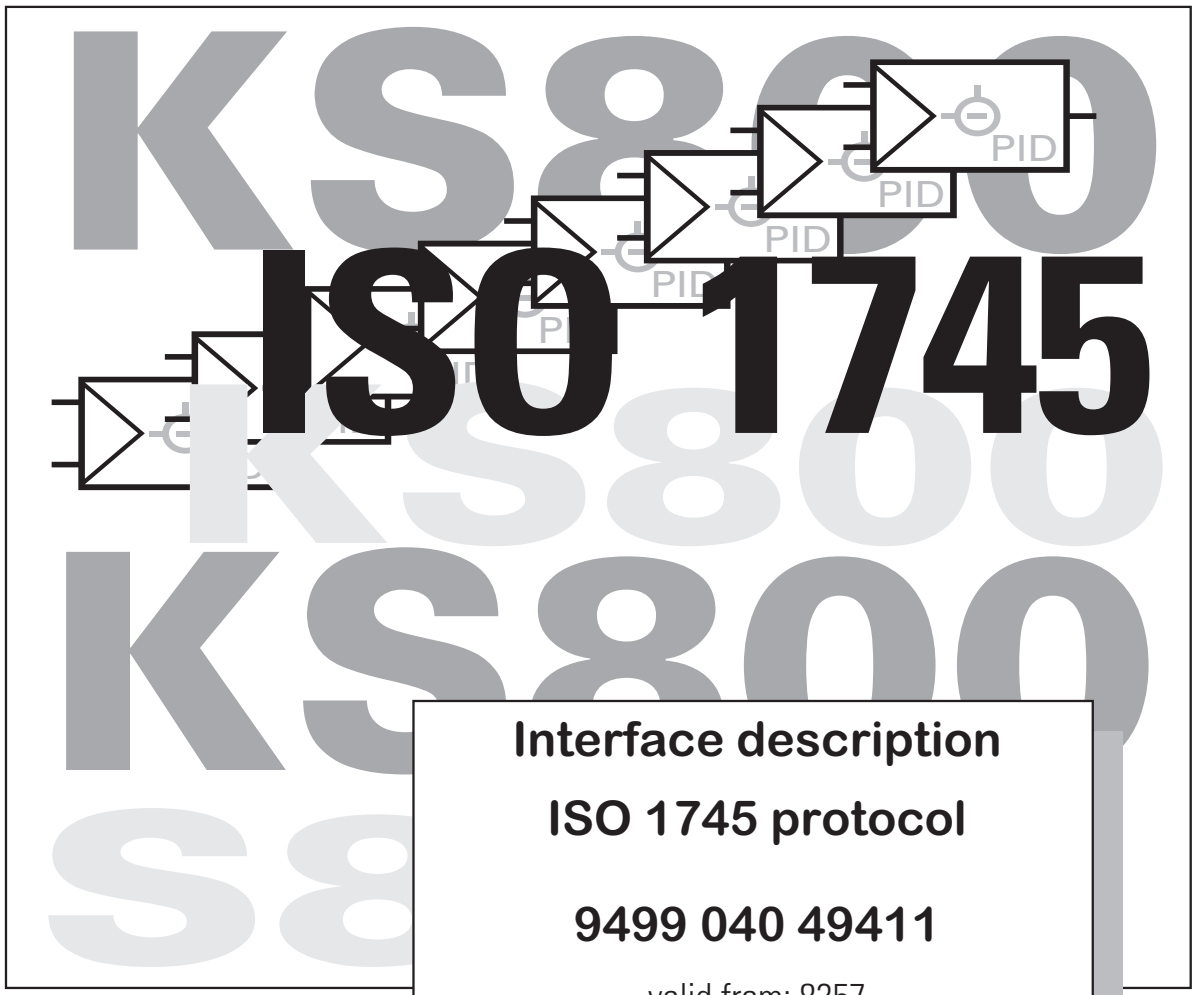
PMA Prozeß- und Maschinen-Automation GmbH

# Multi-temperature controller KS 800




## Interface description

## ISO 1745 protocol

**9499 040 49411**

valid from: 8357

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## Inhalt

# 1 Hints on operation

Multi-temperature controller version KS800-RS is provided with a serial, bussable RS485 interface which can be used for transmission of process, parameter and configuration data. Connection is via (a) 9-pole sub-D socket(s)(connector(s)). The serial communication interface permits connections to supervisory PLCs, visualization tools, etc.
An RS485/422 hardware interface is realized. The protocol available on this hardware is:

- the PCI protocol, which is based on an ISO 1745 frame,

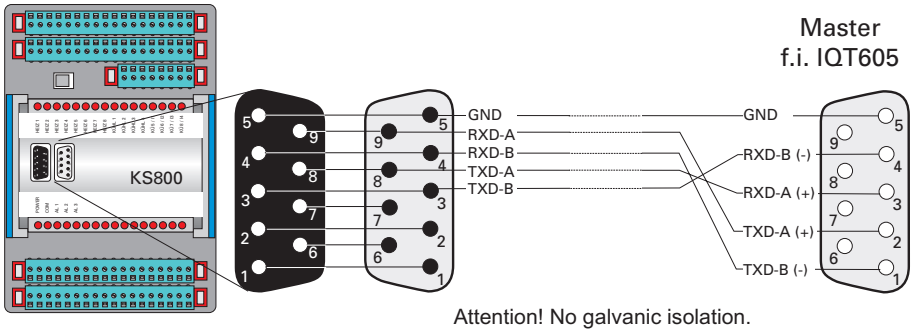
Communication is according to the master/slave principle. KS800 is always slave. The software of the serial interface is implemented as standard in the firmware.

Another standard interface is the PC interface. This interface is used for connecting an engineering tool, which runs on an external PC.

## 1.1 *Connecting the interface*

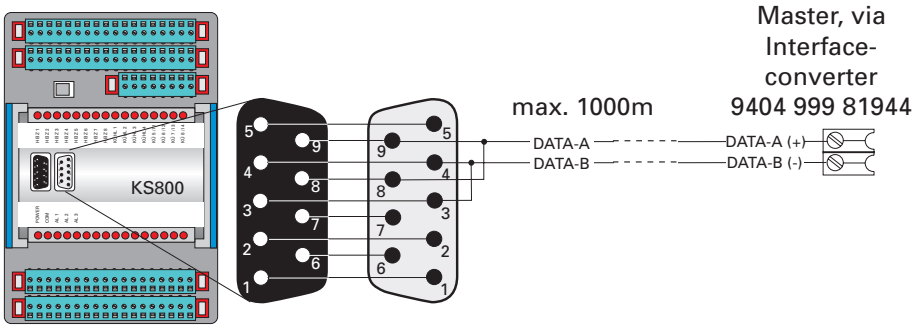
Version KS800-RS offers an RS485 or RS422 interface. ‘RS422’ as available in this product means an RS485 4-wire interface. A driver for reception and a driver for sending are available.

*Fig.: 1 Connection examples RS422 interface*




On the 2-wire RS 485 interface, reception and transmission lines must be galvanically connected by the user.

*Fig.: 2 Connection examples RS485 interface*




If an RGND connection is required with an RS485 adjustment, a 100 Ohm resistor must be mounted across terminal 5 (RGND) and terminal 5 of the interface converter by the user.

The outputs are galvanically isolated.

The interface mode is half-duplex.

Installing appropriate cables must be done by the user, whereby the general cable specifications according to EIA RS485 must be taken into account.

# 2 Interface protocol

## 2.1 *Protocol layer 1*

Bus connection is physical:

- via the PC interface as a TTL signal (COM 1)
- via an RS485/422 connection (COM 2) with version KS800-RS.

### *2.1.1* Data format

The following transmission format, fixed, must be used:

- 1 start bit,
- 7 bits ASCII value or 7 bits binary
- 1 parity bit (EVEN)
- 1 stop bit

LSB is transmitted first, MSB is parity bit.

### *2.1.2* Baud rate

The Baud rate for the serial interface is adjustable. The following Baud rates are available:

- 2400 Baud
- 4800 Baud
- 9600 Baud
- 19200 Baud

### *2.1.3* Parity

Parity detection is fixed to EVEN.

### *2.1.4* Addressing

KS 800 can be operated together with KS40, KS50, KS90, KS92, KS94 , KS98, KS4580, DIGITAL 280/380 and PRO 96 and the ICS 90 and ITS 90 systems at the same bus. Decisive for instrument selection is the address (2 bytes).

The KS 800 (0...99) address is adjusted via the “KS800 Engineering Tool” (general instrument settings → communication → address).

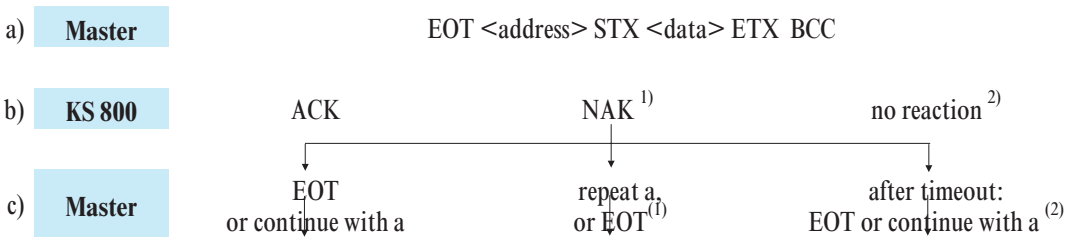
## 2.2 *Protocol layer 2*

A fixed master/slave principle is used, whereby KS800 is always slave. Transmission control (communication start and cancelation by EOT) is always by the master.

Two communication services are available:

❑ for data sending: SDA (Send Data with Acknowledge)
, acknowledged by KS 800

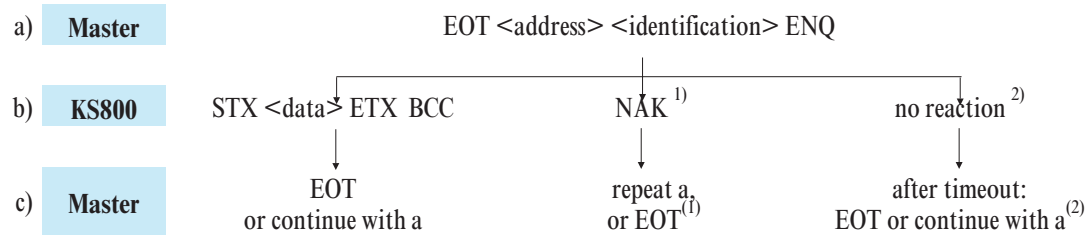
Data flow direction : master → KS 800




1) Possible after disturbance of transmission or after sending inadmissible data.
2) Possible after KS 800 failure, bus failare or faulty address specification.

❑ for data request: RDR (Request Data with Reply)
data request with reply in one message cycle.

Data flow direction : KS800 → Master




## *2.2.1* Transmission control characters

The following transmission control characters are used:

| Abbreviation | HEX | Description |
|---|---|---|
| STX | 02 | Start of Text - data introduction |
| ETX | 03 | End of Text - end of data |
| EOT | 04 | End of Transmission - reset the interface units or transmission cancelation |
| ENQ | 05 | Enquiry - request for reply |
| ACK | 06 | Acknowledge - confirmation |
| NAK | 15 | Not Acknowledge - no confirmation |

## *2.2.2* Character format

Numbers and characters in the address, identification or data field are always transmitted as ASCII characters.
The following 7-bit ASCII characters with parity (EVEN) are valid

| CHR | HEX | Description |
|---|---|---|
| , | 2C | Comma as separator |
| = | 3D | Separator between identification and value |
| 0...9 | 30...39 | Values for numbers and codes |
| B | 41 | Additional for codes |
| :...? | 3A...3F | Values for floating point format (FP) |
| @...; | 40...7F | Values for status and control bytes |
| ...; | 20...7F | Characters for text string (CHAR16) |
| . | 2E | Decimal point |

1) Possible after disturbance of transmission or after sending inadmissible data.
2) Possible after KS 800 failure, bus failare or faulty address specification.

# 3 Message structure

## 3.1 *Message elements*

In the following section, some expressions which shall be explained as follows are used:

| Element | Description | Rem. |
|---|---|---|
| **<addr>** | Address of a participating unit, always 2 bytes long, adjustable on the instruments | **A** |
| **<daten>** | Data field composed of<br>a) fields <identification> a. <value>, separated by character '='<br>b) a series of successive <value> with several block accesses | **B** |
| **<identification>** | identification field composed of<br>a) field <code> and<br>b) different selection criteria <selection> | **C** |
| **<value>** | Value of a datum, which is addressed with a key. | |
| **<code>** | Addressing key of a datum, 2-digit, decimal number range, first digit also 'B'. | **D** |
| **<selection>** | further addressing field for selection of <function block no.> a. <function no.> | **E** |
| **<BCC>** | Block Check Count. All characters between STX (exclusive) and ETX (inclusive) are connected bytewisely by an EXOR function and output as 1 byte, always after ETX. | **F** |

***Bem. A*** ***Address field***

The adress field can be transmitted only after 'EOT' and must be generated only by the master. It is two bytes long. The address number range is 00 ... 99. If the transmitted address corresponds with the one adjusted in the unit, the message is intended for this unit.
Different address settings are possible for COM1 and COM2.

***Bem. B*** ***Data field***

The data field contains the parameters and data to be transmitted.

The equality sign is followed by the value of a datum (<valuex>). Several data are separated by a comma. The data type depends on the access. The last value before 'ETX' ends without ','.

With block read access with additional selection criteria, these criteria are specified only once. The data follow without further identifications. Thus, the message structure becomes more compact.

***Bem. C*** ***Identification field***

The identification field addesses a defined datum or a data area in the instrument. It consists of a code and of an additional selection identification with some accesses.

With a data enquiry, the identification field contains information for KS92/94 which data the unit is expected to send. This is always followed by the address field. In the reply, it is also specified for clear determination of the datum, followed by the data field with separator „=".

With data entry, STX is followed by the identification field for addressing the values to be specified. Connection of the data field is by means of character „=".

***Bem. D*** ***Code***

The code identification is two bytes long and the value range is ASCII '00'...'99' and 'B2'... 'B3'.

***Bem. E*** ***Addition selection criteria***
In order to form a purposeful sub-set from the variety of data, additional selection criteria are defined:

❑ Function block number
A function block is addressed by a function block number. It is within ‘0’ and ‘250’ and is appended to the code field by means of a comma.***‘<code>,<function block no.>’***

Function block number ranges:
- 0general data for the overall instrument
- 1 - 99fixed function blocks
- 100 - 250variable function blocks

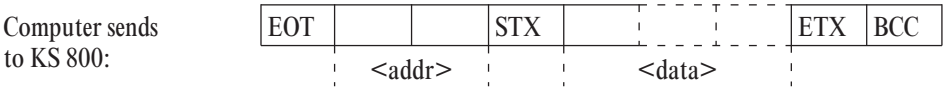
❑ Function number
A function as a partial address of a function block is addressed with a function number. It is within ‘0’ and ‘99’ and is appended to the function block number by means of a comma.
***‘<code>,<function block no.>,<function no.>’***

Function number ranges:
- 0 - 99Functions
- 0Function General, Default, unless a no. is specified

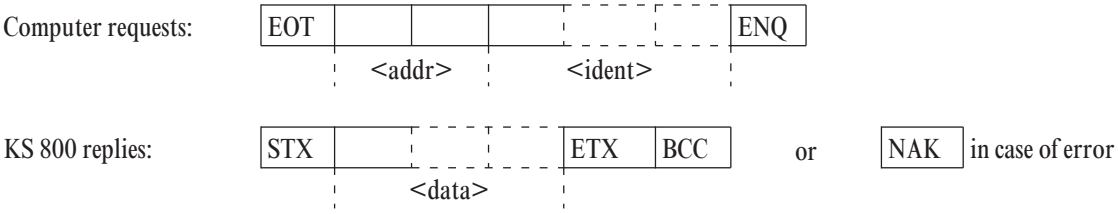
***Bem. F*** ***Safety procedure***
Correct transmission of a message is supported by two safety procedures:
- check of each message byte by formation of parity (1 bit per 7 data bits)
- Check by Block Check Count : safety section, which connects all characters of a message between STX (excl.) and ETX (incl.) bytewisely by a logic XOR function; length 1 byte, follows always after ETX.

## 3.2 *Basic message structure*

Message structure with data transmission:




Message structure with data enquiry:



## 3.3 *Data types*

Data values are classified according to data types for transmission. Only characters which can be represented in ASCII are permitted.

- BCD
  Floating Point number in BCD-ASCII format,
  Range: -9999 ... -0.001, 0, 0.001 ... 9999
  optional: negative polarity sign and decimal point permitted; exponent representation not permitted.
  KS800 controllers with an accuracy of max. 4 digits. With received data, number of digits and decimal point position are not fixed and depend on the FP resolution. The values are not rounded off.
  Switch-off value for BCD data is : -32000
- INT
  positive integer number in ASCII format
  Range: 0 ... 32767
  Range with configuration words: 0000 ... 9999 (→ page 14)
  Exception: switch-off value '-32000'
- ST1
  Status, bit-oriented, 1 byte length
  Range: 00H ... 3FH, transmitted: 40H...7FH
  Only 6 bits for transmission of information can be used, i.e. bit 0...5 (LSB = bit 0). Bit 6 must always be set to '1', in order to avoid confusion with the control characters. Bit 7 contains the parity bit.
- SYS16
  System identification number, 16 bytes
  Format: xx,yyyyyyyy,zzzz (→ page 11)

# 4 Standard protocol

The KS800 standard protocol version represents instrument-specific standard data.

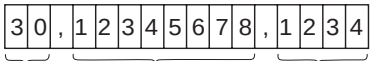
## 4.1 *CODE table*

| Code | Description | R/W | Type | Range | Description | Rem. |
|---|---|---|---|---|---|---|
| 18 | System ident | R | SYS16 | | System identification | A |
| 80 | Block 81... 83 | R | Block | | | |
| 81 | Write Error | R | INT | 0, 100 ... 127 | Error of last write access | B |
| 82 | Write Error Position | R | INT | 0 ... 99 | Position of last write access error | |
| 83 | Read Error | R | INT | 0, 100 ... 127 | Error of last read access | |

***Bem. A*** ***Instrument data***

System dentifiction number (code 18)

For instrument identification, instrument type and software code number can be read via code 18. The datum is composed of the following sections:




Instrument type: (30 =KS800)
SW code number: (the last 8 digits)
Instrument version: 7th to 10th digit of 12NC (4 digits)

***Bem. B*** ***Diagnosis access: block 8x***

For test purposes, an additional debug access which signals errors of the last write or read access is available. Presently, reading is possible for:

- error number of last write access; 0 = no error
- position of the faulty datum during the last write access;
  0 = no error or error in address
  1 = first datum is faulty (also with single accesses)
  n = nth datum is faulty (with block accesses)
- error number of last read access; 0 = no error

An independent memory for error messages is available for each interface COM1 and COM2. Presently, the following error messages are defined:

| Err. no. | Description | Error name |
|---|---|---|
| 101 | unspecified error | ERR_UNSPECIFIED |
| 102 | read not permitted | ERR_RD_NOTALLOWED |
| 103 | write not defined | ERR_WR_NOTALLOWED |
| 104 | local operation / no write access | ERR_LOCOPERAT |
| 105 | non-defined key code | ERR_KEYIDENT |
| 106 | range overflow function block no. | ERR_FB_OVERFL |
| 107 | range overflow function no. | ERR_FCT_OVERFL |
| 108 | write or range overflow | ERR_WR_RANGE_OV |
| 109 | char is not a digit | ERR_NODIGIT |
| 110 | no '\0' found in the correct position | ERR_ENDDELIMITER |
| 111 | no '=' in the correct position | ERR_NO_EQUALSIGN |
| 112 | faulty ST1 format (status) | ERR_NO_ST1FORMAT |
| 113 | no ',' in the correct position | ERR_NO_COMMA |
| 114 | byte range overflow | ERR_BYTE_OVERFL |
| 115 | number of digits exceeded | ERR_DIGIT_OVERFL |
| 116 | range 9999 exceeded | ERR_RG9999_OVERFL |
| 117 | undefined protocol type | ERR_UNDEF_PRTCTYPE |
| 118 | undefined parameter reference | ERR_UNDEF_PARAMREF |
| 119 | undefined decimal point | ERR_UNDEF_DECPNT |

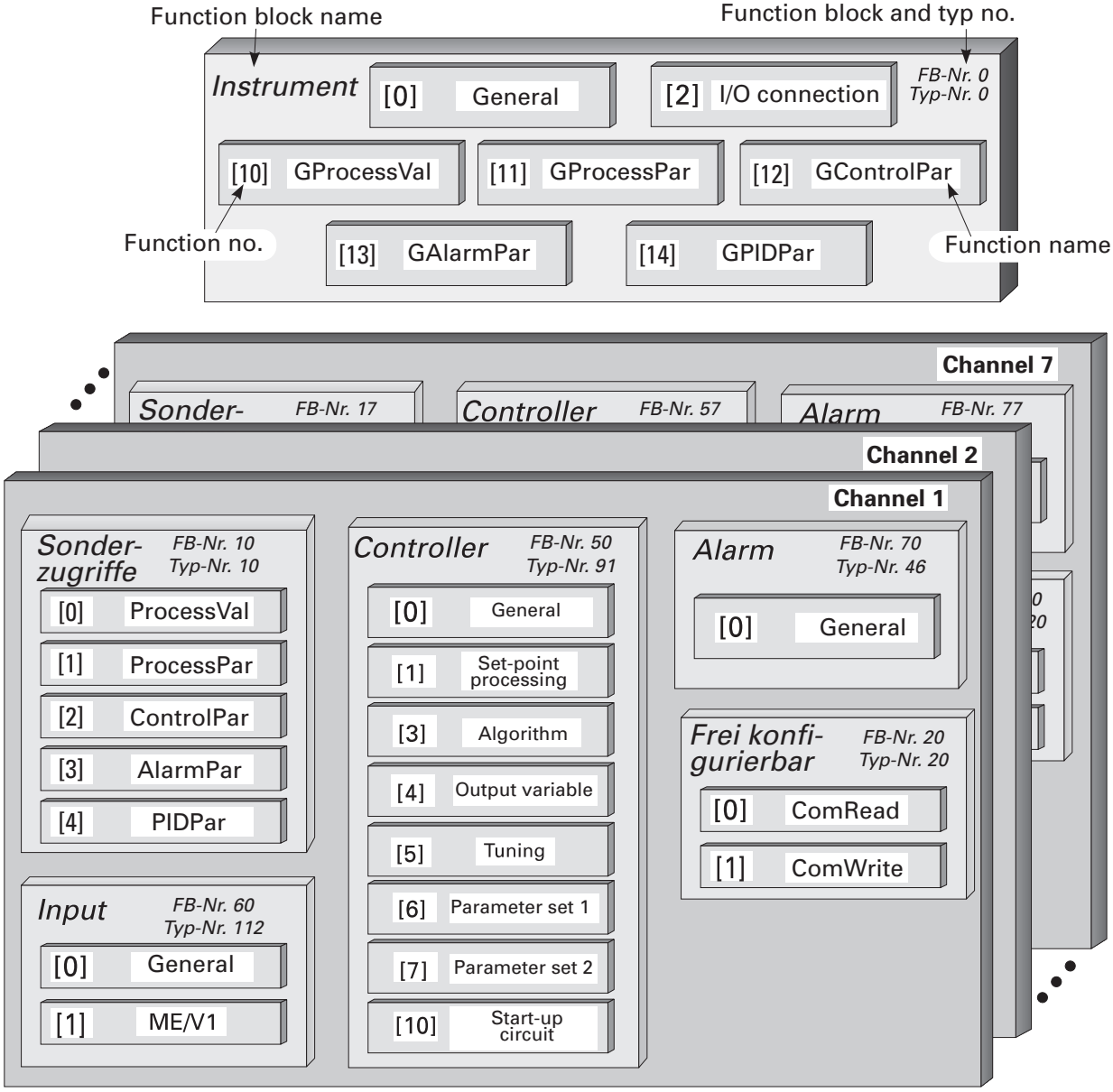
| Err. no. | Description | Error name |
|---|---|---|
| 120 | no STX in the write message | ERR_NO_STX |
| 121 | number INT faulty | ERR_INT_ANZ |
| 122 | number REAL faulty | ERR_REAL_ANZ |
| 123 | faulty access type | ERR_ZUGRIFF |
| 124 | no config level | ERR_WR_NO_CONF |
| 125 | local operation | ERR_WR_LOCAL |
| 126 | error FI switch-over | ERR_WR_FU_UM |

# 5 Function block protocol

## 5.1 *Data structure*

Due to the variety of information to be processed in KS800, logically related data and actions are grouped in function blocks. A function block has input, output data, parameters and configuration data. For KS800, 25 function blocks are defined. They are all addressed via fixed block addresses (FB no.). Each block is also divided into several functions. Functions are addressed via function numbers (Fct-no.). Function number 0 addresses function block-specific data.

*Fig.: 3 Survey of KS 800 function blocks and functions*



## 5.2 *CODE tables*

### *5.2.1* Structure of configuration words (C.xxxx)

The configuration words mentioned in the following code tables are composed of several sections, which can be transmitted only in common.
The data in the table must be interpreted as follows:

**Example (C100):**

| Code | Descr. | R/W | Type | Description | Range |
|---|---|---|---|---|---|
| 71 | C100 | R/W | INT | CFunc: Controller function (T,H)<br>Wfunc: set-point function (E) | 0..xxyz |

| Description | CFunc | | WFunc |
|---|---|---|---|
| | Thousands | Hundreds | Ones |
| Range | x | x | z |
| | 00 ... 07 | | 0...1 |

Example: continuous controller; standard controller; set-point-cascade with offset: **0 2 0 4**

- For transmission of configuration words, see chapter page 29.
- Die Einstellmöglichkeiten der Konfigurationswörter entnehmen Sie der KS 800 Funktionsbeschreibung (Best. Nr. 9499 040 49218)

### *5.2.2* INSTRUMENT (FB no.: 0 type no.: 0)

Function block 'INSTRUMENT' is used for classification of all data which are valid for the overall instrument.

**Process data**

**General** (function no.: 0)

| Code | Descr. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|
| 01 | Unit_State 1 | R | ST1 | Status 1 | | A |
| 10 | Block 13..18 | R | Block | | | |
| 13 | Write Error | R | INT | Error during last write access | 0, 100...127 | → p. 11 |
| 14 | Write Error Position | R | INT | Position of last write access error | 0...99 | |
| 15 | Read Error | R | INT | Error of last read access | 0, 100...127 | |
| 16 | DPErr | R | INT | Error message from DP-module | | B |
| 17 | DPAdr_eff | R | INT | Effectiv PROFIBUS adress | 0 … 126 | |
| 18 | Type | R | INT | Type no. of function block | 0 | |
| 20 | Block 21...27 | R | Block | | | |
| 21 | HWbas | R | INT | Basic HW options: module A, P | | C |
| 23 | SWopt | R | INT | SW options 1 | | D |
| 24 | SWcod | R | INT | SW code no. 7th to 10th digit of 12NC | wxyz | E |
| 25 | SWvers | R | INT | SW code no. 11th to 12th digit of 12NC | 00xy | F |
| 26 | OPVers [1)] | R | INT | Operating version | | |
| 27 | EEPVers[1)] | R | INT | EEPROM version | | |
| 31 | OpMod | R/W | INT | Switch over unit to configuration mode (only after 1) | 0 | |
| | | | | Switch over unit to on-line mode (only after 0) | 1 | |
| | | | | Cancelation of configuration mode (only after 0) | 2 | |
| 32 | Ostartg | R/W | INT | Self-tuning stop/start of all group controllers | 0..1 | |
| 33 | UPD | R/W | INT | Acknowledgement of local data change | 0..1 | G |

1) Data are specified for future use (distinction of internal version).

***Bem. A Unit_State1***

| MSB | | | | | | | LSB |
|---|---|---|---|---|---|---|---|
| D7 | D6 | **D5** | D4 | D3 | D2 | **D1** | D0 |

| Bit no. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | '0' | Always '0' | | |
| D1 | CNF | Instrument status | on-line | configuration |
| D2...D4 | '0' | Always '0' | | |
| D5 | UPD | Parameter update | no | yes |
| D6 | '1' | Always '1' | | |
| D7 | | Parity | | |

***Bem. B DPErr***

| MSB | | | | | | | | | | | | | | | LSB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | **D3** | **D2** | **D1** | **D0** |

| Bit no. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | | Buszugriff nicht erfolgreich | Kein Fehler | Fehler |
| D1 | | Fehlerhaftes Prarametriertelegramm | Kein Fehler | Fehler |
| D2 | | Fehlerhafte Konfiguration | Kein Fehler | Fehler |
| D3 | | Kein Nutzdatenvberkehr mer | Kein Fehler | Fehler |
| D4...D15 | '0' | Always '0' | | |

***Bem. C HWbas***

| COM2 | | 0 | 0 |
|---|---|---|---|
| T | H | Z | E |

| | | | | |
|---|---|---|---|---|
| Basic version without COM2 | 0 | 0 | 0 | 0 |
| COM2 with CANopen | 0 | 1 | 0 | 0 |
| COM2 with PROFIBUS-DP | 1 | 0 | 0 | 0 |
| COM2 with ISO1745 | 1 | 1 | 0 | 0 |

Example: Value '*HWbas = 0100*' means that the addressed instrument is a COM2 interface with CANopen connection.

***Bem. D SWopt***

| Version | | 0 | 0 |
|---|---|---|---|
| T | H | Z | E |

| | | | | |
|---|---|---|---|---|
| Basic version | 0 | 0 | 0 | 0 |
| Water cooling (so far not available) | 0 | 1 | 0 | 0 |

***Bem. E SWCod***

| T | H | Z | E |
|---|---|---|---|
| 7th digit | 8th digit | 9the digit | 10th digit |

Example: Value '*SWCod= 7239*' means that the software for the addressed instrument contains code number 4012 157 239xx.

***Bem. F SWvers***

| T | H | Z | E |
|---|---|---|---|
| 0 | 0 | 11th digit | 12th digit |

Example: Value '*SWVers= 11*' means that the software of the addressed unit contains code number 4012 15x xxx11.

***Bem. G UPD***

Changing a parameter value or a configuration value via an interface is indicated in the UPD flag. This bit is also set after mains recovery. The flag, which can be read also via code UPD, can be reset (value =0).

**I/O connection** (Function no.: 2)

| Code | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|
| 0 | Block 1...2 | R | Block | | | |
| 1 | State_alarm_out | R | ST1 | Status alarm outputs | | G |
| 2 | State_dio | R | ST1 | Status digital inputs/outputs | | H |
| 20 | Block 21...24 | L | Block | | | |
| 21 | SnOEMOpt | L | INT | Seriennummer OEM-Feld | | |
| 22 | SnFabMonth | L | INT | Seriennummer Fabrikationsmonat | | |
| 23 | SnCntHi | L | INT | Seriennummer Zähler High | | |
| 24 | SncntLo | L | INT | Seriennummer Zähler Low | | |
| 30 | Block 31...33 | L | Block | | | |
| 31 | Fdo1 | L/S | ICMP | Forced digitale Ausgänge: OUT1 ... OUT8 | | J |
| 32 | Fdo2 | L/S | ICMP | Forced digitale Ausgänge: OUT9 ... OUT16 | | K |
| 33 | Fdo3 | L/S | ICMP | Forced digitale Ausgänge: OUT17 ... OUT19 | | L |

***Bem. H State_alarm_out***

| MSB | | | | | | | LSB |
|---|---|---|---|---|---|---|---|
| D7 | D6 | D5 | **D4** | **D3** | **D2** | **D1** | **D0** |

| Bit no. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | R1 | Relay 1 | off | on |
| D1 | R2 | Relay 2 | off | on |
| D2 | R3 | Relay 3 | off | on |
| D3 | do1_12 AL | Alarm output short circuit do1 ... do12 | off | on |
| D4 | HCscAL | Alarm message heating current short circuit | off | on |
| D5 | '0' | Always '0' | | |
| D6 | '1' | Always '1' | | |
| D7 | | Parity | | |

***Bem. I State_dio***

| MSB | | | | | | | LSB |
|---|---|---|---|---|---|---|---|
| D7 | D6 | **D5** | D4 | **D3** | **D2** | **D1** | **D0** |

| Bit no. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | Par_Nr | Parameter set number | set 0 | set 1 |
| D1 | w/w2 | w/w2 switch-over | w | w2 |
| D2 | Coff | Controller off | off | on |
| D3 | Leck | Leakage current | off | on |
| D4 | '0' | Always '0' | | |
| D5 | do13_16f | do13 ... do16 Fail | no | yes |
| D6 | '1' | Always '1' | | |
| D7 | | Parity | | |

***Bem. J Aufbau der Datenstruktur***

| Bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bedeutung | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | OUT8 | OUT7 | OUT6 | OUT5 | OUT4 | OUT3 | OUT2 | OUT1 |

***Bem. K Aufbau der Datenstruktur***

| Bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bedeutung | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | OUT16 | OUT15 | OUT14 | OUT13 | OUT12 | OUT11 | OUT10 | OUT9 |

***Bem. L Aufbau der Datenstruktur***

| Bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bedeutung | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | OUT19 | OUT18 | OUT17 |

**GProcessVal** (Funktions-Nr: 10)

| Code | Bez. | Kanal | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|---|
| B2 | Xeff | 1 | L | INT | Effektiver Istwert von Kanal 1 | | |
| | Yeff | 1 | L | INT | Effektive Stellgröße vom Kanal 1 | | |
| | HC | 1 | L | INT | Heizstrom vom Kanal 2 | | |
| | Xeff | 2 | L | INT | Effektiver Istwert von Kanal 2 | | |
| | Yeff | 2 | L | INT | Effektive Stellgröße vom Kanal 2 | | |
| | HC | 2 | L | INT | Heizstrom vom Kanal 2 | | |
| | … | | | | | | |
| | Xeff | 8 | L | INT | Effektiver Istwert von Kanal 8 | | |
| | Yeff | 8 | L | INT | Effektive Stellgröße vom Kanal 8 | | |
| | HC | 8 | L | INT | Heizstrom vom Kanal 8 | | |
| | State_alarm_out | 1 | L | ST1 | Status der Alarmausgänge von Kanal 1 | | **H** |
| | State_alarm_out | 2 | L | ST1 | Status der Alarmausgänge von Kanal 2 | | **H** |
| | … | | | | | | |
| | State_alarm_out | 8 | L | ST1 | Status der Alarmausgänge von Kanal 8 | | **H** |

**GProcessPar** (Funktions-Nr: 11)

| Code | Bez. | Kanal | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|---|
| B2 | Wvol | 1 | L/S | INT | Flüchtiger Sollwert von Kanal 1 | | |
| | W2 | 1 | L/S | INT | Zusatzsollwert von Kanal 1 | | |
| | Yman | 1 | L/S | INT | absolute Stellgrößenvorgabe von Kanal 1 | | |
| | Wboost | 1 | L/S | INT | | | |
| | Tboost | 1 | L/S | INT | | | |
| | Wvol | 2 | L/S | INT | Flüchtiger Sollwert von Kanal 2 | | |
| | W2 | 2 | L/S | INT | Zusatzsollwert von Kanal 2 | | |
| | Yman | 2 | L/S | INT | absolute Stellgrößenvorgabe von Kanal 2 | | |
| | Wboost | 2 | L/S | INT | | | |
| | Tboost | 2 | L/S | INT | | | |
| | ... | | | | | | |
| | Wvol | 8 | L/S | INT | Flüchtiger Sollwert von Kanal 8 | | |
| | W2 | 8 | L/S | INT | Zusatzsollwert von Kanal 8 | | |
| | Yman | 8 | L/S | INT | absolute Stellgrößenvorgabe von Kanal 8 | | |
| | Wboost | 8 | L/S | INT | | | |
| | Tboost | 8 | L/S | INT | | | |

**GControlPar** (Funktions-Nr: 12)

| Code | Bez. | Kanal | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|---|
| B2 | A/M | 1 | L/S | INT | Automatik/Hand- Umschaltung von Kanal 1 | | |
| | Coff | 1 | L/S | INT | Regler ein/aus von Kanal 1 | | |
| | w/W2 | 1 | L/S | INT | Umschaltung w/W2 von Kanal 1 | | |
| | Ostart | 1 | L/S | INT | Start der Selbstoptimierung von Kanal 1 | | |
| | SoftStartEnable | 1 | L/S | INT | | | |
| | BoostStartEnable | 1 | L/S | INT | | | |
| | A/M | 2 | L/S | INT | Automatik/Hand- Umschaltung von Kanal 1 | | |
| | Coff | 2 | L/S | INT | Regler ein/aus von Kanal 1 | | |
| | w/W2 | 2 | L/S | INT | Umschaltung w/W2 von Kanal 1 | | |
| | Ostart | 2 | L/S | INT | Start der Selbstoptimierung von Kanal 2 | | |
| | SoftStartEnable | 2 | L/S | INT | | | |
| | BoostStartEnable | 2 | L/S | INT | | | |
| | ... | | | | | | |
| | A/M | 8 | L/S | INT | Automatik/Hand- Umschaltung von Kanal 1 | | |
| | Coff | 8 | L/S | INT | Regler ein/aus von Kanal 1 | | |
| | w/W2 | 8 | L/S | INT | Umschaltung w/W2 von Kanal 1 | | |
| | Ostart | 8 | L/S | INT | Start der Selbstoptimierung von Kanal 1 | | |
| | SoftStartEnable | 8 | L/S | INT | | | |
| | BoostStartEnable | 8 | L/S | INT | | | |

**GAlarmPar** (Funktions-Nr: 13)

| Code | Bez. | Kanal | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|---|
| B2 | LimL | 1 | L/S | INT | Unterer Voralarm von Kanal 1 | | |
| | LimH | 1 | L/S | INT | Oberer Voralarm von Kanal 1 | | |
| | LimLL | 1 | L/S | INT | Unterer Hauptalarm von Kanal 1 | | |
| | LimHH | 1 | L/S | INT | Oberer Hauptalarm von Kanal 1 | | |
| | LimL | 2 | L/S | INT | Unterer Voralarm von Kanal 2 | | |
| | LimH | 2 | L/S | INT | Oberer Voralarm von Kanal 2 | | |
| | LimLL | 2 | L/S | INT | Unterer Hauptalarm von Kanal 2 | | |
| | LimHH | 2 | L/S | INT | Oberer Hauptalarm von Kanal 2 | | |
| | ... | | | | | | |
| | LimL | 8 | L/S | INT | Unterer Voralarm von Kanal 8 | | |
| | LimH | 8 | L/S | INT | Oberer Voralarm von Kanal 8 | | |
| | LimLL | 8 | L/S | INT | Unterer Hauptalarm von Kanal 8 | | |
| | LimHH | 8 | L/S | INT | Oberer Hauptalarm von Kanal 8 | | |

**GPIDPar** (Funktions-Nr: 14)

| Code | Bez. | Kanal | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|---|
| B2 | Xp1 | 1 | L/S | INT | Proportionalbereich für Kanal 1 | | |
| | Tn1 | 1 | L/S | INT | Nachstellzeit für kanal 1 | | |
| | Tv1 | 1 | L/S | INT | Vorhaltezeit für Kanal 1 | | |
| | T1 | 1 | L/S | INT | minimale Periodendauer für Kanal 1 | | |
| | Xp1 | 2 | L/S | INT | Proportionalbereich für Kanal 2 | | |
| | Tn1 | 2 | L/S | INT | Nachstellzeit für kanal 2 | | |
| | Tv1 | 2 | L/S | INT | Vorhaltezeit für Kanal 2 | | |
| | T1 | 2 | L/S | INT | minimale Periodendauer für Kanal 2 | | |
| | ... | | | | | | |
| | Xp1 | 8 | L/S | INT | Proportionalbereich für Kanal 8 | | |
| | Tn1 | 8 | L/S | INT | Nachstellzeit für kanal 8 | | |
| | Tv1 | 8 | L/S | INT | Vorhaltezeit für Kanal 8 | | |
| | T1 | 8 | L/S | INT | minimale Periodendauer für Kanal 8 | | |

## Parameter a. configuration data

**General** (function no.: 0)

| Code | | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|---|
| B2 | 41 | lim_wk_enable | R/W | INT | Freigabe der Kühlenfunktion für alle Kanäle | -999,9 … 999,9 | |
| B3 | 71 | C900 [1)]<br>COM1 | R/W | INT | Prot: protocol type (T)<br>Baud: Baud rate (H,Z) | 0..xyy0 | |
| | 72 | Adr1 [1)] | L/S | INT | COM1: instrument address: | 0..99 | |
| | 73 | C904 | R/W | INT | Freq: mains frequency 50/60 (T) | 0..x000 | |
| | 74 | C902 [1)]<br>COM2 | R/W | INT | Prot: protocol type (T)<br>Baud: Baud rate (H,Z) | 0..wxyz | |
| | 75 | Adr2 [1)] | R/W | INT | COM2: Instrument address: ISO1745<br>CAN-BUS | 0..99<br>0..255 | |

**I/O connection** (function no.: 2)

| Code | | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|---|
| B3 | 71 | HC100 | R/W | BCD | Span end for HC | 1...9999 | |
| | 72 | C500 | R/W | ICNF | Main configuration di1/do13 ... di4/do16<br>Fkt_dio1: di1 / do13 (T)<br>Fkt_dio2: di2 / do14 (H)<br>Fkt_dio3: di3 / do15 (Z)<br>Fkt_dio4: di4 / do16 (E) | 0..wxyz | |
| | 73 | C530 | R/W | ICNF | Main configuration do17 ... do19<br>mode_do17 (T)<br>mode_do18 (H)<br>mode_do19 (Z) | 0...xyz0 | |
| | 74 | C151 | R/W | ICNF | Allocation HC/leakage current alarm<br>DestHC (T)<br>DestLeck (H)<br>DestOutError (Z) | 0...xyz0 | |
| | 75 | HCycl | R/W | INT | Heating current cycle time | 0...999 | |

1) Baud rate and adress setting are only effective after initialization, e.g. protocol switch-over.

### *5.2.3* Sonderzugriffe (FB-Nr.: 10 ... 17 Typ-Nr.: 10)

Der Funktionsblock ‘Sonderzugriffe’ ermöglicht, auf die Daten des KS800 in anderer Form zuzugreifen. Der Zugriff kann nur über den Code B2 ausgeführt werden.

**ProcessVal** (Funktions-Nr: 0)

| Code | Bez. | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|
| B2 | Xeff | L | INT | Effektiver Istwert | | |
| | Yeff | L | INT | Effektive Stellgröße | | |
| | HC | L | INT | Heizstrom | | |
| | State_alarm_out | L | ST1 | Status der Alarmausgänge | | |

**ProcessPar** (Funktions-Nr: 1)

| Code | Bez. | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|
| B2 | Wvol | L/S | INT | Flüchtiger Sollwert | | |
| | W2 | L/S | INT | Zusatzsollwert | | |
| | Yman | L/S | INT | absolute Stellgrößenvorgabe | | |
| | Wboost | L/S | INT | momentan keine Funktion | | |
| | Tboost | L/S | INT | momentan keine Funktion | | |

**ControlPar** (Funktions-Nr: 2)

| Code | Bez. | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|
| B2 | A/M | L/S | INT | Automatik/Hand-Umschaltung | | |
| | Coff | L/S | INT | Regler ein/aus | | |
| | w/W2 | L/S | INT | Umschaltung w/W2 | | |
| | Osart | L/S | INT | Start der Selbstoptimierung | | |
| | SoftStartEnable | L/S | INT | momentan keine Funktion | | |
| | BoostStartEnable | L/S | INT | momentan keine Funktion | | |

**AlarmPar** (Funktions-Nr: 3)

| Code | Bez. | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|
| B2 | LimL | L/S | INT | unterer Voralarm | | |
| | LimH | L/S | INT | oberer Voralarm | | |
| | LimLL | L/S | INT | unterer Hauptalarm | | |
| | LimHH | L/S | INT | oberer Hauptalarm | | |

**PIDPar** (Funktions-Nr: 4)

| Code | Bez. | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|
| B2 | Xp1 | L/S | INT | Proportionalbereich 1 | | |
| | Tn1 | L/S | INT | Nachstellzeit 1 | | |
| | Tv1 | L/S | INT | Vorhaltezeit 1 | | |
| | T1 | L/S | INT | minimale Periodendauer | | |

### *5.2.4* Frei konfigurierbar (FB-Nr.: 20 ... 27 Typ-Nr.: 20)

Der Funktionsblock “Frei konfigurierbar” definiert Daten die dann per Blockzugriff 20 bzw. 30 gelesen werden können. Die Daten des ComWrite können mit den Schlüsseln 31 - 38 auch geändert werden. Zusätzlich stellt diese Einstellung der Profibus-Schnittstelle für die entsprechenden Datenmodulen die Werte zur Verfügung.

**ComRead** (Funktions-Nr: 0)

| Code | Bez. | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|
| 20 | Block | L | Block | | 21... 28 | |
| 21 | Val 1 | L | Datenspezifisch | Wert 1 | | A |
| 22 | Val 2 | L | Datenspezifisch | Wert 2 | | |
| 23 | Val 3 | L | Datenspezifisch | Wert 3 | | |
| 24 | Val 4 | L | Datenspezifisch | Wert 4 | | |
| 25 | Val 5 | L | Datenspezifisch | Wert 5 | | |
| 26 | Val 6 | L | Datenspezifisch | Wert 6 | | |
| 27 | Val 7 | L | Datenspezifisch | Wert 7 | | |
| 28 | Val 8 | L | Datenspezifisch | Wert 8 | | |

**ComWrite** (Funktions-Nr: 1)

| Code | Bez. | L/S | Typ | Beschreibung | Bereich | Bem. |
|---|---|---|---|---|---|---|
| 30 | Block | L | Block | | 31... 38 | |
| 31 | Val 1 | L/S | Datenspezifisch | Wert 1 | | A |
| 32 | Val 2 | L/S | Datenspezifisch | Wert 2 | | |
| 33 | Val 3 | L/S | Datenspezifisch | Wert 3 | | |
| 34 | Val 4 | L/S | Datenspezifisch | Wert 4 | | |
| 35 | Val 5 | L/S | Datenspezifisch | Wert 5 | | |
| 36 | Val 6 | L/S | Datenspezifisch | Wert 6 | | |
| 37 | Val 7 | L/S | Datenspezifisch | Wert 7 | | |
| 38 | Val 8 | L/S | Datenspezifisch | Wert 8 | | |

***Bem. A*** ***Datenspezifisch***

In Abhängigkeit von dem eingestellten Parameter wird der Wertals INT oder Status ausgegeben. Nicht definierte Werte werden im INT-Format mit -31000 ausgegeben.

## Parameter- u. Konfigurationsdaten

| ComRead | | | | | | (Funktionsnr: 0) | |
|---|---|---|---|---|---|---|---|
| **Code** | | **Bez.** | **L/S** | **Typ** | **Beschreibung** | **Bereich** | **Bem.** |
| B2 | 41 | ComReadBlock1 | L/S | INT | Funktionsblocknummer für Wert 1 | 0 … 77 | B |
| | 42 | ComReadFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 1 | 0 … 2999 | |
| | 43 | ComReadBlock1 | L/S | INT | Funktionsblocknummer für Wert 2 | 0 … 77 | |
| | 44 | ComReadFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 2 | 0 … 2999 | |
| | 45 | ComReadBlock1 | L/S | INT | Funktionsblocknummer für Wert 3 | 0 … 77 | |
| | 46 | ComReadFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 3 | 0 … 2999 | |
| | 47 | ComReadBlock1 | L/S | INT | Funktionsblocknummer für Wert 4 | 0 … 77 | |
| | 48 | ComReadFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 4 | 0 … 2999 | |
| | 49 | ComReadBlock1 | L/S | INT | Funktionsblocknummer für Wert 5 | 0 … 77 | |
| | 51 | ComReadFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 5 | 0 … 2999 | |
| | 52 | ComReadBlock1 | L/S | INT | Funktionsblocknummer für Wert 6 | 0 … 77 | |
| | 53 | ComReadFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 6 | 0 … 2999 | |
| | 54 | ComReadBlock1 | L/S | INT | Funktionsblocknummer für Wert 7 | 0 … 77 | |
| | 55 | ComReadFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 7 | 0 … 2999 | |
| | 56 | ComReadBlock1 | L/S | INT | Funktionsblocknummer für Wert 8 | 0 … 77 | |
| | 57 | ComReadFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 8 | 0 … 2999 | |

| ComRead | | | | | | (Funktionsnr: 0) | |
|---|---|---|---|---|---|---|---|
| **Code** | | **Bez.** | **L/S** | **Typ** | **Beschreibung** | **Bereich** | **Bem.** |
| B2 | 41 | ComWriteBlock1 | L/S | INT | Funktionsblocknummer für Wert 1 | 0 … 77 | B |
| | 42 | ComWriteFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 1 | 0 … 2999 | |
| | 43 | ComWriteBlock1 | L/S | INT | Funktionsblocknummer für Wert 2 | 0 … 77 | |
| | 44 | ComWriteFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 2 | 0 … 2999 | |
| | 45 | ComWriteBlock1 | L/S | INT | Funktionsblocknummer für Wert 3 | 0 … 77 | |
| | 46 | ComWriteFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 3 | 0 … 2999 | |
| | 47 | ComWriteBlock1 | L/S | INT | Funktionsblocknummer für Wert 4 | 0 … 77 | |
| | 48 | ComWriteFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 4 | 0 … 2999 | |
| | 49 | ComWriteBlock1 | L/S | INT | Funktionsblocknummer für Wert 5 | 0 … 77 | |
| | 51 | ComWriteFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 5 | 0 … 2999 | |
| | 52 | ComWriteBlock1 | L/S | INT | Funktionsblocknummer für Wert 6 | 0 … 77 | |
| | 53 | ComWriteFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 6 | 0 … 2999 | |
| | 54 | ComWriteBlock1 | L/S | INT | Funktionsblocknummer für Wert 7 | 0 … 77 | |
| | 55 | ComWriteFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 7 | 0 … 2999 | |
| | 56 | ComWriteBlock1 | L/S | INT | Funktionsblocknummer für Wert 8 | 0 … 77 | |
| | 57 | ComWriteFctKey1 | L/S | INT | Funktionsnummer und Code für Wert 8 | 0 … 2999 | |

***Bem. B*** ***Datenstruktur***

Für die Definition, auf welche Date zugegriffen wird, müssen folgende Einträge Vorgenommen werden:

- Funktionsblocknummer → ComReadBlock bzw. ComWriteBlock
- Funktionsnummer + Einzel-Code → ComReadFctKey bzw. ComWriteFctKey

Beispiel:
Soll der Wvol-Wert des Reglers 2 (Reglerbezeichnung 1 - 8) für ComRead ausgewählt werden, so setzen sich die Werte folgendermaßen zusammen:

| | | | | |
|---|---|---|---|---|
| Funktionsblocknummer | Regler 2 | = 51 | ComReadBlock | = 51 |
| Funktionsnummer | Wvol | = 01 | ComReadFctKey | = 0132 |
| Einzel-Code | Wvol | = 32 | | |

### *5.2.5* INPUT (FB no.: 60 ... 67 Type no.: 112)

All data which concern acquisition and processing of all input values (analog/digital) are grouped in function block 'INPUT'. The data are provided once per controller channel.

## Process data

**General** — Input processing of analog signals (Function no.: 0)

| Code | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|
| 00 | Block | R | Block | Block access (1, 3) | | |
| 1 | Input_x_Fail | R | ST1 | Signal Input x Fail | | A |
| 3 | x1 | R | BCD | Main variable | | |
| 10 | Block | R | Block | Block access (13, 18) | | |
| 13 | INP1 | R | BCD | Raw meas. value before meas. value correction | | |
| 18 | Function Type | R | INT | Type no. of function block | 112 | |

***Bem. A*** ***Statusbyte Input_X_Fail:***

| MSB | | | | | | | LSB |
|---|---|---|---|---|---|---|---|
| D7 | D6 | D5 | D4 | D3 | D2 | D1 | **D0** |

| Bit no. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | INP1F | Input 1 Fail | no | yes |
| D1...D5 | '0' | Always '0' | | |
| D6 | '1' | Always '1' | | |
| D7 | | Parity | | |

## Parameter a. configuration data

**ME/V1** — Measurement value INP1 : acquisition and processing (Function no.: 1)

| Code | | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|---|
| B2 | 41 | $X1_{in}$ | R/W | BCD | Measurement value correction X1 Input | -999..9999 | |
| | 42 | $X1_{out}$ | R/W | BCD | Measurement value correction X1 Output | -999..9999 | |
| | 43 | $X2_{in}$ | R/W | BCD | Measurement value correction X2 Input | -999..9999 | |
| | 44 | $X2_{out}$ | R/W | BCD | Measurement value correction X2 Output | -999..9999 | |
| B3 | 71 | X0 | R/W | BCD | Phys. value at 0% | -999..9999 | |
| | 72 | X100 | R/W | BCD | Phys. value at 100% | -999..9999 | |
| | 73 | $X_{Fail}$ | R/W | BCD | Substitute value at sensor fail | -999..9999 | |
| | 74 | $T_{fm}$ | R/W | BCD | Filter time const. meas. Value processing. | 0.0 .. 999.9 | |
| | 75 | $T_{kref}$ | R/W | BCD | Customer-specified TC | 0...60 °C /32...140°F | |
| | 76 | C200 | R/W | INT | Type: sensor type (T,H)<br>Unit: unit (Z) | 0..xxy0 | |
| | 77 | C205 | R/W | INT | Fail: sensor fail behaviour (T)<br>STk: TC source (H)<br>XKorr: process value correction enable (Z) | 1..wxy0 | |
| | 78 | C190 | R/W | INT | Allocation of digital signals: controller off (Z)<br>w/w2 (E) | 0...00xy | |

### *5.2.6* CONTR (FB no.: 50 ... 57 Type no.: 91)

All data concerning the controller are grouped in function block 'CONTR'. They are provided once for each controller channel.

**Process data**

**General** (Function no.: 0)

| Code | Des. | R/W | Type | Description | Range | Rem |
|---|---|---|---|---|---|---|
| 00 | Block | R | Block | Block access (1...9) | | |
| 1 | Status 1 | R | ST1 | Status 1 | | A |
| 3 | W | R | BCD | Eff. set-point | | |
| 4 | X | R | BCD | Eff. process value | | |
| 5 | Y | R | BCD | Effective output variable | | |
| 6 | xw | R | BCD | Control deviation | | |
| 18 | Type | R | INT | Type no. of function block | 90 | |
| 20 | Block | L | Block | Blockzugriff (21...26) | | |
| 21 | Xeff | L | FP | eff. Istwert | | |
| 22 | Yeff | L | FP | wirksame Stellgröße | | |
| 23 | HC | L | FP | Heizstrommeßwert | | |
| 24 | Unit_State | L | ICMP | Eingangswerte (di) | → Seite | |
| 25 | Alarm_x | L | ICMP | Alarmwerte | → Seite | |
| 26 | Status_x | L | ICMP | Statusinformationen | → Seite | |
| 30 | Block | R | Block | Block access (31...38) | | |
| 33 | A/M | R/W | INT | Automatic/manual switch-over | 0..1 | |
| 34 | OStart | R/W | INT | Self-tuning start | 0..1 | |
| 35 | We/i | R/W | INT | Wext/Wint switch-over | 0..1 | |
| 36 | w/W2 | R/W | INT | w/W2 switch-over | 0..1 | |
| 38 | Coff | R/W | INT | Controller off/on | 0..1 | |

***Bem. A Status1: (code 01)***

| MSB | | | | | | | LSB |
|---|---|---|---|---|---|---|---|
| D7 | D6 | **D5** | **D4** | **D3** | **D2** | **D1** | **D0** |

| Bit no. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | Y1 | Switching output | off | on |
| D1 | Y2 | Switching output | off | on |
| D2 | A/M | Autom/manual | Auto | Manual |
| D3 | CFail | Controller status | ok | not ok |
| D4 | Coff | Controller switched off | no | yes |
| D5 | XFail | Sensor Fail | no | yes |
| D6 | '1' | Always '1' | | |
| D7 | | Parity | | |

**Set-point** Set-point processing (Function no.:1)

| Code | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|
| 00 | Block | R | Block | Block access (1, 3) | | |
| 01 | WState | R | ST1 | Set-point status | | B |
| 03 | Wint | R | BCD | Effective internal set-point | | |
| 30 | Block | R | Block | Block access (31...32) | | |
| 31 | Wnvol | R/W | BCD | Int. set-point, non-volatile | -999..9999 | |
| 32 | Wvol | R/W | BCD | Int. set-point, volatile | -999..9999 | |

***Bem. B WState: (code 01)***

| MSB | | | | | | | LSB |
|---|---|---|---|---|---|---|---|
| D7 | D6 | D5 | **D4** | **D3** | **D2** | **D1** | **D0** |

| Bit no. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | w/W2 | w/W2 switch-over | w | W2 |
| D1 | We/Wi | Wext/Wint | Wext | Wint |
| D2 | w/Wanf | w/Wanfahr | w | Wanf |
| D3 | GRW | Gradient function active | no | yes |
| D4 | Weff_fail | Error effective set-point | no | yes |
| D5 | '0' | Always '0' | | |
| D6 | '1' | Always '1' | | |
| D7 | | Parity | | |

**Output variable** — Output variable processing (function no.:4)

| Code | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|
| 30 | Block | R | Block | Block access (31, 35) | | |
| 31 | dYman | R/W | BCD | Difference output variable | -210..210 | |
| 32 | Yman | R/W | BCD | Absolute output variable | -105..105 | |
| 33 | Yinc | R/W | INT | Increment. output variable | 0, 1 | |
| 34 | Ydec | R/W | INT | Decrement. output variable | 0, 1 | |
| 35 | Ygrw_ls | R/W | INT | Speed for incr./decr. output variable offset | 0, 1 | |

**Tuning** — Self-tuning(Function no.:5)

| Code | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|
| 00 | Block | R | Block | Block access (1, 3) | | |
| 1 | State_Tune1 | R | ST1 | Status Tuning | | C |
| 3 | ParNeff | R | INT | Eff. parameter set number | 0...1 | |
| 30 | Block | R | Block | Block access (31...39) | | |
| 31 | ParNr | R/W | INT | Parameter set number effective | 0 .. 1 | |
| 32 | Tu1 | R | BCD | Delay time heating | 0...9999 s | |
| 33 | Vmax1 | R | BCD | Rate of increase heating | 0,000...9,999 %/s | |
| 34 | Kp1 | R | BCD | Process gain heating | 0,000...9,999 | |
| 35 | MSG1 | R | INT | Error code of self-tuning heating | 0...8 | |
| 36 | Tu2 | R | BCD | Delay time cooling | 0...9999 s | |
| 37 | Vmax2 | R | BCD | Rate of increase cooling | 0,000...9,999 %/s | |
| 38 | Kp2 | R | BCD | Process gain cooling | 0,000...9,999 | |
| 39 | MSG2 | R | INT | Error code of self-tuning cooling | 0...8 | |

***Bem. C Status 1 Tuning 'State_Tune1'***

| MSB | | | | | | | LSB |
|---|---|---|---|---|---|---|---|
| D7 | D6 | D5 | D4 | D3 | **D2** | **D1** | **D0** |

| Bit no. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | OStab | Process at rest | no | yes |
| D1 | Orun | Self-tuning mode | off | on |
| D2 | Oerr | Self-tuning result | Ok | error |
| D3...D5 | '0' | Always '0' | | |
| D6 | '1' | Always '1' | | |
| D7 | | Parity | | |

## Parameter a. configuration data

**General** — (Function no.: 0)

| Code | | Des. | R/W | Type | Description | | Range | Rem. |
|---|---|---|---|---|---|---|---|---|
| B3 | 71 | C100 | R/W | INT | CFunc: controller function<br>CType: controller type<br>WFunc:set-point function | (T,H)<br>(Z)<br>(E) | 0..xxyz | |
| | 72 | C101 | R/W | INT | CMode:controller output action<br>CDiff: x/x-w differentiation<br>CFail: behaviour with sensor fail<br>CAnf: start-up circuit | (T)<br>(H)<br>(Z)<br>(E) | 0..wxyz | |
| | 73 | C700 | R/W | INT | OMode: self-tuning mode<br>OCond: process at rest<br>OGrp: allocation group self-tuning<br>OCntr: controlled adapt. mode | (T)<br>(H)<br>(Z)<br>(E) | 0..wxyz | |
| | 74 | C180 | R/W | INT | SWext: source for Wext | (T) | 0..x000 | |

**Set-point** — Set-point processing(Function no.: 1)

| Code | | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|---|
| B2 | 41 | W0 | R/W | BCD | Lower set-point limit f. Weff | -999..9999 | |
| | 42 | W100 | R/W | BCD | Upper set-point limit f. Weff | -999..9999 | |
| | 43 | W2 | R/W | BCD | Additional set-point | -999..9999 | |
| | 44 | Grw+ | R/W | BCD | Set-point gradient | >0..9.999 | 1) |
| | 45 | Grw- | R/W | BCD | Set-point gradient minus | >0..9.999 | |
| | 46 | Grw2 | R/W | BCD | Set-point gradient W2 | >0..9.999 | |

**Algo** — Control algorithm (Function no.: 3)

| Code | | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|---|
| B2 | 41 | Xsh | R/W | BCD | Neutral zone | 0.2 .. 20,0 % | |
| | 42 | Tpuls | R/W | BCD | Min. pulse length | 0.1..2,0 s | 1) |
| | 43 | Tm | R/W | BCD | Actuator response time | 10..300 s | |
| | 44 | Xsd1 | R/W | BCD | Switching difference signaller | 0,1..9999 % | |
| | 45 | LW | R/W | BCD | Trigger point separation addit. contact | -999..9999 | |
| | 46 | Xsd2 | R/W | BCD | Switching difference addit. contact | 0,1..9999 % | |
| | 47 | Xsh1 | R/W | BCD | Neutral zone | 0.0 .. 999.9% | |
| | 48 | Xsh2 | R/W | BCD | Neutral zone | 0.0 .. 999.9 % | |

**Output variable** — Output variable processing(Function no.: 4)

| Code | | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|---|
| B2 | 41 | $Y_{min}$ | R/W | BCD | Min. output limiting | -105..105 % | |
| | 42 | $Y_{max}$ | R/W | BCD | Max. output limiting | -105..105 % | |
| | 43 | Y0 | R/W | BCD | Working point f. output variable | -105..105 % | |
| | 44 | Yh | R/W | BCD | Maximum mean output value | 5..100% | |
| | 45 | LYh | R/W | BCD | Limit for mean value formation | 0,1 .. 10,0 | |

**Tuning** — Self-tuning(Function no.: 5)

| Code | | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|---|
| B2 | 41 | YOptm | R/W | BCD | Output variable during process at rest | -105..105 | |
| | 42 | dYopt | R/W | BCD | Step height with identification | 5..100 | |
| | 43 | POpt | R/W | INT | Parameter set to be optimized | 0...1 | |
| | 44 | OXsd | R/W | BCD | Hysteresis with parameter selection | 0.0..9999 | |
| | 45 | Trig1 | R/W | BCD | Trigger point 1 | 0.0..9999 | |

**Paramset x** — Control parameter set 1 / 2(Function no.: 6,7)

| Code | | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|---|
| B2 | 41 | Xp1 | R/W | BCD | Proportional band 1 | 0.1..999.9 | |
| | 42 | Tn1 | R/W | BCD | Integral time 1 | 0..9999 | |
| | 43 | Tv1 | R/W | BCD | Derivative time 1 | 0..9999 | |
| | 44 | T1 | R/W | BCD | Min. cycle time 1 | 0.4..999.9 | |
| | 45 | Xp2 | R/W | BCD | Proportional band 2 | 0.1..999.9 | |
| | 46 | Tn2 | R/W | BCD | Integral time 2 | 0..9999 | |
| | 47 | Tv2 | R/W | BCD | Derivative time 2 | 0..9999 | |
| | 48 | T2 | R/W | BCD | Min. cycle time 2 | 0.4..999.9 | |

**Start-up circuit** — (Function no.: 10)

| Code | | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|---|
| B2 | 41 | Ya | R/W | BCD | Max. output value | 5 .. 100 % | |
| | 42 | Wa | R/W | BCD | Start-up set-point | -999 .. 9999 | |
| | 43 | TPa | R/W | BCD | Start-up holding time | 0 .. 9999 min | |

1) Datum has switch-off function; additional data value '-32000'

## *5.2.7* ALARM (FB-Nr.: 70 ... 77 Typ-Nr.: 46)

Function block 'ALARM' defines the overall alarm processing of the relevant controller. The data are provided once per controller channel.

### Process data

General

(Function no.: 0)

| Code | Des. | R/W | Type | Description | Range | Rem. |
|---|---|---|---|---|---|---|
| 00 | Block | R | Block | Block access (1 .. 3) | | |
| 1 | Status_Al1 | R | ST1 | Alarm status 1 | | A |
| 2 | Status_Al2 | R | ST1 | Heating current alarm | | B |
| 3 | HC | R | BCD | Heating current meas. value | | |
| 18 | Type | R | INT | Type no. of function block | 46 | |

***Bem. A Status_Al1***

| MSB | | | | | | | LSB |
|---|---|---|---|---|---|---|---|
| D7 | D6 | D5 | **D4** | **D3** | **D2** | **D1** | **D0** |

| Bit no. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | Lim HH | Alarm HH | off | on |
| D1 | Lim H | Alarm H | off | on |
| D2 | Lim L | Alarm L | off | on |
| D3 | Lim LL | Alarm LL | off | on |
| D4 | Fail | Fail | no | yes |
| D5 | '0' | Always '0' | | |
| D6 | '1' | Always '1' | | |
| D7 | | Parity | | |

***Bem. B Status_Al2***

| MSB | | | | | | | LSB |
|---|---|---|---|---|---|---|---|
| D7 | D6 | D5 | D4 | D3 | **D2** | **D1** | **D0** |

| Bit-Nr. | Name | Allocation | Status '0' | Status '1' |
|---|---|---|---|---|
| D0 | HCAl | Heating current alarm channel | off | on |
| D1 | LeckAl | Leakage current alarm channel | off | on |
| D2 | do1_8Al | Output alarm do1..do8 | off | on |
| D3.. D5 | '0' | Always '0' | | |
| D6 | '1' | Always '1' | | |
| D7 | | Parity | | |

### Parameter a. configuration data

General

(Function no.: 0)

| Code | | Des. | R/W | Type | Description | | Range | Rem. |
|---|---|---|---|---|---|---|---|---|
| B2 | 41 | LimL | R/W | BCD | Low limit alarm | | -999..9999 | 1) |
| | 42 | LimH | R/W | BCD | High limit alarm | | -999..9999 | |
| | 43 | xsd1 | R/W | BCD | Switching difference low and high alarms | | 0..9999 | |
| | 44 | LimLL | R/W | BCD | Low low limit alarm | | -999..9999 | 1) |
| | 45 | LimHH | R/W | BCD | High high limit alarm | | -999..9999 | |
| | 46 | LimHC | R/W | BCD | Heating current limit value | | 0..HC100 | |
| B3 | 71 | C600 | R/W | INT | Src: signal source<br>Fnc: function<br>DestFail: fail Destination | (T,H)<br>(Z)<br>(E) | 0..xxyz | |
| | 72 | C601 | R/W | INT | DestLL :<br>DestL :<br>DestH :<br>DestHH : | (T)<br>(H)<br>(Z)<br>(E) | 0..wxyz | |

1) Datum has switch-off function; additional data value '-32000'

# 6 Examples

## 6.1 *Message examples in standard protocol*

Example:
The computer requests system identification (code 18) from KS800 with address 01.

Computer requests:

| EOT | 0 | 1 | 1 | 8 | ENQ |
|---|---|---|---|---|---|
| | <addr> | | <code> | | |

KS 800 replies:

| STX | 1 | 8 | = | 3 | 0 | , | 1 | 5 | 7 | 2 | 7 | 5 | 1 | 0 | , | 0 | 0 | 0 | 0 | ETX | BCC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | <code> | | | <val> | | | | | | | | | | | | | | | | | |

<val> = 30 means a KS800 is concerned
15727510 ≙ Software code no. 4012-157-27510
0000 ≙ Order no. 9407-480-00001

## 6.2 *Principles of the function block protocol*

A function block comprises input and output data (process data) as well as parameter and configuration data. It can be addressed via a block number. An allocated block type defines the relevant function.

The various access mechanisms are:

### *6.2.1* Single access

This access (code xx) can be used for reading or writing a single process value of a function. Single accesses to parameter and configuration data are not possible.

Example: (message structure with specified data)
Transmission of the absolute output value ($Y_{man}$) to controller channel 1.

Computer transmits data to KS800:

| **EOT** | 0 | 2 | **STX** | 3 | 2 | , | 5 | 0 | , | 4 | = | 5 | 0 | **ETX** | **BCC** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Addr | | | code | | | FB no. | | | Fct-no. | | Value | | | |

KS 800 replies: **ACK** or **NAK** in case of failure

### *6.2.2* Block access (tens block)

This access (code x0) can be used for reading max. nine process values of a function.

Example: (message structure with data request)
Reading of set-points ($W_{nvol}$ and $W_{vol}$) from controller channel 3 .

Computer requests:

| **EOT** | 0 | 2 | 3 | 0 | , | 5 | 3 | , | 1 | **ENQ** |
|---|---|---|---|---|---|---|---|---|---|---|
| | Addr | | Code | | | FB-no. | | | Fct-no. | |

KS 800 replies:

| **STX** | 3 | 1 | = | 5 | 0 | , | 3 | 2 | = | 7 | 9 | **ETX** | **BCC** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Code | | | Value1 | | | Code | | | Value2 | | | |

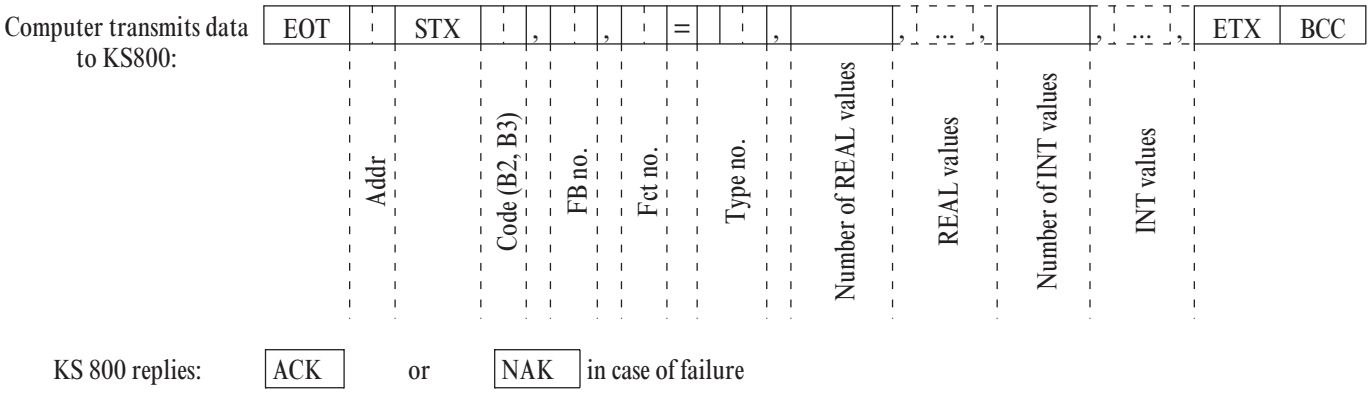
### *6.2.3* Block access (overall block)

This access can be used for reading and writing all parameter (code B2) and configuration data (code B3) of a function. The following conditions are applicable for this access:

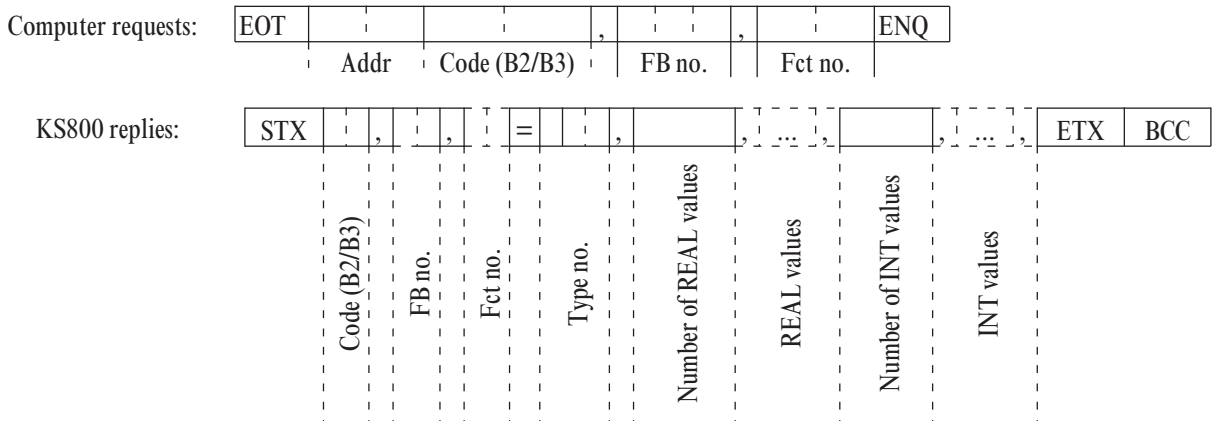
- For writing data with 'Code B3', the unit must be switched to configuration mode (→ see page 14 'OpMod'). All new configuration data and parameters entered are only effective, when the unit was switched back to on-line.
- All data of a message must be defined, omissions are not permissible.
- If all parts of a message in the instrument are unused (HW and SW options), the complete message must be transmitted nevertheless. Checking the non-available data is omitted.
- With faulty block write accesses, the following rule is applicable: A message is answered with NAK, if min. one datum is faulty. Already valid values are stored.
- If the function number is omitted, function 0 (general) is addressed.

The general structure of a message with block accesses with code B2/B3 is shown below. The exact message structure (between ***STX*** and ***ETX***) for the individual functions can be found below the relevant code table.

Message structure with data specification:




Message structure with data request:



## 6.3 *Message structure in function block protocol*

### *6.3.1* INSTRUMENT

Message structure for function ‘General’

| **Block access to configuration data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 41 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B3 | , | 0 | , | 0 | = | 0 | , | 0 | , | 5 | , | C900 | , | Adr1 | , | C904 | , | C902 | , | Adr2 | **ETX** | **BCC** |

Message structure for function ‘I/O connection’

| **Block access to configuration data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 43 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B3 | , | 0 | , | 2 | = | 0 | , | 1 | , | HC100 | , | 4 | , | C500 | , | C530 | , | C551 | , | HCcycl | **ETX** | **BCC** |

### *6.3.2* INPUT

Message structure for function ‘ME/V1’

| **Block access to parameter data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 44 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B2 | , | 6x | , | 1 | = | 112 | , | 4 | , | X1in | , | X1out | , | X2in | , | X2out | , | 0 | **ETX** | **BCC** | | |

| **Block access to configuration data** | | | | | | | | | | | | | | | | | | | | | | max. eff. length: 66 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B3 | , | 6x | , | 1 | = | 112 | , | 5 | , | X0 | , | X100 | , | XFail | , | Tfm | , | Tkref | , | 3 | , | C200 | , | C205 | , | C190 | **ETX** | **BCC** |

### *6.3.3* CONTR

Message structure for function ‘General’

| **Block access to configuration data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 36 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B3 | , | 5x | , | 0 | = | 91 | , | 0 | , | 4 | , | C100 | , | C101 | , | C700 | , | C180 | **ETX** | **BCC** | | |

Message structure for function ‘Set-point’

| **Block access to parameter data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 56 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B2 | , | 5x | , | 1 | = | 91 | , | 6 | , | W0 | , | W100 | , | W2 | , | Grw+ | , | Grw- | , | Grw2 | , | 0 | **ETX** | **BCC** |

Message structure for function ‘Algo’

| **Block access to parameter data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 72 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B2 | , | 5x | , | 3 | = | 91 | , | 8 | , | Xsh | , | Tpuls | , | Tm | , | $Xsd_1$ | , | LW | , | $Xsd_2$ | , | $Xsh_1$ | , | $Xsh_2$ | , | 0 | **ETX** | **BCC** |

Message structure for function ‘Output variable’

| **Block access to parameter data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 51 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B2 | , | 5x | , | 4 | = | 91 | , | 5 | , | Ymin | , | Ymax | , | Y0 | , | Yh | , | LYh | , | 0 | **ETX** | **BCC** |

Message structure for function ‘Tuning’

| **Block access to parameter data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 49 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B2 | , | 5x | , | 5 | = | 91 | , | 4 | , | YOptm | , | dYopt | , | OXsd | , | Trig1 | , | 1 | , | POpt | **ETX** | **BCC** |

Message structure for function ‘Paramset x’

| **Block access to parameter data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 72 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B2 | , | 5x | , | <6, 7> | = | 91 | , | 8 | , | Xp1 | , | Tn1 | , | Tv1 | , | T1 | , | Xp2 | , | Tn2 | , | Tv2 | , | T2 | , | 0 | **ETX** | **BCC** |

Message structure for function ‘Start-up circuit’

| **Block access to parameter data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 37 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B2 | , | 5x | , | 10 | = | 91 | , | 3 | , | Ya | , | Wa | , | Tpa | , | 0 | **ETX** | **BCC** | | | | |

### *6.3.4* ALARM

Message structure for function ‘General ‘

| **Block access to parameter data** | | | | | | | | | | | | | | | | | | | | | max. eff. länge: 58 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B2 | , | 7x | , | 0 | = | 46 | , | 6 | , | LimL | , | LimH | , | xsd_1 | , | LimLL | , | LimHH | , | LimHC | **ETX** | **BCC** |

| **Block access to configuration data** | | | | | | | | | | | | | | | | | | | | | max. eff. length: 36 bytes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STX** | B3 | , | 7x | , | 0 | = | 46 | , | 0 | , | 2 | , | C600 | , | C601 | , | **ETX** | **BCC** | | | | | |

# 7 Annex

## 7.1 *Terms*

| | |
|---|---|
| FB | Abbr. of function block |
| Fkt | Abbr. of function |
| ET | Abbr. of Engineering Tool |
| Function | A self-contained partial function of the function block seen from the interface |
| Function block | Self-contained processing unit |
| HW | Abbr. f. hardware |
| ISO1745 | Standard communication protocol ISO 1745, ASCII-based |
| PC interface | Front-panel interface on KSX controller for connecting an engineering tool |
| PCI | Process Control Instrument |
| PCI protocol | Protocol based ISO 1745, implemented for Philips controllers |
| RS422 | Standard 4-wire interface, Full duplex, (EIA RS 422);<br>in this case: separate send/receive channels with up to 32 units |
| RS485 | Standard 2-wire connection, Half duplex, (EIA RS 485) |
| SW | Abbr. f. software |
| TTL | Signal level at module level |

# 8 Index