KIENZLE

DATA

PROTOCOL

Tankanlagen Salzkotten GmbH

Description of the data transfer between the Kienzle calculator and a master.

1. **The following data is transferred**

1.1 From the calculator to the master:

1.11 The change of the nozzle status: Removing and replacing of the nozzle.

1.12 The selected product.

1.13 The contents of the calculator display: Volume and price to pay.

1.2 From the master to the calculator:

1.21 Control signals: Authorization and emergency stop.

1.22 Unit prices.

1.13 Limitation of the volume or amount to be delivered.

The data is transferred in a secured code.
The baud rate is 1200.

2. Hardware

2.1 Four-wire connection

For each connection one pair of wires will be used. The opto-couplers are located at the receiving ends and are activated by the transmitter.

2.2 Two-wire connection

For both directions one pair of wires will be used. Both opto-couplers are located on the calculator side.

The calculator is designed to accommodate both types of connection without modification.

3. Data word structure

A data word consists of 4 bits: A (2**3), B, C, D which are transferred twice, once directly and once inverted. Before each data word zero is transmitted for the duration of one bit. (Opto-couplers are not activated.) Each data word is followed by a L. The edge between the L at the end and the 0 at the beginning of the next word is used for synchronization.

A block of data is preceded by a pre-pulse for the duration of about 10 bits (min 8, max 12) whose rear edge is the first synchronizing edge.

The first word after the pre-pulse is a control word which defines the meaning and the number of the words of a data block. Resulting from the baud rate of 1200 a bit duration of 833,3 micro seconds given. Bit duration of between 825 and 840 micro seconds is permitted.

Data blocks from the calculator to the master

Filling data

No	Contents				
0	pre-pulse				
1	01	control word			
2	100	litres			
3	10	litres			
4	1	litre			
5	0,1	litre			
6	0,01	litre			
7	100	CU	10	CU	CU= Currency Unit
8	10	CU	1	CU	e.g. £, DM etc.
9	1	CU	0,1	CU	
10	0,1	CU	0,01	CU	
11	0,01	CU	0,001	CU	
	Nozzle number and power of the amount				
	0...7: The powers of the left column apply.				
	8...15 The powers in the brackets apply.				
13	numerator 10**1				
14	numerator 10**0				
	The numerator normally is not used.				

Removing the nozzle

No	Contents
0	pre-pulse
1	08 control word
2	product/nozzle number
3	error code

Product selection

No	Contents
0	pre-pulse
1	00 control word
2	product
3	error code

Replacing the nozzle

No	Contents
0	pre-pulse
1	09 control word
2	product
3	error code

5 Totalizers

No	Contents
0	pre-pulse
1	03 control word
2	10**7
3	10**6
4	10**5
5	10**4
6	10**3
7	10**2
8	10**1
9	10**0
10	10**-1
11	10**-2
12	product and denomination 0.....7= volume 8...15= amount

6 Acknowledgement of a data block

No	Contents
0	pre-pulse

Comments: The acknowledgement itself is not acknowledged. An acknowledgement is followed by a pause of at least 8,33 ms to distinguish it from a repetition.

7 External data (e.g. transferred from a card reader, note acceptor etc.) Not used.

No	Contents
0	pre-pulse
1	15 control word for the master
2	number of the following words

4.8 Nozzle status (Removing or replacing the nozzle when the pump is blocked).

No	Contents
0	pre-pulse
1	11 control word
2	code: 0 = nozzle removed 1 = nozzle replaced 2 = calculator is temporarily off-line 3 = calculator is on-line again
3	product

4.9 Subtotals registered when the calculator is in stand alone mode

No	Contents
0	pre-pulse
1	02 control word
2	10**5
3	10**4
4	10**3
5	10**2
6	10**1
7	10**0
8	10**-1
9	10**-2
10	product

5. Data blocks from the master to the calculator

5.1 preset and unit price

No	Contents
0	pre-pulse
1	01 control word
2	control character for the preset value. The different bits have the following meanings: A: Activates the 3-minutes timer in the calculator. (Not used). B: The last transmitted preset value and control character are still valid, allother bits are redundant. C: Denomination of the preset value: 0 = Litres, 1 = CU D: Not used
3	100 CU or litres
4	10 CU or litres
5	1 CU or litre
6	0,1 CU or litre
7	0,01 CU or litre The preset value "0" is interpreted as an unlimited authorisation.
8	1,000 CU/litre
9	0,100 CU/litre
10	0,010 CU/litre
11	0,001 CU/litre

5.2 Request to send the filling data

No	Contents
0	pre-pulse
1	04 control word

5.3 Authorization

No	Contents
0	pre-pulse
1	00 control word

5.4 Request to send the totalizer data

No	Contents
0	pre-pulse
1	C3 control word
2	product and denomination 0.....7 = volume 8...15 = amount

5.5 Setting the off-line unit prices

No	Contents
0	pre-pulse
1	02 control word
2	product
3	1,000 CU/litre
4	0,100 CU/litre
5	0,010 CU/litre
6	0,001 CU/litre

5.6 Blocking the calculator

No	Contents
0	pre-pulse
1	05 control word

5 Pump illumination

No	Contents
0	pre-pulse
1	06 control word 0 = off 1 = on

5.8 Acknowledgement

No	Contents
0	pre-pulse

The acknowledgement is followed by a pause of at least 8,33 ms.

5.9 External data (not used)

No	Contents
0	pre-pulse
1	15 control word for the calculator
2	number of the following words

The master has to control that during the filling no other data are sent to the calculator because all data are then considered as an emergency stop.

5.10 Preset and unit price with zeroising the calculator dislay

No	Contents
0	pre-pulse
1	07 control word
2	control character for the preset value. The different bits have the following meanings: A: Activates the 3-minutes timer in the calculator. (Not used). B: The last transmitted preset value and control character are still valid, allother bits are redundant. C: Denomination of the preset value: 0 = Litres, 1 = CU D: Not used
3	100 CU or litres
4	10 CU or litres
5	1 CU or litre
6	0,1 CU or litre
7	0,01 CU or litre The preset value "0" is interpreted as an unlimited authorization.
8	1,000 CU/litre
9	0,100 CU/litre
0	0,010 CU/litre
11	0,001 CU/litre

5.11 Clearing of the subtotals (registered in stand alone mode)

No	Contents
0	pre-pulse
1	09 control word

5.12 Request to send the nozzle status (4,8)

No	Contents
0	pre-pulse
1	11 control word
2	type of request 1 = Transmitting the status spontaneously when changed 2 = Transmitting the status once

6. Dialog procedures

Resulting from the above data blocks the following procedures are given:

6.1 When the nozzle is removed and the pump is authorized

Block No	Calculator	Master
1	Removing the nozzle (4.2)	
2		preset and unit price (5.1)
3	ACK	

6.2 When the nozzle is replaced

Block No	Calculator	Master
1	Replacing the nozzle (4.4)	
2		preset and unit price (5.1)
3	ACK	

(The calculator uses the unit price for a check calculation. The preset is redundant.)

6.3 After the check-calculation

Block No	Calculator	Master
1	filling data (4.1)	
2		ACK

6.4 When the filling data are transmitted to the master. (After power off during a transaction.)

Block No	Calculator	Master
1		Request to send (5.2)
2	filling data (4.1)	
3		ACK

6.5 Authorization

Block No	Calculator	Master
1		Authorization (5.3)
2	ACK	

6.6 When the product selection is acknowledged

Block No	Calculator	Master
1	Product selection (4.3)	
2		preset and unit price (5.1)

This dialog also takes place when a calculator is switched on or in case of an error which has not been reported in an other dialog.

6.7 Setting the off-line unit prices from the master

Block No	Calculator	Master
1		Setting the unit prices (5.5)
2	ACK	

6.8 Calling the totalizor contents

Block No	Calculator	Master
1		Request to send the totalizor contents (5.4)
2	totalizor data (4.5)	
3		ACK

6.9 Blocking the pump

Block No	Calculator	Master
1		Blocking the calculator (5.6)
2	ACK	

6.10 Setting a price sign (channel 15 and 16 only)

The price sign does not acknowledge, therefore in these channels the block " Setting the unit prices" (5.5) is transmitted twice.
The transfer takes place when the unit price is modified or when the mode of operation is modified by the console.

6.11 Switching the pump illumination

Block No	Calculator	Master
1		Illumination (5.7)
2	ACK	

6.12 Not used

6.13 After off-line operation mode followed by the first authorisation if subtotals are present.

Block No	Calculator	Master
1	subtotal, product 1 (4.9)	
2		clear subtotal (5.11)
3	ACK	
4	subtotal, product 2 (4.9)	
5		clear subtotal (5.11)
6	etc.	

6.14 When an outdoor payment terminal is connected to the master (ZS 2 only) or when prices have been changed by a KSE.

Block No	Calculator	Master
1		preset and unit prices (5.1)
2	ACK	

6.15 Request for the nozzle status (pump is blocked)

Block No	Calculator	Master
1		request according 5.12, type 2
2	status (4.8)	
3		ACK

6.16 Request for spontaneous sending of the nozzle status

Block No	Calculator	Master
1		request according 5.12, type 1
2	status (4.8)	
3		ACK

6.17 Spontaneous transmission of the changes of the nozzle status

Block No	Calculator	Master
1	status (4.8)	
2		ACK

7. Error handling

When a dialog participant (master or calculator) receives an erroneous data block no reply is transmitted. The absence of a reply is the request for the transmitter to send the data block again. There is a pause of 30 ms to 60 ms until the beginning of the repetition. The receiver must reply no later than 30 ms after the data block ends otherwise the reply is considered as absent.
In case the reply after the repetition is absent again the transmitter continues to send repealedly in the same way, then an error is reported.
The number of repetitions of the calculator is 127, and of the master is 15.

After 10 s of waiting for a repetition in vain, the receiver reports an error. A missing pre-pulse causes an error either because the dialog participants are no longer synchronized or both are waiting for a repetition. On the contrary a missing bit is corrected automaticly. It is therefore nescessary to distinguish a bit from a pre-pulse (which is 10 times longer). Only by that, automatic correcting will make sense.

The master can interrupt a transmission of the calculator with its own pre-pulse. When both participants are transmitting, the master has priority.

The dialog sequence is controlled by the master. This is especially important for the dialog after the check calculation (filling data, acknowledge) when the filling data are summed up in the master. When this dialog is repeatedly started erroneously by the calculator (without the messages "Removing the nozzle" or "Replacing the nozzle" in between) then the master will report error.

8. Exceptions

8.1 When the calculator starts a dialog and the master doesn't reply but starts any other dialog by itself then the calculator will forget its own message.
Therefore the master has to check whether the calculator is active before starting its own message.

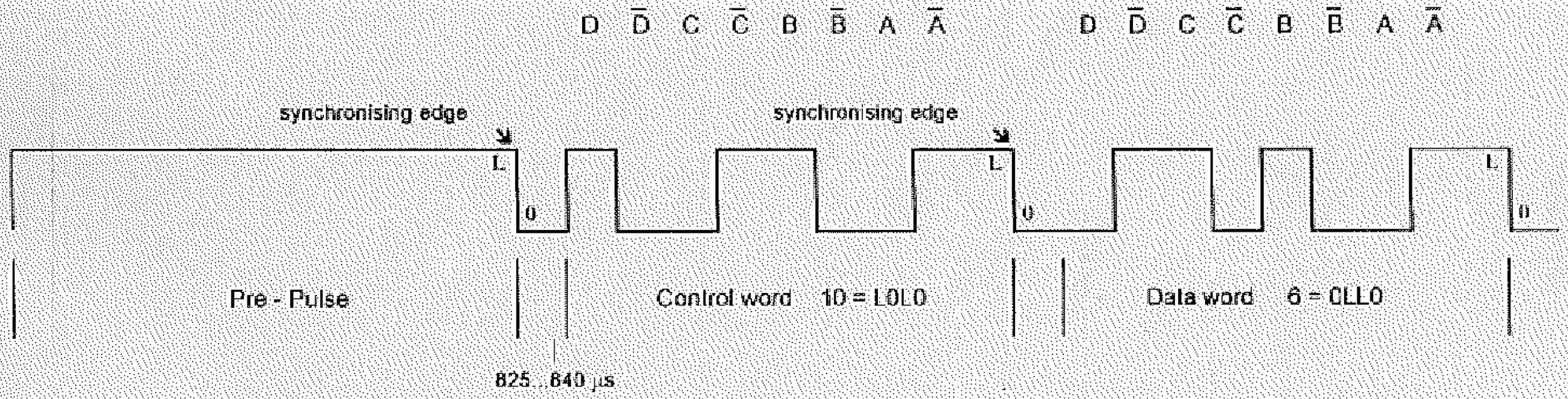
8.2 The Kienzle master ZS 2 must not receive the block "Product selection" when the pump is not authorized.

8.3 The last stopbit of a block of the Kienzle master KSE has only 0,58 ms.
When the KSE is in the operation mode "Without blocking" (service mode) the following dialog will be performed after the check calculation (nozzle replaced):

Block No	Calculator	Master
1	filling data	
2		authorization
3	ACK	

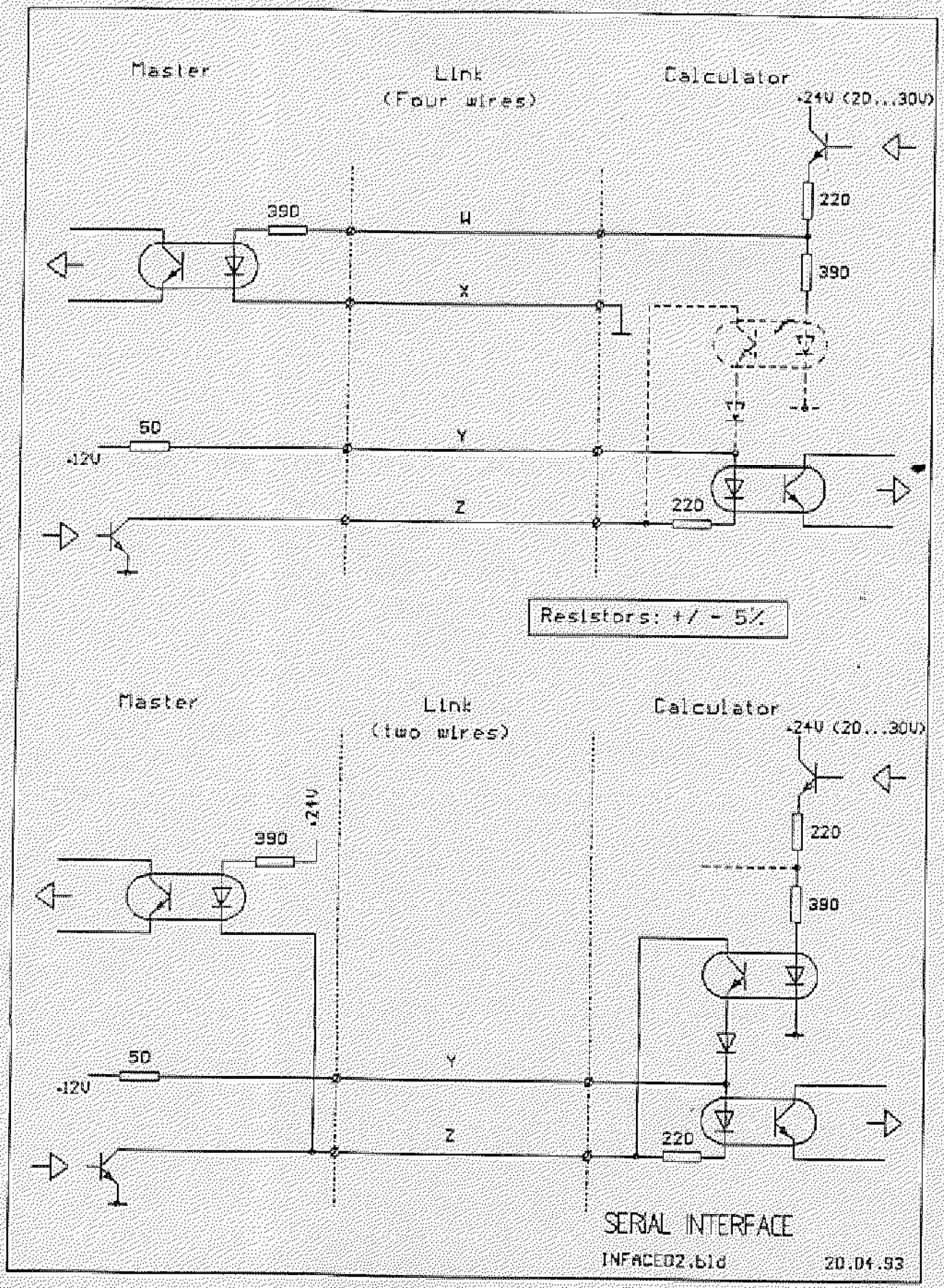
Then the calculator is authorized. The KSE needs a pause of at least 250 ms between the dialogs "Nozzle replaced" (6.2) and " After the check calculation" (6.3).
The pause according 4.6 is not observed by the KSE when it sends an authorization immediately after a zero-transaction.

8.4 The request to send the unit prices by the dialog according 6.6 is permitted only once per filling. It doesn't matter whether this occurs after an authorization or after a blocking.



Structure of a data block
(example)

2001ERDB.DOC


Master
Link
(Four wires)
Calculator
+24V (20...30V)
390
W
X
220
390
50
-12V
Y
Z
220
Resistors: +/- 5%
Master
Link
(two wires)
Calculator
+24V (20...30V)
+24V
390
220
390
50
-12V
Y
Z
220
SERIAL INTERFACE
INFACE02.bld
20.04.93

4.8 Nozzle status (Removing or replacing the nozzle when the pump is blocked).

No	Contents	
0	pre-pulse	
1	11	control word
2	code:	0 = nozzle removed 1 = nozzle replaced 2 = calculator is temporarily off-line 3 = calculator is on-line again
3	product	

4.9 Subtotals registered when the calculator is in stand alone mode

No	Contents	
0	pre-pulse	
1	02	control word
2	10**5	
3	10**4	
4	10**3	
5	10**2	
6	10**1	
7	10**0	
8	10**-1	
9	10**-2	
10	product	

Expanded Kienzle Protokoll

Data bocks from the calculator to the master

Filling Data

No	contents	
0	pre-pulse	
1	control word 1	
2	1000	Liter
3	100	Liter
4	10	Liter
5	1	Liter
6	0,1	Liter
7	0,01	Liter
8	100000	DM
9	10000	DM
10	1000	DM
11	100	DM
12	10	DM
13	1	DM
14	0,1	DM
15	0,01	DM
16	nozzle number	
17	numerator	
18	numerator	

Removing the nozzle

No	contents
0	pre-pulse
1	control word 8
2	product
3	error number

Product selection

No	contents
0	pre-pulse
1	control word 0
2	product
3	error number

Replacing the nozzle

No	contents
0	pre-pulse
1	control word 9
2	product

3	error code

Totalizers

No	contents
0	pre-pulse 3
1	control word 3
2	1000000000
3	100000000
4	10000000
5	1000000
6	100000
7	10000
8	1000
9	100
10	10
11	1
12	0,1
13	0,01
14	product und denomination

Acknowledgement of a data block

No	contents
0	pre-pulse

Subtotals of stand alone mode

No	contents
0	pre-pulse
1	control word 2
2	1000000000
3	100000000
4	10000000
5	1000000
6	100000
7	10000
8	1000
9	100
10	10
11	1
12	0,1
13	0,01
14	product

Data bocks from the master to the calculator

Preset / unit price

No	contents

0	pre-pulse	
1	control word 1	
2	control character for the preset value	
3	100000	Liter/DM
4	10000	Liter/DM
5	1000	Liter/DM
6	100	Liter/DM
7	10	Liter/DM
8	1	Liter/DM
9	0,1	Liter/DM
10	0,01	Liter/DM
11	100	DM/Liter
12	10	DM/Liter
13	1	DM/Liter
14	0,1	DM/Liter
15	0,01	DM/Liter
16	0,001	DM/Liter

Request to send the filling data

No	contents
0	pre-pulse
1	control word 4

Authorization without clearing the display

No	contents
0	pre-pulse
1	control word 7

Clearing of the subtotals

No	contents
0	pre-pulse
1	control word 9

Authorization

No	contents
0	pre-pulse
1	control word 0

Request to send the filling data

No	contents
0	pre-pulse
1	control word 4

Request to send the totalizer data

No	contents
0	pre-pulse
1	control word 3
2	product and denomination 0..7 = volume 8..15 = amount

Setting the off-line unit prices

No	contents	
0	pre-pulse	
1	control word 2	
2	product	
3	100	DM/Liter
4	10	DM/Liter
5	1	DM/Liter
6	0,1	DM/Liter
7	0,01	DM/Liter
8	0,001	DM/Liter

Blocking the calculator

0	pre-pulse
1	control word 5

Pump illumination

0	pre-pulse
1	control word 6
2	0 = Lght otf 1 = Light on

Best reguards

Günter Wilcke
(Salzkotten 11.10.1996)

Tankanlagen Salzkotten