

Operating Instructions

DigiCal **Digital Thermometer**

DCM 2

Valid from serie B02 (see item 10)
06/03
YAME0016

LAUDA DR. R. WOBSE
GMBH & CO. KG
P.O. BOX 1251
97912 Lauda-Königshofen
Germany
Phone (+49) (0)9343/ 503-0
Fax: (+49) (0)9343/ 503-222
e-mail info@lauda.de
Internet <http://www.lauda.de>

**Safety notes:**

Before operating the equipment please read carefully all the instructions and safety notes. If you have any questions please phone us!

Follow the instructions on setting up, operation etc. This is the only way to avoid incorrect operation of the equipment and to ensure full warranty protection.

- Transport the equipment with care!
- Equipment and its internal parts can be damaged:
 - by dropping
 - by shock.
- Equipment should only be operated by technically qualified personnel!
- Do not start up the equipment if
 - it is damaged or leaking
 - the supply cable is damaged.
- Switch off the equipment and pull out the mains plug
 - for servicing or repair
 - if the supply cable is damaged!
- Have the equipment serviced or repaired by properly qualified personnel only!

The Operating Instructions include additional safety notes which are identified by a triangle with an exclamation mark. Carefully read the instructions and follow them accurately! Disregarding the instructions may have serious consequences, such as damage to the equipment, damage to property or injury to personnel!

We reserve the right to make technical alterations!

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Explanation of signs:



Danger:

This sign is used where there may be injury to personnel if a recommendation is not followed accurately or is disregarded.



Note:

Here special attention is drawn to some aspect. May include reference to danger



Reference:

Refers to other information in different Sections.

1. Control and functional elements



2. Handling / Introduction

2.1 General advice



- For cleaning the instrument please do not use abrasive cleaner but a dry or wet piece of cloth.
- Please store the measuring instrument in a dry and clean place.
- Avoid any force like shocks or pressure to the instrument.
- Do not use force to connect the probe or interface plugs in. The interface plug differs from the probe.



- If no sensor is connected to the instrument while switching on „oPEn“ will be indicated on the display (⇒ chapter 4. Error codes/ trouble shooting).

2.2 Operation

Before switching on the instrument, connect the probe/s to the instrument and insert the battery (⇒ chapter 3. Power supply/ battery changing). A number on the instrument's housing marks each port.

2.3 Switching on and off

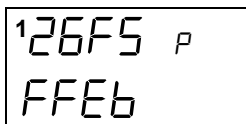
By operating the ON/OFF-key the instrument will be switched on or off.

After switching on the instrument indicates a full segment test in 1,5 sec.

Afterwards the instrument shows the calibration-code and the adjusted measurement category for channel 1 (e.g. [oFF for standard distinguishing line and P for Pt100).

In the following the calibration data of the second channel (if available) will be shown.

Fig 1: Example of channel information after switching on:



Channel-1 calibration based on the calibration code of the probe.

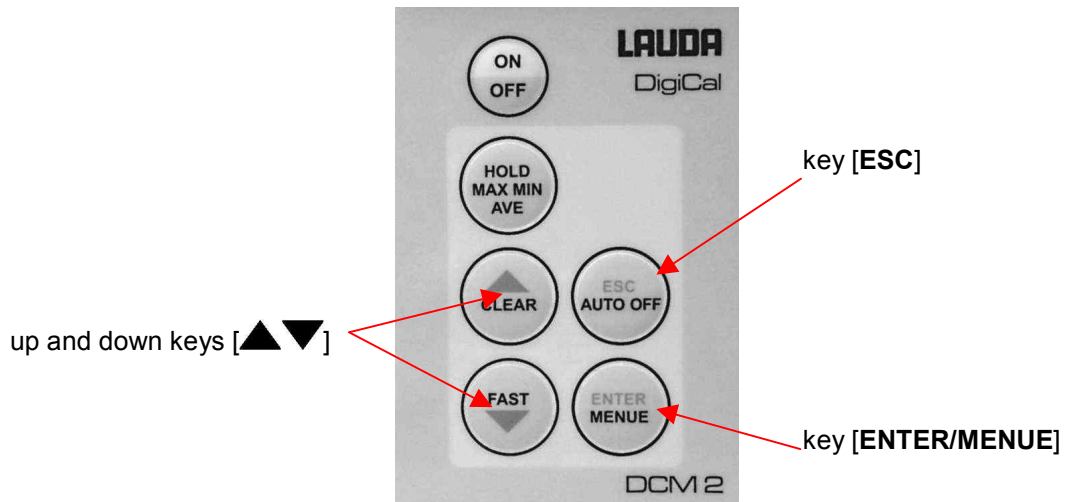
Now the thermometer starts operating in measurement mode indicating the actual measurement value. All instruments display the measurement value of channel 1 on the top display line (large display line). Underneath the trending bargraph is shown. The second channel of your dual channel instruments would be displayed on the bottom line (small display line).

2.4 Menu

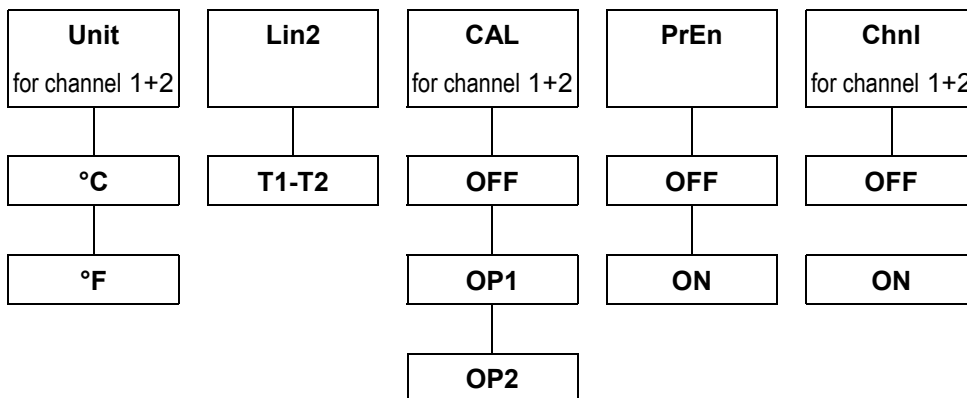
The adjustments of the instruments such as like the temperature unit, calibration of probes, deactivation of channels and others - are resulting from the structure of the menu.

You will reach into the main menu by pressing [ENTER/MENUE]. With the up and down keys [▲▼] you can choose your required menu item.

Push [ESC] to be back in the measuring mode.



Menu structure



2.4.1 Measuring unit switching °C and °F - *Unit*

Unit = Measuring unit

Measuring unit temperature (°C=Celsius, °F=Fahrenheit).

To change the measuring unit press **[ENTER/MENUE]**. Use the up and down keys [**▲▼**] to select *Unit*. press again **[ENTER/MENUE]**. In the left corner of the display appears a small 1, which indicates the selected channel. For changing the channel use the up and down keys [**▲▼**].

Press **[ENTER/MENUE]** to confirm. On the right corner of the display appears °C or °F. Use the up and down keys [**▲▼**] again to adjust the requested measuring unit and press **[ENTER/MENUE]** to confirm.

Press **[ESC]** to get back to the measuring mode.

Display	Keys	Function
<i>Unit</i>	ENTER/MENUE	
¹ <i>Unit</i> ₂ <i>Unit</i>	up and down keys [▲▼]	select the channel 1 or 2
¹ <i>Unit</i>	ENTER/MENUE	
¹ <i>Unit</i> °C ¹ <i>Unit</i> °F	up and down keys [▲▼]	select the measuring unit [°C] or [°F]
	ENTER/MENUE	To keep the amended value.
	ESC	To escape without retention

2.4.2 Temperature Difference- *ΔT*

To display the difference between the two temperature channels push **[ENTER/MENUE]**. Use the up and down keys [**▲▼**] to select *ΔT*. Push again **[ENTER/MENUE]**. On the right corner of the display appears a T1-T2. Use the up and down keys [**▲▼**] to adjust the requested selection. Push **[ENTER/MENUE]** to confirm.

Push **[ESC]** to be back in the measuring mode.



Both channel have to be activated for showing the difference temperature.

2.4.3 Calibration function- CAL



Despite high quality manufacturing techniques, each probe is slightly different from specified standards. To eliminate inaccuracies caused by exchanging or ageing of probes, the instrument offer easy calibration functions which guarantee that the system accuracy is always as good as if the instrument was specifically calibrated to the individual probes in our laboratory.

The instruments offer three calibration options:

- **[oP1]**: LAUDA-factory calibration, encoded calibration with optimum accuracy. Probe and electronics are being calibrated at the same time. Therefore the accuracy reaches 0,03°C for temperature range -100°C to +150°C. This calibration is stored as **oP1** calibration code.
Please note that the accuracy will be 0,05°C in case another probe is connected that was calibrated without the electronics.
(This probe data can be read as a 2x4 digits code on the handle of the LAUDA DigiCal probes and results from the 2-point-comparison method **oP1**).
- **[oP2]**: Calibration by physical standard references with the best possible system accuracy for a user's calibration (calibration with comparative standards: 1-point, 2-point or 3-point-comparison possible).
- **[oFF]**: Standard characteristic curve with a minimum system accuracy (e.g. Pt100-resistance according DIN IEC 60751).

CAL = calibration

Push **[ENTER/MENUE]** to calibrate the instrument with sensor. Use the up and down keys **[▲▼]** to select **CAL**. Push again **[ENTER/MENUE]**. On the left corner the display appears a small **1**, which indicates the selected channel. For changing the channel use the up and down keys **[▲▼]**. Push **[ENTER/MENUE]** to confirm.

Use the up and down keys **[▲▼]** to select the requested calibration option.

Display	Keys	Function
CAL	ENTER/MENUE	
¹ CAL ₂ CAL	up and down keys [▲▼]	select the channel 1 or 2
¹ CAL	ENTER/MENUE	
¹ CAL oP1 oP2 [oFF]	up and down keys [▲▼]	select the calibration mode.
	ENTER/MENUE	To keep the amended value.
	ESC	To escape without retention

2.4.3.1 Encoded Calibration - σP !



This calibrating function is only needed in case you would add another probe to the second measuring channel.

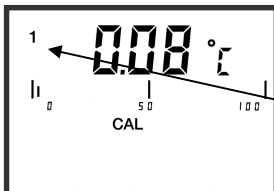
Use the up and down keys [\blacktriangle \blacktriangledown] to select σP !. Press [ENTER/MENUE] to confirm the requested setting. On the bottom of the display appears a small 1, followed by a four-digit number (Hex-Code /0..F). The number can be modified with the up key [\blacktriangle]. For stepping to the next number use the down key [\blacktriangledown]. If the requested number is complete then press [ENTER/MENUE] to confirm. Now on the bottom of the display appears a small 2 and after this number a second four-digit number is displayed. For changing the number please follow the manual as before.

Press [ESC] to get back to the measuring mode.



Important!

After confirming σP ! by pressing [ENTER/MENUE] the function σP ! (encoded calibration) is activated, even though you leave the menu by pressing the [ESC] key.



Display-indication with active calibration code σP !:

The **CAL** – segment and the small 1 on the left indicates to the user that σP ! is activated.

2.4.3.2 Calibration by physical standard references - $\sigma P2$

Use the up and down keys [\blacktriangle \blacktriangledown] to select $\sigma P2$. Press [ENTER/MENUE] to confirm. On the bottom of the display appears $1 P$. To select between a 1-Point [$1 P$], a 2-Point [$2 P$] or 3-Point [$3 P$]-calibration use the up and down keys [\blacktriangle \blacktriangledown].

Example of a 1-Point calibration:

Press [ENTER/MENUE] to confirm. On the display appears 60 . After the displayed measuring value is stabile press [ENTER/MENUE]. App. 2 seconds later in the first display line appears $P 1$ (measuring value 1); in the second display line appears dP . (standing for decimal point).

Use the up and down keys [\blacktriangle \blacktriangledown] to select the number of digits after decimal point:

dP = two decimal digits

dP . = one decimal digit (decimal point is jumping one digit to the right)

Press [ENTER/MENUE] to confirm. On the second line of the display appears S , $_{-}$. Use the up and down keys [\blacktriangle \blacktriangledown] to select the requested sign.

S , $_{-}$ = reference standard shows a negative measuring value (below 0.00C°)

S , $_{|}$ = reference standard shows a positive measuring value (above 0.00C°)

Press [ENTER/MENUE] to confirm. On the second line of the display appears $Fd 0$. Use the up and down keys [\blacktriangle \blacktriangledown] to select the requested range:

$Fd 0$ = below 100.00°C

$Fd 1$ = above 100.00°C

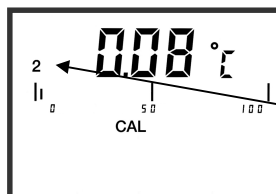
Press [ENTER/MENUE] to confirm. Now the display shows $00 .00$. Please enter here the temperature of your reference. To modify the value use the up key [\blacktriangle]. For stepping to the next number use the down key [\blacktriangledown].

If the requested value is complete then press [ENTER/MENUE].

Press [ESC] to get back to the measuring mode.

Important!

A break of the physical calibration $\sigma P2$ cannot be done by the [ESC]-button. Switching off the instrument can only do a break of the physical calibration.



Display-indication with active calibration code $\sigma P2$:

The CAL – segment and the small 2 on the left indicates to the user that $\sigma P2$ is activated.

2.4.3.3 DIN IEC-Calibration DIN IEC 60751 – [oFF]

Use the up and down keys [▲▼] to select [oFF]. Press [ENTER/MENUE] to confirm.

Press [ESC] to be back in the measuring mode.

2.4.4 Printer port activation / deactivation - PrEn

PrEn = Printer enable

Press [ENTER/MENUE] to activate or deactivate the printer port. Use the up and down keys [▲▼] to select **PrEn** and press [ENTER/MENUE]. Use the up and down keys [▲▼] to activate **on** or deactivate **oFF** the requested adjustment and press [ENTER/MENUE] to confirm.

Press [ESC] to get back to the measuring mode.

Display	Keys	Function
PrEn	ENTER/MENUE	
PrEn on oFF	up and down keys [▲▼]	activation or deactivation
	ENTER/MENUE	To keep the amended value.
	ESC	To escape without retention

2.4.5 Selection / Channel activation - [chnL]

To activate or deactivate a measuring channel press [ENTER/MENUE]. Use the up and down keys [▲▼] to select [chnL] and press [ENTER/MENUE]. On the left corner of the display appears a small **1**, which indicates the selected channel. For changing the channel use the up and down keys [▲▼]. Press [ENTER/MENUE] to confirm. The second display line shows **on** for activation or **oFF** for deactivation. Use the up and down keys [▲▼] again to activate **on** or deactivate **oFF** the requested measuring channel and press [ENTER/MENUE] to confirm.

Press [ESC] to get back to the measuring mode.



- In case that one channel would not be connected to a probe, the main display would indicate **oPEn** in the relevant line.
- There must be at least one active channel !

Display	Keys	Function
ChnL	ENTER/MENUE	
¹ ChnL ₂ ChnL	up and down keys [▲▼]	select the channel 1 or 2
¹ ChnL	ENTER/MENUE	
¹ ChnL on off	up and down keys [▲▼]	activation or deactivation
	ENTER/MENUE	To keep the amended value.
	ESC	To escape without retention

2.5 Recalling the memory data (HOLD MAX MIN AVE)

After pressing first time the key [HOLD MAX MIN AVE] the actual value will be hold in the top display line (big display). Pressing again the key [HOLD MAX MIN AVE], the saved maximum-, minimum and average value will be displayed in the bottom display line (small display).



- First the MAX-MIN-AVE-values of channel 1 will be displayed – afterwards the values of the channel 2 will be displayed. Is there only one probe on a 2-channel instrument we suggest to deactivate the channel without probe (⇒ chapter 2.4.5 Selection / Channel activation - [hnl])
- During the recall of the memory data the extremes (MAX MIN) and the average value (AVE) will not be calculated or carried on.

Clearing the memory (MAX MIN AVE)

Press [CLEAR] key once to erase the stored maximum, minimum and average from memory. On the display appears [CLR].

After erasing the memory the instrument automatically switches back to measuring mode indicating the actual measured value again.

2.6 Measuring rate (FAST-Modus)

Press [FAST/▼] key once to change the measuring rate. Now the measuring rate is app. 4 measurements per second. Press [FAST/▼] key again and the instrument is back in the standard mode (1 measurement per second).

In the fast mode the battery consumption is three times higher than in the standard mode!



After switching off this function is automatically deactivated.

2.7 AUTO-OFF-Function

dAoF = Disable Auto-off

EAoF = Enable Auto-off

Press [ESC/AUTO-OFF] key once. On the display appears **dAoF**. Now the Auto-Off-function is deactivated.

Press [ESC/AUTO-OFF] key again. On the display appears **EAoF**. Now the instrument switches off automatically after app. 30 minutes.



After switching off and on the instrument, the Auto-Off function is automatically activated (standard function is **EAoF**).

3. Power supply

For the power supply of the instrument a 9 Volt dry battery is used. To exchange the battery switch of the instrument and open the battery cover on the backside of the instrument. Remove and disconnect the battery from the instrument. Connect a new 9 V battery to the plug and put the battery back into the instrument.

In case the „**BAT**“ segment is indicated, that the battery has to be exchanged. There is approx. 1 hour of further measuring left as soon the “BAT” segment is shown.

For protection of our environment please don't put the battery into household garbage but use separate special disposal.

4. Error codes

By displaying the following error codes the instrument support the operation of the instrument.

<i>Error</i>	Description
<i>oPEn</i>	no probe or wrong probe is connected
<i>toH ,</i>	“too high“ exceeding of the measuring range
<i>toLo</i>	“too low“ underflow of the measuring range

5. Technical data

Type:	DigiCal DCM 2
Probe Ports 1 / 2	Pt100
Measuring range	-200...+450°C
Accuracy Pt 100 temperature probe with manufacturer calibration	-200...-100°C: 0.05°C -100...+150°C: 0.03°C +150...+200°C: 0.05°C >200°C: 0.1%
Resolution	-200 to +200°C with 0.01°C resolution +200 to +400°C with 0.1°C resolution
Outputs	RS232 Interface (serial Printer can be connected)
Battery life	app. 20 Std.
Connectors	DIN 8-pole
Allowable operating temp.	0°C... +40°C
Display	2-line LCD
Housing	plastic (ABS)
Dimensions	200 x 85 x 40 mm (LxWxH)
Weight	300 g
Power supply.	9V battery
Cat.- no	LMD 917

6. RS232 interface protocol

During the data transmission, the availability via PC of the the tension levels for RTS (=+12V) and DTR (= -12V) must be assured by a software's regulation code:.

Parameter: Baudrate 2400 Baud
Datenbits 8
Stopbits 2
Parität None

To start the data transmission you have to send the following characters. The index below shows which value could be selected via interface.

		DCM2
MEASURING VALUE	1 + 2 autom. recognize	FC (hex)
Enabling the keyboard		0 (hex)

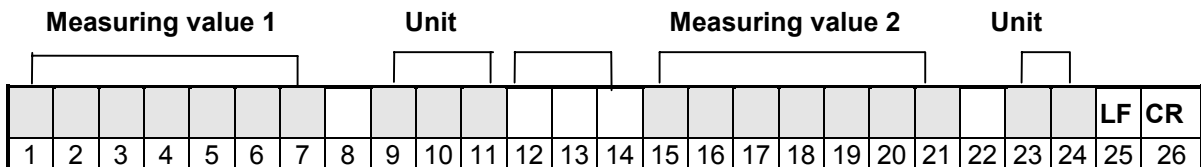


You will get the complete data using the command FC(hex), the instrument locks automatically the keyboard. Please send command 0(hex) to release the keyboard accordingly.

The data would be sent in the following format.

Data Type = String

The length of the string depends on the instrument (a two-channel or one-channel instrument).



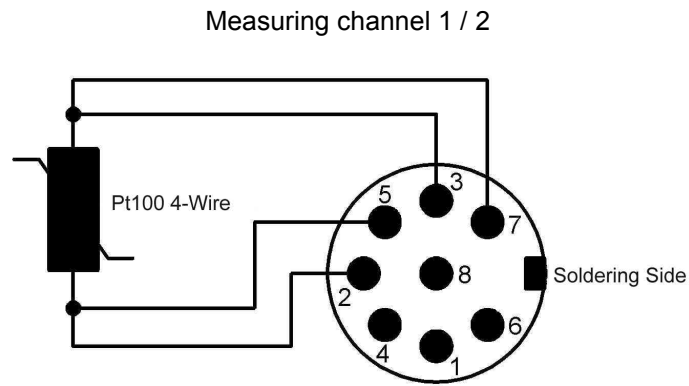
Example: Turbo Pascal Source-Code for initialisation of the RS232 interface

```

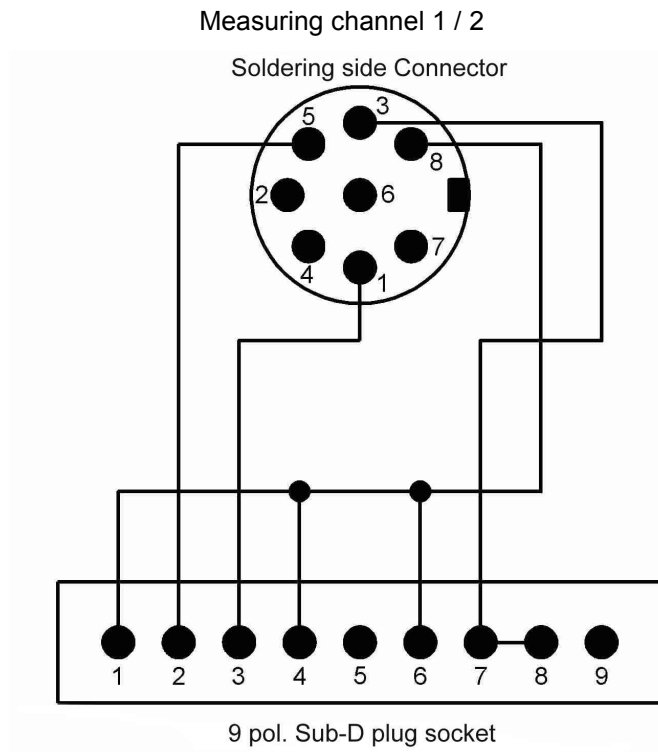
PROCEDURE V24oeffnen(com1,com2:Boolean); { RS 232 Initialisieren }
VAR wert : Byte;
BEGIN
  IF com1 THEN BEGIN
    PORT [$3FB]:=128; { initialisation of COM 1 }
    PORT [$3F9]:= 0; { activate baud rate }
    PORT [$3FB]:= 7; { baud rate - MSB }
    PORT [$3FC]:= 2; { 8 Bits, No Parity, 2 Stop }
    Wert := PORT [$3F8]; { DTR = 0, RTS = 1 }
  END;
END;
  
```

7. Connector layout

7.1 Connector layout Pt100 4-wire



7.2 RS232 – PC-adapter cable (Connector layout)



8. Data of probe-calibration

Our quality-probes are the main reason for the precision and quality of your measuring. To facilitate the exchange of a probe without a losing precision, our probes were measured in our company and added with a code that describes the characteristic line of the probe. The probe is labelled obviously with the relevant code.

If you change the probe you have to enter the code into the measuring instrument. We recommend to write down both values in order to avoid any problems (especially if the probe is positioned at a place difficult to access, or if there are several external probes in use).

Ref.-no: _____
Appellation: _____
Serial number: _____
Calibration data: _____

Ref.-no: _____
Appellation: _____
Serial number: _____
Calibration data: _____

Ref.-no: _____
Appellation: _____
Serial number: _____
Calibration data: _____

Ref.-no: _____
Appellation: _____
Serial number: _____
Calibration data: _____

Ref.-no: _____
Appellation: _____
Serial number: _____
Calibration data: _____

9. Accessories

Accessories	Cat.-No.
Pt 100 sheathed resistance probe with 4-wire connection, class B 1/3 DIN, -200 ... +450°C. The calibration values of this probe are encoded in the LAUDA calibration code. Probes with a 3mm diameter tubing made of stainless steel, 300mm long, length of the sensor at the end of the tube < 35mm, plastic handle made of ABS	ETP 065
Factory calibration certificate for the measurement chain with calibration points at 0° and 150°C	LMZ 052
DKD calibration certificate for the measurement chain at 2 selectable calibration temperatures between -40° and +300°C	LMZ 053
PC adapting cable (RS 232) for DCM 2 with an 8 pole DIN connector to the DCM 2 and a 9 pole Sub-D coupler plug to the PC	EKS 071
Windows PC Data-Recording-Software: WinTherm Plus on CD-ROM	LSDM2002
Plug-In Mains Supply for 230VAC; 50-60Hz	EBE 042
Case for DCM 2, light grey RAL 7035 or similar.	LMZ 051
9V block accumulator for DCM 2	EZ 216
9V Accumulator charger	EBE 044

10. Ordering spares

To avoid questions, delay and delivery of incorrect items, please advise always your instruments type and serial number stated on the manufacturer's label.

The capital letter of the serial number (first position) shows the year of manufacture, e.g. B = 2003

We always would appreciate dealing with your queries and comments and receiving your suggestions, experience and criticism.

LAUDA DR. R. WOBSE
GMBH & CO.KG
P.O. BOX 1251
97912 Lauda-Königshofen
Germany
Phone: (+49) (0)9343/503-0
Fax: (+49) (0)9343/503-222
e-mail [info @ lauda.de](mailto:info@lauda.de)
Internet <http://www.lauda.de>

An / To / A:

LAUDA Dr. R. Wobser • LAUDA Service Center • Fax: +49 (0) 9343 - 503-222

Von / From / De :

Firma / Company / Entreprise: _____

Straße / Street / Rue: _____

Ort / City / Ville: _____

Tel.: _____

Fax: _____

Betreiber / Responsible person / Personne responsable: _____

Hiermit bestätigen wir, daß nachfolgend aufgeführtes LAUDA-Gerät (Daten vom Typenschild):

We herewith confirm that the following LAUDA-equipment (see label):

Par la présente nous confirmons que l'appareil LAUDA (voir plaque signalétique):

Typ / Type / Type :	Serien-Nr. / Serial no. / No. de série:

mit folgendem Medium betrieben wurde

was used with the below mentioned media

a été utilisé avec le liquide suivant

Darüber hinaus bestätigen wir, daß das oben aufgeführte Gerät sorgfältig gereinigt wurde, die Anschlüsse verschlossen sind, und sich weder giftige, aggressive, radioaktive noch andere gefährliche Medien in dem Gerät befinden.

Additionally we confirm that the above mentioned equipment has been cleaned, that all connectors are closed and that there are no poisonous, aggressive, radioactive or other dangerous media inside the equipment.

D'autre part, nous confirmons que l'appareil mentionné ci-dessus a été nettoyé correctement, que les tubulures sont fermées et qu'il n'y a aucun produit toxique, agressif, radioactif ou autre produit nocif ou dangereux dans la cuve.

Stempel Seal / Cachet.	Datum Date / Date	Betreiber Responsible person / Personne responsable

Formblatt / Form / Formulaire:

Unbedenk.doc

Erstellt / published / établi:

LSC

Änd.-Stand / config-level / Version:

0.1

Datum / date:

30.10.1998

LAUDA DR. R. WOBSE GmbH & Co. KG

Pfarrstraße 41/43

D - 97922 Lauda-Königshofen

Internet: <http://www.lauda.de>

Tel: +49 (0)9343 / 503-0

Fax: +49 (0)9343 / 503-222

E-mail: info@lauda.de