LineMaster 300

Continuous-line recorder

Interface description

42/43-34 EN

Rev. 01

Contents

1 Description

Provided for communication with the continuous-line recorder is an RS 485 interface. The type of data protocol used is designed to suit DIN 19 245 Part 1 (Profibus protocol). Only a part of the directives were taken into account. Among others, the directives on the operation of a multimaster (Token-Passing-Procedures) were not taken into account, since the recorder is always a passive subscriber.

2 Technical data for bus connection RS 485

Bus structure
- Line without branchings
- Stub to subscriber < 0.3 m

Medium
- shielded, twisted 2-wire line
- surge resistance 100...130 Ω, for f > 100 kHz
- Cable capacity < 60 pF/m
- Cross section ≥ 0.22 mm^2

Line length
- ≤ 1200 m

Number of bus subscribers
- 32 (active and passive)

Transmission speed
- 600 / 1200 / 2400 / 4800 / 9600 / 19200 baud

Type of transmission
- symmetrical

Driver output
- idle state ±5 V, with load ±1.5 V
- load resistance 60 Ω

Receiver
- sensitivity 200 mV
- input resistance 12 kΩ

Grounding
- The shield should be grounded on both ends to arrest high frequency fault states

Potential balancing
- Potential variations between the data reference potentials (GND) of all bus subscribers may not exceed ±7 V

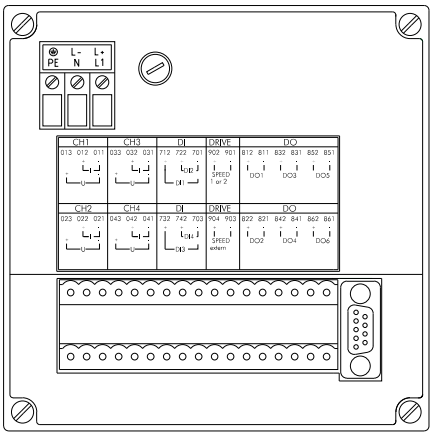

Fig. 1 Rear wall with RS 485 interface
Z-18750

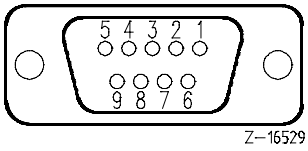

Fig. 2 Terminal layout of RS 485 interface
Z-16529 (9-pin connector SUB D)
- Pin 1 shielding
- Pin 2 I/O converter (+)
- Pin 3 RxD (+)
- Pin 5 GND (reference potential)
- Pin 6 +5 V
- Pin 7 I/O converter (−)
- Pin 8 RxD (−)

The voltage of +5 V on pin 6 is only required when the recorder is used as a bus end-unit.

The shielding is applied through a blade-type terminal on the recorder case.

The quiescent bus potential is fixed with the resistors R_d, R_t und R_u.

R_d = 390 Ω
R_t = 150 Ω
R_u = 390 Ω

Wiring should take place in accordance with Fig. 3. The resistors R_d, R_t and R_u should be installed in the 9-pin bus connector in such way that the recorder can be separated from the bus with the bus remaining closed.

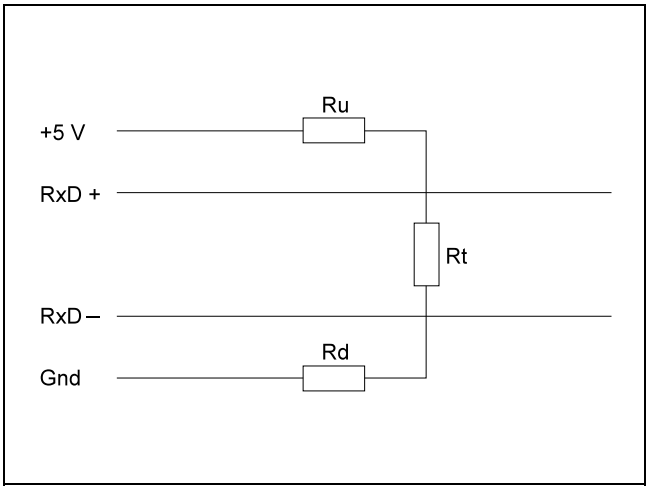

Fig. 3 Bus end wiring
Z-17340

Data formats

The data to be transmitted can be formatted in four different ways:

- Type BYTE Value range 0...255
- Type CHAR Value range −128...+127
- Type WORD Value range 0...65535
- Type FLOAT Value range ±1.175494E−38..±3.402823E+38

BYTE

The BYTE format is used for the selection of parameters from the tables in the “Parameter” section.

CHAR

The CHAR format is used when ASCII characters are transmitted. The character set accepted by the recorder is listed in a table contained in the operating instructions. Hex-codes should be used.

WORD

The WORD format consists of 2 bytes and is used when integers are to be transmitted without preceding signs (integer values). During transmission, high bytes precede low bytes.

For example: The value 820 should be transmitted.

820 dec = 03 34 hex

FLOAT

The FLOAT format consists of 4 bytes and is used when floating decimal values are to be transmitted. The IEEE 754 format should be used. The numerical range accepted by the recorder lies within −9.990E9 and +9.990E9.

For example: transmit the value −12.5.

−12.5 dec = C1 48 00 00 hex

Determination of the hex figure

The general form of the floating decimal point is: (sign) $\times$ $2^{Exp-127}$ $\times$ (Rest).

The binary display of the figure −12.5 is

```
11000001 01001000 00000000 00000000
||       |                        |
||  Exp  |          Rest          |
||(8 bit)|        (23 bit)        |
|
negative sign
```

1. Calculate the sign:
   the bit is set in case of a negative sign.

2. Calculate the exponent:
   the highest exponent is calculated:

   EXP = INT [lg"$Figure_{dec}$"/lg2] + 127

   in the example:
   INT [lg12.5/lg2] + 127 = 130 dec = 82 hex = 10000010 binary

3. Calculate the rest:

   Rest = "$Figure_{dec}$"/2^{Exp}

   in the example:
   $12.5/2^3$ = 1.562

4. Transform into binary code:

   Rank : $2^0 + 2^{-1} + 2^{-2} + 2^{-3} + 2^{-4} + ... + 2^{-23}$
   In the example: 1 1 0 0 1

   The value of 2^0 is always 1 and is therefore not carried forward.

Data transmission

General

A combination of telegram characters is grouped together for the transmission of data. The telegrams accept the “Handshake function”, i.e. each telegram from the computer to the recorder must be first confirmed before being sent.

Notice
Prior to data transfer the interface address and the baud rate must be defined.

Telegram characters

(UART characters or Frame)

Every sign (frame) has 11 bits, a startbit (ST) with “logical 0” signal, 8 information bits with “logical 0” or “1” signal, an optional parity bit (P) with “logical 0” or “1” signal and a stopbit (SP) with logical “1” 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

Permissible address

The recorder only answers queries which use the address set in the unit as target address. Permissible are values between 0 and 126 (= 7E H). These can be allocated in any manner desired. However, no double addresses may be allocated. The recorder does not reply to faulty messages (check sum, wrong address, other faulty reception). Also, faulty messages are not acknowledged.

Some data ranges are identified as “read only” fields. Attempts to write into such fields will be ignored by recorder.

Broadcast address

Messages to the broadcast address (133 dec) are processed by all recorders, no response is however given to a broadcast message.

Telegram formats, framework specifications

The recorder accepts the following types of telegram:

Telegram SD1

Telegram with fixed information field length without data field

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

is used for sending a query to the recorder and for sending acknowledgement by recorder.

Meaning:

SD1 = 10H	Start byte (start delimiter), code: 10H
DA	Target address (Destination Address)
SA	Source address (Source Address)
FC	Function code (Frame Control)
FCS	Test byte (Frame Check Sequence) Sum of the hex value of the L frame without transformation for FFH
ED	End byte (End Delimiter), code: 16H
L	number of bytes in FCS = 3

In reply to a query with FC = 01H (ident-interrogation) the recorder will also respond in the SD1 format. If the unit has no self-test function, the response is in FC = 10H, otherwise it is FC = 11H.

The ident recognition of the recorder is conducted with the function code 4EH as follows:

In reply to a query with FC = 4EH the recorder replies with a message in SD2 format.

The “Data field” of the recognition message is assigned as follows:

LE_VN/LE_CT/LE_HR/LE_SR/VN/CT/HR/SR

LE_VN = 03H	
LE_CT	= 11H
LE_HR	= 05H
LE_SR	= 05H
VN	= “xxx” Manufacturer’s code
CT	= “41422; xxx” Catalog number and apparatus
HR	= “CPU:A”” Index of the recorder CPU card
SR	= “00.00.16” Example for software release

Telegram SD2

Telegram with variable information field length

SD2/LE/LEr/SD2/DA/SA/FC/aa/oo/oo/cc/data field/FCS/ED
|<-- L -->|

is used for sending data to the recorder and for sending replies from the recorder.

Meaning:

SD2	= 68H start byte
LE	number of data bytes + 7
LEr	repetition of LE
SD2	= 68H repetition of start byte
DA	target address (bus subscriber address)
SA	source address
FC	function code: 16H = send data to the recorder
aa	basic address of the parameter field
oo oo	2 byte parameter address (= offset)
cc	number of Datenbytes
data field	data for transmission
FCS	test byte (Frame Check Sequence) sum of hex values of the L frame without transformation for FFH
ED	= 16H end code
L	number of Bytes in FCS

Upon receiving a data message in SD2 format, the recorder responds with a message in SD1 format. FC = 10H if all data is accepted by the recorder, otherwise FC = 11H.

The altered data is written into the non-volatile memory (EEPROM) after receipt of the save command (see “Write unit status”).

The function code 16H is used to send data to the recorder. The recorder uses the function code 15H to send reply telegrams in SD2 format.

Telegram SD3

Telegram with fixed information length

SD3/DA/SA/FC/aa/oo/oo/cc/xx/xx/xx/xx/FCS/ED
|<-- L -->|

is used for sending a query to the recorder.

Meaning:

SD3	= A2H start byte
DA	target address (bus subscriber address)
SA	source address
FC	= 15H function code
aa	basic address of the parameter field
oo oo	2 byte parameter address (offset)
cc	number of data bytes
xx xx	
xx xx	any 4 bytes
FCS	check byte (Frame Check Sequence) sum of hex values of the L-frame without conversion for FFH
ED	= 16H end code
L	number of Bytes in FCS

The response is transmitted in SD2 format.

Meaning:

SD2	= 68H start byte
LE	number of data bytes + 3
LEr	repetition of LE
SD2	= 68H repetition of start byte
DA	target address
SA	source address
FC	= 15 H function code “read data”
aa	data bytes
FCS	test byte (Frame Check Sequence) sum of hex value of the L frame without conversion for FFH
ED	= 16H end code

Transmission rules

The idle state of the line corresponds to the logical “1” signal. Before data transmission starts − from the PC − a minimum time of 33 bits (syn-time) as idle state is required for synchronisation.

Pauses of the length ≥ 3 frames shall be interpreted as telegram end.

The recorder inserts a pause of ≤ 300 ms each between the reception of the last stop bit and the first start bit.

Pause between two telegrams:

Telegram	Break ≤ 300 ms	Answer telegram

Gaps between two frames:

Frame	≤ 0,2 ms	Frame

The receiver checks

−	per frame	Start ,stop and parity bit and
−	per telegram	Start, DA, SA, FCS and end byte.

If the check produces a negative result, the entire telegram should be rejected as incorrect.

In the reply, the recorder takes over the source address of the transmitted telegram as target address and inserts its own address as source address.

Parameters

Addressable parameters

The following parameters can be read or modified with telegrams SD2 and SD3 (see corresponding sections on pages 7 and 8). To be able to do this, a parameter field address (see table on the right), the parameter address (offset, page 10) and the code of the parameter value are required.

For example

The following information is required for the first chart speed:

Parameter field address	10H
Parameter address (offset)	0002H
Code for the chart speed 20 mm/h	05H

Parameter field address

instrument function group	parameter field address
system parameter definition	10H
parameter measuring channel 1	11H
parameter measuring channel 2	12H
parameter measuring channel 3	13H
parameter measuring channel 4	14H
linearization table measuring channel 1	15H
linearization table measuring channel 2	16H
linearization table measuring channel 3	17H
linearization table measuring channel 4	18H
parameter mathematic channel 1	19H
parameter mathematic channel 2	1AH
parameter mathematic channel 3	1BH
parameter mathematic channel 4	1CH
parameter puls channel 1	1DH
parameter puls channel 2	1EH
parameter puls channel 3	1FH
parameter puls channel 4	20H
parameter accounting channel 1	21H
parameter accounting channel 2	22H
parameter accounting channel 3	23H
parameter accounting channel 4	24H
parameter output channel blue	25H
parameter output channel red	26H
parameter output channel green	27H
parameter output channel violet	28H
scaling lines output channel blue	29H
scaling lines output channel red	2AH
scaling lines output channel green	2BH
scaling lines output channel violet	2CH
text lines 1...5	2DH
text lines 6...10	2EH
synchronus times for printout	30H
intervals for printout	31H
assignment DI	32H
date and time	33H
read instrument status	34H
write instrument status	35H
send measuring values to recorder	36H
read measuring values output channels	37H
read measuring values measuring channels	38H
read measuring values mathematic channels	39H
read measuring values puls channels	3AH
read measuring values accounting channels	3BH
calibration data (read only)	40H
send printout line / read queue status	F1H
communications error register	FFH

The above-named addresses are input into the appropriate fields of a message during communication. From the address, the recorder determines the data range to be transmitted. The data transmission takes place with messages in the SD2 and SD3 formats. To read a data field, FC = 15H must always be used, FC = 16H must be used to write a data field. If invalid parameter values are contained in a message, the negative acknowledgement (SD1, FC = 11H) is transmitted by the recorder in reply.

Parameter addresses

System parameter 10H

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Word	Password	0...9999
0002H	Byte	Chart speed 1	00H = off 01H = 1 mm/h 02H = 2,5 mm/h 03H = 5 mm/h 04H = 10 mm/h 05H = 20 mm/h 06H = 30 mm/h 07H = 40 mm/h 08H = 60 mm/h 09H = 120 mm/h 0AH = 240 mm/h 0BH = 300 mm/h 0CH = 600 mm/h 0DH = 1200 mm/h 0EH = 1800 mm/h 0FH = 3600 mm/h 10H = 7200 mm/h
0003H	Byte	Chart speed 2	like chart speed 1
0004H	Byte	Alarm value chart speed	like chart speed 1
0005H	Word	Alarm value mask AK = output channel	01H = GW 1 AK blue 02H = GW 2 AK blue 04H = GW 3 AK blue 08H = GW 4 AK blue 10H = GW 1 AK red 20H = GW 2 AK red 40H = GW 3 AK red 80H = GW 4 AK red 100H = GW 1 AK green 200H = GW 2 AK green 400H = GW 3 AK green 800H = GW 4 AK green 1000H = GW 1AK violet 2000H = GW 2AK violet 4000H = GW 3AK violet 8000H = GW 4AK violet
0007H	Byte	Runtime alarm value speed	00H = 0 s to FFH = 255 s
0008H	Byte	Chart speed pulse	00H = off 01H = 0.025 mm/pulse 02H = 0.050 mm/pulse 03H = 0.100 mm/pulse 04H = 0.200 mm/pulse
0009H	Byte	Pulse divider	00H = pulse divider off 01H = pulse divider on

Parameter address (Offset)	Data type	Function	Value range and coding
000AH	Word	Create signal block 1 The codes of the lines grouped into a signal block are obtained by grouping the individual codes together. Signal block 1 is coupled to DI 1.	00H = off 01H = value AK blue 02H = value AK red 04H = value AK green 08H = value AK violet 10H = value of enabled channels 20H = date/time 40H = text 1 80H = text 2 100H = text 3 200H = text 4 400H = text 5 800H = text 6 1000H = text 7 2000H = text 8 4000H = text 9 8000H = text 10
000CH	Word	Signal block 2 Signal block 2 is coupled to DI 2.	as for signal block 1
000EH	Word	Signal block 3 Signal block 3 ist an DI 3 gekoppelt.	as for signal block 1
0010H	Word	Signal block 4 Signal block 4 is coupled to DI 4.	as for signal block 1
0012H	Byte	Release Time delay compensation	00H = inhibited 01H = enabled
0013H	Byte	Release of cyclical message printout of the time delay compensation	00H = inhibited 01H = enabled
0014H	Byte	Cycle time Display step enabling	00H = off 01H...0AH = 1...10 s
0015H	Byte	Alarm processing	00H = no alarms 01H = manual acknowledgement 02H = automatic acknowledgement
0016H	Byte	Language of the user guidance	00H = German 01H = English 02H = French
0017H	Byte	Type of simulation	00H = off 01H = ramp 02H = sinus 03H = step (10 %)
0018H	Word	Simulation period	0014..07D0H = 20...2000 s
001AH	Word	Revision code	
001CH	Byte	Enable stop key	00H = key inhibited 01H = key enabled
001DH	Byte	Collective alarm output	00H = off 01H...06H = DO 1...DO 6 17H...14H = DO 7...DO 20 via IO converter
001EH	Byte	print chart speed changeover	00H = no 01H = yes
001FH	Byte	Alarm value text line with alarm	00H = no 01H = yes

Parameter address (Offset)	Data type	Function	Value range and coding
0020H	Byte	Enable scaling printout	00H = inhibited 01H = enabled
0021H	Word	Spacing of scaling lines	0028...01F4H = 40...500 mm
0023H	Byte	Date / time format	00H = European 01H = American
0024H	Byte	Operation mode summer / winter time changeover	00H = no changeover 01H = changeover after input 02H = automatic changeover
0025H	Date	Changeover date Summer time	01.01. ... 31.12.
0027H	Time	Changeover time period summer time	00:00...23:59
0029H	Date	Changeover date winter time	01.01. ... 31.12.
002BH	Time	Changeover time winter time date	00:00...23:59
002DH	Byte	Status time changeover	00H = active in winter time 01H = active in summer
002EH	Byte	Connection of IO converter	00H = no 01H = yes
002FH	Byte	Relay output for end-of-paper	00H = no message 00H = off 01H...06H = DO 1...DO 6 17H...14H = DO 7...DO 20 via IO converter
0030H	Byte	Reserved	
0031H	Byte	Reserved	
0032H	Byte	Unit address	0...126 = 00..7EH
0033H	Byte	Baud rate	00H = 1200 01H = 2400 02H = 4800 03H = 9600 04H = 19200
0034H	Byte	Brightness of display	00H...03H
0035H	Time	Time for external clock synchronisation	hour (high byte) 00...23 = 00...17H minute (low byte) 00...59 = 00...3BH
0037H	DWord	Initial value for batch counter	0000H....5F5E0FFH = 0....99 999 999
003BH	Int	Changeover value for counter	−FC18H....03E8H = −1000...+1000
003DH	Byte	Batch counter text line	00H = counter off 01H = text line 1 .. 0AH = text line 10
003EH	Byte	Reset input of the batch counter	00H = no reset 01H = DI 02H = DI 2 03H = DI 3 04H = DI 4 05H = DI 7 IO converter .. 0CH = DI14 IO converter
003FH	Byte	Type of operation History function	00H = not active 01H = standby 02H = standby with measured value storage
0040H	Word	Maximum saving time	0000H...1C20H = 0...7200 min

Parameter address (Offset)	Data type	Function	Value range and coding
0042H	Byte	Activation of standby via binary input	00H = none 01H = DI 1 02H = DI 2 03H = DI 3 04H = DI 4 05H = DI 7 IO converter .. 0CH = DI14 IO converter
0043H	Word	Alarm value coding for standby end AK=output channel	01H = GW 1 AK blue 02H = GW 2 AK blue 04H = GW 3 AK blue 08H = GW 4 AK blue 10H = GW 1 AK red 20H = GW 2 AK red 40H = GW 3 AK red 80H = GW 4 AK red 100H = GW 1 AK green 200H = GW 2 AK green 400H = GW 3 AK green 800H = GW 4 AK green 1000H = GW 1 AK violet 2000H = GW 2 AK violet 4000H = GW 3 AK violet 8000H = GW 4 AK violet
0045H	Byte	Position of the measuring element at standby	00H = scale start 01H = on last measured value
0046H	Byte	Standy via stop key can be activated	00H = no 01H = yes
0047H	Byte	Standby chart speed	like chart speed 1
0048H	Byte	Standby active on switching on the recorder	00H = no 01H = yes
0049H	Byte	Tracking time (delayed switch-on of the standby)	00H....C8H = 0...200 min
004AH	Byte	Relay status	00H = quiescent current 01H = operating current

Measuring channel parameter 11H...14H

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Byte	Input type universal card	0H = off 01H = 4...20 mA 02H = 0...20 mA 03H = ±2.5 mA 04H = ±2.5 mA 05H = ±20 mA 06H = 0...25 mV 07H = ±25 mV 08H = ±100 mV 09H = 0...2.5 V 0AH = ±2.5 V 0BH = 0...10 V 0CH = ±20 V 0DH = Pt100 I (−50..+150 °C) 0EH = Pt100 II (−200..+850 °C) 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 19H = USER 1AH = RS 485
		input type standard card	00H = off 01H = 4...20 mA 02H = 0...20 mA 03H = 0...10 V 04H = RS 485
0001H	Byte	Physical dimensional unit	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/h 0DH = l/s 0EH = % 0FH = 0/00 10H = MW 11H = 1/min 12H = free unit
0002H	Byte	Temperature unit	00H = °C 01H = °F
0003H	Byte	Measuring range changeover Display range	00H = none 01H = DI 1 02H = DI 2 03H = DI 3 04H = DI 4 05H = DI 7 IO converter .. 0CH = DI12 IO converter

Parameter address (Offset)	Data type	Function	Value range and coding
0004H	Float	Lower range value of measuring range 1	within the nominal range of the input type
0008H	Float	upper-range value of measuring range 1	within the nominal range of the input type
000CH	Float	Lower range value of measuring range 2	within the nominal range of the input type
0010H	Float	Upper range value of measuring range 2	within the nominal range of the input type
0014H	Float	Start value of display range 1	−9.99E9...+9.99E9
0018H	Float	Final value of display range 1	−9.99E9...+9.99E9
001CH	Float	Start value of display range 2	−9.99E9...+9.99E9
0020H	Float	Final value of display range 2	−9.99E9...+9.99E9
0024H	Byte	Enable channel for measured value display	00H = no 01H = yes
0025H	Byte	Enable channel for measured value printout	00H = no 01H = yes
0026H	Byte	Display function for display of measured value and scaling line	00H = linear 01H = linear with 1 kink point 02H = linear with 2 kink points 03H = logarithmich 04H = cos 05H = reciprocal
0027H	Byte	Numreical format	00H = decimal format 01H = exponential format
0028H	Byte	Number of post decimal points	00H = none 01H = one 02H = two 03H = three 04H = automatic
0029H	Float	Constant x1	within display range 1
002DH	Float	Constant x2	within display range 1
0031H	Float	Constant y1	within display range 1
0035H	Float	Constant y2	within display range 1
0039H	Byte	Filter time	00...3CH = 0...60 s
003AH	Byte	Inverse recording direction	00H = no 01H = yes
003BH	Byte	Square-rooting	00H = no 01H = yes
003CH	Byte	Reference junction temperature	00H = 0 °C 01H = 20 °C 02H = 50 °C 03H = 60 °C 04H = 70 °C 05H = internal
003DH	Byte	Enable break monitoring	00H = off 01H = on
003EH	Byte	Position of the measuring element in case of sensor break	00H= measured signal 0 % 01H= measured signal 100 %
003FH	Byte	User linearisation as a function of	00H = off 01H = nominal measuring range 02H = measuring range 03H = display range
0040H	Byte	Pt100 connection	00H = 2-wire 01H = 3-wire

Parameter address (Offset)	Data type	Function	Value range and coding
0041H	Byte	Line resistance	00H = 0 Ω 01H = 10 Ω 02H = 20 Ω 03H = 40 Ω 04H = use measured value
0042H	Byte	Input for measuring system hold	00H = none 01H = DI 1 02H = DI 2 03H = DI 3 04H = DI 4 05H = DI 7 IO converter .. 0CH = DI12 IO converter
0043H	char[7]	Free dimensional unit	use character set from the operating instructions
004AH	Byte	End code for free dimensional unit	00H
004BH	Word	ADC control for USER measuring range	0000H...FFFFH = 0...65535
004DH	Word	Constant 1 for USER measuring range	0000H...FFFFH = 0...65535
004FH	Word	Constant 2 for USER measuring range	0000H...FFFFH = 0...65535

Linearisation table to channels 15H...18H

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Word	Input value x1	00H...03E8H = 0...1000
0002H	Word	Output value y1	00H...03E8H = 0...1000
0004H	Word	Input value x2	00H...03E8H = 0...1000
0006H	Word	Output value y2	00H...03E8H = 0...1000
0038H	Word	Input value x15	00H...03E8H = 0...1000
003AH	Word	Input value y15	00H...03E8H = 0...1000
003CH	Word	Output value x16	00H...03E8H = 0...1000
003EH	Word	Output value y16	00H...03E8H = 0...1000

Mathematic channel parameter 19H...1CH

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Float	Result range of initial value	−9.99E9...+9.99E9
0004H	Float	Result range of final value	−9.99E9...+9.99E9
0008H	Byte	Show results on display	00H = no 01H = yes
0009H	Byte	Print results in measured value table	00H = no 01H = yes
000AH	Byte	Numerical format	00H = decimal format 01H = exponential format

000BH	Byte	Number of post decimal places	00H = none 01H = one 02H = two 03H = three 04H = automatic
000CH	Float	Constant memory K1	−9.99E9...+9.99E9
0010H	Float	Constant memory K2	−9.99E9...+9.99E9
0014H	Float	Constant memory K3	−9.99E9...+9.99E9
0018H	Float	Constant memory K4	−9.99E9...+9.99E9
001CH	char[7]	Free dimensional unit	use character set from the operating instructions
0023H	Byte	End code for for free dimensional unit	00H
0024H	char [32]	Function string	use character set from the operating instructions
0044H	Byte	End coding for function string	00H

Pulse channel parameter 1DH...20H

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Byte	Pulse input	00H = off 01H = DI 1 02H = DI 2 03H = DI 3 04H = DI 4
0001H	Byte	Type of operation	00H = off 01H = summation 02H = summation with static alarm value 03H = summation with dynamic alarm value
0002H	Byte	Summation interval	00H = 15 min 01H = 30 min 02H = 1 h 03H = 2 h 04H = 3 h 05H = 6 h 06H = 8 h 07H = 12 h 08H = 1 d 09H = 7 d 0AH = 1 month
0003H	Byte	control input for external interval control	00H = none 01H = DI 1 02H = DI 2 03H = DI 3 04H = DI 4 05H = DI 7 IO converter .. 0CH = DI12 IO converter
0004H	Byte	Synchronous day for interval end	00H = disregard day 01H...1FH = 1...31 days
0005H	Time	Synchronous time for interval end	00:00...23.59
0007H	Byte	Print format of the table	00H = no printout 01H...0FH (= sum of the coding figures) 01H = print interval sum 02H = print total sum 04H = print interval duration 08H = channel code drucken 80H = print table after switch-on

Parameter address (Offset)	Data type	Function	Value range and coding
0008H	Float	Start value of the collective counter	0000H...05F5E0FFH = 0...9999999
000CH	Float	Final value of the collective counter	0000H...05F5E0FFH = 0...99999999
0010H	Float	Change of count per pulse	0000H...05F5E0FFH = 0...99999999
0014H	Float	Statistical alarm value	0000H...05F5E0FFH = 0...99999999
0018H	Byte	Enable measured value display	00H = do not display 01H = display
0019H	Byte	Enable measured value table printout	00H = no 01H = yes
001AH	Byte	Display format	00H = interval counter 01H = summation counter 02H = rest value display
001BH	Byte	Relay contact for alarm value signalling	0H = none 01H = DO 1 02H = DO 2 03H = DO 3 04H = DO 4 05H = DO 5 06H = DO 6 07H = DO 7 IO converter .. 14H = DO 20 IO converter
001CH	Byte	Comment line for table printout	00H = none 01H = text line 1 02H = text line 2 .. 0AH = text line 10
001DH	char[7]	Free dimensional unit	use character set from the operating instructions
0024H	Byte	End code for free dimensional unit	00H
0025H	Byte	Number of positions for measured value display	00H = 4 positions 01H = 5 positions 02H = 6 positions 03H = 7 positions 04H = 8 positions
0026H	Byte	Collective counter reset position	00H = without reset 01H = with reset

Accounting for channel parameter 21H...24H

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Byte	Source channel	00H = no source 01H = channel 1 02H = channel 2 03H = channel 3 04H = channel 4 05H = mathematic channel 1 06H = mathematic channel 2 07H = mathematic channel 3 08H = mathematic channel 4
0001H	Byte	Type of operation	00H = off 01H = average value creation 02H = summation 03H = summation with dynamic alarm value 04H = summation with static alarm value

Parameter address (Offset)	Data type	Function	Value range and coding
0002H	Byte	Control input for external interval control	00H = no input 01H = DI 1 02H = DI 2 03H = DI 3 04H = DI 4 05H = DI 7 IO converter .. 0CH = DI12 IO converter
0003H	Byte	Accounting interval	00H = 15 min 01H = 30 min 02H = 1 h 03H = 2 h 04H = 3 h 05H = 6 h 06H = 8 h 07H = 12 h 08H = 1 d 09H = 7 d 0AH = 1 month
0004H	Time	Synchronous time for interval end	00:00....23.59
0006H	Byte	Synchronous time for interval end	00H = disregard day 01H...1FH = 1...31 days
0007H	Byte	Comment line for table printout	00H = none 01H = text line 1 02H = text line 2 .. 0AH =text line 10
0008H	Float	Alarm value	1...9.999E9
000CH	Byte	Relay contact for alarm value signalling	00H = no output 01H = DO 1 02H = DO 2 03H = DO 3 04H = DO 4 05H = DO 5 06H = DO 6 07H = DO 7 IO converter .. 14H = DO 20 IO converter
000DH	Byte	Rest value display	00H = no 01H = yes
000EH	Byte	Display accounting channel	00H = no 01H = yes
000FH	Byte	Print accounting channel in measured value table	00H = no 01H = yes
0010H	Byte	Print cumulative value on initiating the alarm value	00H = no 01H = yes
0011H	Byte	Print format of the accounting table	00H = no printout 01H = channel code 02H = start-end interval 04H = minimum 08H = maximum 10H = average value 20H = cumulative value

Output channelparameter 25H...28H

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Byte	Source channel	00H = no source 01H = channel 1 02H = channel 2 03H = channel 3 04H = channel 4 05H = mathematic channel 1 06H = mathematic channel 2 07H = mathematic channel 3 08H = mathematic channel 4 09H = pulse channel 1 0AH = pulse channel 2 0BH = pulse channel 3 0CH = pulse channel 4 0DH = accounting channel 1 0EH = accounting channel 2 0FH = accounting channel 3 10H = accounting channel 4
0001H	Byte	Print format of the scaling line	00H = no scaling 01H = module 2 02H = module 3 03H = module 4 04H = module 2 with offset at 20 % 05H = logarithmic 06H = reciprocal 07H = use scaled numerical text 08H = according to display format
0002H	Byte	Initial value Recording range	00H..5AH = 0...90 mm
0003H	Byte	Final value Display range	0AH...64H = 10...100 mm
0004H	Byte	Function of alarm value 1	00H = off 01H = min 02H = max
0005H	Byte	Function of alarm value 2	00H = off 01H = min 02H = max
0006H	Byte	Function of alarm value 3	00H = off 01H = positive gradient 02H = negative gradient 03H = absolute gradient 04H = positive band 05H = negative band 06H = absolute band
0007H	Byte	Function of alarm value 4	as for alarm value 3
0008H	Byte	Contact output for alarm value 1	00H = none 01H = DI 1 02H = DI 2 03H = DI 3 04H = DI 4 05H = DI 7 IO converter .. 0CH = DI12 IO converter
0009H	Byte	Contact output for alarm value 2	as for alarm value 1
000AH	Byte	Contact output for Alarm value 3	as for alarm value 1
000BH	Byte	Contact output for alarm value 4	as for alarm value 1

Parameter address (Offset)	Data type	Function	Value range and coding
000CH	Byte	Text assignement for alarm value 1	00H = none 01H = text line 1 02H = text line 2 .. 0AH =text line 10
000DH	Byte	Text assignment for alarm value 2	as for alarm value 1
000EH	Byte	Text assignment for alarm value 3	as for alarm value 1
000FH	Byte	Text assignment for alarm value 4	as for alarm value 1
0010H	Byte	Hysterese für alarm value 1 und 2	05H...63H = 5...99 0/00
0011H	Word	Timebase for the gradient function	0003H...0E10H = 03...3600 s
0013H	Float	Alarm value 1	within the display range of the source channel
0017H	Float	Alarm value 2	within the display range of the source channel
001BH	Float	Width of the positive band	in units of the display range of source channel
001FH	Float	Width of the negative band	in units of the display range of source channel
0023H	Word	Duration of the average value interval for band monitoring	0000H = group average value 0001H...0E10H = 0...3600 s
0025H	Byte	Mask for group average of channel measuring data (only possible for blue channel)	00H = not active 01H = channel 1 02H = channel 2 04H = channel 3 08H = channel 4 10H = mathematic channel 1 20H = mathematic channel 2 40H = mathematic channel 3 80H = mathematic channel 4

Scaling texts 29H...2CH

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	char[48]	Text for scaling figures as default data for free scaling	Use character set from the operating instructions
0030H	Byte	Marking for the end of the character string	00H
0031H	char[32]	Text line on scaling line as measuring point code	Use character set from the operating instructions
0051H	Byte	Marking for the end of the character string	00H

Text lines 1...5 2DH

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	char[32]	Text line 1	use character set from the operating instructions
0020H	Byte	Marking for the end of the character string	00H
0021H	char[32]	Text line 2	use character set from the operating instructions

0041H	Byte	Marking for the end of the character string	00H
0042H	char[32]	Text line 3	use character set from the operating instructions
0062H	Byte	Marking for the end of the character string	00H
0063H	char[32]	Text line 4	use character set from the operating instructions
0083H	Byte	Marking for the end of the character string	00H
0084H	char[32]	Text line 5	use character set from the operating instructions
00A4H	Byte	Marking for the end of the character string	00H3

Text line 6...10 2EH

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	char[32]	Text line 6	Use character set from the operating instructions
0020H	Byte	Marking for the end of the character string	00H
0021H	char[32]	Text line 7	Use character set from the operating instructions
0041H	Byte	Marking for the end of the character string	00H
0042H	char[32]	Text line 8	Use character set from the operating instructions
0062H	Byte	Marking for the end of the character string	00H
0063H	char[32]	Text line 9	Use character set from the operating instructions
0083H	Byte	Marking for the end of the character string	00H
0084H	char[32]	Text line 10	Use chracter set from the operating instructions
00A4H	Byte	Marking for the end of the character string	00H

Synchronous printout times 30H

Parameter address (offset)	Data type	Function	Value range and coding
0000H	Time	Text line 1	00:00...23:59
0002H	Time	Text line 2	00:00...23:59
0004H	Time	Text line 3	00:00...23:59
0006H	Time	Text line 4	00:00...23:59
0008H	Time	Text line 5	00:00...23:59
000AH	Time	Text line 6	00:00...23:59
000CH	Time	Text line 7	00:00...23:59
000EH	Time	Text line 8	00:00...23:59
0010H	Time	Text line 9	00:00...23:59

0012H	Time	Text line 10	00:00...23:59
0014H	Time	Measured value printout	00:00...23:59
0016H	Time	Date time	00:00...23:59
0018H	Time	Time	00:00...23:59

Printout intervals 31H

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Byte	Text line 1	00H = off 01H = 10 min 02H = 20 min 03H = 1 h 04H = 2 h 05H = 3 h 06H = 4 h 07H = 6 h 08H = 8 h 09H = 12 h 0AH = 24 h
0001H	Byte	Text line 2	like text line 1
0002H	Byte	Text line 3	like text line 1
0003H	Byte	Text line 4	like text line 1
0004H	Byte	Text line 5	like text line 1
0005H	Byte	Text line 6	like text line 1
0006H	Byte	Text line 7	like text line 1
0007H	Byte	Text line 8	like text line 1
0008H	Byte	Text line 9	like text line 1
0009H	Byte	Text line 10	like text line 1
000AH	Byte	Measured value printout	like text line 1
000BH	Byte	Date / time	like text line 1
000CH	Byte	Time	like text line 1

Assignment of binary inputs 32H

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Byte	Event marking 1	00H = no reset 01H = DI 1 .. 04H = DI 4 05H = DI 7 IO converter .. 0CH = DI 14 IO converter
0001H	Byte	Event marking 2	as for event marking 1
0002H	Byte	Event marking 3	as for event marking 1
0003H	Byte	Event marking 4	as for event marking 1
0004H	Byte	Text line 1	as for event marking 1
0005H	Byte	Text line 2	as for event marking 1
0006H	Byte	Text line 3	as for event marking 1
0007H	Byte	Text line 4	as for event marking 1
0008H	Byte	Text line 5	as for event marking 1
0009H	Byte	Text line 6	as for event marking 1

Parameter address (Offset)	Data type	Function	Value range and coding
000AH	Byte	Text line 7	as for event marking 1
000BH	Byte	Text line 8	as for event marking 1
000CH	Byte	Text line 9	as for event marking 1
000DH	Byte	Text line 10	as for event marking 1
000EH	Byte	Measured value printout	as for event marking 1
000FH	Byte	Date / time	as for event marking 1
0010H	Byte	Enable parameter-definition	as for event marking 1
0011H	Byte	Clock synchronisation	as for event marking 1
0012H	Byte	Empty printer queue	as for event marking 1

Date and time 33H

Parameter address (Offset)	Data type	Function	Value range and coding
0000H	Byte	day	01H...1FH = 1...31
0001H	Byte	month	01H...0CH = 1...12
0002H	Byte	year	00H...63H = 0...99
0003H	Byte	hour	00H...17H = 0...23
0004H	Byte	minute	00H...3BH = 0...59

Unit status read 34H

Parameter address (offset)	Data type	Function	Coding
0000H	Float	Measured value output chan. blue	
0004H	Float	Measured value output chan. red	
0008H	Float	Measured value output chan. green	
000CH	Float	Measured value output chan. violet	
0010H	Word	Status of DI binary inputs on recorder	Bit 0 DI 1 1 DI 2 2 DI 3 3 DI 4 4 DI 7 IO converter .. 11 DI 14 IO converter
0012H	Word	Status of DO internal binary outputs on recorder	Bit 0 DO 1 1 DO 2 2 DO 3 3 DO 4 4 DO 5 5 DO 6
0014H	Word	Status of DO external binary outputs (via IO converter)	Bit 0 DO 7 1 DO 8 .. C DO 19 D D0 20
0016H	Byte	Status of chart speed changeover	00H = input open 01H = input closed

Parameter address (offset)	Data type	Function	Coding
0017H	Byte	Status of chart speed control input	00H = input open 01H = input closed
0018H	Word	Status of self-test alarms	Bit 0 CPU error 1 IDATA - error 2 XDATA - error 3 Clock module 4 Relay driver 5 Channel card does not reply 6 Self-test error channel card blue 7 Self-test error channel card red 8 Self-test error channel card green 9 Self-test error channel card violet 10 Access error EEPROM CPU 11 Access error EEPROM channel card 12 Access error FRAM
001A	Word	Acknowledgement status Self-test alarms	the same messages as for self-test alarms
001CH	Word	Status system alarms	Bit 0 Calibration data of check sum 1 Check sum of parameter definition 2 Write error EEPROM channel card 3 Write error EEPROM CPU 4 Watchdog 5 Overflow of printout buffer 6 Time infringement by print head 7 Power fail clock module 8 Chart speed too high for text printout 9 Invalid input type for channel card 10 Error in the CPU pulse generation 11 Check sum FRAM 12 Communication IO converter 13 Invalid DI reference 14 Invalid DO reference
001EH	Word	Acknowledgement status System alarms	the same messages as for system alarms
0020H	Word	Status of alarm values	Bit 0 Alarm 1 blue channel 1 Alarm 2 blue channel 2 alarm 3 blue channel 3 Alarm 4 blue channel 4 Alarm 1 red channel 5 Alarm 2 red channel 6 Alarm 3 red channel 7 alarm 4 red channel 8 Alarm 1 green channel 9 alarm 2 green channel 10 Alarm 3 green channel 11 Alarm 4 green channel 12 Alarm 1 violet channel 13 Alarm 2 violet channel 14 Alarm 3 violet channel 15 Alarm 4 violet channel
0022H	Word	Acknowledgement status for alarm values	same messages as for alarms
0024H	Word	Internal status communication alarms	Bit 0 Blue communication channel faulty 1 Red communication channel faulty 2 Green communication channel faulty 3 Violet communication channel faulty
0026H	Word	Acknowledgement status of communication alarms	same messages as for communication alarms

Parameter address (offset)	Data type	Function	Coding
0028H	Byte	Measuring systems	Bit 0 = 1 → install blue system 1 = 1 → install red system 2 = 1 → install green system 3 = 1 → install violet system
0029H	Byte	Channel card type	00H = standard card 01H = universal card FFH = unknown type
002AH	Byte	Installation of binary inputs /outputs	00H = no BE / BA 01H = with BE / BA
002BH	Byte	Installation of print system	00H = no print system 01H = with print system
002C	Word	Rest paper length	0000H...1900H = 0...6400 cm
002EH	dWord	Betriebsstundenzähler # 1	00000000H...FFFFFFFFH
0032H	dWord	Betriebsstundenzähler # 2	00000000H...FFFFFFFFH
0036H	Byte	Save status of parameter-definition	00H = inactive 01H = parameter-definition is saved
0037H	Byte	Scaling height	00H...FFH
0038H	Byte	Zoom factor	00H = 5 01H = 10

Write unit status 35H

Parameter address (Offset)	Data type	Function	Coding
0000H	Word	Paper length	00H = do not change 0001H...1900H = 1...6400 cm
0002H	dWord	Elapsed time counter; can be reset	00000000H...FFFFFFFFH minutes
0006H	Byte	Save command for parameter-definition data	00H = no action 01H = copy parameter-definition in EEPROM
0007H	Byte	Scaling line print command	01H = print scaling for printout channel 1 02H = print scaling for printout channel 2 03H = print scaling for printout channel 3 04H = print scaling for printout channel 4
0008H	dWord	Elapsed time counter; cannot be reset	00000000H...FFFFFFFFH minutes
000CH	Byte	Scale height	00H...FFH
000DH	Byte	Zoom factor	00H = 5 01H = 10

Transfer measured values to recorder 36H

Parameter address (Offset)	Data type	Function	Coding
0000H	Word	Measured value of channel 1	0000H...0768H = 0...1000
0002H	Word	Measured value of channel 2	0000H...0768H = 0...1000
0004H	Word	Measured value of channel 3	0000H...0768H = 0...1000
0006H	Word	Measured value of channel 4	0000H...0768H = 0...1000

Measured value scanning of output channels 37H

Parameter address (Offset)	Data type	Function	Coding
0000H	Float	Measured value output chan.blue	according to display format
0010H	Byte	Overflow status output channel blue	01H = overflow 02H = underflow 04H = underflow due to RI-correction Pt100 08H = overflow due to RI-correction Pt100 10H = Line break, system at 0 % 20H = Line break, system at 100 %
0004H	Float	Measured value output chan. blue	according to display format
0011H	Byte	Overflow status output chan. red	as for output channel blue
0008H	Float	Measured value output chan. blue	according to display format
0012H	Byte	Overflow status output chan. red	as for output channel blue
000CH	Float	Measured value output chan. blue	according to display format
0013H	Byte	Overflow status output chan. red	as for output channel blue

Measured value scanning of channels 38H

Parameter address (Offset)	Data type	Function	Coding
0000H	Float	Measured value output channel 1	according to display format
0004H	Byte	Overflow status channel 1	01H = overflow 02H = underflow 04H = underflow due to RI-correction Pt100 08H = overflow due to RI-correction Pt100 10H = line break, system at 0 % 20H = line break, system at 100 %
0005H	Float	Measured value output channel 2	according to display format
0009H	Byte	Overflow status channel 2	as for channel 1
000AH	Float	Measured value output channel 3	according to display format
000EH	Byte	Overflow status channel 3	as for channel 1
000FH	Float	Measured value output channel 4	according to display format
0013H	Byte	Overflow status channel 4	as for channel 1

Measured value scanning of mathematical channels 39H

Parameter address (Offset)	Data type	Function	Coding
0000H	Float	Measured value math. channel 1	according to display format
0004H	Byte	Overflow status math. channel 1	01H = overflow 02H = underflow
0005H	Float	Measured value output math. channel 2	according to display format
0009H	Byte	Overflow status math. channel 2	as for mathematic channel 1
000AH	Float	Measured value output math. channel 3	according to display format
000EH	Byte	Overflow status math. channel 3	as for mathematic channel 1
000FH	Float	Measured value output math. channel 4	according to display format
0013H	Byte	Overflow status math. channel 4	as for mathematic channel 1

Measured value scanning of pulse channels 3AH

Parameter address (Offset)	Data type	Function	Coding
0000H	Float	Measured value output pulse channel 1	0...99999999
0004H	Byte	Overflow status pulse channel 1	01H = overflow 02H = underflow
0005H	Float	Measured value output pulse channel 2	0...99999999
0009H	Byte	Overflow status pulse channel 2	as for pulse channel 1
000AH	Float	Measured value output pulse channel 3	0...99999999
000EH	Byte	Overflow status pulse channel 3	as for pulse channel 1
000FH	Float	Measured output of pulse channel 4	0...99999999
0013H	Byte	Overflow status pulse channel 4	as for pulse channel 1

Measured value scanning of accounting channels 3BH

Parameter address (Offset)	Data type	Function	Coding
0000H	Float	Measured value output accounting channel 1	0...9.999E9
0004H	Byte	Overflow status accounting channel 1	00H = overflow not possible
0005H	Float	Measured value output accounting channel 2	0...9.999E9
0009H	Byte	Overflow status accounting channel 2	00H = overflow not possible
000AH	Float	Measured value output accounting channel 3	0...9.999E9
000EH	Byte	Overflow status accounting channel 3	00H = overflow not possible
000FH	Float	Measured value output accounting channel 4	0...9.999E9
0013H	Byte	Overflow status accounting channel 4	00H = overflow not possible
0014H	Float	Aver. value accounting channel 1	according to display format Source channel
0018H	Float	Aver. value accounting channel 2	according to display format Source channel
001CH	Float	Aver. value accounting channel 3	according to display format Source channel
0020H	Float	Aver. value accounting channel 4	according to display format Source channel
0024H	Float	Min. value accounting channel 1	according to display format Source channel
0028H	Float	Min. value accounting channel 2	according to display format Source channel
002CH	Float	Min. value accounting channel 3	according to display format Source channel
0039H	Float	Min. value accounting channel 4	according to display format Source channel
0034H	Float	Max. value accounting channel 1	according to display format Source channel
0034H	Float	Max. value accounting channel 2	according to display format Source channel
0034H	Float	Max. value accounting channel 3	according to display format Source channel
0034H	Float	Max. value accounting channel 4	according to display format Source channel

Read calibration data 40H

Parameter address (offset)	Data type	Function	Coding
0000H..0007H	Word	Calibration start value recording system blue, red, green, violet	0000H...FFFFH
0008H..000FH	Word	Calibration final value recording system blue, red, green, violet	0000H...FFFFH
0010H..0017H	Word	Input of calibration initial value Channels 1, 2, 3, 4	0000H...FFFFH
0018H..001FH	Word	Input of calibration final value Channels 1, 2, 3, 4	0000H...FFFFH
0020H..0027H	Word	Code for line resistance Pt 100 Channels 1, 2, 3, 4	0000H...FFFFH
0028H..002FH	Word	Code for offset calibration Channels 1, 2, 3, 4	0000H...FFFFH

Creating text blocks

If variable parameters are to be printed at the start and end of a batch process (precondition: the printer channel is installed in recorder), complete text lines can be sent to the recorder with the parameter field address F1H.

Send printout lines to recorder

(with parameter field address F1H)

It is with this message that a text line with 48 characters is sent to the recorder. The recorder enters the message in the printer queue. As soon as the queue is empty, text printout begins immediately, otherwise the text lines stored in the queue are printed first. The recorder acknowledges the message with the acknowledgment code 10H, if the message is received correctly and entered into the queue. If the queue has no more free space, the acknowledgement code 11H is sent in response.

The message format is:

```
SD2/LE/LEr/SD2/DA/SA/FC/F1/aa/bb/cc/[text line]/FCS/ED
                    |<--          L          -->|
```

meaning:

SD2	= 68H start byte
LE	number of data bytes + 6
LEr	repetition of LE
SD2	= 68H repetition start byte
DA	target address (bus subscriber address)
SA	source address
FC	= 16H function code
F1	field address
aa	= 00H filling byte
bb	date/time control 00H = print text without date / without time 01H = print text mit time 02H = print text with date 03H = print text with date / with time
cc	number of text lines (00H ..30H = 0...48)
[Text line]	contents of the text line
FCS	check sum
ED	= 16H end of the code identification
L	Number of bytes in FCS

Scanning of the printout status

The number of lines in the printout queue is scanned by the recorder with:

SD3/DA/SA/FC/aa/oo/oo/cc/xx/xx/xx/xx/FCS/ED
|<-- L -->|

meaning:

SD3 = A2H
start byte
DA target address (bus subscriber address)
SA source address
FC = 15H
function code
aa = F1H
basic address of the parameter field
oooo = 00 00H
2 bytes of parameter address (Offset)
cc = 01H
number of scanned data bytes
xx xx
xx xx any 4 bytes
FCS check sum
ED = 16H
end code
L number of Bytes in FCS

The answer of the recorder is:

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

meaning:

SD2 = 68H
start byte
LE number of data bytes +3
LEr repetition of LE
SD2 = 68H
repetition start byte
DA target address (bus subscriber address)
SA source address
FC = 15H
function code
aa number of information items in the queue
FCS check sum
ED = 16H
end of coding identification

Communication error register FFH

The communication error registers are used for making error diagnostics in case of communication problems which occur when invalid values are transmitted.

The error registers are scanned by the recorder with:

SD3/DA/SA/FC/aa/oo/oo/cc/xx/xx/xx/xx/FCS/ED
|<-- L -->|

meaning:

SD3 = A2H
start byte
DA target address (bus subscriber address)
SA source address
FC = 15H
function code
aa = FFH
basic address of the parameter field
oooo = 00 00H
2 byte parameter address (offset)
cc = 09H
number of scanned data bytes
xx xx
xx xx any 4 bytes
FCS check sum
ED = 16H
end code
L number of Bytes in FCS

The answer of the recorder is:

SD2/LE/LEr/SD2/DA/SA/FC/aa/bb/cc/dd/ee/FCS/ED

meaning:

SD2 = 68H
start byte
LE = 0CH
number of data bytes +3
LEr = 0CH
repetition of LE
SD2 = 68H
repetition of start byte
DA target address (bus subscriber address B)
SA source address
FC = 15H
function code
aa requested data field length
bb type of error
00H = no error
01H = wrong basic field address
02H = wrong length
03H = wrong offset
04H = wrong value
05H = wromg function code
06H = no access (manual parameter definition active)
cc field address of where error occured
dd offset at which error occured
ee 4 bytes copy of the incorrect value
FCS check sum
ED = 16H
end code

Subject to technical changes.

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