ACOMEL

Technical description
Edition JAN12/2007
File: ACO5_Profibus_prod_spec_gb

Communication profile PROFIBUS DP for the Product Line ACO5000

PRELIMINARY

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Printed / Converted to PDF: 12.01.2007 / 10:01:21 /HJU

Edition	Comments
March 14, 2005	First PRELIMINARY version
June 10, 2005	Registration of GSD file, clarification of transmit and receiver buffer
June 29, 2006	• Completion of chap. 3.5.2.12 &13 • Correction of chap. 4.2.1 and completion of chap. 4.2.3 • Added PNU 1100.
January 12, 2007	• Added PNU 1301 • Added PNU 1302

Acknowledgements

TABLE OF CONTENT

1. GENERAL

1.1. About this manual

This operating manual applies to the ACO5000 product line family. It describes the connections and basic functions of the standard models.

For more general information about PROFIBUS, please visit the following web page www.profibus.com.

1.2. Representation convention

Unless otherwise noted all data represented in this manual are in the so called “Little- Endian” representation. See table 1 for in dissociable data bytes.
Along this manual, the word motor is used for both motor and spindle.

1.3. Safety instructions

See ACO5000 User manual.
Never use ACO5000 Windows setup program when the ACO5000 is running with a PROFIBUS master. This will cause unexpected result and/or crash of PROFIBUS functionality!

2. INSTALLATION / SETUP

2.1. Hard- and Software installation

2.2. Parameterization of the master-interface module

The characteristic communication features of a PROFIBUS device are defined in the form of an electronic device data sheet or device description file (GSD, in german "**G**eräte-**S**tamm-**D**atei").

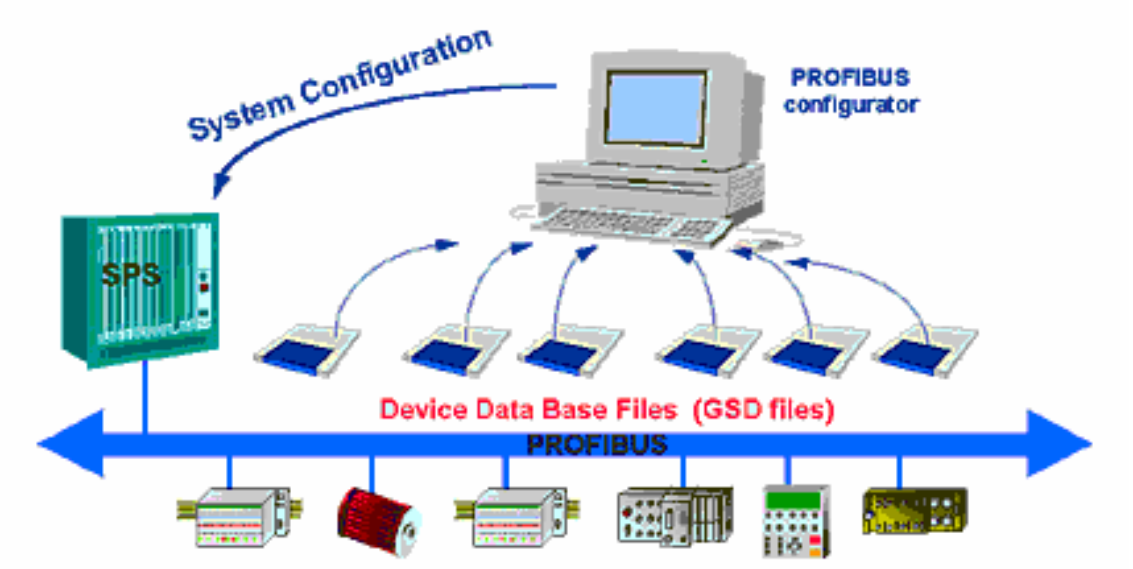


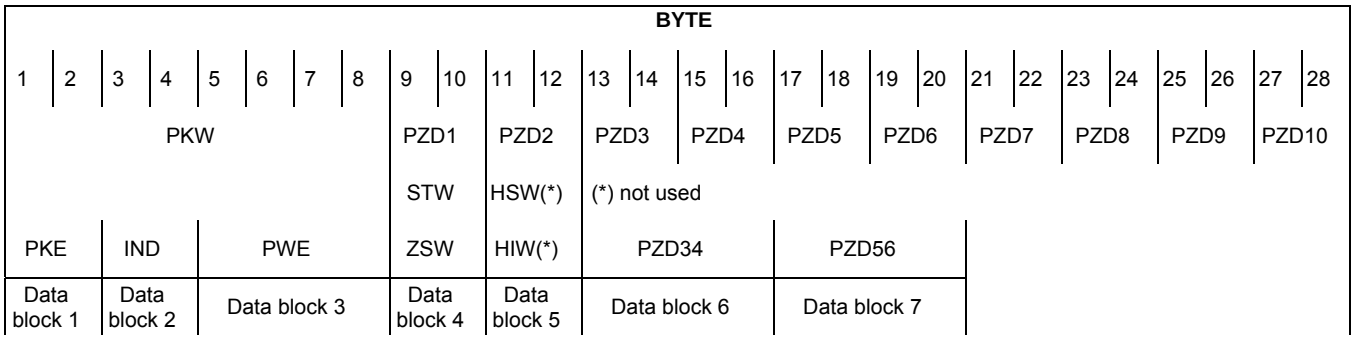
Figure 1

GSD files expand open communication up to operator control level. GSD files can be loaded during configuration. This means that integration of devices from different manufacturers into the PROFIBUS system is simple and user-friendly.
Use our registered "ACO50992.GSD" file by PROFIBUS Nuetzerorganisation for this configuration.

3. INTRODUCTION: PROFIDRIVE

3.1. General Description

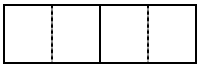
The PROFIBUS-profile “PROFIdrive” includes the following parameter process-data objects (PPO):



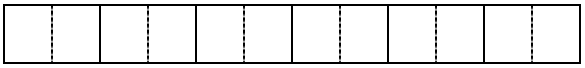
Typ 1 : Octet-String 12

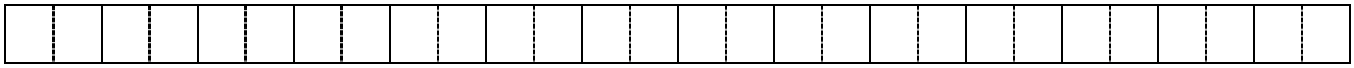
Typ 2 : Octet-String 20 (Used by ACO5000)

Typ 3 : Octet-String 4



Typ 4 : Octet-String 12





Typ 5 : Octet-String 28

ABBREVIATIONS

PKW	Parameter ID value
PKE	Parameter ID (1st and 2nd octet)
IND	Index with PPO (3rd octet), 4th octet is reserved
PWE	Parameter value (5th to 8th octet)
STW	Main control word
HSW	Secondary control word
ZSW	Main status word
HIW	Secondary control word
PZD	Process data

Table 1.

ACO5000 only uses the PPO-type 2 (with 4 words PKW-section and 6 words PZD-section).The PKW-section is used mainly for the transmission of parameters for the drive, the PZD-section is used principally for handling motion functions. Furthermore, it means that the total amount of buffer size needed for a write and read is equal to 2 "Octet-String 20" (40 octets, 20 for write and read).

The table 2 shows the buffer place requested for a write and read and meaning

Byte																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Write from master to ACO5000																			
PKE		IND		PWE				STW		HSW		PZD34				PZD56			
Byte																			
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Read from ACO5000 into master																			
PKE		IND		PWE				ZSW		HIW		PZD34				PZD56			

Table 2.

The instrument profile can be divided into two sections or data channels:
1. PKW-section (4 words)
2. PZD-section (6 words)

3.1.1. Parameter / Service Channel (PKW channel)

The PKW data channel can also be called the service channel. The service channel only uses confirmed communication services, and is used by ACO5000 as a parameter channel. This channel has no real-time capability.

3.1.2. Process Data Channel (PZD channel)

The PZD data channel can also be termed the process data channel. The process data channel uses unconfirmed communication services. The response of the servo amplifier to an unconfirmed service can only be seen in the reaction of the instrument (status word, actual values).This channel has real-time capability.

3.2. Parameter / Service Channel (PKW)

The service channel PKW is subdivided in 3 categories that have the following meaning:

PKW (Parameter ID value)		
PKE (Parameter ID (1st and 2nd byte) For meaning see "3.2.1."	IND (Index according PPO) For meaning see "3.2.2."	PWE (Parameter value) For meaning see "3.2.3."

Table 3.

3.2.1. Parameter ID (PKE)

Byte 1								Byte 2							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

ABBREVIATIONS

AK	task / response ID
SPM	Toggle-Bit for spontaneous message (not implemented at present)
PNU	Parameter number

AK	SPM	PNU

Table 4.

Bold lines in the table are valid for the ACO5000

	Master —> Slave	**Slave —> Master**	
Task ID	**Function**	**Response ID positive**	**Response ID negative**
0	**no task**	**0**	**0**
1	**request parameter value**	1,**2**	**7**
2	alter parameter value [W]	1	7/8
3	**alter parameter value [DW]**	**2**	**7**/8
4	request description element	3	7
5	alter description element	3	7/8
6	request parameter value [A]	4,5	7
7	alter parameter value [A/W]	4	7/8
8	alter parameter value	5	7/8
9	request number of array elements	6	7
10 – 15	Reserved		

Table 5.

3.2.1.1. Interpretation of the response IDs

Response ID	Interpretation
0	**no task**
1	transmit parameter value
2	**transmit parameter value**
3	transmit description element
4	transmit parameter value
5	transmit parameter value
6	transmit number of array elements
7	**task is not possible (with error no.)**
8	no operating authority for PKW interface
9	spontaneous message [W]
10	spontaneous message [DW]
11	spontaneous message [A/W]
12	spontaneous message [A/DW]

Table 6.

Abbreviations in the tables:
A: Array
W: Word
DW: Double-word

3.2.1.2. Profile specific error numbers with response ID 7

Error no.	Description
0	**illegal PNU**
1	**parameter value cannot be changed**
2	**Lower or upper limit violated**
3	Erroneous sub-index
4	**no array**
5	**Incorrect data type**
6	setting not allowed (can only be reset)
7	Descriptive element cannot be changed
8	PPO-write, requested in IR, not available
9	descriptive data not available
10	access group incorrect
11	No parameter change rights
12	Password incorrect
13	Text cannot be read in cyclic data transmission
14	Name cannot be read in cyclic data transmission
15	text array not available
16	PPO-write missing
17	**task cannot be executed due to operating status**
18	**other error**
19-100	reserved
101	**faulty task ID**
102	**software error (command table)**
103	**only possible in disabled state**
104	only possible in enabled state
105	BCC-error in the EEPROM data
106	only possible after task is stopped
107	wrong value [16,20]
108	wrong parameter (OCOPY x [- y] z)

Table 7.

Table 7 cont.

109	wrong motion block no. (0,1..180,192..255)
110	wrong parameter (PTEACH x [y])
111	EEPROM write error
112	wrong value
113	BCC-error in motion block
114	Object is read only or write only
115	Incompatible object (SDO channel only)
>115	reserve

Table 7.

3.2.2. Subindex (IND)

Byte 3								Byte 4							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

RESERVED	RESERVED

Table 8.

Not used, reserved for future extension!

3.2.3. Parameter value (PWE)

The data for the PNU-variable is contained in the PWE, which is a 4 byte data (double-word DW)
Commands are transferred with task ID 3. If a command cannot be executed, the response identification AK = 7 signals the error, and an error number is given out. The error numbers are described in chapter 3.2.1.2 in table 7.

3.3. The Process Data Channel (PZD)

Cyclical data are exchanged across the PROFIBUS through the process data section of the 20-byte telegram. Each PROFIBUS cycle triggers an interrupt in the ACO5000. This has the effect that new process data are exchanged and processed. The interpretation of these process data depends on the operating mode that is set. The operating mode is set through a PROFIBUS parameter (PNU 930).
In all operating modes, the data word 1 of the process data (PZD1) in the direction from control system -> ACO5000 is used for instrument control, and in the direction from ACO5000 -> control system it has the function of a status indicator for the drive.

Caution:
When the ACO5000 is switched on, the operating mode that is set is always –126 (safe state). Before changing the operating mode, bit 10 of the control word STW must always be set to 0. The new operating mode only becomes active when bit 10 of the control word is set to 1. Using the parameter channel

The digital high frequency drives of the ACO5000 have to be adapted to the circumstances of your machine. The parameters for the controllers are set using either the setup Software or via the PROFIBUS.

3.4. Read / write an amplifier parameter

Read (AK = 1) or write (AK = 3) amplifier parameters.

Telegram layout:

	Request	**Response**
PKE/AK	1 (read) / 3 (write)	2 (OK) / 7 (error)
PKE/PNU	see IV.2.1	as transmitted
	for AK = 3 see 3.5 for data type	for AK = 3 returns the PWE of the request
PWE		
	for AK = 1 data type irrelevant	for AK = 1 see 3.5 for data type

Table 9.

3.5. Summary of the parameter numbers

All the parameter numbers for ACO5000 are listed in numerical order in the table 10, with a short description.

- The parameter numbers in the range 900 – 999 are profile-specific for the PROFIBUS drive profile PROFIDRIVE.
- Parameter numbers > 999 are manufacturer specific.

List of the parameter numbers

PNU	**Data type**	**Access**	**Description**
Profile parameter			
904	UINT32	ro	Number of the supported PPO-write, always 2
911	UINT32	ro	Number of the supported PPO-read, always 2
918	UINT32	ro	Participant address on PROFIBUS
930	UINT32	r/w	Selector for operating mode
963	UINT32	ro	PROFIBUS baud rate
965	Octet-String2	ro	Number of the PROFIDRIVE profile (0302H)
Manufacturer-specific parameters for ACO5000			
1000	Visible string4	ro	Device name
1001	UINT32	ro	Manufacturer-specific error register
1002	UINT32	ro	Manufacturer-specific status register
1003	Visible string4	ro	Embedded software version
1010	UINT32	ro	Delivery date of drive
1011	UINT32	ro	Serial number of drive
1012	TFLIEEE	ro	Running time [hours]
1013	TFLIEE	ro	Time power applied [hours]
1050	TFLIEE	ro	Actual motor current [A]
1052	TFLIEE	ro	Mirror of SAN 1 [0..10.0 V]
1053	UBYTE	ro	Mirror of SAN 2 [0..10.0 V]
1054	TUCHAR	r/w	Meaning of SAN1
1055	TUCHAR	r/w	Meaning of SAN2
1056	TFLIEEE	ro	Actual motor power [W]
1057	TFLIEEE	ro	Actual motor voltage [V]
1058	TFLIEEE	ro	Actual main voltage [V]
1059	TFLIEEE	ro	Actual chopper voltage [V]
1060	TFLIEEE	ro	Actual motor temperature [ºC] (PTC style)
1061	TFLIEEE	ro	Actual drive temperature [ºC]
1062	TFLIEEE	ro	Actual motor temperature [ºC] (KTY style)

Table 10.

Table 10 cont.

1070	TFLIEE	r/w	MCM Abs0 value [A]
1071	TFLIEE	r/w	MCM Abs1 value [A]
1072	TFLIEE	r/w	MCM Abs2 value [A]
1073	TFLIEE	r/w	MCM Abs3 value [A]
1080	TFLIEE	r/w	MCM SH0 value [A]
1081	TFLIEE	r/w	MCM SH1 value [A]
1082	TFLIEE	r/w	MCM SH2 value [A]
1083	TFLIEE	r/w	MCM SH3 value [A]
1090	TFLIEE	r/w	MCM DTO0 value
1091	TFLIEE	r/w	MCM DTO0 value
1092	TFLIEE	r/w	MCM DTO0 value
1093	TFLIEE	r/w	MCM DTO0 value
1100	TUCHAR	r/w	Active partition
1200	TFLIEE	r/w	Acceleration time [s]
1201	TFLIEE	r/w	Deceleration time [s]
1202	TSHORT	r/w	Low frequency stabilization
1203	TFLIEE	r/w	DC braking value [A]
1204	TFLIEE	r/w	DC braking duration [s]
1205	TFLIEE	r/w	Permanent DC braking value [A]
1300	UINT32	ro	Set speed [RPM]
1301	UINT32	ro	Maximum speed of selected partition [RPM]
1302	UINT32	ro	Minimum speed of selected partition [RPM]

Table 10.

3.5.1. Profile parameters

3.5.1.1. PNU 904 / 911: PPO - type

These parameters describe the numbers of the supported PPO-types write und read. Since only PPO-type 2 is supported, this parameter is always set to 2.

3.5.1.2. PNU 918: PROFIBUS – node address

With this parameter the PROFIBUS - node address of the drive can be read.

You can alter the node address (station address in a PROFIBUS network) by using the ACO5000 “Windows” commissioning software.
Caution: If the address has been changed, then to take effect, the ACO5000 has to be switched off and on again!
In order to be able to run the converter with the PROFIBUS option then both option **and** enabling of it are mandatory. (See also settings in the “Windows” commissioning software)
All drives are shipped with address 126.

3.5.1.3. PNU 930: Selector for operating modes

The “Selector for operating modes” is defined by the drive profile, and mirrors the operating modes of the drive profile to the operating modes of the DRIVE. The following table 11 shows a summary of the operating modes:

Caution!
If process data are exchanged across the PROFIBUS, then the operating modes of the drive profile must only be selected with PNU 930.

Operating mode of drive profile	Operating mode ACO5000	Description
1	0	Digital speed control according to PROFIDRIVE profile
-1	1	Analog speed control (In preparation)
-126	-	Initial settings when instrument is switched on

Table 11.

The individual operating modes are described in Table 11. Change of operating mode can only be undertaken in connection with the control word.

The operating mode must be changed according to the following sequence:

1. **Inhibit set points and process data**
   Bit 10 in the control word is set to 0, so that **no** new set points will be accepted by the ACO5000 and no new control functions can be initiated. A new operating mode can, however, be selected while a motion function is being performed. The control word is only inhibited to the extent that the ACO5000 can always be switched into a safe state.
2. **Select the new operating mode with PNU 930**
   The new operating mode is selected with parameter 930 through the parameter channel, but not yet accepted.
3. **Set/receive the set points and actual values**
   Enter the corresponding set points in the set point area of the process data. The interpretation of the actual values is also altered. The user program must respond accordingly.
4. **Enable the set points**
   Bit 10 of STW is set to 1. The set points are immediately accepted and processed. The new actual values are output with the appropriate normalization and data format.

Caution
In the safe operating mode (-126), no motion functions can be initiated via the PROFIBUS. However, it is possible to perform motion functions with the aid of the setup Software. If the operating mode is changed, then motion functions can only be operated via the PROFIBUS

3.5.1.4. PNU 963: BAUDRATE

This parameter defines the index of the baud rate that is used for PROFIBUS communication, and can only be read. The baud rate is given out by the PROFIBUS-master. The table 12 shows the indices with the according baud rates:

Indices	0	1	2	3	4	5	6	7	8	9
Baud rate (kbps)	12000	6000	3000	1500	500	187,5	93,75	45,45	19,2	9,6

Table 12.

3.5.1.5. PNU 965: PROFIDRIVE profile number

This parameter can be used to read out the number of the PROFIDRIVE profile. Profile Number 3, Version 2 is used.

3.5.2. Manufacturer specific parameters (ACO5000)

3.5.2.1. PNU 1000: Device name

The device name consists of four ASCII characters with the contents “ACOx” whereby x stands for the power level of the ACO5000. The table 13 shows the indices with the according power level:

Drive label	ACO5005	ACO5008	ACO5012	ACO5020
Indices	1	2	3	4

Table 13.

3.5.2.2. PNU 1001: Manufacturer-specific error

Bit	**Comment**
0	Reserved for future extensions
1	Converter overload
2	Earth default
3	Input over voltage
4	Main supply out of tolerance
5	Supply voltage fail
6	External trip
7	Motor temperature too high
8	Converter temperature too high
9	External braking resistor temperature too high
10	Motor overload
11	Reserved for future extensions
12	Reserved for future extensions
13	Reserved for future extensions
14	Reserved for future extensions
15	Reserved for future extensions
16	Reserved for future extensions
17	Reserved for future extensions
18	Reserved for future extensions
19	Reserved for future extensions
20	Reserved for future extensions
21	Reserved for future extensions
22	Reserved for future extensions
23	Reserved for future extensions
24	Reserved for future extensions
25	Reserved for future extensions
26	Reserved for future extensions
27	Reserved for future extensions
28	Reserved for future extensions
29	Reserved for future extensions
30	Reserved for future extensions
31	Reserved for future extensions

Table 14.

3.5.2.3. PNU 1002: Manufacturer-specific status

Bit	Comment
0	State of (Input) Terminal block number 24
1	State of (Input) Terminal block number 23
2	State of (Input) Terminal block number 22
3	State of (Input) Terminal block number 21
4	State of (Input) Terminal block number 20
5	State of (Input) Terminal block number 19
6	State of (Input) Terminal block number 18
7	State of (Input) Terminal block number 17
8	State of (Output) Terminal block number 26
9	State of (Output) Terminal block number 27
10	State of (Output) Terminal block number 28
11	State of (Output) Terminal block number 29
12	No meaning
13	State of STOP input
14	State of RESET input
15	No attribution
16	Software interlock
17	STOP in progress
18	Rotation direction change in progress
19	DC Braking in progress
20	Permanent DC braking in progress
21	Actual speed reduction in progress
22	No attribution
23	No attribution
24	Physical rotation direction
25	No attribution
26	Safety relay ON
27	No attribution
28	Internal DC Bus discharge in progress
29	Software fault latent
30	Software fault
31	Fatal error

Table 15.

3.5.2.4. PNU 1003 Embedded software version.

The embedded software version consists of four ASCII characters.

3.5.2.5. PNU 1010 Delivery dates of drive.

The delivery date is a “TLONG” data type and is formatted as in the following example:

Returned value: 20050222

Value	2005	02	22
Meaning	Year	Month	day

Table 16.

3.5.2.6. PNU 1011 Serial number of drive.

See user manual for meaning.

3.5.2.7. PNU 1012 Running time.

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.8. PNU 1013 Time during which power is applied.

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.9. PNU 1050 Value of actual motor current.

Representation of actual motor current [A]

3.5.2.10. PNU 1052 Mirror of analog output “SAN1”.

This parameter reflects the analog signal of “SAN1”. The returned value is in Volt (0...10V). 10 Volts corresponds always to maximum of displayed value (see PNU 1054).
The value is represented according the IEEE standard for 32bits float values.

3.5.2.11. PNU 1053 Mirror of analog output “SAN2”.

This parameter reflects the analog signal of “SAN2”. The returned value is in Volt (0...10V).). 10 Volts corresponds always to maximum of displayed value (see PNU 1055).
The value is represented according the IEEE standard for 32bits float values.

3.5.2.12. PNU 1054 Meaning of displayed value on “SAN1”.

This parameter defines what is represented at the analog output “SAN1”. As in the “ACO5000 “Windows” commissioning software, it is impossible to select the same indice on “SAN1” and “SAN2”. The last selected “SAN..” will reset to zero the first one.
Example:
If on “SAN1” the indice 1 (Fs) and then on “SAN2” also indice 1 (Fs) then the output “SAN1” will be set to zero!
The table 17 shows the indices with the according meaning:

Indices	1	2	3	4	5	6
Meaning	Fs (output freq.)	Im (total motor current)	N (Motor speed) (*)	Pw (motor power)	Iw (motor current)	Us (motor voltage)

Table 17.

(*) The output is set to zero if there is no speed feedback. Furthermore speed measurement should be selected with the ACO5000 “Windows” commissioning software.

3.5.2.13. PNU 1055 Meaning of displayed value on “SAN2”.

This parameter defines what is represented at the analog output “SAN1” The table 18 shows the indices with the according meaning: (See PNU 1054 for complete explanation)

Indices	1	2	3	4	5	6
Meaning	Fs (Output freq.)	Im (total motor current)	N (Motor speed) (*)	Pw (Motor power)	Iw (motor current)	Us (Motor voltage)

Table 18.

(*)The output is to zero if there is no speed feedback. Furthermore speed measurement should be selected with the ACO5000 “Windows” commissioning software.

3.5.2.14. PNU 1056 Value of actual motor power

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.15. PNU 1057 Value of actual motor voltage

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.16. PNU 1058 Value of actual main voltage

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.17. PNU 1059 Value of actual internal DC power voltage

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.18. PNU 1060 Value of actual motor temperature (PTC style)

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.19. PNU 1061 Value of actual drive temperature

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.20. PNU 1062 Value of actual motor temperature (KTY style)

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.21. PNU 1070 Value of “MCM ABS 0”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.22. PNU 1071 Value of “MCM ABS 1”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.23. PNU 1072 Value of “MCM ABS 2”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.24. PNU 1073 Value of “MCM ABS 3”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.25. PNU 1080 Value of “MCM SH 0”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.26. PNU 1081 Value of “MCM SH 1”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.27. PNU 1082 Value of “MCM SH 2”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.28. PNU 1083 Value of “MCM SH 3”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.29. PNU 1090 Value of “MCM DTO 0”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.30. PNU 1091 Value of “MCM DTO 1”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.31. PNU 1092 Value of “MCM DTO 2”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.32. PNU 1093 Value of “MCM DTO 3”

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.33. PNU 1094 Selection of type of “MCM”

The table 18. below shows the available indices

Caution
In order to use the “MCM” it is mandatory to assign a programmable output to the “MCM” function. This can be done exclusively through the ACO5000 “Windows” commissioning software!
The selection of type of “MCM” is not memorized in the drive and has therefore to be re-entered at every power up.

Indices	0	1	2
MCM type	ABS (absolute)	SH (sample hold)	DTO (auto gap)

Table 19.

3.5.2.34. PNU 1095 Selection of level of “MCM”

See user manual for meaning.

The selection of level of “MCM” is not memorized in the drive and has therefore to be re-entered at every power up.

3.5.2.35. PNU 1100 Value of active partition

See user manual for meaning.
Programming of partition through "PNU1100" will take precedence over terminal block settings.

3.5.2.36. PNU 1200 Value of dynamic acceleration time

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.37. PNU 1201 Value of dynamic deceleration time

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.38. PNU 1202 Value of low frequency stabilization “SBF”

See user manual for meaning.

3.5.2.39. PNU 1204 Value of DC brake current

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.40. PNU 1205 Value of time of DC brake current

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.41. PNU 1206 Value of permanent DC brake current

See user manual for meaning.
The value is represented according the IEEE standard for 32bits float values.

3.5.2.42. PNU 1300 Value of set speed

The returned value is an image of data written in PZD34

3.5.2.43. PNU 1301 Value of maximum speed of partition

See user manual for meaning.

3.5.2.44. PNU 1302 Value of minimum speed of partition

See user manual for meaning.

4. PROCESS DATA CHANNEL

The process data channel is used for real-time communication. This channel can effectively be divided into two telegram portions:

PZD1: Control word (STW) /Status word (ZSW) – instrument control
The control word and the status word are used to control the instrument and monitor the status of the instrument.

PZD2-6: Set point / actual values depending on the operating mode.
Set points and actual values such as position, velocity and current are exchanged in this section.

The availability of a process data channel is determined in the PROFIDRIVE drive profile. The significance of the process data is defined according to the operating mode. The process data that are used are determined in such a way that the real-time capability of this channel is optimally used. A central role is played by the parameter
In the following, the instrument control is described first, and then the significance and functioning of the operating modes.

4.1. Instrument control

The control of the instrument is described with the aid of a status machine. The status machine is defined in the drive profile by a flow diagram for all operating modes. The following diagram shows the possible instrument states for the DRIVE.

The following table describes the instrument states and the transitions.

States of the status machine:

State	Description
Not ready for switch-on	The ACO5000 is not read for switch-on. Internal initialization not full filed
Switch-on inhibited	The ACO5000 is ready for switch-on. Parameters can be transferred, motion cannot be carried out yet
Ready for switch-on	Parameters can be transferred, motion cannot be carried out yet
Ready for operation	Parameters can be transferred, motion cannot be carried out yet
Operation enabled	No error present. Motion is enabled
Fast stop activated	Drive has been stopped using the emergency stop. Output stage is switched off. Motion is enabled
Error response active/error	If an error occurs in the ACO5000, then the ACO5000 changed to the “Error response active” In this state, the power stage is switched off immediately (disabled). This state can only be terminated by the bit-command “Error-reset” To do this, the error cause must have been removed

Table 20.

Transitions of the status machine:

Transition		Description
0	Event	Reset / Internal power supply switched on
	Action	Initialization started
1	Event	Initialization successful. ACO5000 switch-on inhibit
	Action	None

Table 21.

Table 21 cont.

2	Event	Bit 1 (inhibit voltage) and Bit 2 (fast stop) are set in the control word
	Action	none
3	Event	Bit 0 (switch-on) is also set
	Action	None
4	Event	Bit 3 (operation enabled) is also set
	Action	Motion is enabled, depending on the operation mode
5	Event	Bit 3 is canceled
	Action	Drive is braked using the standard ramp
6	Event	Bit 0 is canceled
	Action	Output stage is switched off
7	Event	Bit 1 or bit 2 is canceled
	Action	Fast stop
8	Event	Bit 0 is canceled
	Action	Output stage is switched off
9	Event	Bit 1 is canceled
	Action	Output stage is switched off
10	Event	Bit 1 or bit 2 is canceled
	Action	Output stage is switched off
11	Event	Bit 4 is canceled
	Action	Fast stop
12	Event	Bit 1 is canceled
	Action	Output stage is switched off
13	Event	Error response active
	Action	Output stage is switched off
14	Event	Error
	Action	None
15	Event	Bit 7 is set
	Action	Acknowledge error
16	Event	Bit 4 is set
	Action	Motion is enabled
17	Event	Bit 2 is canceled
	Action	Output stage is switched off

Table 21

The state transitions are affected by internal events (e.g. switching off the DC-link voltage) and by the flags in the control word (Bits 0, 1, 2, 3, 7).

4.1.1. Control word (STW)

With the aid of the control word, you can switch from one instrument state to another. In the diagram for the state machine you can see which instrument states can be reached by which transitions. The momentary instrument state can be taken from the status word.
Several states may be passed through during a telegram cycle (e.g. Ready for switch on -> Ready for operation -> Operation enabled).
The bits in the control word can be (operating-) **mode-dependent** or **mode-independen**t.
The following table describes the bit assignment in the control word.

Bit	Name	Commentary
0	Switch on	-
1	Inhibit voltage	-
2	Fast stop, switch-on inhibited	1 → 0 drive brakes using **normal** ramp
3	Operation enabled	(*)
4	Fast stop	1 → 0 drive brakes using **normal** ramp
5	Pause	Freezes the actual speed
6	Set point enable	

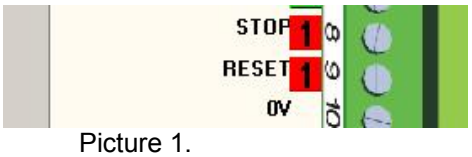
Table 22.

Table 22 cont.

7	Reset Fault	only effective with errors 0 → 1
8	Inching 1	Not implemented
9	Inching 2	Not implemented
10	PZD (enable/inhibit)	
11	Manufacturer-specific	
12	Manufacturer-specific	
13	Manufacturer-specific	Hold current value for MCM SH mode (**)
14	Manufacturer-specific	Reserved
15	Manufacturer-specific	Physical rotation direction (***)

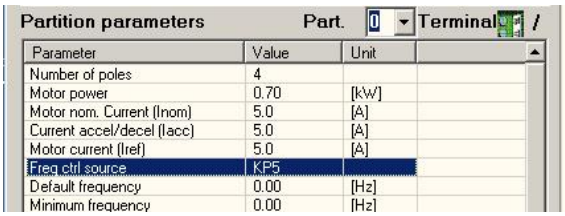
Table 22.

(*) In order to be able to start the ACO5xxx, It is mandatory to wire the "Stop" and "Reset" Terminal blocks according the user manual via the ACO5000 “Windows” commissioning software (see picture 1).

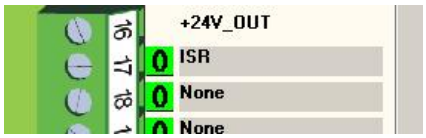


Picture 1.

(**) See PNU 1094.
(***) In order to be able to change the physical rotation of the motor through PROFIBUS, it is mandatory to enable it (see picture 2) and to assign a programmable input to the “ISR” function via the ACO5000 “Windows” commissioning software (see picture 3).



Picture 2.



Picture 3 (example of assignment).

Depending on the bit combination in the control word, a corresponding control command is defined. The following table shows the bit combinations and also determines the priorities of the individual bits, in case several bits are altered in one telegram cycle.

Command	Bit 7	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Transitions
Shutdown	X	X	X	1	1	0	2, 6, 8
Switch-on	X	X	X	1	1	1	3
Inhibit voltage	X	X	X	X	0	X	7, 9, 10, 12
Fast stop (disable)	X	X	X	0	1	X	7, 10,11->12
Fast stop (enable)	X	0	1	1	1	1	11
Inhibit operation	X	X	0	1	1	1	5
Enable operation	X	1	1	1	1	1	4, 16
Reset error	1	X	X	X	X	X	15
Acknowledge warnings	X	X	X	X	X	X	-

Table 23.

Bits labelled with X are irrelevant.

4.1.2. Status word (ZSW)

With the aid of the status word, the instrument state can be represented and the transmitted control word can be verified. If an unexpected condition is reported, as the result of a transmitted control word, then first of all the boundary conditions for the expected instrument state must be clarified (e.g. enable of the output stage – hardware + software).

The following table describes the bit assignment in the status word.

Bit	Name	Commentary
0	Ready for switch-on	
1	Switched on	
2	Operation enabled	
3	Fault / Error	
4	Voltage inhibited	
5	Quick stop	
6	Switch-on inhibit	
7	Warning	
8	Set point monitoring	Not reached = 0, Reached = 1
9	Remote	Not supported, fixed to 1

Table 24.

Table 24 cont.

10	Set point reached	Not implemented
11	Manufacturer-specific	Reserved
12	Manufacturer-specific	Reserved
13	Manufacturer-specific	Reserved
14	Manufacturer-specific	Reserved
15	Manufacturer-specific	Reserved

Table 24.

State of the status machine:

State	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not ready for switch-on	0	X	X	0	0	0	0
Switch-on inhibit	1	X	X	0	0	0	0
Ready for switch-on	0	1	X	0	0	0	1
Ready for operation	0	1	X	0	0	1	1
Operation enabled	0	1	X	0	1	1	1
Error	0	X	X	1	X	X	X
Error response	0	X	X	1	0	0	0
Quick stop active	0	0	X	0	1	1	1

Table 25.

4.2. Operating modes

The selection of a new operating mode is described in detail in the chapter on the parameter channel. This procedure must be observed and adhered to.

WARNING
Appropriate precautionary measures against damage caused by faulty representation of data formats or normalization of the set points must be taken by the user.

The possible operating modes are described below. Operating modes with a positive number (1,2) are defined in the drive profile. Operating modes with a negative number (-1,-2...) are labeled in the drive profile as being manufacturer-specific modes.

4.2.1. Digital speed (operating mode 1)

PZD 1	PZD 2	PZD 3	PZD 4	PZD 5	PZD 6
STW	-	Speed set point (MSB little endian)	Speed set point (LSB little endian)	-	-
ZSW	-	Actual speed (MSB little endian)	Actual speed (LSB little endian)	Drive status	Drive status

Table 26.

4.2.2. Analog speed (operation mode –1)

In preparation.

4.2.3. Example returned status

The table 28 shows the returned state of the drive depending on the action done in the table 27.

Indice	Action	Drive reaction without PROFIBUS part
1	Power ON with enable relay ON	Nothing
2	Start with wrong OP mode or not set (STW = 0x047F) desired speed set in PZD34	Nothing

Table 27.

Talbe 27 cont.

3	Write correct OP mode with (STW = 0x047F)	Error 17
4	Write correct OP mode with (STW = 0x007F)	Nothing
5	Switch ON disable (STW = 0x047E)	Nothing
6	Switch ON enable (STW = 0x047F)	Drive starts and ramps up
7	Switch ON enable (STW = 0x047F)	Drive reaches set point in PZD34
8	Operation enable → 0	Drive stops and ramps down
9	Operation enable → 0	Drive reaches zero frequency
10	Operation enable → 1	Drive starts and ramps up to set point
11	Switch ON → 0	Drive stops and ramps down and reaches zero speed
12	Switch ON → 1	Drive starts and ramps up to set point
13	Disable voltage → 0	Drive stops and ramps down and reaches zero speed
14	Disable voltage → 1	Nothing
15	Switch ON → 0	Nothing
16	Switch ON → 1	Drive starts and ramps up to set point
17	Quick stop enable → 0	Drive stops and ramps down
18	Quick stop enable → 0	Drive reaches zero frequency
19	Quick stop → 1, Switch ON → 0	Nothing
20	Switch ON → 1	Drive starts and ramps up to set point
21	Quick stop → 0	Drive stops and ramps down and reaches zero speed
22	Quick stop → 1	Drive starts and ramps up to set point
23	Freeze → 0	Drive does not respond to new set point
24	Freeze → 1, new set point	Drive ramps up or down to new set point
25	Release val → 0	Drive stops and ramps down and reaches zero speed
26	Release val → 1	Drive starts and ramps up to set point
27	External Interlock → 0	Drive goes in inhibit mode and displays error on 7 segment display
28	External Interlock → 1	Nothing
29	Fault reset → 1	Drive starts and ramps up to set point
30	Fault reset → 0	Nothing
31	Rotation direction change	Drive ramps down
32	Same stat as before	Drive reaches zero frequency and changes rotation direction
33	Same stat as before	Drive ramps up to set point
34	Read of PNU 930 at power up	See table 29 for answer
35	Write data of "255" into PNU 930 with STW set (0x0400)	See table 29 for answer
36	Write data of "1" into PNU 930 with STW not set (0x0000)	See table 29 for answer
37	Read of PNU 904	See table 29 for answer
38	Write data of "1" into PNU 904	See table 29 for answer
39	Read of PNU 1000	See table 29 for answer

Table 27

Control Word (STW)

0	SENS_ROTATION	...	...	...	...	PZD_FREE	...	...	RESET_FAULT	RELEASE_VAL	INTERM_STOP	QUICK_STOP	ENABLE_OP	QSTOP_ENA	DIS_VOLTAGE	SWITCH_ON
1	0	-	-	-	-	0	-	-	0	0	0	0	0	0	0	0
2	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
3	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
4	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	0
5	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
6	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
7	0	-	-	-	-	1	-	-	0	1	1	1	0	1	1	1
8	0	-	-	-	-	1	-	-	0	1	1	1	0	1	1	1
9	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
10	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	0
11	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
12	0	-	-	-	-	1	-	-	0	1	1	1	1	1	0	1
13	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
14	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	0
15	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
16	0	-	-	-	-	1	-	-	0	1	1	1	1	0	1	1
17	0	-	-	-	-	1	-	-	0	1	1	1	1	0	1	1
18	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	0
19	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
20	0	-	-	-	-	1	-	-	0	1	1	0	1	1	1	1
21	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
22	0	-	-	-	-	1	-	-	0	1	0	1	1	1	1	1
23	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
24	0	-	-	-	-	1	-	-	0	0	1	1	1	1	1	1
25	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1

Status Word (ZSW)

0	freeze setpoint	...	...	...	...	...	External Command SET to 1	Reached setpoint	Warning	switch on disable	quick stop low aktiv	disable Voltage	fault	operation enable	switch on	ready to switch on
1	0	-	-	-	-	-	1	0	0	1	0	1	0	0	0	0
2	0	-	-	-	-	-	1	0	0	1	1	1	0	0	0	0
3	0	-	-	-	-	-	1	0	0	1	1	1	0	0	0	0
4	0	-	-	-	-	-	1	0	0	0	1	0	0	0	0	1
5	0	-	-	-	-	-	1	0	0	0	1	0	0	1	1	1
6	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1
7	0	-	-	-	-	-	1	0	0	0	1	0	0	1	1	1
8	0	-	-	-	-	-	1	0	0	0	1	0	0	1	1	1
9	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1
10	0	-	-	-	-	-	1	0	0	0	1	0	0	0	0	1
11	0	-	-	-	-	-	1	0	0	0	1	0	0	1	1	1
12	0	-	-	-	-	-	1	0	0	1	1	1	0	0	0	0
13	0	-	-	-	-	-	1	0	0	1	1	1	0	0	0	0
14	0	-	-	-	-	-	1	0	0	0	1	0	0	0	0	1
15	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1
16	0	-	-	-	-	-	1	0	0	0	0	0	0	1	1	1
17	0	-	-	-	-	-	1	0	0	0	1	0	0	1	0	1
18	0	-	-	-	-	-	1	0	0	0	1	0	0	0	0	1
19	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1
20	0	-	-	-	-	-	1	0	0	0	0	0	0	1	1	1
21	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1
22	1	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1
23	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1
24	0	-	-	-	-	-	1	0	0	0	1	0	0	1	1	1
25	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1

Drive status (PZD56)

0	fatal fault	Software fault	Fatal software fault	DC bus is discharging	...	Enable relay	...	Physical speed direction	...	...	Output frequecy decreasing	Premanet DC brake ON	DC brake ON	Speed direction change in progress	STOP in progress	Software interlock	...	RESET -> bom 9	STOP -> bom 8	START -> bom 7	OUT4 -> bom 29	OUT3 -> bom 28 (4)	OUT2 -> bom 27 (3)	OUT1 -> bom 26 (2)	IN8 -> bom 17	IN7 -> bom 18	IN6 -> bom 19	IN5 -> bom 20	IN4 -> bom 21	IN3 -> bom 22	IN2 -> bom 23 (1)	IN1 -> bom 24
1	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
2	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
3	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
4	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
5	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	0	-	-	-	-	-	-	1	-
6	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
7	0	0	0	0	-	1	-	0	-	-	1	0	0	0	1	0	-	0	1	-	-	0	0	0	-	-	-	-	-	-	1	-
8	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
9	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
10	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
11	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
12	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
13	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
14	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
15	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
16	0	0	0	0	-	1	-	0	-	-	1	0	0	0	1	0	-	0	1	-	-	0	0	0	-	-	-	-	-	-	1	-
17	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
18	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
19	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
20	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
21	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
22	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
23	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
24	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	1	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
25	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-

Table 28

Table 28 cont.

D	Control Word (STW)															
	SENS_ROTATION	....	....	....	....	PZD_FREE	....	....	RESET_FAULT	RELEASE_VAL	NTERM_STOP	QUICK_STOP	ENABLE_OP	QSTOP_ENA	DIS_VOLTAGE	SWITCH_ON
26	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
27	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
28	0	-	-	-	-	1	-	-	1	1	1	1	1	1	1	1
29	0	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
30	1	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
31	1	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1
32	1	-	-	-	-	1	-	-	0	1	1	1	1	1	1	1

D	Status Word (ZSW)															
	reeze setpoint	....	....	....	....	....	External Command SET to 1	Reached setpoint	Warning	switch on disable	quick stop low aktiv	disable Voltage	fault	operation enable	switch on	ready to switch on
26	0	-	-	-	-	-	1	0	1	0	1	0	1	1	1	1
27	0	-	-	-	-	-	1	0	1	0	1	0	1	1	1	1
28	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1
29	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1
30	0	-	-	-	-	-	1	0	0	0	1	0	0	1	1	1
31	0	-	-	-	-	-	1	0	0	0	1	0	0	1	1	1
32	0	-	-	-	-	-	1	1	0	0	1	0	0	1	1	1

D	Drive status (PZD56)															
	Fatal fault	Software fault	Fatal software fault	DC bus is discharging	....	Enable relay	....	Physical speed direction	....	....	Output frequecy decreasing	Premanet DC brake ON	DC brake ON	Speed direction change in progress	STOP in progress	Software interlock
26	0	1	0	0	-	1	-	0	-	-	0	0	0	0	0	1
27	0	1	0	0	-	1	-	0	-	-	0	0	0	0	0	1
28	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0
29	0	0	0	0	-	1	-	0	-	-	0	0	0	0	0	0
30	0	0	0	0	-	1	-	0	-	-	0	0	0	1	0	0
31	0	0	0	0	-	1	-	1	-	-	0	0	0	0	0	0
32	0	0	0	0	-	1	-	1	-	-	0	0	0	0	0	0

D	Drive status (PZD56) cont.															
	....	RESET -> born 9	STOP -> born 8	START -> born 7	OUT4 -> born 29	OUT3 -> born 28 (4)	OUT2 -> born 27 (3)	OUT1 -> born 26 (2)	IN8 -> born 17	IN7 -> born 18	IN6 -> born 19	IN5 -> born 20	IN4 -> born 21	IN3 -> born 22	IN2 -> born 23 (1)	IN1 -> born 24
26	-	0	1	-	-	0	1	0	-	-	-	-	-	-	0	-
27	-	0	1	-	-	0	1	0	-	-	-	-	-	-	1	-
28	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
29	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-
30	-	0	1	-	-	1	0	0	-	-	-	-	-	-	1	-
31	-	0	1	-	-	1	0	0	-	-	-	-	-	-	1	-
32	-	0	1	-	-	1	0	1	-	-	-	-	-	-	1	-

Example of input / output setting
(1) External interlock is set on terminal block 23
(2) Reached frequency is set on terminal block 26
(3) Zero frequency is set on terminal block 27
(4) Start/stop is set on terminal block 28

Table 28

Write from Master to ACO5000

Byte	PKE 1(*)	PKE 2	PKE 3	PKE 4	IND 5	IND 6	IND 7	IND 8	PWE 9	PWE 10	PWE 11	PWE 12	PWE 13	PWE 14	PWE 15	PWE 16
34	0 0 0 1	0 0 1 1	1 0 1 0	0 0 1 0	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
35	0 0 1 1	0 0 1 1	1 0 1 0	0 0 1 0	- - - -	- - - -	- - - -	- - - -	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 1
36	0 0 1 1	0 0 1 1	1 0 1 0	0 0 1 0	- - - -	- - - -	- - - -	- - - -	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 1
37	0 0 0 1	0 0 1 1	1 0 0 0	1 0 0 0	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
38	0 0 1 1	0 0 1 1	1 0 0 0	1 0 0 0	- - - -	- - - -	- - - -	- - - -	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	1 1 1 1	1 1 1 1
39	0 0 0 1	0 0 1 1	1 1 1 0	1 0 0 0	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -

Read from ACO5000 into Master

Byte	PKE 21(*)	PKE 22	PKE 23	PKE 24	IND 25	IND 26	IND 27	IND 28	PWE 29	PWE 30	PWE 31	PWE 32	PWE 33	PWE 34	PWE 35	PWE 36
34	0 0 1 0	0 0 1 1	1 0 1 0	0 0 1 0	- - - -	- - - -	- - - -	- - - -	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	1 1 1 1	1 1 1 1	1 0 0 0	0 0 1 0
35	0 1 1 1	0 0 1 1	1 0 1 0	0 0 1 0	- - - -	- - - -	- - - -	- - - -	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 1	0 0 0 1
36	0 0 1 0	0 0 1 1	1 0 1 0	0 0 1 0	- - - -	- - - -	- - - -	- - - -	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 1
37	0 0 1 0	0 0 1 1	1 0 0 0	1 0 0 0	- - - -	- - - -	- - - -	- - - -	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 1 0
38	0 1 1 1	0 0 1 1	1 0 0 0	1 0 0 0	- - - -	- - - -	- - - -	- - - -	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 1
39	0 0 1 0	0 0 1 1	1 1 1 0	1 0 0 0	- - - -	- - - -	- - - -	- - - -	0 1 0 0	0 0 0 1	0 1 0 0	0 0 1 1	0 1 0 0	1 1 1 1	x x x x	x x x x

(*) See table 2 on page 7

Table 29.

5. SAMPLE TELEGRAMS AND EXAMPLES

5.1. Zero telegram

At the beginning of communication via the parameter channel and after communication errors a zero telegram should be sent:

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

Table 30.

The DRIVE answers, by likewise setting the first 8 byte of the telegram to zero.

5.2. Setting the operating mode

After switch-on or a reset the DRIVE is in the operating mode -126, in which it cannot perform any motion functions. To be able to carry out motion, it must be set to the speed control mode 1.

The procedure to do this is as follows:

a) Set the control word Bit 10 (PZD1, Bit 10) to 0.
This invalidates the process data for the DRIVE.

Byte 9	10	11	12
xxxx x0xx	xxxx xxxx	xxxx xxxx	xxxx xxxx
STW		HSW	

Table 31.

b) Transmit a parameterization telegram for the operating mode setting.

Byte 1	2	3	4	5	6	7	8
0011 0011	1010 0010	xxxx xxxx	xxxx xxxx	0000 0000	0000 0000	0000 0000	0000 0001
PKE		IND		PWE			

Table 32.

The bits in the PKE section have the following significance:
Bit 0 to 10 = PNU 930, Bit 12 to 15 = AK 3

The DRIVE sends a response telegram with AK = 2 and mirrors (identical) the values for PNU and PWE.

c) Switch on the new operating mode by setting the control word Bit 10 to 1. This validates the process data.

If, for example, point a) is not observed, the DRIVE transmits a negative answer: (response ID=7)

Byte 1	2	3	4	5	6	7	8
0111 0011	1010 0010	0000 0000	0000 0000	0000 0000	0000 0000	0000 0000	0001 0001
PKE		IND		PWE			

Table 33.

The number that is transferred in the PWE section represents the error number, and can be looked up in the table 7 in Chapter 3.2.1.2. In this case, error no. 17, “Task impossible because of operating mode” will be signaled.

5.3. Enable the DRIVE

The enable can be made by setting the bit combination for the “Operation enabled” state in the control word.

Byte 9	10	11	12
xxx0 x1xx	0011 1111	xxxx xxxx	xxxx xxxx
STW		HSW	

Table 34.

The DRIVE then reports back the corresponding state in its status word, or indicates a warning or error message.

Byte 9	10	11	12
xxxx xx1x	0010 0111	xxxx xxxx	xxxx xxxx
ZSW		HSW	

Table 35.

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