

Bus description

## PSxHub EtherCAT



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## **Original operating instructions**

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The manufacturer owns the copyright to this instruction manual. It contains technical data, instructions and drawings detailing the device's features and how to use them. It must not be copied either wholly or in part or made available to third parties.

The instruction manual is part of the product. Please read this manual carefully, follow our instructions, and pay special attention to the safety information provided. This instruction manual should be available at all times. Please contact the manufacturer if you do not understand any part of the instructions.

The manufacturer reserves the right to continue developing this device model without documenting such development in each individual case. The manufacturer will be happy to determine whether this manual is up-to-date.

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## 1. General Information

The PSxHub is a EtherCAT device that can supply and control up to ten PSD or PSE IO-Link drives. The IO-Link process data of the connected drives are merged into the EtherCAT process data of the PSxHub.

The following limitations apply to the use with halstrup-walcher drives.

The PSxHub is currently compatible with halstrup-walcher IO-Link drives of type PSE3xx, PSW3xx, as well as all PSD with software modules 1 (Standard), M (Modulo Function), and P (target speed in process data). The designations PSD and PSE in the following bus description refer to the mentioned device types.

The technical data on the electrical connections of the PSxHub and the connected drives can be found in the connection and plug description on the website: <http://service.hwg.eu>.



Please search for "PSxHub" and select your type, click on "Instruction manual" and download the connection and plug assignment offered for your bus system.

## 2. Conformity

This device corresponds to the state of the art. It meets the legal requirements according to the EC directives.  
This is documented by the affixing of the CE mark.



EtherCAT® ist eine eingetragene Marke und patentierte Technologie lizenziert durch die EtherCAT Technology Group (ETG).

### 3. Safety precautions

This section provides an overview of all important safety aspects for optimal protection of personnel as well as for safe and trouble-free operation.

#### 3.1. Qualified personnel

This operating manual is intended for electricians and installers who are authorized to assemble, electrically connect, commission, and label devices and systems according to safety standards, as well as for the operator and manufacturer of the system.

The personnel must be provided with all applicable accident prevention and safety regulations that arise during the commissioning or installation of the system.

It must be ensured that the personnel are familiar with all applicable accident prevention and safety regulations.

#### 3.2. Explanation of symbols

In this operating manual, the following highlights are used to indicate the dangers described below when handling the system:

|                                                                                                   |                                                                                                                                    |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
|  <b>DANGER!</b>  | <b>DANGER!</b><br>Indicates a situation of imminent danger, which will lead to a fatality or serious injuries if not prevented.    |
|  <b>WARNING!</b> | <b>WARNING!</b><br>Indicates a potentially dangerous situation, which may lead to a fatality or serious injuries if not prevented. |
|  <b>CAUTION!</b> | <b>CAUTION!</b><br>Indicates a potentially dangerous situation, which may lead to minor/slight injuries if not prevented.          |
| <b>NOTICE</b>                                                                                     | <b>NOTICE</b><br>Indicates a potentially harmful situation, which may lead to material damage if not prevented.                    |

#### 3.3. Appropriate use

The positioning systems used in conjunction with the PSxHub are particularly suitable for automatically setting tools, stops, or spindles on wood-processing equipment, packing lines, printing equipment, filling units and other types of special machines.

**This PSxHub is a not stand-alone device and may only be used if coupled to another machine.**

|                                                                                                     |
|-----------------------------------------------------------------------------------------------------|
|  <b>WARNING!</b> |
| Personal injury and property damage due to incorrect use of the products!                           |

The PSxHub is designed for use in industrial environments and may only be used as intended. If it is not used as intended, situations can arise that result in property damage and personal injury.

|                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------|
| <b>NOTICE</b>                                                                                                    |
| The device is used as intended if all instructions and information in these operating instructions are observed. |

- Only operate the device in perfect technical condition
- When attaching to a machine, observe the current safety regulations.
- Do not operate the product in all installed state unless all necessary protective measures have been taken.
- Observe the relevant regulations for the prevention of accidents (e.g. accident prevention regulations).
- In order to avoid the risk of accidents due to contact with moving parts, appropriate separating or non-separating guards must be provided.
- Use appropriate protective equipment (e.g. safety helmet, safety goggles, safety shoes, protective gloves).
- Use appropriate assembly and transport equipment.
- Store and transport the product in its original packaging, reuse protective caps for plugs if necessary.
- Adequate ventilation must be provided at the point of use to avoid excessive heating.
- During project planning, ensure that the device is always operated within its specifications, see **7 Technical Data** and the corresponding bus description table of min-, max- and default values).

### 3.4. Inappropriate use

Use of the PSxHub outside the operating conditions and specified technical data described in the documentation is considered "improper use." The PSxHub is designed for proper operation under normal environmental conditions (according to EN / IEC / UL 61010-1).

- Operation inside buildings
- Operation at altitudes up to 2000m above sea level
- Ambient temperatures deviating from standard: 0°C to 40°C
- Maximum relative humidity 80% at temperatures up to 31°C, decreasing linearly to 50% relative humidity at 45°C
- Fluctuations in the supply voltage between -5% to +15% of the nominal voltage at 50%
- The IP-protection rating is a manufacturer specification.

Any use of the device that goes beyond the intended use and/or is used differently can lead to dangerous situations:

- Underwater usage of the PSxHub is not allowed
- The PSxHub be used for certain applications, such as the transport of people and animals or as a press-bending device for cold processing of metal.
- If the operating requirements stated in chapter **7 Technical Data** and in the corresponding bus description (table of min-, max- and default values) are exceeded, personal injury or material damage may occur.
- The PSxHUB cannot be used in hazardous areas.

### 3.5. Limitation of liability

The device may only be operated in accordance with these operating instructions.

All information and instructions in these operating instructions have been compiled taking into account the applicable standards and regulations, the state of the art and our many years of experience and knowledge.

The manufacturer accepts no liability arising from improper or unintended use. Warranty claims also expire in this case:

- non-observance of the operating instructions
- improper use
- improper installation
- Use by untrained personnel
- Modifications to the device
- Technical modifications
- Unauthorized modifications

The user is responsible for carrying out commissioning in accordance with the safety regulations of the applicable standards and all other relevant national or local regulations regarding conductor dimensioning and protection, grounding, circuit breakers, overcurrent protection, etc. The person who carried out the assembly or installation is liable for any damage caused during assembly or connection.

### 3.6. Faults, maintenance, repair, disposal

Faults or damage to the device must be reported immediately to the specialist personnel responsible for the electrical connection.

The device must be taken out of operation by the responsible specialist staff until the fault has been rectified and secured against accidental use.

The device does not require any maintenance.

Repair measures that require the housing to be opened may only be carried out by the manufacturer.

The electronic components of the device contain environmentally harmful substances and are also recyclable material carriers. The device must therefore be recycled after its final decommissioning. The environmental guidelines of the respective country must be observed for this purpose.

### 3.7. Product labeling

| Warning                                                                            | Meaning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <b>Reference to further documentation</b><br>Read the operating instructions and safety instructions before transportation, installation or commissioning                                                                                                                                                                                                                                                                                                                                                                                   |
|   | <b>Warning of hot surface</b><br>The appliance can become very hot during operation. Temperatures of over 70°C can occur. In the event of a fault, internal components may be overloaded.<br>Use personal protective equipment or wait long enough for the appliance to cool down.                                                                                                                                                                                                                                                          |
|   | <b>Warning of dangerous electrical voltage</b><br>Before working on the product, check that all power connections are de-energized!                                                                                                                                                                                                                                                                                                                                                                                                         |
|   | <b>Disposal of batteries, electrical and electronic equipment</b> <ul style="list-style-type: none"> <li>In accordance with international regulations, batteries, rechargeable batteries and electrical and electronic equipment must not be disposed of with household waste.</li> <li>The owner is legally obliged to dispose of these devices properly at the end of their service life.</li> </ul> <p>WEEE: This symbol on the product, its packaging or in this document indicates that a product is subject to these regulations.</p> |
|   | <b>CE marking</b><br>CE stands for "Conformité Européenne". The CE marking expresses the conformity of a product with the relevant EC directives.                                                                                                                                                                                                                                                                                                                                                                                           |
|  | <b>GROUNDING</b><br>Chassis grounding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



## 4. Start Up



### **WARNING!**

Risk of injury if used inappropriately.  
The device must be installed by trained technical personnel.



### **WARNING!**

Improper assembly can lead to the destruction of the PSxHub.



### **WARNING!**

Make sure that the supply lines are not pinched or crushed.  
Lay the supply lines in accordance with the general and special local laying regulations.  
If the supply lines are not part of the delivery, please select suitable cables according to the application.  
Do not operate the PSxHub if the supply lines are visibly damaged.



### **WARNING!**

Injury. In the event of functional errors, high contact voltages can occur.  
This can be avoided by grounding.



### **WARNING!**

The PSxHub must be protected from excessive heating.  
Appropriate protective measures must be ensured by the user / operator.

## 4.1. Electrical connection

### NOTICE

The following information regarding the power supply should be observed

If there are concerns about mechanical strength or in places where cables may be exposed to mechanical damage/stress, they must be protected accordingly. This can be ensured, for example, by a cable duct or a suitable armored pipe.

If the power supply cables are laid in the immediate vicinity of the drives or other heat sources, ensure that the cables have a temperature resistance of at least 90°C.

With appropriate design measures, e.g. sufficient ventilation or cooling, lower temperature resistances of the cables are also permissible. This must be checked and specified on site.

Make sure that the flammability class of the cable for USA is equivalent to UL 2556 VW-1, e.g. according to IEC 60332-1-2 or IEC 60332-2-2 depending on the cross-section. For Canada, the flammability class FT1 is required, FT4 exceeds this and is therefore also permitted. Cables for the North American market often meet both requirements.

The flammability class requirements are applied exclusively to the motor power supply of the PSxHub. The currents in the connections to the drives are limited by fuses in the PSxHub to the values of a Class 2 circuit. The control voltage must be limited on the side of the deployment by a suitable fuse. See **4.2 Protection of the engine and control supply** also for further information.

When installing in North America, please always observe the requirements of the National Electrical Code NFPA 70 and the Electrical Standard for Industrial Machinery NFPA 79 (USA) or the Canadian Electrical Code and C22.2 (Canada) in their respective valid versions.

Minimum cross-sections are required for connection to the power supply.

### 4.1.1. Wiring between PSxHub and connected drives

The drives are connected via the X1 - X10 connectors. 1-wire spring headers from the manufacturer WAGO are used for the connection (WAGO article number: 714-105). The following pin assignment applies, pin 1 is the left PIN for X1-X10, see also connector X1 in the figure in chapter 4.2 Protection of the engine and control supply → **Figure 1: connection diagram**.

PIN 1: L+  
PIN 2: P24 (motor supply +24V)  
PIN 3: L-  
PIN 4: C/Q  
PIN 5: N24 (GND Motor)

The following cable cross-section is recommended for the connecting cables that are mounted between the PSxHub and the connected actuators in order to minimize the voltage drop for longer cables.

For the connection cables installed between the PSxHub and the connected drives, the conductor cross-section specified below is recommended in order to minimize voltage drop over longer cable lengths.

The connection cables are connected via terminals X13 (+24 V) and X14 (GND); see also the illustration in section **4.2 Protection of the engine and control supply**.

| Connection                     | Cable cross-section  |
|--------------------------------|----------------------|
| Power supply and communication | 0.75 mm <sup>2</sup> |

### 4.1.2. Power supply

The motor is powered by the X13 (+24V) and X14 (GND) connections. Corresponding conductor cross-sections are listed in the following table:

| wire cross-section                                                                   | Cross-section                                                                                 |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Conductor cross-section rigid                                                        | 0.75 mm <sup>2</sup> .. 16 mm <sup>2</sup><br>(conductor connection with open terminal point) |
| Conductor cross-section rigid                                                        | 0.75 mm <sup>2</sup> .. 16 mm <sup>2</sup> (push-in connection)                               |
| Flexible conductor cross-section                                                     | 0.75 mm <sup>2</sup> .. 16 mm <sup>2</sup>                                                    |
| Conductor cross-section flexible with ferrule without plastic sleeve                 | 0.75 mm <sup>2</sup> .. 16 mm <sup>2</sup>                                                    |
| Conductor cross-section flexible with ferrule with plastic sleeve                    | 0.75 mm <sup>2</sup> .. 10 mm <sup>2</sup>                                                    |
| 2 conductors of the same cross-section flexible with TWIN ferrule and plastic sleeve | 0.75 mm <sup>2</sup> .. 4 mm <sup>2</sup>                                                     |
| Stripping length                                                                     | 18 mm                                                                                         |
| Conductor cross-section AWG                                                          | 20.. 4                                                                                        |
| Connector X13                                                                        | +24V<br>(see figure <b>4.2 Protection of the engine and control supply</b> )                  |
| Connector X14                                                                        | GND<br>(see figure <b>4.2 Protection of the engine and control supply</b> )                   |

#### 4.1.3. Supply control side

Connector X15 and X16 are used to supply the control side. Both ports are identical. One of the connectors can be used to loop through the supply voltage of the control side, see also figure in 4.2 Protection of the engine and control supply.

The PIN assignments for X15 and X16 are:

- PIN 1: +24V
- PIN 2: GND

Corresponding conductor cross-sections are listed in the following table:

| wire cross-section                                                                   | Cross-section                                                                                        |
|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Conductor cross-section rigid                                                        | 0.2 mm <sup>2</sup> .. 1.5 mm <sup>2</sup><br>(conductor connection when the terminal point is open) |
| Conductor cross-section rigid                                                        | 0.34 mm <sup>2</sup> .. 1.5 mm <sup>2</sup><br>(push-in connection)                                  |
| Flexible conductor cross-section                                                     | 0.2 mm <sup>2</sup> .. 1.5 mm <sup>2</sup>                                                           |
| Conductor cross-section flexible with ferrule without plastic sleeve                 | 0.25 mm <sup>2</sup> .. 1.5 mm <sup>2</sup><br>(stripping length 8mm)                                |
| Conductor cross-section flexible with ferrule with plastic sleeve                    | 0.25 mm <sup>2</sup> .. 0.75 mm <sup>2</sup><br>(stripping length 8mm)                               |
| 2 conductors of the same cross-section flexible with TWIN ferrule and plastic sleeve | 10 mm                                                                                                |
| Conductor cross-section AWG                                                          | 24.. 16                                                                                              |

## 4.2. Protection of the engine and control supply



### CAUTION!

The PSxHub secures each output on the motor side via a 4A fuse, and there is also a replacement fuse on the PCB that could be used directly. The control side is protected with 2A and there is also a replacement fuse here.

The fuses F1 to F10 secure the power supply.

The fuse of the supply voltage is 40 A or: <number of drives> x 4A,

A spare fuse is located on the board below the motor fuses.

The F15 fuse protects the control system from overload. To protect the control system, a fuse with 2A is used. For line protection, the control voltage at the point of provision must also be protected against short circuits and overloads with a suitable fuse, depending on the cable cross-section.

A replacement fuse is located on the board to the right of the control fuse.

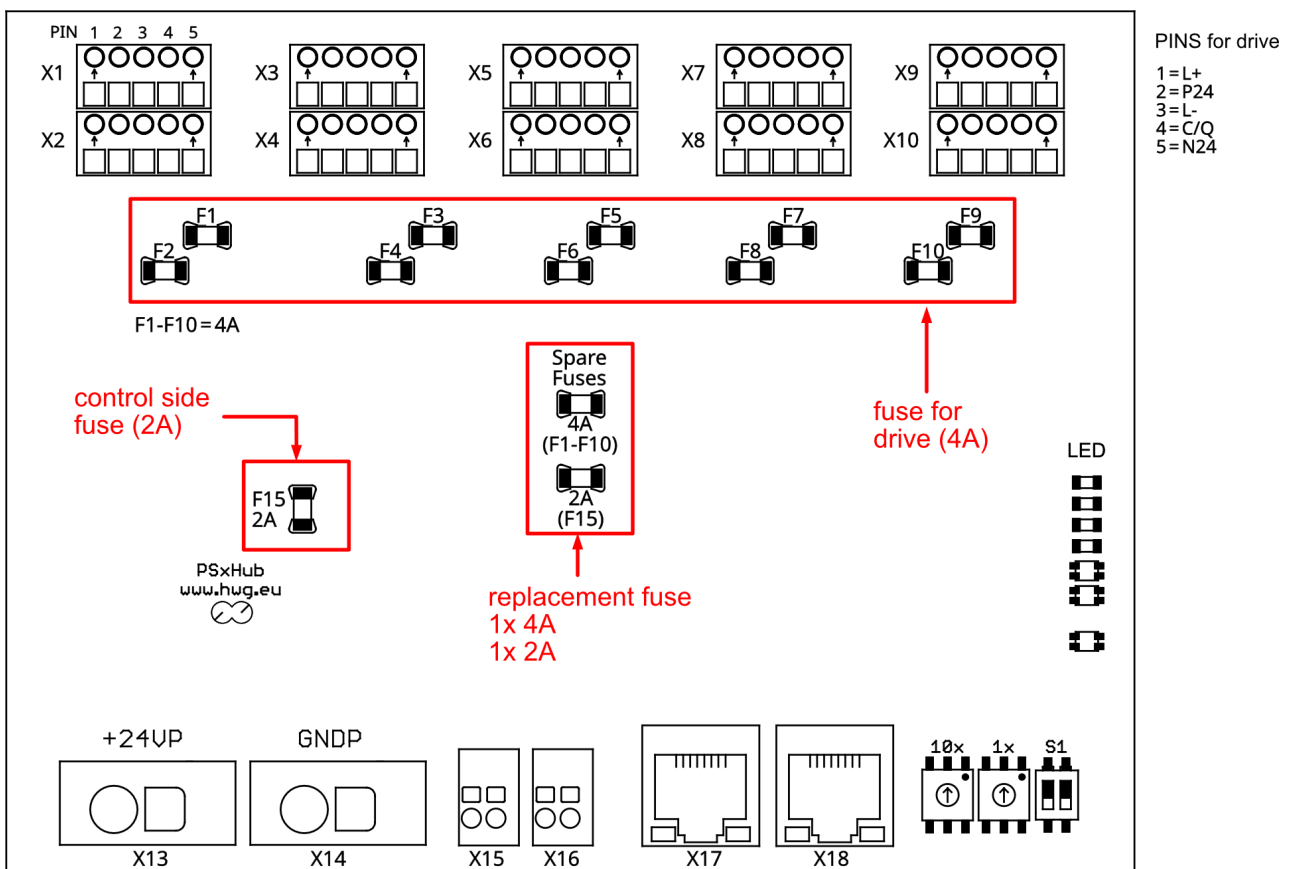


Figure 1: connection diagram

| connector | description                            |
|-----------|----------------------------------------|
| X1 - X10  | Connection of drives                   |
| F1 - F10  | Fuse motor side of the drives (4 amps) |
| F15       | Fuse control side (2 amps)             |
| X13, X14  | Power supply motor                     |
| X15, X16  | Power supply control side              |
| X17, X18  | RJ45                                   |

### 4.3. Powering on the device

After the supply voltages have been applied and the communication has been successfully initialized, the connected drives can be controlled.

### 4.4. Hotplugging

Connecting and disconnecting drives with switched on power supply is not recommended and can lead to undefined behaviour. Identification of the connected halstrup-walcher drives only happens during startup. To restart the identification process parameter 0xF58F of the PSxHub, "Delivery state" can be used with value "-4".

### 4.5. Restore delivery state (without PLC)

It is possible to set the PSxHub to the delivery state even without the presence of a PLC.

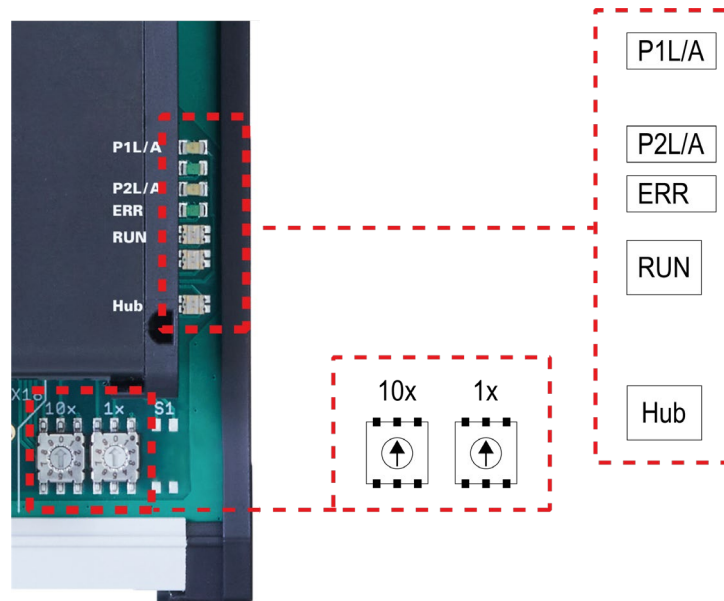
To restore the delivery state:

- 1) Disconnect the device from the supply voltage.
- 2) Set the address switch to 98.
- 3) Switch on the device (control and motor voltage).
- 4) The status LED of the PSxHub flashes after a few seconds for 10 s at 10 Hz (red).  
During this time, if the address is set to 99, the color of the status LED will change to green.  
All parameters of the PSxHub are set to delivery state and stored.
- 5) Set the address switch to 00 to complete the delivery status, the status LED of the PSxHub now lights up permanently green.
- 6) Turn off the device.

If the 10-second period is exceeded without the address switch being set to 99, the initialization of the device will continue.

## 5. EtherCAT description

### 5.1. Status LEDs



Next to the cover on the right side of the device are the following LEDs:

|   |        |                                      |
|---|--------|--------------------------------------|
| 1 | P1 L/A | Green LED = Link/Activity            |
| 2 | P2L/A  | Green LED = Link/Activity            |
| 3 | Run    | Grüne LED = indicates the ESM status |
| 4 | Error  | Rote LED = indicates an Error        |
| 5 | Hub    | PSxHub status LED (Hub-LED)          |

Below the LEDs are the following address switches:

|     |                    |
|-----|--------------------|
| X10 | Address switch x10 |
| X1  | Address switch x1  |

#### Meaning of the LEDs:

Each of the ports (P1/P2) has an associated green LED ("Link/Activity")

For each port (P1/P2), the following states are possible:

|                   |                                                 |
|-------------------|-------------------------------------------------|
| Off               | No connection                                   |
| On                | Line connection is active, no data activity     |
| Flashing at 10 Hz | Line connection is active, data transfer active |

The green "Run" LED indicates the ESM status:

|                    |                  |
|--------------------|------------------|
| Off                | INIT             |
| Flashing at 2.5 Hz | PRE-OPERATIONAL  |
| Flashing at 1 Hz   | SAFE-OPERATIONAL |
| On                 | OPERATIONAL      |

The red "Error" LED indicates an error:

|                        |                                                 |
|------------------------|-------------------------------------------------|
| Off                    | No error                                        |
| Single flashes at 1 Hz | Local error, application is changing ESM status |
| Double flashes at 1 Hz | Watchdog timeout                                |
| Flashing at 2.5 Hz     | Configuration error                             |

| HUB: PSxHub Status LED |                                                 |
|------------------------|-------------------------------------------------|
| Slow flashing (0.5 Hz) | Initialization active                           |
| LED permanently on     | Initialization successful, device ready for use |
| Flashing at 2Hz        | Error condition                                 |
| Flashing at 10Hz       | Ready for ALZ without control                   |

| PSxHub Status |                         |
|---------------|-------------------------|
| Red           | Initialization active   |
| Green         | Initialization Complete |

## 5.2. EtherCAT interface

### 5.2.1. Modular device

The PSxHub is designed as a modular device in accordance with ETG.5001.1, where each drive represents a module.

### 5.2.2. Process data

The hub itself provides 16 bytes of input data and 16 bytes of output data. Of these, 8 bytes are currently used for the status word and control word respectively; the remaining bytes are reserved for a future parameter interface.

Each drive also provides 16 bytes of input data and 16 bytes of output data. Eight bytes are used for the drive process data, while the remaining 8 bytes serve as a parameter interface for the drive ISDUs. The parameter interface uses the *PKW mechanism* as specified in the Profidrive drive profile.

### 5.2.3. Detailed description of the process data

The content of the input and output data is in **Chapter 8.1 Table of the process data overview** listed.

The first 8 bytes of process data (input and output data) consist of the PSxHub's PKW interface. This is followed by 8 bytes of status or control word for the PSxHub. Among other things, the control word of the hub is used to operate the synchronization functionality, or to monitor it with the status word. Status and control word are divided into "status word 1" and "status word 2" or "control word 1" and "control word 2" and are also available as acyclic parameters.

The drives themselves are controlled via 8 bytes of output data each via a control word, a target speed and a target position. The current status of the drives can accordingly be acquired via 8 bytes of input data, containing a status word, the actual speed, and the actual value.

The target speed is only adopted by the drive if the connected device is a PSD4xxIO with the characteristic "Software Modules" = "P" or "Z". For other PSD4xxIO the target speed has no effect. For the PSE3xx devices, the process data format can be set using parameter ISDU116.

For 8 bytes output data including target speed, this value has to be set to 2. For 6 bytes output data (ignoring the target speed), this value has to be set to 1. Value 0 (timestamp function) cannot be used with the PSxHub.

In addition, another 8 bytes are available for each connected drive as a "PKW" interface (parameter identifier value). With this PKW interface, the parameters of the connected IO-Link drives can be accessed directly via the process data as an alternative to the acyclic parameter commands.

The PKW mechanism is described in chapter 5.7 („PKW mechanism“).

### 5.2.4. Acyclic Read and Write Requests

The EtherCAT interface uses the CANopen over EtherCAT protocol in accordance with ETG1000.6 Section 5.6.

### 5.3. EtherCAT parameters of the PSxHub

| Bezeichnung                                  | Index:Subldx | Funktion                                                                                                          | Datentyp/<br>Wertebereich | Defaultwert | R/W |
|----------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------|---------------------------|-------------|-----|
| Device type                                  | 0x1000:0     | Device type                                                                                                       | UDINT                     |             | R   |
| Identity                                     | 0x1018:0     | Identity Object                                                                                                   | USINT                     |             | R   |
| Vendor ID                                    | 0x1018:1     | Vendor ID                                                                                                         | UDINT                     |             | R   |
| Product Code                                 | 0x1018:2     | Product Code                                                                                                      | UDINT                     |             | R   |
| Revision Number                              | 0x1018:3     | Revision Number                                                                                                   | UDINT                     |             | R   |
| Serial Number                                | 0x1018:4     | Serial Number                                                                                                     | UDINT                     |             | R   |
| SM Comm Types                                | 0x1C00:0     |                                                                                                                   | USINT                     |             | R   |
| SM0                                          | 0x1C00:1     | Sync Manager 0                                                                                                    | USINT                     |             | R   |
| SM1                                          | 0x1C00:2     | Sync Manager 1                                                                                                    | USINT                     |             | R   |
| SM2                                          | 0x1C00:3     | Sync Manager 2                                                                                                    | USINT                     |             | R   |
| SM3                                          | 0x1C00:4     | Sync Manager 3                                                                                                    | USINT                     |             | R   |
| SM2 PDO Assignment                           | 0x1C12:0     |                                                                                                                   | USINT                     |             | R   |
| 0x1600                                       | 0x1C12:1     |                                                                                                                   | UINT                      |             | R   |
| SM3 PDO Assignment                           | 0x1C13:0     |                                                                                                                   | USINT                     |             | R   |
| 0x1A00                                       | 0x1C13:1     |                                                                                                                   | UINT                      |             | R   |
| Production date                              | 0xF500:0     | Year and week of manufacture;<br>given as an integer (YYWW)                                                       | UINT                      |             | R   |
| Serial number                                | 0xF501:0     | Device serial number                                                                                              | UINT                      |             | R   |
| Hardware version                             | 0xF502:0     | Hardware Version of PSxHub                                                                                        | UINT                      |             | R   |
| Software version                             | 0xF503:0     | Software Version of PSxHub                                                                                        | UINT                      |             | R   |
| Power supply                                 | 0xF506:0     | Current supply of PSxHub in 0,1 V                                                                                 | UINT                      |             | R   |
| Device temperature                           | 0xF507:0     | Internal device temperature in °C                                                                                 | INT                       |             | R   |
| Limit for undervoltage                       | 0xF50B:0     | Lower limit of hub supply voltage of PSxHub in 0,1 V (for bit „Undervoltage“)                                     | UINT<br>180..240          | 190         | R/W |
| Limit for overtemperature                    | 0xF50C:0     | Upper limit of device temperature (Hub) in °C (for bit „overtemperature“)                                         | UINT<br>10..80            | 70          | R/W |
| Current value of the hardware address switch | 0xF50F:0     | Current setting of the address switch                                                                             | UINT                      |             | R   |
| Software adress                              | 0xF510:0     | Configurable address of the PSxHub                                                                                | UINT                      | 0           | R/W |
| Sync group                                   | 0xF512:0     | Assigning individual ports to synch groups using subindexes                                                       | USINT                     |             | R   |
| Port 1                                       | 0xF512:1     | Assigned synch group, Port 1                                                                                      | USINT<br>0..5             | 0           | R/W |
| Port 2                                       | 0xF512:2     | Assigned synch group, Port 2                                                                                      | USINT<br>0..5             | 0           | R/W |
| Port 3                                       | 0xF512:3     | Assigned synch group, Port 3                                                                                      | USINT<br>0..5             | 0           | R/W |
| Port 4                                       | 0xF512:4     | Assigned synch group, Port 4                                                                                      | USINT<br>0..5             | 0           | R/W |
| Port 5                                       | 0xF512:5     | Assigned synch group, Port 5                                                                                      | USINT<br>0..5             | 0           | R/W |
| Port 6                                       | 0xF512:6     | Assigned synch group, Port 6                                                                                      | USINT<br>0..5             | 0           | R/W |
| Port 7                                       | 0xF512:7     | Assigned synch group, Port 7                                                                                      | USINT<br>0..5             | 0           | R/W |
| Port 8                                       | 0xF512:8     | Assigned synch group, Port 8                                                                                      | USINT<br>0..5             | 0           | R/W |
| Port 9                                       | 0xF512:9     | Assigned synch group, Port 9                                                                                      | USINT<br>0..5             | 0           | R/W |
| Port 10                                      | 0xF512:10    | Assigned synch group, Port 10                                                                                     | USINT<br>0..5             | 0           | R/W |
| Limit Sync mode monitoring                   | 0xF513:0     | The maximum number of steps by which the drives within a group are allowed to deviate before an error is detected | UDINT<br>2..100000        | 100         | R/W |



| Bezeichnung           | Index:SubIdx | Funktion                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Datentyp/<br>Wertebereich | Defaultwert | R/W |
|-----------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------|-----|
| factory default state | 0xF58F:0     | <b>Writing a “-5”:</b><br>resets the hub after a FoE update<br><b>Writing a “-4”:</b><br>resets the hub (equivalent to turning the control voltage off and then back on)<br><b>Writing a “-3”:</b><br>reserved<br><b>Writing a “-1”:</b><br>resets the values of all parameters storable in the hub to their factory defaults without saving the parameters to EEPROM<br><b>Writing a “0”:</b><br>no action<br><b>Writing a “1”:</b><br>saves the parameters to EEPROM | INT                       |             | R/W |
| Free register         | 0xF590:0     | freely usable registers                                                                                                                                                                                                                                                                                                                                                                                                                                                | USINT                     |             | R   |
| Register 0            | 0xF590:1     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| Register 1            | 0xF590:2     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| Register 2            | 0xF590:3     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| Register 3            | 0xF590:4     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| Register 4            | 0xF590:5     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| Register 5            | 0xF590:6     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| Register 6            | 0xF590:7     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| Register 7            | 0xF590:8     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| Register 8            | 0xF590:9     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| Register 9            | 0xF590:10    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UDINT                     | 0           | R/W |
| PSxHub status word 1  | 0xF614:0     | Bit 0: Undervoltage<br>Bit 1: Overvoltage<br>Bit 2: Overtemperature<br>Bit 3: EEPROM error<br>Bit 4-5: Reserved<br>Bit 6: Sync error occurred<br>Bit 7: Reserved<br>Bit 8: Synchronization error detected<br>Bit 9-13: Deviation detected in synchronization group x<br>Bit 14-31: reserved                                                                                                                                                                            | UDINT                     |             | R   |
| PSxHub status word 2  | 0xF615:0     | Bit 0 - 31: reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                   | UDINT                     |             | R   |
| PSxHub control word 1 | 0xF716:0     | Bit 0: activate sync mode monitoring (0 deactivated, 1 activated)<br>Bit 1: reset Bit 1: Reset synchronization error bit in the hub status word                                                                                                                                                                                                                                                                                                                        | UDINT                     |             | R/W |
| PSxHub control word 2 | 0xF717:0     | Bit 0 - 31: reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                   | UDINT                     |             | R/W |

### 5.3.1. Parameter interface of the drives

#### Acyclic access:

The parameters of the drives can be accessed via ADS over EtherCAT (AoE). Drive 1 uses port 1000, drive 2 uses port 1001, and so on.

#### HINWEIS

For CODESYS-based controllers, when using the function blocks ETC\_ADS\_IoLinkRead or ETC\_ADS\_IoLinkWrite, an offset of 0x1000 is already applied. In this addressing scheme, drive 1 corresponds to port 0, drive 2 to port 1, and so on

#### Cyclic access:

The parameters of the drives can alternatively be addressed via their respective PKW interface, see **5.7 PKW mechanism**. This approach enables parameter access independently of the underlying industrial Ethernet protocol.

## 5.4. Process Data Layout

### 5.4.1. Output module (from the Device → IO controller's point of view)

| Byte    | Meaning                    | corresponding par. no. |
|---------|----------------------------|------------------------|
| 0-7     | reserved                   |                        |
| 8-11    | PSxHub Control Word 1      | 0xF7 16:0              |
| 12-15   | PSxHub Control Word 2      | 0xF7 17:0              |
|         | <b>Drive 1</b>             |                        |
| 16-23   | PKW Interface PSx Drive 1  |                        |
| 24-25   | Control Word PSx Drive 1   |                        |
| 26-27   | Target speed PSx drive 1   |                        |
| 28-31   | Target value PSx Drive 1   |                        |
|         | <b>Drive 2</b>             |                        |
| 32-39   | PKW Interface PSx Drive 2  |                        |
| 40-41   | Control Word PSx Drive 2   |                        |
| 42-43   | Target speed PSx drive 2   |                        |
| 44-47   | Target value PSx Drive 2   |                        |
|         | <b>Drive 3</b>             |                        |
| 48-55   | PKW Interface PSx Drive 3  |                        |
| 56-57   | Control Word PSx Drive 3   |                        |
| 58-59   | Target speed PSx drive 3   |                        |
| 60-63   | Target value PSx Drive 3   |                        |
|         | <b>Drive 4</b>             |                        |
| 64-71   | PKW Interface PSx Drive 4  |                        |
| 72-73   | Control Word PSx Drive 4   |                        |
| 74-75   | Target speed PSx drive 4   |                        |
| 76-79   | Target value PSx Drive 4   |                        |
|         | <b>Drive 5</b>             |                        |
| 80-87   | PKW Interface PSx Drive 5  |                        |
| 88-89   | Control Word PSx Drive 5   |                        |
| 90-91   | Target speed PSx drive 5   |                        |
| 92-95   | Target value PSx Drive 5   |                        |
|         | <b>Drive 6</b>             |                        |
| 96-103  | PKW Interface PSx Drive 6  |                        |
| 104-105 | Control Word PSx Drive 6   |                        |
| 106-107 | Target speed PSx drive 6   |                        |
| 108-111 | Target value PSx Drive 6   |                        |
|         | <b>Drive 7</b>             |                        |
| 112-119 | PKW Interface PSx Drive 7  |                        |
| 120-121 | Control Word PSx Drive 7   |                        |
| 122-123 | Target speed PSx drive 7   |                        |
| 124-127 | Target value PSx Drive 7   |                        |
|         | <b>Drive 8</b>             |                        |
| 128-135 | PKW Interface PSx Drive 8  |                        |
| 136-137 | Control Word PSx Drive 8   |                        |
| 138-139 | Target speed PSx drive 8   |                        |
| 140-143 | Target value PSx Drive 8   |                        |
|         | <b>Drive 9</b>             |                        |
| 144-151 | PKW Interface PSx Drive 9  |                        |
| 152-153 | Control Word PSx Drive 9   |                        |
| 154-155 | Target speed PSx drive 9   |                        |
| 156-159 | Target value PSx Drive 9   |                        |
|         | <b>Drive 10</b>            |                        |
| 160-167 | PKW Interface PSx Drive 10 |                        |
| 168-169 | Control Word PSx Drive 10  |                        |
| 170-171 | Target speed PSx drive 10  |                        |
| 172-175 | Target value PSx Drive 10  |                        |

#### NOTICE

The process data layout cannot be changed.  
The target speed is only adopted by the drive if the connected device is a PSD4xxIO with the feature "Software Modules" = "P" or "Z". For other PSD4xxIO the target speed has no effect.  
For PSE3xx devices, 8 bytes of output data must be selected in the process data. In this case, the PSE device ID ends with "4".

#### 5.4.2. Input module (from the Device → IO controller's point of view)

| Byte    | Meaning                    | corresponding par. no. |
|---------|----------------------------|------------------------|
| 0-7     | reserved                   |                        |
| 8-11    | PSxHub Status Word 1       | 0xF614:0               |
| 12-15   | PSxHub Status Word 2       | 0xF615:0               |
|         | <b>Drive 1</b>             |                        |
| 16-23   | PKW Interface PSx Drive 1  |                        |
| 24-25   | Status Word PSx Drive 1    |                        |
| 26-27   | Actual Speed PSx Drive 1   |                        |
| 28-31   | Actual value PSx drive 1   |                        |
|         | <b>Drive 2</b>             |                        |
| 32-39   | PKW Interface PSx Drive 2  |                        |
| 40-41   | Status Word PSx Drive 2    |                        |
| 42-43   | Actual Speed PSx Drive 2   |                        |
| 44-47   | Actual value PSx drive 2   |                        |
|         | <b>Drive 3</b>             |                        |
| 48-55   | PKW Interface PSx Drive 3  |                        |
| 56-57   | Status Word PSx Drive 3    |                        |
| 58-59   | Actual Speed PSx Drive 3   |                        |
| 60-63   | Actual value PSx drive 3   |                        |
|         | <b>Drive 4</b>             |                        |
| 64-71   | PKW Interface PSx Drive 4  |                        |
| 72-73   | Status Word PSx Drive 4    |                        |
| 74-75   | Actual Speed PSx Drive 4   |                        |
| 76-79   | Actual value PSx drive 4   |                        |
|         | <b>Drive 5</b>             |                        |
| 80-87   | PKW Interface PSx Drive 5  |                        |
| 88-89   | Status Word PSx Drive 5    |                        |
| 90-91   | Actual Speed PSx Drive 5   |                        |
| 92-95   | Actual value PSx drive 5   |                        |
|         | <b>Drive 6</b>             |                        |
| 96-103  | PKW Interface PSx Drive 6  |                        |
| 104-105 | Status Word PSx Drive 6    |                        |
| 106-107 | Actual Speed PSx Drive 6   |                        |
| 108-111 | Actual value PSx drive 6   |                        |
|         | <b>Drive 7</b>             |                        |
| 112-119 | PKW Interface PSx Drive 7  |                        |
| 120-121 | Status Word PSx Drive 7    |                        |
| 122-123 | Actual Speed PSx Drive 7   |                        |
| 124-127 | Actual value PSx drive 7   |                        |
|         | <b>Drive 8</b>             |                        |
| 128-135 | PKW Interface PSx Drive 8  |                        |
| 136-137 | Status Word PSx Drive 8    |                        |
| 138-139 | Actual Speed PSx Drive 8   |                        |
| 140-143 | Actual value PSx drive 8   |                        |
|         | <b>Drive 9</b>             |                        |
| 144-151 | PKW Interface PSx Drive 9  |                        |
| 152-153 | Status Word PSx Drive 9    |                        |
| 154-155 | Actual Speed PSx Drive 9   |                        |
| 156-159 | Actual value PSx drive 9   |                        |
|         | <b>Drive 10</b>            |                        |
| 160-167 | PKW Interface PSx Drive 10 |                        |
| 168-169 | Status Word PSx Drive 10   |                        |
| 170-171 | Actual Speed PSx Drive 10  |                        |
| 172-175 | Actual value PSx drive 10  |                        |

## 5.5. Detailed description of the PSxHub's status bits

Description of the individual bits of "PSxHub Status Word 1" (EC-index 0xF614:0):

| Bit No. | Description                       |                                                                                                                                                                                                                                                                                                                                                                                             |
|---------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bit 0   | Undervoltage                      | <u>is set:</u> <ul style="list-style-type: none"> <li>if the control voltage falls below the voltage value defined in parameter 91</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>if the control voltage again exceeds the voltage value defined in parameter 91</li> </ul>                                                                                           |
| Bit 1   | Overvoltage                       | <u>is set:</u> <ul style="list-style-type: none"> <li>voltage on control side has exceeded 28V</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>control voltage is below 27.2V after previous overvoltage (control side)</li> </ul>                                                                                                                                     |
| Bit 2   | Overtemperature                   | <u>is set:</u> <ul style="list-style-type: none"> <li>if the temperature value defined in parameter 92 is exceeded</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>if the temperature value is below the value defined in parameter 92 again</li> </ul>                                                                                                                |
| Bit 3   | EEPROM Error                      | <u>is set:</u> <ul style="list-style-type: none"> <li>if there is an error in the device's memory</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>after restarting the device</li> </ul>                                                                                                                                                                               |
| Bit 4   | reserved                          |                                                                                                                                                                                                                                                                                                                                                                                             |
| Bit 5   | reserved                          |                                                                                                                                                                                                                                                                                                                                                                                             |
| Bit 6   | reserved                          |                                                                                                                                                                                                                                                                                                                                                                                             |
| Bit 7   | reserved                          |                                                                                                                                                                                                                                                                                                                                                                                             |
| Bit 8   | Synchronization error occurred    | <u>is set:</u> <ul style="list-style-type: none"> <li>if the maximum position difference of two drives exceeds the value of parameter 0xF513:0 in one of the defined synchronization groups.</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>if bit 1 of the control word is set</li> </ul>                                                                            |
| Bit 9   | Errors in synchronization group 1 | <u>is set:</u> <ul style="list-style-type: none"> <li>if in synchronization group 1 the maximum position difference of two drives exceeds the value of parameter 0xF513:0.</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>if in synchronization group 1 the maximum position difference of two drives no longer exceeds the value of parameter 0xF513:0.</li> </ul>   |
| Bit 10  | Error in synchronization group 2  | <u>is set:</u> <ul style="list-style-type: none"> <li>if in synchronization group 2 the maximum position difference of two drives exceeds the value of parameter 0xF513:0.</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>if in synchronization group 2 the maximum position difference of two drives no longer exceeds the value from parameter 0xF513:0.</li> </ul> |
| Bit 11  | Error in synchronization group 3  | <u>is set:</u> <ul style="list-style-type: none"> <li>if in synchronization group 3 the maximum position difference of two drives exceeds the value of parameter 0xF513:0</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>if in synchronization group 3 the maximum position difference of two drives no longer exceeds the value from parameter 0xF513:0.</li> </ul>  |

| Bit No.                    | Description                      |                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bit 12</b>              | Error in synchronization group 4 | <u>is set:</u> <ul style="list-style-type: none"> <li>if in synchronization group 4 the maximum position difference of two drives exceeds the value of parameter 0xF513:0.</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>if in synchronization group 4 the maximum position difference of two drives no longer exceeds the value of parameter 0xF513:0.</li> </ul> |
| <b>Bit 13</b>              | Error in synchronization group 5 | <u>is set:</u> <ul style="list-style-type: none"> <li>if in synchronization group 5 the maximum position difference of two drives exceeds the value of parameter 0xF513:0.</li> </ul> <u>is deleted:</u> <ul style="list-style-type: none"> <li>if in synchronization group 5 the maximum position difference of two drives no longer exceeds the value of parameter 0xF513:0.</li> </ul> |
| <b>Bit 14 until Bit 31</b> | reserved                         |                                                                                                                                                                                                                                                                                                                                                                                           |

## 5.6. Detailed description of the control bits of the PSxHub

Description of the individual bits of "PSxHub Control Word 1" (EC-Index 0xF716:0):

| Bit No.         | Description                                     |
|-----------------|-------------------------------------------------|
| <b>Bit 0</b>    | Synchronous monitoring active                   |
| <b>Bit 1</b>    | Reset a synchronization error that has occurred |
| <b>Bit 2-32</b> | Reserved                                        |

## 5.7. PKW mechanism

The PKW mechanism (PKW = parameter identifier value) can be used to write and read parameter values in cyclic data traffic. The PSxHub itself and each drive has its own PKW interface.

The IO controller issues and transmits PKW commands. It repeats this command cyclically until the PSxHub has processed the command and given a response.

The PSxHub provides the answer until the IO controller formulates a new command. A parameter value that the PSxHub sends back in response to a read access refers to the time at which the command was issued. This means that if the value of a parameter shall be observed over a longer period of time, the IO controller must send a new request command after the current parameter value has been received. This is done by setting the order ID 0 "no order" and then waiting for the PSxHub to confirm this with response ID 0 (no response). The same parameter value can then be requested again.

Only one order can be processed per drive at any one time.

| PKW body |   |     |   |     |   |   |   | PKE | Parameterization |
|----------|---|-----|---|-----|---|---|---|-----|------------------|
| PKE      |   | IND |   | PWE |   |   |   | IND | Index            |
| 0        | 1 | 2   | 3 | 4   | 5 | 6 | 7 | PWE | Parameter        |

### Structure of the identifier PKE (german: ParameterKennungWert):

The information "Parameter identifier" (PKE) consists of a data word (bytes 0 and 1 of the PKW part) in which the type of order (or response) and the corresponding parameter number are encoded mapped:

| Parameter identifier PKE |    |    |    |     |    |                        |   |   |   |   |   |   |   |   |   |
|--------------------------|----|----|----|-----|----|------------------------|---|---|---|---|---|---|---|---|---|
| Bit No                   |    |    |    |     |    |                        |   |   |   |   |   |   |   |   |   |
| 15                       | 14 | 13 | 12 | 11  | 10 | 9                      | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| AK                       |    |    |    | SPM |    | Parameter Number (PNU) |   |   |   |   |   |   |   |   |   |

| AK  | Order or response identifier (german: Auftragskennung)        |
|-----|---------------------------------------------------------------|
| SPM | Toggle bit for spontaneous message (function not implemented) |
| PNU | Parameter number                                              |

The parameter number (PNU) corresponds to the ISDU of the connected drive and can be found in the respective bus documentation.

### Order ID (IO controller → drive)

| OrderID | Function                                   | possible response identifier of the drive *) |          |
|---------|--------------------------------------------|----------------------------------------------|----------|
|         |                                            | positive                                     | negative |
| 0       | no order                                   | 0                                            | 7        |
| 1       | Request Parameter Value                    | 1 or 2                                       |          |
| 2       | Change Parameter Value (Word)              | 1                                            |          |
| 3       | Change Parameter Value (Double Word)       | 2                                            |          |
| 6       | Request Parameter Value (Array)            | 4 or 5                                       |          |
| 7       | Change Parameter Value (Array Word)        | 4                                            |          |
| 8       | Change Parameter Value (Array Double Word) | 5                                            |          |
| 9       | Request Number of Array Elements           | 6                                            |          |

\*) The column "Response identifier" contains the possible answers belonging to the order in the event of successful execution ("positive") or in the event of error ("negative").

#### Response ID (IO → Controller Drive):

| Answer-identifier | Function                                     |
|-------------------|----------------------------------------------|
| 0                 | no answer                                    |
| 1                 | Transfer Parameter Value (Word)              |
| 2                 | Transfer Parameter Value (Double Word)       |
| 4                 | Transfer Parameter Value (Array Word)        |
| 5                 | Transfer Parameter Value (Array Double Word) |
| 6                 | Transfer Number of Array Elements            |
| 7                 | Order not executable                         |

#### Subindex IND:

For requests and responses related to array elements, the IND field contains the array subindex.

#### Parameter value PWE:

This field contains the numerical value associated with each parameter.

For non-executable jobs (i.e., response ID AK = 7), the drive responds with an error code according to the table below:

| Error code | Meaning                                             |
|------------|-----------------------------------------------------|
| 0          | invalid parameter number                            |
| 1          | parameter value cannot be changed                   |
| 2          | lower or upper value limit exceeded                 |
| 3          | faulty subindex                                     |
| 4          | no array                                            |
| 5          | incorrect data type                                 |
| 6          | no setting allowed (only resettable)                |
| 17         | order cannot be executed due to operating condition |
| 18         | miscellaneous error                                 |

In the case of successfully processed write requests of parameter values (i.e. request ID AK = 2, 3, 7 or 8), the response contains the same data as the reading of this parameter value. The response ID AK is then one of the values 1, 2, 4 or 5, depending on the data type. The parameter number PNU, the index IND and the parameter value PWE are as specified in the request. This allows it to be checked again that the drive has adopted the requested values.



## 6. Synchronization monitoring

The transmission of the target positions and target speeds to the drives via the process data takes place synchronously across all connections. As a result, drives with the same start and target position and the same target speed move synchronously.

The PSxHub offers the possibility to monitor this synchronization functionality. For this purpose, up to four drives can be combined in a synchronization group. For the drives within a synchronization group, it is monitored whether the set maximum step deviation (PSxHub parameter 0xF513:0) has been exceeded. If a deviation occurs, e.g. due to blockage of a drive, the hub intervenes and resets the release bit of the drives of the affected synchronization group. It is recommended to change the parameters for synchronization only when the drives used are at a standstill, so as not to generate undefined behaviour.

### 6.1. Configuration

The following parameters are used to configure the synchronization function:

| Designation                             | Parameter number<br>[decimal] | Function                                                                                      |
|-----------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------|
| Configuration for synchronization group | 0xF512:1                      | Synchronization group setting port 1                                                          |
|                                         | 0xF512:2                      | Synchronization group setting port 2                                                          |
|                                         | 0xF512:3                      | Synchronization group setting port 3                                                          |
|                                         | 0xF512:4                      | Synchronization group setting port 4                                                          |
|                                         | 0xF512:5                      | Synchronization group setting port 5                                                          |
|                                         | 0xF512:6                      | Synchronization group setting port 6                                                          |
|                                         | 0xF512:7                      | Synchronization group setting port 7                                                          |
|                                         | 0xF512:8                      | Synchronization group setting port 8                                                          |
|                                         | 0xF512:9                      | Synchronization group setting port 9                                                          |
|                                         | 0xF512:10                     | Synchronization group setting port 10                                                         |
| Synchronization monitoring limit        | 0xF513:0                      | Number of steps that drives in a synchronization group may deviate before a fault is detected |

Using subindices 1–10 of parameter 0xF512, each of the ten connections is assigned to one of the synchronous groups 0–5. This is done by setting the corresponding subindex to a value between 0 and 5. Connections assigned to group 0 are not monitored.

For synchronous groups 1–5, it is monitored whether the monitoring limit configured in parameter 0xF513 is exceeded.

A drive can only be added to a synchronous group if that group contains fewer than four drives.

## 6.2. Error detection behaviour

To report an error to the controller, there is one bit per group in the hub's status word 1.

| PSxHub Status Word 1 | Function                                                       |
|----------------------|----------------------------------------------------------------|
| <b>Bit No.</b>       |                                                                |
| 0..7                 | Reserved                                                       |
| 8                    | Set when synchronization error occurred                        |
| 9                    | Set when position deviation in Synchronous group 1 is detected |
| 10                   | Set when position deviation in Synchronous group 2 is detected |
| 11                   | Set when position deviation in Synchronous group 3 is detected |
| 12                   | Set when position deviation in Synchronous group 4 is detected |
| 13                   | Set when position deviation in Synchronous group 5 is detected |
| 14-63                | Reserved                                                       |

A bit in position 9-13 is set as soon as the deviation between the smallest and largest position of the drives of a synchronization group is greater than parameter 0xF513:0.

The bit is reset again as soon as the deviation is less than (parameter 0xF513)/2. As soon as an error is detected in a group, the bit 8 is also set in the status word 1 of the hub. This bit is not automatically reset by the PSxHub.

Control word 1 of the hub can be used to influence the behavior in the event of an error.

| Control word 1 bit | Function                                                                                                                                                       |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0                  | Set to 1<br>→ automatic abort of positioning run in case of synchronization error                                                                              |
| 1                  | Setting to 1<br>→ status word bit 8 ("synchronization error occurred") is reset<br><br>Note: Position deviation has to be resolved before the bit can be reset |

If the bit 0 of control word 1 of the PSxHub is set, all drives assigned to this group will be stopped when a deviation is detected (warning of the corresponding group active). As a result, if a drive is blocked, for example, all drives in this group are automatically stopped. A further procedure via positioning runs is then no longer possible.

To correct the error, the drives must be returned to the same position and afterwards bit 1 of the control word must be reset.

## 6.3. Procedure for the Movement of Two Drives in Synchronization

To allow two or more drives to run in Synchronous mode, proceed as follows:

1. Set bit 0 of control word 1 of the PSxHub to 0 to prevent the drives from being locked directly during configuration.
2. Assign all ports that are to be moved in synchronization to the same group, e.g. port 1 and 5 should be moved in synchronization:  
Set parameter 0xF512:1 and parameter 0xF512:5 to the value 1.
3. Set the maximum allowable deviation via parameter 0xF513:0.
4. Move all drives of the group to the same starting position.
5. Re-enable automatic blocking in case of position deviations within the group by setting bit 0 of control word 1 to 1.  
Set a new target position for all drives in the group at the same time.

## 6.4. Procedure in case of synchronization error

Initial scenario:

- Drives at port 1 and at port 5 are assigned to synchronization group 1.
  - Parameter 0xF512:1 and parameter 0xF512:5 have a value of 1.
- Auto-block is active
  - Bit 0 of Control Word 1: Value 1
- Reset "Error Occurred" Bit Is Not Active
  - Bit 1 of Control Word 1: Value 0
- There is currently no error detected in Synchronous group 1
  - Bits 8 and 9 of Status Word 1: Value 0

During the positioning run, the drive at port 1 is blocked. The deviation exceeded the value of parameter 0xF513:0.

- The hub automatically stops the drives at ports 1 and 5.
- Bits 8 and 9 of status word 1 have a value of 1.

The following procedure can correct the error.

1. Eliminate the reason for the blockage (disable engine supply if necessary).
2. Specify a new identical target position (this position will be used in the next step without active synchronization monitoring).
3. Reset bit 0 of control word 1 of the PSxHub to enable the drive to move again.
4. Once the new position has been reached by the drives: Reset the bit "synchronization Error" (bit 8 of status word 1 of the PSxHub) by briefly setting bit 1 of control word 1 of the PSxHub.
5. Reactivate synchronization monitoring by setting bit 0 of control word 1 of the PSxHub to 1, if necessary setting new target positions for the drives.

## 7. Technical Data

For the technical data and the drawing, please refer to the current data sheet on the website:  
<http://service.hwg.eu>.



Search for "PSxHub" and select your type, click on "Datasheets".  
Please contact us if you need further information.

## 8. Appendix

### 8.1. Table of the process data overview

|                                        |        | Output module (from the point of view of the IO controller) |        |         |         | Input module (from the point of view of the IO controller) |        |         |         |
|----------------------------------------|--------|-------------------------------------------------------------|--------|---------|---------|------------------------------------------------------------|--------|---------|---------|
| Device                                 |        | Process data layout                                         |        |         |         | Process data layout                                        |        |         |         |
| <b>PSxHub PKW Interface</b>            | Byte   | 0                                                           | 1      |         |         | 0                                                          | 1      |         |         |
|                                        |        | PKE[8]↑                                                     | PKE[9] |         |         | PKE[8]↑                                                    | PKE[9] |         |         |
|                                        | Byte   | 2                                                           | 3      |         |         | 2                                                          | 3      |         |         |
|                                        |        | IND[8]↑                                                     | IND[9] |         |         | IND[8]↑                                                    | IND[9] |         |         |
|                                        | Byte   | 4                                                           | 5      | 6       | 7       | 4                                                          | 5      | 6       | 7       |
|                                        |        | PWE[8]↑                                                     | PWE[9] | PWE[10] | PWE[11] | PWE[8]↑                                                    | PWE[9] | PWE[10] | PWE[11] |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |
|                                        | Byte   | 8-15                                                        |        |         |         |                                                            |        |         |         |
| <b>PSxHub</b>                          |        | CW_Hub                                                      |        |         |         | SW_Hub                                                     |        |         |         |
| <b>Port_1 PKW Interface</b>            | Byte   | 16                                                          | 17     |         |         | 16                                                         | 17     |         |         |
|                                        |        | PKE[8]↑                                                     | PKE[9] |         |         | PKE[8]↑                                                    | PKE[9] |         |         |
|                                        | Byte   | 18                                                          | 19     |         |         | 18                                                         | 19     |         |         |
|                                        |        | IND[8]↑                                                     | IND[9] |         |         | IND[8]↑                                                    | IND[9] |         |         |
|                                        | Byte   | 20                                                          | 21     | 22      | 23      | 20                                                         | 21     | 22      | 23      |
|                                        |        | PWE[8]↑                                                     | PWE[9] | PWE[10] | PWE[11] | PWE[8]↑                                                    | PWE[9] | PWE[10] | PWE[11] |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |
| <b>Drive-Port_1 Control Interface</b>  | Byte   | 24                                                          | 25     |         |         | 24                                                         | 25     |         |         |
|                                        |        | CW[8]                                                       | CW[9]↑ |         |         | SW[8]                                                      | SW[9]↑ |         |         |
|                                        | Byte   | 26                                                          | 27     | 28      | 29      | 26                                                         | 27     |         |         |
|                                        |        | TP[8]↑                                                      | TP[9]  | TP[10]  | TP[11]  | AS[8]↑                                                     | AS[9]  |         |         |
|                                        | Byte   | 30                                                          | 31     |         |         | 28                                                         | 29     | 30      | 31      |
|                                        |        | TS[8]↑                                                      | TS[9]  |         |         | AP[8]↑                                                     | AP[9]  | AP[10]  | AP[11]  |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |
| <b>Drive-Port_10 bis Drive-Port_9</b>  | 32-159 | ..                                                          |        |         |         | ..                                                         |        |         |         |
| <b>Drive-Port_10 PKW Interface</b>     | Byte   | 160                                                         | 161    |         |         | 160                                                        | 161    |         |         |
|                                        |        | PKE[8]↑                                                     | PKE[9] |         |         | PKE[8]↑                                                    | PKE[9] |         |         |
|                                        | Byte   | 162                                                         | 163    |         |         | 162                                                        | 163    |         |         |
|                                        |        | IND[8]↑                                                     | IND[9] |         |         | IND[8]↑                                                    | IND[9] |         |         |
|                                        | Byte   | 164                                                         | 165    | 166     | 167     | 164                                                        | 165    | 166     | 167     |
|                                        |        | PWE[8]↑                                                     | PWE[9] | PWE[10] | PWE[11] | PWE[8]↑                                                    | PWE[9] | PWE[10] | PWE[11] |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |
| <b>Drive-Port_10 Control Interface</b> | Byte   | 168                                                         | 169    |         |         | 168                                                        | 169    |         |         |
|                                        |        | CW[8]                                                       | CW[9]↑ |         |         | SW[8]                                                      | SW[9]↑ |         |         |
|                                        | Byte   | 170                                                         | 171    | 172     | 173     | 170                                                        | 171    |         |         |
|                                        |        | TP[8]↑                                                      | TP[9]  | TP[10]  | TP[3]   | AS[8]↑                                                     | AS[9]  |         |         |
|                                        | Byte   | 174                                                         | 175    |         |         | 172                                                        | 173    | 174     | 175     |
|                                        |        | TS[8]↑                                                      | TS[9]  |         |         | AP[0]↑                                                     | AP[1]  | AP[2]   | AP[3]   |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |
|                                        |        |                                                             |        |         |         |                                                            |        |         |         |

| Legend |                                                   |     |                             |
|--------|---------------------------------------------------|-----|-----------------------------|
| PKE    | Parameterkennung (engl. Parameter identification) | TS  | Target Speed                |
| IND    | Index                                             | TP  | Target Position             |
| PWE    | Parameterwert (engl. Parameter value)             | SW  | Statusword                  |
| CW_Hub | Controlword Hub                                   | ACE | Actual Speed                |
| SW_Hub | Statusword Hub                                    | AP  | Actual Position             |
| CW     | Controlword                                       | ↑   | msb - most significant byte |

## 9. Notes



