# Leybold

# Serial Interfaces for TURBO.DRIVE S, L, 300, 400 and 700

Operating Instructions GA05281_002_C0

# Contents

# Contents
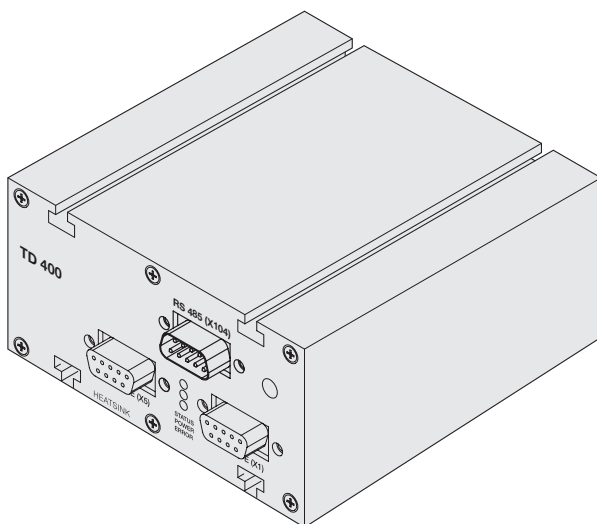
# Safety Information

**Important Safety Information**

The Leybold **TURBO.DRIVE with serial interfaces** have been designed for safe and efficient operation when used properly and in accordance with these Operating Instructions. It is the responsibility of the user to carefully read and strictly observe all safety precautions described in this section and throughout the Operating Instructions. The devices **must only be operated in the proper condition and under the conditions described in the Operating Instructions**. It must be operated and maintained by trained personnel only. Consult local, state, and national agencies regarding specific requirements and regulations. Address any further safety, operation and/or maintenance questions to our nearest office.

## 1 General

Frequency converters TURBO.DRIVE S, TURBO.DRIVE L, TURBO.DRIVE 300, 400 and 700 may optionally be equipped with one of the following interfaces:

- RS 232
- RS 485
- Profibus DP

The Operating Instructions for the frequency converter or the pump cover the way in which the serial interface connectors for RS 232 and RS 485 have been wired and how to make the link work. Moreover, these Operating Instructions contain a list of parameters for the frequency converter.

Pxxx denotes parameter value xxx.

TURBO.DRIVE are slave units and thus respond to requests from the master, and they supply data exclusively after having received a request to do so from the master, i.e. the interface of the frequency converter will always respond to a read or write access to the frequency converter.

In the case of word data (16 or 32 bit word length) the high bit is transmitted first (Motorola standard).

## 2    Description of the Protocol used for RS 232 and RS 485

## 2.1    Structure of the Character Frames for Transferring a Telegram Byte



- ■ The even parity bit is a check bit: the number of data bits "ones" (including the parity bit) is an even number.
- ■ Start bit = 0
- ■ Stop bit = 1
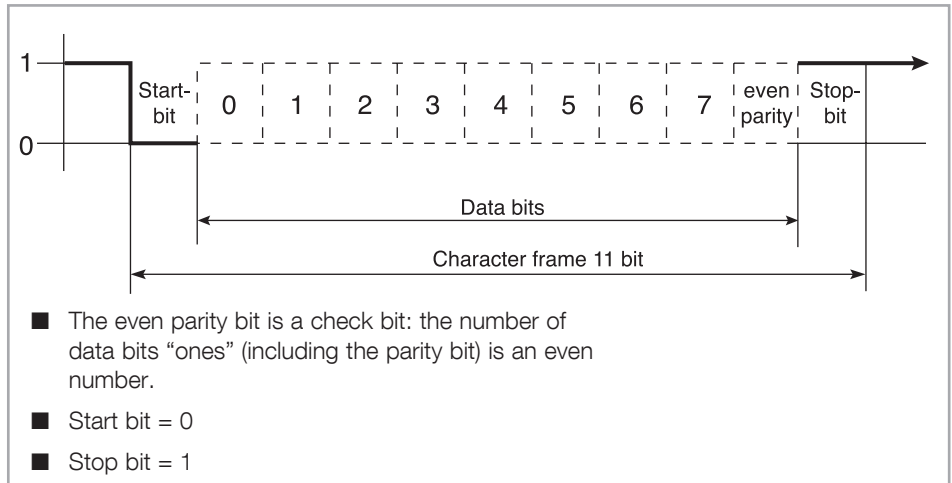
## 2.2 Structure of a Complete Data Telegram in Accordance with USS Protocol Specifications when using the RS 232 and RS 485 Interface

| Byte No. | Abbreviation | Description | Read access to frequency converter | Write access to frequency converter | Response from frequency converter |
|---|---|---|---|---|---|
| 0 | STX | Start byte | | 2 | |
| 1 | LGE | Length of the payload data block in byte (bytes 3 to 22) + 2: 22 | | 22 | |
| 2 | ADR | Address of the frequency converter | | RS232: 0 RS485: 0...15 | |
| 3-4 | PKE | Parameter number and type of access | | Value (s. 4.1) | |
| 5 | – | reserved | | 0 | |
| 6 | IND | Parameter index | | Value (s. 4.2) | Value |
| 7-10 | PWE | Parameter value | 0 | Value | Value |
| 11-12 | PZD1 STW, ZSW | Status and control bits | | Value (s. 4.3) | |
| 13-14 | PZD2, HSW HIW, (MSW) | Current rotor frequency (= P3) | 0 | 0 | Value (Hz) |
| 15-16 | PZD3, HSW HIW, (LSW) | Current temperature of the frequency converter (= P11) | 0 | 0 | Value (°C) |
| 17-18 | PZD4 | Current setpoint for motor current (= P5) | 0 | 0 | Value (0.1 A) |
| 19-20 | PZD5 | Current bearing temperature (= P125 or P127) | 0 | 0 | Value (°C) |
| 21-22 | PZD6 | Current converter supply voltage (=P4) | 0 | 0 | Value (V) |
| 23 | BCC | Recursive calculation: Check sum = byte (i=0) Check sum (i) = check sum (i-1) XOR Byte (i); i from 1 to 22, i = Byte No. | | Check sum (i=22) | |

Payload data block for RS 232 and RS 485

## 3    Profibus DP

In a Profibus DP system, a difference is made between master and slave units. Here the master units control all traffic. They transmit data to the related slaves and request data from these. It is possible to run one or several masters in a system.

For more information on the Profibus system:

„The New Rapid Way to Profibus DP",
Manfred Popp, Profibus Nutzerorganisation e.V.
Haid-und-Neu-Str. 7
D-76131 Karlsruhe
P/N 4.072
www.profibus.com

## 3.1    Description of the Interface

At both ends of the bus a terminating resistor is required. Such a terminator must be incorporated in an external plug. The connections for this plug are provided through the interface connector. For this also see the standards.

| Standards | Profibus DP V0 acc. to IEC 61158-2 and IEC 61784 Type 3 |
| --- | --- |
| Protocol | in acc. with Profibus profile for variable-speed drives Profile No.3; Version 2.0 |

Transmission rates and cable lengths
(see also the standards)

| Transmission rate (kBit/s) | Max. segment length (m) |
| --- | --- |
| 9.6 –93.75 | 1200 |
| 187.5 | 1000 |
| 500 | 400 |
| 1500 | 200 |
| 3000 - 12000 | 100 |

The baud rate is set automatically. The following baud rates are supported:

| | | |
| --- | --- | --- |
| 9.6 k Baud | 19.2 k Baud | 45.45 k Baud |
| 93.75 k Baud | 187.5 k Baud | 500 k Baud |
| 1.5 M Baud | 3 M Baud | 6 M Baud |
| 12 M Baud | | |

# Profibus



Pins 3, 5, 6, 8 floating

Frame: PE
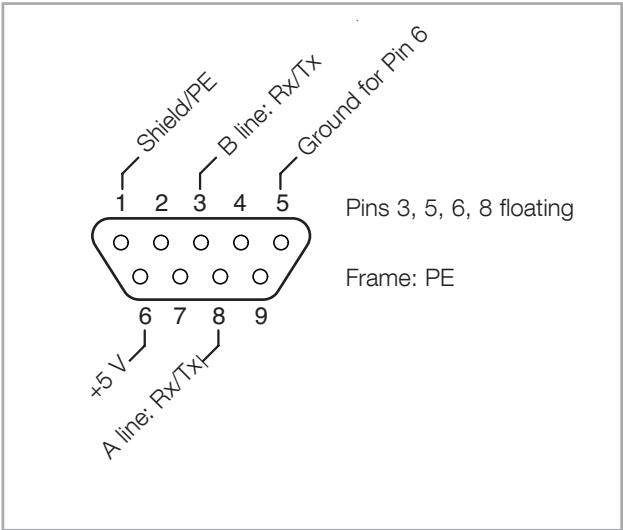
Pin assignment for the socket (female)
on the side of the frequency converter

| | |
|---|---|
| Address range corresponding to | Hex $01 ... $7E; Decimal 1 ... 126 |
| Cable type P/N | SIEMENS-SINEC-L2 bus cable; 6XV1830-0AH10 |
| Voltage level | see standards |
| Interface connector Thread | Sub-D 9 way socket (female) on the side of the instrument UNC4-40 |

Both sync mode and freeze mode are supported.

The TURBO.DRIVE 300 and 700 are also equipped with the Profibus watchdog function, which in the event of a failure affecting the cyclic exchange of Profibus data will stop the pump after about 5 s.

Note: After having changed the bus address through the rotary switch, switch the frequency converter off (yellow Power LED off) and then on again so as to enable the new address setting.

## 3.2 Description of the Telegram

Three types of protocol (PPO types) have been implemented. In the following only the payload data are described. Data which serve communication purposes (data link layer, layer 2 acc. to OSI, for example, start byte and addressing etc.) are processed automatically in the background by the Profibus.

### 3.2.1 PPO Type 1 (Profibus)

Length of the payload data block: 6 words = 12 bytes

Designator = 0xF3, 0xF1 (see 3.3 GSD File)

| Byte No. | Abbre-viation | Description | Read access on con-verter | Write access on con-verter | Response from con-verter |
|---|---|---|---|---|---|
| 0-1 | PKE | Parameter number and type of access | | Value (s. 4.1) | |
| 2 | IND | Parameter index | | Value (s. 4.2) | |
| 3 | – | reserved | | 0 | |
| 4-7 | PWE | Parameter value | 0 | Value | Value |
| 8-9 | PZD1 STW ZSW | Status and control bits | | Value (s. 4.3) | |
| 10 -11 | PZD2 HSW HIW (MSW) | Current rotor frequency (= P3) | 0 | 0 | Value (Hz) |

# Profibus

### 3.2.2  PPO Type 6 (Profibus)

Length of the payload data block: 1 word = 2 bytes

Designator = 0x00, 0xF0 (see 3.3 GSD File)

| Byte No. | Abbre- viation | Description | Read access on con- verter | Write access on con- verter | Response from con- verter |
|---|---|---|---|---|---|
| 0-1 | PZD1 STW ZSW | Status and control bits | | Value (s. 4.3) | |

### 3.2.3  PPO Type 7 (Profibus)

Length of the payload data block: 1 byte

Designator = 0x00, 0xB0 (see 3.3 GSD File)

| Byte No. | Abbre- viation | Description | Read access on con- verter | Write access on con- verter | Response from con- verter |
|---|---|---|---|---|---|
| 0 | PZD1 STW ZSW | Status and control bits | | Value (s. 4.4) | |

### 3.3 GSD File (Example)

Documented in the GSD file are the parameters of the Profibus DP interface. The file format has been defined in the standard so that project tools from different manufacturers can be used. The current GSD file is available from Leybold upon request. In addition the contents of the GSD file have been documented in the following.

```
========================================
GSD-Datei for LEYBOLD SS18135

Status : 24.09.98 - Harald Fleischmann Sync_mode_supp

Freeze_mode_supp

========================================
#Profibus_DP

Vendor_Name = „Leybold AG

Model_Name = „NT 1600C

Revision = „Ausgabestand 1"

Ident_Number = 0x00F1

Protocol_Ident = 0

Station_Type = 0 FMS_supp = 0

Hardware_Release = „A01"

Software_Release = „A01"

9.6_supp = 1

19.2_supp = 1 93.75_supp = 1

187.5_supp = 1 500_supp = 1

1.5M_supp = 1 3M_supp = 1

6M_supp = 1 12M_supp = 1

MaxTsdr_9.6 = 60

MaxTsdr_19.2 = 60

MaxTsdr_93.75 = 60

MaxTsdr_187.5 = 60

MaxTsdr_500 = 100

MaxTsdr_1.5M = 150
```

# Profibus

MaxTsdr_3M = 250

MaxTsdr_6M = 450

MaxTsdr_12M = 800

Redundancy = 0

Repeater_Ctrl_Sig = 2

24V_Pins = 0

Slave spezifische Werte

Freeze_Mode_supp = 1

Sync_Mode_supp = 1

Auto_Baud_supp = 1

Set_Slave_Add_supp = 0

Min_Slave_Intervall = 1

Modular_Station = 1

Max_Module = 1

Max_Input_Len = 20

Max_Output_Len = 20

Max_Data_Len = 40

Max_Diag_Data_Len = 6

Module = „PPO 1" 0xF3, 0xF1 EndModule

Module = „PPO 6" 0x00, 0xF0 EndModule

Module = „PPO 7" 0x00, 0xB0 EndModule

# 4 Description of PKE, IND, Control and Status Bits

## 4.1 PKE: Parameter Number and Type of Access (RS 232, RS 485, Profibus)
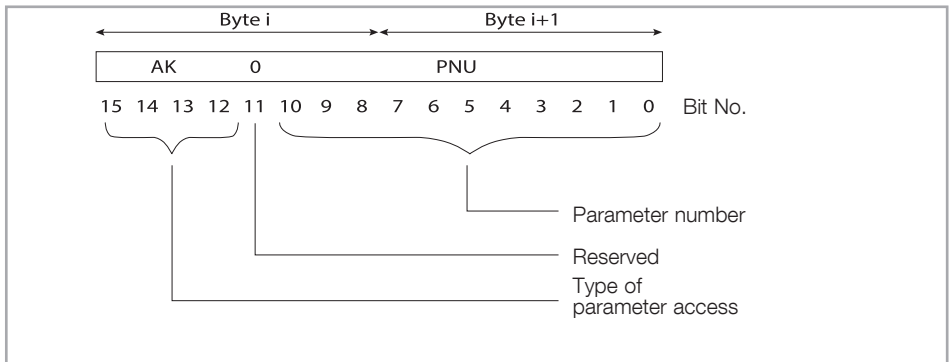


The parameter number is sent when accessing the frequency converter and also in the response of the frequency converter.

The receiver is provided with information on the parameter value PWE: size, field value or individual value, read or write.

## Type of Parameter Access to the Frequency Converter (Query Designator)

| Bit number 15 | 14 | 13 | 12 | |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | No access |
| 0 | 0 | 0 | 1 | Parameter value requested |
| 0 | 0 | 1 | 0 | Write a 16 bit value |
| 0 | 0 | 1 | 1 | Write a 32 bit value |
| 0 | 1 | 1 | 0 | Field value requested (*) |
| 0 | 1 | 1 | 1 | Write a 16 bit field value (*) |
| 1 | 0 | 0 | 0 | Write a 32 bit field value (*) |
| 1 | 0 | 0 | 1 | Number of field elements of a field requested |

## Type of Parameter Response from the Frequency Converter (Reply Designator)

| Bit number 15 | 14 | 13 | 12 | |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | No response |
| 0 | 0 | 0 | 1 | 16 bit value is sent |
| 0 | 0 | 1 | 0 | 32 bit value is sent |
| 0 | 0 | 1 | 1 | 16 bit value is sent |
| 0 | 0 | 1 | 0 | 32 bit value is sent |
| 0 | 1 | 0 | 0 | 16 bit field value is sent; (*) |
| 0 | 1 | 0 | 1 | 32 bit field value is sent; (*) |
| 0 | 1 | 0 | 0 | 16 bit field value is sent; (*) |
| 0 | 1 | 0 | 1 | 32 bit field value is sent; (*) |
| 0 | 1 | 1 | 0 | Number of field elements of a field is sent |

**Further responses**

| 15 | 14 | 13 | 12 | |
|---|---|---|---|---|
| 0 | 1 | 1 | 1 | The frequency converter can not run the command |
| 1 | 0 | 0 | 0 | During a write access: no permission to write |

(*) Position of the field value: see 4.2 IND

## 4.2    IND: Parameter index
## (RS 232, RS 485, Profibus)

```
              ←——————— Byte i ———————→
              ┌──────────────────────────────┐
              │ 15  14  13  12  11  10  9  8  │   Bit No.
              └──────────────────────────────┘
```
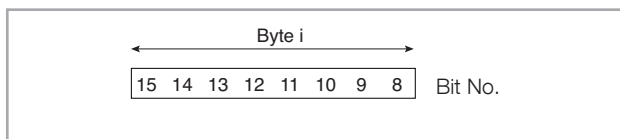
Most parameters address during writing and reading only one value and do not need any sub-addressing. The TURBO.DRIVE have an error memory allowing to save either the 8 most recent or the last 40 (error) events as a data field and if required for presentation of indexed field values.

The parameter index indicates the position of a field value in a field. In the case of the TURBO.DRIVE S and L there are two field parameters: the error code memory (P171) and the error operating hours memory (P176) with 8 field values each.

In the case of the TURBO.DRIVE 300, 400 and 700 there is in addition an error memory for the rotor frequency (P174) and 40 field values each.

| Parameter | High Byte (Byte i) | Low Byte (Byte i+1) |
|---|---|---|
| Field parameter (only P171, P176 (and P174 for TD 300, 400 & 700) | 0 | Low byte = Position of the value in field − 1, $0 \leq$ low byte $\leq 7$ Example: 4th field value $\rightarrow$ Low byte = 3 |
| Parameter (not P171, P176 P174) | 0 | Low byte = 0 |

# Status and Control Bits

### 4.3 Status and Control Bits for RS 232, RS 485, Profibus PPO Type 1 and 6

The status and control bits are only temporary available, i.e. after interrupting the power supply the bits are set to default.

### 4.3.1 Control Word (PZD1, STW) = 16 Bits (only for TURBO.DRIVE S and L)

Is sent each time the frequency controller is accessed.

| Bit No. | Default status | Description |
|---|---|---|
| 0 | 0 | * 1 = Start; 0 = Stop<br>Start/Stop are only run if<br>■ no error is present and<br>■ control bit 10 =1 or P12 = 1 or 2 |
| 7 | 0 | * 0 to 1 transition = error reset<br>Reset is only run if<br>■ the fault cause has been removed and<br>■ control bit 0 = 0 and<br>■ control bit 10 =1 or P12 = 1 or 2 |
| 10 | 0 | 1 = Start/Stop via serial interface<br>0 = Start/Stop via REMOTE (X1)<br>Remark: Control bit 10 sets the status bit 15 if the frequency converter is ready to accept control commands through the interface. |

All other bits are reserved.

* In order to enable the control functions via the Profibus interface, bit 10 for PPO type 1 or 6 must be set. Control via the control plug X1 or through the service interface (RS 232/485) is then disabled.

### 4.3.2  Status Word (PZD1, ZSW) = 16 Bits (only for TURBO.DRIVE S and L)

Is sent together with each reply from the frequency converter.

| Bit No. | Description |
|---|---|
| 0 | 1 = frequency converter and pump are ready to start; like P303, Bit 1 |
| 2 | 1 = active operation; the frequency converter is driving the pump |
| 3 | 1 = a fault has occurred affecting the pump or the frequency converter, the pump is stopped |
| 4 | 1 = pump speed is increasing, like P303, bit 2 |
| 5 | 1 = pump speed is dropping, like P303, bit 3 |
| 9 | 1 = the frequency converter accepts parameters from the serial interface, normally always 1 (set) |
| 10 | 1 = the pump is running normally $(P3 \geq P24 \times P25)$; like P303, bit 0 |
| 11 | 1 = the pump is turning (speed > 1 Hz) |
| 15 | 1 = Start/Stop (control bit 0) and Reset (control bit 7) is possible through the serial interface; is set through control bit 10 = 1 or with P12 =1 or 2; 0 = Start/Stop and Reset only via REMOTE (X1) is possible; is set to 0 with control bit 10 = 0 or P12 = 0. |

All other bits are reserved.

# Status and Control Bits

### 4.3.3 Control Word (PZD1, STW) = 16 Bits (only for TURBO.DRIVE 300 and 700)

Is sent each time the frequency controller is accessed.

| Bit No. | Default status | Description |
|---|---|---|
| 0 | 0 | * 1 = Start; 0 = Stop <br> Start/Stop are only run if <br> ■ no error is present and <br> ■ control bit 10 =1 or P12 = 1 or 2 |
| 6 | 0 | * Enable setpoint (releases the main set point (speed)) for PPO type 1 for taking over; for PPO type 6 set always to 0 |
| 7 | 0 | * 0 to 1 transition = error reset <br> Reset is only run if <br> ■ the fault cause has been removed and <br> ■ control bit 0 = 0 and <br> ■ control bit 10 =1 or P12 = 1 or 2 |
| 8 | 0 | * Standby speed (see P150 and P151) |
| 10 | 0 | 1 = Start/Stop via serial interface <br> 0 = Start/Stop via REMOTE (X1) <br> Remark: Control bit 10 sets the status bit 15 if the frequency converter is ready to accept control commands through the interface. |
| 11 | 0 | * Purge gas ON (see description of parameter 29) |
| 12 | 0 | * Venting ON (see description of parameter 29) |

All other bits are reserved.

\*   In order to enable the control functions via the Profibus interface, bit 10 for PPO type 1 or 6 must be set. Control via the control plug X1 or through the service interface (RS 232/485) is then disabled.

### 4.3.4 Status Word (PZD1, ZSW) = 16 Bits
###      (only for TURBO.DRIVE 300 and 700)
Is sent together with each reply from the frequency converter.

| Bit No. | Description |
|---|---|
| 0 | 1 = frequency converter and pump are ready to start; like P303, Bit 1 |
| 2 | 1 = active operation; the frequency converter is driving the pump |
| 3 | 1 = a fault has occurred affecting the pump or the frequency converter, the pump is stopped |
| 4 | 1 = pump speed is increasing, like P303, bit 2 |
| 5 | 1 = pump speed is dropping, like P303, bit 3 |
| 6 | Switch on lock: 1 = in case of an error, pump can not be started |
| 7 | Warning temperature; see P227; all temperature warnings |
| 9 | 1 = the frequency converter accepts parameters from the serial interface, normally always 1 (set) |
| 10 | 1 = the pump is running normally (P3 ≥ P24 x P25); like P303, bit 0 |
| 11 | 1 = the pump is turning (speed > 1 Hz) |
| 12 | Warning bearing change |
| 13 | Warning high load / overload; see P227 |
| 14 | Collective warning, see P227, all warnings |
| 15 | 1 = Start/Stop (control bit 0) and Reset (control bit 7) is possible through the serial interface; is set through control bit 10 = 1 or with P12 =1 or 2; 0 = Start/Stop and Reset only via REMOTE (X1) is possible; is set to 0 with control bit 10 = 0 or P12 = 0. Changes status at a cycle rate of 1 s as a "sign of life" |

All other bits are reserved.

# Status and Control Bits

### 4.3.5 Control Word (PZD1, STW) = 16 Bits (only for TURBO.DRIVE 400)

| Bit No. | Description |
|---|---|
| 0 | 1 = Start; 0 = Stop<br>Start/Stop are only run if<br>■ no error is present and<br>■ control bit 10 =1 |
| 2-5 | Reserved |
| 6 | Enable setpoint (releases the main set point (speed)) for PPO type 1 for taking over; for PPO type 6 set always to 0 |
| 7 | 0 to 1 transition = error reset<br>Reset is only run if<br>■ the fault cause has been removed and<br>■ control bit 0 = 0 and<br>■ control bit 10 =1 |
| 8 | Standby speed (see P150 and P151)<br>0 = System drives to normal set speed (P24)<br>1 = System drives to stand-by speed (P150) |
| 9 | Reserved |
| 10 | Enable process data (Bit 0, 6, 7, 8, 11, 12)<br>1 = Start/Stop via serial interface<br>0 = Start/Stop via REMOTE (X1)<br>Remark: Control bit 10 sets the status bit 15 if the frequency converter is ready to accept control commands through the interface. |
| 11 | Error relay; enables control of the relay output on X1<br><br>If parameter 29 index 1 is set to 2:<br>0 = Relay is not triggered<br>1 = Relay is triggered |
| 12 | Normal operation relay; enables control of the relay output on X1<br><br>If parameter 29 index 0 is set to 2:<br>0 = Relay is not triggered<br>1 = Relay is triggered |
| 13-15 | Reserved |

### 4.3.6 Status Word (PZD1, ZSW) = 16 Bits
####     (only for TURBO.DRIVE 400)

| Bit No. | Description |
|---|---|
| 0 | 1 = frequency converter and pump are ready to start; like P303, Bit 1 |
| 2 | 1 = active operation; the frequency converter is driving the pump |
| 3 | 1 = a fault has occurred affecting the pump or the frequency converter, the pump is stopped |
| 4 | 1 = pump speed is increasing, like P303, bit 2 |
| 5 | 1 = pump speed is dropping, like P303, bit 3 |
| 6 | Switch on lock: 1 = in case of an error, pump can not be started |
| 7 | Warning temperature; see P227; all temperature warnings |
| 8 | Reserved |
| 9 | 1 = the frequency converter accepts parameters from the serial interface, normally always 1 (set) |
| 10 | 1 = the pump is running normally (P3 ≥ P24 x P25); like P303, bit 0 |
| 11 | 1 = the pump is turning (speed > 3 Hz) |
| 12 | Reserved |
| 13 | Warning high load / overload; see P227 |
| 14 | Collective warning; see P227; all warnings |
| 15 | 1 = Start/Stop (control bit 0) and Reset (control bit 7) is possible through the serial interface; is set through control bit 10 = 1; |
|    | 0 = Start/Stop and Reset only via REMOTE (X1) is possible; is set to 0 with control bit 10 = 0 |

# Status and Control Bits

### 4.3.7  Examples for 16 Bit Control Words (PPO Type 1 and 6)

| Decimal value | Hexadecimal value | Binary value ← MSB  LSB → | Description |
|---|---|---|---|
| 0 | 0000 | 0000 0000 0000 0000 | No control via this interface, all other bits disabled |
| 1024 | 0400 | 0000 0100 0000 0000 | Control via this interface; no start, no reset |
| 1025 | 0401 | 0000 0100 0000 0001 | Control via this interface; start is active, no reset |
| 1152 | 0480 | 0000 0100 1000 0000 | Control via this interface; no start, reset is active |

### 4.3.8  Examples for 16 Bit Status Words (PPO Type 1 and 6)

| Decimal value | Hexadecimal value | Binary value ← MSB  LSB → | Description |
|---|---|---|---|
| 513 | 0201 | 0000 0010 0000 0001 | Parameters are ready, start is ready |
| 33281 | 8201 | 1000 0010 0000 0001 | Control is ready, parameters are ready, start is ready |
| 35348 | 8A14 | 1000 1010 0001 0100 | Control is ready, pump is rotating, parameters are ready, speed is increasing, active operation |
| 36356 | 8E04 | 1000 1110 0000 0100 | Control is ready, pump is rotating, normal operation parameters are ready, active operation |
| 36484 | 8E84 | 1000 1110 1000 0100 | Control is ready, pump is rotating, normal operation parameters are ready, temperature warning, active operation |
| 33352 | 8248 | 1000 0010 0100 1000 | Control is ready, switch on lock, error is present |

## 4.4 Status and Control Bits for Profibus PPO Type 7

The status and control bits are only temporary available, i.e. after interrupting the power supply the bits are set to default.

```
                    Byte i
         ┌──────────────────────────┐
         │ 7  6  5  4  3  2  1  0 │   Bit No.
         └──────────────────────────┘
```

### 4.4.1 Control Byte = 8 Bits
         (only for TURBO.DRIVE S and L)
Is sent each time the frequency controller is accessed.

| Bit No. | Default status | Description |
|---------|----------------|-------------|
| 0 | 0 | * 1 = Start; 0 = Stop<br>Start/Stop are only run if<br>■ no error is present and if<br>■ control bit 10 =1 or P12 = 1 or 2 |
| 2 | 0 | 1 = Start/Stop via serial interface<br>0 = Start/Stop via REMOTE (X1) |
| 7 | 0 | * 0 to 1 transition = error reset<br>Reset is only run if<br>■ the fault cause has been removed and if<br>■ control bit 0 = 0 and<br>■ control bit 10 =1 or P12 = 1 or 2 |

All other bits are reserved.

# Status and Control Bits

### 4.4.2 Status Byte = 8 Bits
### (only for TURBO.DRIVE S and L)

Is sent together with each reply from the frequency converter.

| Bit No. | Description |
|---|---|
| 0 | 1 = the pump is running normally (P3 ≥ P24 x P25); like P303, bit 0 |
| 1 | 1 = the pump is turning (speed > 1 Hz) |
| 3 | 1 = a fault has occurred affecting the pump or the frequency converter, the pump is stopped |

All other bits are reserved.

\* In order to enable the control functions via the Profibus interface, bit 2 for PPO type 7 must be set. Control via the control plug X1 or through the service interface (RS 232/485) is then disabled.

### 4.4.3 Control Byte = 8 Bits
### (only for TURBO.DRIVE 300, 400 and 700)

Is sent each time the frequency controller is accessed.

| Bit No. | Default status | Description |
|---|---|---|
| 0 | 0 | \* 1 = Start; 0 = Stop Start/Stop are only run if ■ no error is present and if ■ control bit 10 =1 or P12 = 1 or 2 |
| 2 | 0 | 1 = Start/Stop via serial interface 0 = Start/Stop via REMOTE (X1) |
| 4 | 0 | Error relay;  enables control of the relay output on X1 (See description of parameter 29) |
| 5 | 0 | Normal operation relay; enables control of the relay output on X1 (See description of parameter 29) |
| 6 | 0 | \*Go to standby speed |

| 7 | 0 | *0 to 1 transition = error reset |
|---|---|---|
|   |   | Reset is only run if |
|   |   | ■ the fault cause has been removed and if |
|   |   | ■ control bit 0 = 0 and |
|   |   | ■ control bit 10 =1 or P12 = 1 or 2 |

All other bits are reserved.

### 4.4.4 Status Byte = 8 Bits
### (only for TURBO.DRIVE 300, 400 and 700)

Is sent together with each reply from the frequency converter.

| Bit No. | Description |
|---|---|
| 0 | 1 = the pump is running normally (P3 ≥ P24 x P25); like P303, bit 0 |
| 1 | 1 = the pump is turning (speed > 1 Hz) |
| 2 | Maintenance required |
| 3 | 1 = a fault has occurred affecting the pump or the frequency converter, the pump is stopped |
| 6 | Warning high load |
| 7 | Warning high temperature |

All other bits are reserved.

\* In order to enable the control functions via the Profibus interface, bit 2 for PPO type 7 must be set. The control means via the control plug X1 or through the service interface (RS 232/485) is then disabled.

# Status and Control Bits

### 4.4.5  Examples for 8 Bit Control Bytes (PPO Type 7)

| Decimal value | Hexadeci-mal value | Binary value ← MSB | LSB → | Description |
|---|---|---|---|---|
| 0 | 00 | 0 0 0 0 | 0 0 0 0 | No control via this interface, all other bits disabled |
| 2 | 02 | 0 0 0 0 | 0 0 1 0 | Control via this interface; no start, no reset |
| 3 | 03 | 0 0 0 0 | 0 0 1 1 | Control via this interface; start is active, no reset |
| 130 | 82 | 1 0 0 0 | 0 0 1 0 | Control via this interface; no start, reset is active |

### 4.4.6  Examples for 8 Bit Status Bytes (PPO Type 7)

| Decimal value | Hexadeci-mal value | Binary value ← MSB | LSB → | Description |
|---|---|---|---|---|
| 0 | 00 | 0 0 0 0 | 0 0 0 0 | Start is ready |
| 2 | 02 | 0 0 0 0 | 0 0 1 0 | Pump is turning |
| 3 | 03 | 0 0 0 0 | 0 0 1 1 | Pump is turning, normal operation |
| 131 | 83 | 1 0 0 0 | 0 0 1 1 | Temperature warning, pump is turning, normal operation |
| 10 | 0A | 0 0 0 0 | 1 0 1 0 | Error is present, pump is (still) turning |

## 5 Troubleshooting

Symptom: no data transfer.

| Possible fault causes | Notes on remedial action |
|---|---|
| Wrong bus address for the frequency converter or in the data protocol. | Check address setting at the frequency converter. |
| Cable broken or not connected. | Check cables. |
| Bus termination improperly connected, not properly rated, not enabled. | On the Profibus enable both terminating resistors at both ends of the Profibus itself. Any additional terminating resistors must not be enabled. |
| Cable shield not connected in addition (in the case of high interference levels). | If the standard ground connection is inadequate, connect instrument ground or frame ground to the shield of the bus cable: remove a short piece of insulation from the bus cable and use a metal clamp, for example, to provide an ultra-short link at a suitable place between cable shield and casing section. |
| Hardware defective. | Replace the frequency converter. |
| No or incorrect power supply voltage for powering the bus system. | In order to let the interface take part in the communication process with the field bus, the frequency converter needs to be powered with a suitable DC voltage. For Profibus: if the bus terminating resistors are supplied with power via the field bus cable, the required voltage of 5 V must be supplied. Normally the terminating resistors will be powered by the frequency converter so that here there should be no problem. |

# Sales and Service

## Germany

**Leybold GmbH**
Sales, Service, Support Center (3SC)
Bonner Strasse 498
D-50968 Cologne
T:  +49-(0)221-347 1234
F:  +49-(0)221-347 31234
sales@leybold.com
www.leybold.com

**Leybold GmbH**
**Sales Area North**
Branch Office Berlin
Industriestrasse 10b
D-12099 Berlin
T:  +49-(0)30-435 609 0
F:  +49-(0)30-435 609 10
sales.bn@leybold.com

**Leybold GmbH**
**Sales Office South**
Branch Office Munich
Karl-Hammerschmidt-Strasse 34
D-85609 Aschheim-Dornach
T:  +49-(0)89-357 33 9-10
F:  +49-(0)89-357 33 9-33
sales.mn@leybold.com
service.mn@leybold.com

**Leybold Dresden GmbH**
**Service Competence Center**
Zur Wetterwarte 50, Haus 304
D-01109 Dresden
Service:
T:  +49-(0)351-88 55 00
F:  +49-(0)351-88 55 041
info.dr@leybold.com

## Europe

### Belgium

**Leybold Nederland B.V.**
**Belgisch bijkantoor**
Leuvensesteenweg 542-9A
B-1930 Zaventem
Sales:
T:  +32-2-711 00 83
F:  +32-2-720 83 38
sales.zv@leybold.com
Service:
T:  +32-2-711 00 82
F:  +32-2-720 83 38
service.zv@leybold.com

### France

**Leybold France S.A.S.**
Parc du Technopolis, Bâtiment Beta
3, Avenue du Canada
F-91940 Les Ulis cedex
Sales and Service:
T:  +33-1-69 82 48 00
F:  +33-1-69 07 57 38
info.ctb@leybold.com
sales.ctb@leybold.com

**Leybold France S.A.S.**
Valence Factory
640, Rue A. Bergès
B.P. 107
F-26501 Bourg-lès-Valence Cedex
T:  +33-4-75 82 33 00
F:  +33-4-75 82 92 69
marketing.vc@leybold.com

## Great Britain

**Leybold UK LTD.**
Unit 9
Silverglade Business Park
Leatherhead Road
Chessington
Surrey (London)
KT9 2QL
Sales:
T:  +44-13-7273 7300
F:  +44-13-7273 7301
sales.ln@leybold.com
Service:
T:  +44-13-7273 7320
F:  +44-13-7273 7303
service.ln@leybold.com

## Italy

**Leybold Italia S.r.l.**
Via Trasimeno 8
I-20128 Mailand
Sales:
T:  +39-02-27 22 31
F:  +39-02-27 20 96 41
sales.mi@leybold.com
Service:
T:  +39-02-27 22 31
F:  +39-02-27 22 32 17
service.mi@leybold.com

## Netherlands

**Leybold Nederland B.V.**
Floridadreef 102
NL-3565 AM Utrecht
Sales and Service:
T:  +31-(30) 242 63 30
F:  +31-(30) 242 63 31
sales.ut@leybold.com
service.ut@leybold.com

## Switzerland

**Leybold Schweiz AG, Pfäffikon**
Churerstrasse 120
CH-8808 Pfäffikon
Warehouse and shipping address:
Riedthofstrasse 214
CH-8105 Regensdorf
Sales:
T:  +41-44-308 40 50
F:  +41-44-302 43 73
sales.zh@leybold.com
Service:
T:  +41-44-308 40 62
F:  +41-44-308 40 60
service.zh@leybold.com

## Spain

**Leybold Spain, S.A.**
C/. Huelva, 7
E-08940 Cornellà de Llobregat
(Barcelona)
Sales:
T:  +34-93-666 43 11
F:  +34-93-666 43 70
sales.ba@leybold.com
Service:
T:  +34-93-666 46 11
F:  +34-93-685 43 70
service.ba@leybold.com

## America

### USA

**Leybold USA Inc.**
5700 Mellon Road
USA-Export, PA 15632
T:  +1-724-327-5700
F:  +1-724-325-3577
info.ex@leybold.com
Sales:
T:  +1-724-327-5700
F:  +1-724-333-1217
Service:
T:  +1-724-327-5700
F:  +1-724-325-3577

### Brazil

**Leybold do Brasil**
Rod. Vice-Prefeito Hermenegildo Tonolli,
nº. 4413 - 6B
Distrito Industrial
Jundiaí - SP
CEP 13.213-086
Sales and Service:
T:  +55 11 3395 3180
F:  +55 11 99467 5934
sales.ju@leybold.com
service.ju@leybold.com

## Asia

### P. R. China

**Leybold (Tianjin)**
**International Trade Co. Ltd.**
Beichen Economic
Development Area (BEDA),
No. 8 Western Shuangchen Road
Tianjin 300400
China
Sales and Service:
T:  +86-22-2697 0808
F:  +86-22-2697 4061
F:  +86-22-2697 2017
sales.tj@leybold.com
service.tj@leybold.com

### India

**Leybold India Pvt Ltd.**
No. 82(P), 4th Phase
K.I.A.D.B. Plot
Bommasandra Industrial Area
Bangalore - 560 099
Indien
Sales and Service:
T:  +91-80-2783 9925
F:  +91-80-2783 9926
sales.bgl@leybold.com
service.bgl@leybold.com

### Japan

**Leybold Japan Co., Ltd.**
Headquarters
Shin-Yokohama A.K.Bldg., 4th floor
3-23-3, Shin-Yokohama
Kohoku-ku, Yokohama-shi
Kanawaga 222-0033
Japan
Sales:
T:  +81-45-471-3330
F:  +81-45-471-3323
sales.yh@leybold.com

**Leybold Japan Co., Ltd.**
Tsukuba Technical Service Center
1959, Kami-yokoba
Tsukuba-shi, Ibaraki-shi 305-0854
Japan
Service:
T:  +81-29 839 5480
F:  +81-29 839 5485
service.iik@leybold.com

### Malaysia

**Leybold Malaysia**
**Leybold Singapore Pte Ltd.**
No. 1 Jalan Hi-Tech 2/6
Kulim Hi-Tech Park
Kulim, Kedah Darul
Aman 09000
Malaysia
Sales and Service:
T:  +604 4020 222
F:  +604 4020 221
sales.ku@leybold.com
service.ku@leybold.com

### South Korea

**Leybold Korea Ltd.**
3F. Jellzone 2 Tower
Jeongja-dong 159-4
Bundang-gu Sungnam-si
Gyeonggi-do
Bundang 463-384, Korea
Sales:
T:  +82-31 785 1367
F:  +82-31 785 1359
sales.bd@leybold.com
Service:
623-7, Upsung-Dong
Cheonan-Si
Chungcheongnam-Do
Korea 330-290
T:  +82-41 589 3035
F:  +82-41 588 0166
service.cn@leybold.com

### Singapore

**Leybold Singapore Pte Ltd.**
8 Commonwealth Lane #01-01
Singapore 149555
Singapore
Sales and Service:
T:  +65-6303 7030
F:  +65-6773 0039
sales.sg@leybold.com
service.sg@leybold.com

### Taiwan

**Leybold Taiwan Ltd.**
No 416-1, Sec. 3
Chunghsin Rd., Chutung
Hsinchu County 310
Taiwan, R.O.C.
Sales and Service:
T:  +886-3-500 1688
F:  +886-3-583 3999
sales.hc@leybold.com
service.hc@leybold.com

**Headquarter**
**Leybold GmbH**
Bonner Strasse 498
D-50968 Cologne
T: +49-(0)221-347-0
F: +49-(0)221-347-1250
info@leybold.com

**Leybold**

www.leybold.com