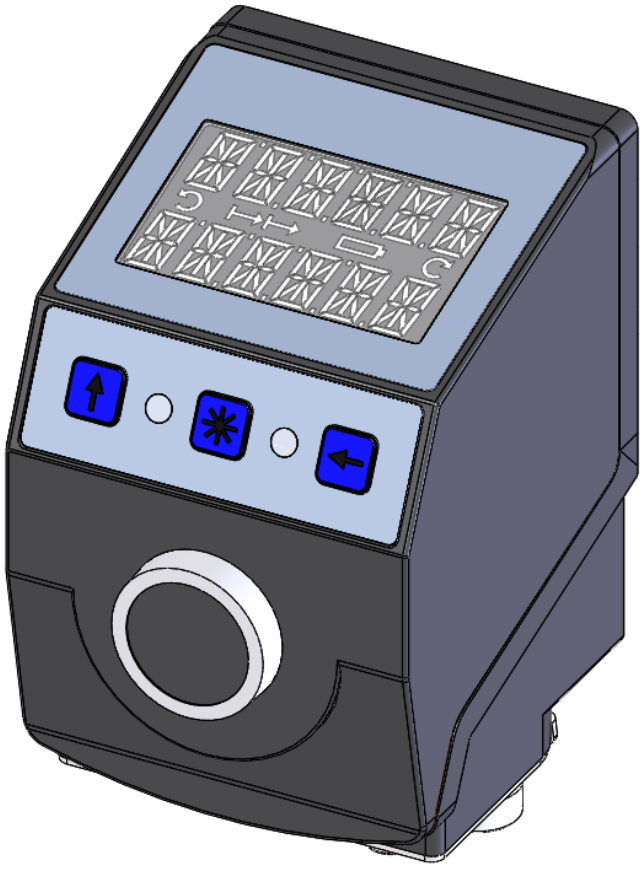
AP10T

Set point display with RS485 / SIKONETZ5 interface

User manual



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183/18

Table of contents

1 General Informaton

1.1 Dokumentation

The following documents describe this product:

- The data sheet describes the technical data, the dimensions, the pin assignments, the accessories and the order key.
- The installation instructions describe the mechanical and electrical installation including all safety-relevant requirements and the associated technical specification.
- The user manual for commissioning and integrating the position indicator into a fieldbus system.

These documents can also be downloaded at **http://www.siko-global.com/p/ap10t**.

Additional information and support for this device can also be found there.

1.2 Definitions

If not explicitly indicated otherwise, decimal values are given as figures without addition (e. g. 1234), binary values are labeled with b (e. g. 1011b), hexadecimal values are identified by h (e. g. 280h) after the figures.

2 Intended use

The instrument is a set point display. Alpha-numeric set points can be transferred to the instrument via the RS485 interface and indicated via the backlit two-row LC display. Receipt of the set points can be acknowledged via the front button. The state of acknowledgment of the set points is signified by means of the two bi-color LEDs.

Acknowledgment can also be performed via the interface by means of a control word. Additionally, it can activate the LEDs in order to realize various visualization tasks. Acknowledgment and button states are output in the status word.

Some device parameters can be adjusted by means of the 3 buttons. You can change the set point, output the position value and adjust all device parameters via the integrated bus interface.

2.1 Switching on the supply voltage

The AP10T will be initialized after switching on the supply voltage. A display test is executed during initialization, the LEDs are lighted consecutively and the configutation parameters are loaded from the non-volative memory into the RAM of the controller.
With the display still unconfigured all parameters are set to their default values. See to it that the bus will be connected only after correct adjustment of baud rate and ID (see chapter 3.6: Parameterization of the set point display and 5.8: Auto-ID). The AP10T functions with the data last parameterized.
AP10T is in the normal operating state. According to the requirements of the application, the display can be parameterized via the SIKONETZ5 interface in this state.

3 Brief description

3.1 General

The set point display has a two-line display with special characters and four control keys. The device is configured and activated via three symbol keys whereas received data is acknowledged via the fourth key. Two LEDs serve for signifying acknowledgement.

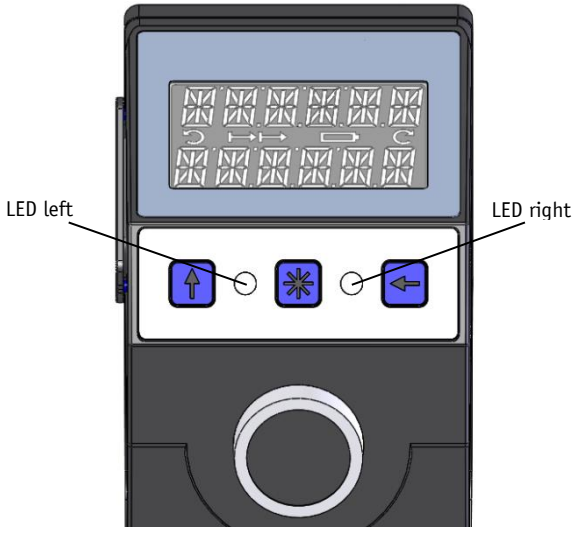

Fig. 1: Control elements

3.2 LCD display

NOTICE	The The display range is limited to -19999 ... 99999. Values outside this range are displayed with "FULL".

With supply voltage applied to the set point display with factory settings, set points are displayed in both rows depending on validity and acknowledgment status. If there is no valid set point, "---" will be displayed in the 2nd row. A valid set point flashes until after acknowledgement.

Two 6-digit set points can be displayed. Both rows are freely writeable.

3.2.1 Extended display range

Values up to -999999 can be displayed by means of the control word. If the relevant bit has been set and the value to be displayed is between -199999 and -999999, then the negative sign and the digit of the highest order will flash alternately. If the value range drops below -999999, "FULL" will be displayed.

3.3 LED display

With factory settings, the LED display works according to the following table.

Operating mode	LED	Status	Meaning
There is no valid set point.	both	off	
There is a valid set point.	LED left	red	Set point1 not acknowledged
		green	Set point1 acknowledged
	LED right	red	Set point2 not acknowledged
		green	Set point2 acknowledged

Table 1: LED display in the Alpha-numeric display operating mode

With the basic function of the LEDs inactivated, every LED can be controlled independently via the control word (see chapter 5.9.8 until 5.9.10 and 5.9.14: LEDs and chapter 5.3.4: Control word).

3.4 Keys

With the Auto-ID function, the new ID is adopted by actuating the ↑ key (see chapter 5.8: Auto-ID).

Pressing the ✱ key acknowledges a pending error (see chapter 3.7.2: Errors).

Pressing the ← key starts the parameterization mode (see chapter 3.6: Parameterization of the set point display).

With factory settings, the set points received are acknowledged by pressing the front button (Set point1 and Set point2).

3.5 Communication

Set point1 (in row 1) is received via the parameter FBh: Set point1. Likewise, set point2 (in row 2) is received via parameter FFh: Set point2. The data identifier must be correctly set in the respective control word. The data identifier serves for determining whether the data is interpreted and displayed as number or as alpha-numeric characters (ASCII) (see chapter 5.3.4: Control word).

Control word: (see chapter 5.3.4)

In the control word, the respective type (number or character string) and the validity of the set point are transferred to the display. Additionally, the set point can be acknowledged via the control word.

Status word: (see chapter 5.3.5)

Type, validity and acknowledgement status of the set points are recorded in the status word.

3.6 Parameterization of the set point display

The set point display can be fully parameterized via the bus interface. You can configure manually via keyboard the most significant bus parameters (node address and baud rate).

3.6.1 Manual parameterization

3.6.1.1 Starting parameterization

After applying supply voltage and passing initialization, the set point display will be on the uppermost level of the menu structure (default/factory settings). By actuating the ← key, the set node address and baud rate is displayed. Parameterization starts if this key is actuated during the enable period (see parameter 04h: Keys enable time: Configuration start delay and 3Dh: Key function enable3: Configuration enable via keyboard).

3.6.1.2 Value input

Enter values via the ↑ key and the ← key. Confirm values entered by pressing the ✳ key.

← - decimal place selection key

↑ - value input key

3.6.1.3 Value selection

For some parameters you can select values from a list.

Direct value input is not possible there.

Pressing the ↑ key, the value can be selected from the list. By pressing the ✳ key, the selection is confirmed.

3.6.1.4 Adjustable parameters

The following parameters can be adjusted.

Display	Parameter	Options
ID	Node-ID	1 ... 127
KBAUD	Baud rate	19.2 kbaud
		57.6 kbaud
		115.2 kbaud
Protcl	Protocol	SIKONETZ5
		Service-standard
BUS TO	Bus-Timeout	0 ... 20
Inhibt	Response delay	0 ... 20
CODE	System commands	Reset factory settings (see chapter 3.8.1)
		Start diagnosis (see chapter 3.8.2)

Table 2: Manually adjustable parameters

3.6.2 Parameterization via interface

The set point display can be completely parameterized in the RS485 interface (see chapter 5: Communication via SIKONETZ 5).

3.7 Warnings / Errors

3.7.1 Warnings

No warnings are output.

3.7.2 Errors

Errors are signified via the display (written in red) and via the interface.
The cause of error must be removed to enable resumption of normal operation. Afterwards you can acknowledge or delete the error message by pressing the ✳ key or via the interface (see chapter 5.3.4: Control word).

(For signaling see chapter 5.3.5: Status word and chapter 3.8.2: Read error memory)

Display	Error code SIKONETZ5	Bit assignment in the status word	Error
CS bUS	0080h	7	Checksum SIKONETZ5
to bUS	0081h	7	Timeout SIKONETZ5

Table 3: Error messages

3.8 System commands

3.8.1 Restore factory settings

There are various options for restoring the factory settings of the device:

Access	Coding		Factory settings are restored
Manuell	CODE	11100	all parameters
		11102	all except bus parameters
		11105	only bus parameters
SIKONETZ5 (see parameter A0h: System commands)	A0h	1	all parameters
		2	all except bus parameters
		5	only bus parameters

Table 4: Access to factory settings

3.8.2 Read error memory

To receive a list of device errors that occurred switch the device to the diagnosis mode. Enter CODE "200000" in parameterization (see chapter 3.6.1: Manual parameterization) and confirm by pressing the ✱ key. Any errors occurring are output indicating the error number and total of occurrences in the upper row. The type of error is shown in the lower row. Error number 1 contains the latest error. The oldest error is output with the highest error number.

3.8.3 Diagnosis of bus communication

By entering code CODE 300 00X, three different diagnostic modes can be called up:

Mode	Diagnostic parameters to be specified	Possible results of diagnosis
General communication	Baud rate Node address	• There is genral bus communication. • Bus load • Addressed nodes • Connection or data quality, resp.
Data scan	Node address (ID) to be checked Access type (read/write) Parameter address	• The data content of the set telegram last received meets the expectation. • The set telegram is sent with the expected quantity and time.
Telegram scan	Node address to be checked Access type (read/write) Parameter address Data content	The expected telegram is sent or received, resp.

Table 5: Diagnostic modes

LED status	Meaning
All OFF	No messages are received (no bus traffic).
red	General bus traffic is detected, but not with the set telegram properties.
green	The set node address is addressed, or the data contents correspond with the set value, resp.

Table 6: Meaning of the LED

3.8.3.1 General communication

Start via input "CODE 300.000".

Display	Adjustment	Meaning
	ID to be checked	Number of all telegrams received with this ID, per second. M/s = Message / second. here: to ID 31: 63 telegrams/s
	ID to be checked	Number of all telegrams received with this ID, per second. M/s = Message / second. here: to ID 31: 0 telegrams/s → no telegrams with this ID (0M/s) However, telegrams with a different ID are received (indicated by the red LED)
	ID to be checked	Number of all telegrams received with this ID, per second. M/s = Message / second. here: to ID 31: 0 telegrams/s → no telegrams with this ID (0M/s) → no telegrams with a different ID (no LED) Possible causes: wrong baud rate, disconnection, master does not send, defective device driver

Display	Adjustment	Meaning
	ID to be checked acknowledged by ✳ key	1st line "FE" = Parameter address in hex (here: actual value). ".0" = read command (see chapter 5.3.1) "Nxx" = number of telegrams received (here: 63)
		2nd line: The data content of the message last heard is displayed in decimal notation. (here: 0). Consequently, the data content, e. g. of the position value may alternate between "0" and "x". The master sends "0" in its request, the respective device responds with "x". Messages sent by the device itself cannot be displayed/recorded.
	ID to be checked acknowledged by ✳ key	If no telegram with this confirmed ID was received, "no COM" will be displayed.
	ID to be checked again acknowledged by ✳ key	1st line: Number of telegrams with checksum error (with valid ID) in one second. (here: 7)
		2nd line: Number of telegrams with CS error compared with number of all telegrams. Expressed as a percentage (here: 99.99 %)

3.8.3.2 Data scan

With the data scan, the data content of a specific telegram is output.
Start via input "CODE 300.001".

Display	Adjustment	Meaning
	ID to be checked	Telegrams directed to node address xx are examined below. (Annotation to the picture: LED off: no bus traffic!) Here: node address = 31

Display	Adjustment	Meaning
	Command to be checked (access type)	The command is input in decimal notation (lower line). The command is displayed in hexadecimal notation due to lack of space (upper line). Here "0" = read command
	Parameter to be checked	The parameter address is input in decimal notation (lower line). The parameter address is displayed in hexadecimal notation due to lack of space (upper line). Here parameter address = "0xFF" = set point
	The ID, the access type and the parameter address were input	The parameter address and the access type are displayed in the upper line. After the X, the number of these telegrams received is indicated. (The counter overruns at 0xFF) In the lower line, the data content of the message last received is displayed in decimal notation. Attention: The data content may alternate between 0 (= question of the master) and x (= response of the device).

3.8.3.3 Telegram scan

Start via input "CODE 300.002".
Here, node address, command, and parameter address aere set as is the case with the data scan. Additionally, the expected data content is set. If a telegram is received where all items match exactly, the Received counter is increased, and the LED switched to green.

4 Overview of parameters

Name	Description	see page
00h: Node address	Node address	22
01h: Baud rate	Baud rate of the RS485 interface	22
02h: Bus Timeout	Indication of bus timeout in x100 ms	22
03h: Response parameter to a set point write access	Defines the response to the command "Write set point"	23
04h: Keys enable time: Configuration start delay	Period of key actuation in order to start configuration.	23

Name	Description	see page
05h: Key function enable1: Calibration enable	Enable calibration	23
06h: LED flashing	All LEDs flashing	24
07h: LED3 (green right)	LED green right (LED3)	24
08h: LED2 (red left)	LED red left (LED2)	24
09h: LED1 (green left)	LED green left (LED1)	25
0Ah: Decimal places	Number of decimal places	25
0Dh: Display orientation	Display orientation	25
0Eh: Configuration programming mode	Basic setting of programming interlock	26
39h: LED4 (red right)	LED red right (LED4)	26
3Ah: LCD backlight flashing	Flashing LCD backlight	26
3Bh: LCD backlight white	LCD backlight white	27
3Ch: LCD backlight red	LCD backlight red	27
3Dh: Key function enable3: Configuration enable via keyboard	Configuration enable	27
3Eh: Acknowledgement settings	Acknowledgment settings	28
65h: Device identification	SIKONETZ5 device identification (AP10T = 10)	28
67h: Software version	Software version	28
80h: Number of errors	Number of error incidents	29
81h until 8Ah: Errors	Error list	29
96h: Input errors	Input error list	29
A0h: System commands	Various system commands	30
A8h: Programming mode	Programming disable	30
D0h: Response delay	Delay until a SIKONETZ5 bus telegram is answered.	31
D2h: Auto-ID assignment	Automated node address assignment	31
FAh: Status word	Device status	31
FBh: Set point1	Set point1 (alpha-numeric display)	32
FDh: Error telegram	Error telegram	32
FFh: Set point2	Target position	32

Table 7: Parameter description

5 Communication via SIKONETZ 5

5.1 Interface

RS485 interface
Available baud rates: 19.2 kBit / 57.6 kBit (factory setting) / 115.2 kBit

No parity, 8 data bits, 1 stop bit, no handshake

5.2 Data exchange

The protocol functions according to the master – slave principle.

The set point display acts as a slave. Every instance of communication must be initiated by the master. When the master has sent a command telegram, the slave sends a reply telegram. Broadcast commands are an exception, they remain always unanswered by the slave.

The protocol is optimized for cyclical data exchange. The relevant data such as set point and actual value as well as control and status words can be transferred between master and slave by a single telegram exchange.

The parameter to be returned by the slave as a reply to the master's Write set point command can be defined via the "Write set point reply parameter".

5.3 Telegram setup

Control word (CW), status word (SW) and data are transferred in the Big-Endian format.

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte	9th byte	10th byte
Command	Node address	Parameter address	high Byte	low Byte	MSB			LSB	Check sum
			CW		Data				

Table 8: Command telegram (from master)

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte	9th byte	10th byte
Command	Node address	Parameter address	high Byte	low Byte	MSB			LSB	Check sum
			SW		Data				

Table 9: Reply telegram (from slave)

5.3.1 Command

The following access types are provided by SIKONETZ5.

Access code	Meaning	Description
00h	read	The master requests the addressed slave to output the relevant value in a response telegram.
01h	write	The master requests the addressed slave to accept the value transferred in the same telegram.
02h	broadcast	The master requests all connected slaves to execute the command transferred in the same telegram.

5.3.2 Node address

The device address can be freely set in the range of 0 to 127. The delivered devices are preset to node address 31 ex works and must be reset to the desired address to enable their operation with multiple slaves on the SIKONETZ5 fieldbus (see parameter 00h: Node address and chapter 5.8: Auto-ID).

Each address can be assigned in the fieldbus only once!

5.3.3 Parameter address

A distinct address is assigned to every parameter (e. g. calibration value) or functional value (e. g. set point) (see chapter 5.9: Parameter description).

5.3.4 Control word

The control word consists of 16 bits.

Control word															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB			High Byte					Low Byte							LSB

The following table lists the designations of the individual bits of the control word and their meanings.

Bit	Meaning	Value = 0	Value = 1
0	reserved	ever 0	-
1	reserved	ever 0	-
2	Validity of set point1	invalid	valid
3	Display range	standard	extended
4	reserved	ever 0	-
5	Error	not acknowledged	acknowledged
6	Acknowledgement of set point2	not acknowledged	acknowledged
7	Data identifier	number	ASCII
8	reserved	ever 0	-
9	Validity of set point2	invalid	valid
10	Acknowledgement of set point1	not acknowledged	acknowledged
11	LED1 green left	Off	On
12	LED3 green right	Off	On
13	LED4 red right	Off	On
14	LED2 red left	Off	On
15	LED blinking	Off	On

Table 10: Control word

5.3.5 Status word

The status word indicates the current status of AP10T. It consists of 16 bits.

Status word															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB			High Byte					Low Byte							LSB

The following table lists the designations of the individual bits of the status word and their meanings.

Bit	Meaning	Value = 0	Value = 1
0	reserved	ever 0	-
1	reserved	ever 0	-
2	Validity set point1	invalid	valid
3	Acknowledgement of set point2	not acknowledged	acknowledged
4	reserved	ever 0	-
5	Acknowledgement of set point1	not acknowledged	acknowledged
6	reserved	ever 0	-
7	General error	not present	is present
8	front key	not actuated	actuated
9	data identifier	number	ASCII-String
10	Validity set point2	invalid	valid
11	reserved	ever 0	-
12	reserved	ever 0	-
13	← key	not actuated	actuated
14	* key	not actuated	actuated
15	↑ key	not actuated	actuated

Table 11: Status word

5.3.6 Data

Range for data exchange. Size: 4 bytes.

5.3.7 Check sum

For checking error-free data transfer, a check sum is formed at the end of the telegram. The check sum is the exclusive-OR-link of bytes 1 ... 9:

Check sum [Byte10] =

[Byte1] XOR [Byte2] XOR [Byte3] XOR [Byte4] XOR [Byte5] XOR [Byte6] XOR [Byte7] XOR [Byte8] XOR [Byte9]

The following applies for checking the telegram received:

[Byte1] XOR [Byte2] XOR [Byte3] XOR [Byte4] XOR [Byte5] XOR [Byte6] XOR [Byte7] XOR [Byte8] XOR [Byte9] XOR [Byte 10] = 0

With a result unequal 0 a transmission error is to be assumed.

When a check sum error is detected, it is answered with an error telegram.
With three subsequent check sum errors, the check sum SIKONETZ5 error will be triggered.

5.4 Synchronization

NOTICE	Processing of the "Restore factory settings" system command may take up to 600 ms. Acknowledgment is reported only after proper updating of all parameters in the non-volatile memory.

Byte/telegram synchronization is via "Timeout". The intervals between the individual bytes of a telegram must not exceed the value of 10 ms. If an addressed device does not respond, the master must not send another telegram earlier than after 30 ms.

5.5 Error telegram

Illegal entries are replied with an error telegram.

An error telegram consists of parameter address FDh and an error code.

The error code is in the data section of the reply telegram. The error code is divided in two bytes. Code 1 describes the error proper, code 2 contains additional information if available.

In the following example an attempt was made at writing a value of 90 to the key enable time parameter address.

However, a maximum value of only 60 is admissible for this parameter.

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte	9th byte	10th byte
Command	Node address	Parameter address	CW		Data				Check sum
01h	01h	04h	00h	00h	00h	00h	00h	5Ah	5Eh

Table 12: Telegram from master to slave

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte	9th byte	10th byte
Command	Node address	Parameter address	SW		Data				Check sum
					-	-	Code 2	Code 1	
01h	01h	FDh	00h	81h	00h	00h	02h	82h	FCh

Table 13: Reply telegram from slave

5.5.1 SIKONETZ5 error codes

Code 2	Code 1	Description
00h	80h	Check sum SIKONETZ5
00h	81h	Timeout SIKONETZ5
00h	82h	Value rage exceeded / inadequate
01h		Value < MIN
02h		Value > MAX
00h	83h	Unknown parameter
00h	84h	Access is not supported
01h		write attempt to read only
02h		read attempt to write only

Code 2	Code 1	Description
00h	85h	Error due to device status
03h		Programming locked

Table 14: SIKONETZ5 error codes

5.6 Communication errors

Error states of the slave are signified with the status word.7 = 1.

Every error must be acknowledged with control word.5 = 0/1 or by pressing the ✳ key. If the cause of the error has not been resolved at the time of acknowledgment, the error will not be reset or triggered anew, resp.

Errors that have not been acknowledged can be read via a read command on Parameter FDh: Error telegram. The error code will be output (see chapter 3.7.2: Errors and 5.5.1: SIKONETZ5 error codes).

A list of errors occurring is output in Diagnosis (see chapter 3.8.2).

5.7 Communication monitoring

5.7.1 Bus-Timeout

Bus timeout monitoring is activated by configuring a valid time value (>0) for timeout (see parameter 02h: Bus Timeout).

The first telegram received by the slave starts time monitoring.

Every new telegram recognized as valid by a slave (correct check sum) triggers time monitoring.

If timeout occurs, this will result in the Timeout SIKONETZ5 error.

After establishing cyclic communication between master and slave, this function can detect a broken cable of the connection line for instance and signal the defect.

5.7.2 Programming interlock

Programming interlock is controlled via parameter 0Eh: Configuration programming mode. This parameter being enabled, the interlock must be canceled prior to write access to a lockable parameter (see entry at the relevant parameter) by applying a write access to parameter A8h: Programming mode. Correspondingly, the interlock should be enabled again immediately after a write access.

This mechanism enhances protection against unintentional parameterization.

Write access to locked parameters is replied with "Error due to device state" (see chapter 5.5.1: SIKONETZ5 error codes).

5.8 Auto-ID

This function facilitates first commissioning of the devices in the plant. The node numbers can be assigned by the superordinate control or by pressing the relevant button on the device concerned. The functional principle is illustrated in Fig. 2: Auto-ID function.

The Node-ID 1Fh (31d) is factory-set. Now, the SIKONETZ5 master must send a write command on parameter D2h: Auto-ID assignment with the new Node ID to be set to the bus subscriber(s) with the current Node-ID 1Fh and wait for an SIKONETZ5 response. A write command on devices with a node ID different from 1Fh is responded to with an error message.

"New ID" will be displayed on all devices that have the current Node-ID 1Fh. The user must press the ↑ key on the device intended to adopt the new Node ID. Afterwards, this device sends a SIKONETZ5 response with the parameter D2h: Auto-ID assignment. The new Node-ID is taken over and stored in the EEPROM. The initialization phase is finally repeated so that the new Node ID applies henceforth. All other devices do not react. Afterwards, the control unit can execute a read command on a parameter for the node with the node ID 1Fh for instance in order to detect any other devices with node ID 1Fh present in the bus. If so, the procedure may be repeated until all devices have received the desired Node-ID. The Auto-ID function is aborted in the AP10T when an illegal value was sent for the new ID. Error messages will be returned in this case.

Use of this function is optional. The node numbers can also be set via parameterization (see chapter 3.6: Parameterization of the set point display).

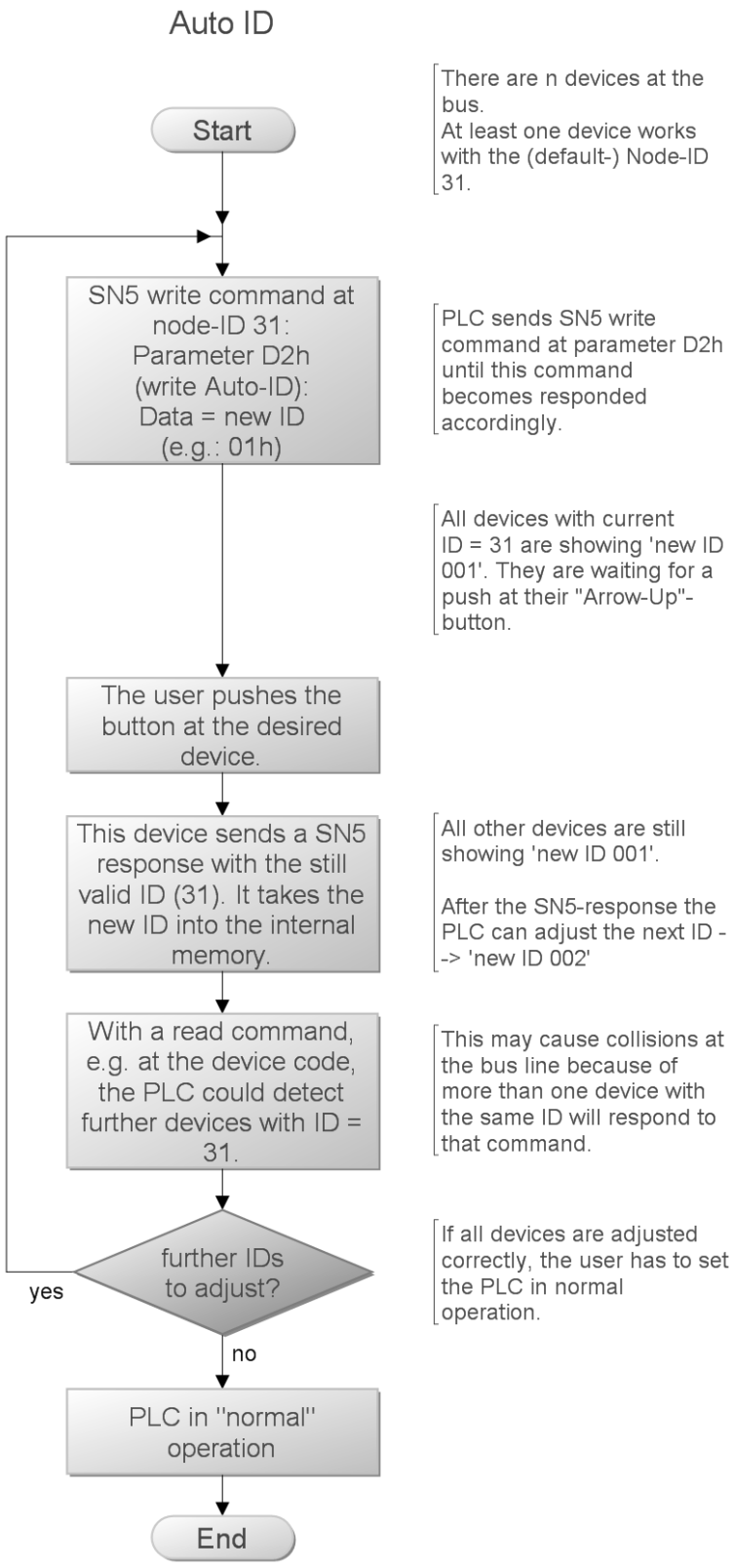

Fig. 2: Auto-ID function

5.9 Parameter description

5.9.1 00h: Node address

Setting of the SIKONETZ5 node address.
Changes become active only after restart of the device.

Parameter address	00h
Description	node address
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	31
Data content	1 ... 127

5.9.2 01h: Baud rate

Setting of the SIKONETZ5 baud rate.
Changes become active only after restart of the device.

Parameter address	01h
Description	Baud rate of the RS485 interface
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	57600 kBaud
Data content	0 = 19200 1 = 57600 2 = 115200

5.9.3 02h: Bus Timeout

See chapter 5.7.1: Bus-Timeout.

Parameter address	02h
Description	Indication of bus timeout in x100 ms
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0 ... 20

5.9.4 03h: Response parameter to a set point write access

Parameter address	03h
Description	This parameter defines the response to the command "Write set point"
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0 = set point

5.9.5 04h: Keys enable time: Configuration start delay

Configuration start delay (key enable time) is set via parameter 04h.

Parameter address	04h
Description	Duration of key actuation to start configuration.
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	5
Data content	1 … 60 s

5.9.6 05h: Key function enable1: Calibration enable

The parameter 05h indicates whether calibration of the position value is enabled via key actuation.

Parameter address	05h
Description	Key enable
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	1
Data content	0: Calibration disabled 1: Calibration enabled

5.9.7 06h: LED flashing

Flashing of the LEDs can be set via parameter 06h (see chapter 3.3: LED display). This setting applies to all LEDs.

Parameter address	06h
Description	Flashing of all LEDs
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0 = no flashing 1 = any glowing LED is flashing

5.9.8 07h: LED3 (green right)

LED3 (green, right) can be set via parameter 07h (see chapter 3.3: LED display). The control word can be freely accessed only if the LED is switched off here.

Parameter address	07h
Description	LED green right (LED3)
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	1
Data content	0 = Off 1 = position-dependent

5.9.9 08h: LED2 (red left)

LED2 (red, left) can be set via parameter 08h (see chapter 3.3: LED display). The control word can be freely accessed only if the LED is switched off here.

Parameter address	08h
Description	LED red left (LED2)
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	1
Data content	0 = Off 1 = position-dependent

5.9.10 09h: LED1 (green left)

LED1 (green, left) can be set via parameter 09h (see chapter 3.3: LED display). The control word can be freely accessed only if the LED is switched off here.

Parameter address	09h
Description	LED green left (LED1)
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	1
Data content	0 = Off 1 = position-dependent

5.9.11 0Ah: Decimal places

The parameter 0Ah indicates the number of decimal places.

Parameter address	0Ah
Description	number of decimal places
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0 ... 4

5.9.12 0Dh: Display orientation

Display orientation can be set via parameter 0Dh.

Parameter address	0Dh
Description	display orientation
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0 = 0° 1 = 180° rotated

5.9.13 0Eh: Configuration programming mode

Basic settings of programming interlock (see chapter 5.7.2: Programming interlock).

Parameter address	0Eh
Description	Configuration programming mode
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0 = no active programming interlock 1 = active programming interlock

5.9.14 39h: LED4 (red right)

The LED4 (red, right) can be set via parameter 39h (see chapter 3.3: LED display). Free access via the control word is only enabled if the LED is switched off here.

Parameter address	39h
Description	LED red right (LED4)
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	1
Data content	0 = Off 1 = position-dependent

5.9.15 3Ah: LCD backlight flashing

Flashing of the LCD backlight can be set via parameter 3Ah. This setting applies to either color.

Parameter address	3Ah
Description	Flashing of the LCD backlight
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0 = no flashing 1 = the current backlight is flashing.

5.9.16 3Bh: LCD backlight white

The white LCD backlight can be set via parameter 3Bh.

Parameter address	3Bh
Description	LCD backlight white
Access	rw
EEPROM	yes
Programming mode	j yes a
Data type	UNSIGNED 8
Default	1
Data content	0 = Off 1 = On

5.9.17 3Ch: LCD backlight red

The red LCD backlight can be set via parameter 3Ch.

Parameter address	3Ch
Description	LCD backlight red
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	1
Data content	0 = Off 1 = On

5.9.18 3Dh: Key function enable3: Configuration enable via keyboard

Parameter 3Dh indicates whether configuration via key actuation is enabled.

Parameter address	3Dh
Description	Key enable
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	1
Data content	0: configuration disabled 1: configuration enabled

5.9.19 3Eh: Acknowledgement settings

Parameter 3Eh serves for determining the key to be used as acknowledgement key. By pressing the relevant key, the previously received set points (set point1 and set point2) are acknowledged. If both values are unacknowledged, both values will be acknowledged via one keystroke.
Additionally, the actual release of key actuation can be set.

Parameter address	3Eh
Description	acknowledgement settings
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0: ✳ and front key 1: only front key 2: ↑ and ← key

5.9.20 65h: Device identification

Parameter address	65h
Description	Device identification
Access	ro
EEPROM	no
Programming mode	no
Data type	UNSIGNED 8
Default	10
Data content	10 = 0Ah = AP10T

5.9.21 67h: Software version

Parameter address	67h
Description	Software version number
Access	ro
EEPROM	no
Programming mode	no
Data type	UNSIGNED 32
Default	-
Data content	100 (= version 1.00) or higher

5.9.22 80h: Number of errors

See chapter 3.7: Warnings / Errors.

Parameter address	80h
Description	Number of errors recorded
Access	ro
EEPROM	yes
Programming mode	no
Data type	UNSIGNED 8
Default	0
Data content	0 … 10

5.9.23 81h until 8Ah: Errors

See chapter 3.7: Warnings / Errors. The oldest error is found under parameter address 81h, the most recent error is found under the highest address.

Parameter address	81h until 8Ah
Description	error
Access	ro
EEPROM	yes
Programming mode	no
Data type	UNSIGNED 16
Default	0
Data content	see chapter 3.7.2: Errors

5.9.24 96h: Input errors

Output of a list (10 entries) of input errors (see chapter 5.5.1: SIKONETZ5 error codes). The list is deleted with initialization of the device at program start (reset or power-on).
The error number must be transferred in data byte 3 of the telegram.
Data byte 3 with the request = 0 → number of errors occurring is reported.
Data byte 3 with the request = 1 → error number 1 (latest error) is reported.

Example:
Telegram structure of master: latest error (= no. 1) shall be read:

Command	ID	Parameter	ZSW		Error number				CS
00h	1Fh	96h	XX	YY	01h	00h	00h	00h	NNh

Telegram structure of slave: latest error (1) is output:

Command	ID	Parameter	ZSW		Error number	Error code			CS
00h	1Fh	96h	XX	YY	01h	00h	00h	83h	NNh

Parameter address	96h
Description	error
Access	ro
EEPROM	yes
Programming mode	no
Data type	UNSIGNED 16
Default	0
Data content	see chapter 5.5.1: SIKONETZ5 error codes

5.9.25 A0h: System commands

Various system commands can be executed via parameter A0h (see chapter 3.8.1).

Parameter address	A0h
Description	System commands
Access	wo
EEPROM	no
Programming mode	no
Data type	UNSIGNED 32
Default	0
Data content	1: Reset all parameters to factory settings
	2: Reset all parameters to factory settings, except the bus parameters
	5: Reset only the bus parameters to factory settings
	8: Delete error memory
	9: Software reset (warm start)

5.9.26 A8h: Programming mode

Programming interlock (see chapter 5.7.2: Programming interlock).

Parameter address	A8h
Description	Programming mode
Access	wo
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0 = parameter programming disabled 1 = parameter programming enabled

5.9.27 D0h: Response delay

Number of internal program cycles deferred before responding to a SIKONETZ5 bus telegram. The response to a telegram can be delayed until the master is ready to receive. The value 10 corresponds to a delay of approx. 5 ms.

Parameter address	D0h
Description	Response delay
Access	rw
EEPROM	yes
Programming mode	yes
Data type	UNSIGNED 8
Default	0
Data content	0 ... 20

5.9.28 D2h: Auto-ID assignment

See chapter 5.8: Auto-ID.

Parameter address	D2h
Description	Automated assignment of a node address
Access	wo
EEPROM	yes, the node number is stored with its adoption
Programming mode	no
Data type	UNSIGNED 8
Default	-
Data content	1 ... 31

5.9.29 FAh: Status word

The status word can be read via this parameter. Bit 4: "Target window1 static" is deleted in the status word with this operation. With this function, it can be detected whether the actual position was ever in the target window even if this is not the case at present (see chapter 5.3.5: Status word).

Parameter address	FAh
Description	Read status word and delete "Target window1 static"
Access	ro
EEPROM	no
Programming mode	no
Data type	UNSIGNED 16
Default	-
Data content	0

5.9.30 FBh: Set point1

The current set point1 can be written and read via address FBh.

Parameter address	FBh
Description	Set point1
Access	rw
EEPROM	no
Programming mode	no
Data type	UNSIGNED 32
Default	-
Data content	0h ... FFFFFFFFh

5.9.31 FDh: Error telegram

Illegal entries are answered with an error telegram.
An error telegram consists of the parameter address FDh and an error code (see chapter 5.5: Error telegram).

Parameter address	FDh
Description	Error telegram
Access	-
EEPROM	no
Programming mode	no
Data type	UNSIGNED 32
Default	-
Data content	see chapter 5.5: Error telegram

5.9.32 FFh: Set point2

The current set point2 can be written and read via address FFh.

Parameter address	FFh
Description	Set point2
Access	rw
EEPROM	no
Programming mode	no
Data type	SIGNED / UNSIGNED 32 (depending on the transmission mode)
Default	-
Data content	0h ... FFFFFFFFh

6 Communication via Service Standard Protocol

6.1 General

The service protocol enables the control of the position indicator via ASCII commands. No additional devices must be connected to the RS485 interface since this protocol is not bus-compatible.

An ASCII terminal sends a letter and additional parameters if required (ASCII).
Subsequently, the set point displaysends a reply with a concluding <CR>.

Available baud rates: 19.2 kBit / 57.6 kBit (factory setting) / 115.2 kBit
Additional settings: No parity, 8 data bits, 1 stop bit, no handshake

6.2 Error number encoding

The following error messages are returned in case of wrong input.

Error number	Description
?1	input of illegal parameter number
?2	illegal value range

Table 15: Error number encoding

6.3 Service protocol commands list

Command	Length	Reply	Description
Ay	2/17	"AP10 SN5 zW xxxx>"	Device type / software version
			y=0: hardware version; z = H y=1: software version; z = S
Sxxxxx	6/2	">"	System commands
			x=11100: all parameters into basic state After restart, the factory settings will be active, this applies to bus protocol and baud rate as well.
			x=11101: reset all to factory settings, except bus parameters
			x=11102: only bus parameters into basic state
			x=11105: activate bootloader
Z	1/11	"±xxxxxxxx>"	Output actual position (AP10T = 0)

Table 16: Service protocol commands list