



CE

## Calibrator CAL 01

Original instruction manual  
Issued 11.13

## Operating Instructions

Item No. 08900995  
Oetiker Horgen/CH

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# 1 Introduction

## 1.1 Validity

These Operating Instructions apply to all the "Test-Equipment CAL 01" sets listed below:

Article number	First language	Second language	Power supply
13600068	German	English	EURO
13600075	French	English	EURO
13600076	Dutch	English	EURO
13600077	Italian	English	EURO
13600078	Spanish	English	EURO
13600079	Swedish	English	EURO
13600080	English	German	UK
13600081	English	Spanish	USA
13600082	English	German	Australia
13600155	English	German	Euro/China

Tab. 1

## 1.2 Introduction

These Operating Instructions are part of the scope of supply. They must always be near the unit and accessible, and must be passed on to the new owner if the unit is sold. These Operating Instructions are not included in a revision service.

- ▶ Please observe the instructions given below.
- ▶ Read the Operating Instructions attentively before putting the Test-Equipment CAL 01 into service. Ensure that you are thoroughly familiar with all equipment and features and their functions.
- ▶ Follow all operation and maintenance instructions. They are a prerequisite for long and reliable service from the CAL 01.

Service and repair work must only be carried out by Oetiker factories.

The Test-Equipment CAL 01 must only be used by persons familiar with it, who have been instructed about the dangers associated with it.

The Test-Equipment CAL 01 is designed and manufactured only for its intended purpose (proper use). Use for any other purpose is considered to be improper use. The manufacturer is not liable for damage resulting from improper use; any such risks are born entirely by the user.

The relevant accident prevention regulations and other generally-recognized safety and health rules must be observed. Unauthorized alterations to the Test-Equipment CAL 01 absolve the manufacturer of any responsibility for damage resulting from them.

**Spare parts**

The quick and correct supply of spare parts is only possible if the order is absolutely clear.

Orders for spare parts should include the following:

- Product name, article number, serial number, names and quantities of parts required, part numbers, how the parts should be sent, and full address. More detailed instructions are given in the product catalog.





Because we continually strive to improve the quality of our products, we reserve the right to make improvements without changing the Operating Instructions. For this reason, data quoted for items such as masses, weights, materials, performance and designations may not apply to all units. The electrical drawings supplied with a calibrator set are always valid for that unit.

**1.3 Symbols and means of representation used**

Safety notices are used in this manual to warn of the risk of personal injury or property damage.

- ▶ Always read and observe these safety notices.
- ▶ Observe all notices that are flagged with a safety alert symbol and signal word.

The following symbols are used in this instruction manual:

Symbol	Meaning
 <b>DANGER</b>	Hazardous situation. Failure to observe this notice will lead to death or serious injury.
 <b>WARNING</b>	Hazardous situation. Failure to observe this notice may lead to death or serious injury.
 <b>CAUTION</b>	Hazardous situation. Failure to observe this notice may lead to minor injury.
<b>CAUTION</b>	Information on the avoidance of property damage.
 <b>NOTICE</b>	Information relating to the understanding or optimization of working practices. Information indicating technical requirements for optimum performance and efficiency.
▶	One-step instruction
1. ... 2. ... 3. ...	Multi-step instruction ▶ Carry out the steps in the order shown.
✓	Requirement Necessary or labor-saving steps for the successful execution of an action

Tab. 2

## 1.4 Scope of supply

Part	Abbreviation	Article number / notes
Calibrator	CAL 01	1360XXXX (depending on country-specific version)
Closing-force sensor	SKS 01	13600063 (cable length: 1500 mm)
Closing force jaws	SKB 10	13600058 (installed on SKS 01)
Closing force jaws	SKB 07	13600059 (optionally supplied)
Power supply	STN 01	06001159
Closing jaws	SKB 07	13600059 (7 kN, 7 mm)
Lithium block battery	BAT 01	06001165
I/O cable X2	-	13600083
Data cable	X3 CAL-ELK/ELS	13600116
Data cable	X3 CAL-PC	13600117
Hexagon key	SW 3	09002013
Carrying case CAL 01	-	08901001
Operating Instructions	-	0890XXXX - depending on language
Screw-retaining fluid	-	Loctite 243

Tab. 3



Fig. 1

- |   |                                |
|---|--------------------------------|
| 1. Closing-force sensor SKS 01 with jaws SKB 10 | 6 Lithium block battery BAT 01 |
| 2 Hexagon key                                   | 7 Power supply STN 01          |
| 3 Screw-retaining fluid                         | 8 Data cable X3 CAL-ELK        |
| 4 Jaws SKB 07 (7 mm wide)                       | 9 Data cable X                 |
| 5 Calibrator CAL 01                             | 10 I/O cable X2                |

## 1.5 Accessories

Part	Abbreviation	Notes
13600060	SKB 05	Pair of closing-force jaws 2.5 kN, 5 mm wide with screws
13600070	SVG 01	Guard for permanently mounting the SKS on HO 2000, 3000, 4000 and MK 38-X pincer
13600071	SVG 02	Guard for permanently mounting the SKS on HO 5000/7000 and MK 45-X pincer
06001157	NHM 01	Block battery 9 V, 160 mAh nickel-metal-hybrid
06001158	SLG 01	Charging unit 230 V / 50 Hz for fast charging of NHM 01 battery
13600198	SKS 01/600	Closing force sensor SKS 01, with cable length 600 mm
13600197	SKS 01/2000	Closing force sensor, with cable length 2000 mm

Tab. 4

## 2 Safety instructions

### 2.1 Safety advice

To ensure safe operation, the unit must only be used in accordance with these Operating Instructions. In addition, when using it, the relevant legal and safety regulations must be observed. The operator of a plant, in which the Test-Equipment CAL 01 is being used, is responsible for the welfare of his employees; it is a part of this responsibility to implement measures to ensure that such regulations are observed, and to check on their execution.

- ▶ In particular, the plant operator must ensure that:
  - the Test-Equipment CAL 01 is only used for the intended purpose;
  - a check is made before initial start-up to ensure that the specified operating voltage corresponds to that available where the machine is to be used, and that the supply circuit has adequate protective measures;
  - the Test-Equipment CAL 01 is only used when it is in perfect operating condition;
  - the Operating Instructions are always kept available, complete and in readable condition near where the CAL 01 is being used;
  - only personnel who are authorized and qualified for the task use the Test-Equipment CAL 01;
  - these persons are regularly instructed in relevant aspects of safety at work and environmental protection, and are familiar with the Operating Instructions and in particular with the safety instructions they contain;
  - none of the safety and warning notices on the Test-Equipment CAL 01 are removed, and that all are kept in a legible condition.

### 2.2 Proper use

The Test-Equipment CAL 01 is intended exclusively for verifying the closing force of, and interactive communication with pneumatic/hydraulic pincers types ELK/ELS from Oetiker. Any use outside the scope of that description is considered to be "improper use".

"Improper use" includes, for example:

- force measurements on tools for which the Test-Equipment CAL 01 is not approved and/or those that are not Oetiker products;
- controlling units other than the ELK/ELS.



## 2.3 General dangers resulting from failure to observe safety instructions

The Test-Equipment CAL 01 conforms to the 'state of the art' and is safe. The unit can nevertheless give rise to residual dangers if it is used by untrained persons or for inappropriate tasks. For any injury or damage to persons or property that are caused by improper use, the operating authority is responsible, not the manufacturer of the CAL 01.

All persons who are entrusted with the tasks of assembling, commissioning, maintaining or repairing the unit must have read and understood these Operating Instructions and in particular the safety recommendations they contain.

## 2.4 Basic safety instructions for work on pneumatic equipment

Maintenance and repair work on pneumatic equipment must only be carried out by persons specially trained for such work. Before starting maintenance and repair work, pressure must be released from the pneumatic and hydraulic parts of the machine.

Service and repair work must only be carried out by Oetiker factories. The only exception to this rule is changing the battery, as described in chapter 4.1.1, p. 4-10.

## 2.5 Safety-conscious operation

Fault messages must only be acknowledged when the cause of the fault has been corrected and there is no further danger.

- ▶ Before starting to use it, check the Test-Equipment CAL 01 for visible damage, and ensure that it is in perfect operating condition.
- ▶ Report any defects found to your supervisor immediately, and stop using the Test-Equipment CAL 01.

## 2.6 Changes and modifications

The Test-Equipment CAL 01 must not be changed in any way affecting its construction or safety without our express permission. Any change will have the effect of cancelling our liability for resultant damage. In particular, it is forbidden to carry out any extension of cables, changes to the cables, and repairs.

## 2.7 Qualified personnel

This unit must only be used by qualified personnel and exclusively in accordance with the technical data and safety advice given in these Operating Instructions. In addition, while it is being used, the legal and safety regulations that are valid for that particular application must be observed.

Qualified persons are persons who are familiar with installation, assembly, commissioning and operation of the tool, and who have qualifications appropriate to their function.

## 2.8 Inspection and maintenance

The service and maintenance intervals given in the Operating Instructions must be observed. Follow the maintenance and repair instructions in these Operating Instructions.

## 3 Applications

The Test-Equipment CAL 01 consists of a handheld unit (pocket calibrator) for:

- measuring the closing force (SK), using a closing-force sensor (SKS), and automatically transmitting the measured value to the ELK/ELS being tested;
- selecting an active program number (in APN mode) by sending a bit combination at the 24 V level to the X2 interface of ELK/ELS.

## 4 Connections

### 4.1 Supply voltage for Test-Equipment CAL 01

The unit can be operated either independently or attached to the power supply.

#### 4.1.1 Independent operation using batteries

On the lower back of the Calibrator CAL 01, there is a compartment into which you can fit one of the following:

- a lithium block battery 9 V/1.2 Ah (supplied with the unit), preferably Type BAT 01, A. No. 06001165

– or –

- a 9 V rechargeable battery Type NMH 01 A. No. 06001157

#### How long will it operate?

CAL 01: 1 minute ON; 5 minutes OFF

- Rechargeable battery Type NMH 01 ca. 60 measurements
- Battery Type BAT 01 (Lithium 9 V/1.2 Ah) ca. 500 measurements

#### NOTICE

If not connected to the power supply, **only** the 'SKS measurement' and 'TRANSMIT' functions are available.

For all other functions, the unit must be connected to the power supply unit supplied (STN 01); see chapter 4.1.2, p. 4-11.

#### NOTICE

When being used independently, the Test-Equipment CAL 01 switches off automatically if no button is pressed in a 60-second period.

The NiMH rechargeable battery, Type NMH 01, can be charged or recharged at any time.

- ▶ Use only the charging unit Type SLG 01, which is an optional accessory, for the purpose.

### 4.1.2 Operation connected to power supply unit STN 0X

At the rear of the Calibrator CAL 01 there is a socket labelled "DC IN 24V" for connecting the power supply unit. Power supply units are country-specific, and are supplied with the appropriate adapter.

Part	Abbreviation	Country	Item number
Power supply unit	STN 01	EURO	06001159
Power supply unit	STN 02	UK	06001166
Power supply unit	STN 03	USA	06001167
Power supply unit	STN 04	Australia	06001168

Tab. 5

#### NOTICE

When the unit is connected to the power supply, all functions are available.

## 4.2 Closing-force sensor SKS

#### NOTICE

To use the unit, a closing-force sensor must always be connected!

The SKS closing-force sensor must be connected to the socket labelled "SKS". If the Calibrator CAL 01 is switched on without the closing-force sensor connected, the display shows "SENSOR ? !". This is to inform you that the closing-force sensor has not yet been connected.

Every SKS is individually coded!

The SKS closing-force sensor supplied with your Calibrator CAL 01 has already been set-up and calibrated with it, so that it is ready for use. Additional closing-force sensors need set-up and calibration with your calibrator; please send your Test-Equipment CAL 01 to Oetiker for this to be carried out!

A maximum of nine different SKS 01 configurations can be saved in the CAL 01. When connecting a SKS 01 the sensor will automatically identified and the individual set-up is activated.

### 4.3 RS 232 interface

The RS 232 interface can be connected either to the ELK/ELS electronics, or to a PC.

To do this:

Data cable X3 CAL-ELK/ELS is used to make the connection between the CAL 01 and the ELK/ELS.

– or –

Data cable X3 CAL-PC is used to make the connection between the CAL 01 and the PC.

They are included in the scope of supply.

#### The RS 232 interface

This interface is used,

- when connected to the ELK/ELS: to transmit the closing force measured during a pincer test to the ELK/ELS – the CAL 01 must be in NOM-ELK mode;
- when connected to a PC: to transmit all closing-force data.










### 4.4 The I/O interface

















The I/O interface provides an interactive connection between the CAL 01 and the ELK/ELS, using the I/O cable X2 (supplied with the unit).

## 5 Keypad and display

### 5.1 Keypad functions and information

The Test-Equipment CAL 01 has the following functions:

Key	Function	2nd function / Notes
	For switching the Test-Equipment CAL 01 on and off.	
	Submenu: Leakage Measurement	Not available for this version
	Submenu Pincer test request / Nominal force entry	
	Selection of APN in ELK/ELS via X2 interface	
	Goes back to measurement mode	
	Submenu: SKS Mode, Language, N/lbs, NOM ELK, Sensor DEF, Sensor calibration, CMK/CM-tol, Auto power off	
– SKS Mode	Selects "dynamic" or "hold".	
– Language	Selects display language and keypad functions.	
– N/lbs	Switches units between Newton (N) and pounds (lbs).	
– NOM ELK	Force definition: largest, smallest, last value, average.	
– Sensor DEF	Special function for setting up a new SKS (only in service mode possible)	
– Sensor calibration	Special function for calibrating a new SKS (only in service mode possible)	
– Auto power off	adjusted standard tolerance is described in chapter 5.7)	
– CMK/CM-tol	For manual input of tolerances for CMK-test	See chapter 6.2.6, p. 6-23
	Submenu: voltage measurement	Not available for this version
	Submenu: pressure / force measurement (external sensor required))	Not available for this version
	Submenu: CMK-TEST	

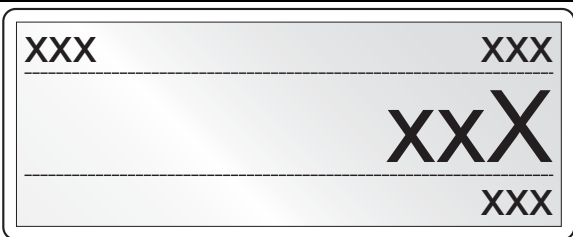
Key	Function	2nd function / Notes
	Transmission of measured value via RS 232 interface to ELK/ELS/PC	
	Shift from capital to small letters	
	Sets the Calibrator CAL 01 display to zero.	
	Deletes the last digit	In average measurement mode: starts a new series of measurement
	Jumps one screen back in the menu structure	
	Confirmation of selection by cursor keys or any data input	
	Entry of letters and numbers	
	Entry of letters and numbers	Cursor key "up" "
	Entry of letters and numbers	
	Entry of letters and numbers	Cursor key "left"
	Entry of letters and numbers	
	Entry of letters and numbers	Cursor key "right"
	Entry of letters and numbers	
	Entry of letters and numbers	Cursor key "down"
	Entry of letters and numbers	
	Entry of letters and numbers	

Tab. 6

## 5.2 LCD display (screens and infos)

The LCD display has a maximum of four lines, and has three different screen zones: the top line; the two middle lines, which can be combined to a single, large display; and the bottom line.

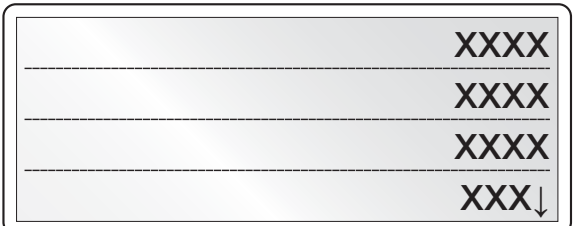
### 5.2.1 Measurement display

Display	Content	Note
	Measurement method	20 characters
	Current reading	10 characters
	Information	20 characters

Tab. 7

### 5.2.2 Menu display

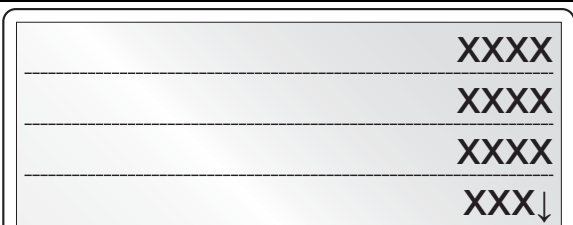
4 lines with up to 20 characters in each line.

Display	Content	Note
	Menu title	shown with color inversion
	Various menu selections	
	Various menu selections	
	Various menu selections	↓ : Info about further menus

Tab. 8

### 5.2.3 Function display

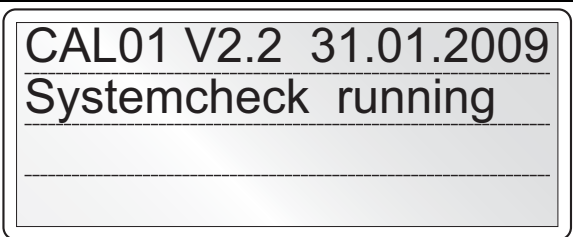
4 lines with up to 20 characters in each line.

Display	Content	
	Function	
	Info	
	Info	
	Info	↓ : Info about further menus

Tab. 9

## 6 Functions

### 6.1 ON/OFF SKS mode

Display	Content
	Current software status
	System check

Tab. 10

When the system check has been completed, the CAL 01 goes to the SKS DISPLAY level in SKS mode.

For this to happen, it is essential that a closing-force sensor, SKS 01, is connected, otherwise the message "SENSOR?!" will be displayed.

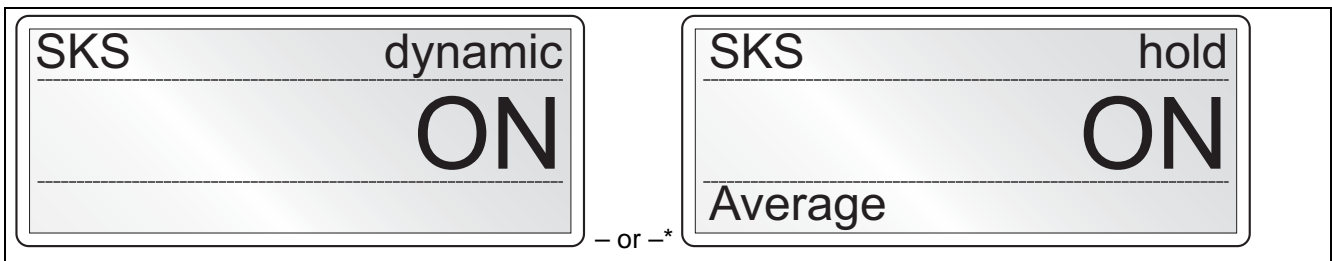


Fig. 2

\* depending on DEF setting

The last display entry "Average" can be switched to (see chapter 5.2.1, p. 5-15):

- Largest value
- Smallest value
- Last value
- Average

<p><b>! NOTICE</b></p> <p>When the load is greater than 11500 N, "Overload" appears in the display.</p> <p>▶ To clear this message, reduce the force immediately and press the OK button.</p>
---



## 6.2 DEF (Definition)

The DEF mode is used for defining the type of measurement, range, and limits:

- SKS Mode / dynamic / hold
- Language
- Units: N/lbs
- Auto power-off setting
- Nom ELK
- Sensor def
- Sensor calibration
- CMK-tol

Some definitions are password-protected; these functions are only accessible to Oetiker service personnel.

### 6.2.1 DEF: SKS Mode / dynamic / hold

When measuring the closing force with the SKS there is the possibility of a dynamic respective saved (hold) measurement. Please keep in mind that in the hold-mode only closing forces of 200 N and bigger are measured.

In the dynamic mode the closing forces are shown continuously.

In the hold-ME-EL-measurement mode values are can be shown as follows:

- last value, average, largest value, smallest value

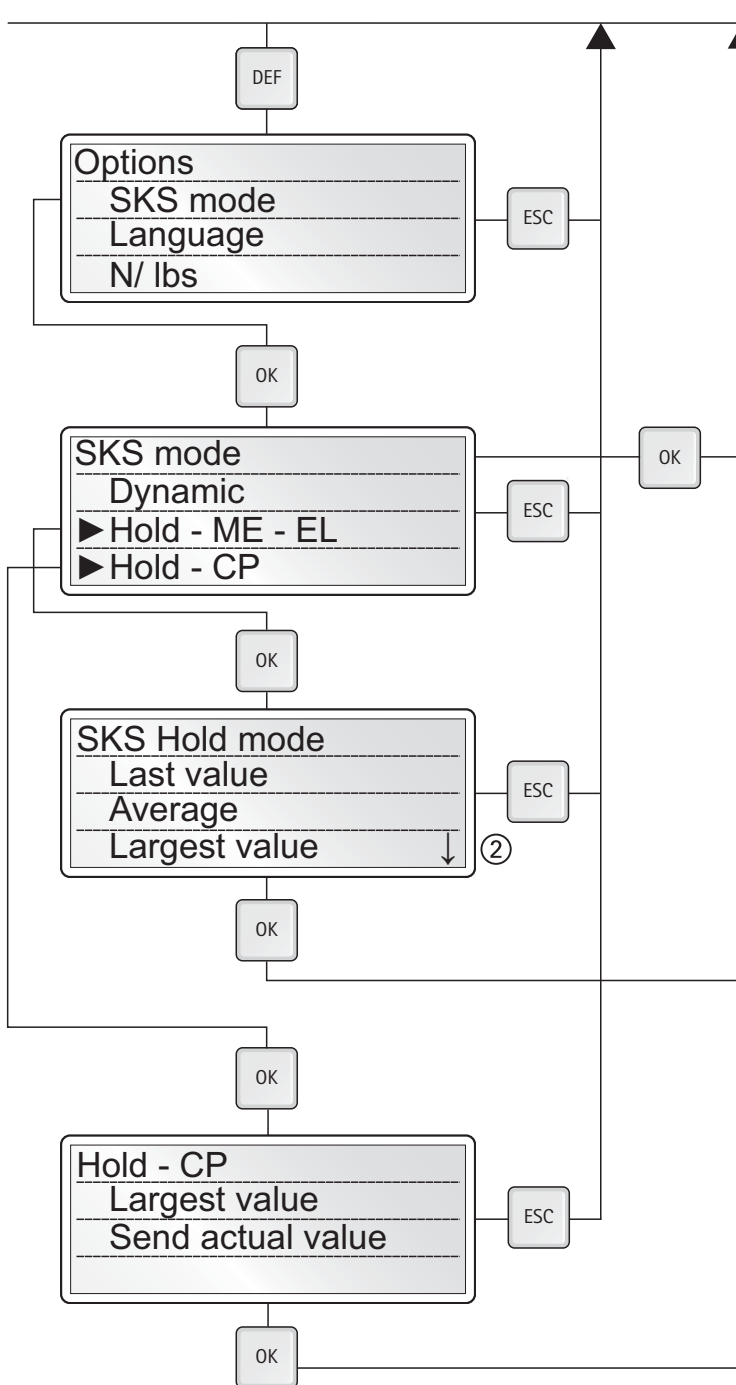
In the hold-CP-mode the largest value of the last measurement is shown.

In both hold-modes the automatic sending of the value can be activated via a X3-interface

Technical data of the X3 interface (RS232):

- 9600 baud
- 8 data bits
- 1 stop bit
- parity: even
- protocol / handshake: none
- All outputs occur in readable ASCII signs. Rows are completed with CR/LF (Chr \$0D / Chr \$0A).

Example: "FN: 2100 N" (" "= space)



- ① 1 SKS display level
- 2 Press cursor key to view next entry:  
"Smallest value"  
"Send actual value"

### 6.2.2 DEF: Language

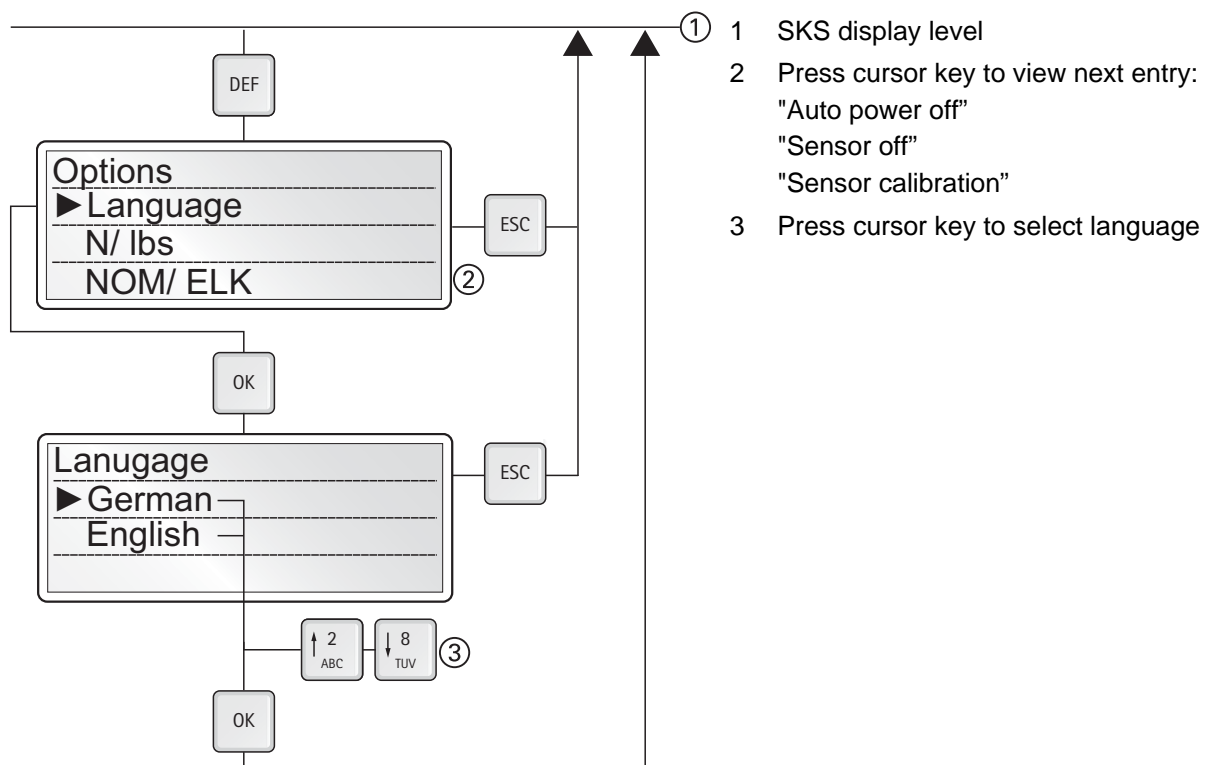
Every Test-Equipment CAL 01 is supplied with a choice of two languages.

- The language is defined by the article number (German, English, French, Italian, Spanish, Swedish or Dutch)

As delivered, the first language is the language of the country to which the unit is supplied. The second language is defined by the article number.

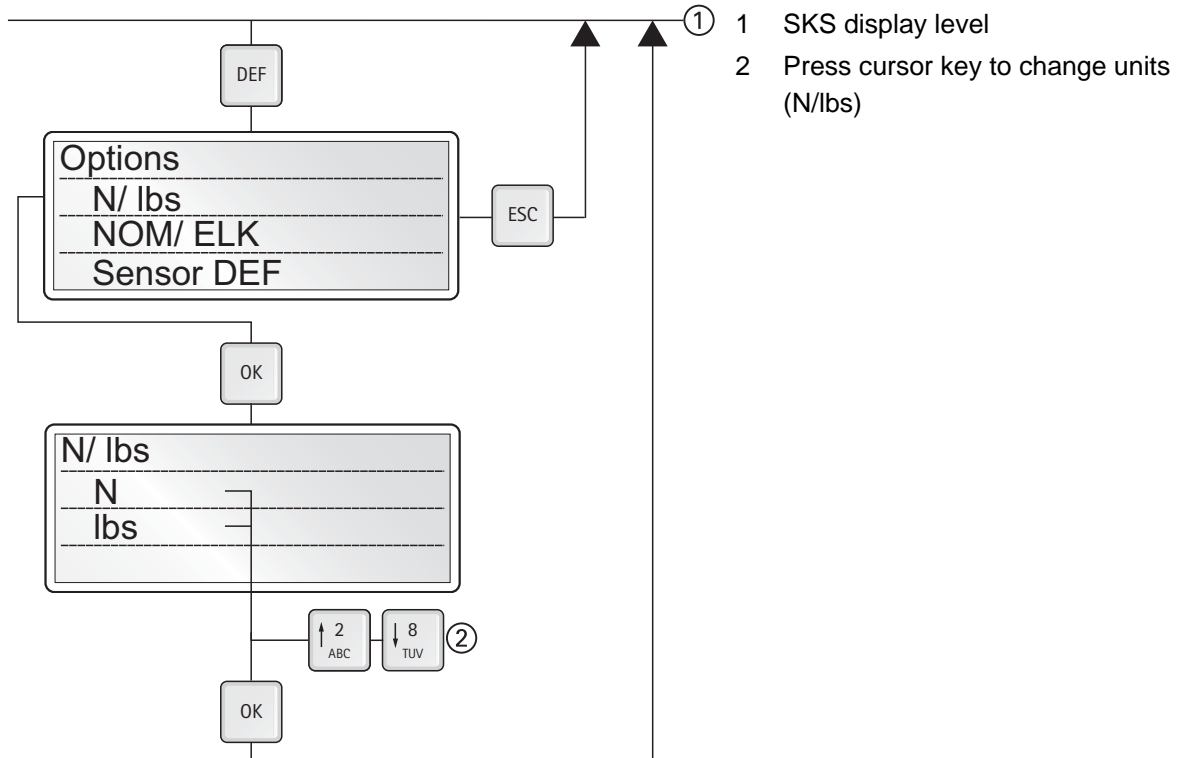
If required, the CAL 01 can be programmed by Oetiker in another language; in such a case, please contact Oetiker.

The key functions change with the language.



### 6.2.3 DEF: N/ lbs

Changes the unit of force between newtons (N) and pounds (lbs). The result of this change is that all displays, settings and limits, and the calibration are changed to the selected unit. Transmission in "lbs" to a ELK/ELS is only possible with ELK/ELS Software Version V3.0 or later versions!



### 6.2.4 DEF: NOM/ ELK

The NOM/ELK-mode is used, when carrying out a pincer test on an ELK, for automatic entry of the measured closing-force data.

#### The DEF: NOM/ELK-mode

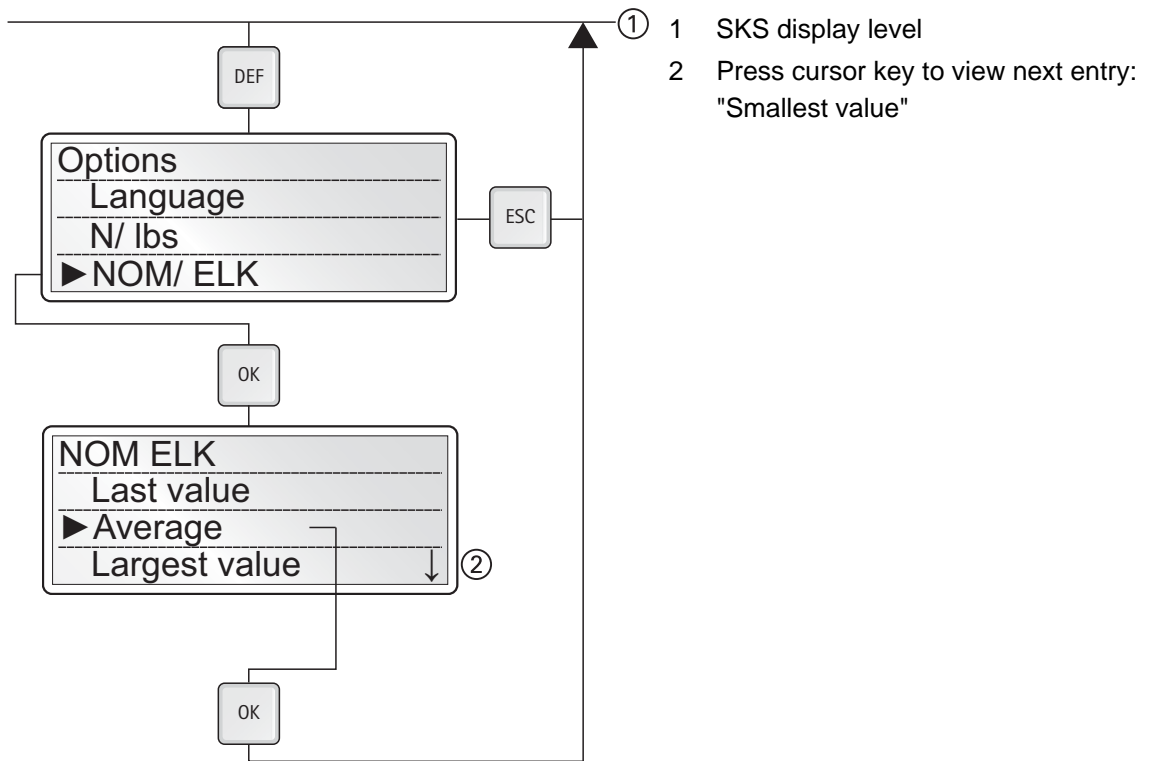
In this mode the preferred values can be selected, either

- last value, average, largest value

– or –

- smallest value.

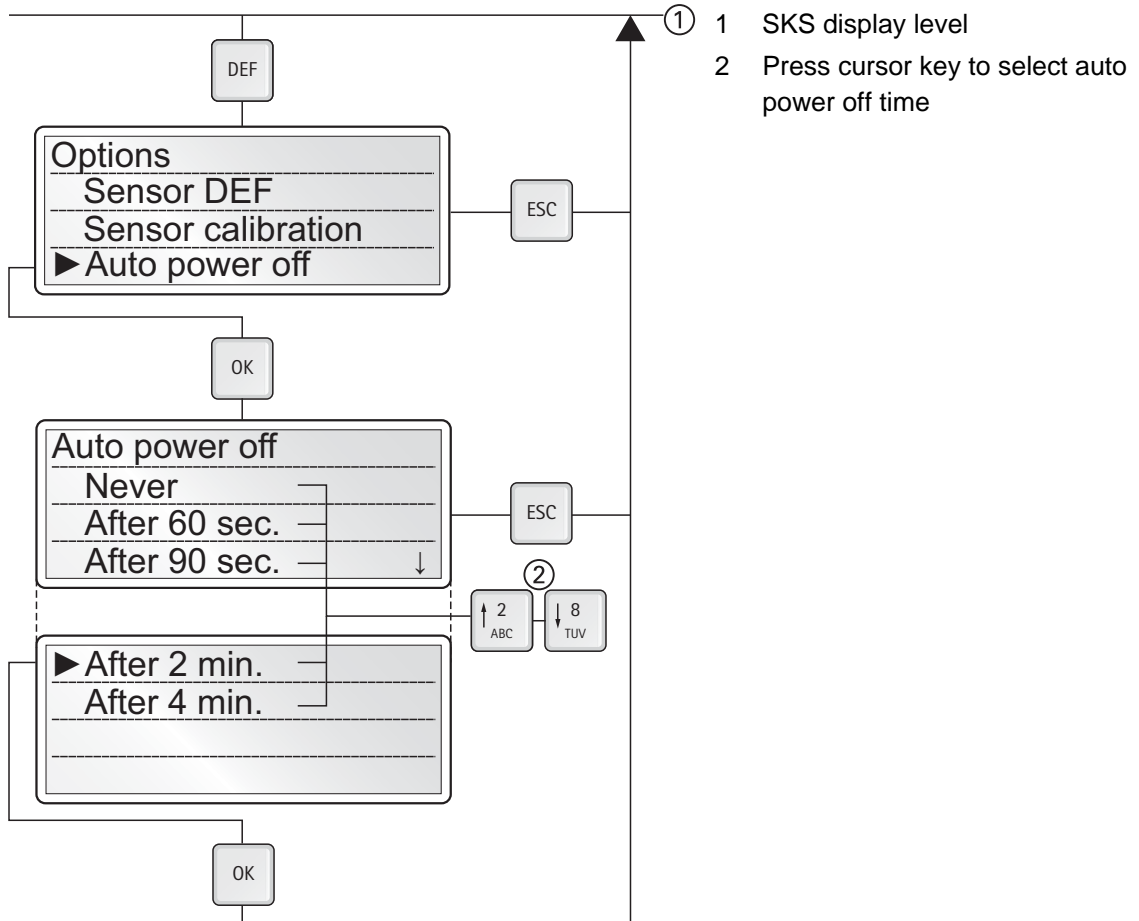
The selected value always appears as the first entry when "NOM/ ELK" is called up. In NOM/ELK-mode, it is always possible to switch to one of the other values.



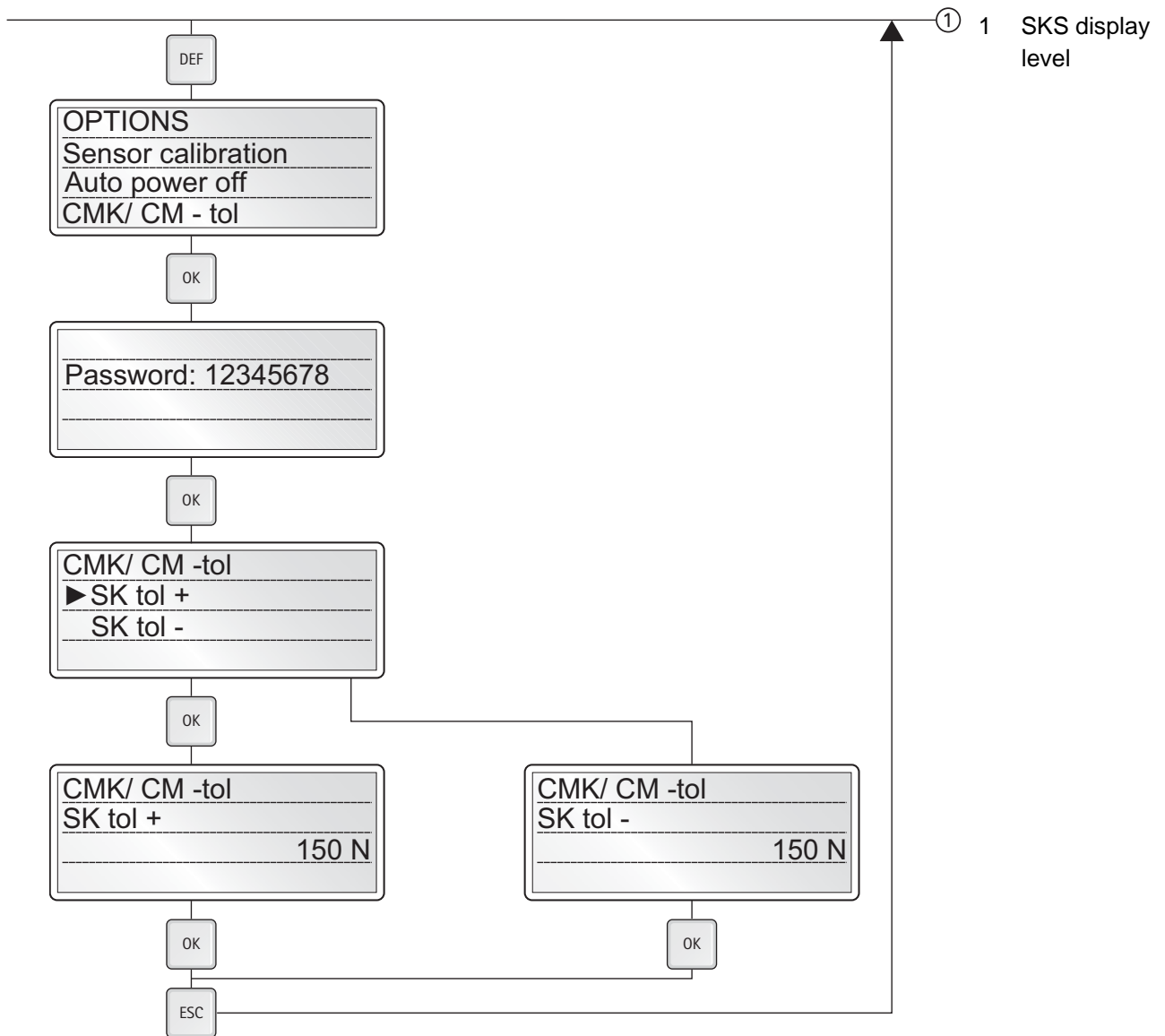
### 6.2.5 DEF: Auto power off

"Auto Power off" switches the CAL 01 off after a pre-selected period. When used independent of the power supply, the unit is always switched off after 60 seconds to save the battery.

For very accurate measurements under suitably stable ambient conditions (temperature, humidity, etc.), we recommend warming up the CAL 01 for ca. 5 min. after switching on. To permit this, "Auto Power off" must be set to "Never", which is only possible when connected to the power supply.



### 6.2.6 DEF: CMK/ CM - tol



Password: "12345678"

### 6.2.7 DEF: Sensor calibration

not available

### 6.2.8 DEF: Sensor DEF

not available

### 6.3 NOM ELK: Request Pincer Test

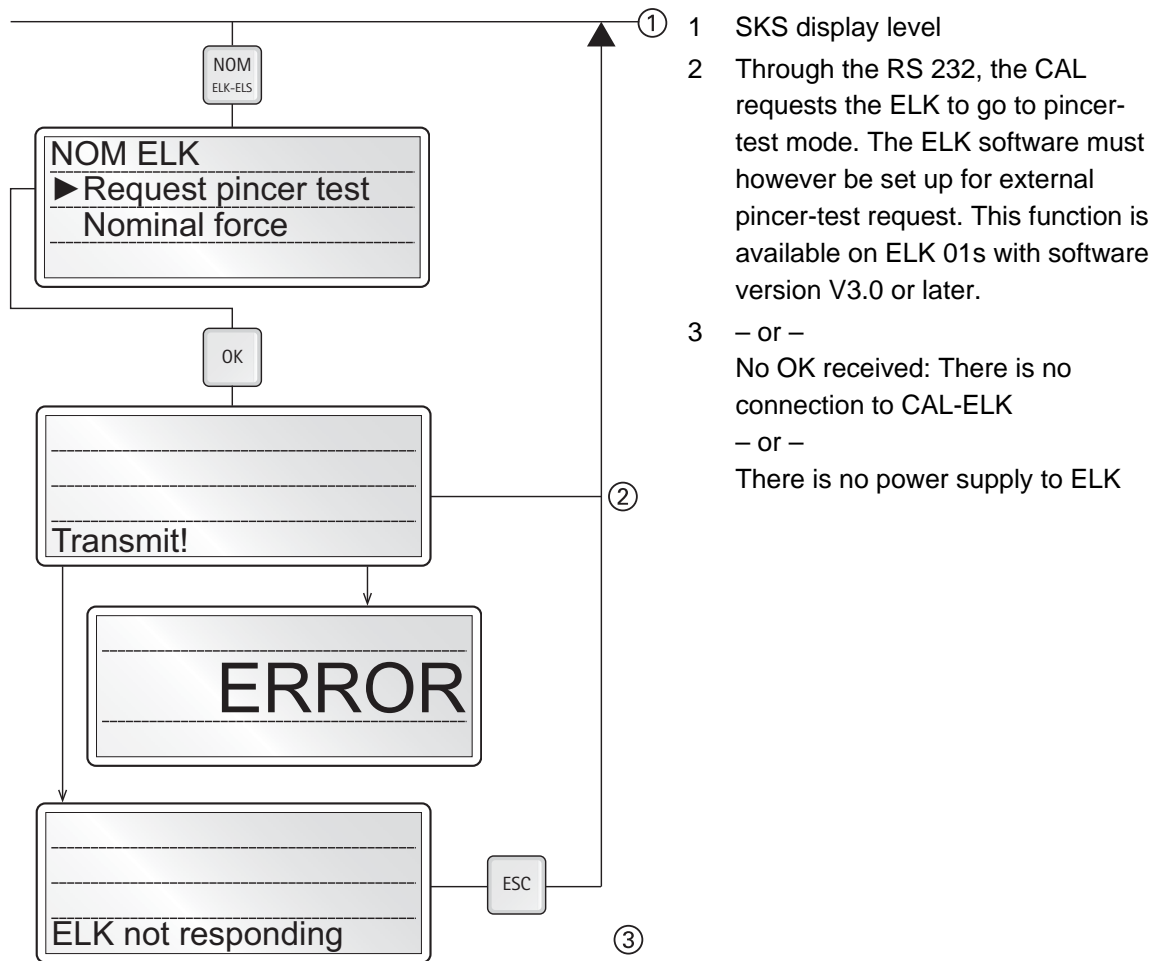
**Hardware requirements**

- Power supply: battery or mains operation
- Connections: data cable X3 CAL ELK/ELS Art. No. 13600116

**Function: Request pincer-test**

With this function, the CAL 01 requests the ELK/ELS to go to pincer-test mode.

This function is only possible with ELK/ELS Software Version V3.0 or later versions.





## 6.4 NOM ELK (Nominal force) / TRANSMIT

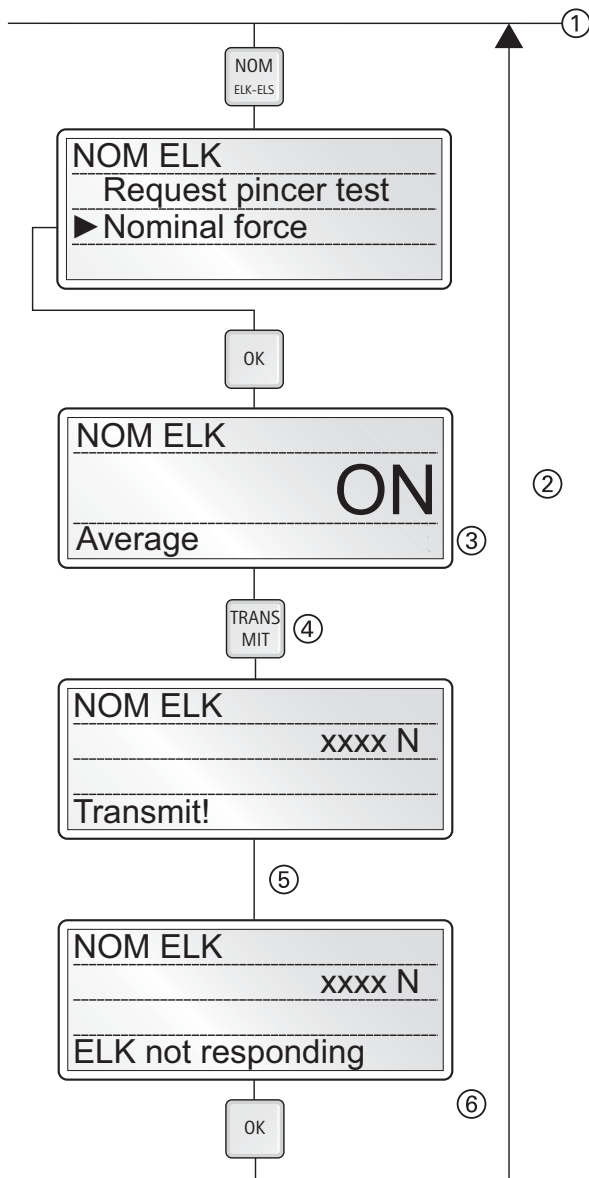
### Hardware requirements

- Power supply: battery or mains
- Connection: data cable X3 CAL-ELK/ELS Art. No. 13600116

### Function

During a pincer test on the ELK/ELS, this function is used for automatic entry of the measured closing force data.

If the ELK/ELS is in pincer test "Force", then in the NOM-ELK "Nominal force" menu of the CAL 01, a closing force can be determined by making one or more closures, and sent to the ELK/ELS by pressing the TRANSMIT key.



- 1 SKS display level
- 2 Can be switched to:  
"Largest value" / "Average" /  
"Smallest value" / "Last value"
- 3 The display is updated when a  
closing force = >100 N is recorded  
Make 5 to 10 trial closures at  
>100 N to bed the unit in!
- 4 After the nominal force has been  
determined, this data can be sent to  
the ELK/ELS using the TRANSMIT  
function
- 5 No transmission?
- 6 – or –  
No OK received: the CAL-ELK  
connection is missing

## 6.5 SKS (Closing-force-sensor mode)

### Hardware requirements

- Power supply: battery or mains
- Connections: closing-force sensor SKS on Calibrator CAL 01, connected to SKS socket.

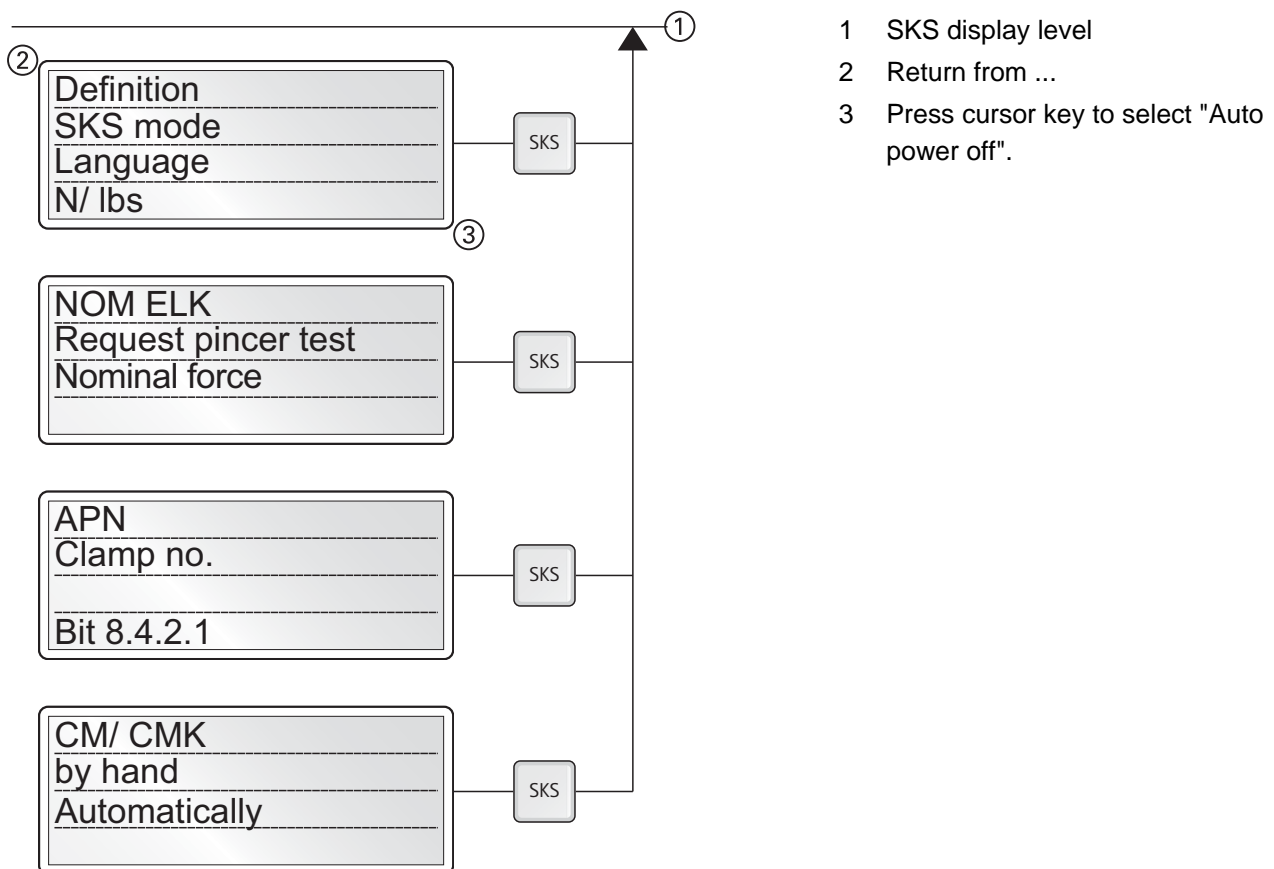
### Function

Direct selection in the SKS mode upon switching on.

Return from the functions

- Definition
- NOM-ELK
- APN
- CM/ CMK

In the SKS mode from a previously selected mode (but only from the first level).



### ! NOTICE

The measuring range of an SKS 01 closing-force sensor is given on its type plate.

If the 12% (= 11.200 N) overload limit is exceeded, the sensor **must** be re-calibrated by Oetiker!

## 6.6 APN (Active Program Number)

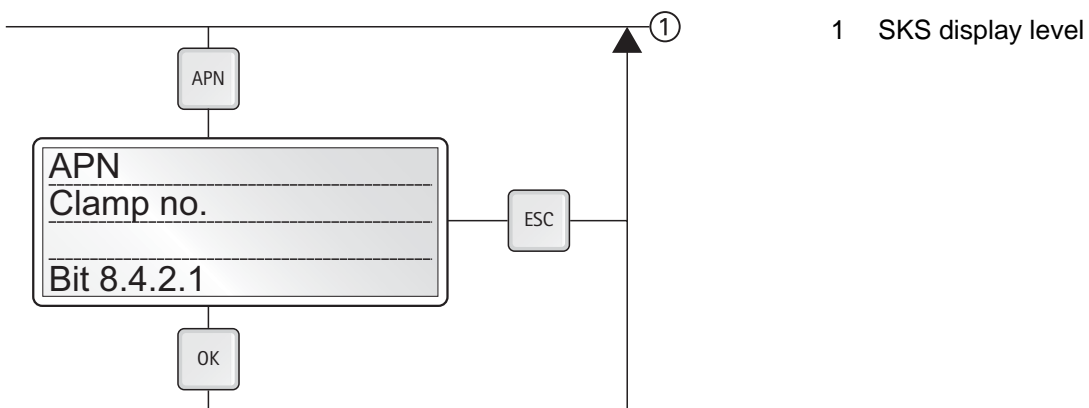
### Hardware requirements

- Power supply: **only** from power supply unit (**not possible when battery-operated**).
  - Will not operate from battery
- Connection: I/O cable X2, A. No. 13600083 (in scope of supply) must be plugged into CAL E-A and ELK/ELS X2.

### Function

In the APN mode, you can set a bit combination for accessing the ELK/ELS and selecting an active program number (APN) between 1 and 9.

From ELK/ELS 01/ V3.0 onwards, the relevant settings and special functions can be controlled using bits 10...15.



## 6.7 CMK / CM

### Hardware requirements

- Power supply
  - Manual activation: battery or power supply:
  - Automatic activation: **only from mains unit** (not possible from battery). Will not operate from battery

### Connections

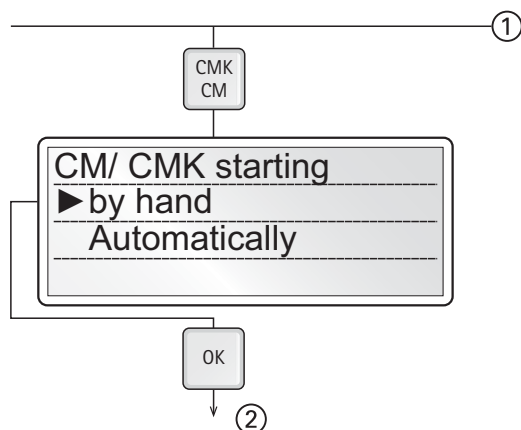
- Manual activation: none between CAL 01 and ELK/ELS
- Automatic activation: I/O cable X2, A. No. 13600083 (in scope of supply)
- Data output : data cable X3 CAL-PC, A. No. 13600117

### Function:

For determining machine capability with MK and HO pincers.

The upper and lower limits are:

- < 5000 N +/- 150 N
- > 5000 N +/- 200 N



- 1 SKS display level
- 2 Continued in flowchart on next page

### Manual

Operation of the SKS is triggered by pressing the button on the pincer, or externally by a signal to X2 on the ELK/ELS.

### Automatic

Interactive, the CAL 01 triggers pincer operation of the ELK/ELS. The ELK/ELS signals OK or NO for the operation back to the CAL, thus establishing a dialog.

### WARNING

#### Danger of crushing!

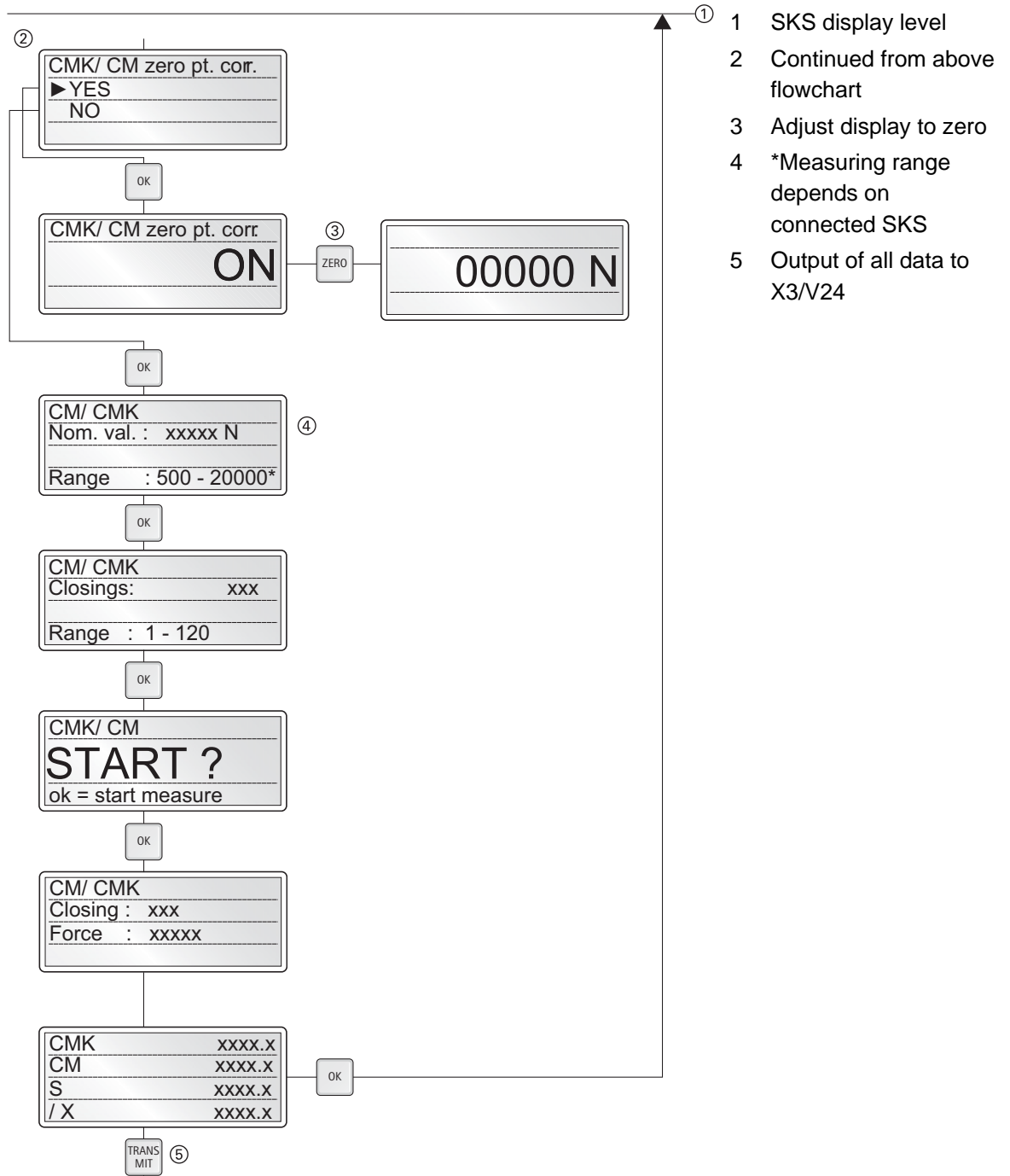
- ▶ Make sure that the SKS is fitted to the pincer jaws so that there is no danger of injury.

**⚠ WARNING**

**Risk of electric shock!**

Mechanical and electrical protective measures must be in place when the unit is externally controlled!

The guards SVG 01 and SVG 02 are optional extras, see Section 1.5, p. 1-7 Accessories



## 7 Measuring closing force using the closing-force sensor SKS

### CAUTION

#### Risk of property damage!

The closing-force sensor is a measuring instrument and should be treated with appropriate care.

- ▶ Do **not** use the cable to pick up the sensor!

- ▶ Insert the closing-force jaws SKB of the SKS flush into the pincer opening so that:
  - they are inserted to the bedstop,
  - are central in the pincer jaws, and
  - are axial to the axis of the pincer.
- ▶ Take care that the socket cap screws are always firmly tightened.

If a screw is loose, it may result in breakage of the jaw and/or screw.

- ▶ Use screw-retaining fluid on the screws.

The pincer closes to a jaw gap of 6.5 mm +0.5/-1.0 mm.

Closing the pincer:

- for electronic pincers, by pressing the "Start" button, or externally through connection X2
- for mechanical pincers, by operating the activating lever.

### ! NOTICE

Variations in the speed of closing can give rise to differences in the kinematic forces, which can cause differences in the closing force.

The reason for this is that the SKS does not have the same resilience as a clamp.

We recommend slow, process orientated closure.

The closing-force sensor can be used in the ways described below.

#### Manual:

The SKS is held in the pincer jaws by hand.

- ▶ Make sure that you are not exposed to danger.

#### Using an instrument holder:

On the rear face (where the cable is connected), the SKS has an M6 internal thread, into which a support can be screwed to permit mounting in a commercially-available instrument holder.

**Using an SVG guard:**

Optimum protection is provided by the guards:

- SVG 01 suitable for HO 2000, 3000, 4000
- SVG 02 suitable for HO 5000, 7000

The SKS fits in a Plexiglas tube, which is secured to the pincer.

## 7.1 Analog output of closing force

Dynamic output for connection to analog instruments such as oscilloscopes, pen recorders and data-recording systems.

Technical data, see chapter "X 6 Analog output of closing force", p. 8-33.

## 7.2 Closing-force jaws SKB XX

### 7.2.1 Types

There are three types of closing-force jaws, which differ in their maximum measuring, limiting and breaking loads, and in their width.

Number	Type	Parameter	Value
SKB 10	closing force jaw	nominal load	7500 N
		limiting load	10000 N
		jaw width	10 mm
SKB 07	closing force jaw	nominal load	4500 N
		limiting load	6000 N
		jaw width	7 mm
SKB 05	closing force jaw	nominal load	2500 N
		limiting load	3000 N
		jaw width	5 mm

Tab. 11:

### 7.2.2 Jaw replacement

- ▶ Use the hexagon key supplied to undo the socket cap screws M4x8.
- ▶ Fit the new closing-force jaws.
- ▶ Apply screw-retaining fluid, Loctite 243, to the screws.
- ▶ Press the closing-force jaws on to the support surfaces on the closing-force sensor.
- ▶ Tighten the screws firmly (approx. 4.5 Nm).

## 8 Technical Data

### 8.1 Test-Equipment Calibrator CAL 01

Pocket calibrator with sensor SKS 01 (strain-gauge sensor UB 5.0 V, bridge 350 Ohm)

Accuracy with SKS 01  $\pm 1\%$  of end value  
 Display resolution  $\pm 2$  N  
 Instrument class 2 (with SKS 01)

#### 8.1.1 Operating voltage

9 V lithium block battery 9 V, 1.2 Ah,  
 Type BAT 01

– or – (optionally )

9 V rechargeable block battery 9 V, 160 mAh  
 Type NMH 01 nickel-metal-hybrid battery

–or –

Connected to the main power supply via STN 0X. Voltage range from 85 V~ to 265 V~

Supply voltage to CAL 01 24 V DC,  $\pm 1$  V; 630 mA  
 with low-voltage socket 10 mm / 3.1 mm

#### 8.1.2 Interfaces

The Test-Equipment CAL 01 has 4 interfaces for connecting:

Type	Number	Number
Closing-force sensor	SKS 01	SKS X5
Control electronics	ELK/ELS (I/O signals)	I/O X2
Control electronics	ELK/ELS (data)	RS 232 X3
For connecting a PC	-	RS 232 X3
Analog output of closing force	-	X6

Tab. 12:

#### SKS/X5 for closing-force sensor SKS 01

Bridge supply 5 V, max. <20 mA  
 Coded inputs 3 inputs 0 ... 5 V (sensor code)  
 Connection 9-pin SUB-MIN D socket.



**X 6 Analog output of closing force**

Output: function of closing force, dynamic

Level	0...5 V
X6.1	signal
X6.10	GND
Connection	15-pin SUB-MIN HD socket

**I/O X2 for ELK/ELS control unit**

For controlling "Start", level	24 V=
For controlling clamp data (APN 1...9) and special functions level	24 V=
For recording OK or NO signals, level	24 V=
Connection	15-pin SUB-MIN HD socket.

**RS 232/X3 for ELK/ELS control unit or PC**

For data transmission between CAL 01 and ELK/ELS using

- Data cable X3 CAL-ELK/ELS Art. No. 136000116

For data transmission between CAL 01 and PC using

- Data cable X3 CAL-PC Art. No. 136000117

Connection	9-pin SUB-MIN D plug
------------	----------------------

**Data protocol CAL 01 to PC**

Baud rate	9600 bd
Data bits	8
Parity	even
Stop bits	1
Protocol	none (text as readable ASCII characters)

### 8.1.3 Dimensions, weight, materials

L x B x H	180 x 105 x 55 mm
Weight	360 g with battery
Casing	PVC, grey
Membrane keypad	PVC, pantone / blue

### 8.1.4 Display

Max. 4-line alpha-numeric display.

Display not illuminated.

4-line display	max. 20 characters	
3-line display	2 lines	max. 20 characters, 4 mm high
	1 line	max. 10 characters, 10 mm high

### 8.1.5 Keypad

25 positive-action keys

## 8.2 Closing-force sensor SKS 01

Principle	U-beam
Measuring system	strain gauge, bridge 350 Ohm, temperature-compensated
Measuring force	100 N ... 10000 N (overload 11200 N)
Jaw spacing	6.5 mm + 0.5 mm
Measuring stroke	0.5 mm
Accuracy	+/-0.5% of end value
Dimensions	60 x 40 x 18 mm
Weight	300 g
Cable length	1500 mm, must <b>not</b> be extended or shortened!
Connection	SUB MIN D 9-pin plug
Thread	M6 for instrument holder

### Installation drawing

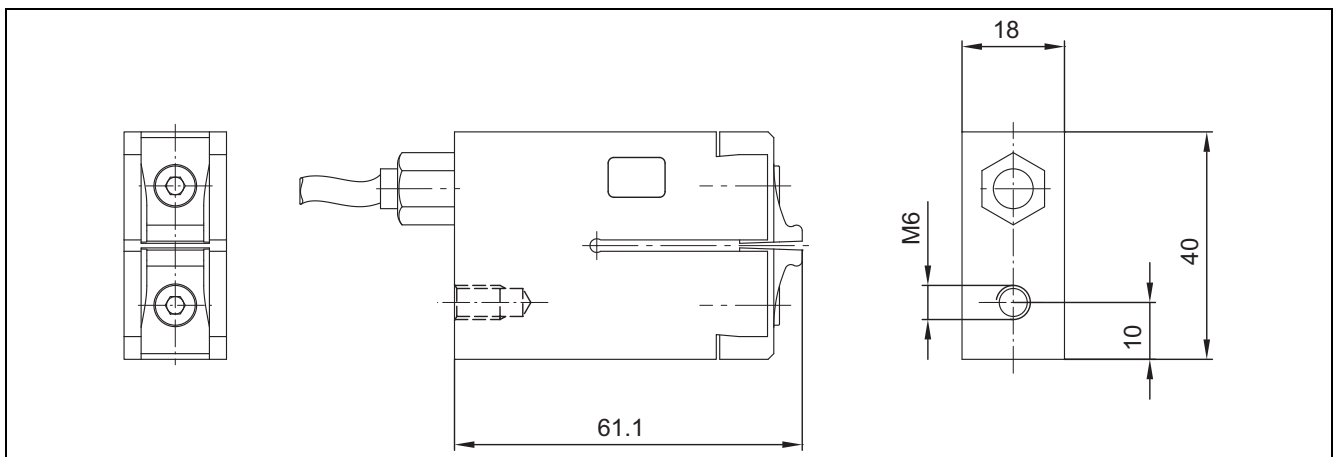


Fig. 3

## 8.3 Power supply unit STN 0X

Input	100 V ... 240 V, 47 Hz ... 63 Hz
Plug	Euro plug, etc.
Output	24 V DC, 625 mA
Dimensions	90 x 52 x 34 mm
Weight	100 g
Cable length	1000 mm, must <b>not</b> be extended or shortened!

## 9 Troubleshooting

Problem	Cause / Remedy
Unit cannot be switched on using ON/OFF	No battery, battery discharged, no power supply, mains unit or calibrator defective. <ul style="list-style-type: none"> <li>▶ Return for servicing.</li> <li>▶ Always remove an empty battery, even when using the mains unit.</li> </ul>
Display: Batt low Power	▶ Replace battery or connect to mains unit.
Display: Sensor?	▶ Connect or replace sensor.
Display not on zero with no closing force	▶ Press "Zero" button.
Display: "Wrong language"	▶ Switch to correct language, or use CAL 01 with different Article No.
Unit switches off after 60 sec.	AUTO POWER OFF is set to 60 sec. (standard for battery operation).
Display: LM cable	▶ Connect LM cable.
Display: "ELK not responding"	▶ Connect I/O-cable X2 between CAL 01 and ELK/ELS.
Display: "Trans. not possible"	▶ Connect data cable X3 CAL-ELK/ELS between CAL 01 and ELK/ELS.
Display: "Data transfer to PC not possible"	▶ Connect data cable X3 CAL-PC between CAL 01 and PC.

Tab. 13:

## 10 Checking and maintenance

The Test-Equipment CAL 01 is calibrated in our works with closing-force sensor SKS 01 and complies with the technical data when delivered. To ensure that the high quality of this measuring instrument is maintained, Oetiker recommends that the unit is checked in our works once a year.

Please send the CAL 01 to your local Oetiker works - see address list on the rear cover.

## 11 Declaration of Conformity

EC Declaration of Conformity

- in accordance with the Machinery Directive (2006/42/EC)
- in accordance with the EMC Directive (2004/108/EC)

The manufacturer hereby declares that the following product complies with the above directives.

### **Manufacturer**

Hans Oetiker AG

Maschinen- und Apparatefabrik

Oberdorfstrasse 21

CH-8810 Horgen (Zürich)

### **Product designation**

Test-Equipment CAL 01 including closing-force sensor SKS 01

### **Series /Type**

Art. No. as given in chapter 1.1, p. 1-4