# WH5850, WV5850

## Absolute encoder with PROFINET® interface

User manual

159/22

## Table of contents

# 1 General Information

## 1.1 Documentation

The following documents are associated with this document:

- The data sheet describes the technical data, the dimensions, the pin assignment, the accessories and the order key.
- The installation instructions describe the mechanical and electrical installation with all safety-relevant conditions and the associated technical specifications.
- The User manual for encoder commissioning and integration into a fieldbus system.

You can also download these documents at **http://www.siko-global.com/p/wv5850**, **http://www.siko-global.com/p/wh5850**.

Additional information and guidance regarding this device can also be found there.

### 1.1.1 History

| Mod. status | Date | Description |
|---|---|---|
| 159/22 | 23.08.2022 | Document prepared |

## 1.2 Definitions

If not explicitly stated, decimal values are given as digits without addition (e. g., 1234), binary values are marked with "b" (e. g., 1011b), hexadecimal values with "h" (e. g., 280h) after the digits. Individual bits of larger logic units are named with their value after a dot (e. g., CW.9; control word bit 9).

### 1.2.1 Abbreviations

| Abbreviation | Description |
|---|---|
| API | Application Process Identifier |
| ccw | counterclockwise, counting direction |
| cw | clockwise, counting direction |
| DAP | Device Access Point. It represents the access point of the unit to communication. |
| EEPROM | Electrically erasable programmable read-only memory. Non-volatile electronic memory device whose stored information can be electrically erased. |
| IRT | Isochronous Realtime |
| LSB | Least Significant Bit |
| MAP | Module Access Point. The MAP is part of DAP. |

| Abbreviation | Description |
|---|---|
| MRPD | Media Redundancy for Planned Duplication - Enables seamless switching of the connection paths in the event of a link branch failure, such as a cable break. |
| MSB | Most Significant Bit |
| MUR | Measuring Units per Revolution |
| NDR | Number of Distinguishable Revolutions |
| PAP | Parameter Access Point. The PAP is a data record in the MAP submodule. |
| PNU | Parameter Number - Number of the respective PROFINET encoder parameter. |
| rpm | Revolutions per minute |
| RT | Real Time - Includes cycle times of up to 1 ms. |
| Sync | Synchronization |
| TMR | Total Measuring Range |
| USF | Universal Scaling Function |

*Table 1: Abbreviations*

## 1.3 Intended use

For the further functional description, normal operation of the system with unchanged factory setting is assumed unless otherwise described.

The present device is an absolute rotary encoder with integrated industrial Ethernet interface for corresponding shaft mounting. It detects the position of rotary axes and outputs the position in the form of a unique digital numerical value. Indicators and interface are only active with external power supply. The scanning of the singleturn (ST) gray code measuring encoder is carried out optically. Without an external power supply, encoder changes are recorded with battery support. Operating conditions or device faults are indicated by color LEDs.

Control values can be changed via the interface, actual value (position, speed) as well as the status of the rotary encoder can be queried, and device parameters can be adjusted.

## 1.4 Switching on the operating voltage

| | |
|---|---|
| **NOTICE** | The output data bytes evaluated internally by the encoder are set to 00h when it is switched on (supply voltage is applied), every time the Profinet connection is disconnected (e. g., the Profinet data line is disconnected) or when the Profinet controller sets "IOPS = BAD" (e. g., when the PLC goes to "STOP") and are thus deleted. |

| | |
|---|---|
| **NOTICE** | In the case of the standard telegrams 81, 82, 83 and 84 according to Encoder profile V4.2, the parking sensor is active in the initial state, with which the rotary encoder does not output any data or the position is frozen. To set the encoder to the operating state, the parking sensor can be deactivated via G1_STW.14. |

| NOTICE | The standard telegram is stored ex works. It does not contain any speed values. |
|---|---|

The encoder will be initialized after switching on the supply voltage. A system test is performed during initialization, and the device parameters are loaded from the nonvolatile memory into the main memory of the device controller.

At first use, the default values are used during initialization. After the external power supply has been restored, the rotary encoder operates with the parameters previously stored in a zero voltage-proof manner or transmitted by the controller in the start-up phase.

Unless a fault has been detected, the encoder starts normal operation.

## 2 LED display

LED2, LED3 LED4 and LED4 inform about the status of the Ethernet module of the rotary encoder. The LED1 and LED5 inform about PROFINET port activity. The functions of the LEDs are permanently defined and cannot be changed.

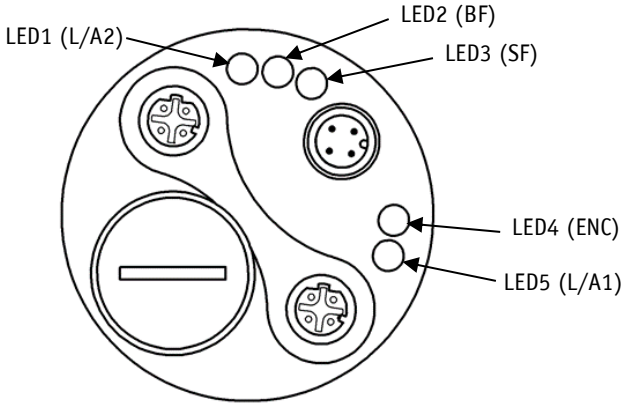


*Fig. 1: LEDs*

### 2.1 BF - Bus Failure LED2

| LED state | Description |
|---|---|
| off | No error: PROFINET connection was established correctly. |
| red | No configuration / no or restricted physical connection: Position error, temperature limit exceeded, commissioning error, watchdog or process data interface between microcontroller and slave. |
| red, flashing | No data exchange |

### 2.2 SF - System Failure LED3

| LED state | Description |
|---|---|
| off | No error |

| LED state | Description |
|---|---|
| red | No configuration / no or restricted physical connection: Position error, temperature limit exceeded, commissioning error, watchdog or process data interface between microcontroller and slave. |
| red, flashing | Device passivated |
| red, flashing 0.5 Hz | PROFINET connection was established, but the "user parameter data" (BF00 telegram) are missing. |
| red, flashing 1.0 Hz | Internal memory error (FLASH or RAM) |
| red, flashing 5.0 Hz | Internal position sensor (ICLG): No valid data available. |

### 2.3 ENC-Encoder LED4

| LED state | Description |
|---|---|
| off | No operating voltage |
| green, yellow | ACTIVITY: Data transfer active |
| green | OPERATIONAL: The complete process data traffic is active. Actual and setpoint values are transmitted. |

### 2.4 L/A1 & L/A2 - Link/Activity LED1, LED5

| LED state | Description |
|---|---|
| off | No connection, no activity |
| yellow | Connection detected, no activity |
| yellow, flickers | Connection detected, activity |

## 3 Functional description

For the further description, the basics of established IT standards, basic knowledge in the handling and programming of programmable logic controllers and familiarity with the PROFINET® mechanism are required. PROFINET exchanges data, including quality and asset management information, quickly and deterministically. The protocol is standardized in IEC 61158 and IEC 61784.

According to the PROFINET specification, the encoder corresponds to the device model:

- An IO device instance.
- Each IO device instance comprises one or more application processes, which are defined by the identifier (API = Application Process Identifier).
- Each API contains one or more slots.
- Each slot includes one or more subslots.
- Each subslot contains one or more channels.

## 3.1 Parameterization

The PROFINET must be configured by parameterization according to the purpose of the application. The GSDML file for the encoder must be installed in the PLC Engineering software used to activate this configuration. This provides appropriate slots or subslots in the DAP.

### 3.1.1 Implemented profile versions

- Encoder Profile Version 4.2
- PROFIdrive Version V4.2

### 3.1.2 Implemented and optional features

| | |
|---|---|
| **NOTICE** | The function use of various features depends on the IO controller or other IO devices used within a PROFINET network. If the features are supported in the respective system, it may also be necessary to activate or configure the relevant function explicitly in the controller. |

| | |
|---|---|
| **NOTICE** | The overview shows whether the feature is implemented in the encoder. However, this does not mean that the feature is implemented in the same way in every PROFINET device. |

| Optional PROFINET features | Description |
|---|---|
| Discovery and basic Configuration Protocol (DCP) | The Discovery and basic Configuration Protocol is used to assign a symbolic device name. |
| Network Redundancy with Media Redundancy Protocol (MRP) | The Media Redundancy Protocol provides network ring redundancy for PROFINET IO real-time networks. |
| System Redundancy | Enables a primary and backup controller for redundant applications with PROFINET. |
| Supervisor Access | Enables an IO device to be taken over by an IO supervisor to check inputs, outputs and device functions. |
| Extended Device Information (Identification & Maintenance Records 1 … 3) | Extended device identification (location name, installation date, etc.) |
| Simple Network Management Protocol (SNMP) | Enables reading simple network management protocols and topology information. |
| Simple Device Replacement | Enables an IO controller to name a replaced IO device automatically in the event of equipment failure and replacement. |
| Fast Start Up (FSU) | Fast start-up of the device after power-on for specific applications (e. g., tool changer). |

| Optional PROFINET features | Description |
|---|---|
| Isochronous Real Time (IRT) | Isochronous real-time enables synchronous communication with bandwidth reservation and scheduling up to 250 µs with <1 µs jitter for motion control applications. |
| Application and Device Profiles | Specific application/device profiles for specific applications (e. g., security, energy, drives) or device data sets for specific device types (e. g., encoders). |
| Manufacturer Specific Alarms | Manufacturer-specific PROFINET diagnostic alarms (e. g., redundant power supply fault, manufacturer-specific fault code). |

*Table 2: Optional PROFINET features*

#### 3.1.2.1 FSU - Fast Start Up

An optimized system start-up is defined with a Fast Start Up (FSU) to enter the data exchange much faster from the second start-up, since many parameters have already been stored in the field devices. This optional path can be used parallel to the standard start-up (which continues to be used after "Power-On" during the first start-up or "Reset"). It must be possible to permanently store the communication parameters for this purpose.

The start-up normally takes 6-7 seconds after the operating voltage is switched on. With the FSU activated, the rotary encoder is ready for operation in approx. 2 seconds. This is indicated by the flashing Link/Activity LED of the port used (see chapter 2.4).

#### 3.1.2.2 LLDP - Link Layer Discovery Protocol

| | |
|---|---|
| **NOTICE** | Commercially available switches can be used for the network infrastructure in CC-A, which support neighborhood recognition with Link Layer Discovery Protocol (LLDP) according to IEEE 802.1AB (messages with the special Ether type may not be forwarded by the switch). |

| | |
|---|---|
| **NOTICE** | In order for device replacement to work without a removable medium in the form of Plug & Play, it must be ensured that the new PROFINET device does not have a device name. This is the as-delivered condition. Current controls also support overwriting of existing device names. This must then be set on the control side. Likewise, seamless device replacement without additional parameterization can only be guaranteed if the old PROFINET device has been configured with telegrams that are also supported in the new device. |

LLDP is a manufacturer-independent Layer 2 protocol. A device that supports LLDP sends a message to its neighbor devices every few seconds to identify itself and transmit network-related information. These messages provide information about the device and its type of integration into the respective topology (port description, IP address, device name, etc.).

The LLDP function is always active by default, but can also be deactivated. During the network startup, all devices exchange this information with each other. This makes its possible to view or reconstruct the current topology directly using an engineering tool. The main advantage is the simplified replacement of defective devices. The new device is automatically assigned an LLDP ALIAS name. This enables it to log on to the network automatically without using any software.

#### 3.1.2.3 MRP - Media Redundancy Protocol

| | |
|---|---|
| **NOTICE** | All devices must be in the same subnet to form a logical ring. This also applies to the PC via which the controller is parameterized. The function requires corresponding prerequisites and device settings on the part of the controller. |

PROFINET provides the option of setting up ring topology. MRP provides the option of transporting the data to the controller via both directions of the logical ring. However, this is only done if necessary (typically in the event of cable breakage) - i. e., as soon as a transmission path no longer works, a second one is opened. The changeover usually takes a few milliseconds. MRP is usually used in conjunction with RT, but can also be used with IRT.

#### 3.1.2.4 Isochronous Mode IRT

| | |
|---|---|
| **NOTICE** | For this purpose, all devices involved must be connected to one another directly in such a clock system without transition by non-synchronous devices. |

| | |
|---|---|
| **NOTICE** | MRP cannot be used in conjunction with IRT. The devices in the ring must support MRPD to achieve this. |

If the shortest cycle times of the respective application are not sufficient, the isochronous mode can be activated additionally. For this purpose, a clock master synchronizes all local clock generators of the devices in a clock system (IRT domain) to the same clock with the aid of synchronization messages.

This ensures that the data are deterministic at all times. The minimum clock cycle is 250 µs. The cycle time can be an arbitrary multiple of the minimum cycle time. All transmission times to all subscribers in the network are calculated in advance. Collisions and latencies due to jitter are ruled out by network-side prioritization mechanisms. As a result, the encoder value can be assigned to an exact time (±1 µs).

### 3.1.3 Acyclic communication

Encoder parameters are set when the encoder is configured. PROFIdrive devices also know parameters in which other required data are held. These parameter data are processed in parallel in time and in addition to the cyclic process data transmission. They are normally not transmitted cyclically during the runtime of an automation program, but only "acyclically" if required.

Access to the acyclic parameter data was implemented according to the PROFIdrive drive profile in the encoder.

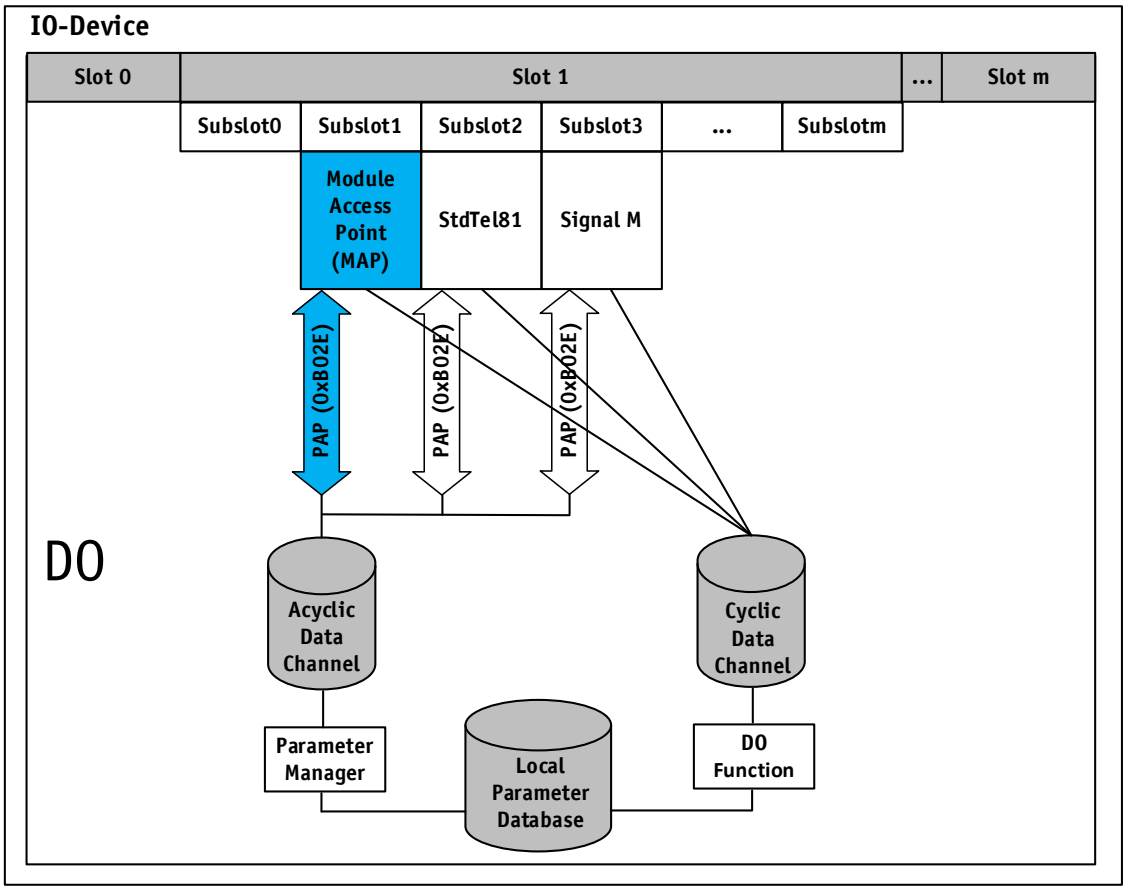


*Fig. 2: Acyclic communication*

## 3.2 Standard telegrams for cyclic process data

| NOTICE | Set the preset only at standstill. If the preset value is greater than the total resolution, the warning "Preset value out of range" is set. |
|---|---|

The standard message frames 81, 82, 83, 84, 86, 88 are implemented for the cyclic process data.

Standard message frames 81 to 84 are typically used when the encoder is used together with a motion control system with PROFIdrive interface. Telegrams 81 to 84 provide a standard PROFIdrive sensor interface corresponding to the sensor interface of a standard drive. However, telegrams 81 to 84 can also be used with a programmable logic controller if the monitoring of sign-of-life or error codes via a cyclic interface is required.

With the standard telegrams 86 and 88, it is possible to set a user-defined preset value accordingly during the running application.

Different signals are processed in the different telegrams.

| Abbreviation | Meaning | Length (Bit) | Sign |
|---|---|---|---|
| G1_XIST1 | Position 1 | 32 | No |
| G1_XIST2 | Position 2 | 32 | No |
| G1_XIST3 | Position 3 | 64 | No |
| NIST_A | Speed A | 16 | Yes |
| NIST_B | Speed B | 32 | Yes |

| Abbreviation | Meaning | Length (Bit) | Sign |
|---|---|---|---|
| G1_STW | Sensor 1 control word | 16 | No |
| G1_ZSW | Sensor 1 status word | 16 | No |
| STW2_ENC | Encoder control word 2 | 16 | No |
| ZSW2_ENC | Encoder status word 2 | 16 | No |
| G1_XIST_PRESET_B | Sensor preset signal G1_XIST1 | 32 | No |
| G1_XIST_PRESET_C | Sensor preset signal G1_XIST3 | 64 | No |

*Table 3: Cyclic signals of standard telegrams*

### 3.2.1 Structure of the standard telegrams

Standard data format according to encoder profile V4.2. The byte order corresponds to the Big Endian format. The bit value of the actual position and speed values is right-aligned (shift factor 0).

Input data (master ⇒ slave); output data (slave ⇒ master)

#### 3.2.1.1 Standard telegram 81

| | |
|---|---|
| **NOTICE** | In contrast to standard telegram 86, the preset value is transmitted cyclically in standard telegram 81. For the value itself, this means that it is not transmitted in the telegram, but instead uses a variable. This variable has the designation B02Eh and can be defined in the general settings of the submodule (see chapter 3.3.4). |

- Standard PROFIdrive encoder channel

Structure input data

| PZD/Word | 1 | 2 |
|---|---|---|
| Set point | STW2_ENC | G1_STW |

Structure output data

| PZD/Word | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Actual value | ZSW2_ENC | G1_ZSW | G1_XIST1 | | G1_XIST2 | |

#### 3.2.1.2 Standard telegram 82

- Standard PROFIdrive encoder channel
- Speed A

Structure input data

| PZD/Word | 1 | 2 |
|---|---|---|
| Set point | STW2_ENC | G1_STW |

Structure output data

| PZD/Word | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Actual value | ZSW2_ENC | G1_ZSW | G1_XIST1 | | G1_XIST2 | | NIST_A |

### 3.2.1.3 Standard telegram 83

- Standard PROFIdrive encoder channel
- Speed B

Structure input data

| PZD/Word | 1 | 2 |
|---|---|---|
| Set point | STW2_ENC | G1_STW |

Structure output data

| PZD/Word | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Actual value | ZSW2_ENC | G1_ZSW | G1_XIST1 | | G1_XIST2 | | NIST_B | |

### 3.2.1.4 Standard telegram 84

- PROFIdrive encoder channel with position 3
- Speed B

Structure input data

| PZD/Word | 1 | 2 |
|---|---|---|
| Set point | STW2_ENC | G1_STW |

Structure output data

| PZD/Word | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Actual value | ZSW2_ENC | G1_ZSW | G1_XIST3 | | | | G1_XIST2 | | NIST_B | |

### 3.2.1.5 Standard telegram 86

- Position 2
- Speed B

Structure input data

| PZD/Word | 1 | 2 |
|---|---|---|
| Set point | G1_XIST_PRESET_B | |

Structure output data

| PZD/Word | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Actual value | G1_XIST2 | | NIST_B | |

#### 3.2.1.6 Standard telegram 88

- Position 3
- Speed B

Structure input data

| PZD/Word | 1 | 2 |
|---|---|---|
| Set point | G1_XIST_PRESET_C | |

Structure output data

| PZD/Word | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Actual value | G1_XIST3 | | | | NIST_B | |

### 3.2.2 Telegrammdaten

#### 3.2.2.1 Position value G1_XIST1 (slave ⇒ master)

| Bit | Description |
|---|---|
| Bit 0 ... 31 | Current absolute position value with max. 32 bit. Is affected by scaling and preset. Consideration of the preset can be deactivated by "Disable G1_XIST1 Preset Control" (see chapter 3.3.1.3). By default, only G1_XIST1 is active and displays the scaled position set by TMR + MUR (see chapter 3.3.1.6 or chapter 3.3.1.5). |

*Table 4: Position value G1_XIST1*

#### 3.2.2.2 Position value G1_XIST2 (slave ⇒ master)

| Bit | Description |
|---|---|
| Bit 0 ... 31 | Current absolute position value with max. 32 bit. Is affected by scaling and preset.<br>G1_XIST2 can be activated by STW2_ENC.13. G1_XIST2 then shows the same position as G1_XIST1.<br>Corresponding error codes are output in the event of an error<br>(see chapter 3.4.3.4). |

*Table 5: Position value G1_XIST2*

#### 3.2.2.3 Position value G1_XIST3 (slave ⇒ master)

| Bit | Description |
|---|---|
| Bit 0 ... 63 | Current absolute position value with max. 64 bit. Is affected by scaling and preset. |

*Table 6: Position value G1_XIST3*

#### 3.2.2.4 Speed value NIST_A (slave ⇒ master)

| Bit | Description |
|---|---|
| Bit 0 ... 15 | Current speed value date with max. 15 bit. The value is output in the unit parameterized for the speed measurement (see chapter 3.3.1.7).<br>Bit 15 contains the sign: 0 = + / 1 = - |

*Table 7: Speed value NIST_A*

#### 3.2.2.5 Speed value NIST_B (slave ⇒ master)

| Bit | Description |
|---|---|
| Bit 0 ... 31 | Current speed value with max. 31 bit. The value is output in the unit parameterized for the speed measurement (see chapter 3.3.1.7).<br>Bit 31 contains the sign: 0 = + / 1 = - |

*Table 8: Speed value NIST_B*

#### 3.2.2.6 Control word: G1_STW (master ⇒ slave)

| Bit | Description |
|---|---|
| Bit 0 ... 10 | Reserved, always 0 |
| Bit 11 | Preset Mode<br>0 = Absolute preset (new position = preset value) |
| | 1 = Relative preset (new position = old position + preset value) |
| Bit 12 | Positive edge triggers a preset process. |
| Bit 13 | Request Absolute Value Cyclically<br>0 = Deactivated. G1_XIST2 is not transmitted |
| | 1 = Activated. G1_XIST2 is transmitted |
| Bit 14 | Activate Parking Sensor<br>0 = Deactivated |
| | 1 = The controller deactivates the encoder ("Parking").<br>In this case, G1-ZSW.14 assumes the value 1.<br>The current position data is frozen.<br>No new errors are output. |
| Bit 15 | Sensor Error Acknowledge<br>0 = Transmission sensor error deactivated |
| | 1 = Transmission sensor error activated |

*Table 9: Control word G1_STW*

### 3.2.2.7 Control word: STW2_ENC (master ⇒ slave)

| Bit | Description |
|---|---|
| Bit 0 | Trigger preset<br>Positive edge sets the preset value from G1_XIST_PRESET_x as the new actual position value.<br>The actual position value is corrected by a calculated offset value. The offset is stored internally and confirmed via ZSW2_ENC.0. |
| Bit 1 … 6 | Reserved, always 0 |
| Bit 7 | Error acknowledgment<br>Positive edge confirms current errors in the error memory. |
| Bit 8, 9 | Reserved, always 0 |
| Bit 10 | Control by PLC<br>0 = No control by PLC. Data are not valid except for the Sign-Of-Life. G1_XIST2 is deactivated. |
| | 1 = Control by PLC. Control via the interface; I/O data are valid. |
| Bit 11 | Reserved, always 0 |
| Bit 12 … 15 | Master Sign-Of-Life<br>Only required if isochronous mode is activated. The encoder expects a bit-by-bit increment of the bits.<br>As soon as the Master Sign-Of-Life contains a value not equal to 0, the encoder starts to output the encoder Sign-Of-Life. As soon as a deviation from the expected count sequence is determined in the master Sign-Of-Life, the error counter is increased and, if necessary, the error 0F02h is output in G1_XIST2. |

*Table 10: Control word STW2_ENC*

### 3.2.2.8 Status word: G1_ZSW (slave ⇒ master)

| | |
|---|---|
| **NOTICE** | If the error cannot be acknowledged after the cause of the error has been eliminated and the error is still present even after a power-on reset, the encoder must be checked in the factory. |

| Bit | Description |
|---|---|
| Bit 0 … 10 | Reserved, always 0 |
| Bit 11 | Requirement Of Error Acknowledgement Detected<br>Switches to 1 if there is an error. Other causes:<br>Controller sets or deletes G1_STW.15 Sensor Error Acknowledge. Sensor error G1_ZSW.15 is present and error code in G1_XIST2 or controller deletes G1_ZSW.15 and G1_XIST2 again contains a position value. |
| Bit 12 | Set/Shift Of Home Position Executed<br>The encoder sets this bit to 1 after executing a preset operation until the corresponding bit in G1_STW is deleted again by the controller. |
| Bit 13 | Transmit Absolute Value Cyclically<br>Is 1 if there is a valid position in G1_XIST2. Is 0 if G1_ZSW.14 or G1_ZSW.15 = 1. |

| Bit | Description |
|---|---|
| Bit 14 | Parking Sensor Active<br>Switches to 1 as soon as G1_STW.14 is set. The reported position is fixed in this case. |
| Bit 15 | Sensor Error<br>Switches to 1 if a hardware error is detected. G1_XIST2 then contains the error code and G1_ZSW.13 is set to 0. This error bit must be acknowledged via G1_STW.15. |

*Table 11: Status word G1_ZSW*

### 3.2.2.9 Status word: ZSW2_ENC (slave ⇒ master)

| | |
|---|---|
| **NOTICE** | If the error cannot be acknowledged after the cause of the error has been eliminated and the error is still present even after a power-on reset, the encoder must be checked in the factory. |

| Bit | Description |
|---|---|
| Bit 0 | Preset operation<br>0 = The offset value of the last preset operation is stored. The encoder is ready for another preset operation. |
| | 1 = The preset value has been set as the new position actual value. This is confirmed by changing the bit from 0 ⇒ 1. The value has been stored internally. |
| Bit 1 | Validity G1_XIST x<br>0 = The position value in G1_XIST x is invalid. |
| | 1 = The position value in G1_XIST x is valid. |
| Bit 2 | Validity G1_NIST x<br>0 = The speed value in NIST x is invalid. |
| | 1 = The speed value in NIST x is valid. |
| Bit 3 | Encoder error<br>0 = The encoder did not detect any error. |
| | 1 = The encoder detected one or more errors. |
| Bit 4 … 6 | Reserved, always 0 |
| Bit 7 | Encoder warning<br>0 = The encoder does not have any warning messages. |
| | 1 = There are warning messages in the encoder. |
| Bit 8 | Reserved, always 0 |
| Bit 9 | Connection status<br>0 = No connection to the PLC. |
| | 1 = Connection was established to the PLC. |
| Bit 10, 11 | Reserved, always 0 |

| Bit | Description |
|---|---|
| Bit 12 ... 15 | Encoder Sign-Of-Life<br>As soon as the controller sends the Master Sign-Of-Life, the encoder begins to send the sign of life. This is a bitwise incremented signal with the values 0 ... 15.<br>The initial value is 0. |

*Table 12: Status word ZSW2_ENC*

#### 3.2.2.10 Preset signal: G1_XIST_PRESET_B and Trigger Bit (master ⇒ slave)

| Bit | Description |
|---|---|
| Bit 0 ... 30 | Preset value (without bit 31) for G1_XIST1 |
| Bit 31 | Preset Steuerbit<br>0 = Preset mode not active. This bit is used as a "preset control" for standard telegram 86. |
| | 1 = Activate preset. The preset value is used as the current position value; the offset value is calculated and stored in a zero-voltage-proof manner. |

#### 3.2.2.11 Preset signal: G1_XIST_PRESET_C and Trigger Bit (master ⇒ slave)

| Bit | Description |
|---|---|
| Bit 0 ... 62 | Preset value (without bit 63) for G1_XIST3 |
| Bit 63 | Positive edge triggers the preset value transfer as current position value. |

## 3.3 Configuration parameters

### 3.3.1 General Modul Parameter

The encoder has various parameters that can be set equally in each telegram.

#### 3.3.1.1 Code Sequence Counter Clockwise

Influences the counting behavior depending on the direction of rotation. When looking at the shaft side of the encoder.

| | |
|---|---|
| CW (default) | The encoder position increases when the shaft rotates clockwise. |
| CCW | The encoder position increases when the shaft rotates counterclockwise. |

#### 3.3.1.2 CLASS 4 Functionality

Influences the consideration of the scaling, preset and direction of rotation setting in all telegrams or in the position data G1_XIST1, G1_XIST2 and G1_XIST3.

| | |
|---|---|
| Deactivated | Application class 3 - Scaling, preset and rotation direction setting deactivated. |
| Activated (default) | Application class 4 - Scaling, preset and rotation direction setting activated. |

#### 3.3.1.3 Disable G1_XIST1 Preset Control

| | |
|---|---|
| **NOTICE** | This parameter controls the consideration of the preset at G1_XIST1. The execution of a preset on G1_XIST2 and G1_XIST3 is always taken into account. |

| | |
|---|---|
| **NOTICE** | If G1_XIST1 is deactivated and the position value rises above the maximum value or falls below 0, the device outputs the maximum position value within the scaled total range for the position value G1_XIST2.<br>The position value G1-XIST1 is not limited to the scaled total range. For the position value G1-XIST1, the device also outputs a scaled position value within the total measuring range, e. g., max. 33554432 position at 25 bits. |

Influences the consideration of the preset (B02Eh).

| | |
|---|---|
| Deactivated (default) | G1_XIST1 displays the current position, taking into account the preset (G1_XIST1 = G1_XIST2, but without any error code). |
| Activated | G1_XIST1 displays the current position without considering the preset. |

#### 3.3.1.4 Scaling Function Control

| | |
|---|---|
| **NOTICE** | The decisive factor is whether the division ratio k results in an integer. Only with a binary division ratio would the overflow from TMR to 0 occur together with the overflow of the physical multiturn to 0! |

Influences the consideration of scaling.

| | |
|---|---|
| Deactivated | The position is represented in the maximum possible total resolution (ST+MT = TMR) of the telegram used in each case. |
| Activated (default) | The encoder position is displayed scaled (according to MUR and TMR). |

If the scaling parameters are enabled (encoder class 4 functionality = activated and scaling function = activated), the physical resolution of the measuring system can be changed. The USF enables not only binary, but also decimal division ratios for scaling, which are required depending on the applications.
If the encoder was parameterized with MUR and TMR to a decimal division ratio relative to the max. physical position (TMRph), a position error would result after the maximum position is reached. After the max. physical MT speed (NDRph), there would be an overflow, since the physical multi-turn value changes from TMR to 0 in the middle of the calculation.

The division ratio k can be calculated using the formula k = TMRph / TMR.

Example USF in general:

In the case of a rotary encoder with MURph = 16 bit and NDRph = 12 bit, TMRph = 28 bit-physical total resolution results.

- TMR = 67108864
  K = 2^28 / 67108864 = 4 ⇒ Binary division ratio
- TMR = 65000000
  K = 2^28 / 65000000 = 4.1297 ⇒ Decimal division ratio

The USF is particularly useful in those applications which require a special division or transmission ratio.

### 3.3.1.5 MUR – Measuring Units per Revolution

Sets the number of different positions per revolution (ideally a power of 2). This depends on the resolution of the respective device and the permissible maximum number of bits of the message frame used.

| Standard telegram | MUR max. bits from device | TMR max. bits from device | Bits max. permissible after telegram |
|---|---|---|---|
| 81, 82, 83, 84 | 16 | 32 | 32 |
| 86, 88 | 19 | 43 | 64 |

Value range

| Value |
|---|
| 1 ... 65535 |
| 8192 (default) |

### 3.3.1.6 TMR – Total Measuring Range

| NOTICE | MUR > TMR is also possible, whereby the MUR value is decisive for the single-turn resolution. The TMR value 8192 is set ex works for MT encoders, which is an ST encoder for MUR 8192. |
|---|---|

Total number different from the reporting positions, for all revolutions to be differentiated. The following applies for this:

- TMR / MUR — highest value to be set = max. multi-turn value.
- TMR / MUR = 1 ⇒ Singleturn

Example:

MUR = 8192

TMR = 65536

TMR is reached after eight (8) revolutions or the positions 0 to 65535 repeat every eight (8) revolutions.

Value range

| Value |
|---|
| 4 ... 4294967295 |
| 8192 (default) |

### 3.3.1.7 Velocity Measuring Unit

| | |
|---|---|
| NOTICE | The calculation generally takes place once per second. |

| | |
|---|---|
| NOTICE | The value range ranges from -200 % to 200 %. Adapt the setpoint to the respective application to make optimal use of the value range. If the expected speed value does not appear in the signal NIST_x, check the selected normalization or scaling for NIST. |

Diese Einstellung beeinflusst die Einheit der berechneten Geschwindigkeit.

| | |
|---|---|
| 0 | Steps (positions) / second |
| 1 | Steps (positions) / 0.1 second |
| 2 | Steps (positions) / 0.01 second |
| 3 (default) | Revolutions / minute (rpm) |
| 4 | N2/N4 normalized<br>Speed normalization (scaling) as used in PROFIdrive telegrams. The actual speed value in NIST is a percentage of the setpoint. |

The following applies for this:

- N2/N4 normalized [%]
- 100 % = Velocity Reference Value (Parameter 60000)
- MSB = 1 is a negative sign; MSB = 0 is a positive sign

Example:

Parameter 60000 = 4000 rpm

Current speed = 2000 rpm, which corresponds to 50 % of 4000 rpm
⇒ NIST_A is 50 %

Current speed = -6000 rpm, which corresponds to -150 % of 4000 rpm
⇒ NIST_A is -150 %

### 3.3.1.8 PRESET value

| | |
|---|---|
| NOTICE | When the preset process is triggered via standard telegram 86 or 88, the preset value is determined, transmitted and triggered directly via the cyclic input data. This means that no preset can be used via B02Eh when these telegrams are used. |

Specifies an absolute or relative position that can be accessed when executing a preset, e. g., using the standard telegram 81.

Permissible value range:

- Absolute preset: 0 ... ("TMR"-1)
- Relative preset: 0 ... ±("TMR"-1)

When the PROFINET connection is established, the preset value specified here is automatically set by the controller. If necessary, the preset value can also be changed later.

### 3.3.2 Acyclic parameter data

| NOTICE | The sequence must be adhered to, regardless of whether read or write access is used. |
|---|---|

Using the acyclic parameter data, information can be read from the encoder and parameters can also be written to the encoder.

In principle, parameter data is written/read in the PROFIdrive profile via "Base Mode Parameter Access". This service is defined and provided by PROFIdrive. The PROFIdrive profile specifies how precisely this basic mechanism is used or how the PROFINET master can read or write access data blocks in the PROFINET slave.

A parameter access always consists of:

- Write Request ("Write data record")
- Read Request ("Read data record")

The parameter job (request) is transmitted with a "write data record" (e. g., read parameter x). With a "Read data record", the response to this parameter job is retrieved (value of parameter x).

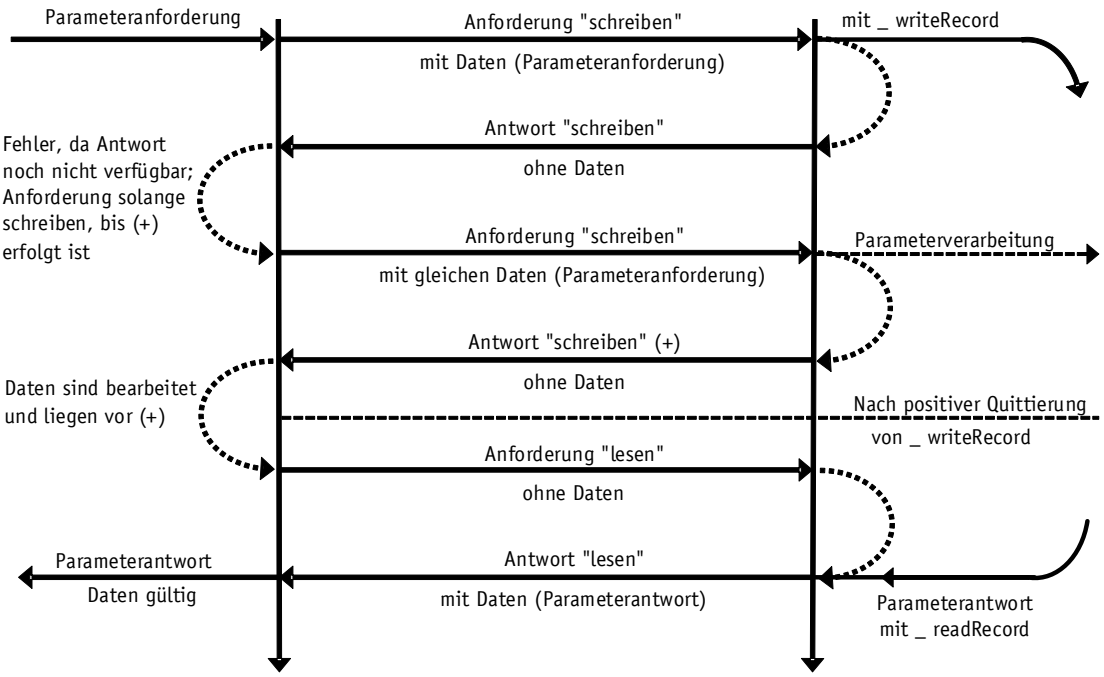


*Fig. 3: Read and write acyclic parameter data*

PROFINET provides various access options depending on the area.

| Record Data Object | Parameter access service | Slot | Subslot |
|---|---|---|---|
| AFF0h | I&M 0 Parameter | 01h | 01h |
| AFF1h | I&M 1 Parameter | | |
| AFF2h | I&M 2 Parameter | | |
| AFF3h | I&M 3 Parameter | | |
| B02Eh | Base Mode Parameter Access | 01h | 01h |
| BF00h | Start-up Configuration | 01h | 01h |

*Table 13: Record Data Objects*

All encoder parameters are referenced by reference numerals: the parameter numbers-PNU or the index as well as the subindex. This is accessed via Record Data Objects, which communicate with the parameter Manager via PAP.

Standard and system functions are provided by various control systems for acyclic communication.

Example:

For a Siemens PLC (S7), these are:

- SFB52 = RDREC (Read Record)
- SFB53 = WRREC (Write Record)

The function blocks implement Base Mode Parameter Access (B02Eh).

#### 3.3.2.1 Write access

| NOTICE | A "Write data record" without data is used to determine the status of "Write data record" with data until the positive acknowledgment takes place. Successful completion of "Write data record" only signals error-free transfer of the data record via the communication path, but not error-free execution of the process in the target device. This is checked by the subsequent "Read data record" request. |
|---|---|

To write a parameter value, data (P-Request/Response data record) are first transferred to the job structure, which are then transferred via "Write data record". The status can be checked by repeated "Write data record" (_writeRecord without data) until positive acknowledgment is received. The execution in the target device is queried with a "Read record" request (_readRecord).

- "Write Request" by the IO controller with parameter number and the user data to be written.
- "Write Response" from the IO device

Write Request from IO controller

| | | | | |
|---|---|---|---|---|
| Slot | | | BYTE | 01h |
| Subslot | | | BYTE | 01h |
| Index | | | WORD | B02Eh |
| Data Length | | | BYTE | Individual |

| | | | | |
|---|---|---|---|---|
| Data | Request Header | Request Reference | BYTE | |
| | | Request ID | BYTE | 01h = "Read"<br>02h = "Write" |
| | | Drive Object ID | BYTE | 00h |
| | | Number of Parameters | BYTE | 01h |
| | Parameter Value | Attributes | BYTE | 10h = "Value" |
| | | Number of Elements/Values | BYTE | |
| | | Parameter Number | WORD | |
| | | Subindex | WORD | |
| | | Format / Data Type | BYTE | at "Write Request" |
| | | Number of values | BYTE | at "Write Request" |
| | | Values to write (if any) | BYTE | at "Write Request" |

*Table 14: Write Request from IO controller*

Write Response from IO device

| | | |
|---|---|---|
| Slot | BYTE | 01h |
| Subslot | BYTE | 01h |
| Index | WORD | B02Eh |
| Data Length | BYTE | Individual |

*Table 15: Write Response from IO device*

#### 3.3.2.2 Read access

To read parameter values, the data block is first compiled of the parameter to be read. This data record is transferred to the encoder as a request via "Write data record" (_writeRecord). A subsequent "Read data record" (_readRecord) as a request then returns the requested values once.

- "Write Request" by the IO controller. The parameters to be read are transmitted here.
- "Write Response" from IO device.
- "Read Request" by the IO controller.

Read Request from IO controller

| | | |
|---|---|---|
| Slot | BYTE | Always 01h |
| Subslot | BYTE | Always 01h |
| Index | WORD | Always B02Eh |
| Data Length | BYTE | Depends on parameters |

*Table 16: Read Request from IO controller*

Read Response from the IO device with the requested user data.

| | | | |
|---|---|---|---|
| Slot | | | BYTE |
| Subslot | | | BYTE |
| Index | | | WORD |
| Data Length | | | BYTE |
| Data | Response Header | Response Reference | BYTE |
| | | Response ID | BYTE |
| | | Drive Object ID | BYTE |
| | | Number of Parameters | BYTE |
| | Parameter Value | Format / Data Type<br>02h = Integer8<br>03h = Integer16<br>04h = Integer32<br>05h = Unsigned8<br>06h = Unsigned16<br>07h = Unsigned32<br>08h = FloatingPoint<br>0Ah = OCTET STRING<br>41h = Byte<br>42h = WORD<br>43h = DOUBLE WORD<br>44h = error message | BYTE |
| | | Number of values | BYTE |
| | | Values | see format |

*Table 17: Read Response from IO device*

### 3.3.2.3 Examples of for reading and writing a parameter

The following examples show the values for reading or writing the parameter 65000, which contains the preset value of the encoder.

Request to read a parameter

| | | | | |
|---|---|---|---|---|
| Data | Request Header | Request Reference | BYTE | 01h |
| | | Request ID | BYTE | 01h |
| | | Drive Object ID | BYTE | 00h |
| | | Number of Parameters | BYTE | 01h |
| | Parameter Value | Attributes | BYTE | 10h = "Value" |
| | | Number of Elements/Values | BYTE | 00h |
| | | Parameter Number | WORD | FDE8h = 65000 |
| | | Sub-index | WORD | 0000h |

*Table 18: Example for Request Read a parameter*

Response to read a parameter

| | | | | |
|---|---|---|---|---|
| Data | Response Header | Request Reference | BYTE | 01h |
| | | Request ID | BYTE | 01h |
| | | Drive Object ID | BYTE | 00h |
| | | Number of Parameters | BYTE | 01h |
| | Parameter Value | Format / Data Type | BYTE | 43h |
| | | Number of values | | 01h |
| | | Values | | 00000064h = 100 |

*Table 19: Example for Request Read a parameter*

Request to write a parameter

| | | | | |
|---|---|---|---|---|
| Data | Request Header | Request Reference | BYTE | 01h |
| | | Request ID | BYTE | 02h |
| | | Drive Object ID | BYTE | 00h |
| | | Number of Parameters | BYTE | 01h |
| | Parameter Value | Attributes | BYTE | 10h = "Value" |
| | | Number of Elements/Values | BYTE | 00h |
| | | Parameter Number | WORD | FDE8h = 65000 |
| | | Sub-index | WORD | 0000h |
| | | Format / Data Type | BYTE | 43h |
| | | Number of values | BYTE | 01h |
| | | Values to write (if any) | BYTE | 00000064h = 100 |

*Table 20: Example for Request Write a parameter*

Request to write a parameter

| | | | | |
|---|---|---|---|---|
| Data | Response Header | Request Reference | BYTE | 01h |
| | | Request ID | BYTE | 02h |
| | | Drive Object ID | BYTE | 00h |
| | | Number of Parameters | BYTE | 01h |

*Table 21: Example for Response Write a parameter*

### 3.3.3 I&M Data

The I&M data can be found directly in the device. As a rule, they can be read or adapted in the relevant device in the Inspector window under Properties/General/Catalog Information or Properties/General/Identification & Maintenance.

The program is accessed via Read Record with the index AFF0h. The basic device parameters in relation to PROFINET and the manufacturer identification are there.

| | Data | Data type | Content |
|---|---|---|---|
| Block Header | Block Type | UINT16 | 0020h |
| | Block Length | UINT16 | 0038h |
| | Block Version High | UINT8 | 01h |
| | Block Version Low | UINT8 | 01h |
| I&M Block | Manufacturer-ID | UINT16 | 02EBh (SIKO GmbH) |
| | Order_ID | STRING | "Wx5850-xxxx" |
| | Serial Number | STRING | "0123456789" |
| | Hardware Revision | STRING | "6" |
| | Software Revision | STRING | "V1.0.4" |
| | Revision Counter | UINT16 | 0000h |
| | Profile-ID | UINT16 | 3D00h |
| | Profile Specific Type | UINT16 | 0001h |
| | I&M Version (major) | UINT8 | 01h |
| | I&M Version (minor) | UINT8 | 01h |
| | I&M Supported | UINT16 | 000Eh |

*Table 22: I&M 0 data block*

In addition to the standard I&M 0 data, additional I&M data can be stored. These are subdivided as follows:

- I&M 1 (AFF1h) = system indicator and location indicator
- I&M 2 (AFF2h) = installation date
- I&M 3 (AFF3h) = manufacturer-specific additional information in the device

### 3.3.4 Base Mode Parameter

The encoder parameters are accessed according to PROFIdrive profile V4.2.

## 3.4 Parameter

Parameters are divided into PROFIdrive, Interface and Encoder parameters.



### 3.4.1 PROFIdrive Parameter

#### 3.4.1.1 PNU 922: Telegram Selection

The parameterized telegram type can be read via this parameter.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned8 |
| Access | Read |
| PNU | 922 |

Value range

| Value | Description |
|---|---|
| 81 (default) | PROFIdrive standard telegram 81 |
| 82 | PROFIdrive standard telegram 82 |
| 83 | PROFIdrive standard telegram 83 |
| 84 | PROFIdrive standard telegram 84 |
| 86 | Standard telegram 86 with 32 bit position + 32 bit speed |
| 88 | Standard telegram 88 with 64 bit position + 32 bit speed |

#### 3.4.1.2 PNU 925: Number of Controller Sign-Of-Life Failures Tolerated

| | |
|---|---|
| NOTICE | In operation with profile 4.2, this parameter is always "1". |

| | |
|---|---|
| NOTICE | The parameter can only be written if the Master Life signal is deactivated. |

The parameter reads or writes the number of tolerable errors of the "Sign-Of-Life" of the IO controller.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned8 |
| Access | Read/Write |
| PNU | 925 |

Value range

| Value | Description |
|---|---|
| 1 ... 255 | |
| 255 | Sign-of-Life monitoring is deactivated |
| 1 (default) | |

#### 3.4.1.3 PNU 964: Drive Unit Identification

A data record for identifying the rotary encoder can be read via this parameter.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned16 |
| Access | Read |
| PNU | 964 |

Value range

| Sub-index | Description |
|---|---|
| 0 | Manufacturer ID |
| 1 | Object type (manufacturer-specific) |
| 2 | Firmware version e. g., 0064h = 100 corresponds to V1.00 |
| 3 | Firmware date (year) e. g., 7E4h = 2020 |
| 4 | Firmware date (day/month) e. g., 0067h = 103 corresponds to 1/03 |
| 5 | Number of Drive Objects |

#### 3.4.1.4 PNU 965: Profile Identification Number

The parameter reads the PROFILE ID of the encoder PROFILE as well as its parameterized version.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Byte |
| Access | Read |
| PNU | 965 |

Value range

| Subindex | Description |
|---|---|
| 0 | Profil-ID: 3Dh shortened |
| 1 | 1Fh = 31 corresponds to V3.1<br>2Ah = 42 corresponds to V4.2 |

### 3.4.1.5 PNU 974: Base Mode Parameter Access Service Identification

This parameter reads three properties of the parameter channel:

- Max. data length.
- Multi-parameter access capability.
- Max. processing time for access as an indication of a customer timeout.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned8 |
| Access | Read |
| PNU | 974 |

Value range

| Sub-index | Description |
|---|---|
| 0 | Max. data length (240Byte = F0h) |
| 1 | Max. number of parameter requests per multi-parameter request |
| 2 | Max. access processing time |

### 3.4.1.6 PNU 975: DO Identification

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned16 |
| Access | Read |
| PNU | 975 |

Value range

| Sub-index | Description |
|---|---|
| 0 | Manufacturer ID |
| 1 | Object type (manufacturer-specific) |
| 2 | Firmware version e. g., 0064h = 100 corresponds to V1.00 |
| 3 | Firmware date (year) e. g., 7E4h = 2020 |
| 4 | Firmware Date (day/month) e. g., 0067h = 103 corresponds to 1/03 |
| 5 | PROFIdrive Type Class, e. g., 0005h = 5 corresponds to encoder |
| 6 | PROFIdrive DO Subclass 1 |
| 7 | Drive Object ID |

#### 3.4.1.7 PNU 979: Sensor Format

This parameter reads the set user parameters of the encoder.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned32 |
| Access | Read |
| PNU | 979 |

Value range

| Sub-index | Description |
|---|---|
| 0 | Header information |
| 1 | Basic encoder (G1) type if 979[2] to 979[5] valid; otherwise 0x00000000. |
| 2 | Sensor resolution |
| 3 | Shift factor in the telegram part G1_XIST1 |
| 4 | Shift factor for the absolute value in G1_XIST2 |
| 5 | Determinable revolutions |
| 6 | Reserved |
| 7 | Reserved |
| 8 | Reserved |
| 9 | Reserved |
| 10 | Reserved |

### 3.4.1.8 PNU 980: Defined Parameters

This parameter reads all supported parameter numbers.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | | | |
|---|---|---|---|
| Data type | Unsigned16 | | |
| Access | Read | | |
| PNU | 980 | Subindex | 0 |

Value range

| Sub-index | Description |
|---|---|
| 0 | 922 |
| 1 | 925 |
| 2 | 964 |
| 3 | 965 |
| 4 | 974 |
| 5 | 975 |
| 6 | 978 |
| 7 | 979 |
| 8 | 61000 |
| 9 | 61001 |
| 10 | 61002 |
| 11 | 61003 |
| 12 | 61004 |
| 13 | 65000 |
| 14 | 65001 |
| 15 | 65002 |
| 16 | 65003 |
| 17 | 65004 |
| 18 | 65005 |
| 19 | 65006 |
| 20 | 65007 |
| 21 | 65008 |
| 22 | 65009 |
| 23 | 65010 |
| 24 | 0 = End Mark |

### 3.4.2 Interface Parameter

| Chapter | from page |
|---|---|
| PNU 61000: Name of Station | 34 |
| PNU 61001: IP of Station | 35 |
| PNU 61002: MAC of Station | 35 |
| PNU 61003: Default Gateway of Station | 36 |
| PNU 61004: Subnet Mask of Station | 36 |

In the factory setting, the station name and the IP configuration are set via the PROFINET DCP protocol.

The following basic settings apply:

| | |
|---|---|
| Station name | "" (blank) |
| IP address | 0.0.0.0 |
| Subnet mask | 0.0.0.0 |
| Gateway | 0.0.0.0 |

#### 3.4.2.1 PNU 61000: Name of Station

The parameter reads the device name. Length of the name from null (deleted) up to 240 characters, no null termination.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | OCTET STRING |
| Access | Read |
| PNU | 61000 |

Value range

| Value | Description |
|---|---|
| 0 ... 240 | |
| 0 (default) | Device name deleted/blank |

Value range

| Sub-index | Description |
|---|---|
| 0 | Device name deleted/blank |
| [n] | n+1 = string length of the device name |

#### 3.4.2.2 PNU 61001: IP of Station

This parameter reads the IP address of the encoder.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | UINT32 |
| Access | Read |
| PNU | 61001 |

Value range

| Value | Description |
|---|---|
| 0.0.0.0 ... 255. 255. 255. 255. | IP address encoder |
| 0.0.0.0 (default) | |

#### 3.4.2.3 PNU 61002: MAC of Station

This parameter reads the MAC ID of the encoder.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | OCTET STRING |
| Access | Read |
| PNU | 61002 |

Value range

| Value | Description |
|---|---|
| 98:02:D8:60:00:00 ... 98:02:D8:6F:FF:FF | MAC-ID encoder |

Value range

| Sub-index | Description |
|---|---|
| 0 | OUI (Organizationally Unique Identifier) |
| 1 | OUI (Organizationally Unique Identifier) |
| 2 | OUI (Organizationally Unique Identifier) |
| 3 | (*) Individual part of the MAC |
| 4 | (*) Individual part of the MAC |
| 5 | (*) Individual part of the MAC |

#### 3.4.2.4 PNU 61003: Default Gateway of Station

This parameter reads the IP address of default gateway of the encoder.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | UINT32 |
| Access | Read |
| PNU | 61003 |

Value range

| Value | Description |
|---|---|
| 0.0.0.0 ... 255. 255. 255. 255. | IP address Default-Gateway |
| 0.0.0.0 (default) | |

#### 3.4.2.5 PNU 61004: Subnet Mask of Station

The parameter reads the subnet mask of the network in which the encoder is located.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | UINT32 |
| Access | Read |
| PNU | 61004 |

Value range

| Value | Description |
|---|---|
| 0.0.0.0 ... 255. 255. 255. 255. | Subnet mask |
| 0.0.0.0 (default) | |

### 3.4.3 Encoder Parameter

#### 3.4.3.1 PNU 60000: N2/N4 Velocity Reference Value

| NOTICE | Changes only take effect after a reset. |
|---|---|

The actual speed value output in the signals NIST_A and NIST_B is a percentage of the speed reference value specified here (see chapter 3.3.1.7).

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | U/Min |

PROFINET

| | |
|---|---|
| Data type | FloatingPoint |
| Access | Read/Write |
| PNU | 60000 |

Value range

| Value | Description |
|---|---|
| 1.175494e-38 | Lower limit |
| 3.402823e+38 | Upper limit |
| 4000 (default) | |

#### 3.4.3.2 PNU 60001: Velocity Value Normalization

| NOTICE | Changes only take effect after a reset. |
|---|---|

This parameter can be used to set the unit for the output speed (see chapter 3.3.1.7).

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned16 |
| Access | Read/Write |
| PNU | 60001 |

Value range

| Value | Description |
|---|---|
| 0 | Steps (positions) / second |
| 1 | Steps (positions) / 0.1 second |
| 2 | Steps (positions) / 0.01 second |
| 3 (default) | Revolutions / minute (rpm) |
| 4 | N2/N4 normalized<br>Speed normalization (scaling) as used in PROFIdrive telegrams. The actual speed value in NIST is a percentage of the setpoint. |

#### 3.4.3.3 PNU 65000: Preset Value 32bit

The zero point of the measuring system can be adjusted via this parameter (see chapter 3.3.1.8).

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Integer32 |
| Access | Read/Write |
| PNU | 65000 |

Value range

| Value | Description |
|---|---|
| –268435455 | Lower limit |
| +268435455 | Upper limit |
| 0 (default) | |

#### 3.4.3.4 PNU 65001: Operating Status

The parameter reads the current operating state and current parameters.

General characteristics

| | |
|---|---|
| EEPROM | no |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned32 |
| Access | Read |
| PNU | 65001 |

Value range

| Sub-index | Description |
|---|---|
| 2 | Error |
| 4 | Warnings |

Parameter 65001 [2]: Error
Errors are related to the error codes displayed in G1_XIST2:

- 0001h Sensor/device error - Bits: 0, 5, 6, 12, 14, 22, 24
- 0F01h syntax error - Bits: 15
- 0F02h Master Sign of Life Error - Bits: 11
- 0F04h Sync error - Bits: 10

| Bit | Definition | 0 | 1 |
|---|---|---|---|
| Bit 0 | Position error (hardware and signal quality) | Position OK | Position error |
| Bit 5 | Position error (frequency /speed) | Position OK | Position error |
| Bit 6 | Invalid scaling | Scaling parameter OK | Scaling parameter error |
| Bit 12 | Overspeed | Always 0 | - |
| Bit 14 | Presets failed | Always 0 | - |
| Bit 22 | Memory | No memory error | Memory error |
| Bit 24 | Battery voltage | No battery error | Battery error |

Parameter 65001 [4]: Warnings

| Bit | Definition | 0 | 1 |
|---|---|---|---|
| Bit 0 | Position error (hardware and signal quality) | Position OK | Position warning |
| Bit 5 | Position error (frequency /speed) | Position OK | Position warning |
| Bit 6 | Invalid scaling | Scaling parameters OK | Scaling parameters warning |
| Bit 12 | Overspeed | Always 0 | - |
| Bit 14 | Presets failed | Always 0 | - |
| Bit 22 | Memory | No memory error | Memory warning |
| Bit 24 | Battery voltage | No battery fault | Battery warning |

### 3.4.3.5 PNU 65002: Preset Value 64Bit

The zero point of the measuring system can be adjusted via this parameter (see chapter 3.3.1.8).

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Integer64 |
| Access | Read/Write |
| PNU | 65002 |

Value range

| Value | Description |
|---|---|
| –268435455 | Lower limit |
| +268435455 | Upper limit |
| 0 (default) | |

### 3.4.3.6 PNU 65004: Function Control

| | |
|---|---|
| NOTICE | Changes only take effect after a reset. |

The setting of the function control parameter enables or disables the functionality of the encoder accordingly.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned32 |
| Access | Read/Write |
| PNU | 65004 |

Value range

| Bit | Description |
|---|---|
| Bit 0 | Code sequence<br>0 = CW |
| | 1 = CCW |
| Bit 1 | Class 4 Functionality<br>0 = Deactivated |
| | 1 = Activated |
| Bit 2 | G1_XIST1 Preset Control<br>0 = Activated |
| | 1 = Deactivated |
| Bit 3 | Scaling Function Control<br>0 = Deactivated |
| | 1 = Activated |
| Bit 4 | Alarm Channel Control<br>0 = Deactivated |
| | 1 = Activated |
| Bit 5 | V3.1 Compatibility Mode (not used) |

| Bit | Description |
|---|---|
| Bit 6 | Encoder Type<br>0 = Rotary encoders |
| | 1 = Linear encoders |
| Bit 7 ... 31 | Reserved, always 0 |

### 3.4.3.7 PNU 65005: Parameter Control

| NOTICE | Changes only take effect after a reset. |
|---|---|

Setting the Parameter Control parameter enables or blocks access to parameters and special device-related functions.

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned16 |
| Access | Read/Write |
| PNU | 65005 |

Value range

| Bit | Description |
|---|---|
| Bit 0, 1 | Parameter initialization control<br>0 = (default) Initialization of the parameter, from PRM data record. |
| | 1 = Initialization of the parameter from internal NV-RAM. |
| Bit 2 ... 4 | Parameter write protection<br>0 = (Default) Write all: All parameters of the base mode parameter channel can be read and written. |
| | 1 = Read only: Parameters of the BMP parameter channel can only be read. |
| | 2 = Write Controller: Parameters of the base mode parameter channel can only be written by the controller. |
| | 3 = Write Supervisor: Parameters of the base mode parameter channel can only be written by the supervisor. |
| Bit 5 | Parameter 65005 write protection<br>0 = (Default) Write all: Reading and writing access to parameter 65005 and parameter 971 via the base mode parameter channel. |
| | 1 = Read only: Only reading access to parameter 65005 and parameter 971 via the base mode parameter channel. |
| Bit 6 | Device Reset Control Protection<br>0 = (Default) Write all: Reading and writing access to the Base Mode parameter channel. |
| | 1 = Read only: Only reading access to the Base Mode parameter channel. |
| Bit 7 ... 15 | Reserved, always 0 |

### 3.4.3.8 PNU 65006: Measuring Units per Revolution (MUR)

| NOTICE | Changes only take effect after a reset. |
|---|---|

This parameter is used to set the resolution of the measuring system in [steps per revolution] (see chapter 3.3.1.5).

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned32 |
| Access | Read/Write |
| PNU | 65006 |

Value range

| Value |
|---|
| 1 ... 65535 |
| 8192 (default) |

### 3.4.3.9 PNU 65007: Total Measuring Range in Measuring Units (TMR)

| NOTICE | Changes only take effect after a reset. |
|---|---|

This parameter is used to define the total number of steps over the entire measuring range of the measuring system (see chapter 3.3.1.5 and chapter 3.3.1.6).

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned32 |
| Access | Read/Write |
| PNU | 65007 |

Value range

| Value |
|---|
| 4 ... 4294967295 |
| 8192 (default) |

### 3.4.3.10 PNU 65008: Measuring Units per Revolution (MUR) 64 Bit

| NOTICE | Changes only take effect after a reset. |
|---|---|

This parameter is used to set the resolution of the measuring system in [steps per revolution] (see chapter 3.3.1.5).

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned64 |
| Access | Read/Write |
| PNU | 65008 |

Value range

| Value |
|---|
| 1 ... 65535 |
| 8192 (default) |

### 3.4.3.11 PNU 65009: Total Measuring Range in Measuring Units (TMR) 64 Bit

| | |
|---|---|
| NOTICE | Changes only take effect after a reset. |

This parameter is used to define the total number of steps over the entire measuring range of the measuring system (see chapter 3.3.1.5 and chapter 3.3.1.6).

General characteristics

| | |
|---|---|
| EEPROM | yes |
| Unit | - |

PROFINET

| | |
|---|---|
| Data type | Unsigned64 |
| Access | Read/Write |
| PNU | 65009 |

Value range

| Value |
|---|
| 4 ... 4294967295 |
| 8192 (default) |

# 4 Block diagram

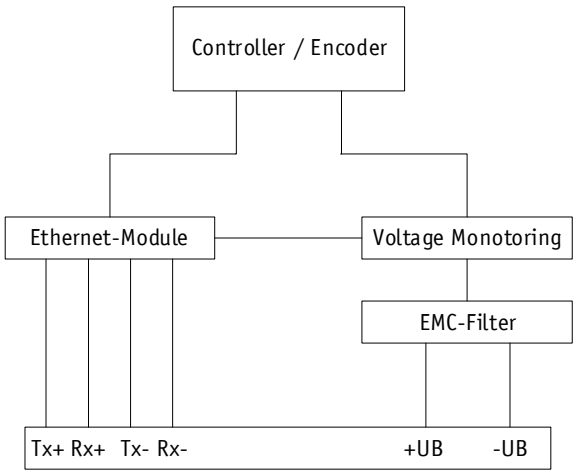


*Fig. 4: Block diagram*

**SIKO GmbH**

Weihermattenweg 2
79256 Buchenbach

**Phone**

+ 49 7661 394-0

**Fax**

+ 49 7661 394-388

**E-Mail**

info@siko-global.com

**Internet**

www.siko-global.com

**Service**

support@siko-global.com