

S600 Profibus - Example Communication Commands

Introduction

Before the drive is run with the Profibus, it should be configured according to the application and tested with the PC set-up software (Drive.exe). To do that you need to disable the watchdog by setting the parameter EXTWD = 0. To start the Servostar with Profibus please follow these steps.

Null Telegram

At the beginning of the communication via the parameter channel and in case of a communication error a null telegram should be sent:

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
0000	0000	0000	0000

The Servostar will answer by also setting the first 8 bytes of the telegram to zero.

Set Operation Mode

After power up the Servostar will always be in the so-called safe operation mode –126, no matter which operation mode has been set with the set-up software. To operate the drive, the PNU 930 must be set to the required operation mode using the parameter channel. The example shows how to set operation mode 2, Positioning. Note OPMODE 2 Profibus = OPMODE 8 Serial

Task ID (AK) = 3; PNU 930 = 0x3A2, Parameter Value (PWE) = 2

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
33A2	0000	0000	0002

In case of successful writing the drive will answer with Response ID (AK) 2 and show the parameter number as well as the parameter value:

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
23A2	0000	0000	0002

In case of AK = 7 (PKE = 0x73A2) PWE will show an error number. The meaning of this number can be found in the manual. One reason for the error may be that no null telegram had been sent before. Up to here the parameter channel has been used (bytes 1 – 8). The following steps will be done via the process data channel. The parameter channel can be set to zero to be ready for the next read or write access.

Enable Drive

Now the internal state machine can be switched to “Operation Enabled” using the control word (STW). This will enable the drive.

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8	Byte 9, 10
PKE	IND	PWE		PZD 1
				STW
0000	0000	0000	0000	043F

If the hardware enable signal is switched on, the motor will be under servo control. Because bit 10 of the STW (PZD enable) is set, actual position and speed values should be sent from the Servostar. This can be seen looking onto the Profibus page of the set up software. HIW and PZD4 in the line input should change.

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Jogging

Before a reference move has been executed, the motor can only be moved in jog mode. To do this bit 8 of the STW must be set additionally and a speed setpoint must be written in byte 6 (PZD 2 = Main Setpoint HSW), in the example 10000 (2710hex).

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8	Byte 9, 10	Byte 11, 12
PKE	IND	PWE		PZD 1	PZD 2
				STW	HSW
0000	0000	0000	0000	053F	2710

The speed at the motor results from this value multiplied with the adjustable multiplier PNU 1250. The default value of this parameter is 1. The sign of the speed determines the move direction.

Reference (Home) Move

The mode and the direction of the reference move can be set with the PC set-up software or with the PNUs 1350 and 1351 (s. chap. IV.2.6). In the STW the reference (home) bit must be set in addition, and a speed setpoint must be written in the HSW (PZD 2). The speed at the motor results from this value multiplied with the adjustable multiplier PNU 1250. The default value of this parameter is 1. For the reference move the sign of the speed does not matter.

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8	Byte 9, 10	Byte 11, 12
PKE	IND	PWE		PZD 1	PZD 2
				STW	HSW
0000	0000	0000	0000	0C3F	2710

The drive will show the start of the reference move with the bit „Motion Task active“, bit 0 of PZD 5. (Bits 16 – 31 of the manufacturer specific status are transferred here.) The answer may look as follows:

Byte 9, 10	Byte 11, 12	Byte 13, 14	Byte 15, 16	Byte 17, 18	Byte 19, 20
PZD1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
ZSW	HIW			manufacturer specific status	
02A7	xxxx	xxxx	xxxx	4401	0000

When the reference move is finished, the bit „Motion Task active“ will be reset and – assumed the in position window is set to a reasonable value – bit 3 of PZD5, „In Position“, is set. Attention! The bit „Reference Point set“ is active once the drive internally knows its reference position. At this time the motor may still be moving. After the reference move is finished, you may e.g. see PZD5 = 5406h.

Start a Direct Motion Task

For a direct motion task bit 14 in the STW (PZD1) must be set. The motion task type is chosen according to the manual chapter IV.2.5.3 and the setpoints transferred as described in chap. V.2.1. In this example the drive will go to the absolute position of 440000 µm with a speed of 50000 µm/s.

Byte 9, 10	Byte 11, 12	Byte 13, 14	Byte 15, 16	Byte 17, 18	Byte 19, 20
PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
STW	V _{soll}		position setpoint		motion task type
447F	0000	C350	0006	B6C0	2000

Every edge of bit 6 in the STW will start a motion task. The start and end of the motion task will be indicated by the bits „Motion Task active“ and „In Position“ as described for the reference move.

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Read and writing parameters (using Manufacturer specific PNUs)

The PWE (bytes 1 to 8) are used to read or write a parameter. Many SERVOSTAR parameters can be transmitted through Profibus using manufacturing specific parameters PNU 1200 to 1599. These PNUs along with the Serial (ASCII) Name can be found in the Profibus manual. For example: The maximum position error is PNU 1253. Serial Name is PEMAX.

To Read PEMAX:

Task ID (AK) = 1; PNU 1253 = 0x4E5,

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
14E5	0000	0000	0000

In case of successful reading the drive will answer with Response ID (AK) 2 and show the parameter number as well as the parameter value:

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
24E5	0000	0000	09C4

PEMAX = 0x09C4(hex) = 2500 (Dec) (in User units)

To Write PEMAX:

Task ID (AK) = 3; PNU 1253 = 0x4E5, Parameter Value (PWE) = 4000 (dec) = 0x0FA0 (hex)

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
34E5	0000	0000	0FA0

In case of successful writing the drive will answer with Response ID (AK) 2 and show the parameter number as well as the parameter value:

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
24E5	0000	0000	0FA0

Read and writing parameters (using Object Channel)

Additional SERVOSTAR parameters are available through the manufacturer specific object channel. This channel is called the SDO (Service Data Object) and is associated with PNU 1600 to 2000. To determine the PNU for these parameters use the following formula PNU Number = 1600 + DPR (number). The DPR or Dual Port Ram Number can be found in the ASCII.chm Parameter document. If there is a number in the field "PROFIBUS PNU" then this calculation is already done

When read/ writing these parameters the Byte 3 (Index) must be set to 01 (hex)

Example: IPEAK (Drive Peak current limit)

To Read IPEAK:

Task ID (AK) = 1; PNU 1710= 0x6AE, Index Byte 3 = 1

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
16AE	0100	0000	00000

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In case of successful reading the drive will answer with Response ID (AK) 2 and show the parameter number as well as the parameter value:

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
26AE	0100	0000	11BC

IPEAK = 11BC(hex) = 4540 (Dec)

Remove weighting = 4.54 amps (See explanation for weighting below)

To Write IPEAK:

Task ID (AK) = 3; PNU 1710= 0x6AE, Parameter Value (PWE) = 5.200 (Dec). Then adding weighting results in 1450 (Hex),
Index Byte 3 = 1

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
36AE	0100	0000	1450

In case of successful writing the drive will answer with Response ID (AK) 2 and show the parameter number as well as the parameter value:

Byte 1, 2	Byte 3, 4	Byte 5, 6	Byte 7, 8
PKE	IND	PWE	
26AE	0100	0000	1450

Negative Values

Values are sent through Profibus in a hex format. Negative value will have the MSB (most significant bit) = 1. To convert a hex number to decimal do the following:

1. Convert the number to binary.
2. Invert each bit
3. Add 1
4. Make negative number

Example 1: Read PFB - Position Feedback

Position (hex) = FFFD 3468

Position (Binary) = 1111 1111 1111 1101 0011 0100 0110 1000

Position (Inverted) = 0000 0000 0000 0010 1100 1011 1001 0111

Position (Decimal) = 183191

Position (Decimal + 1) = 183192 -183192

Example 2: Write Profibus OPMODE -4 (Gearing - PNU 930)

Position (dec) = -4

Position (hex) = FFFF FFFC (in 32 bit format)

Reading/ Writing Numbers with Weighting

Some parameters (examples: VF, VCMD, GV) have a weighting factor of 1000. Therefore the number read in Profibus is 1000 x greater than the actual value:

Example: VF (PNU 1953)

Value (Hex) = 0003 4921

Value (Dec) = 215329

Actual Speed of Motor will be 215.539 with weighting added

To determine if a parameter has weighting look at the "Weighting" category for the parameter in the ASCII.chm document