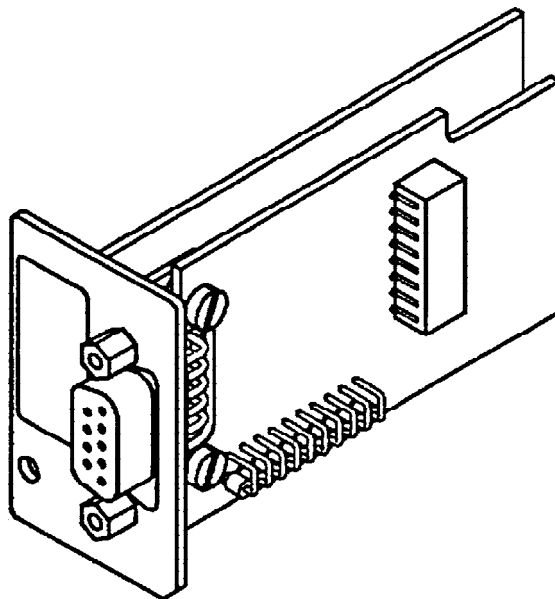


Operating Instructions

Interface RS 232 and
Interface RS 485 / Profibus

for

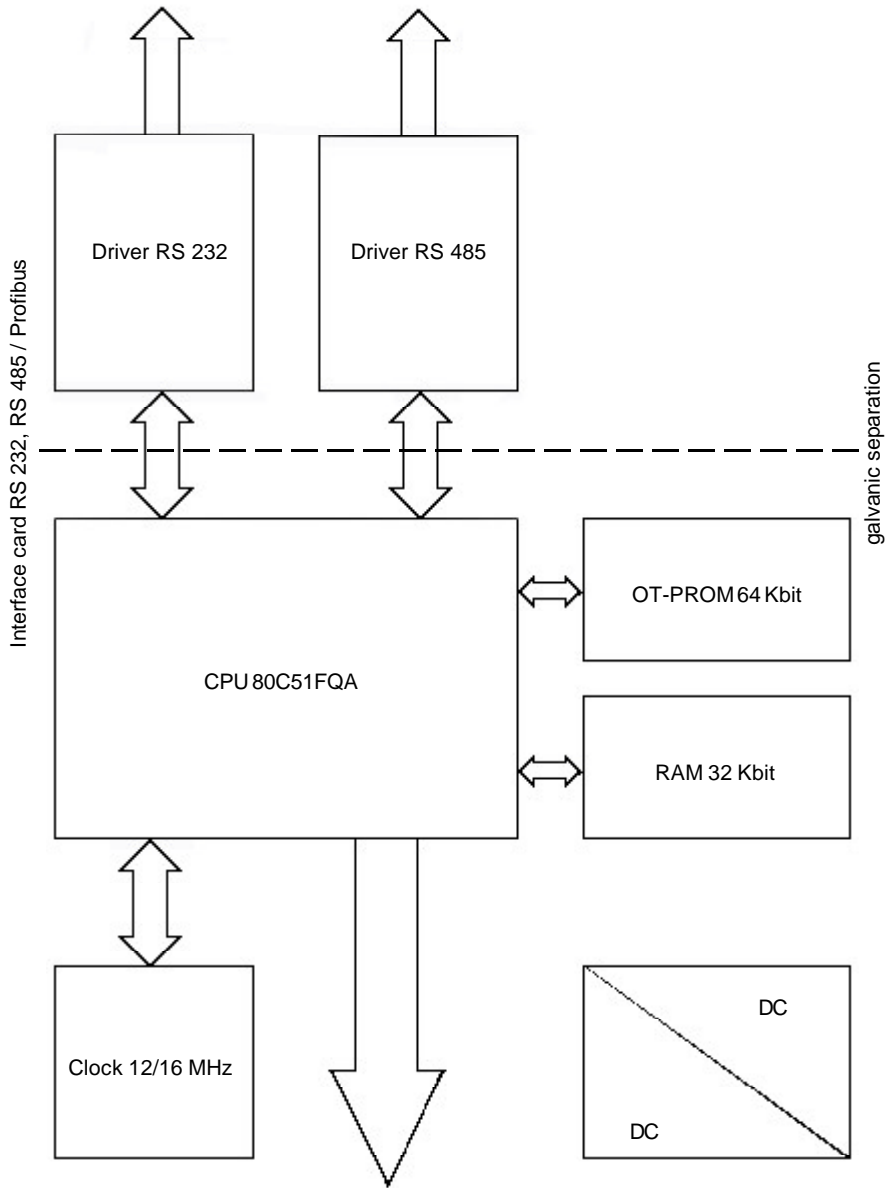
Digital Industrial Controller Type 1110
and
Digital Batch Controller Type 1115



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1 Block diagram of functions



2 Notices concerning use and safety

In order to ensure a perfect functioning and a long working life of the interface card when using this card, the user is requested to follow this operating instructions and the operating instructions of the digital units to be used with this card (e.g. Digital Industrial Controller

Type 1110 or Digital Batch Controller Type 1115) as well as to maintain the operating conditions and to observe the allowed specifications according to the data sheet. Installation and maintenance personnel must be trained and qualified for this work.

All possibilities of unauthorized operation with the resulting impairment of the process are to be ruled out through precautionary measures. For maintenance purposes, safe electrical disconnectors and media technical shut off devices are to be provided. Should the unit equipped with the interface card be part of a complex automation system, then the automation system must be provided with a defined and controlled restart process as specified in the instructions for starting up again following an interruption.

When operating the device or carrying out service and repair work on the equipment, the regulations in force for the prevention of accidents and the safety of electrical equipment must be observed.

Commissioning, start-up and repairs may only be carried out through authorized specialists.

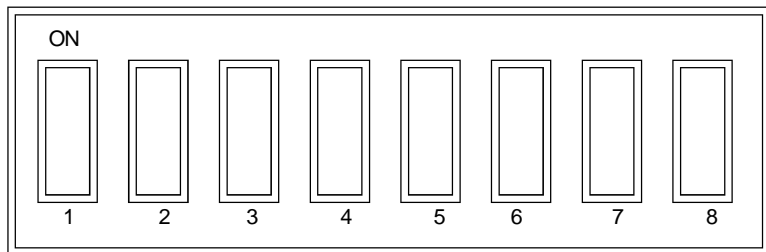
3 System description

3.1 Introduction

The Digital Industrial Controller 1110 as well as the Digital Batch Controller 1115 can be equipped with a digital interface.

Using the additional card required for this purpose, either a point-to-point connection can be erected through RS 232 or, by using additional equipment, a network can be built through RS 485/Profibus.

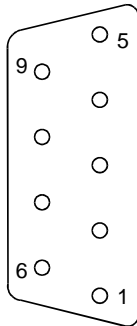
3.2 Switch configuration



	RS 232	RS 485	RS 485 add. equipment	Profibus	Profibus add. equipment
1	OFF	OFF	ON	OFF	ON
2	OFF	OFF	ON	OFF	ON
3	OFF	ON	ON	ON	ON
4	OFF	ON	ON	ON	ON
5	ON	OFF	OFF	OFF	OFF
6	ON	OFF	OFF	OFF	OFF
7	OFF	ON	ON	ON	ON
8	OFF	OFF	OFF	ON	ON

3.3 Connector pin assignment

D sub-connector 9 terminal/female



RS 232

2	TxD
positive	
3	RxD
negative	
5	GND

RS 485 / Profibus

3	reception/transmission data
8	reception/transmission data
5	GND

3.4 Installation

The maximum bus baud rate is 500 KBaud.
The following performance lengths can be achieved:

1200 m	9.6 / 19.2 / 93.75	KBaud
600 m	187.5	KBaud
200 m	500	KBaud

twisted double-wiring, shielded
standard wiring diameter 0.22 mm²
doubled wiring length at 0.5 mm²

Notice:
for additional information refer to the
Profibus standard DIN 19245

To operate, remove equipment from the mains supply. Remove plastic inset from back of equipment and insert interface card.
After reconnecting to mains supply, the following settings are necessary in serial menu supplements:

1. address
(for Profibus, the baud rate adjusts automatically)
2. additionally for RS 232/485:
parity / odd / even / none
baud rate 4800 / 9600

4. Profibus

Profibus is standardized according to DIN 19 245.
We support the following features:

Get OV (long)
Read
Write.

FMS features supported are therefore:

80 30 00 00 00 00

Our equipment is slave.

We provide the following communication references:

Index	Typ	SAP
2	MSZY	3
3	MSAZ	4
4	MSZY	5
5	MSAZ	6
6	MSZY	7
7	MSAZ	8
8	MSZY	9
9	MSAZ	10

(Master **S**lave **C**yclic / **A**cyctic)

4.1 List of the objects for the Digital Industrial Controller Type 1110

Structure of the masks

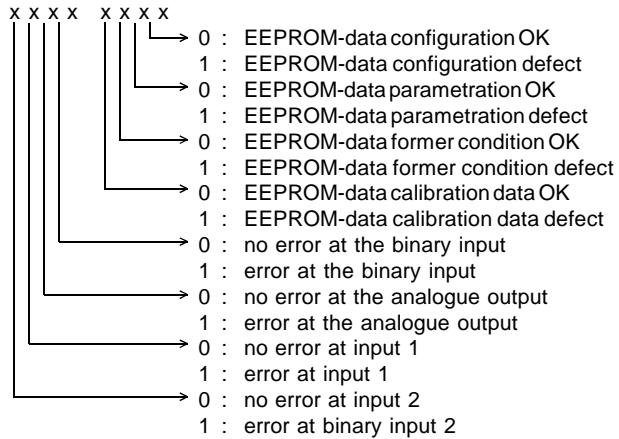
Within a mask, the variable required for the configuration from among the following will be represented. Sequence: 1st variable = LSB
LSB represented.

- 1- is required in the configuration
- 0- is not required in the configuration

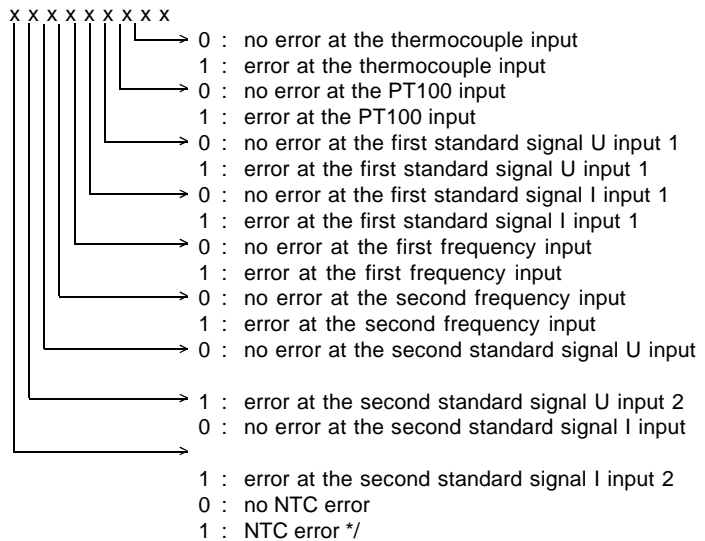
20	UINT16	Mask process values
21	UINT8	Hardware unit
22	FLP	X1 measurable value channel 1
23	FLP	X2 measurable value channel 2
24	FLP	W1 set point main controller or single controller
25	FLP	Yh correcting variable main controller at cascade
26	FLP	W2 set point support controller at cascade
27	FLP	Y2h correcting variable heating/continuous
28	FLP	Y2k correcting variable cooling
29	FLP	Xdh control offset main controller

30	FLP	Xd2 control offset support/single controller
31	UINT8	Relay position output relay 0: non-active 1: active Bit 0 = position relay 1 Bit 1 = position relay 2 Bit 2 = alarm relay 2 Bit 3 = alarm relay 2
	valve`s	Pulse valve: Not the current relay condition, but rather the switching condition is set.
32	UINT8	Reading-in condition of binary input (please follow Index 182/181)
33	UINT8	Reading-in condition of binary input (please follow Index 183/184)
34	UINT8	Condition of set point ramp 0: off 1: on
35	UINT8	Condition of set point tracking (SPT) 0: off 1: on
36	UINT8	Condition of main controller (only with cascade controller) 0: manual 1: automatic 2: manual 3: manual
37	UINT8	Condition of support controller 0: manual 1: automatic 2: manual 3: manual

38 UINT8 Controller errors



39 UINT16 Input errors



40 UINT8 Operating errors
refer to error list 3.2

- 41 UINT8 Configuration/parametrization
- 0: reserve
 - 1: process
 - 2: configuration
 - 3: parametrization

- 42 UINT8 Remote / local switching
 0: local
 1: remote
- 43 UINT16 Alteration 1
 The contents of the following indices can be automatically altered by the internal processor; i.e. meaningless user parametrations will be automatically corrected.
- | Index | Bit | Index | Bit |
|-------|-----|-------|-----|
| 57 | 0 | 81 | 6 |
| 56 | 1 | 92 | 7 |
| 85 | 2 | 91 | 8 |
| 84 | 3 | 101 | 9 |
| 58 | 4 | 125 | 10 |
| 82 | 5 | 170 | 11 |
- 44 UINT16 Alteration 2
 The contents of the following indices can be automatically altered by the internal processor; i.e. meaningless user parametrations will be automatically corrected.
- | Index | Bit | Index | Bit |
|-------|-----|-------|-----|
| 61 | 0 | 171 | 5 |
| 63 | 1 | 76 | 6 |
| 66 | 2 | 166 | 7 |
| 145 | 3 | 181 | 8 |
| 156 | 4 | | |
- 45 UINT8 Address / station address of the unit
- 49 UINT8 PT 100 Type (connection type)
 0: 3 conductors
 1: 4 conductors
- 50 UINT16 **Mask configuration 1st input**
- 51 UINT8 Type 1st input
 0: 0 - 10 V
 1: 0 - 20 mA
 2: 4 - 20 mA
 3: frequency
 4: Pt 100
 5: thermocouple J
 6: thermocouple K
 7: thermocouple T
 8: thermocouple R
 9: thermocouple S

52	UINT8	Vst reference junction compensation ext / int at thermocouple 0: internal 1 external
53	UINT8	Rad evolving a root 0: no 1: yes
54	UINT16	Fre final value frequency input
55	FLP	Fg1 limit frequency filter
56	FLP	X1u minimum value 1st input (lower scale value)
57	FLP	X1o maximum value 1st input (upper scale value)
58	FLP	Xvu minimum value ratio input (lower scale value)
59	FLP	Xvo maximum value ratio input (upper scale value)
60	UINT16	Mask configuration limit of correcting variable
61	FLP	Yu lower limit main controller
62	FLP	Yo upper limit main controller
63	FLP	Y2hu lower limit heating/continuous
64	FLP	Y2ho upper limit heating/continuous
65	FLP	Y2ku lower limit cooling
66	FLP	Y2ko upper limit cooling
70	UINT16	Mask structure / configuration 2nd input
71	UINT8	Structure of the controller 0: standard controller 1: external set point 2: ratio controller 3: disturbance-variable compensation 4: reserve 5: cascade controller
72	UINT8	Type 2nd input 0: 0 - 10 V 1: 0 - 20 mA 2: 4 -2 0 mA 3: frequency
73	UINT8	Evolving a root 0: off 1: on
74	UINT16	Fre2 final value frequency input
75	FLP	Fg2 limiting frequency filter
76	FLP	X2u minimum value 2. input (lower scale value)
77	FLP	X2o maximum value 2. input (upper scale value)

80	UINT16	Mask	configuration alarm function
81	FLP	X1-	lower alarm limit actual value
82	FLP	X1+	upper alarm limit actual value
83	FLP	A1 Hy	alarm hysteresis actual value
84	FLP	A1Q-	lower alarm limit absolute value ratio regulation
85	FLP	A1Q+	upper alarm limit absolute value ratio regulation
86	FLP	A1QH	hysteresis absolute value ratio regulation
87	UINT8	Mode	alarm function 0: absolute alarm 1: band alarm
90	UINT16	Mask	configuration set point limits
91	FLP	W1u	lowest set point limit
92	FLP	W1o	upper set point limit
100	UINT16	Mask	configuration set point ramp
102	FLP	D	gradient (standard: W/min)
103	UINT8	Pon	ramp at alteration of set point 0: off 1: on
110	UINT16	Mask	configuration Set Point Tracking
111	FLP	SPTE	final value set point tracking (read only!)
112	FLP	SPTD	gradient set point tracking
113	UINT8	SPT	on / off 0: off 1: on
120	UINT16	Mask	configuration disturbance-variable compensation
121	FLP	kps	amplification
122	FLP	Tds	derivative-action time
123	FLP	Ts	delay time
124	FLP	Xsd	insensitiveness
125	FLP	X0	operating point
140	UINT16	Mask	configuration main controller
141	FLP	kp1	amplification
142	FLP	Tn	reset time
143	FLP	Tv	derivative-action time
144	FLP	Ratio	derivative-action time / delay time
145	FLP	Y0	operating point
146	FLP	Xtb	insensitiveness

150	UINT16	Mask configuration support / single controller
151	FLP	kp1 amplification heating / continuous
152	FLP	kp2 amplification cooling
153	FLP	Tn reset time
154	FLP	Tv derivative-action time
155	FLP	Ratio derivative-action time / delay time
156	FLP	Y0 operating point
157	FLP	Xtb insensitiveness
158	UINT8	direction of effect 0: positive direction of effect 1: inverted direction of effect
160	UINT16	Mask configuration output
161	UINT8	Function output 0: reserve 1: 2-point 2: 3-point 3: 3-point step (without external feedback) 4: continuous 5: position (with external feedback)
162	UINT8	Type continuous output 0: 0 - 10 V 1: 0 - 20 mA 2: 4 - 20 mA
163	UINT8	Pulse valve yes / no (with 2 point output) 0: no pulse valve 1: pulse valve
164	FLP	Ty motor running time
165	FLP	Xsh hysteresis
166	FLP	Xsd insensitiveness
167	FLP	T+ cycle time heating
168	FLP	T- cycle time cooling
169	FLP	Gt gear lot
170	FLP	Olp overlapping range
171	FLP	Ys safety value
180	UINT16	Mask configuration binary input / output
181	UINT8	Function binary input 0: no (no function) 1: alarm 2: manual / automatic 3: external / internal W (if index 71 = 1) 4: safety value
182	UINT8	Effect binary input 0: normal 1: inverted

183	UINT8	Function binary output 0: no (no function) 1: alarm 2: manual / automatic 3: feeler break
184	UINT8	Effect binary output 0: normal 1: inverted
190	UINT16	Mask code
191	UINT16	Code priority 1 (configuration)
192	UINT16	Code priority 2 (parametration)
193	UINT16	Code priority 3 (process operation)
200	UINT16	Mask configuration other
201	UINT8	Language 0: German 1: English 2: French
202	UINT8	Representation 2nd line 0: actual value 1: bar graph
203	UINT8	Resolution bar graph

4.2 Error list operating errors

Index 40

- 1: Acknowledged
- 2: Access OK
- 3: Data base not up to date
- 4: Value outside of value range
- 5: Value cannot be described in current condition
- 6: Another enquiry is still in progress

- 7: Main controller cannot be operated
- 8: Main controller contains wrong value

- 9: Support / single controller cannot be operated
- 10: Support / single controller contains wrong value

- 11: W main controller / single controller cannot be operated
- 12: W main controller / single controller contains wrong value

- 13: W support controller cannot be operated
- 14: W support controller contains wrong value

- 15: Yh main controller cannot be operated
- 16: Yh main controller contains wrong value

- 17: Y2h support / single controller cannot be operated
- 18: Y2h support / single controller contains wrong value

- 19: Y2k support / single controller cannot be operated
- 20: Y2k support / single controller contains wrong value

- 21: Y2h 3-point step cannot be operated
- 22: Y2h 3-point step contains wrong value

- 23: Set point ramp cannot be operated
- 24: Set point ramp contains wrong value

- 25: Parametration is not possible
- 26: Configuration is not possible
- 27: Parametration is not possible → not part of process operation
- 28: Parametration is not possible → LOCAL in configuration
- 29: Configuration is not possible → not part of process operation

4.3 List of the objects for Digital Batch Controller Type 1115

20	UINT16	Mask process values
21	UINT8	Hardware unit
22	FLP	Actual volume 1
23	FLP	Actual volume 2
24	FLP	Actual volume 1 + 2
25	FLP	Residual volume 1
26	FLP	Residual volume 2
27	FLP	Residual volume 1 + 2
28	FLP	Required volume 1
29	FLP	Required volume 2
30	FLP	Required volume 1 + 2
31	FLP	Exact limit 1
32	FLP	Exact limit 2
33	FLP	Throughput 1
34	FLP	Throughput 2
35	FLP	Throughput 1 + 2
36	FLP	Total volume 1
37	FLP	Total volume 2
38	FLP	Total volume 1+2
39	UINT8	Condition 1
		0: Channel turned off
		1: Filling procedure stopped
		2: Approximate proportioning
		3: Exact proportioning
		4: Runoff
		5: Filling procedure completed
		6: Channel placed back
40	UINT8	Condition 2
		0: Channel turned off
		1: Filling procedure stopped
		2: Approximate proportioning
		3: Exact proportioning
		4: Runoff
		5: Filling procedure completed
		6: Channel placed back
41	UINT8	Total condition
		0: Process at standstill
		1: Process in progress
		2: Process will be placed back
		3: Manual proportioning
42	UINT8	Starting time in hours
43	UINT8	Starting time in minutes
44	UINT8	Starting time in seconds
45	UINT16	Remaining proportionings

46	UINT8	Remaining time in hours
47	UINT8	Remaining time in minutes
48	UINT8	Remaining time in seconds
49	UINT8	Configuration on / off
50	UINT8	Error output
51	UINT8	Batch errors 0: EEPROM - data configuration defective 1: EEPROM - data parametrization defective
52	UINT8	Batch warning 0: calibration defective 1: standard signal output defective 2: feeler channel 1 defective 3: feeler channel 2 defective 4: process data defective 5: power failure
53	UINT8	Operating error (refer to 4.4)
54	UINT8	Remote / local mode 0: local 1: remote
60	UINT8	Address
61	UINT8	Version - internal
62	UINT8	Error - access
		} internal indices only for the manufacturer
70	UINT16	Mask configuration 1st input
71	UINT8	Type 1st input 0: input not in use 1: frequency 2: 0 - 20 mA 3: 4 - 20 mA 4: 0 - 10 V
72	UINT8	Evolving the root 0: off 1: on
73	UINT8	Standard type 0: manual 1: teach IN
74	FLP	k-factor
75	FLP	maximum flow

80	UINT16	Mask configuration 2nd input
81	UINT8	Type 2nd input 0: input not in use 1: frequency 2: 0 - 20 mA 3: 4 - 20 mA 4: 0 - 10 V
82	UINT8	Evolving the root 0: off 1: on
83	UINT8	Standard type 0: manual 1: teach in
84	FLP	k-factor
85	FLP	maximum flow
90	UINT16	Mask configuration hunting
91	UINT8	Hunting correction 0: no 1: yes
92	UINT16	Maximum hunting time
100	UINT16	Mask configuration valve
101	UINT8	Valve type 0: standard 1: pulse
110	UINT16	Mask configuration output
111	UINT8	Type output 0: input not in use 1: frequency 2: 0 - 20 mA 3: 4 - 20 mA 4: 0 - 10 V
112	UINT8	Process sizes 0: throughput channel 1 1: throughput channel 2 2: throughput channel 1 + 2 3: actual value channel 1 4: actual value channel 2 5: actual value channel 1+ 2
113	FLP	Maximum flow

120	UINT16	Mask configuration binary output
121	UINT8	Type binary output 0: off 1: EOB 2: delay
122	UINT8	Effect of binary output 0: low - active 1: high - active
130	UINT16	Mask configuration code
131	UINT16	Code priority 1
132	UINT16	Code priority 2
133	UINT16	Code priority 3
140	UINT16	Mask total volume
141	UINT8	Total volume delete (during parametration) 0: no 1: total volume channel 1 2: total volume channel 2 3: total
150	UINT16	Mask configuration automatic
151	UINT8	Mode type 0: manual 1: automatic
152	UINT8	Limits automatic 0: no limits 1: limits regarding number of proportionings 2: limits regarding time
153	UINT16	Required proportioning
154	UINT8	Proportioning duration - hours
155	UINT8	Proportioning duration - minutes
156	UINT8	Proportioning duration - seconds
160	UINT16	Mask configuration starting delay
161	UINT8	Starting delay - hours
162	UINT8	Starting delay - minutes
163	UINT8	Starting delay - seconds
170	UINT16	Mask configuration operation
171	UINT8	Mode type 0: internal 1: external 2: global

172	UINT8	Effect
		0: normal
		1: inverted
180	UINT16	Mask configuration language
181	UINT8	Language
		0: German
		1: English
		2: French

4.4 Error list operating errors

Batch controller-errors from the monitor

- 1: acknowledged
- 2: access OK
- 3: data base not up to date
- 4: value outside of value range
- 5: value cannot be described in current condition
- 6: another enquiry is still in progress

- 7: start cannot be operated
- 8: stop cannot be operated
- 9: reset cannot be operated

- 10: required channel 1 > cannot be operated
- 11: required channel 1 > corrected to limit

- 12: required channel 2 > cannot be operated
- 13: required channel 2 > corrected to limit

- 14: exact channel 1 > cannot be operated
- 15: exact channel 1 > corrected to limit

- 16: exact channel 2 > cannot be operated
- 17: exact channel 2 > corrected to limit

- 18: condition k1 cannot be operated
- 19: reserve
- 20: condition k2 cannot be operated
- 21: reserve
- 22: reserve
- 23: reserve
- 24: reserve

- 25: parametration not possible
- 26: configuration not possible
- 27: parametration not possible → not part of process operation
- 28: parametration not possible → LOCAL in configuration
- 29: configuration not possible → not part of process operation

5. RS 232 - Protocol

5.1 Transmission format

8 Bit ASCII
1 Startbit
1 Stopbit
1 Paritybit (if "odd" or "even")

The data is transmitted in IEEE format.

S.	E.	E.	E.	E.	E.	E.	E.	E.	Value	=	$(-1)^S * 2^{(E-127)} * 1.$	Mantissa
E.	M.	M.	M.	M.	M.	M.	M.	M.	S	=	Sign	
M.	M.	M.	M.	M.	M.	M.	M.	M.	E	=	Exponent	
M.	M.	M.	M.	M.	M.	M.	M.	M.	M	=	Mantissa	
									hex 40 40 00 00	=	$1 \cdot 2 \cdot 1,5$	

A parity check will be carried out ("odd", "even", "none")

In addition, a block check will be carried out.

All bytes are added onto one byte without considering the overflow.

The LSByte of the "block check" symbol is transmitted as the second to last symbol (before the ETX).

Each block begins with an STX (HEX 2) and ends with an ETX (HEX 3).

STX and ETX are not components of the "block check".

5.2 Transmission protocol

Following each write access the unit answers with ACK (HEX 6) whenever the access has

been carried out correctly.

The unit answers with NAK (HEX 15) whenever the access could not be carried out even

through the block was correctly received.

In the event of a transmission error, no answer is given.

If an STX is received within a telegram, then this will result in a new start being carried out and the former content being lost.

An access is built as follows:

1. Byte address: address of the station MSByte
2. Byte address: address of the station LSByte
3. Byte index: object index MSByte
4. Byte index: object index LSByte
5. Byte value: value MSByte
6. - 13. byte: value according to value length

During the writing, the value to be written is transmitted in "*Wert*".
During the reading, the value is not included while going out. When coming back, the complete "*Buffer*" is transmitted along with the value.

Example of 5.1: Transmission format

Write	Required Value		Address 5, Index 24, Value 3								
02	3035	3138	3430	3420	30	30	30	30	3536	30	
STX	05	24	3						block check	ETX	
Read	Required Value		Address 5, Index 24								
Enquiry:	02	3035	3138	4345	03						
Answer:	02	3035	3138	3430	3430	30	30	30	30	3536 30	

The indices of the individual values correspond to those of the profibus protocol.

PC Programme

You will find further details in the file "Read .me".

Each interface card contains a disk with which you can build a RS 485 / profibus net or a RS 232 connection.

The programme is structured in menu technique and is therefore easy to handle.

The programme is started with "PROFIBUS" and/or "RS232".

For exchanging data, two rudimentary programmes are available on the disk.

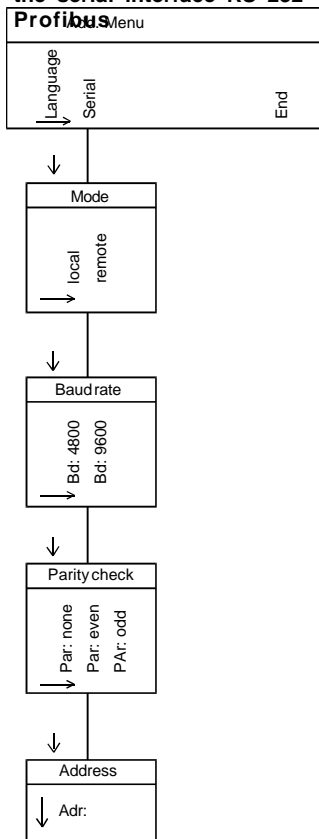
These allow reading and writing transactions to be carried out:

- a) RS 232.exe
- b) Profibus.exe

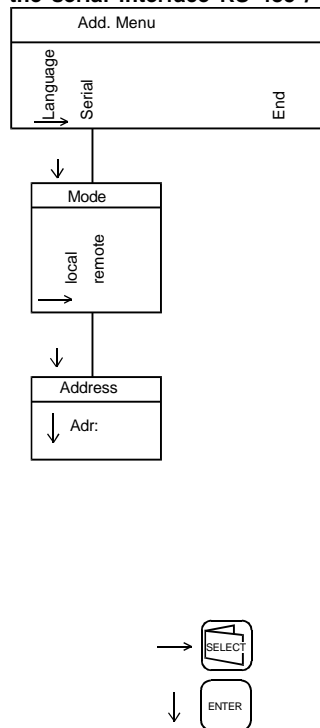
6 Configuration of the interfaces

When the interface card (RS 232 or RS 485 / Profibus) has been installed, then appears in the menu item "Add. Menu" of the digital unit (e.g. Digital Industrial Controller Type 1110 or Digital Batch Controller Type 1115) the menu item "Serial" (after the menu item "Language").

Menu for configuring the serial interface RS 232



Menu for configuring the serial interface RS 485 /



Further information concerning the menus

Mode

- local** In the *local* mode, only data from digital units can be requested through the serial interface. External data cannot be transmitted to the units.
The digital units can only be configured and parametrated and the required value can only be adjusted (at the controller) by using the unit's keyboard and not through the serial interface.
- remote** In the *remote* mode, data can be transmitted in both directions through the serial interface.
The digital unit can be configured and parametrated and the required value can be adjusted using the serial interface.
In this case, the parametration and alteration of the required value cannot be carried out through the unit's keyboard.
If the operator mode is accessed through the *remote* mode by using the unit keyboard, then the main configuration menu does not appear as usual, but rather a menu item appears which permits the setting of the interface mode.
The *configuration* can be carried after the mode has been switched from remote to local.

Baud rate

Bd: 4800 The baud rate equals 4800 baud.

BD: 9600 The baud rate equals 9600 baud.

This parameter can only be set by using the interface RS 232.

Parity check

Par: none No parity check will be carried out.

Par: even A check and/or an alteration will be carried out on an even parity.

Par: odd A check and/or an alteration will be carried out on an odd parity.

This parameter can only be set by using the interface RS 232.

Address

Adr: Address of the interface card
Address range with RS 232: 1 ... 32
Address range with RS 485 / Profibus: 0 .. 127.

Contact addresses / Kontaktadressen

Germany / Deutschland / Allemagne

Bürkert Fluid Control System
Sales Centre
Chr.-Bürkert-Str. 13-17
D-74653 Ingelfingen
Tel. + 49 (0) 7940 - 10 91 111
Fax + 49 (0) 7940 - 10 91 448

E-mail: info@de.buerkert.com

International

Contact addresses can be found on the internet at:

Die Kontaktadressen finden Sie im Internet unter:

Les adresses se trouvent sur internet sous :

www.burkert.com Bürkert Company Locations