Hand-Held Pendant Station with Display

HBAS

Manual

EUCHNER

More than safety.

Table of contents

1. Mechanical dimensions and Pin assignment

1.1 Mechanical dimensions

See data-sheet and operating instruction enclosed to the product.

1.2 Pin assignment

See data-sheet and operating instruction enclosed to the product.

2. Features

Housing of Hand-Held Pendant Station

Plastic housing made of polycarbonate with mounting magnet on the rear of the device

Keypad

Membrane keypad made of polyester
with window for LC display, 20 keys and 2 LEDs
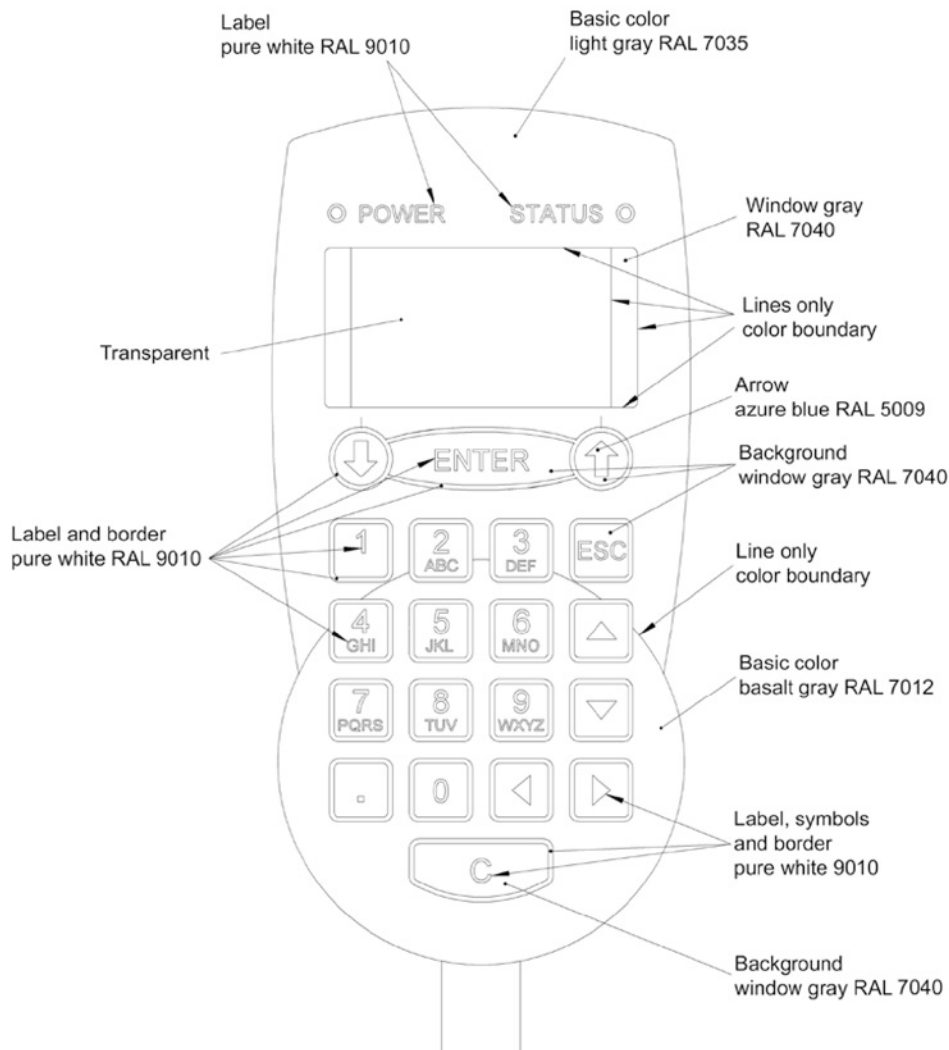
Switching elements / display elements

On the membrane keypad there are 20 keys with labels, as well as a green POWER LED and a green STATUS LED.

The EMERGENCY STOP device is on the top of the device and has rotary unlocking according to EN 418 with 2 normally closed contacts.

An enabling switch with a normally open contact is integrated into each side.
The contacts are wired separately (see Pin assignment).

Display

Gray LC display with LED background lighting
128 x 64 dots, text operating mode
Window: 45.2 x 27.0 mm (W x H)
Pixel size: 0.28 mm x 0.34 mm (W x H)

Small font: Large font:
Character size: 2.2 mm x 2.62 mm   Character size: 4.44 mm x 5.28 mm
16 characters per line, 8 lines   8 characters per line, 4 lines
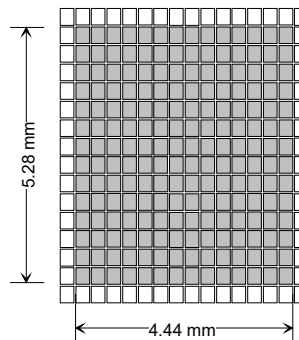
Device connection

The hand-held pendant station is connected using a 3.5 m spiral cable and a 19-pin round plug connector with pin contacts.
The cross-section of all cores is 0.14 mm².

The related flange socket is available as an accessory.

3. Data transfer

3.1 Protocol 3964 R

The protocol for the serial interface corresponds to the procedure 3964 (R).

The data transfer is initiated by sending an **STX** character. The receiver must answer with
a **DLE** character within the stipulated acknowledgement delay of 500 ms.
The transmitter then switches to send mode.
If the receiver answers with **NAK**, a character <> **DLE**, with an incomplete character, or the
acknowledgement delay elapses, then the attempt to establish the connection has failed. After three
unsuccessful attempts, the transmitter interrupts the procedure and outputs an error message to the
higher level program.
 If the connection is successfully established (receiver answers with **DLE** within the acknowledgment
delay), then the characters in the send buffer are sent to the receiver. The receiver expects the data
within a character delay of 128 ms. If this delay is not met, the receiver sends an NAK character.
The transmitter then tries again to send the message.
After three unsuccessful attempts, the transmitter interrupts the procedure and outputs an error
message to the higher level program.
After the content of the buffer has been sent, the transmitter adds **DLE** and **ETX** as an end marker.
Then the **BCC** (Block Check Character) is sent. The receiver must confirm correct reception with **DLE**
within the acknowledgement delay, or indicate erroneous transfer
with **NAK**.

3.2 Definition of the characters

Character format: 8 bits
Value range: 00H ... FFH

The value range is divided up as follows:

Value range	Function	Transfer direction
00H ... 1FH	General control character for protocol	HBAS ←→ Control system
30H ... 44H	Key code for the keys 1 to 20 and error bytes	HBAS → Control system
20H ... 53H	Control character or commands for the LC display, the pulse generator and the transfer of configuration parameters	Control system → HBAS
80H ... FFH	Character set for the LC display (see section Character set)	Control system → HBAS

Control characters:

Control character	Value	Function	Explanation
STX	02H	Start of Text	Start of the character string to be sent
ETX	03H	End of Text	End of the character string to be sent
DLE	10H	Data Link Escape	Data transfer switch over
NAK	15H	Negative Acknowledge	Negative response
BCC	Is calculated, (section 3.3)	Block Check Character	Block check character for checking correct data transfer

3.3 BCC Block Check Character

The **BCC** (Block Check Character) is defined by calculation.
During this process an EXCLUSIVE-OR operator is applied to all characters after STX.
The result is added at the end as the BCC character.

XOR operator

STX   Data block   **DLE   ETX**   **BCC**
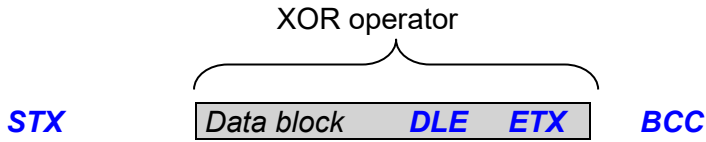
Calculation:

	1st character in the data block
XOR	2nd character in the data block
XOR	nth character in the data block
XOR	last character in the data block
XOR	**DLE**
XOR	**ETX**
=	**BCC**

Simplification:

As the 2 special characters **ETX** and **DLE** are always present, these can be combined and calculated separately to the actual data block.

03H XOR 10H = **13H**

The result for the data block is the subjected to an EXCLUSIVE-OR operation with the constant **13H**.

BCC = (**XOR data block**) **XOR**   **13H**.

3.4 Examples for the determination of the BCC

Example 1:   The HBAS sends the key 7 (37H):

Byte 1	**STX**	
Byte 2	**37H**	(37H)
Byte 3	**DLE**	(10H)
Byte 4	**ETX**	(03H)
Byte 5	**BCC**	

XOR operator
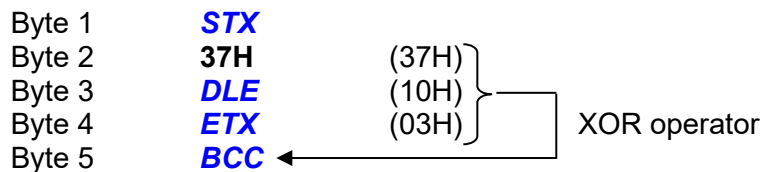
37H   XOR   10H   =   27H
              27H XOR   03H   =   24H

Simplification by combining **DLE** and **ETX** :

37H   XOR   13H   =   24H

Example 2:   The text *"Euchner"* is output on the display at the current cursor position:

Euchner

Control system	STX		6CH	A5H	D5H	C3H	C8H	CEH	C5H	D2H	DLE	ETX	BCC	
HBAS		DLE												DLE

Byte 1   **STX**
Byte 2   **6CH**   LCD identifier byte
Byte 3   **A5H**
Byte 4   **D5H**
Byte 5   **C3H**
Byte 6   **C8H**   *Euchner*
Byte 7   **CEH**
Byte 8   **C5H**
Byte 9   **D2H**
Byte 10   **DLE**   (10H)   XOR operator
Byte 11   **ETX**   (03H)
Byte 12   **BCC**   (formed across bytes 2 to 11)

Calculation**:**

6CH   XOR   A5H   = C9H   Byte 2 XOR Byte 3

C9H   XOR   D5H   = 1CH   XOR Byte 4

1CH   XOR   C3H   = DFH   XOR Byte 5

DFH   XOR   C8H   = 17H   XOR Byte 6

17H   XOR   CEH   = D9H   XOR Byte 7

D9H   XOR   C5H   = 1CH   XOR Byte 8

1CH   XOR   D2H   = CEH   XOR Byte 9

CEH   XOR   10H   = DEH   XOR Byte 10

DEH   XOR   03H   = DDH   XOR Byte 11

BCC = **DDH**

Simplification by combining *DLE* and *ETX* :

6CH XOR A5H XOR D5H XOR C3H XOR C8H XOR CEH XOR C5H XOR D2H = CEH

CEH   XOR   13H   = DDH

4. Priorities on a data collision

The term data collision is used when a user receives an STX character while the
user itself is trying to send an STX character. I.e. both users are sending the STX character at the same time.
To negotiate this data collision, the behavior of the HBAS on the occurrence of a collision can be set.
Either the hand-held pendant station has priority, that is the HBAS sends its data first and then receives the data from the control system, or the control system has priority and the data from the control system are received first and then the data sent to the control system.

This setting is set either in the Configuration (Konfiguration) menu (see section 5) or
as a parameter using parameter transfer (section 9).

Priority: "Control system"

The transmitter in the control system has high priority.
The transmitter in the HBAS has lower priority.

In the case of a data collision, this means that the HBAS detects an STX character when it is also sending an STX to the control system, it interrupts its transfer and first receives the data from the control system.
The data transfer to the control system is then repeated.

Example of a possible collision:

HBAS sends a key change	STX	DLE	??
The control system sends "LCD text"	STX	DLE	??

Solution:

First the control system sends   and then the HBAS sends

HBAS	STX	DLE					DLE	STX		31H	DLE	ETX	BCC	
Control system	STX		6CH	25H	DLE	ETX	BCC			DLE				DLE
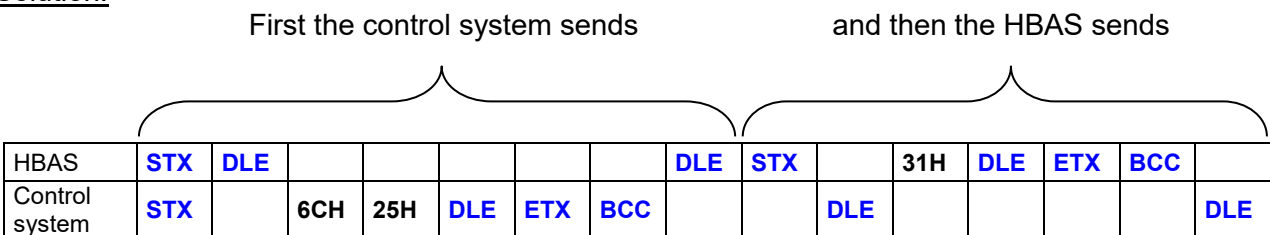
Priority: "HBAS"

The transmitter in the HBAS has high priority.
The transmitter in the control system has lower priority.

In the case of a data collision when the HBAS detects an STX character while it is
also sending an STX character, the control system must also detect the collision and acknowledge the data transfer initiated by the HBAS with a DLE character. Only after
the successful completion of the data transfer, the control system can start its data transfer.
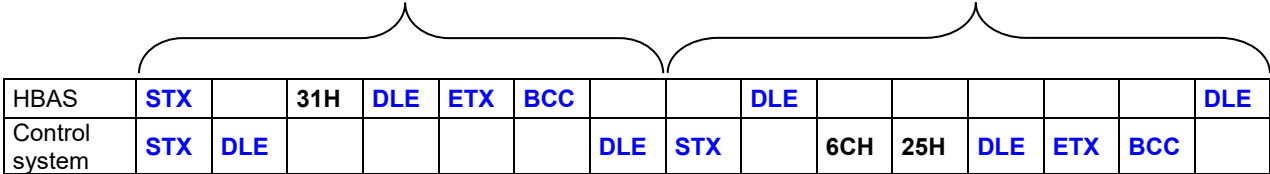
Example of a possible collision:

HBAS sends a key change	**STX**	??
The control system sends "LCD text"	**STX**	??

Solution:

First the HBAS sends   then the control system sends

	STX		**31H**	**DLE**	**ETX**	**BCC**			**DLE**						**DLE**
HBAS	**STX**		**31H**	**DLE**	**ETX**	**BCC**			**DLE**						**DLE**
Control system	**STX**	**DLE**					**DLE**	**STX**		**6CH**	**25H**	**DLE**	**ETX**	**BCC**	

Structure chart send/receive routine for the control

Check input buffer for new character

If   receive new character

then   else

call **Receive routine**	**Send STX**
	Wait for new character
	If new character = DLE
	then else

Start new transfer routine	**Send data**	**If new character = STX**
		then else
		Wait for new character	**Send NAK**
		If new character = DLE	
		then else	**call Status check**
		Send data	**Send NAK**	
			call Status check	
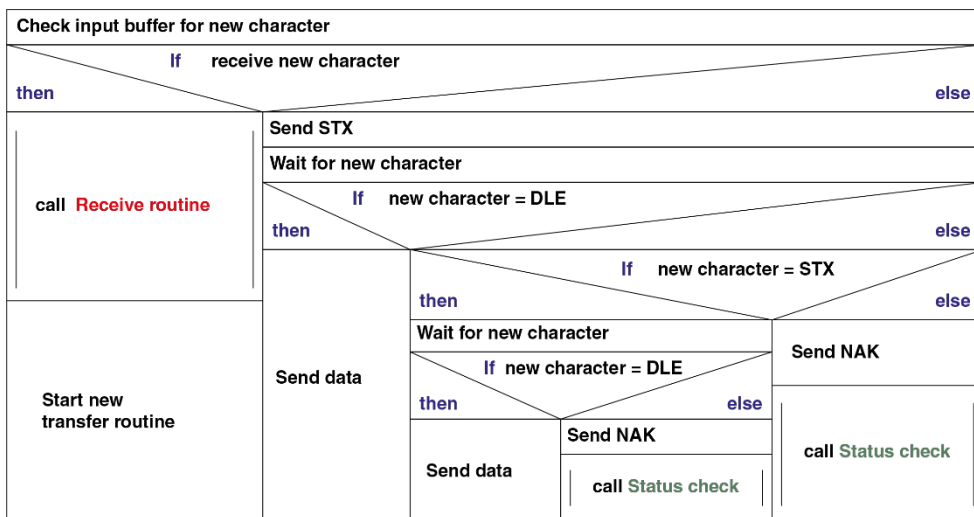
Receive routine   *Status check*

Check input buffer for new character

If   receive new character

then   else

If new character = STX	
then else	
Send DLE	**Send NAK**	**exit sub**
Receive data block		
Check BCC		
If BCC = ok		
then else		
Send DLE	**Send NAK**	
Evaluate key change + error byte		

Send status request (#)
Wait for status information
Evaluate status
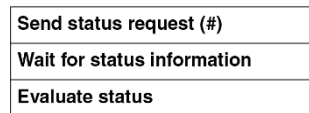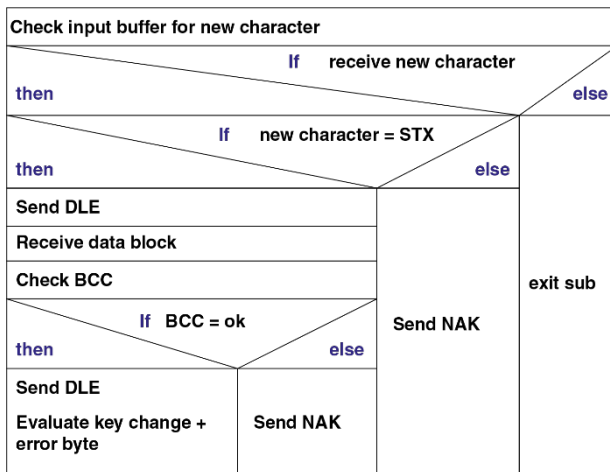
5. Behavior on switch on / initialization

Immediately after the power supply is switched on, the HBAS is in an initial passive state.
The hand-held pendant station performs a self-test; this takes approx. 7 seconds.

After the self-test, a short sound is emitted and for 5 seconds it is possible to open the Configuration (Konfiguration) menu using the <ENTER> key. The serial communication interface is activated when this period has elapsed.
The EUCHNER LOGO is shown on the display and initialization by the control system is awaited.

Until the initialization (see section 9) has been performed, all key operations are ignored.

5.1 Configuration (Konfiguration) menu

On the Configuration (Konfiguration) menu all parameters, that enable the hand-held pendant station to be configured to meet specific requirements, can be changed manually. It takes approx. 5 seconds to save a parameter change. The successful application of the new parameters is confirmed by a short sound.
The Configuration (Konfiguration) menu is protected with a PIN. (Default setting on delivery "1234").
The serial communication interface is shut down.

After the power supply is switched on, the text **"Configure hand-held pendant station, <ENTER>"** (**Handbediengerät konfigurieren, <ENTER>)** appears after the self-test.
The user now has 5 seconds to open the menu using the <ENTER> key.
After <ENTER> is pressed, a prompt for the PIN is displayed. A PIN with a maximum of 4 digits is to be entered. The exception here is the SuperPIN (151050) with 6 digits; this PIN cannot be changed. It is possible to delete a character using the ◀ key.

The following settings are now possible:

Change PIN (PIN ändern)	(section 5.1.1)	
Priority (Priorität)	(section 5.1.2)	
Version information (Versionsabfrage)	(section 5.1.3)	
Pulse generator (Impulsgeber)	(section 5.1.4)	
Key click (Tasten-Klick)	(section 5.1.5)	
Firmware Update	(section 5.1.6)	

```
KONFIGURATION:


 Pin ändern
 Priorität
```

A selection is made using the ⬇ ⬆ keys, the selection is confirmed using <ENTER>.
The Configuration (Konfiguration) menu is left using the <ESC> key.

5.1.1 Change PIN (PIN ändern)

The Configuration (Konfiguration) menu is protected with a PIN. The hand-held pendant station is supplied as standard with the PIN: "1234". This PIN should be changed by the customer to protect the configuration settings for the hand-held pendant station.
Only the numbers 0-9 can be entered.

A digit is deleted using the ◀ key.
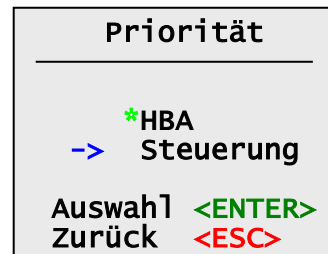An entry is accepted using **<ENTER>**.
Entry is cancelled using **<ESC>**.

The PIN must be confirmed a 2nd time.

```
┌─────────────────────┐
│     PIN ändern      │
│ ─────────────────── │
│     Neue PIN:       │
│    ┌───────┐        │
│    │ ****  │        │
│    └───────┘        │
│     <ENTER>         │
└─────────────────────┘
```

```
┌─────────────────────┐
│     PIN ändern      │
│ ─────────────────── │
│   PIN bestätigen    │
│    ┌───────┐        │
│    │ ****  │        │
│    └───────┘        │
│     <ENTER>         │
└─────────────────────┘
```

5.1.2 Priority (Priorität)

If the HBAS and the control system send STX at the same time, the term collision is used.
It must be defined which end has priority.

Select using the **arrow –>** with the **<arrow keys>** ⬇ ⬆ and accept using the **<ENTER>** key.
Leave the window with **<ESC>**.
The setting currently saved is marked by the * **(asterisk)**.

```
┌─────────────────────┐
│     Priorität       │
│ ─────────────────── │
│                     │
│      *HBA           │
│   ->  Steuerung     │
│                     │
│  Auswahl  <ENTER>   │
│  Zurück   <ESC>     │
└─────────────────────┘
```

5.1.3 Version information (Versionsabfrage)

The current firmware version and the related date are displayed in this window.
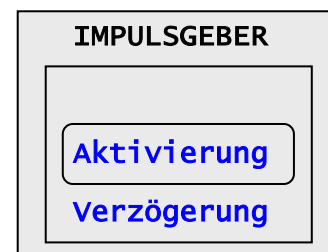Leave the window with **<ESC>**.

```
┌─────────────────────┐
│      Version        │
│ ─────────────────── │
│                     │
│   Firmware V1.0     │
│    01.07.2003       │
│                     │
│  Zurück   <ESC>     │
└─────────────────────┘
```

5.1.4 Pulse generator (Impulsgeber)

The following functions can be selected on the Pulse generator (Impulsgeber) menu:

- *Activation (Aktivierung)*
- *Delay (Verzögerung Taste)*
- *Key assignment (Tastenbelegung)*
- *Frequency (Frequenz)*

Select using the **<arrow keys>** ⬇ ⬆ and accept using the **<ENTER>** key.
Leave the menu using **<ESC>**.

```
┌─────────────────────┐
│    IMPULSGEBER      │
│  ┌───────────────┐  │
│  │ ┌───────────┐ │  │
│  │ │Aktivierung│ │  │
│  │ └───────────┘ │  │
│  │  Verzögerung  │  │
│  └───────────────┘  │
└─────────────────────┘
```
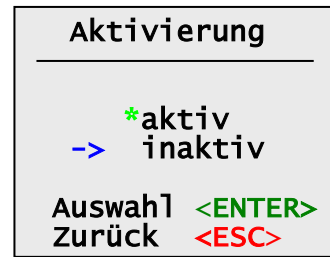
Activation (Aktivierung):

Setting as to whether the pulse generator function is
to be activated:
Select using the **arrow ->** with the **<arrow keys>** ⬇ ⬆
and accept using the **<ENTER>** key.
Leave the window with **<ESC>**.
The setting currently saved is marked by the ***** **(asterisk)**.

```
┌─────────────────────┐
│     Aktivierung     │
│ ─────────────────── │
│                     │
│      *aktiv         │
│   ->  inaktiv       │
│                     │
│  Auswahl  <ENTER>   │
│  Zurück   <ESC>     │
└─────────────────────┘
```

Delay (Verzögerung Taste):

If a pulse generator key is pressed, then a 1 pulse
is output. (Section 8.)
If this pulse generator key is operated for longer than the
delay, then pulses are output with a constant frequency.
This delay (in milliseconds) for switching over from single
pulse to a constant pulse sequence can be selected here.
Select using the **<arrow keys>** ⬇ ⬆ in the steps:
100, 250, 500, 1000, 1500, 2000,
and accept using the **<ENTER>** key.
Leave the window with **<ESC>**.

```
┌─────────────────────┐
│   Verzöger.Taste    │
│ ─────────────────── │
│  Eingabe in ms:     │
│                     │
│     0100  ⬇ ⬆       │
│                     │
│  Auswahl  <ENTER>   │
│  Zurück   <ESC>     │
└─────────────────────┘
```

Key assignment (Tastenbelegung) for pulse sequence left / right:

The keys for the pulse generator function can be defined
as required. Exceptions are the <ENTER>, <ESC>, <C>
and <.> keys
The key to which the **arrow <--** is pointing can be defined
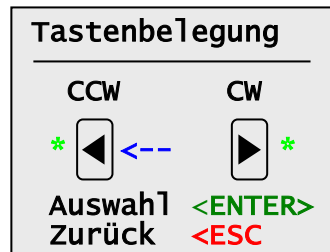by operating the corresponding key.
Each time the key is operated, the arrow toggles between
counter clockwise rotation (CCW) and clockwise rotation (CW).
The setting currently saved is marked by the ***** **(asterisk)**.
The assignment of the same key is not possible and will
be inhibited on saving.
Accept using the **<ENTER>** key.
Leave the window with **<ESC>**.

```
┌─────────────────────┐
│   Tastenbelegung    │
│ ─────────────────── │
│   CCW       CW      │
│                     │
│ * ◄ <-- ►  *        │
│                     │
│  Auswahl  <ENTER>   │
│  Zurück   <ESC      │
└─────────────────────┘
```
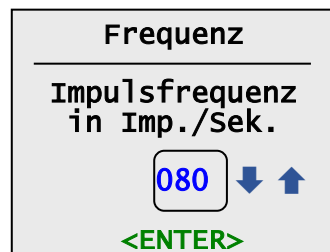
Frequency (Frequenz):

When a pulse generator key is pressed until the delay
has elapsed, pulses are output at a constant frequency in
pulses / second.
This frequency is selected using the **<arrow keys>** ⬇ ⬆
in the steps **10, 20, 30, 40, 48, 60, 80, 121, 242**
Accept using the **<ENTER>** key.
Leave the window with **<ESC>**.

```
┌─────────────────────┐
│      Frequenz       │
│ ─────────────────── │
│   Impulsfrequenz    │
│    in Imp./Sek.     │
│                     │
│     080  ⬇ ⬆        │
│      <ENTER>        │
└─────────────────────┘
```

5.1.5 Key click (Tasten-Klick)

It is possible to indicate when a key is pressed
by emitting a short sound.
Select using the **arrow ->** with the **<arrow keys>** ⬇ ⬆
and accept using the **<ENTER>** key.
Leave the window with **<ESC>**.
The setting currently saved is marked by the * **(asterisk)**.

```
    Tasten-Klick
    _____

        Klick Ein
    -> *Klick Aus

    Auswahl <ENTER>
    Zurück  <ESC
```

5.1.6 Firmware Update

The hand-held pendant station is equipped with a flash
program memory. This enables the firmware to be changed
or updated. The update is done by the manufacturer.

5.2 Setting the baud rate

The hand-held pendant station automatically detects the baud rate of the control system and sets
itself accordingly. Possible values are 9600 and 19200 baud.

This automatic setting is made on the initialization of the hand-held pendant station
(see section 9). A change to the baud rate can only be made when the hand-held pendant station is
briefly isolated from the power supply. On the subsequent re-initialization the HBAS is set to the new
baud rate.

6. Signaling

6.1 Acoustic signaling (command byte 52H)

An acoustic transducer is integrated into the hand-held pendant station. This can be operated from the control system. For this purpose the command byte **52H** must be sent with the related parameters.

Command byte	Description	Parameter:
52H	Continuous sound off Continuous sound on Pulsed sound on (frequency 1Hz) Pulsed sound 0.1s	**30H** **31H** **32H** **33H**

Example: *Switch on pulsed sound*

HBAS		**DLE**						**DLE**
Control system	**STX**		**52H**	**32H**	**DLE**	**ETX**	**BCC**	

If an incorrect parameter is entered, the error byte is set to 34H.
The error byte can be polled using the status polling (section 9.1).

6.2 Optical signaling: Status LED

The Status LED signals internal program information. The user cannot access the way the LED is operated.

The following information is signaled:

Status LED	Function
Continuously illuminated	Data transfer active
Flashing 0.5Hz	Data transfer inactive, HBAS ready for initialization
Flashing 2 Hz	Hand-held pendant station in configuration mode
Flashing 4 Hz	Communication error [1]

[1] If the attempt to establish the connection from the HBAS to the control system is unsuccessful, or if an existing connection is broken off (see section 3), then
the hand-held pendant station enters the error state and the Status LED flashes at
a frequency of 4 Hz.

6.3 Optical signaling: Power LED

The Power LED signals the correct supply of power.

The following information is indicated:

Power LED	Function
Off	Voltage too low
Flashing	Power supply in the critical range.→ no function
Continuously illuminated	Power supply correct

7. Signaling a key change

Once the hand-held pendant station has been initialized and the communication with the control system established, the corresponding key byte is sent to the control system on the operation of a key.

Key byte transfer with simultaneous operation of several keys:

In principle the first key operated is always transferred.
If another key is already pressed when a key is operated, the second key is ignored,
a state change only takes place when the first key operated is released.
If a third key is also pressed, and then the first key released, the key information for the first key is retained.

Key change

Control system		**HBAS**		
		Byte 1	**STX**	(02H)
Byte 1	**DLE**			
		Byte 2	**KEY BYTE**	(see key table)
		Byte 3	**DLE**	(10H)
		Byte 4	**ETX**	(03H)
		Byte 5	**BCC**	
Byte 2	**DLE**			

Example: *Key S11 is operated*

HBAS	**STX**		**3BH**	**DLE**	**ETX**	**BCC**	
Control system		**DLE**					**DLE**

Example: *Key S11 is released*

HBAS	**STX**		**30H**	**DLE**	**ETX**	**BCC**	
Control system		**DLE**					**DLE**

EUCHNER

Key table

| Key No.		KEY BYTE
Key	S 1	31H
Key	S 2	32H
Key	S 3	33H
Key	S 4	34H
Key	S 5	35H
Key	S 6	36H
Key	S 7	37H
Key	S 8	38H
Key	S 9	39H
Key	S 10	3AH
Key	S 11	3BH
Key	S 12	3CH
Key	S 13	3DH
Key	S 14	3EH
Key	S 15	3FH
Key	S 16	40H
Key	S 17	41H
Key	S 18	42H
Key	S 19	43H
Key	S 20	44H
No key operated		30H

## Key layout
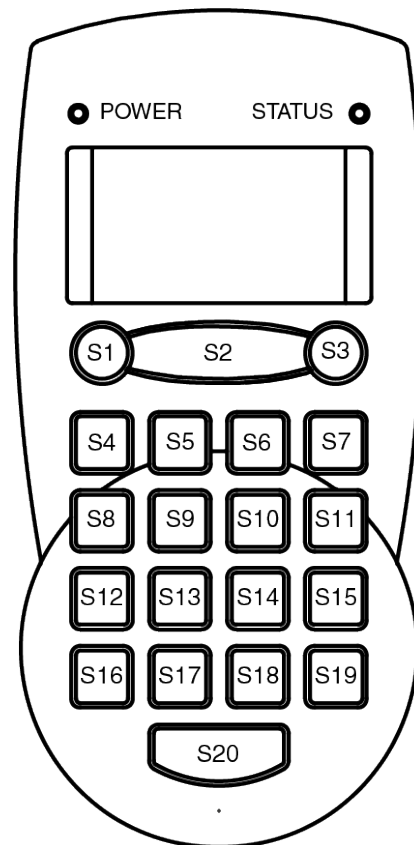
8. Pulse generator function

A pulse generator is integrated into the hand-held pendant station. This function is operated using two keys that can be chosen as required. The keys are defined on the Configuration menu (Konfiguration) (section 5.1.4). The default setting is the ◄ ► keys.   The pulse generator is also enabled on the Configuration (Konfiguration) menu.
The default setting is: "Activated" ("Aktiviert").

The operator can send counter pulses to the control system by actuating one of the two keys. An RS422 driver module is used as the output stage; this contains the output signals A, /A, and B, /B (see technical data).

If the ► key is pressed (or the key as defined by customer) briefly, then 1 clockwise (CW) counter pulse is sent.
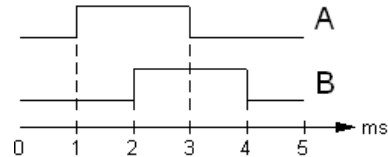
If the ◄ key is operated (or the key defined by the customer) 1 counter clockwise (CCW) counter pulse is sent.
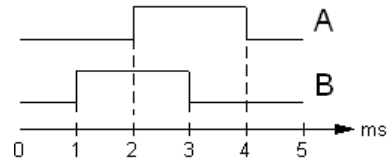
If one of the two keys is pressed for longer than the delay set (switch over from single pulse to continuous sequence of pulses), then when this period has elapsed a counter frequency in the corresponding direction is output. The value for this period and
the frequency are set on the Configuration (Konfiguration) menu (section 5.1.4).

Example: *Key for CW is operated for approx.2 seconds.*
          Delay set = 500ms, counter frequency set = 80 Hz.
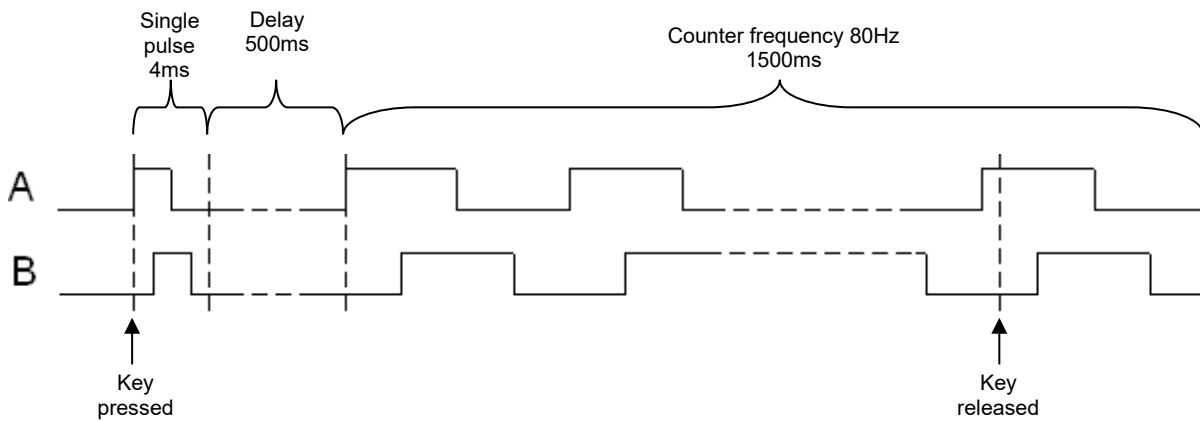
9. Initialization

To enable the communication interface, the hand-held pendant station must be initialized.
The initialization is performed either by polling the current states of the keys with the "Status polling" ("Statusabfrage") function (section 9.1) and the transfer of parameters (section 9.2), or by sending another valid command byte (section 10.3 Overview of commands).
The baud rate is also set on initialization (see section 5).

9.1 Status polling (command byte 23H)

The state of the keys and the error byte can be polled by the control system at any time using the command byte 23H.
The error byte remains set until a status poll has been performed or a further error-free transfer is made.
After the status polling the error byte is reset to 31H (no error).
It is recommended to perform a status poll for initialization after the reception of a NAK character, as in this way the HBAS is reset.

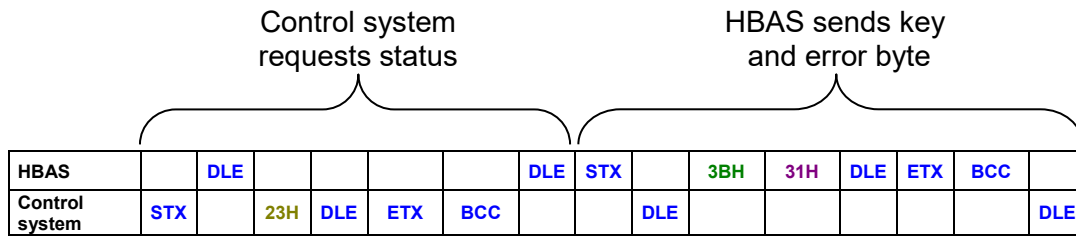*The control system requests the current status from the HBAS*

HBAS		Control system		
		Byte 1	*STX*	(02H)
Byte 1	*DLE*			
		Byte 2	*STATUS WORD*	(23H)
		Byte 3	*DLE*	(10H)
		Byte 4	*ETX*	(03H)
		Byte 5	*BCC*	
Byte 2	*DLE*			

The HBAS sends its current status to the control system

Control system		HBAS		
		Byte 1	*STX*	(02H)
Byte 1	*DLE*			
		Byte 2	*KEY BYTE*	(see section 7)
		Byte 3	*ERROR BYTE*	(see section 9)
		Byte 4	*DLE*	(10H)
		Byte 5	*ETX*	(03H)
		Byte 6	*BCC*	
Byte 2	*DLE*			

The control system is only allowed to continue the transfer of data when the HBAS has completed the transfer of the status.

Example: *Status request and sending key S11 and error byte 31H*

Control system
requests status

HBAS sends key
and error byte

| HBAS | | DLE | | | | DLE | STX | | 3BH | 31H | DLE | ETX | BCC | |
| Control system | STX | | 23H | DLE | ETX | BCC | | DLE | | | | | | DLE |

Error bytes

If an incorrect parameter is transferred for a command that requires a parameter, this error byte can be polled by polling the status. The error byte is sent after the key information.

The following error messages are possible:

Error byte	Error	Explanation
31H	No error	Error-free operating state
32H	Text not defined	An item of text opened with a short command has not yet been defined
33H	Area not defined	An area opened with a short command has not yet been defined
34H	Parameter invalid	A parameter entered is outside the valid value range
35H	Too many parameters	The number of the parameters given does not correspond to the number expected
36H	Area invalid	An area opened overlaps with a character that is displayed with the large font. (Section 10.2.6)

9.2 Configuration parameter transfer (command byte 53H)

All parameters that can be set on the Configuration (Konfiguration) menu can be transferred from the control system at any time.
For this purpose the command byte **53H** must be set before the parameter data.

After the data transfer has been started, the STATUS LED goes out.
The display is cleared and the text "Save param." ("Par. speichern") output.

A short sound is emitted by the HBAS as an acknowledgement of the correct storage of the data in the flash and the text "Save param." ("Par. speichern") is cleared.

If a parameter is not given correctly, then the error byte "34H" is set. The error byte can be polled by the control system by polling the status.

It is imperative that the following sequence for the individual parameters is observed!
1. PIN
2. Priority
3. Key click
4. Pulse generator activation
5. Pulse generator delay (when pulse generator active)
6. Pulse generator CW key (when pulse generator active)
7. Pulse generator CCW key (when pulse generator active)
8. Pulse generator frequency (when pulse generator active)

If the pulse generator function is not activated, then the pulse generator parameters
> *"Pulse generator delay",*
> *"Pulse generator CW key",*
> *"Pulse generator CCW key"*
> *"Pulse generator frequency"*

do not need to be transferred.

Parameter no.	Explanation	Parameter value
1	PIN: 1000s digit	Only figures 0-9 in HEX format 30H ... 39H
2	PIN: 100s digit	Only figures 0-9 in HEX format 30H ... 39H
3	PIN: 10s digit	Only figures 0-9 in HEX format 30H ... 39H
4	PIN: 1s digit	Only figures 0-9 in HEX format 30H ... 39H
5	Priority:	30H = Control system has priority 31H = HBAS has priority
6	Key click	30H = Key click off 31H = Key click on
7	Pulse generator activation	30H = Pulse generator inactive 31H= Pulse generator active
8	Pulse generator delay 1000s	Only figures 0-9 in HEX format 30H ... 39H
9	Pulse generator delay 100s	Only figures 0-9 in HEX format 30H ... 39H
10	Pulse generator delay 10s	Only figures 0-9 in HEX format 30H ... 39H
11	Pulse generator delay 1s	Only figures 0-9 in HEX format 30H ... 39H
12	Pulse generator CW key	All keys except S2 (32H), S7 (37H), S16 (40H), and S20 (44H)
13	Pulse generator CCW key	All keys except S2 (32H), S7 (37H), S16 (40H), and S20 (44H)
14	Pulse generator freq. in Hz 100s	Only figures 0-9 in HEX format 30H ... 39H
15	Pulse generator freq. in Hz 10s	Only figures 0-9 in HEX format 30H ... 39H
16	Pulse generator freq. in Hz 1s	Only figures 0-9 in HEX format 30H ... 39H

<u>Error byte:</u>

31H: Parameters transferred correctly

34H: Parameter transfer erroneous

Example: *Pulse generator active*

			Cmd. byte	PIN				Priority	Click	Pulse gen. active	Delay 1500 ms				CW	CCW	Freq.121Hz						
Control system	STX		53H	36H	37H	38H	39H	30H	30H	31H	31H	35H	30H	30H	43H	42H	31H	32H	31H	DLE	ETX	BCC	
HBAS		DLE																					DLE

Example: *Pulse generator inactive*

			Cmd. byte	PIN				Priority	Click	Pulse gen. active				
Control system	STX		53H	36H	37H	38H	39H	30H	30H	30H	DLE	ETX	BCC	
HBAS		DLE												DLE

Default parameters

When the hand-held pendant station is delivered, the following parameters are set:

Parameters	Value
PIN	1234
Priority	Control system
Key click	off
Pulse generator activation	on
Pulse generator delay	1000 ms
Pulse generator CW key	▶ key
Pulse generator CCW key	◀ key
Pulse generator frequency	80 pulses/sec.

9.3 Software reset (command byte 54H)

The control system can initiate a software reset in the HBAS.
Therefor the command byte **54H** must be sent.
The hand-held pendant station restarts. See section 5.

Example:

Control system	STX		54H	DLE	ETX	BCC	
HBAS		DLE					DLE

10. LC display

The display on the hand-held pendant station is operated in text mode. To display text,
the control system must send information on the type and the content of the display.

Text to be displayed frequently can be transferred to the HBAS at any time after initialization and
saved in the HBAS in a data memory (RAM). These items of text can
then be displayed using a short command (section 10.2.5).

It is also possible to define areas and to assign attributes to them. These areas can also
be displayed with a short command (section 10.2.6).

Controlling the LC display

Each LCD data block that contains a command for controlling the display must have the LCD identifier
byte as the first character.

This is defined as *6CH*.

An **LCD data block** can contain several LCD commands, however the block must not exceed the
length of 135 bytes.

Command to the LC display:

Control system	HBAS/LCD
Byte 1 *STX* (02H)	
	Byte 1 *DLE* (10H)
Byte 2 *LCD data block*	
Byte 3 *DLE* (10H)	
Byte 4 *ETX* (03H)	
Byte 5 *BCC*	
	Byte 2 *DLE* (10H)

Important!

**It is not allowed to interrupt a data block that has already been confirmed with DLE.
Prior to a new transfer, it is necessary to check the receive buffer for a STX from the HBAS**.

10.1 Character set

ASCII character set from 80H ... FFH

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
8		!	"	#	$	%	&	´	(	)	*	+	,	-	.	/
9	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
A	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
B	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
C	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
D	p	q	r	s	t	u	v	w	x	y	z	{	¦	}	~	
E	Ç	ü	é	â	ä	à	å	ç	ê	ë	è	ï	î	ì	Ä	Å
F	É	æ	Æ	ô	ö	ò	û	ù	ÿ	Ö	Ü	ø	£	Ø	×	ƒ

10.2 LCD functions (identifier 6CH)

10.2.1 Cursor functions

The cursor is controlled by sending a command byte and, if necessary, by sending additional parameters.

Command byte	Description	Parameters
21H	Cursor to the next character	
22H	Cursor to the previous character	
23H	Cursor one line down	
24H	Cursor one line up	
25H	Cursor at the start of the display	
26H	Cursor at the start of the line	
27H	Cursor at a specific position	**Small font:** line (**30H...37H**), column (**30H...3FH**) **Large font:** line (**30H...33H**), column (**30H...37H**)

Example: *Cursor is first placed at the start of the display and then at line 2, column 3*

Control system	STX		6CH	25H	27H	32H	33H	ETX	BCC	
HBAS		DLE								DLE

10.2.2 Character output

To output a character at the current position of the cursor, it is sufficient to write this character to the data block. The cursor is then moved forward one position (except at the end of the display). At the end of the line a LF is performed. On the last line at the last position, the cursor remains stationary and writes the remaining text at this position.

Example: *The text "Euchner" is output at the current cursor position*

Control system	STX		6CH	A5H	D5H	C3H	C8H	CEH	C5H	D2H	ETX	BCC	
HBAS		DLE											DLE

10.2.3 Text attributes

Items of text with various attributes can be output using the related command bytes. The attributes set remain valid until a reset.

Command byte	Description	Parameters
40H	Inverse on: all subsequent characters are output inverse	
41H	Inverse off: all subsequent characters are output normally	
42H	Flashing on: all subsequent characters are output flashing	
43H	Flashing off	
50H	Selection "small font"	
51H	Selection "large font"	

Example:

Inverse and flashing output of text "Euchner" with large font at the current position of the cursor. Then flashing and inverse off again.

Control system	STX		6CH	51H	40H	42H	A5H	D5H	C3H	C8H	CEH	C5H	D2H	41H	43H	ETX	BCC	
HBAS		DLE																DLE

Explanation on the font size:

The character set can be displayed in 2 different font sizes. Characters can be displayed in both font sizes at the same time.
When the font size is changed, the cursor is automatically set to the start of the display.

Small font: The display is divided into 8 lines and 16 characters. The individual characters comprise 8x8 pixels.

Large font: The display is divided into 4 lines and 8 characters. The individual characters comprise 16x16 pixels and are thus twice the size of the small font.

10.2.4 Clear commands

Command byte	Description	Parameter:
28H	Clear the current cursor position [1]	
29H	Clear to the end of the line [2]	
2AH	Clear to the end of the display [3]	
2BH	Clear the entire display [4]	
2CH	Clear a display area [5] (Independent of the font size, a basis of 8 lines and 16 columns is always used)	Start line (**30H...37H**), Start column (**30H...3FH**), End line (**30H...37H**), End column (**30H...3FH**)

[1] After "Clear at the current cursor position", the cursor remains in the same position.
[2] After "Clear to the end of the line", the cursor remains at the end of the line.
[3] After "Clear to the end of the display", the cursor remains at the end of the display.
[4] After "Clear the entire display", the cursor is at the start of the display.
[5] After "Clear a display area", the cursor is at the bottom right of the area cleared.

Example: *Clearing from the current position of the cursor to the end of the line*

Control system	**STX**		**6CH**	**29H**	**ETX**	**BCC**	
HBAS		**DLE**					**DLE**

Example: *Clearing from **column 2, line 3** to **column 12, line 6***

Control system	**STX**		**6CH**	**2CH**	**32H**	**33H**	**3CH**	**36H**	**ETX**	**BCC**	
HBAS		**DLE**									**DLE**

10.2.5 Text commands

The user can define up to 200 different items of text and their position on the screen and display the items of text using a short command. An item of text is allowed to be a maximum of 30 characters long.
The text definitions can be made at any time. If an item of text already defined is re-defined, the old item of text is erased. Within a defined item of text, other LCD commands are also allowed, thus longer command sequences can also be opened using the short command (macro function).

If an item of text that has not yet been defined is to be output, the error byte is set to 34H. The error byte can be polled using the status polling (section 9.1).

Command byte	Description	Parameters
48H	Definition of an item of text	Text number (**31H...F9H**), Font size (**50H** or **51H**), Line (see table below), Column (see table below), Text: (**21H...2C**),(**40H...43H**), (**80H...FFH**)
49H	Output of a previously defined item of text	Text number (**31H...F9H**)

Important!

The line and column information is dependent on the font size!

Font size	Line	Column
small	**30H ... 37H**	**30H ... 3FH**
large	**30H ... 33H**	**30H ... 37H**

Example: *Definition of text "Euchner" with small font in line 4 column 0 as text No. 5*

The sequence for text and character sent must be observed

Control system	STX		6CH	48H	35H	50H	34H	30H	A5H	D5H	C3H	C8H	CEH	C5H	D2H	ETX	BCC	
HBAS		DLE																DLE

Example: *Display of text No. 5*

Control system	STX		6CH	49H	35H	ETX	BCC	
HBAS		DLE						DLE

Example: *Flashing display of text No. 5*

Control system	STX		6CH	42H	49H	35H	43H	ETX	BCC	
HBAS		DLE								DLE

Example: *Definition of "Clear display" and text "EUCO" with small font, inverse display, at the start of the display as text No. 6*

Control system	STX		6CH	48H	36H	50H	30H	30H	2BH	40H	A5H	B5H	A3H	AFH	41H	ETX	BCC	
HBAS		DLE																DLE

10.2.6 Area commands

The user can define up to 32 areas that can be cleared, inverted, displayed flashing
or normally using short commands. The otherwise valid attribute is not changed.

Command byte	Description	Parameter:	
4AH	Definition of an area	Area number Start line Start column End line End column	(**31H...51H**), (**30H...37H**), (**30H...3FH**), (**30H...37H**), (**30H...3FH**)
4BH	Clear a previously defined area	Area number	(**31H...51H**)
4CH	Inverse display of an area	Area number	(**31H...51H**)
4DH	Flashing display of an area	Area number	(**31H...51H**)
4EH	Inv. + flashing display of an area	Area number	(**31H...51H**)
4FH	Normal display of an area	Area number	(**31H...51H**)

Important: The line and column information is <u>independent</u> of the font size!

The area numbers are from 31H (area 1) to 51H (area 32).
If an undefined area is addressed, then the *error byte* is set to *33H*.
The error byte can be polled using the status poll and is reset after the poll to *31H* (section 9.1).


Warning:

When a defined area is opened, there must not be any intersection between the area boundaries and the boundaries of character in large font. If this is the case, the command is not executed and the *error byte* is set to *36H*. The error byte can be polled using the status poll and is reset after the poll to *31H*.

Example

Large font

Area:
31H, 31H, 32H, 3EH
(line 1 to 2 and
line 1 to 14)

← **Incorrect!**

← **Correct!**
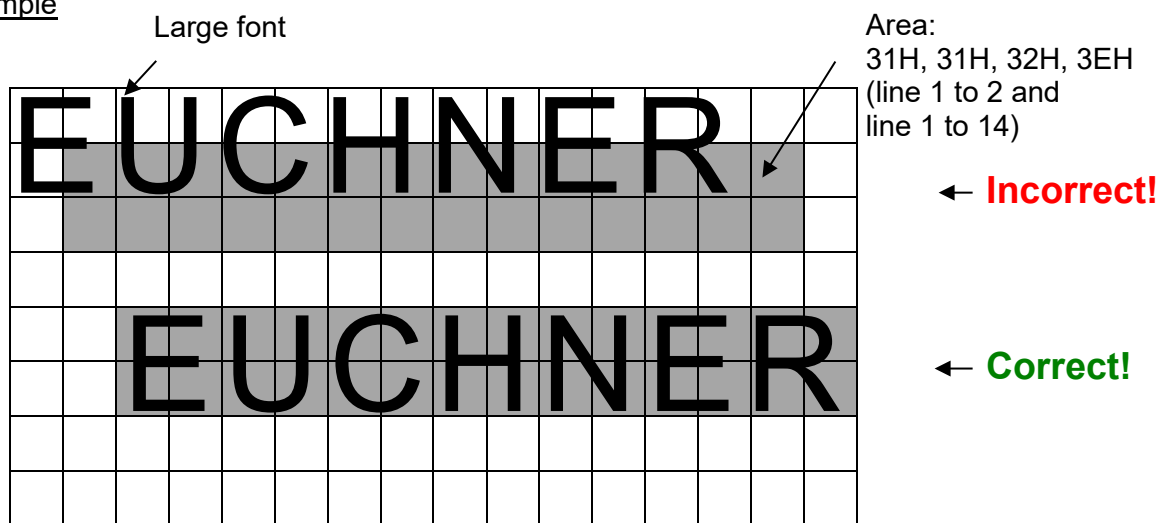
Example: ***Define*** area **No. 22** from ***line 4 / column 0*** to ***line 6 / column 10***

Control system	STX		6CH	4AH	46H	34H	30H	36H	3AH	ETX	BCC	
HBAS		DLE										DLE

Defined area →
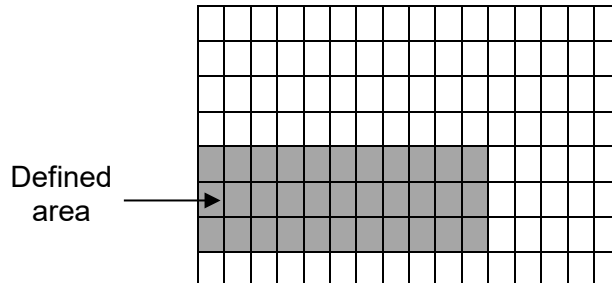
Example: ***Clear*** area **No. 22**

Control system	STX		6CH	4BH	46H	ETX	BCC	
HBAS		DLE						DLE

Example: ***Display*** area **No. 22 flashing**

Control system	STX		6CH	4DH	46H	ETX	BCC	
HBAS		DLE						DLE

10.3 Overview of commands

Identifier byte	Command byte	Description	Parameter:
6CH	21H	Cursor to the next character	
	22H	Cursor to the previous character	
	23H	Cursor one line down	
	24H	Cursor one line up	
	25H	Cursor at the start of the display	
	26H	Cursor at the start of the line	
	27H	Cursor at a specific position	Line, column
	28H	Clear the current cursor position	
	29H	Clear to the end of the line	
	2AH	Clear to the end of the display	
	2BH	Clear the entire display	
	2CH	Clear a screen area	Start line, start column, end line, end column
	40H	Inverse on: all subsequent characters are output inverse	
	41H	Inverse off	
	42H	Flashing on: all subsequent characters are output flashing	
	43H	Flashing off	
	48H	Definition of an item of text	Text number, font size, line, column, text
	49H	Output of a previously defined item of text	Text number
	4AH	Definition of an area	Area number, start line, start column, end line, end column
	4BH	Clear a previously defined area	Area number
	4CH	Inverse display of an area	Area number
	4DH	Flashing display of an area	Area number
	4EH	Inv. + flashing display of an area	Area number
	4FH	Normal display of an area	Area number
	50H 51H	Selection "small font" Selection "large font"	
	80H ... FFH	ASCII character set	
none	23H	Status poll (keys 30H ... 44H and error byte 31H ... 36H are sent)	
	52H	Continuous sound off Continuous sound on Pulsed sound on Pulsed sound 0.5 s	30H 31H 32H 33H
	53H	Transfer parameter settings	PIN, priority, pulse generator active, pulse generator delay, key assignment, pulse generator frequency, key click
	54H	Software reset	

11. Installation instructions

The observance of the EMC regulations stipulated for the EUCHNER hand-held pendant stations requires the use of screened connection cables.
The screen on the hand-held pendant station cable is connected to the plug housing.
A metal flange socket is to be fitted to the customer's installation and its housing grounded with a low resistance and low inductance connection.
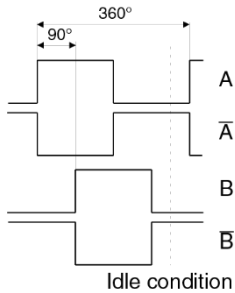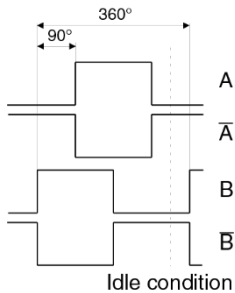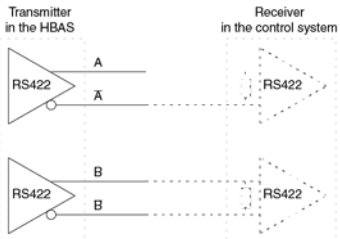Further cables from this point to the communication interface and for the further processing of pulse generator signals are also to be screened and the screen connected to a suitable point of grounding on the control system.
A flange socket is available as an accessory for installation

An RS 422A transmitter module and an RS 422A receiver module are to be provided for the communication interface.
An RS422A receiver module is to be provided on the control system for the pulse generator signals.

12. Technical Data: Pulse generator

Pulse generator	
Output circuit	RS 422A
Connection	A corresponding RS 422 receiver module is to be used at the control system end
Pulse diagram for increasing numbers, CW (clockwise rotation)	
Pulse diagram for decreasing numbers, CCW (counter clockwise rotation)	
Driver layout	

13. Technical Data: General

For further specifications see operating instruction enclosed to the product.

Parameters	
c(UL)us LISTED POW. CONV. EQ. 82HA	Operation with UL-class 2 power supply only

Electrical connection	
Operating voltage U_B DC	24 V ± 20%
Operating current, max.	100 mA

Communication interface	
Type	serial, RS 422A (4-wire)
Data format	8 data bits + 1 parity bit (even), 1 stop bit
Transfer speed	9 600 or 19 200 baud, automatic detection
Transfer protocol	Procedure 3964 R

Memory	
Program memory (firmware)	flash, 64 kbyte
Text data memory	RAM, 32 kByte, volatile

2-stage enabling switches	
Switching element	1 NO contact
Switching voltage, max. DC	30 V
Switching current, max.	0.1 A

Other components of the HBAS see EUCHNER catalog for handheld pendant stations	

Accessories	
Flange socket, 19-pin	
Bracket	
Active-X-Module	
Demo and test software is available on the Internet at www.euchner.de	

EUCHNER

More than safety.