration either 16 or 32 bits) to the slave.

In mode *Data Exchange* the dual LED is on green continuous.

4 Annex

4.1 Encoder operating parameters

Parameter	Measurement range	Factory settings	Data type	Description
Code sequence	CW/CCW	CW	Octet string	Output code behavior according to cw/ccw shaft rotation when looking at the flange ▪ CW = ascending values at clockwise rotation ▪ CCW = ascending values at counterclockwise rotation
Measuring units p.revolution	1 to 2097152 (2^{21})	8192 (2^{13})	Unsigned 32	Number of steps per revolution Input of steps as integer number
Total measuring range(units)	1 to 2147483648 (2^{31})	536870912 (2^{29})	Unsigned 32	Number of steps per revolution x number of revolutions Input of steps as integer number
Preset value	0 to (measuring range - 1)	0	Unsigned 32	The current position value is assigned a related output value (referencing).

4.2 Parameterization function

INFO

The smallest *Octet Nr.* of a parameter represents MSB (most significant Byte) of the respective parameter.

Parameter	Device class	Octet Nr.	Data type	Wertebereich	Default	Description
Station status	1	1	Octet string			Definition of Profibus-specific data ▪ Sync- Mode/Freeze Mode enabled ▪ Response monitoring time active ▪ Master assigned
Response monitoring time	1	2 to 3	Octet string			Identification of master failure, master is expected to respond within this time frame

Parameter	Device class	Octet Nr.	Data type	Wertebereich	Default	Description
Minimum Station Delay Responder (tsdr)	1	4	Octet string			Minimum waiting time of slave prior to being allowed to reply to the master request
Ident_Number	1	5 to 6	Octet string			Device identifier, unambiguous for each device type and defined and reserved by PNO
Group_Ident_Number	1	7	Octet string			Profibus-specific data
Operating parameters	1	8	Octet string			Profibus-specific data
Operating parameters	1	9	Unsigned 32	▪ Bit 0 = 0/1 CW/CCW ▪ Bit 1 = 0/1 Device class 2 Off/On ▪ Bit 3 = 0/1 Scaling function off/on	▪ CW ▪ Class 2 Device class 2 on ▪ Scaling function on	Definition of application-specific data ▪ Counting direction ▪ Functional scope of the encoder, defined in device class 1 and 2 ▪ Scaling function
Measuring units p.revolution	2	10 to 13 10 11 12 13 high low MSB LSB	Unsigned 32	1 ... 2097152 (2^{21})	8192	Defining the number of steps per revolution
Total measuring range (units)	2	14 to 17 14 15 16 17 high low MSB LSB	Octet string	1 ... 2147483648 (2^{31})	536870912	Total resolution in steps = number of steps x number of revolutions
Reserved (system-specific)	2	18 to 25	Octet string		0	–
Speed Timebase	2	26	Octet string	▪ 0 = steps/s ▪ 1 = steps/100 ms	3	Defining the measuring unit for output of speed signal (if selected). (e.g. rpm)

Parameter	Device class	Octet Nr.	Data type	Wertebereich	Default	Description
				▪ 2 = steps/10 ms ▪ 3 = RPM		
Speed update time	2	27	Octet string	1...255	16	This parameter defines the cycle time applied to building the internal average using the speed values provided by the speed filter. The number of stored speed values in the speed filter is defined by parameter "Speed - Filter depth".
Speed filter depth	2	28	Octet string	1...255	1	Defines the number of speed values stored in the speed filter.
Gear factor: activation	2	29	Octet string	▪ 0 = disabled ▪ 1 = enabled	0	Gear factor activation
Gear factor: multiplier	2	30 to 33 30 31 32 33 high low MSB LSB	Unsigned 32	1...32768	4096	Gear factor numerator
Gear factor: divider	2	34 to 37 34 35 36 37 high low MSB LSB	Unsigned 32	1...65535	1	Gear factor denominator

4.3 Diagnostic function

INFO

The smallest *Octet Nr.* of a parameter represents MSB (most significant Byte) of the respective parameter.

Parameter	Device class	Octet Nr.	Data type	Wertebereich	Description
Station status 1	1	1	Octet string	Profibus-specific data	Status of ▪ Parameterization ▪ Configuration ▪ Diagnostic data Diag.ext(. Bit and Diag.stat. Bit at alarm and warning message)
Station status 2	1	2	Octet string	Profibus-specific data	Status of ▪ Response monitoring time ▪ Freeze or Sync mode
Station status 3	1	3	Octet string	Profibus-specific data	Not supported
Diag_Master	1	4	Octet string	Profibus-specific data	Address of master the slave was initially configured by
Ident_Number	1	5 to 6	Octet string	059Bh	Device recognition ▪ unambiguous for every device type ▪ reserved and saved at PNO

Parameter	Device class	Octet Nr.	Data type	Wertebereich	Description
Extended diagnostic header	1	7	Octet string	▪ 16 bytes class1 ▪ 57 bytes class 2	Length of encoder diagnostic data including diagnostic header byte for extended diagnostics
Alarms	1	8	Octet string	▪ Bit 0 = 1: Position error	Indicate malfunctions that may entail position errors. Triggered by ▪ Code consistency error or invalid preset value ▪ Preset value outside the permitted limits
Operating state	1	9	Octet string	▪ Bit 0 = 0: CW ▪ Bit 0 = 1: CCW ▪ Bit 1 = 1: Encoder supports class 2 functionality ▪ Bit 3 = Scaling function on/off	Indicates the supported user-specific data ▪ Counting direction ▪ Functional scope of the encoder, defined in device class 1 and 2 ▪ Extended diagnostics ▪ Scaling function
Encoder type	1	10	Octet string	▪ 01h = Multiturn ▪ 00h = Singleturn	Encoder type specification
Steps per revolution	1	11 to 14	Unsigned 32	2097152 (2^{21})	Maximum resolution [in steps] per encoder revolution
Number of revolutions	1	15 to 16	Unsigned 32	65536 (2^{16})	Maximum number of revolutions
Additional alarms	2	17	Octet string		Not supported

Parameter	Device class	Octet Nr.	Data type	Wertebereich	Description
Supported alarms	2	18 to 19	Octet string	Bit 0 = 1: Position error supported	Indicates the supported alarm ▪ Position value incorrect
Warnings	2	20, 21	Octet string	Bit 5 = 1: Lithium cell voltage has dropped below the specified value (multiturn encoders only)	Indicates any internal parameters being outside the tolerance window. Unlike alarm messages, such events do not entail position errors. ▪ Voltage of the lithium cell has fallen below the specified value (multiturn encoders only)
Supported warnings	2	22, 23	Octet string	Bit 5 = 1: Lithium cell voltage (multiturn encoder only) is supported	Indicates the supported warnings ▪ Voltage of the lithium cell has fallen below the specified value (multiturn encoders only)
Profile version	2	24, 25	Octet string	Encoder profile 1.10	Encoder profile version in revision number and index
Software version	2	26, 27	Octet string	Current software version	Software version
Operation hours counter	2	28 to 31	Octet string	Unit 6min (1/10h)	Time the device was in operation, unit 6min (1/10h)
Offset	2	32 to 35	Octet string	Depending on the preset value	Indicates the offset saved to EEPROM after preset
Manufacturer offset	2	36 to 39	Octet string		Not supported, reserved for servicing

Parameter	Device class	Octet Nr.	Data type	Wertebereich	Description
Measuring units p.revolution	2	40 to 43 40 41 42 43 high low MSB LSB	Unsigned 32	1 to 2097152 (2^{21})	Indicates the encoder's configured steps per revolution
Total measuring range(units)	2	44 to 47 44 45 46 47 high low MSB LSB	Unsigned 32	1 to 2147483648 (2^{31})	Indicates the encoder's configured total resolution
Serial number	2	48 to 57	ASCII string		Not supported
Reserved		58, 59	Octet string		Not supported, reserved for servicing

4.4 Example for parameter input

The following parameter data are stored in the GSD file as 32 bit values (double words, format Unsigned 32):

- Steps per revolution
- Total resolution

Many configuration programs for Profibus masters do not support this word length for parameter input. This requires separate input as decimals of the upper and lower 16 bits of these parameters (block "hi", block "lo").

For parameters inferior to 65535 (16 bits) it is sufficient to enter block "hi" = 0 to have the parameter presented as decimal straight in block "lo".

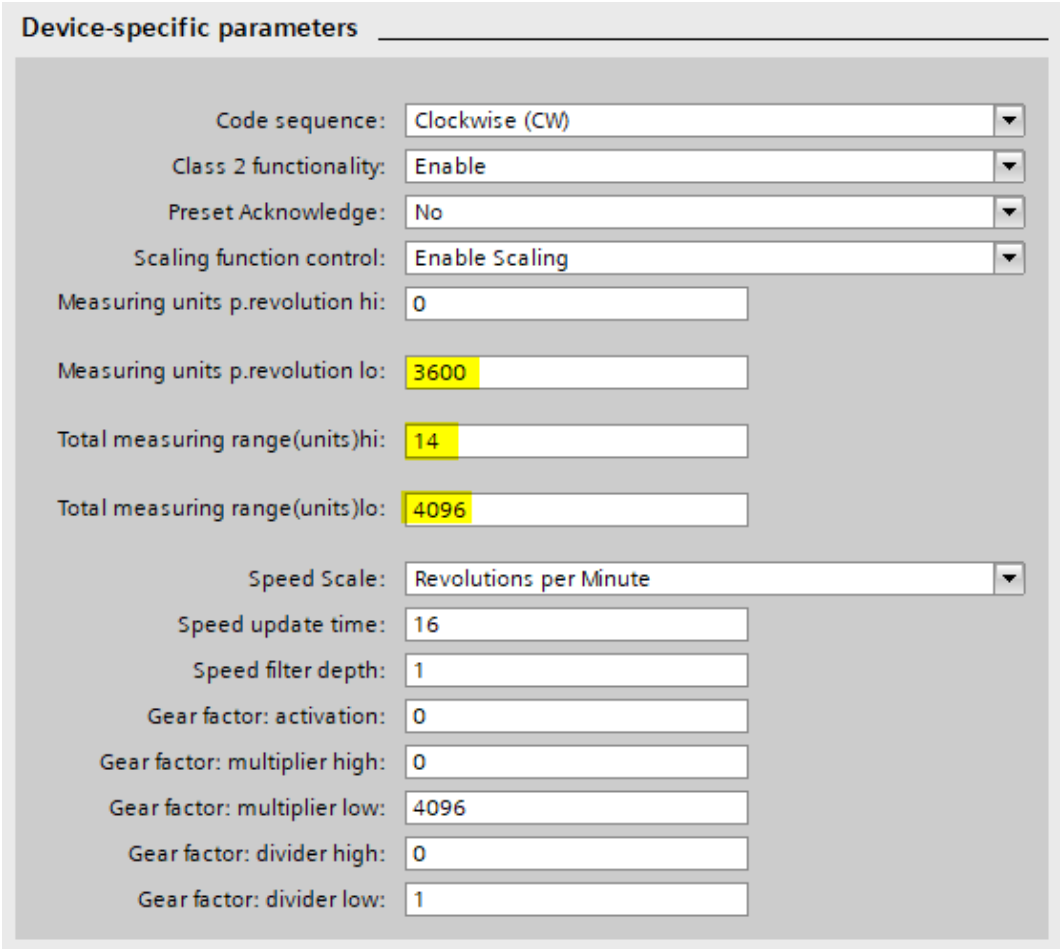
Parameters higher than 65535 (16 bits) require separate entry and prior conversion as described below. Here, a calculator with hexadecimal function is helpful.

- Conversion of the desired parameter from decimal to hexadecimal format
- Splitting the hexadecimal value into two blocks, "hi" and "lo". Block length is two words each
- The hexadecimal format of the two blocks "hi" and "lo" is converted to decimal format
- Enter the decimals in the input mask

Example

Total resolution	= 3600 steps per revolution x 256 revolutions	= 921600
Conversion to hexadecimal format		= E1000h
Broken down into"hi		= 000Eh
Conversion to decimal format		= 14
Broken down into "lo		= 1000h
Conversion to decimal format		= 4096
Total measuring range (units) hi	calculated parameter for input	= 14
Total measuring range (units) lo	calculated parameter for input	= 4096
Steps per revolution	= 3600 steps	= 3600
Measuring units per rev. hi	calculated parameter for input	= 0
Measuring units per rev. lo	calculated parameter for input	= 3600

Example for parameter input (TIA Portal®)



Ill. 1: Example see TIA Portal®

List of illustrations

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Baumer
Passion for Sensors

Baumer Germany GmbH & Co. KG
Bodenseeallee 7
DE-78333 Stockach
www.baumer.com