GOSSEN METRAWATT CAMILLE BAUER

LINAX 4000H

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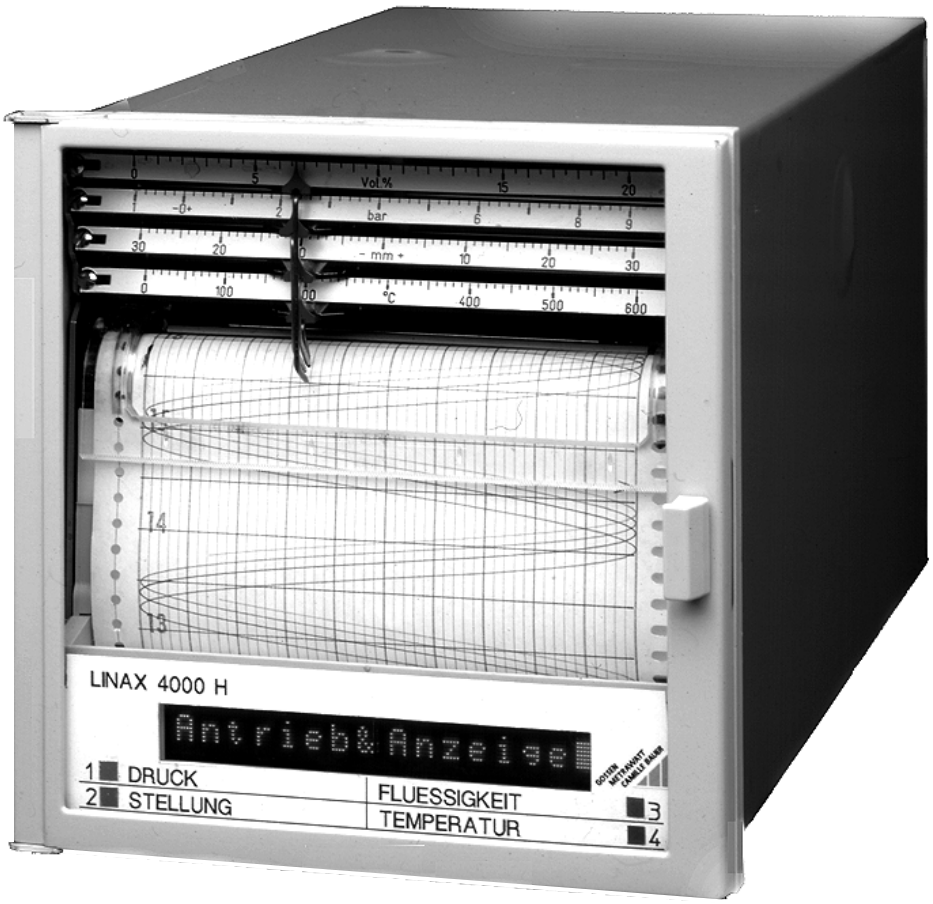

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1 Description

The LINAX 4000H continuous-line recorder includes both RS 232C and RS 485 interfaces. The RS 232C is the default interface. In order to switch to RS 485 interface operation, the two sliding switches on the options adapter must be set to the positions shown in figures 1 and 2.
Parameters for the recorder can be set at the LINAX 4000H control panel, or via the interface with the help of a PC and the PARATOOL 4000H parameters program. In most cases, the RS 232C interface is used for the setting of recorder parameters. A prefabricated connector cable is provided for use with the RS 232C interface (length: 2.5 m; order no. A420A). A prefabricated cable can also be used with the RS 485 interface (length: 0.2 m; order no. A420B).
Serial communications for the LINAX 4000H continuous-line recorder in accordance with the RS 485 interface standard is in compliance with DIN 19 245 Part 1. Only a subset of determinations has been taken into consideration. Amongst other things, determinations regarding multi-master operation (token-passing procedures) have not been taken into consideration, because the continuous-line recorder is always a passive user.

2 Technical Data

2.1 RS 232C Point-to-Point Connection

Medium	Shielded 3-wire cable, cross section: min. 0.22 mm^2
Cable Length	max. 15 m
Number of Users	1 transmitter 1 receiver
Transmission Speed	300, 600, 1,200, 2,400, 4,800 9,600 and 19,200 baud
Transmission Type	asymmetrical
Driver Output	Open-circuit: ± 15 V, with ± 5 V load Load resistance: 3 ... 7 kΩ
Receiver	Sensitivity: ± 3 V input resistance: 3 ... 7 kΩ Character 1: < –3 V Space: > +3 V
Earthing	Shield must be grounded at both ends for the discharge of high frequency interference. Ground terminals at both users must be connected.
Electrical Isolation	none

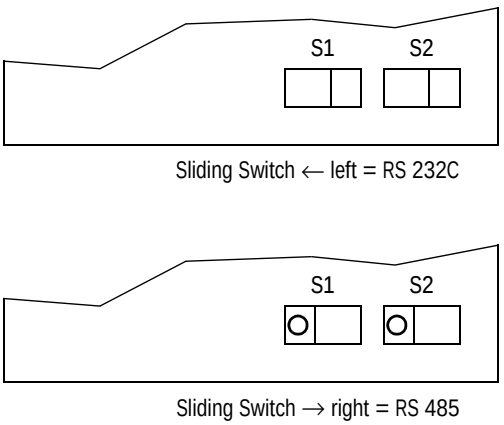


Figure 1 Options Adapter
Switch position for RS 232C ↔ RS 485

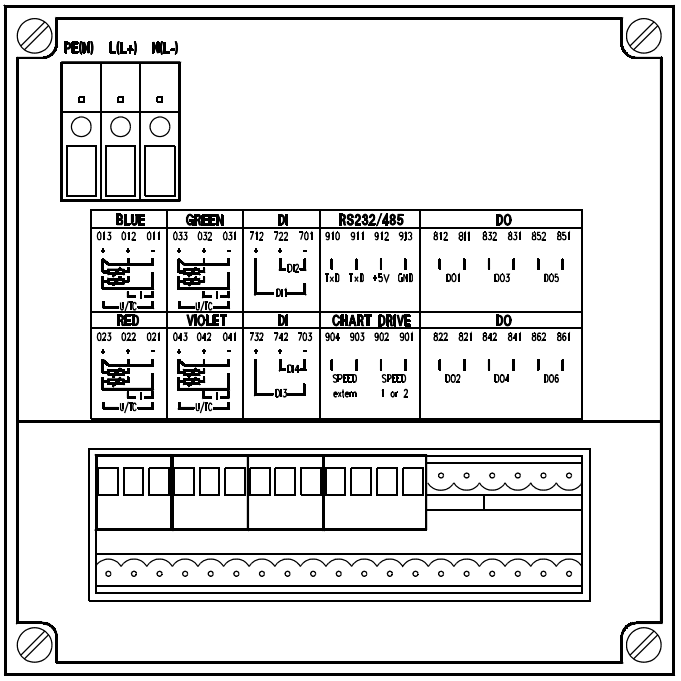


Figure 2 LINAX 4000H Rear Panel
Terminal 910 = TXD
Terminal 911 = RXD
Terminal 912 = +5 V (not for RS 232C)
Terminal 913 = GND
The shield is connected to a knife terminal at the recorder housing

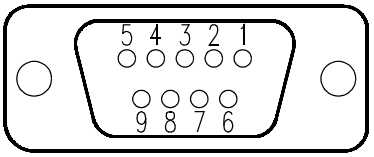


Figure 3 RS 232C Interface Pin Assignment (9 pole Sub-D port)
2 = RXD
3 = TXD
5 = GND

2.2 RS 485 Bus Connection

Bus Structure	Line, no branches, Spur lines to users < 0.3 m
Medium	Shielded, braided 2-wire cable, wave impedance: 100 ... 130 W, at f > 100 kHz Cable capacitance: < 60 pF/m, cross section: min. 0.22 mm^2
Cable Length	max. 1200 m
Number of Bus Users	32 (active and passive)
Transmission Speed	300, 600, 1,200, 2,400, 4,800 9,600 and 19,200 baud
Transmission Type	symmetrical
Driver Output	Open-circuit: ± 5 V, with ± 1,5 V load Load resistance: ≥ 60 Ω
Receiver	Sensitivity: 200 mV Input resistance: 12 kΩ
Earthing	Shield must be grounded at both ends for the discharge of high frequency interference.
Potential Equalization	The difference in potential between the data reference potentials (GND) of all bus users may not exceed ± 7 V
Electrical Isolation	none

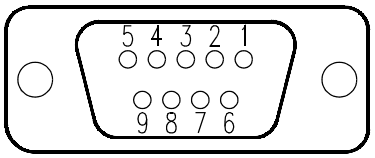


Figure 4 RS 485 Interface Pin Assignment (9 pole Sub-D port)
1 = shield
3 = RXD (+)
5 = GND (reference potential)
6 = + 5 V
8 = RXD (–)

A voltage of +5 V at pin 6 is only required, if the LINAX 4000H is used as a terminal bus device.
Open-circuit potential for the bus is determined with the help of resistors Ru, Rt and Rd.

Ru = 390 Ω
Rt = 150 Ω
Rd = 390 Ω

Connections are made in accordance with figure 5.

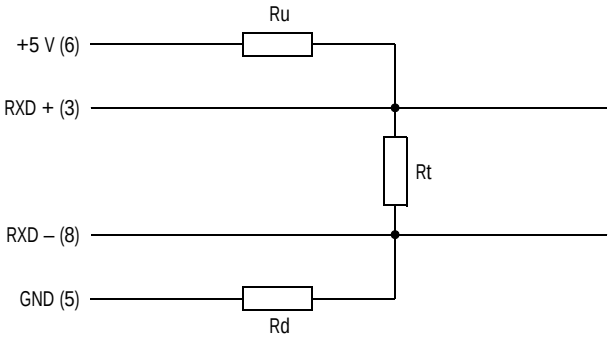


Figure 5 Bus Termination Wiring

Resistors Ru, Rt and Rd are to be installed into the 9 pole bus plug such that the recorder can be disconnected from the bus without disrupting bus termination.

3 Data Formats

Transmission data are encoded into 4 different format types.

1. Byte	value range	0 ... 255
2. Char	value range	–128 ... +127
3. Word	value range	0...65535
4. Float	value range	± 1.175494E–38 ... ± 3.402823E+38

Byte

The byte format is used to select parameters from the tables (see chapter 5.3).

Char

The char format is used to transmit ASCII characters. The set of characters accepted by the recorder is listed in chapter 7. The hex codes must be used.

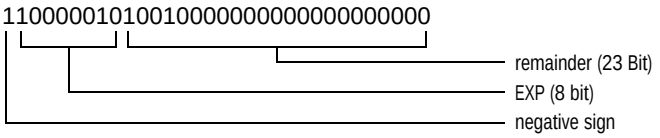
Word

The word format consists of 2 bytes, and is used for the transmission of integers without sign (whole number values). The set of numbers accepted by the recorder ranges from 0 ... 1000. During transmission, the high byte is transmitted before the low byte.
Example: The value 820 is to be transmitted.
820 dec. = 03 34H

Float

The float format consists of 4 bytes (IEEE 754 format), and is used when floating-point values are transmitted. Range limits are defined by the nominal measuring range for the transmission of measuring range values. The set of numbers accepted by the recorder for the transmission of display ranges and limit values ranges from –1000 ... +9999. The set of numbers accepted by the recorder for the transmission of summation limit values (for balancing) ranges from 1 to 7,500,000.
Example:
The value –12.5 is to be transmitted.
–12.5 dec. = C1 48 00 00H
Determination of hexadecimal number
The floating-point number usually takes the following form:
(sign) • $2^{EXP-127}$ • (remainder)

Binary representation of the number –12.5



1. Determination of Sign
   The bit is set for a negative sign.
2. Determination of Exponent
   The highest exponent is ascertained.
   EXP= INT [lg lnumberl / lg 2] + 127
   Example:
   INT [lg 12.5 / lg 2] +127 = 130D = 82H = 10000010
3. Determination of Remainder
   remainder = lnumberl / $2^{EXP-127}$, Example: 12.5 / 2^3 = 1.5625

Transformation into Binary Code:

Valency	2^0	$+2^{-1}$	$+2^{-2}$	$+2^{-3}$	$+2^{-4}$ + ... 2^{-23}
Example:	(1)	1	0	0	1

The value 2^0 is always 1, and is thus not transmitted.

4 Data Transmission

4.1 General

A group of message characters are combined for transmission. The messages assume the “handshake function”, i.e. every message from the PC to the recorder must first be acknowledged, before the next message can be transmitted.

Note

Before data transmission takes place, the interface must be activated at the recorder, and parameters must be set for the interface address, parity and baud rate.

4.2 Message Characters (UART characters or frames)

Each frame (character) has 11 bits:
– one start bit (ST) with low level signal
– 8 information bits with low level or high level signal
– one parity bit (P) (optional) with low level or high level signal
– one stop bit (SP) with high level signal

0	b1	b2	b3	b4	b5	b6	b7	b8	(P)	1
ST	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	(P)	SP

Figure 6 Bits in a Frame

4.3 Allowable Addresses

The LINAX 4000H only responds to queries from the RS 485 interface, whose destination address is equal to the pre-selected device address. Values from 0 ... 126 (= 7EH) are allowed. Assignment is arbitrary. However, each address may only be assigned once. The LINAX 4000H does not respond to faulty messages (check sum, incorrect address, other receiving error), nor are faulty messages acknowledged.
Some data areas are designated as read only.
Attempts to make entries to these data fields are ignored by the recorder.

4.3.1 Broadcast Address

Messages to the broadcast address (132D) are processed by all LINAX 4000H recorders, although no response is made to a broadcast message.

4.4 Message Formats, General Specifications

The LINAX 4000H accepts the following message types:

4.4.1 SD1 Message

Message with fixed information field length without data field:

SD1/ DA/SA/FC /FCS/ED
I<--- L--->I

Used for the transmission of a query to the recorder and as an acknowledgement from the recorder.

The following applies:

SD1 = 10H	Start delimiter, code: 10H
DA	Destination address
SA	Source address
FC	Frame control
FCS	Frame check sequence Sum of hex values from “L” frames without amount carried forward from FFH
ED	End delimiter, code: 16H
L	Number of bytes in FCS = 3

In response to a query where FC = 01H (ID query), the recorder transmits an answer in the SD1 format as well. If no self-test error has been detected at the device, FC is equal to 10H in the response. Otherwise FC is equal to 11H.

With function code 4EH, identification recognition for the recorder is performed in accordance with an internal standard.

In response to a query where FC = 4EH the recorder transmits an answer in the SD2 format (see chapter 4.4.2).
The data field of the recognition message is arranged as follows:

VN =	“Gossen Metrawatt”	Manufacturer identification
CT =	“43412”	Product master number and
	“L4000H”	Device designation
HR =	“CPU:A”	Recorder CPU adapter index
SR =	“01.04”	Software release (example)

4.4.2 SD2 Message

Message with variable information field length:

SD2/LE/LEr/SD2/DA/SA/FC/aa/oo/oo/cc/data field/FCS/ED
L

Used for the transmission of data to the recorder, and for data responses from the recorder.

The following applies:

SD2 = 68H	Start delimiter
LE	Number of data bytes + 7
LEr	Repeat LE
SD2 = 68H	Repeat start delimiter
DA	Destination address (bus user address)
SA	Source address
FC	Frame control (16H = read; 15H = write)
aa	Parameter field base address
oo oo	2 byte parameter address (=offset)
cc	Number of data bytes
Data Field	Address to be transmitted
FCS	Frame check sequence (sum of hex values from L frames without amount carried forward from FFH)
ED = 16H	End delimiter
L	Number of bytes in FCS

The recorder transmits a message in SD1 format in response to a received data message in SD2 format. In this case FC = 10H, if all data have been received by the recorder, otherwise FC = 11H.

Modified data are automatically stored to non-volatile memory 1 minute after receipt of the last data message at the recorder.

Function code 16H is used for transmission of data to the recorder. The recorder uses function code 15H for responses from the recorder in SD2 format .

4.4.3 SD3 Message

Message with fixed information field length:

SD3/DA/SA/FC/aa/oo/oo/cc/xx/xx/xx/xx/FCS/ED
L

Used for the transmission of queries to the recorder.

The following applies:

SD3 = A2H	Start delimiter
DA	Destination address (bus user address)
SA	Source address
FC = 15H	Frame control
aa	Parameter field base address
oo oo	2 byte parameter address (offset)
cc	Number of data bytes
xx xx xx xx	4 arbitrary bytes
FCS	Frame check sequence (sum of hex values from L frames)
ED = 16H	End delimiter
L	Number of bytes in FCS

4.5 Transmission Requirements

The deactivated condition corresponds to the high level signal. Before transmission begins – from the PC – a minimum duration of 33 bits (syn-time) in the deactivated condition is required for synchronization.

Pauses ≥ 3 frames are interpreted as the end of a message. The LINAX 4000H inserts a pause of ≤ 300 ms between receipt of the last stop bit and transmission of the first start bit.

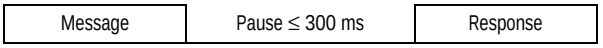


Figure 7 Pause between messages

The gap between individual frames is equal to max. 0.2 ms.

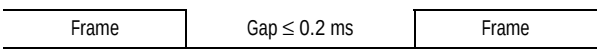


Figure 8 Gap between two frames

The receiver checks:
– per frame start, stop and parity bit,
– per message SD, DA, SA, FCS and ED
If this test results in a failure, the entire message is rejected as faulty.

The LINAX 4000H uses the source address of the received message as a destination address for its response, and its own address as a source address.

5 Parameters

5.1 Addressable Parameters

The following parameters can be read or changed with the messages defined in chapters 4.4.2 and 4.4.3. To this end, the entry of a parameter field address and a parameter address (offset), as well as the coding of the parameter value are necessary. Parameter field addresses can be found in chapter 5.2. Parameter addresses can be found in chapter 5.3.
Thus the following entries are required for the first advance:

Parameter Field Address:	10H
Parameter Address (offset):	0002H
Coding for 20 mm/hr. Advance:	0EH

5.2 Assignment of Device Functional Groups to Parameter Field Addresses

Device Functional Group	Parameter Field Address
Systems Parameter Settings	10H
Channel Parameter Settings, BL	11H
Channel Parameter Settings, RD	12H
Channel Parameter Settings, GN	13H
Channel Parameter Settings, VI	14H
Text Lines	17H
Print Interval	18H
Print Synchronous Time	19H
Communications Parameters	1AH
DI Assignment	1BH
Date and Time	1CH
Calibration Data	1DH
Measurement Values and Status	1EH
Transmit Print Lines	F1H

The above named addresses are entered into the corresponding message fields during communication. The recorder determines the range of data to be transmitted based on the address.

Data transmission is carried out with messages in SD2 and SD3 format. FC 15H must always be used for reading data fields. FC 16H is used for the writing of data fields. If invalid parameter values are entered during the writing of a message, the recorder transmits a negative acknowledgement (SD1, FC = 11H).

The 8 data bits are always transmitted together with a stop bit. Parity and baud rate must be set in accordance with the values selected at the recorder.

5.3 Parameter Addresses

5.3.1 Systems Parameters, 10H

Parameter Address (offset)	Data Type	Function and Coding	
0000H	Word	password	0000 ... 270EH
0002H	Byte	advance 1	00H = off 01H = 2.5 mm/hr. 02H = 5 mm/hr. 03H = 10 mm/hr, 04H = 20 mm/hr. 05H = 30 mm/hr. 06H = 40 mm/hr. 07H = 60 mm/hr. 08H = 120 mm/hr. 09H = 240 mm/hr. 0AH = 300 mm/hr. 0BH = 600 mm/hr. 0CH = 1200 mm/hr. 0DH = 1800 mm/hr. 0EH = 3600 mm/hr. 0FH = 7200 mm/hr.
0003H	Byte	Advance 2	same as Advance 1
0004H	Byte	Advance Pulse	00H = off 01H = 0.025 mm/pulse 02H = 0.050 mm/pulse 03H = 0.100 mm/pulse 04H = 0.200 mm/pulse
0005H	Byte	Display Cycle	00H = off 01H ...0AH = 1 ... 10 s
0006H	Byte	Date / Time Format	00H = European 01H = American
0007H	Byte	Alarm Acknowledgement	00H = no display 01H = man. acknowledge 02H = auto acknowledge
0008H	Byte	Language	00H = German 01H = English 02H = French
0009H	Byte	Simulation	00H = off 01H = ramp 02H = sine 03H = step (10 %)
000AH	Word	Simulation Period	0014 .... 07D0H
000CH	Word	Software Revision Identification	
000EH	Byte	Stop Key	00H = off 01H = on
000FH	Byte	Group Alarm	00H = off 01H = DO1 02H = DO2 03H = DO3 04H = DO4 05H = DO5 06H = DO6
0010H	Byte	Print Function: print advance at switch over	00H = off 01H = on
0011H	Byte	Print Function: expand text lines via limit value	00H = on 01H = off
0012H	Byte	Print Function: print double lines	00H = off 01H = on
0013H	Word	Print Function: double line spacing	32H ... 258H = 50 .... 600 in mm steps
0015H	Byte	History: operating mode	00H = off 01H = stand-by 02H = memo
0016H	Word	History: retention time	0001H ... 0B40H = 1 ... 2880 min

Systems Parameters, 10H Continued

Parameter Address (offset)	Data Type	Function and Coding
0018H	Byte	History: input stand-by activation 00H = off 01H = DI1 02H = DI2 03H = DI3 04H = DI4
0019H	Byte	History: stand-by stop via limit value violation sum of code numbers = channel selection code number per following table no LV 00H LV 1, blue channel 01H LV 2, blue channel 02H LV 1, red channel 04H LV 2, red channel 08H LV 1, green channel 10H LV 2, green channel 20H LV 1, violet channel 40H LV 2, violet channel 80H
001AH	Byte	History: position measuring system in stand-by mode 00H = scale lower limit 01H = last meas. value prior to stand-by
001BH	Byte	History: trigger stand-by with stop key 00H = no 01H = yes
001CH	Byte	History: advance in stand-by mode 00H = off 01H = 1 mm/hr.
001DH	Byte	History: stand-by after switching recorder on 00H = no 01H = yes
001EH	Byte	History: lag time 00H ... C8H = 0 ... 200 min.
001FH	Word	Print Function: message block 1 sum of code number = formation of block 1 (max. 1FFFH) code number per following table no block formation 0000H MV, blue channel 0001H MV, red channel 0002H MV, green channel 0004H MV, violet channel 0008H date & time line 0010H text line 1 0020H text line 2 0040H text line 3 0080H text line 4 0100H text line 5 0200H text line 6 0400H text line 7 0800H text line 8 1000H
0021H	Word	Print Function: message block 2 same coding as message block 1
0023H	Word	Print Function: message block 3 same coding as message block 1
0025H	Word	Print Function: message block 4 same coding as message block 1
0027H	Byte	paper empty signal 00H = off 01H = DO1 02H = DO2 03H = DO3 04H = DO4 05H = DO5 06H = DO6

5.3.2 Channel Parameters, 11 ... 14H

Parameter Address (offset)	Data Type	Function and Coding
0000H	Byte	Input Type 00H = off 01H = 4 ... 20 mA 02H = 0 ... 20 mA 03H = 0 ... 10 V 04H = ± 2.5 mA 05H = ± 5.0 mA 06H = ± 20 mA 07H = 0 ... 25 mV 08H = ± 25 mV 09H = ± 100 mV 0AH = 0 ... 2.5 H 0BH = ± 2.5 V 0CH = ± 20 V 0DH = Pt 100 (–50 ... +150) 0EH = Pt 100 (–50 ... +850) 0FH = TC B 10H = TC E 11H = TC J 12H = TC K 13H = TC L 14H = TC N 15H = TC R 16H = TC S 17H = TC T 18H = TC U
0001H	Byte	Physical Unit of Measure 00H = mA 01H = A 02H = mV 03H = V 04H = bar 05H = mbar 06H = psi 07H = Pa 08H = kPa 09H = °C 0AH = °F 0BH = K 0CH = m^3/hr. 0DH = l/s 0EH = % 0FH = ‰ 10H = MW 11H = 1/min 12H = -TEXT- (free unit)
0002H	Float	Measuring Range Lower Limit
0006H	Float	Measuring Range Upper Limit
000AH	Float	Display Range Lower Limit
000EH	Float	Display Range Upper Limit
0012H	Byte	Filtering Time 00H .... 3CH = 0 .... 60 s
0013H	Byte	Direction 00H = 0 –> 100 01H = 100 <– 0
0014H	Byte	Reduction 00H = off 01H = on
0016H	Byte	Reference Junction, TC 00H = 0 °C 01H = 20 °C 02H = 50 °C 03H = 60 °C 04H = 70 °C 05H = internal
0017H	Float	Limit Value # 1
001BH	Float	Limit Value # 2
001FH	Byte	Hysteresis for limit value 05H ... 63H = 5 ... 99 ‰
0020H	Byte	Hysteresis for dyn. limit value 03H ... 1EH = 3 ... 30 s
0021H	Byte	Text line for limit value 1 00H ... 08H
0022H	Byte	Text line for limit value 2 00H ... 08H
0023H	Byte	Text line for dyn. limit value 00H ... 08H

Channel Parameters, 11 ... 14H continued

Parameter Address (offset)	Data Type	Function and Coding
0024H	Byte	Limit Value Function 1 00H = min 01H = max
0025H	Byte	Limit Value Function 2 00H = min 01H = max
0026H	Char[ ]	free physical unit (5 characters) Char[0] = 1st character : Char[4] = 5th character Char[5] = 0 (string end)
002EH	Byte	user linearization 00H = off 01H = on
002FH	Word	Node 1 x1 = 0000 ... 03E8H (0 ... 1000 ‰)
0031H	Word	Node 1 y1 = 0000 ... 03E8H (0 ... 1000 ‰)
0033H	Word	Node 2 x2 = 0000 ... 03E8H (0 ... 1000 ‰)
0035H	Word	Node 2 y2 = 0000 ... 03E8H (0 ... 1000 ‰)
0037H	Word	Node 3 x3 = 0000 ... 03E8H (0 ... 1000 ‰)
0039H	Word	Node 3 y3 = 0000 ... 03E8H (0 ... 1000 ‰)
003BH	Word	Node 4 x4 = 0000 ... 03E8H (0 ... 1000 ‰)
003DH	Word	Node 4 y4 = 0000 ... 03E8H (0 ... 1000 ‰)
003FH	Word	Node 5 x5 = 0000 ... 03E8H (0 ... 1000 ‰)
0041H	Word	Node 5 y5 = 0000 ... 03E8H (0 ... 1000 ‰)
0043H	Word	Node 6 x6 = 0000 ... 03E8H (0 ... 1000 ‰)
0045H	Word	Node 6 y6 = 0000 ... 03E8H (0 ... 1000 ‰)
0047H	Word	Node 7 x7 = 0000 ... 03E8H (0 ... 1000 ‰)
0049H	Word	Node 7 y7 = 0000 ... 03E8H (0 ... 1000 ‰)
004BH	Word	Node 8 x8 = 0000 ... 03E8H (0 ... 1000 ‰)
004DH	Word	Node 8 y8 = 0000 ... 03E8H (0 ... 1000 ‰)
004FH	Byte	Pt 100 Connection 00H = 2-wire connection 01H = 3-wire connection
0050H	Byte	Relay Contact Limit Value 1 00H = off 01H = DO1 02H = DO2 03H = DO3 04H = DO4 05H = DO5 06H = DO6
0051H	Byte	Relay Contact LV 2 (same as LV 1)
0052H	Byte	Relay Contact Gradient (same as LV 1)
0053H	Byte	Pointer position for cable break at sensor 00H = scale lower limit 01H = scale upper limit
0054H	Byte	Cable resistance for Pt 100, 2-wire connection 00H = 10 Ω 01H = 20 Ω 02H = 40 Ω 03H = internal
0055H	Byte	Places after decimal point at measurement value display 00H = floating-point 01H = 0 02H = 1 03H = 2 04H = 3
0056H	Char[ ]	Text line for double line (max. 32 characters) Char[0] = 1st character Char[1] = 2nd character : Char[1FH] = 32nd character Char[20H] = 0 (string end)
0077	Byte	Balancing: Operating Mode 00H = off 01H = x 02H = Σx 03H = ΔΣx 04H = Δx
0078	Byte	Balancing: group registration with measuring system 00H = off 01H = on

Channel Parameters, 11 ... 14H continued

Parameter Address (offset)	Data Type	Function and Coding
0079H	Byte	Balancing: External Interval Control 00H = off 01H = DI1 02H = DI2 03H = DI3 04H = DI4
007AH	Byte	Balancing: Internal Interval Control 00H = 15 min 01H = 30 min 02H = 1 hr. 03H = 2 hr. 04H = 3 hr. 05H = 6 hr. 06H = 8 hr. 07H = 12 hr. 08H = 1 d 09H = 7 d 0AH = 1 month
007BH	Word	Balancing: Synchronous Time = Start Time Interval high byte 00H ... 17H = hour (0 ... 23) low byte 00H ... 3BH = minute (0 ... 59)
007DH	Byte	Balancing: Synchronous Day 00H = off 01H ... 1FH = day (1 ... 31)
007EH	Byte	Balancing: Comment Line 00H = without text line 01H ... 08H = text lines 1 ... 8
007FH	Float	Balancing: Value Entry, Limit Value 3F800000 ... 4AE4E1C0H = 1 ... 7,500E6
0083H	Byte	Balancing: Relay Contact Limit Value 00H = off 01H = DO1 02H = DO2 03H = DO3 04H = DO4 05H = DO5 06H = DO6
0084H	Byte	Reserve
0085H	Byte	Reserve
0086H	Byte	Trigger System Hold 00H = off 01H = DI1 02H = DI2 03H = DI3 04H = DI4
0087H	Byte	Recording Range, Start Value 00H ... 5AH = 0 ... 90 %
0088H	Byte	Recording Range, End Value 0AH ... 64H = 10 ... 100 %

5.3.3 Text Lines, 17H

Parameter Address (offset)	Data Type	Function and Coding
00 ... 1FH	Char [ ]	Text Line #1 (1st character for offset 00)
20 ... 3FH	Char [ ]	Text Line #2 (1st character for offset 20)
40 ... 5FH	Char [ ]	Text Line #3
60 ... 7FH	Char [ ]	Text Line #4
80 ... 9FH	Char [ ]	Text Line #5
A0 ... BFH	Char [ ]	Text Line #6
C0 ... DFH	Char [ ]	Text Line #7
E0 ... FFH	Char [ ]	Text Line #8

Otherwise unoccupied character positions must be occupied by the character 20H. Every character must lie within a range of 12 to 130. If the recorder detects invalid characters, they are replaced with 20H and a negative acknowledgement is sent in response.

5.3.4 Print Intervals, 18H

Parameter Address (offset)	Data Type	Function and Coding
0000H	Byte	Print Intervals for Text #1 00H = off 01H = 15 min 02H = 30 min 03H = 1 hr. 04H = 2 hr. 05H = 3 hr. 06H = 8 hr. 07H = 12 hr. 08H = 24 hr.
0001H	Byte	Print Intervals for Text #2 same as Text 1
0002H	Byte	Print Intervals for Text #3 same as Text 1
0003H	Byte	Print Intervals for Text #4 same as Text 1
0004H	Byte	Print Intervals for Text #5 same as Text 1
0005H	Byte	Print Intervals for Text #6 same as Text 1
0006H	Byte	Print Intervals for Text #7 same as Text 1
0007H	Byte	Print Intervals for Text #8 same as Text 1
0008H	Byte	Print Intervals for Measurement Values same as Text 1
0009H	Byte	Print Intervals for Date and Time same as Text 1

5.3.5 Synchronous Time for Text Printing, 19H

Parameter Address (offset)	Data Type	Function and Coding
0000H	Word	Synchronous Time for Text 1 High-Byte 00H ... 17H = hour (0 ... 23) Low-Byte 00H ... 3BH = minute (0 ... 59)
0002H	Word	Synchronous Time for Text 2
0004H	Word	Synchronous Time for Text 3
0006H	Word	Synchronous Time for Text 4
0008H	Word	Synchronous Time for Text 5
000AH	Word	Synchronous Time for Text 6
000CH	Word	Synchronous Time for Text 7
000EH	Word	Synchronous Time for Text 8
0010H	Word	Synchronous Time for Measurement Values
0012H	Word	Synchronous Time for Date and Time

Synchronous time is also processed by the recorder in the 24 hour format for the US date format.

5.3.6 Communications Parameters, 1AH

Parameter Address (offset)	Data Type	Function and Coding
0000H	Byte	Device Address 00H ... 7EH = 0 ... 126
0001H	Byte	Baud Rate 00H = 300 01H = 600 02H = 1200 03H = 2400 04H = 4800 05H = 9600 06H = 19200
0002H	Byte	Parity 00H = none 01H = even 02H = odd
0003H	Byte	Interface Type 00H = RS 232C 01H = RS 485

Device address 131 is designated as a broadcast address. A message to this address is processed by all recorders.
No message is transmitted to the initiator of the message.

5.3.7 Assignment of Binary Inputs, 1BH

Parameter Address (offset)	Data Type	Function and Coding
0000H	Byte	Event Mark #1 00H = off 01H = DI1 02H = DI2 03H = DI3 04H = DI4
0001H	Byte	Event Mark #2 (same as event mark #1)
0002H	Byte	Event Mark #3 (same as event mark #1)
0003H	Byte	Event Mark #4 (same as event mark #1)
0004H	Byte	Trigger Printing, Text Line #1 (same as event mark #1)
0005H	Byte	Trigger Printing, Text Line #2 (same as event mark #1)
0006H	Byte	Trigger Printing, Text Line #3 (same as event mark #1)
0007H	Byte	Trigger Printing, Text Line #4 (same as event mark #1)
0008H	Byte	Trigger Printing, Text Line #5 (same as event mark #1)
0009H	Byte	Trigger Printing, Text Line #6 (same as event mark #1)
000AH	Byte	Trigger Printing, Text Line #7 (same as event mark #1)
000BH	Byte	Trigger Printing, Text Line #8 same as event mark #1)
000CH	Byte	Trigger Printing, Meas. Values (same as event mark #1)
000DH	Byte	Trigger Printing, Date & Time (same as event mark #1)
000EH	Byte	Release Parameter Setting (same as event mark #1)

5.3.8 Date and Time, 1CH

Parameter Address (offset)	Data Type	Function and Coding
0000H	Byte	Day 01H ... 1FH = 1 ... 31
0001H	Byte	Month 01H ... 0CH = 1 ... 12
0002H	Byte	Year 00H ... 63H = 00 ... 99
0003H	Byte	Hour 00H ... 17H = 00 ... 23
0004H	Byte	Minute 00H ... 3BH = 00 ... 59

5.3.9 Calibration Data, 1DH
[data can only be read]

Parameter Address (offset)	Data Type	Function and Coding
0000H ... 0007H	Word	Channel: blue, red, green, violet paper zero-line 0000H ... FFFFH
0008H ... 000FH	Word	Channel: blue, red, green, violet paper 100% line 0000H ... FFFFH
0010H ... 0017H	Word	Channel: blue, red, green, violet input calibration start value
0018H ... 001FH	Word	Channel: blue, red, green, violet input calibration end value
0020H ... 0027H	Word	Channel: blue, red, green, violet Cable resistance for Pt 100, 2-wire connection
0028H ... 002FH	Word	offset correction

5.3.10 Channel Measurement Values and Device Status, 1EH
[data can only be read]

Parameter Address (offset)	Data Type	Function and Coding
0000H	Float	Measurement Channel, blue
0004H	Float	Measurement Channel, red
0008H	Float	Measurement Channel, green
000CH	Float	Measurement Channel, violet

Channel Measurement Values and Device Status, 1EH continued

Parameter Address (offset)	Data Type	Function and Coding
0018H	Byte	Status, DI 7 6 5 4 3 2 1 0 DI1 = on DI2 = on DI3 = on DI4 = on
0019H	Byte	Status, DO 7 6 5 4 3 2 1 0 DO1 = on DO2 = on DO3 = on DO4 = on DO5 = on DO6 = on
001AH	Byte	Status, external advance selection 0 = input open, advance 1 active 1 = input closed, advance 2 active
001BH	Byte	Status, external advance control 0 = input open, advance 1 or 2 active 1 = input closed, advance off
001CH	Word	Self-Test Alarm Status F E D C B A 9 8 7 6 5 4 3 2 1 0 CPU int. RAM ext. RAM clock relay driver channel adapter self-test, blue self-test, red self-test, green self-test, violet read cal. EEPROM read param. EEPROM
001EH	Word	Self-Test Alarm Acknowledgement Status Assignment of bits as above (Self-Test Alarm Status) 0 = Alarm Acknowledged
0020H	Word	System Alarm Status F E D C B A 9 8 7 6 5 4 3 2 1 0 check sum., cal. check sum, param. write, cal. E2 write, param. E2 watchdog reset printer queue full printer error power failure, clock advance too large incorrect input type
0022H	Word	System Alarm Acknowledgement Status Assignment of bits as above (System Alarm Status) 0 = Alarm Acknowledged
0024H	Byte	Limit Value Alarm Status F E D C B A 9 8 7 6 5 4 3 2 1 0 blue, LV 1 red, LV 1 green, LV 1 violet, LV 1 blue, LV 2 red, LV 2 green, LV 2 violet, LV 2 blue, gradient red, gradient green, gradient violet, gradient
0026H	Word	Limit Value Alarm Acknowledgement Status Assignment of bits as above (Limit Value Alarm Status) 1 = Alarm Acknowledged
0028H	Word	Channel Adapter Communication Alarm Status F E D C B A 9 8 7 6 5 4 3 2 1 0 ComEr. blue ComEr. red ComEr. green ComEr. violet
002AH	Word	Channel Adapter Comm. Alarm Acknowledgement Status Assignment of bits as above (Chan. Adpt. Comm. Alarm) 1 = Alarm Acknowledged

Channel Measurement Values and Device Status, 1EH continued

Parameter Address (offset)	Data Type	Function and Coding
002CH	Byte	Registration Systems 7 6 5 4 3 2 1 0 system, green system, red system, blue system, violet
002DH	Byte	Channel Adapter Type 0 = standard 1 = universal 255 = unknown type
002EH	Byte	Installation, DI and DO 0 = none 1 = installed
002FH	Byte	Serial Interface 0 = none 1 = installed
0030H	Byte	Print Head 0 = not installed 1 = installed
0031H	Word	Remaining Paper Length

6 Formation of Text Blocks

If variable parameters are to be printed at the beginning or end of a batch process (printer channel must be installed at recorder), a complete text line can be transmitted to the recorder with parameter field address F1H.

6.1 Transmit Print Lines to Recorder

(with parameter field address F1H)

A text line with 16 characters is transmitted to the recorder with this message. The recorder enters the message into the printer queue. If the queue is empty, printing of the text is started immediately, otherwise the text lines stored in the queue are printed first. The recorder acknowledges the message with acknowledgement code 10H, if the message has been received error-free and entered into the queue. If the queue is full, response is made with acknowledgement code 11H.

The message format is as follows:

SD2/LE/LEr/SD2/DA/SA/FC/aa/oo/dd/cc/[text line]/FCS/ED

L

The following applies:

SD2 = 68H	Start delimiter
LE = 17H	Number of data bytes + 7
LEr = 17H	Repeat LE
SD2 = 68H	Repeat start delimiter
DA	Destination address (bus user address)
SA	Source address
FC = 16H	Frame control
aa = F1H	Parameter field base address
oo = 00H	Stuffing byte
dd	Date control 00H = print text without date, without time 01H = print text with time 02H = print text with date 03H = print text with date and time
cc = 10H	Number of data bytes
Text Line	16 ASCII characters, unused characters must be set to 20H (space)
FCS	Frame check sequence
ED = 16H	End delimiter
L	Number of bytes in FCS

6.2 Printer Status Query

The number of lines in the printer queue can be queried with the following message.

The query to the recorder is as follows:

SD3/DA/SA/FC/aa/oo/oo/cc/xx/xx/xx/xx/FCS/ED

L

The following applies:

SD3 = A2H	Start delimiter
DA	Destination address (bus user address)
SA	Source address
FC = 15H	Frame control
aa	Parameter field base address (F1H)
oo oo	2 byte parameter address (offset) (0000H)
cc	Number of queried data bytes (19H)
xx xx xx xx	4 arbitrary bytes
FCS	Frame check sequence (sum of hex values from L frames)
ED = 16H	End delimiter
L	Number of bytes in FCS

The recorder responds as follows:

SD2/LE/LEr/SD2/DA/SA/FC/aa/FCS/ED

L

The following applies:

SD2 = 68H	Start delimiter
LE = 17H	Number of data bytes + 7
LEr = 17H	Repeat LE
SD2 = 68H	Repeat start delimiter
DA	Destination address (bus user address)
SA	Source address
FC = 16H	Frame control
aa	Number of messages in queue
FCS	Frame check sequence
ED = 16H	End delimiter
L	Number of bytes in FCS

7 Character Set Table

Character	Coding		Character	Coding	
	Dec	Hex		Dec	Hex
µ	12	C	G	71	47
π	13	D	H	72	48
σ	14	E	I	73	49
Σ	15	F	J	74	4A
τ	16	10	K	75	4B
Φ	17	11	L	76	4C
Ω	18	12	M	77	4D
Å	19	13	N	78	4E
å	20	14	O	79	4F
Ä	21	15	P	80	50
ä	22	16	Q	81	51
Ö	23	17	R	82	52
ö	24	18	S	83	53
Ü	25	19	T	84	54
ü	26	1A	U	85	55
←	27	1B	V	86	56
√	28	1C	W	87	57
²	29	1D	X	88	58
£	30	1E	Y	89	59
¥	31	1F	Z	90	5A
	32	20	[	91	5B
!	33	21	\	92	5C
"	34	22	]	93	5D
#	35	23	^	94	5E
$	36	24	_	95	5F
%	37	25	`	96	60
&	38	26	a	97	61
'	39	27	b	98	62
(	40	28	c	99	63
)	41	29	d	100	64
*	42	2A	e	101	65
+	43	2B	f	102	66
,	44	2C	g	103	67
-	45	2D	h	104	68
.	46	2E	i	105	69
/	47	2F	j	106	6A
0	48	30	k	107	6B
1	49	31	l	108	6C
2	50	32	m	109	6D
3	51	33	n	110	6E
4	52	34	o	111	6F
5	53	35	p	112	70
6	54	36	q	113	71
7	55	37	r	114	72
8	56	38	s	115	73
9	57	39	t	116	74
:	58	3A	u	117	75
;	59	3B	v	118	76
<	60	3C	w	119	77
=	61	3D	x	120	78
>	62	3E	y	121	79
?	63	3F	z	122	7A
@	64	40	{	123	7B
A	65	41	|	124	7C
B	66	42	}	125	7D
C	67	43	~	126	7E
D	68	44	▮	127	7F
E	69	45	³	128	80
F	70	46	‰	129	81
			°	130	82

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