KERN
WAAGEN · GEWICHTE · BALANCES · WEIGHTS

KERN & Sohn GmbH

Operation manual
Analytical balances

KERN AES/AEJ

Version 1.2
09/2009
GB

English

Table of Contents

English

The margin text "English" is a vertical label.

English

1 Technical Data

KERN	AEJ 120-4M	AEJ 220-4M
Weighing range (max)	120 g	220 g
Readability (d)	0.1 mg	
Minimum load (Min)	10 mg	
Verification value (e)	1 mg	
Verification class	I	
Adjustment weight	intern	
Weighing Units	mg, g, ct	
Reproducibility	0.1 mg	
Linearity	± 0.3mg	
Stabilization time (typical)	3 sec	
Warm-up time	8 hours	
Minimum unit weight at piece counting	> 0,5 mg	
Reference quantities at piece counting	5, 10, 30, 100	
Electric Supply	Line adapter 220V-240V, 50 Hz Weighing balance 9 V DC, 600mA	
Operating temperature	+ 10° C …. + 30° C	
Humidity of air	max. 80 % (not condensing)	
Underfloor weighing	Clevis type eyelet, standard	
Case (plastic), W x D x H [mm]	213 x 290 x 314	
Dimensions wind screen (plastic), W x D x H [mm]	178 x 170 x 209 (weighing space) 197 x 185 x 230 (exterior)	
Weighing plate (stainless steel)	78 mm (outside) 65 mm (inside)	
Weight kg (net)	7 kg	
Interface	RS 232C	

KERN	AES 120-4	AES 220-4
Weighing range (max)	120 g	220 g
Readability (d)	0.1 mg	
Recommended adjustment weight, not added (class)	100 g (E1)	200 g (E1)
Weighing Units	ct, dwt, g, gn, lb, mg, mo, oz, ozt, tl (Cn), tl (HK), tl (Singap. Malays), tl (Tw), tol	
Reproducibility	0.1 mg	
Linearity	± 0.3mg	
Stabilization time (typical)	3 sec.	
Warm-up time	8 hours	
Minimum unit weight at piece counting	> 0,5 mg	
Reference quantities at piece counting	5, 10, 30, 100	
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1.1 Dimensions
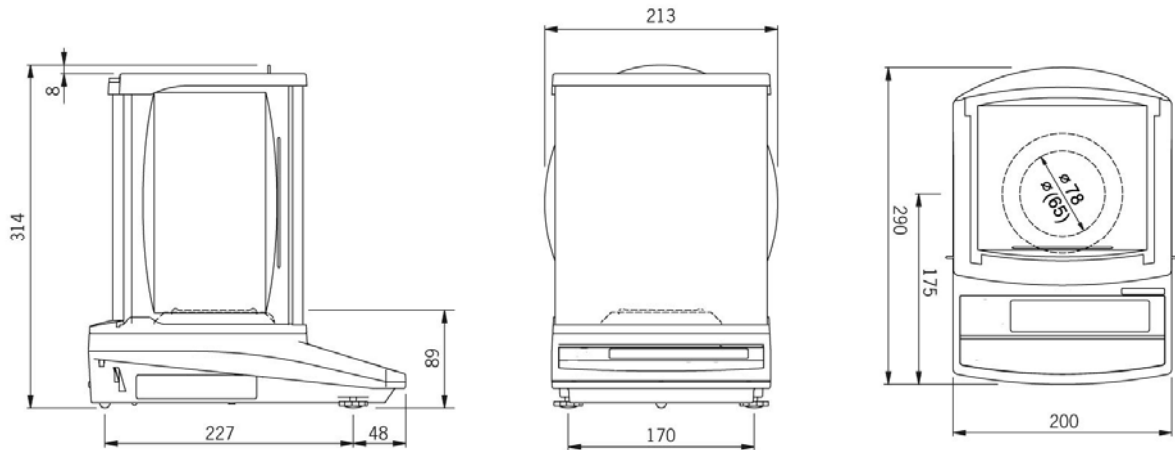
1.2 Conversion tables for weighing units

Weighing unit	Gram	Carat	Ounce	Pound	Troy ounce	Penny weight
1g	1	5	0.03527	0.00220	0.03215	0.64301
1ct	0.2	1	0.00705	0.00044	0.00643	0.12860
1oz	28.34952	141.74762	1	0.06250	0.91146	18.22917
1lb	453.59237	2267.96185	16	1	14.58333	291.66667
1ozt	31.10348	155.51738	1.09714	0.06857	1	20
1dwt	1.55517	7.77587	0.05486	0.00343	0.05	1
1GN	0.06480	0.32399	0.00229	0.00014	0.00208	0.04167
1tl (HK)	37.429	187.145	1.32027	0.08252	1.20337	24.06741
1tl (SGP,Mal)	37.79936	188.99682	1.33333	0.08333	1.21528	24.30556
1tl (Taiwan)	37.5	187.5	1.32277	0.08267	1.20565	24.11306
1mom	3.75	18.75	0.13228	0.00827	0.12057	2.41131
1to	11.66380	58.31902	0.41143	0.02571	0.37500	7.5

Weighing unit	Grain	Tael (Hong Kong)	Tael (Singapore, Malaysia)	Tael (Taiwan)	Momme	Tola
1g	15.43236	0.02672	0.02646	0.02667	0.26667	0.08574
1ct	3.08647	0.00534	0.00529	0.00533	0.05333	0.01715
1oz	437.5	0.75742	0.75	0.75599	7.55987	2.43056
1lb	7000	12.11874	12	12.09580	120.95797	38.88889
1ozt	480	0.83100	0.82286	0.82943	8.29426	2.66667
1dwt	24	0.04155	0.04114	0.04147	0.41471	0.13333
1GN	1	0.00173	0.00171	0.00173	0.01728	0.00556
1tl (HK)	577.61774	1	0.99020	0.99811	9.98107	3.20899
1tl (SGP,Mal)	583.33333	1.00990	1	1.00798	10.07983	3.24074
1tl (Taiwan)	578.71344	1.00190	0.99208	1	10	3.21507
1mom	57.87134	0.10019	0.09921	0.1	1	0.32151
1to	180	0.31162	0.30857	0.31103	3.11035	1

2 Declaration of conformity

KERN & Sohn GmbH

D-72322 Balingen-Frommern   Tel: 0049-[0]7433- 9933-0
Postfach 4052   Fax: 0049-[0]7433-9933-149
E-Mail: info@kern-sohn.de   Internet: www.kern-sohn.de

Declaration of conformity

EC-Konformitätserklärung	EC-Declaration of -Conformity
EC- Déclaration de conformité	EC-Declaración de Conformidad
EC-Dichiarazione di conformità	EC-Conformiteitverklaring
EC- Declaração de conformidade	EC- Prohlášení o shode
EC-Deklaracja zgodności	EC-Заявление о соответствии

D	Konformitäts-erklärung	Wir erklären hiermit, dass das Produkt, auf das sich diese Erklärung bezieht, mit den nachstehenden Normen übereinstimmt.
GB	Declaration of conformity	We hereby declare that the product to which this declaration refers conforms with the following standards.
CZ	Prohlášení o shode	Tímto prohlašujeme, že výrobek, kterého se toto prohlášení týká, je v souladu s níže uvedenými normami.
E	Declaración de conformidad	Manifestamos en la presente que el producto al que se refiere esta declaración está de acuerdo con las normas siguientes
F	Déclaration de conformité	Nous déclarons avec cela responsabilité que le produit, auquel se rapporte la présente déclaration, est conforme aux normes citées ci-après.
I	Dichiarazione di conformitá	Dichiariamo con ciò che il prodotto al quale la presente dichiarazione si riferi-sce è conforme alle norme di seguito citate.
NL	Conformiteit-verklaring	Wij verklaren hiermede dat het product, waarop deze verklaring betrekking heeft, met de hierna vermelde normen overeenstemt.
P	Declaração de conformidade	Declaramos por meio da presente que o produto no qual se refere esta declaração, corresponde às normas seguintes.
PL	Deklaracja zgodności	Niniejszym oświadczamy, że produkt, którego niniejsze oświadczenie dotyczy, jest zgodny z poniższymi normami.
RUS	Заявление о соответствии	Мы заявляем, что продукт, к которому относится данная декларация, соответствует перечисленным ниже нормам.

Electronic Balance: KERN AES, AEJ

Mark applied	EU Directive	Standards
CE	2004/108/EC	EN 55022 (2006)
	2006/95/EC	EN 60950 (2001)

Date: 07.10.2008   Signature:

**Gottl. KERN & Sohn GmbH
Management**

3 Appliance overview

Wind screen

Protection ring

Weighing plate

Air bubble

Display

English

RS 232 interface

Printer interface

Connection mains adapter

Foot screw

Underfloor
weighing device

Foot
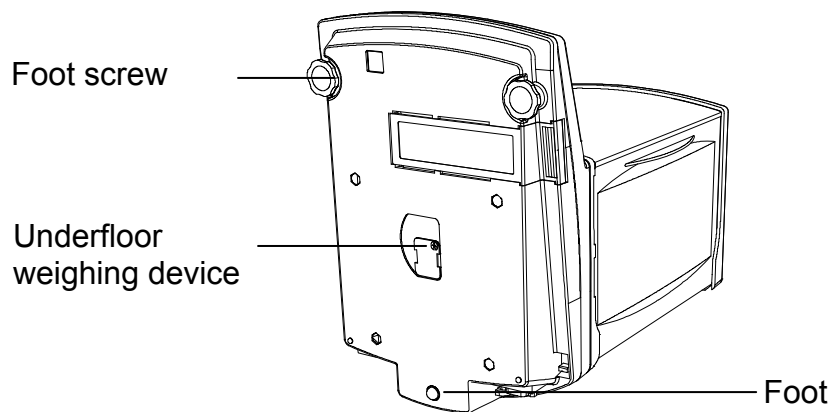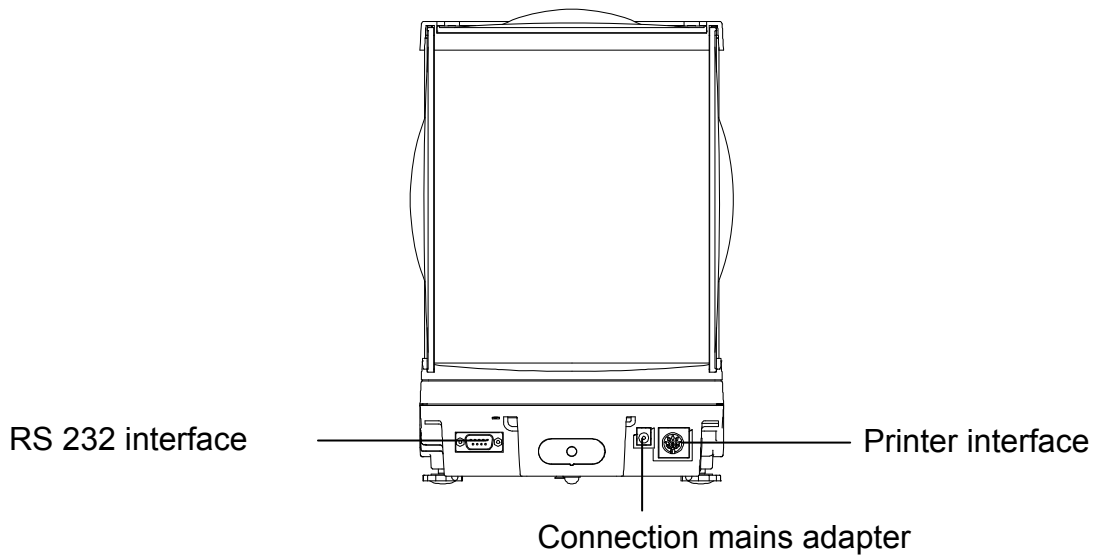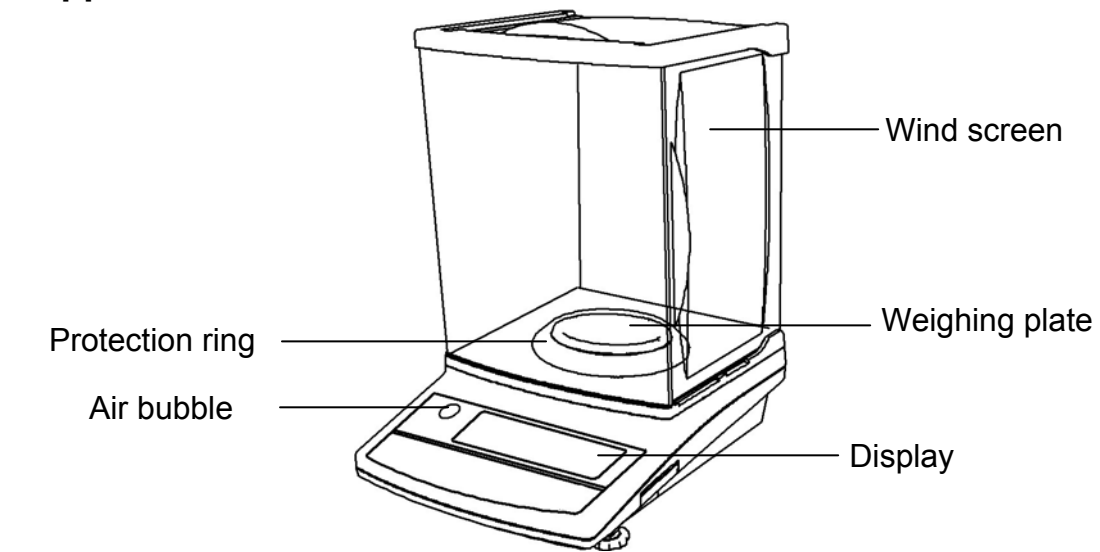
3.1 Keyboard overview

Key	Designation	Function
		short key pressing
TARE →0←	**TARE** key	• Taring • Zeroing • During numeric input increase of digit • Change menu settings
ON OFF	**ON/OFF** switch	• Turn on/off
CAL	**CAL**-key	• Adjustment
PRINT	**PRINT**-key	• Calculate weighing data via interface • Cancel process/input
S	**S**-key	• Save settings/back to weighing mode • For instructions how to change the speed of the display, see chpt. 8.5
F	**F**-key	• Change to additional operating modes/weighing unit/net-gross • During numeric input selection of next digit • How to invoke a menu, see chpt.10.1.1 • How to select a menu, see chpt.10.1.1

3.2   Overview of display

Display	Description
◀	Tolerance marker
	Power display (power supply for balance via line adapter) Balance in adding mode
○	Stability display
	Prompt for reference optimisation
	Minus
M	Display storage value, flashes during storage process
→0←	Zeroing display
▟▓▓▓▓▌	Bar graph/capacity display
CAL	Adjustment symbol
🕐	This is displayed during setting of date/time. Flashes during interval output
⤷	Calculate weighing data via interface
B/G	Gross weight
Net	Tare symbol
	Symbol during weighing with freely programmable weighing unit
Σ	Symbol during display of "total"
Pcs	Symbol during piece counting
(mom)	Weighing unit Momme
	Symbol during percentage calculation
ꝏꝏꝏ	Display weighing unit
mg	Milligram
▲, ▶	Display depending on function
⎕	Display last decimal place (AEJ only)

4   Basic Information (General)

4.1   Proper use

The balance you purchased is intended to determine the weighing value of material to be weighed. It is intended to be used as a "non-automatic" balance, i.e. the material to be weighed is manually and carefully placed in the centre of the weighing plate. As soon as a stable weighing value is reached the weighing value can be read.

4.2   Improper Use

Do not use balance for dynamic weighings. In the event that small quantities are removed or added to the material to be weighed, incorrect weighing results can be displayed due to the "stability compensation" in the balance. (Example: Slowly draining fluids from a container on the balance.)
Do not leave permanent load on the weighing plate. This may damage the measuring system.
--
Impacts and overloading exceeding the stated maximum load (max) of the balance, minus a possibly existing tare load, must be strictly avoided. Balance may be damage by this.
Never operate balance in explosive environment. The serial version is not explosion protected.
The structure of the balance may not be modified. This may lead to incorrect weighing results, safety-related faults and destruction of the balance.
The balance may only be used according to the described conditions. Other areas of use must be released by KERN in writing.

4.3   Warranty

Warranty claims shall be voided in case

- Our conditions in the operation manual are ignored
- The appliance is used outside the described uses
- The appliance is modified or opened
- Mechanical damage or damage by media, liquids, natural wear and tear
- The appliance is improperly set up or incorrectly electrically connected
- The measuring system is overloaded

4.4   Monitoring of Test Resources

In the framework of quality assurance the measuring-related properties of the balance and, if applicable, the testing weight, must be checked regularly. The responsible user must define a suitable interval as well as type and scope of this test. Information is available on KERN's home page (www.kern-sohn.com with regard to the monitoring of balance test substances and the test weights required for this. In KERN's accredited DKD calibration laboratory test weights and balances may be calibrated (return to the national standard) fast and at moderate cost.

5 Basic Safety Precautions

5.1 Pay attention to the instructions in the Operation Manual

Carefully read this operation manual before setup and commissioning, even if you are already familiar with KERN balances.

5.2 Personnel training

The appliance may only be operated and maintained by trained personnel.

6 Transportation & Storage

6.1 Testing upon acceptance

When receiving the appliance, please check packaging immediately, and the appliance itself when unpacking for possible visible damage.

6.2 Packaging

Keep all parts of the original packaging in case you need to return the appliance.
Only use original packaging for returning.
Before sending, disconnect all connected cables and loose/movable parts.
Attach possibly existing transport safeguards. Secure all parts, e.g. weighing plate, power unit etc., to prevent slipping and damage.

7 Unpacking, Setup and Commissioning

7.1 Installation Site, Location of Use

The balances are designed in a way that reliable weighing results are achieved in common conditions of use.
You will work accurately and fast, if you select the right location for your balance.
Therefore, observe the following for the installation site:

- Place the balance on a firm, level surface;

- Avoid extreme heat as well as temperature fluctuation caused by installing next to a radiator or in the direct sunlight;

- Protect the balance against direct draughts due to open windows and doors;

- Avoid jarring during weighing;

- Protect the balance against high humidity, vapors and dust;

- Do not expose the device to extreme dampness for longer periods of time. Non-permitted condensation (condensation of air humidity on the appliance) may occur if a cold appliance is taken to a considerably warmer environment. In this case, acclimatize the disconnected appliance for ca. 2 hours at room temperature.

- Avoid static charge of goods to be weighed or weighing container.

Major display deviations (incorrect weighing results) may be experienced should electromagnetic fields (e.g. due to mobile phones or radio equipment), static electricity accumulations or instable power supply occur. Change location or remove source of interference.

7.2   Unpacking and erection

Carefully remove the balance from the packaging, remove plastic cover and setup balance at the intended workstation.
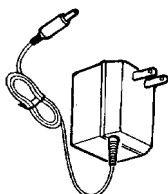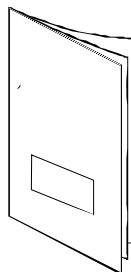
⇨ **Scope of delivery / serial accessories**
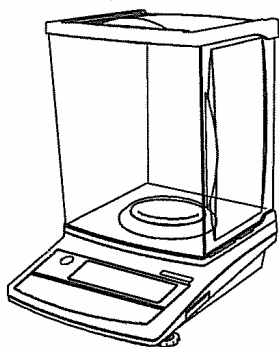
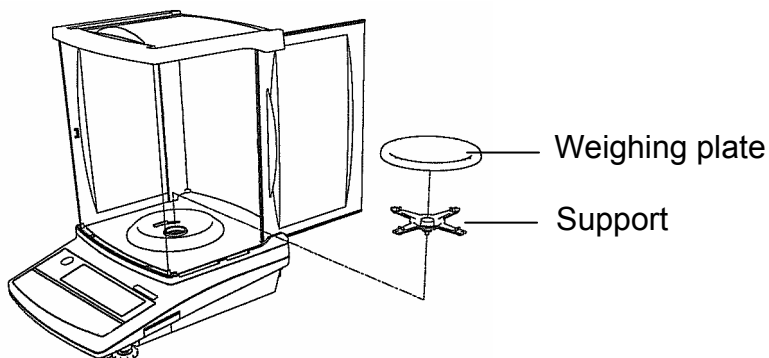| Balance	Carrier of weighing plate	Weighing plate

Mains adapter	Operating Manual

⇨ **Positioning of weighing plate**

Weighing plate

Support

Screw down carrier according to drawing and then insert weighing pan.

➪ **Levelling balance**
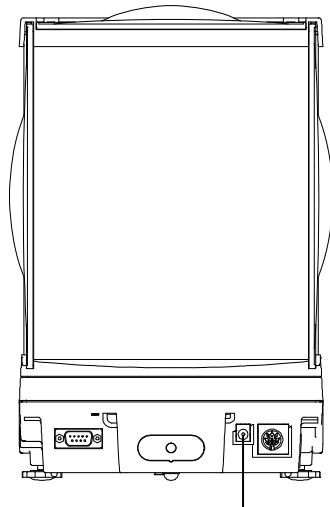

Air bubble
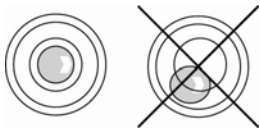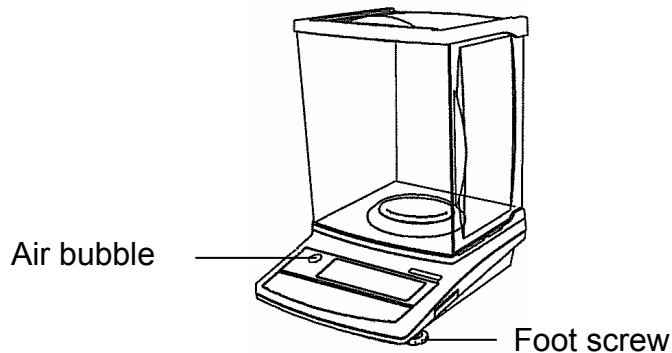
Foot screw

Level balance with foot screws until the air bubble of the water balance is in the prescribed circle.

➪ **Mains connection**

Power is supplied via the external mains adapter. The stated voltage value must be the same as the local voltage.
Only use original KERN mains adapters. Using other makes requires consent by KERN.

Connection mains adapter

7.3 Connection of peripheral devices

Before connecting or disconnecting of additional devices (printer, PC) to the data interface, always disconnect the balance from the power supply.

With your balance, only use accessories and peripheral devices by KERN, as they are ideally tuned to your balance.

7.4 Initial Commissioning

In order to obtain exact results with the electronic balances, your balance must have reached the operating temperature (see warming up time chap. 1).
During this warming up time the balance must be connected to the power supply (mains, accumulator or battery).
To adapt the balance to ambient conditions, open wind screen doors.
The accuracy of the balance depends on the local acceleration of gravity.
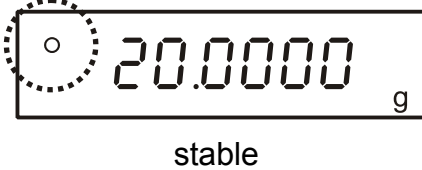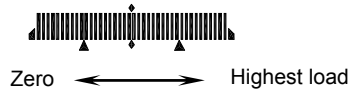Strictly observe hints in chapter Adjustment.

8 Basic Operation

8.1 Switching on/off

If the (*) sign can be seen, the balance is being supplied with power via the mains adaptor.	✱
Turn on balance by pressing the **ON/OFF** key. The balance will carry out a self-test The balance is ready for weighing when the weight display appears. The weighing balance will start in the mode it was in when last switched off, e. g. piece counting.	○ 0.0000 g
Turn off balance by pressing the **ON/OFF key**. Symbol (*) appears.	✱

English

8.2   Simple weighing

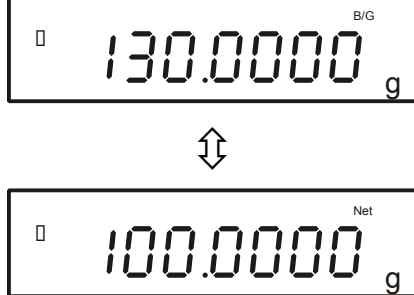|	
⇨ Place goods to be weighed on balance. ⇨ Wait until the stability display appears [O]. ⇨ Read weighing result. If the display shows the stability display [O] the balance is in a stable status. If the status is instable the [O] display disappears. Observe stable environmental conditions.	o *20.0000* g stable *19.9948* g unstable
Bar graph display The bar graph display moves from the left to the right and proceeds equally to the weight loaded onto the weighing balance. Its full width is reached at maximum load. This is an analogue display of the current allocation of the weighing area.	▲▲▲ Zero ⟷ Highest load
Balance zero display If the weighing balance does not definitely show zero, wait for the stability display [O] and then press the **TARE**-key. The balance starts with resetting to zero. Symbol **[→0←]** appears.	o →0← *0.0000* g

8.3   Taring

⇨ Place the weighing box and press the **TARE**-key. After successful control of the rest position you will see displayed zero and the **Net** symbol. The weight of the container is now internally saved.	→0← *0.0000* Net g
⇨ Weigh the material, the net weight will be indicated.	*100.0000* Net g

⇨ The weight of the weighing container will be displayed as a minus number after removing the weighing container.

⇨ To delete the tare value, remove load from weighing pan and press the **TARE**-key.

⇨ The tare procedure can be repeated as many times as necessary, for example with initial weighing of several components for a mix (add-on weighing). The limit is reached when the total weighing range capacity is full.

English

8.4 Net/gross

The dead weight of any weighing container may be tared away by pressing a button. For subsequent weighings the net weight of the goods to be weighed as well as the gross weight goods + taring container can be displayed.

Condition: Menu setting **[ι 5Eε. ι]**, see chpt. 10.1.2

⇨ Place the weighing box and press the **TARE**-key. After successful control of the rest position you will see displayed zero and the **Net** symbol. The weight of the container is now internally saved.	→0← Net 0.0000 g
⇨ Weigh the material, the net weight will be indicated.	Net 100.0000 g
⇨ Press the **F**-key to prompt a display of the gross weight (load + weighing container) and the symbol **B/G.** ⇨ To switch between net and gross weight, press the **F**-key several times.	B/G 130.0000 g ⇕ Net 100.0000 g

ℹ
- This procedure may be repeated any number of times until the weighing range of the weighing balance has been exhausted.
- Net/gross function only available in weighing mode.
- Taring is only available as long as **net weight** is displayed.

8.5 Display speed

To change the display speed of the weighing balance without invoking the menu, press the **S**-key. However, this only will limit your options to the three settings **normal → slow → fast**.

Within the menu it is possible to fine-tune the weighing balance for certain ambient conditions and measuring purposes, see chpt. 10.1.1, menu items [5.rE.*] and [6.EnU.*].

⇨ Press the **S**-key, current setting appears.	FASt
	⇕
⇨ Repeated pressing of the **S**-key allows you to select any of the following settings **normal → slow → fast**	nOrnAL
⇨ After selecting, wait until the weighing balance has returned automatically to weighing mode.	○ 0.0000 g

These settings correspond to the settings in menu item [S. RE. *] and [6. EnU. *].

S-key	Adjustment	Description	Corresponding settings in menu	
			6.EnU	5.rE.
FASt	FAST	Weighing balance sensitive and fast	0	1
nOrnAL	NORMAL	Weighing balance working at medium speed	0	3
SLoU	SLOW	Weighing balance insensitive and slow	1	3

8.6 Data output

To print out or transfer weighing and GLP data to a computer you will have to connect a printer or computer. The weighing balance's factory settings define that data output happens after successful rest position control was carried out followed by pressing the **PRINT**-key. For additional settings see chpt. 10.1.5.

During a display ⇨ weighing data are calculated via interface.

8.7 Underfloor weighing

Objects unsuitable for placing on the weighing scale due to size or shape may be weighed with the help of the flush-mounted platform.
Proceed as follows:

- Switch off the balance

- Remove the weighing pan and carefully turn over the weighing balance.

- Loosen screw, turn cover plate (1) by 90º and reattach with the help of the screw.

- Suspend hook for underfloor weighing **carefully and completely**.

- Place weighing balance over an opening.

- Attach load to hook and carry out weighing procedure.
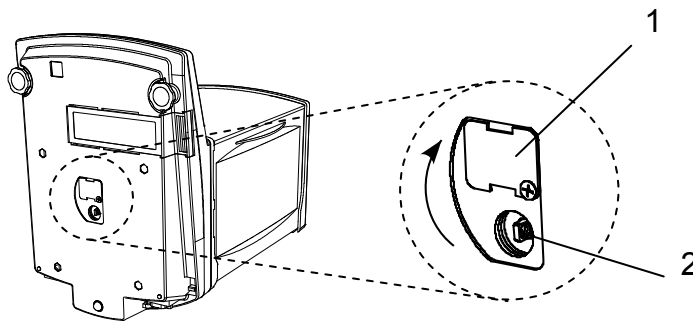
Fig. 1: Setup of balance for underfloor weighing

⚠ **CAUTION**	– Always ensure that all suspended objects are stable enough to hold the desired goods to be weighed safely (danger of breaking). – Never suspend loads that exceed the stated maximum load (max) (danger of breaking) – Always ensure that there are no persons, animals or objects that might be damaged underneath the load.

ℹ	After completing the underfloor weighing the opening on the bottom of the balance must always be closed (dust protection).

9 Adjustment

As the acceleration value due to gravity is not the same at every location on earth, each balance must be coordinated - in compliance with the underlying physical weighing p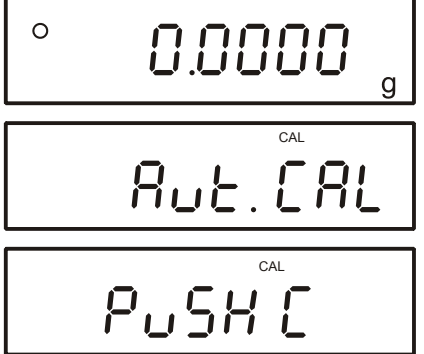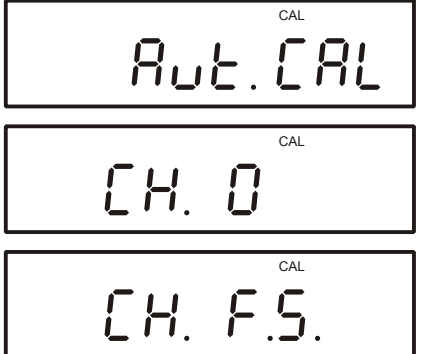rinciple - to the existing acceleration due to gravity at its place of location (only if the balance has not already been adjusted to the location in the factory). This adjustment process must be carried out during the initial start-up, after change in location and variation of surrounding temperature. To receive accurate measuring values it is also recommended to adjust the balance periodically in weighing operation.

i Observe stable environmental conditions. A warming up time (see chapter 1) is required for stabilization. Ensure that there are no objects on the weighing plate.

9.1 Adjustment with internal weight (KERN AEJ only)

With the internal adjustment weight, the weighing accuracy can be checked and re-adjusted at any time.

Condition: For menu setting [*8 CA. 1*] see chpt. 10.1.2
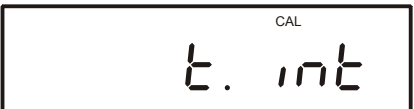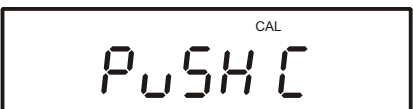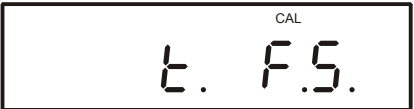
⇨ Press the **CAL** key	° **0.0000** g CAL **Aut.CAL** CAL **PuSH C**
⇨ Press the **CAL**-key again and adjustment will take place automatically.	CAL **Aut.CAL** CAL **CH. 0** CAL **CH. F.S.**
⇨ The process of adjustment is completed. Adjustment protocols will be issued automatically if you connect an optional printer, see chpt. 15 "printer mode". Whilst printing is in progress [busy ↪] will be displayed.	CAL **End**
⇨ The balance returns automatically into weighing mode.	° **0.0000** g

9.2 Adjustment with external weight (only AEJ)

During adjustment tests the balance automatically compares the saved value of the adjustment weight with the actual value. This is only a check, i.e. no values are changed.

i **Condition**: Menu setting [8. ᴄᴀ. 2], see chpt. 10.1.2

⇨ Press the **CAL** key	○ 0.0000 g CAL t. int CAL PuSH C
⇨ Press the **CAL**-key again and the adjustment test will take place automatically.	CAL t. int CAL t. 0 CAL t. F.S.
⇨ The difference between the saved value and the measured value is displayed. Adjustment protocols will be issued automatically if you connect an optional printer, see chpt. 15 "printer mode". Whilst printing is in progress [busy ⤷] will be displayed.	CAL d iFF CAL 0.0007 g
⇨ Press any key; adjustment process will stop. The balance returns to weighing mode.	○ 0.0000 g

9.3 Adjustment with external weight (only AES)

Carry out adjustment with the help of the recommended adjustment weight (see chapter 1 "Technical Specifications").
Info about adjustment weights can be found on the Internet at: http://www.kern-sohn.com

i **Condition**: Menu setting [8 $CA.$ 3], see chpt. 10.1.2
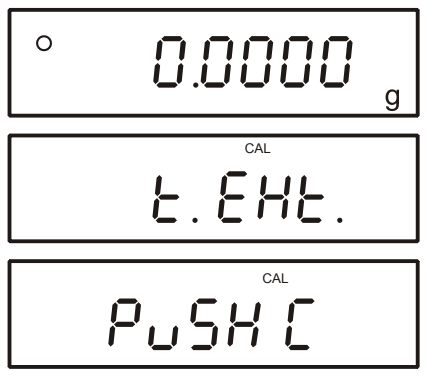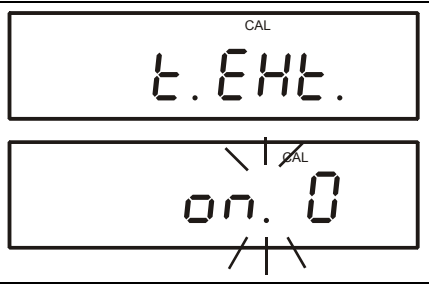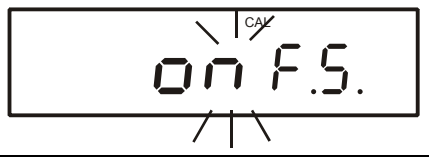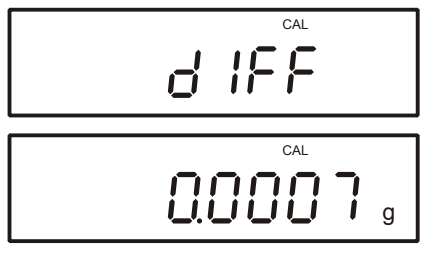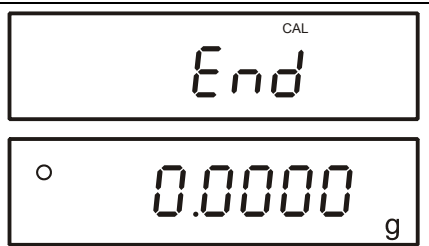
⇨ Press the **CAL** key	○ **0.0000** g
	CAL **CAL EHt.**
	CAL **PuSH C**
⇨ Press the **CAL**-key again; zero point will be saved.	CAL **CAL EHt.**
	CAL **on. 0**
⇨ When display **[on F.S]** appears, put the adjusting weight carefully in the centre of the weighing pan.	CAL **on F.S.**
⇨ The adjustment process is started	CAL **on F.S.**
⇨ The process of adjustment is completed. Adjustment protocols will be issued automatically if you connect an optional printer, see chpt. 15 "printer mode". Whilst printing is in progress [busy ⮫] will be displayed.	CAL **buSY** CAL **End**
⇨ The balance returns automatically into weighing mode. Take away adjustment weight. An adjusting error or incorrect adjusting weight will be indicated by the error message **[- Err]**. Repeat adjustment procedure.	○ **0.0000** g

9.4 Adjustment with external weight (only AES)

During adjustment tests the balance automatically compares the saved value of the adjustment weight with the actual value. This is only a check, i.e. no values are changed.

ⓘ **Condition**: For menu setting [𝟖 𝐶𝐴. 𝟒] see chpt. 10.1.2

⇨ Press the **CAL** key	○ 0.0000 g
	CAL t.EHt.
	CAL PuSH C
⇨ Operate the **CAL**-key	CAL t.EHt.
	CAL on. 0
⇨ When display **[on F.S]** appears, put the adjusting weight carefully in the centre of the weighing pan.	CAL on F.S.
⇨ Adjustment test is starting	CAL on F.S.
⇨ The difference between the saved value and the measured value is displayed. ⇨ Adjustment protocols will be issued if you connect an optional printer and by pressing the **PRINT**-key, see chpt. 15 "printer mode". Whilst printing is in progress [⤷] will be displayed.	CAL d IFF
	CAL 0.0007 g
⇨ Press any key; adjustment process will stop. Remove adjusting weight, balance will return into weighing mode.	CAL End
	○ 0.0000 g

- When the **PRINT**-key is pressed during the adjusting procedure, [stop] will be displayed and adjustment interrupted. The balance returns to weighing mode.
- You can cancel the adjusting procedure by pressing any key.

- The following error messages may be displayed during adjust-ment/adjustment test.

  1-Err   Incorrect adjusting weight

  2-Err   Divergence last external adjustment > 1%

  3-Err   During the adjustment there was one weight on the weighing plate

  4-Err   Divergence from last internal adjustment > 1%

  A-Err   Internal adjustment automatics defective

  ↪   Adjustment protocols can be issued by connecting an optional printer, see chpt. 15 "printer operation".
  [↪] is displayed during printing.

9.5 Advice CAL/Auto-CAL (KERN PEJ only)

Automatic adjustment is started or required every 4 hours, or when a temperature change of 5 ºC occurs, depending on the setting in the menu, see chpt. 10.1.1.

Advice CAL = menu setting [$E.\ AdC.\ 1$]
When "Advice CAL" is set, the required adjustment will merely be requested and manual adjustment must be carried out.
"**CAL**" will start flashing if adjustment is required (after 4 h/ ± 5ºC). "**CAL**" will keep flashing until the adjustment is started.
For AEJ models this is carried out with an internal adjustment weight (chpt. 9.1), for AES models with an external adjustment weight (chpt. 9.3).

Advice CAL = menu setting [$E.\ AdC.\ 2$]
Automatic adjustment is carried out when "Auto-CAL" is set and an adjustment due (after 4 h / ± 5ºC).
"CAL" will start flashing 10 minutes before the start of automatic adjustment with internal adjusting weight. Complete current weighing in processes within this time frame. Automatic adjustment will not be started until the weighing balance is unloaded and a successful stability display has appeared.

ⓘ   It is only possible to enable the Auto-Cal function in menu setting
[$8\ CA.\ 1$], see chpt. 10.1.2.

9.6 Standard deviation (KERN PEJ only)

⇨ Keep **CAL**-key pressed until [$Ar\Pi$] appears.

⇨ The weighing balance in conjunction with the adjusting weight defines 10 measured values $Cnt.\quad 1$ ➔ $Cnt.\quad 10$ in succession.

⇨ The defined standard deviation (e.g. 0.000073 g) will be displayed.

⇨ Press any key; balance will return to weighing mode.

⇨ To interrupt measuring, press the **PRINT**-key.

9.7 Verification

General introduction:

According to EU directive 90/384/EEC balances must be officially verified if they are used as follows (legally controlled area):

    a) For commercial transactions if the price of goods is determined by weighing.
    b) For the production of medicines in pharmacies as well as for analyses in the medical and pharmaceutical laboratory.
    c) For official purposes.
    d) For manufacturing final packages.

In cases of doubt, please contact your local trade in standard.

Verification instructions

An EU type approval exists for balances described in their technical data as verifiable. If a balance is used where obligation to verify exists as described above, it must officially verified and re-verified in regular intervals.
Re-verification of a balance is carried out according to the respective national regulations. The validity for verification of balances in Germany is e.g. 2 years.
The legal regulation of the country where the balance is used must be observed!

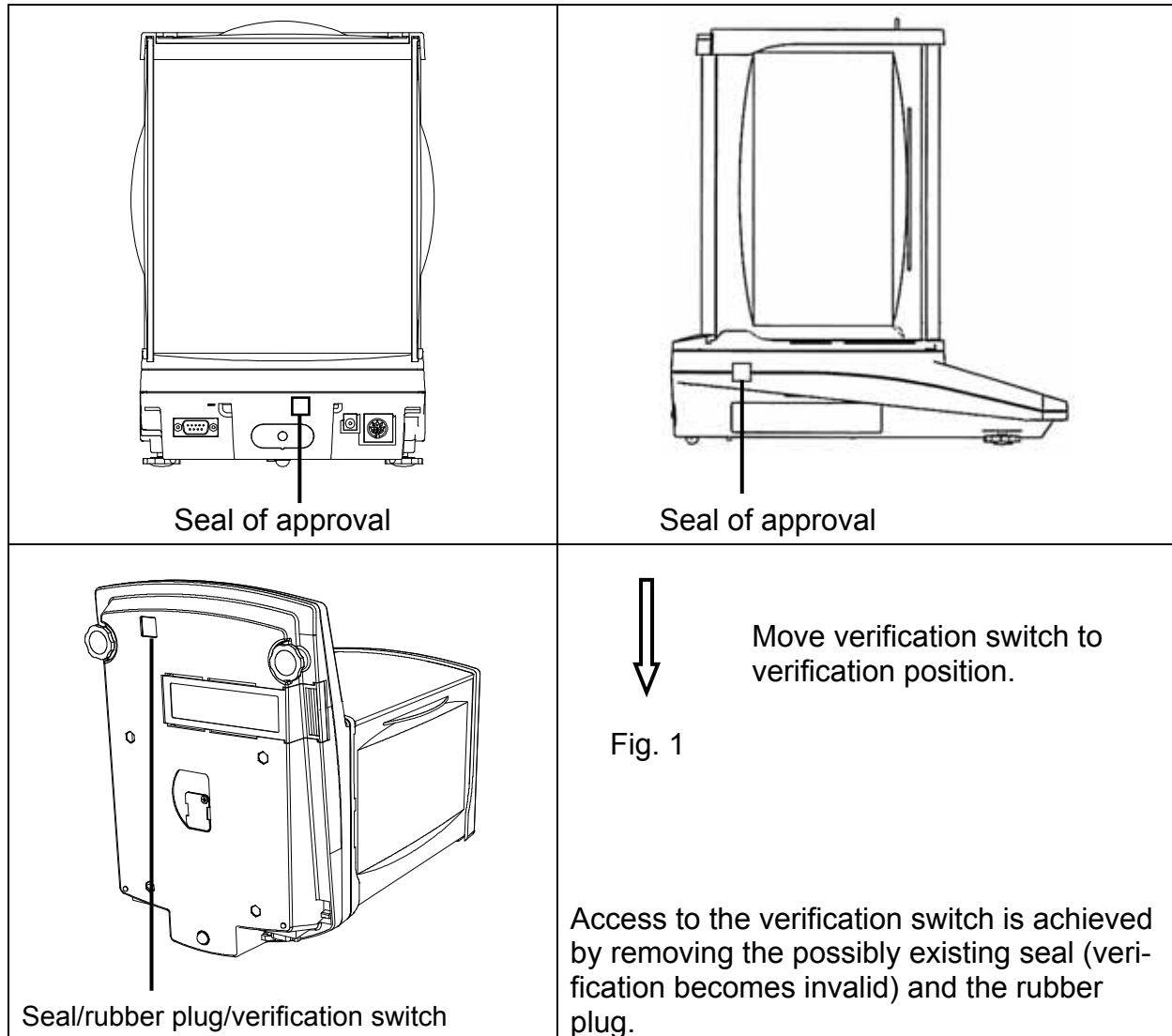**i**   **Verification of the balance is invalid without the "seal".**

Balances with obligation to verify must be taken out of operation if:

- **The weighing result of the balance is outside the error limit.** Therefore, in regular intervals load balance with known test weight (ca. 1/3 of the max. load) and compare with displayed value.

- **The reverification deadline has been exceeded.**

9.7.1 Verification switch and seals

Prior to verification you will have move the calibration switch to verification position (See direction of arrow, fig. 1). In this position the display shows a bracket around the last display point.

After verification the balance is sealed at the indicated positions.

| Seal of approval | Seal of approval |

Seal/rubber plug/verification switch

Move verification switch to verification position.

Fig. 1

Access to the verification switch is achieved by removing the possibly existing seal (verification becomes invalid) and the rubber plug.
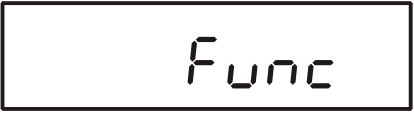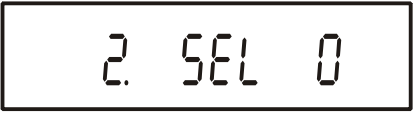
Position of verification switch	Status
forwards	Balance is unlocked for the adjustment process, adjustment will be possible "ADJ" appears when the balance is switched on.
backwards	Verification position - Adjustment locked

10 Menu

In the menu the settings of the balance can be modified and functions can be activated. This way, the balance can be adjusted to individual weighing requirements. The menu is sub-divided into "menu 1" and "menu 2".

10.1 Menu 1

10.1.1 Navigation in menu 1

Access to menu ⇨ In weighing mode keep the **F**-key pressed down until [Func] appears on the display. Release button. The first menu item showing the current setting will be displayed.	○ *0.0000* g *Func* *1. SEt 1*
How to select menu items ⇨ Press the **F**-key to select the individual menu items showing the current settings one by one.	*1. SEt 1* *2. SEL 0*
How to change settings ⇨ Press the **TARE**-key to change the setting of a selected menu item. Each time the **TARE**-key is pressed the next setting will be displayed. As soon as the desired setting appears on the display you can select the next menu item (see above) or exit the menu (see paragraphs below).	*2. SEL 0* *2. SEL 2*
How to save settings and to exit the menu ⇨ Press the **S**-key; balance will return to weighing mode. or ⇨ Press the **F**-key repeatedly until the weighing balance returns to weighing mode. ⇨ All changes will be saved.	*1. SEt 1* *2. SEL 0* ○ *0.0000* g
Cancel ⇨ Press the **PRINT**-key briefly; balance will return to weighing mode. Changes will not be saved.	

10.1.2 Overview Menu 1

Default setting is marked by *.

Menu item	Display F	Selection TARE →0←		Description	
Weighing mode	1. SEt.	*	1	Weighing	
			2	Count pieces / weigh	
			3	Percentage calculation / weigh	
			4	Weighing with freely programmable weighing unit	
			5	Density determination of solids	For settings see chpt. 10.1.3
			6	Determining density of liquids	
Additional functions	2. SEL	*	0	Disabled	
			1	Add up ➡ [26. AD.N.]	
			2	Tolerance weighing	For settings see chpt. 10.1.4
			3	Tolerance weighing /Add up	
Automatic zero point correction (zero tracking)	3. A.0		0	Automatic zero tracking off	
		*	1	Automatic zero tracking on	
			2	Level of deviation (1-4) weak	models AES only
			3	↕	
			4	strong	
Stability display	4. S.d.	only AES	1	Fast (rough)	
		*	2	↕	
			3	Slow (fine)	
			4		
Display speed	5. rE.		0	Setting for dispensing	
			1	Sensitive/fast	
			2		
		*	3	↕	(See chpt. 8.5)
			4		
			5	Insensitive / slow	
Vibration filter	6. EnU	*	0	Calm and stable environment	
			1	Busy environment	
Interface	7. 1.F.		0	deactivated	
		*	2	7-digit data format	See chpt. 10.1.5
			3	extended 7-digit data format	
			4	Special formats	

| Special format | 7. 1.F. | *41 | Special format 1 | During setting only [7. 1.F. 4] |
| | | 42 | Special format 2 | |

Adjustment	8. CA.	0	CAL-key deactivated	
		*1 1	Internal adjustment	Models AEJ only
		2	Adjustment test using internal weight	
		*2 3	External adjustment	Models AES only
		4	Adjustment test using external weight	

| Bar graph | 9. b.G. | 0 | Hide bar graph | |
| | | * 1 | Show bar graph | |

| Automatic turn-off for battery operation (function only exists for battery operation) | A. A.P. | 0 | | |
| | | * 1 | Not documented | |

| Auto backlight OFF function | b. A.b. | 0 | Off | |
| | | * 1 | Backlight will switch off automatically 3 minutes after achieving a stable weighing value. Changes in weight or pressing of keys will automatically result in backlight switching on again. | |

Weighing unit A (standard weighing unit) Not all units are available for calibrated weighing balances, see chpt. 1	C1. u.A	1	mg
		* 2	g
		4	ct
		5	oz
		6	lb
		7	ozt
		8	dwt
		9	gn
		A	tl (HK)
		b	tl (Singap. Malays)
		C	tl (Tw)
		d	mom
		E	tol

Change readability for weighing unit A, see chpt. 13.3 (models AES only)	C2. d.A	* 1	Fine
		2	
		3	↕
		4	
		5	Rough

Weighing unit B To choose between units A and B, press the F-key	C3. u.b	* 0	No unit
		1	Settings [1 ~ E] See weighing units A
		⌡	
		E	

Change readability for weighing unit A, see chpt. 13.3 (models AES only)	C4. d.b	* 1	Fine	Is only displayed at setting [C3. u.b] = [1 ~ 6]
		2		
		3	↕	
		4		
		5	Rough	
Display last fractional digit Models AEJ only	d .A.i.	0	No	
		* 1	Yes; always use this setting!	
Advice CAL/ Auto CAL	E. Ad.C.	*2 0	Disabled	
		1	Advice CAL	
		*1 2	Auto CAL, only models AEJ	
ISO/GLP/GMP – compliant output	F. GLP	* 0	No	
		1	Yes	
Output adjustment protocol	F1 out	0	No	Setting [F. GLP 1] only
		* 1	Yes	
ISO/GLP/GMP – compliant output for weighing data, see chpt. 15.2	F2. od.	* 0	No	
		1	Yes	
Selection of Language	F3. P.F.	* 1	English	
		2	not documented	
Date output	G. dAtE	1	Display in year-month-day	
		2	Display in month-day-year	
		* 3	Display in day-month-year	
Time output	H. t.o.	* 0	Output - NO	
		1	Output - YES	
Taring range (models AES only)	_1. tA.	1	Zero displayed immediately after keystroke	
		* 2	Zero displayed after keystroke not until weighing value is stable	
How to store the tare value see chpt. 13.4 (models AES only)	L. tArE	* 0	No	
		1	Yes	
Instant start, see chpt. 13.5	n. d.St.	* 0	When connecting the mains cable, the balance will immediately go into stand-by mode	
		1	Balance switches on when plugging in mains power supply	
Backlight	P. b.L.	0	Display background illumination off	
		1	Display background illumination on	
		* 2	Backlight of display on (for connection via line adapter)	
Output interface (models AEJ only)	n. P.r.F.	1	not documented	
		2	not documented	
		* 3	For calibrated weighing balances always use this setting	

English

ℹ
- *   Marks default setting
- *1   Default setting model KERN AEJ only
- *2   Default setting model KERN AES only

10.1.3 Settings for density determination

	Menu item	Display	Selection	Description
Density determination	Measure medium	11. ΠEd.	* 0	dest. Water
			1	Measuring liquid of your selection
	Data output	12. d.o.d.	* 0	only output measuring value density
			1	Output of all density parameters
	Autom. Data output	13. A.o.	* 0	OFF (Output only after pressing PRINT key)
			1	ON

10.1.4 Settings for tolerance weighing / add-up

Not displayed at menu setting „2. SEL 0"

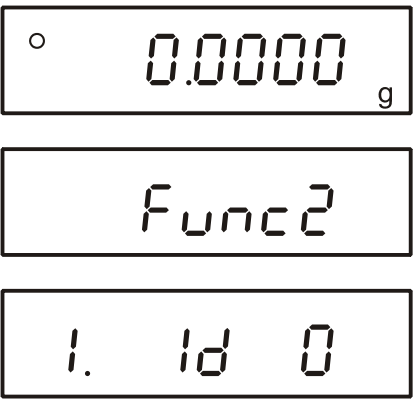| Menu item	Display F	Selection TARE →0←	Description	
Display conditions of the tolerance marker	21. Co.	* 1	Tolerance marker is always displayed, even if standstill control is not yet displayed.	
		2	Tolerance marker is only displayed in connection with standstill control.	
Tolerance range	22. Li.	0	Tolerance marker is only displayed above zero range (mind + 5).	
		* 1	Tolerance marker is displayed for the whole range.	
Number of limiting points	23. Pi	1	1- Limiting point (OK/ -)	
		* 2	2- Limiting points (+/OK/-)	
		3	3- Limiting points (1-4)	
		4	4- Limiting points (1-5)	
Grading	24. tYP.	* 1	for absolute values	
		2	for differential values	
Display of Results	25. LG	* 1	Display via +, OK or -	
		2	For setting 2 limits display in bar graph is possible	
Adding	26 Ad.Π.	* 1	Add-up function without AUTO-TARE	During setting only [2. SEL 1] or [2. SEL 3]
		2	Adding function with AUTO-TARA	

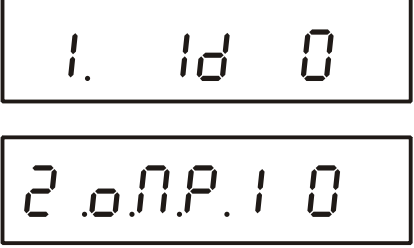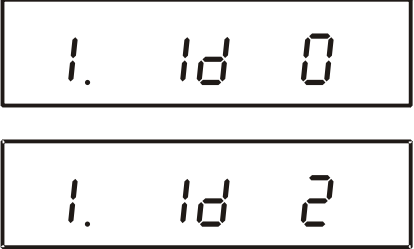## 10.1.5 Settings for serial interface

Not shown for menu setting „7 1 F 0" (interface de-activated).

Menu item	Display [F]	Selection [TARE →0←]	Description	
Output condition at interface	7 1. o.c. *1	0	no data output	
		1	Continuous data output	
		2	Continuous data output stable weighing values	
		* 3	Output for stable and instable weighing values after pressing PRINT key	
		4	Output for stable weighing value after previous relief of balance	
		5	One output for stable weighing value. No output for stable weighing values. Renewed output after stabilization	
		6	One output for stable weighing value. Continuous output for instable weighing values.	
		* 7	Output of stable weighing values after pressing PRINT key	
		A	One-off instant output after fixed interval (see chpt. 13.6	
		b	One-off instant output after fixed interval and stable weighing value (see chpt. 13.6)	
Baud rate	72. b.L.	* 1	1200 bps	
		2	2400 bps	
		3	4800 bps	
		4	9600 bps	
		5	19200 bps	
Parity	73. PA.	* 0	No parity bit	During setting only [7 1 F] = [2~4]
		1	Odd parity	
		2	Even parity	
Data Bits	74. d.L.	7	7 bits	During setting only [7 1 F] = [3, 4]
		* 8	8 bits	
Stop Bits	75. St.	1	1 bit	
		* 2	2 bit	
not documented	76. u.n.	* 0	Always use this setting	
		1		
Feedback, see chpt. 14.5.1	77. rES.	* 1	A00/Exx Format	
		2	ACK/NAK Format	

10.2 Menu 2

10.2.1 Navigation in menu 2

Access to menu ⇨ Hold **F-key** while **TARE** key is pressed until [$Func\ 2$] is displayed. Release button. The first menu item showing the current setting will be displayed.	○ 0.0000 g $Func2$ $1.\quad Id\quad 0$
How to select menu items ⇨ Press the **F**-key to select the individual menu items showing the current settings one by one.	$1.\quad Id\quad 0$ $2\ .o.\Pi.P.1\quad 0$
How to change settings ⇨ Press the **TARE**-key to change the setting of a selected menu item. Each time the **TARE**-key is pressed the next setting will be displayed. As soon as the desired setting appears on the display you can select the next menu item (see above) or exit the menu (see paragraphs below).	$1.\quad Id\quad 0$ $1.\quad Id\quad 2$
How to save settings and to exit the menu ⇨ Press the **S**-key; balance will return to weighing mode. or ⇨ Press the **F**-key repeatedly until the weighing balance returns to weighing mode. ⇨ All changes will be saved.	○ 0.0000 g
Cancel ⇨ Press the **PRINT**-key briefly; balance will return to weighing mode. Changes will not be saved.	

10.2.2 Overview Menu 2

Default setting is marked by *.

Menu item	Display $\boxed{F}$	Selection $\boxed{\substack{\text{TARE} \\ \to 0 \leftarrow}}$	Description	
Setup balance ID no.	1. Id	* 0	Off	
		1	ON	
Not documented	2. oᘓP.	* 0	Always use this setting	
		1		
Overwriting the adjusting weight **Attention:** Modifications may only be carried out by specialized personnel!	3. rᘓA	* 0	Off	Non-calibrated models AEJ only
		1	ON	
Not documented	4. ᘓE.H.	* 0	Always use this setting	
		1		

English

11 Operating modes

Depending on the setting in menu 1, it is possible to switch the weighing balance to additional enabled operating modes by pressing the **F**-key, see chpt. 10.1.2 menu item **[1 SEt.]**. Additional operating modes such as add-up / tolerance weighing may be enabled under menu item **[2 SEL]** (except density determination mode).
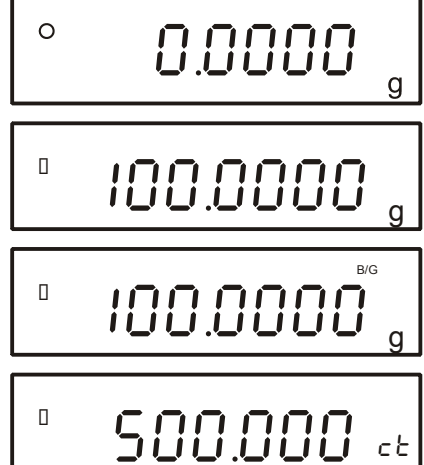
Menu item	Application
1 SEt. 1	Weighing
1 SEt. 2	Weighing/parts counting
1 SEt. 3	Weighing/percent determination
1 SEt. 4	Weighing / weighing with freely programmable weighing unit
1 SEt. 5	Weighing / density determination of solids
1 SEt. 6	Weighing / density determination of liquids
2 SEL 1	Adding
2 SEL 2	Tolerance weighing
2 SEL 3	Add-up / tolerance weighing

Overview of available functions

Operating mode	Mode		Additional functions	
	Unit	Function	Adding	Tolerance weighing
Weighing	Weighing unity A	Weighing	○	○
	Weighing unit A B/G	Gross weight	×	×
	Weighing unit B	Weighing	×	×
	Weighing unit A Σ	Adding	Display	×
Parts counting	Pcs	Counting	○	○
	Pcs Σ	Total piece counting	Display	×
	Weighing unit A Pcs	Average parts weight	×	×
	Weighing unity A	Weighing	×	×
Percent determination	%	Percent determination	○	
	% Σ	Total percentage	Display	
	Weighing unity A	Weighing	×	
Weighing with freely programmable weighing unit	#	Multiplication factor	○	○
	# Σ	Total	Display	×
	Weighing unity A	Weighing	×	×
Density determination (solids/liquids)	g (fix)	Density determination mode	×	×

i
○ = available
× = not available
Display = value being shown

11.1 Weighing / Weighing unit change

⇨ Place goods to be weighed on balance	○ *0.0000* g
⇨ Wait until the stability display appears [O]	
⇨ Read weighing result.	☐ *100.0000* g
⇨ Press repeatedly the button **F** to switch-over display into net/gross Net weight unity A ↔ gross weight unity A see chapter 8.4, or in other activated weighing unity (menu setting **[C3.u.b]**)	☐ *100.0000* B/G g
	☐ *500.000* ct
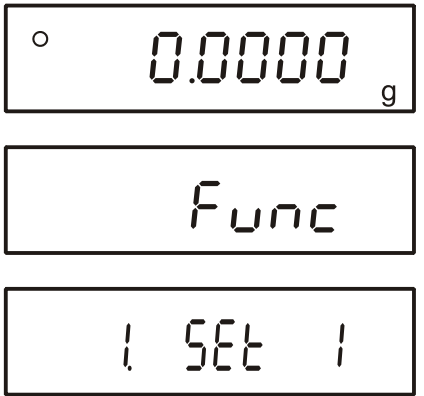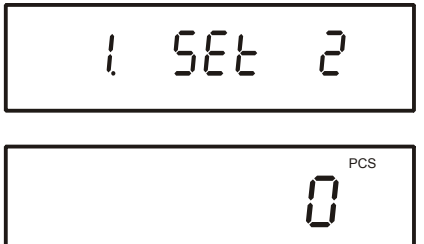
11.2 Parts counting

During piece counting parts can either be counted into a container or out of a container. To count a greater number of parts the average weight per part has to be determined with a small quantity (reference quantity).
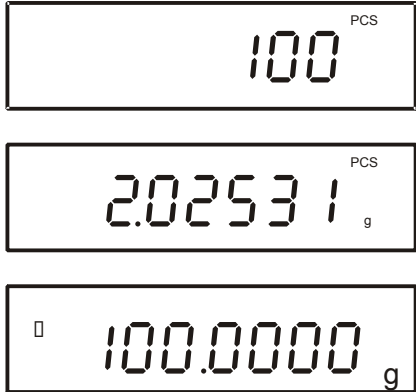The larger the reference quantity, the higher the counting exactness.
High reference must be selected for small parts or parts with considerably different sizes.
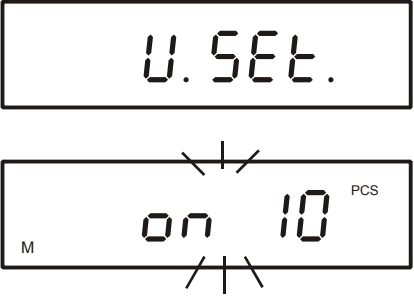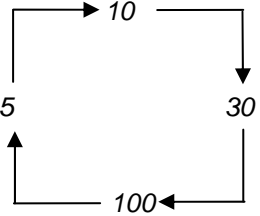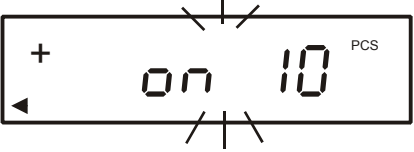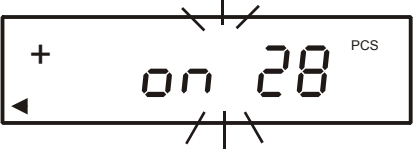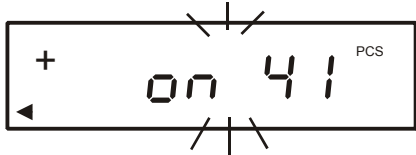
The process has four steps:

- Tare the weighing container
- Determine the reference unit
- Original weighing of reference weight
- Count the items

Activate function	○ *0.0000* g
⇨ In weighing mode keep the **F**-key pressed down until **[Func]** appears on the display. Release button. The first menu item showing the current setting will be displayed.	*Func*
	1 SEt 1
⇨ Use the **TARE**-key to select "piece counting" and confirm by pressing the **S**-key.	*1 SEt 2*
The balance is situated in the piece counting mode.	*0* PCS

|	
Determine the reference unit ⇨ If required, place a weighing container on the weighing pan ⇨ Press the **F**-key for about 4 seconds until **[*U. SEt.*]** appears and then let go. The reference quantity is displayed flashing. The display e.g. 10 Pcs. prompts you to enter 10 pieces as reference.	$U.5Et.$ M on 10 PCS

Change reference quantity
 	
⇨ Select the desired number of reference pieces by pressing the **TARE**-key.
 	
       → 10
5   30
       100
 	
Important: The larger the reference quantity, the more accurate the parts counting.	

Original weighing of reference weight ⇨ Place as many pieces to add-up as required by the set reference piece number. ⇨ Press **F** key	+ ◄ on 10 PCS The balance offers the possibility of reference optimisation. If you do not want this, press F key.
⇨ By adding more pieces (up to the 3-fold quantity), you can optimise the reference. At every reference optimisation, the reference weight is calculated anew. As the additional pieces increase the base for the calculation, the reference also becomes more exact. Symbol **[+]** on the display indicates that you are requested to add more parts.	+ ◄ on 28 PCS

English

How to save the reference	$+$ on 41 PCS
⇨ Press the **F**-key to save the reference whereupon the weighing scale automatically calculates an average weight per part. Remove reference weight. The balance is now in parts counting mode and counts all units on the weighing plate.	
Count the items	100 PCS
⇨ **Place load on pan and read the number of pieces.**	
Display change	100 PCS
Pressing the **F**-key repeatedly is a way to change the display value, for instance to:	
• Number of parts placed on balance "Pcs"	
⇕	2.02531 PCS g
• Average part weight "g/Pcs"	
⇕	100.0000 g
• Weight of parts placed on balance in "g"	

English

Print

⇨ The display value can be printed out by connecting an optional printer and pressing the **PRINT**-key, see chpt. 15 "printer mode".
[⏏] is displayed during printing.

Printout

• Number of parts placed

```
+0000020 PC S
```
        ↓   ↓
        1   2

• Average part weight "g/Pcs"

```
+9.999719 GUU
```
           ↓ ↓
           3 4
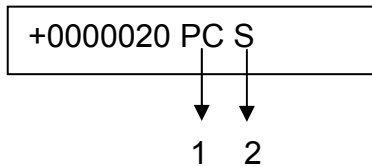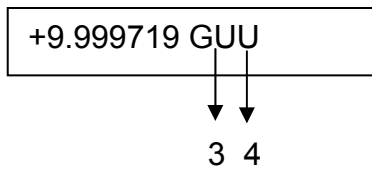
• Weight of parts placed on balance in "g"

```
+199.996/7 G S
```
         ↓   ↓ ↓
         5   6 7
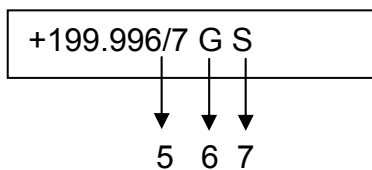
1	PC	Parts counting
2	S	Stable value
3	GU	Average weight of parts in gram
4	U	Instable value
5	/	Auxiliary display (verifiable models only)
6	G	Weighing unit "gram"
7	S	Stable value

ⓘ **Display   Description**

5Ub   3-fold quantity was exceeded during reference optimisation.
          Either you accept the error and confirm by pressing the **F**-key or restart reference calculation.

Add   The number of pieces placed is too small for a correct reference calculation.
          Either you accept the error and confirm by pressing the **F**-key or you add additional items.

L-Err   Piece below minimum weight of piece (See chpt. 1 "Technical specifications"):
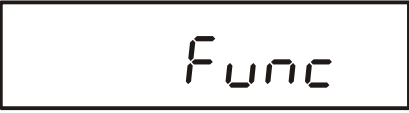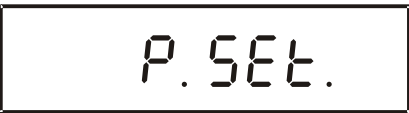
To interrupt a reference calculation, press the **PRINT**-key.

The reference weight will remain stored even after the weighing balance was turned off until the reference is reset.

11.3 Percent determination

Percentage calculation facilitates weight display in percent related to a reference weight equivalent to 100 %.

11.3.1 Entering the reference weight by weighing

|	

Activate function ⇨ In weighing mode keep the **F**-key pressed down until **[Func]** appears on the display. Release button. The first menu item showing the current setting will be displayed.	○ `0.0000` g
	
	 `Func`
	
	 `1. SEt  1`

⇨ Press the **TARE**-key repeatedly until menu item "percentage calculation" appears. ⇨ Confirm by pressing the **S**-key. The balance is situated in the percent determining mode.	`1. SEt  3` `0` %
How to determine a reference weight (100 %) ⇨ If required, place a weighing container on the weighing pan ⇨ Press the **F**-key for about 4 seconds until **[P. SEt.]** appears and then let go. The most recently saved reference weight will be displayed (flashing).	`P.SEt.` M `0.0000` g
⇨ Put on reference weight (=100 %) ⇨ Confirm by pressing the **F**-key. This completes the determination of a reference weight. ⇨ Remove reference weight	`100.00` %
Percent determination ⇨ Place goods to be weighed on balance. The weight of the sample is displayed in percentage in terms of the reference weight.	`85.37` %

Display change

Pressing the **F**-key repeatedly is a way to change the display value to [g] or [%] or additional functions (see chpt. 11).
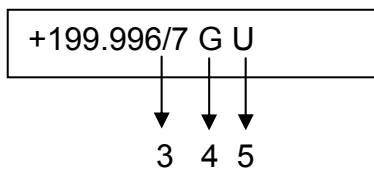
Print

⇨ The display value can be printed out by connecting an optional printer and pressing the **PRINT**-key, see chpt. 15 "printer mode".
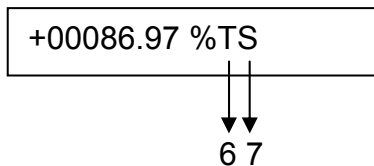[⤷] is displayed during printing.

Printout
• Display value in [%]

+00033.33 % S

↓ ↓
1 2

• Display value in [g]

+199.996/7 G U

↓ ↓ ↓
3 4 5
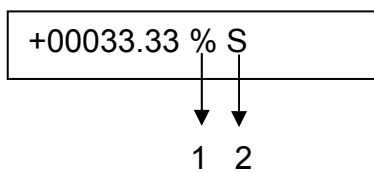
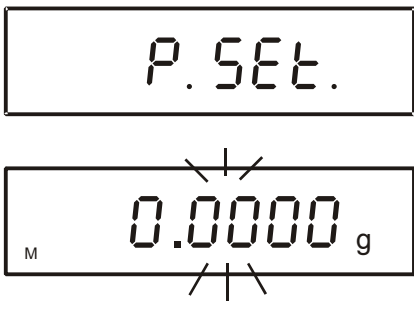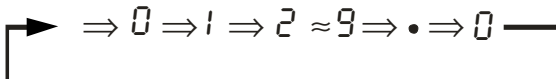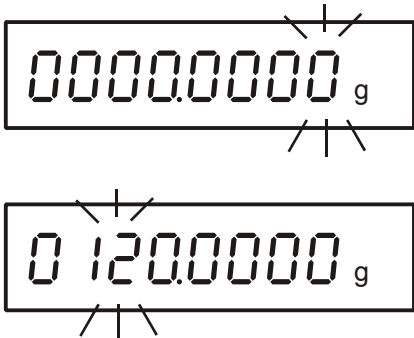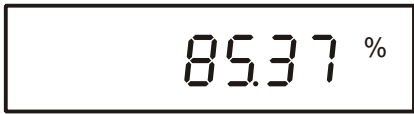|		
1	%	Percent determination
2	S	Stable value
3	/	Auxiliary display (verifiable models only)
4	G	Weighing unit "gram"
5	U	Instable value
6	T	Sum
7	S	Stable value

• Total in [%]

+00086.97 %TS

↓ ↓
6 7

ℹ
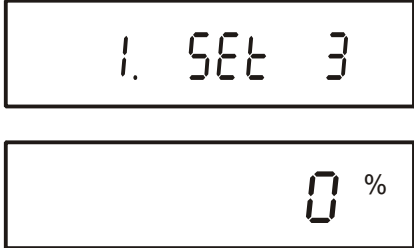
L-Err   Reference weight < minimum weight = underload

1 %   Minimum load ≤ reference weight < minimum load x 10

0.1 %   Minimum load x 10 ≤ reference weight < minimum load x 100

0.01 %   Minimum load x 100 ≤ reference weight

Minimum load dependent on model, see chpt. 1 "Technical specifications".

The reference weight (100 %) will remain stored even after the weighing balance was turned off until the reference is reset.

11.3.2 Numeric entering of the reference weight

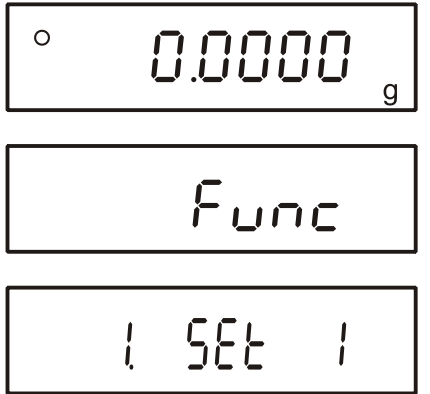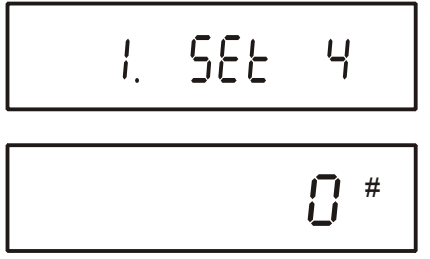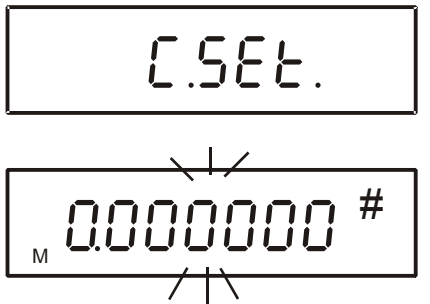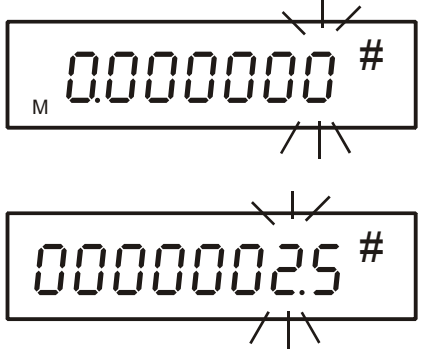|	

Activate function
 	
⇨ See chpt. 11.3.1
	```. SEt 3```
	
	```0``` %

How to determine a reference weight (100 %) ⇨ If required, place a weighing container on the weighing pan ⇨ Press the **F**-key for about 4 seconds until **[*P. SEt.*]** appears and then let go. The most recently saved reference weight will be displayed (flashing).	```P.SEt.``` M ```0.0000``` g

⇨ Enter reference weight (=100 %)
 	
Each time the **TARE**-key is pressed, numbers will run through from 0-9 and the decimal point.
 	
$$\Rightarrow 0 \Rightarrow 1 \Rightarrow 2 \approx 9 \Rightarrow \bullet \Rightarrow 0$$
 	
Select the number to be changed using **F** key (the active position flashes):
 	
⇨ Save the reference weight by pressing the **S**-key
or
cancel the entry by pressing the **PRINT**-key.
	```00000000``` g
	
	```0120.0000``` g

Percent determination ⇨ Place goods to be weighed on balance. The weight of the sample is displayed in percentage in terms of the reference weight.	```85.37``` %
Display change Pressing the F-key repeatedly is a way to change the display value, for instance to [g] or [%].	

11.4 Weighing with freely programmable weighing unit

The weighing value in [g] will automatically be multiplied by the variable factor set and the result will be displayed (showing unit #).

Example:

A sheet of paper of the size 10 x 10 cm weighs 0.6 g – the task is to determine the weight/1m². For this purpose the factor needs to be set to 100.

From this follows a display value of 0.6 g x 100 = 60.0 #, that is 60 g/m².

Activate function ⇨ In weighing mode keep the **F**-key pressed down until [*Func*] appears on the display. Release button. The first menu item showing the current setting will be displayed.	○ *0.0000* g *Func* *1. SEt 1*
⇨ Press the **TARE**-key repeatedly until the menu item "Weighing with freely programmable weighing unit" appears. ⇨ Confirm by pressing the **S**-key.	*1. SEt 4* *0* #
Enter the factor for the weighing unit ⇨ Press the **F**-key for about 4 seconds until [**C. *SEt.***] appears and then let go. The most recently saved factor will be displayed (flashing).	*C.SEt.* M *0.000000* #
⇨ To enter the factor, press the **TARE**-key; the enabled digit starts flashing. Each time the **TARE**-key is pressed, numbers will run through from 0-9 and the decimal point. ► ⇒ *0* ⇒ *1* ⇒ *2* ≈ *9* ⇒ • ⇒ *0* Select the number to be changed using **F** key (the active position flashes): Save the factor by pressing the **S**-key or cancel the entry by pressing the **PRINT**-key.	M *0.000000* # *00000025* #

Weighing by applying factor Place goods to be weighed on balance. The weighing value in [g] will automatically be multiplied by the set factor, e. g. Display value 250.000 # = factor (2.5) x weighing value in ”g“ (100.000 g)	*250.0000* #
Display change Pressing the **F**-key repeatedly is a way to change the display value to [g] or [#] or additional enabled functions (see chpt. 11).	*250.0000* # ⇕ *100.0000* g

Print

⇨ The display value can be printed out by connecting an optional printer and pressing the **PRINT**-key, see chpt. 15 "printer mode".
[⬈] is displayed during printing.

Printout
- Display value in [#]

  +0500.033 # S

      1 2

- Display value in [g]

  +050.000/5 G U
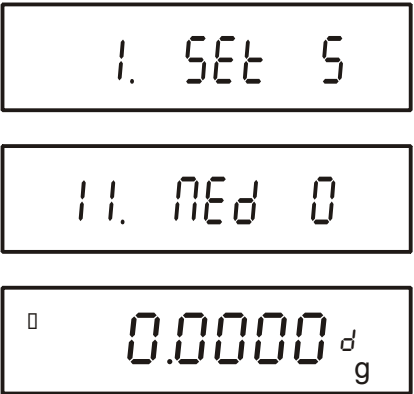
    3 4 5
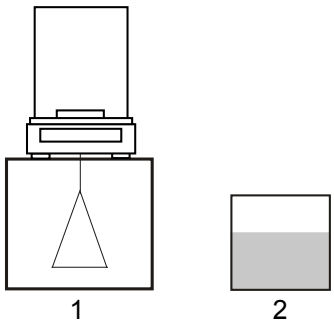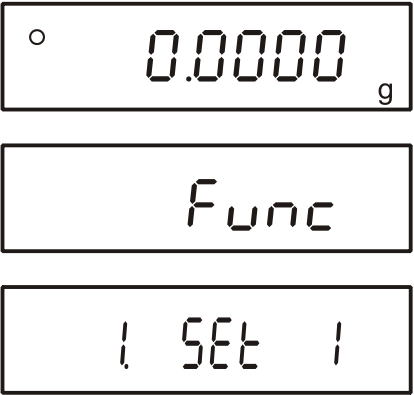
1	%	Variable factor for weighing unit
2	S	Stable value
3	/	Auxiliary display (verifiable models only)
4	G	Weighing unit "gram"
5	U	Instable value

i Readability is automatically set to 1, 2 or 5 according to the factor set.

English

11.5 Density determination of solids (hydrostatic weighing)

Density is the relationship of weight [g] : volume [cm^3]. The weight is determined by weighing the sample in air. The volume results from the ascending force [g] of the sample dipped in a liquid. The density [g/cm^3] of that liquid is known (principle of Archimedes).

1. How to prepare the weighing balance

The density is determined with help of the underfloor weighing device. Prepare the balance as follows: • Switch off the balance • Remove the weighing pan and carefully turn over the weighing balance. • Screw-in hook for underfloor weighing (option) • Place weighing balance over an opening. • Attach sample holder (1) • Fill measuring liquid (2) in a vessel e.g. beaker and temper it.	 1　　　　2
Activate function ⇨ In weighing mode keep the **F**-key pressed down until [Func] appears on the display. Release button. The first menu item showing the current setting will be displayed.	○　　0.0000 g Func 1. SEt 1
⇨ Press the **TARE**-key repeatedly until the menu item "density determination solids" appears. ⇨ Press and hold the **F**-key until the next menu item appears that is used for selecting the auxiliary liquid. 　[0] :　dest. Water 　[1] :　Measuring your choice of liquid, density of which is known ⇨ Confirm by pressing the **S**-key.	1. SEt 5 11. MEd 0 0.0000 $\frac{d}{g}$

2. Input parameter auxiliary liquid

Was **dest.water** selected as measuring liquid [*l l ∏E d. 0*] the water temperature is input (input range 0.0 to 99.9°).
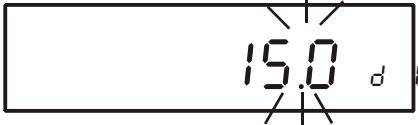
|	
⇨ Press and hold the **TARE**-key until the flashing display used for entering water temperature appears. Each time the **TARE**-key is pressed, numbers will run through from 0-9 and the decimal point. ▸ 0 ⇒ 1 ⇒ 2 ~ 9 Select the number to be changed using **F** key (the active position flashes): ⇨ Confirm by pressing the **S**-key.	*15.0* d t ⊡ *0.0000* d g

Defined as auxiliary liquid of **your choice** [*l l ∏E d. l*] its density is input (input range 0.0001 to 9.9999 g/cm³).

⇨ Press and hold the **TARE**-key until the flashing display used for entering density appears. Each time the **TARE**-key is pressed, numbers will run through from 0-9 and the decimal point. ▸ 0 ⇒ 1 ⇒ 2 ~ 9 Select the number to be changed using **F** key (the active position flashes): ⇨ Confirm by pressing the **S**-key.	▸ *1.0000* d ◂ ⊡ *0.0000* d g

English

3. Density determination sample

After the parameter input for the measuring liquid, the density of your sample will be determined
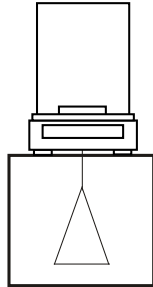
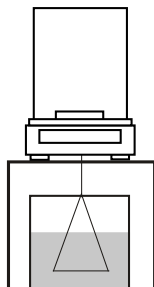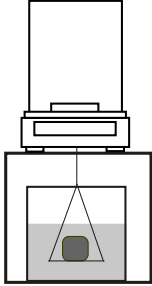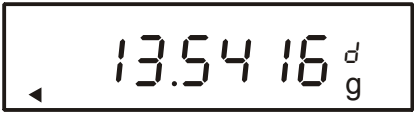|	
Weight of the sample in air Tare sample holder by pressing the **TARE**-key.	`0.0000` ᵈg
⇨ Put-on sample Wait until the weight display of the weighing balance has become stable and then press the **S**-key. [ı ⊓] is flashing, weight of "sample in air" is displayed. [◄] indicates that the weight of the "sample in air" has been saved.	`21.4705` ᵈg ◄
Weight of sample in auxiliary liquid Immerse sample holder and tare by pressing the **TARE**-key	
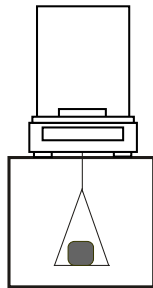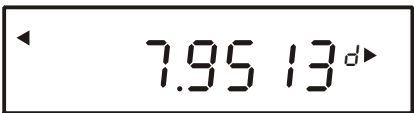
⇨ Place sample and immerse it Make sure that the sample holder does not touch the beaker. Wait until the weight display of the weighing balance has become stable and then store by pressing the **S**-key. The density of your sample is displayed, characterized by the ▶ symbol right above.	$13.5416\,^{d}_{g}$ ⇩ 2.7004^{d}
(1) Display change Repeated pressing of the **F**-key is a way to change from **[density of sample]** to **[volume of sample]**.	2.7004^{d} ⇕ 7.9513^{d}
(2) Back to weighing mode. When **[density of sample]** appears on the screen, press the **S**-key. Weight of sample is indicated.	

ℹ To interrupt measuring, press the **PRINT**-key.

4. Data output in density determination mode

In density determination mode data output will take place after this was set in menu item **[13. A.o.]**, regardless of the settings in menu item **[71.   o.c.],** see chpt. 10.1.5.

The content of the data output is defined in menu item **[12. d.o.d.].**

For settings in menu see chpt. 10.

Data output	12. d.o.d.	* 0	only output measuring value density
		1	Output of all density parameters
Autom. Data output	13. A.o.	* 0	OFF (Output only after pressing PRINT key)
		1	ON

Examples of data output
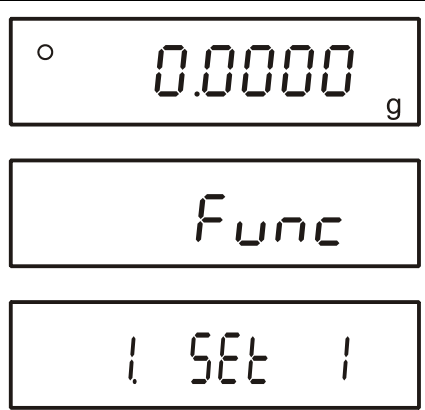
<table>
<tr><th rowspan="2">Menu settings</th><th colspan="2">Printout</th></tr>
<tr><th>Auxiliary liquid water</th><th>Measuring liquid of your selection</th></tr>
<tr>
<td>12.   d.o.d. 1</td>
<td>

DENSITY SOLID
2. 751
SAMPLE WEIGHT
21. 4705 g
TEMPERATURE NOW
15. 0 c

Output of all density parameters
</td>
<td>

DENSITY SOLID
2. 414
SAMPLE WEIGHT
30. 0023 g
DENSITY MED. LIQ
1. 325
VOLUME/ cm8
10. 2198

Output of all density parameters
</td>
</tr>
<tr>
<td>12. d.o.d. 0</td>
<td colspan="2">

DENSITY LIQUID
1. 2351

only output measuring value density
</td>
</tr>
</table>

11.6 Adding of displayed values

This function can be used to automatically add any number of single weighings to a total, such as single weighings of a batch.
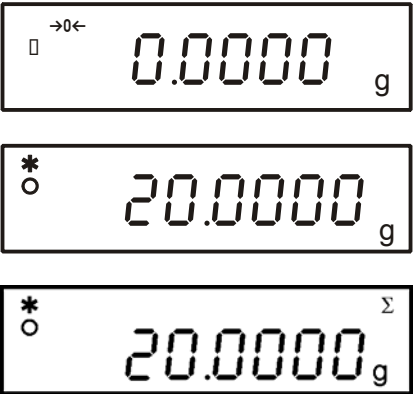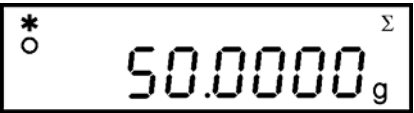
The add-up function is available for the following functions:

- Weighing
- Parts counting
- Percent determination
- Weighing with freely programmable weighing unit

Activate function ⇨ In weighing mode keep the **F**-key pressed down until **[Func]** appears on the display. Release button. The first menu item showing the current setting will be displayed.	○ 0.0000 g Func 1. SEt 1
⇨ Press the **F**-key and menu item **[2 SEL]** will appear. ⇨ Select the desired setting by pressing the **TARE**-key **[1]** : Add-up **[3]** : Tolerance weighing /Add-up	2. SEL 1
⇨ Press the **F**-key again ⇨ Select the desired setting by pressing the **TARE**-key **[1]** : Add-up without AUTO-TARA **[2]** : Adding with AUTO-TARA ⇨ Confirm by pressing the **S**-key. (*) indicates that weighing balance is in add-up mode.	26. Ad.n 1

English

11.6.1 Add-up without AUTO-TARE

Menu setting [26. Ad.N. 1]

Adding 1. Press the **TARE**-key and wait for zero to be displayed. 2. Deposit weight **A** 3. Wait until stability display [O] appears and then press the **S**-key. The displayed value is added into the total adding memory. The total **[Σ]** is briefly shown	→0← 0.0000 g * O 20.0000 g * Σ O 20.0000 g
4. Remove load or leave load on weighing pan and reset display to zero by pressing the **TARE**-key. 5. Wait until the balance zero display is shown, then place weight **B** on balance	* O 30.0000 g
6. Wait until stability display [O] appears and then press the **S**-key. The displayed value is added into the total adding memory. The total **[Σ]** is briefly shown.	* Σ O 50.0000 g
Remove weight and place further weights on balance; for each weight, repeat step 2 to 4	
Display "total" ⇨ Press the **F**-key repeatedly; total for all single weighings will be displayed or switch-over to additional enabled functions will take place (see chpt. 11).	* Σ O 50.0000 g
Delete total added memory ⇨ Display total and then press the **TARE**-key.	→0← Σ O 0.0000 g
Back to weighing mode / start new add-up process. ⇨ Press **F** key	O 0.0000 g

11.6.2 Adding with AUTO-TARA

Menu setting [$26.\ Rd\Pi.\ 2$]

Adding of displayed values is possible without removing the weight.
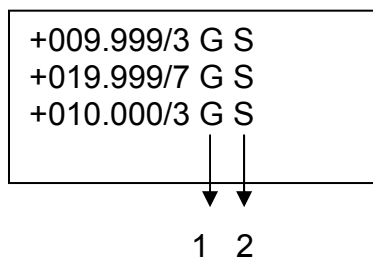
Implementation same as for add-up without AUTO-TARA (see chpt. 11.6.1).
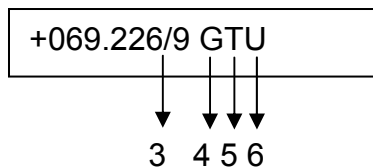Hereby omit step 4. The balance is automatically reset to zero, without taking away the weight.

Print

⇨ The display value can be printed out by connecting an optional printer and pressing the **PRINT**-key, see chpt. 15 "printer mode".
[⏎] is displayed during printing.

Printout

* Single weighings A - C

```
+009.999/3 G S
+019.999/7 G S
+010.000/3 G S
```

     ↓ ↓
     1 2

* Sum

```
+069.226/9 GTU
```

   ↓ ↓↓↓
   3 4 5 6

1	G	Weighing unit "gram"
2	S	Stable value
3	/	Auxiliary display (verifiable models only)
4	G	Weighing unit "gram"
5	T	Total of all individual weighings

i

t-Err	Display was not reset to zero after pressing the **S**-key.
*	You may add more load.

11.7 Weighing with tolerance range

11.7.1 General

This balance can be used as dispensing as well as sorting balance; the respective lower tolerance limit as well as upper tolerance limit can be programmed. An acoustic signal supports portioning, dispensing or sorting.

Tolerance weighing function in menu (see chpt. 10.1):

$$\text{[2.SEL.2]}$$

or activate the combination tolerance weighing/adding (tolerance control on the respective poured quantity):

$$\text{[2. SEL.3]}$$

Entering limits is possible for the following functions:

- Weighing
- Parts counting
- Percent determination
- Weighing with freely programmable weighing unit

There are two different ways to carry out evaluation of limits:

1. Evaluation of absolute values **[24. typ. 1]**:
   An exact reference value (e.g. 1 kg) is set.

2. Evaluation with difference values **[24. typ.2]**:
   An upper limit and a lower limit for a reference value are set.

Example:

	Reference value	Lower limit	Upper limit
Poured quantity	100.0000 g	97.0000 g	105.0000 g
Evaluation of absolute values	100.0000 g	97.0000 g	105.0000 g
Evaluation with difference values	100.0000 g	-3.0000 g	5.0000 g

There are two different ways to set the tolerance limits:

1. By weighing, that is by placing item on weighing balance and saving this value.

2. Numeric entry of values via keyboard

i
- If a limiting value was set it remains saved until the balance is turned off.

- For the functions weighing, counting, percent individual limits can be set.

- When entering limits, pay particular attention to the type of classification set (absolute/differential values).
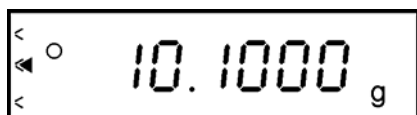
11.7.2 Display of the results

The triangular tolerance marker (◄) in the display of the display shows whether the goods to be weighed are within the two tolerance limits.
The tolerance marker is only in operation during operating mode tolerance weighing; it is otherwise not visible.

The tolerance marker provides the following information:
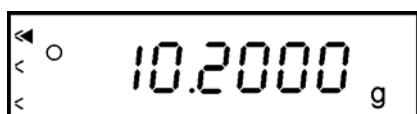
10.2000 g	Goods to be weighed above tolerance limit
10.1000 g	Goods to be weighed within tolerance range
10.0000 g	Goods to be weighed below tolerance limit

Bar graph display:

	Lower limit < Weight
	Lower limit ≤ Weight ≤ Upper limit
	Weight < Lower limit
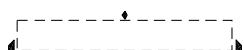
Display tolerance tag at 1-2 limiting points:

◀◀ ----------- Upper tolerance limit

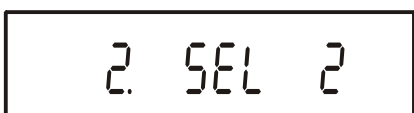◀◀ ----------- Within tolerance range

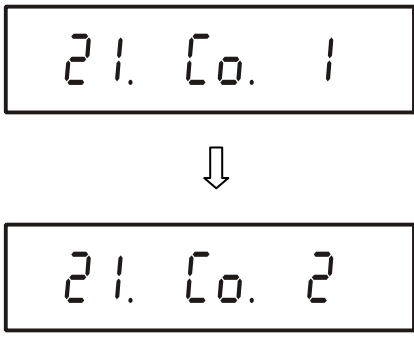◀◀ ----------- Lower tolerance limit
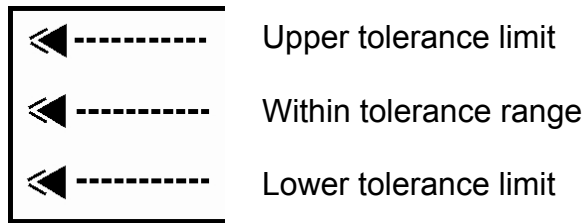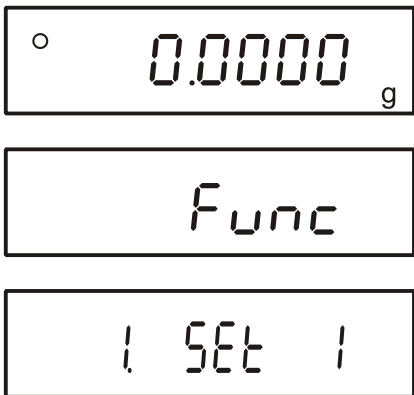
Grading	If a point is set as lower limit	If two points are set as upper and lower limit
Goods to be weighed above tolerance limit	No display	Upper limit < weight
Goods to be weighed within tolerance range	Lower limit $\leq$ Weight	Lower limit $\leq$ Weight $\leq$ Upper limit
Goods to be weighed below tolerance limit	Weight < lower limit	Weight < lower limit

Display tolerance tag at 3-4 limiting points:

◀◀ ----------- Limit 5
◀◀ ----------- Limit 4
◀◀ ----------- Limit 3
◀◀ ----------- Limit 2
◀◀ ----------- Limit 1
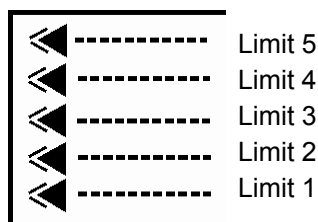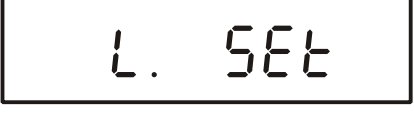
Limit 5	4. Limiting point $\leq$ weight
Limit 4	3. Limiting point $\leq$ weight < 4th limiting point
Limit 3	2. Limiting point $\leq$ weight < 3th limiting point
Limit 2	1. Limiting point $\leq$ weight < 2nd limiting point
Limit 1	Weight < 1st limiting point

11.7.3 Enable function / settings in menu

Activate function ⇨ In weighing mode keep the **F**-key pressed down until **[Func]** appears on the display. Release button. The first menu item showing the current setting will be displayed.	○ **0.0000** g **Func** **1. SEt 1**
⇨ Press the **F**-key and menu item **[2 SEL]** will appear. ⇨ Select the desired setting by pressing the **TARE**-key **[2]** : Tolerance weighing **[3]**: Tolerance weighing /Add-up	**2. SEL 2**
Select menu item "settings" ⇨ Press the **F**-key again ⇨ Press the **TARE**-key to select the desired setting, see chpt. 10.1.4. From then on additional settings can be selected each time the **F**-key is pressed.	**21. Co. 1** The first menu item for setting the tolerance marker appears.
How to change settings ⇨ Select the desired setting by pressing the **TARE**-key, see chpt. 10.1.4. ⇨ Confirm by pressing the **S**-key.	**21. Co. 1** ⇩ **21. Co. 2**
How to save settings / how to exit the menu ⇨ Press the **S**-key Weighing balance is in tolerance mode, the triangular tolerance tags are faded in.	◄◄ ◄ **0.0000** g ◄

11.7.4 Tolerance control for absolute values

• **Entering 2 limits by weighing**

|	
1. How to enable the tolerance weighing function **[2.SEL.2]** or **[2.SEL.3],** see chpt. 11.7.3.	⟦ 2. SEL 2 ⟧
2. For settings in menu see chpt. 11.7.3.	⟦ 21. Co. 1 ⟧ ⇩ Setting for 2 limiting values: ⟦ 23. Pi. 2 ⟧ ⇩ Setting for absolute value: ⟦ 24. tYP. 1 ⟧
3. How to save settings / how to exit the menu ⇨ Press the **S**-key Weighing balance is in tolerance mode, the triangular tolerance tags are faded in.	⟦ ◄ 0.0000 g ⟧
4. Entering limiting values: ⇨ Press the **S**-key for about 4 seconds until [*L. SET.*] appears and then let go. The most recently saved lower limit will be displayed (flashing).	⟦ L. SEt ⟧ ⇩ ⟦ ◄M 0.0000 g ⟧

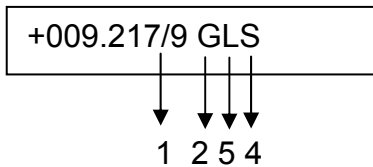|	
5. Place sample for the lower (i.e. smaller) limiting value on the weighing plate: 6. Save by pressing the **F**-key. The lower limit will briefly be faded in, followed by [*H. SET*] (This completes the entry provided only one limit is set for tolerance control – menu setting [*23. P ı. ı*])	H. SEt
7. Wait until the display starts flashing and the most recently upper limit is displayed. Place sample for the upper (i.e. larger) limiting value on the weighing plate.	◄ M 0.0000 g
8. Save by pressing the **F**-key. The upper limit will be faded in and the weighing balance returns to tolerance weighing mode. Remove sample. From here evaluation takes place whether the goods to be weighed are within the two tolerance limits.	< < ▯ 0.0000 g ◄
Display change Pressing the **F**-key repeatedly is a way to change the display value to additional enabled functions.	

English

Print

⇨ The display value can be printed out by connecting an optional printer and pressing the **PRINT**-key, see chpt. 15 "printer mode".
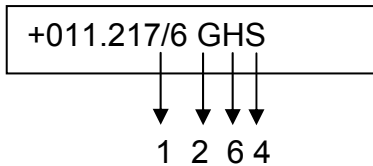[⤷] is displayed during printing.

Printout

- Goods to be weighed within tolerance range
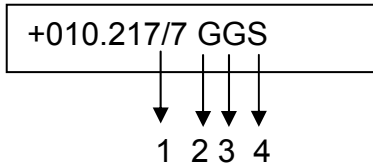
```
+010.217/7 GGS
```
↓ ↓ ↓ ↓
1 2 3 4

- Goods to be weighed below tolerance limit

```
+009.217/9 GLS
```
↓ ↓↓↓
1 2 5 4

- Goods to be weighed above tolerance limit

```
+011.217/6 GHS
```
↓ ↓↓↓
1 2 6 4

1	/	Auxiliary display (verifiable models only)
2	G	Weighing unit "gram"
3	G	Goods to be weighed within tolerance range
4	S	Stable value
5	L	Goods to be weighed below tolerance limit
6	H	Goods to be weighed above tolerance limit

- **Entering 3 or 4 limits by weighing**

Menu setting **[23. P 1. 3]** or **[23. P 1. 4].**
For setting of limits proceed as for entry of 2 limits. Instead of [*L. SET*] and [*H. SET*] appears [*L1. SET*] - [*L3. SET*] or [*L4. SET*]. For this purpose repeat step 2 and 3 in each case.
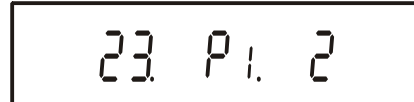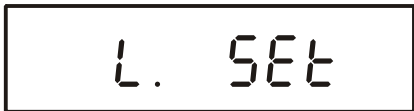
Display of tolerance mark:

≪ ---------- L 4. SEt
≪ ---------- L 3. SEt

≪ ---------- L 2. SEt
≪ ---------- L 1. SEt
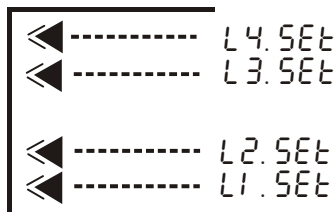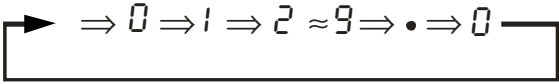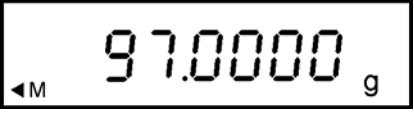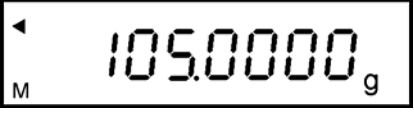
- **Numeric entering of 2 limits**

Example:

	Lower limit	Upper limit
Weight value	97.0000g	105.0000 g
Input	97.0000g	105.0000 g

1. How to enable the tolerance weighing function **[2.SEL.2]** or **[2.SEL.3],** see chpt. 11.7.3.	2. SEL 2
2. For settings in menu see chpt. 11.7.3.	21. Co. 1 ⇩ Setting for 2 limiting values: 23. Pi. 2 ⇩ Setting for absolute value: 24. tYP. 1
3. How to save settings / how to exit the menu ⇨ Press the **S**-key Weighing balance is in tolerance mode, the triangular tolerance tags are faded in.	0.0000 g
4. Entering limiting values: ⇨ Press the **S**-key for about 4 seconds until [*L. SET*] appears and then let go. The most recently saved lower limit will be displayed (flashing).	L. SEt ⇩ 0.0000 g

5. Press and hold the **TARE**-key until the display used for entering the limit appears.
 	
Each time the **TARE**-key is pressed, numbers will run through from 0-9 and the decimal point.
 	
$$\Rightarrow 0 \Rightarrow 1 \Rightarrow 2 \approx 9 \Rightarrow \bullet \Rightarrow 0$$
 	
Select the number to be changed using **F** key (the active position flashes):
 	
6. Save by pressing the **S**-key. The lower limit will briefly be faded in, followed by [*H. SET*] (This completes the entry provided only one limit is set for tolerance control – menu setting [*23. Pi. 1*])
	`0000.0000 g`
	
	`0097.0000 g`
	
	`◄M  97.0000 g`
	
	`H. 5Et`

7. Wait until the display starts flashing and the most recently upper limit is displayed. Enter upper limit by repeating 5-6.	`◄`
	`M  0.0000 g`
	
	`◄`
	`M  105.0000 g`

8. Save by pressing the **S**-key. The upper limit will briefly be faded in and the weighing balance returns to tolerance weighing mode. Remove sample. From here evaluation takes place whether the goods to be weighed are within the two tolerance limits.	`0.0000 g`
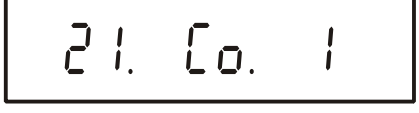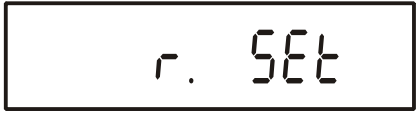
- **Numeric entry of 3 or 4 limits**

Menu setting [*23. Pi. 3*] or [*23. Pi. 4*].
For numeric entry of limits proceed as for entry of 2 limits. Instead of [*L. SET*] and [*H. SET*] appears *[L1. SET]* - [*L3. SET*] or [*L4. SET*]. For this purpose repeat step 5 to 7 in each case.

11.7.5 Tolerance control for differential values

- **Entering 2 limits by weighing**

1. How to enable the tolerance weighing function [*2.SEL.2*] or [*2.SEL.3*], see chpt. 11.7.3.	⎕ 2. SEL 2
2. For settings in menu see chpt. 11.7.3.	⎕ 21. Co. 1 ⇩ Setting for 2 limiting values: ⎕ 23. Pi. 2 ⇩ Setting for differential value: ⎕ 24. tYP. 2
3. How to save settings / how to exit the menu ⇨ Press the **S**-key Weighing balance is in tolerance mode, the triangular tolerance tags are faded in.	⎕ 0.0000 g
4. How to set reference weight and limits: ⇨ Press the **S**-key for about 4 seconds until [*r. SET.*] appears and then let go. The most recently saved reference weight will be displayed (flashing).	⎕ r. SEt ⇩ ⎕ M 0.0000 g

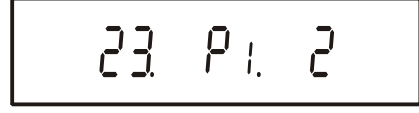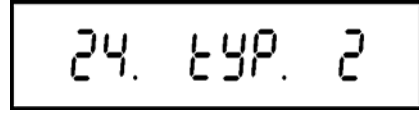|	
5. Place the sample used to determine the reference weight on the weighing pan. 6. Save by pressing the **F**-key. The reference weight will briefly be faded in, followed by [*L. SET*]. 7. Wait until the display starts flashing and the most recently stored value is displayed.	[*L. SEt*] ⇩ [◂ M *0.0000* g]
9. Place sample for the lower (i.e. smaller) limiting value on the weighing plate: 10. Save by pressing the **F**-key. The difference "reference weight – lower limit" will briefly be faded in, followed by [*H. SET*].	[*H. SEt*]
11. Wait until the display starts flashing and the most recently upper limit is displayed. Place sample for the upper (i.e. larger) limiting value on the weighing plate:	[◂ M *0.0000* g]
12. Save by pressing the **F**-key. The difference "reference weight – upper limit" will briefly be faded in, followed by the weight value of the sample. The balance returns to tolerance weighing mode. Remove sample. From here evaluation takes place whether the goods to be weighed are within the two tolerance limits.	[< < ⬚ ◂◂ *0.0000* g]

- **Entering 3 or 4 limits by weighing**

Menu setting **[23. P ı. 3]** or **[23. P ı. 4].**
For setting of limits proceed as for entry of 2 limits. Instead of [*L. SET*] and [*H. SET*] appears [*L1. SET*] - [*L3. SET*] or [*L4. SET*]. For this purpose repeat step 5 to 7 in each case.

Display of tolerance mark:

≪ ----------- *L 4. SEt*
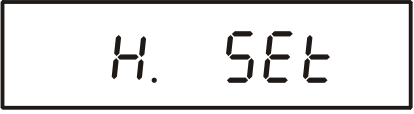≪ ----------- *L 3. SEt*
≪ ----------- *r. SEt*
≪ ----------- *L 2. SEt*
≪ ----------- *L ı. SEt*
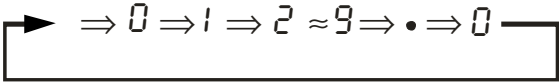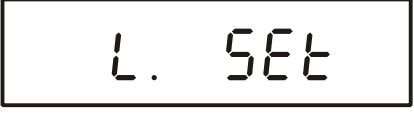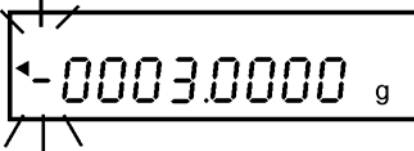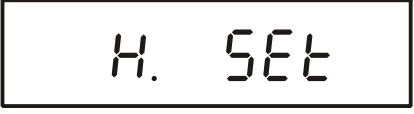
- **Numeric entering of 2 limits**

Example:

	Reference weight	Lower limit	Upper limit
Weight value	100.0000 g	97.0000 g	105.0000 g
Input	100.0000 g	-3.0000 g	5.0000 g

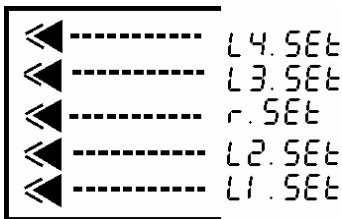|	
1. How to enable the tolerance weighing function **[2.SEL.2]** or **[2.SEL.3],** see chpt. 11.7.3.	2. SEL 2
2. For settings in menu see chpt. 11.7.3.	21. Co. 1 ⇩ Setting for 2 limiting values: 23. Pi. 2 ⇩ Setting for differential value: 24. tYP. 2
3. How to save settings / how to exit the menu ⇨ Press the **S**-key Weighing balance is in tolerance mode, the triangular tolerance tags are faded in.	0.0000 g
4. How to set reference weight and limits: ⇨ Press the **S**-key for about 4 seconds until [*r. SET*.] appears and then let go. The most recently saved reference weight will be displayed (flashing).	r. SEt ⇩ 0.0000 g M

5. Press and hold the **TARE**-key until the display used for entering the reference weight appears. Each time the **TARE**-key is pressed, numbers will run through from 0-9 and the decimal point. $$\Rightarrow 0 \Rightarrow 1 \Rightarrow 2 \approx 9 \Rightarrow \bullet \Rightarrow 0$$ Select the number to be changed using **F** key (the active position flashes): 8. Confirm by pressing the **S**-key. The reference weight will briefly be faded in, followed by [*L. SET*].	`0000.0000` g `100.0000` g `L.  SEt`
6. Wait until the display starts flashing and the most recently stored value is displayed. Enter difference "reference weight – lower limit" as described in step 5.	`-0003.0000` g
7. Confirm by pressing the **S**-key. The value will briefly be faded in, followed by [*H. SET*]. (This completes the entry provided only one limit is set for tolerance control – menu setting [*23. Pi.1*]).	`H.  SEt`
8. Wait until the display starts flashing and the most recently stored value is displayed. Enter difference "reference weight – upper limit" as described in step 5.	`0005.0000` g
9. Save by pressing the **S**-key. The balance returns to tolerance weighing mode. Remove sample. From here evaluation takes place whether the goods to be weighed are within the two tolerance limits.	`0.0000` g
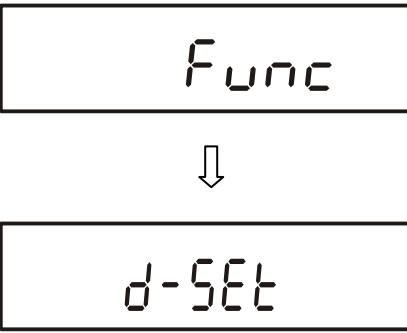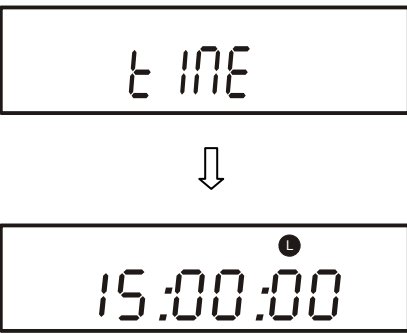
- **Numeric entry of 3 or 4 limits**

Menu setting **[*23. Pi.3*]** or **[*23. Pi.4*].**
For numeric entry of limits proceed as for entry of 2 limits. Instead of [*L. SET*] and [*H. SET*] appears *[L1. SET]* - [*L3. SET*] or [*L4. SET*]. For this purpose repeat step 5 to 7 in each case.
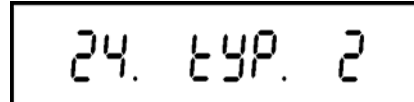
12 How to set date/time
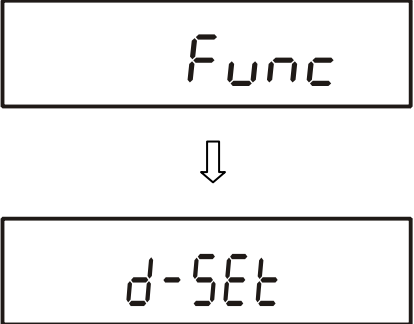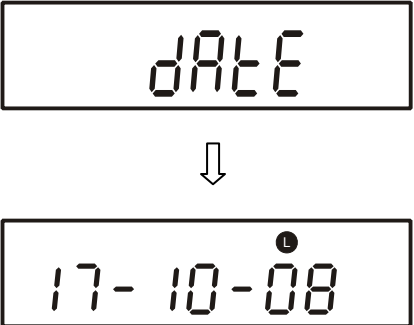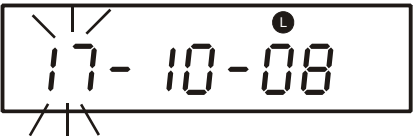
12.1 Time

Invoke time ⇨ Press and hold the **F**-key in weighing mode until [Func] followed by [d-SEt] appears.	$\boxed{Func}$ ⇩ $\boxed{d\text{-}SEt}$
⇨ Press the **F**-key again; most recently saved time will appear.	$\boxed{t\,IIE}$ ⇩ $\boxed{15{:}00{:}00}$
How to change time ⇨ Press the **S**-key. Press the **TARE**-key to change the numeric value. Press the **F**-key to select the digit (enabled digit is flashing each time). Press the **PRINT**-key to cancel your entry.	$\boxed{15{:}00{:}00}$
How to save time settings ⇨ Press the **S**-key; date display appears. For change of settings, see chapter 12.2 below.	$\boxed{17\text{-} 10\text{-}08}$
Return to weighing mode ⇨ Press **F** key	$\boxed{0.0000 \ g}$

ℹ Output of time adjustable in menu item **[H   t.o.]**, see chpt. 10.1.2.

12.2 Date

Invoke time ⇨ Press and hold the **F**-key in weighing mode until [ᖴⵕᴨᴄ] followed by [ᑯ-ᔑᴇᴛ] appears.	ᖴⵕᴨᴄ ⇩ ᑯ-ᔑᴇᴛ
⇨ Press the **F**-key repeatedly.	ᑯᴀᴛᴇ ⇩ ● 17- 10-08
Change date ⇨ Press the **S**-key. Press the **TARE**-key to change the numeric value. Press the **F**-key to select the digit (enabled digit is flashing each time). Press the **PRINT**-key to cancel your entry.	● 17- 10-08
Save date ⇨ Press the **S**-key; balance will automatically return to weighing mode.	○ 0.0000 g

i   Output format of time adjustable in menu item [ᴳ. ᑯᴀᴛᴇ], see chpt. 10.1.2.

13 Description of individual menu items

13.1 Automatic cut-off of display backlight (Auto backlight OFF)

Menu item: **[b. Ab]** see chpt. 10.1.2

To save battery when function is enabled backlight of display will automatically switch off after 3 minutes during which there was no change of load or activity.

13.2 How to change weighing units

Menu item: **[C 1 u.A]** and **[C 3 u.b]** see chpt. 10.1.2.

This setting can be used to set different display units (A or B) for a weighing value. Use the **F**-key to choose between units A and B.

- "Units A" are available in all operating modes.

- "Units B" are only available in weighing mode **[1 SEt 1]**.

13.3 How to change readability (models AES only)

Menu item: **[C2 d.A]** and **[C 4 d.b]** see chpt. 10.1.2.

This function is used to change readability for weighing unit A or B. The last decimal place will be rounded or removed from the display.
Example for weighing unit [g] :

Function 1	C2 d.A / C4 d.b	Readability	Reaction to ambient conditions
Menu settings	1	0.0001 g	sensitive
	2	0.0002 g	
	3	0.0005 g	↕
	4	0.001 g	
	5	0.002 g	insensitive

13.4 Save tare value automatically (models AES only)

Menu item: **[** L.   tArE **]** see chpt. 10.1.2

Last tare value will be saved if function is enabled.
After turning off/on the weighing balance will continue working with the saved tare value.

13.5 Instant start

Menu item: **[** n.   d.St. **]** see chpt. 10.1.2

If this function is enabled, the weighing balance will automatically start when the line adapter is connected without having to press the **ON/OFF**-key.

13.6 Interval output function
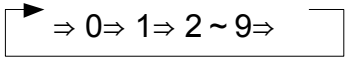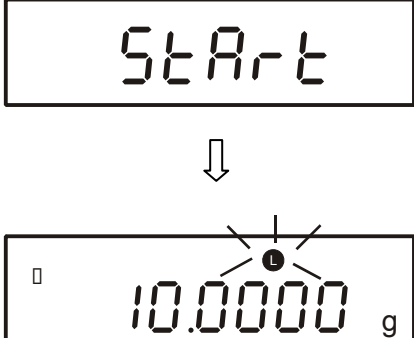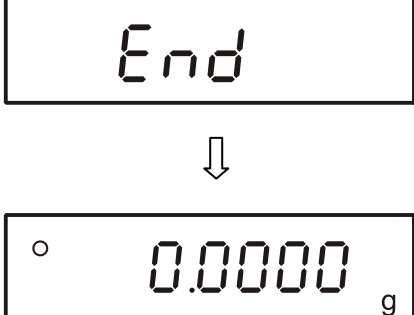
Menu item: **[** 7ι   o.c.   A **]** and **[** 7ι   o.c   b. **]** see chpt. 10.1.5.

This menu item is used to define after which interval data output must take place.

Call function	
⇨ In weighing mode keep the **S**-key pressed until **[** Int.UAL **]** appears. Time to be changed is flashing	Int.UAL ⇩ 00:00:05

How to change settings ⇨ Press the **TARE**-key to change the numeric value. Press the **F**-key to select the digit (enabled digit is flashing each time). Press the **PRINT**-key to cancel your entry.	⇒ 0⇒ 1⇒ 2 ~ 9⇒
Save setting ⇨ Press the **S**-key; balance will automatically return to weighing mode.	○ 0.0000 g
Start interval output ⇨ Press the **PRINT**-key [●] flashing between output [▣] flashing during output	StArt ⇩ 10.0000 g
Stop interval output ⇨ Press the **PRINT**-key; balance will automatically return to weighing mode.	End ⇩ ○ 0.0000 g
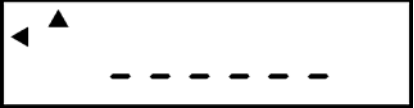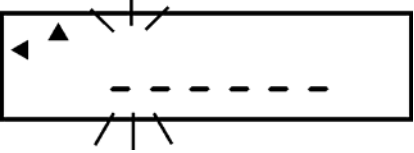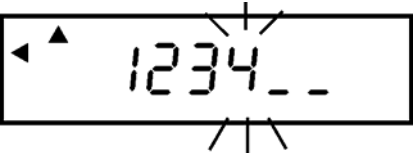
ℹ
- Error message [б-Err] appears for invalid entries, such as interval = 0
- When menu item **[Hi t.o.]** is enabled, see chpt. 10.2 interval output will take place showing current time.

13.7 How to enter ID number for weighing balance

The weighing balance ID number set in this menu item will be issued during ISO/GLP/GMP printouts.

Display symbol **[◄]** and **[▲]**

You may enter a 6-digit number ranging from [0-9], [A-F], [-] and blank characters [_].

Call function ⇨ Go to menu 2 and invoke menu item **[⌐ ⌐d ⌐]**, see chpt. 10.2.1.	⌐ ⌐d ⌐
⇨ Press the **F**-key, current ID No. will appear.	▲ ◄ ------
⇨ Press the **TARE-key,** changed digit will start flashing.	▲ ◄ ------
How to change settings ⇨ Press the **TARE**-key to change the numeric value. Press the **F**-key to select the digit (enabled digit is flashing each time). Press the **PRINT**-key to cancel your entry.	▲ ◄ 1234__
Save setting ⇨ Press the **S**-key, current menu item will appear. ⇨ Press the **S**-key again; balance will automatically return to weighing mode.	○ 0.0000 g

14 Data output

The regular equipment of the balance includes an RS 232C interface and a printer interface.

14.1 RS 232C interface

The RS 232C interface allows a bi-directional data exchange from the balance to external devices. This data exchange is asynchronous using ASCII - Code.

Pin allocation of balance output plug:

Pin nr.	Signal	Input/Output	Function
1	-		
2	RXD	Input	Receive data
3	TXD	Output	Transmit data
4	DTR	Output	HIGH
5	GND	-	Signal ground
6	-	-	
7	-	-	
8	-	-	
9	-	-	
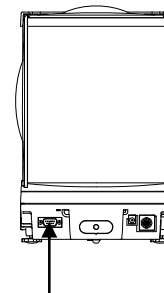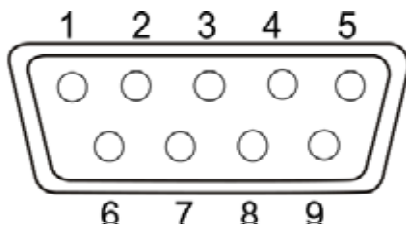
Interface cable:

- Balance – PC 9-pole

PC D-SUB9P			Balance D-SUB9P	
TXD	3	→	2	RX
RX	2	←	3	TXD
GN	5		5	GN
DC	1			
RTS	7			
CTS	8			
DS	6			
DTR	4			

- Balance – PC 25-pole

PC D-SUB25P			Balance D-SUB25P	
TXD	2	→	2	RXD
RXD	3	←	3	TXD
GND	7		5	GND
DCD	8			
RTS	4			
CTS	5			
DSR	6			
DTR	20			
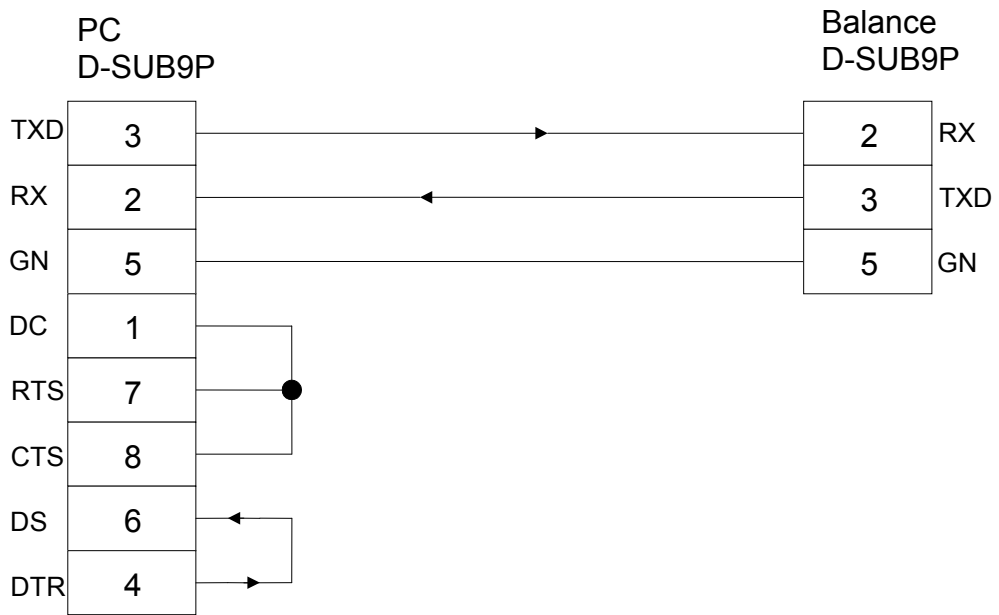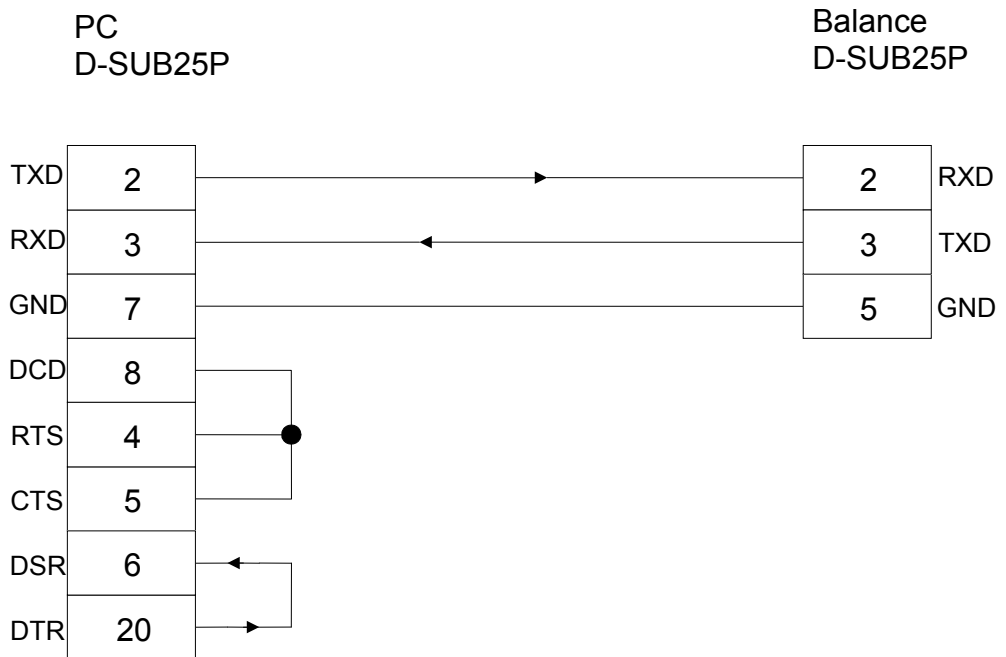
Technical Data

1. Transmission system   Serial/start-stop synchronous

2. Baud rate   1200/2400/4800/9600/19200 bps

3. Transmission code   ASCII codes (8/7 bits)

4. Signal   HIGH level (data logic 0) +5 to +15 V
   LOW level (data logic 1) -5 to -15 V

5. Bit setting

Start bit	1 bit
Data bits	8/7 bits
Parity bit	0/1 bit
Stop bits	2/1 bit

6. Parity   None/Odd/Even

Example: 8 Data bits/2 Stop bits
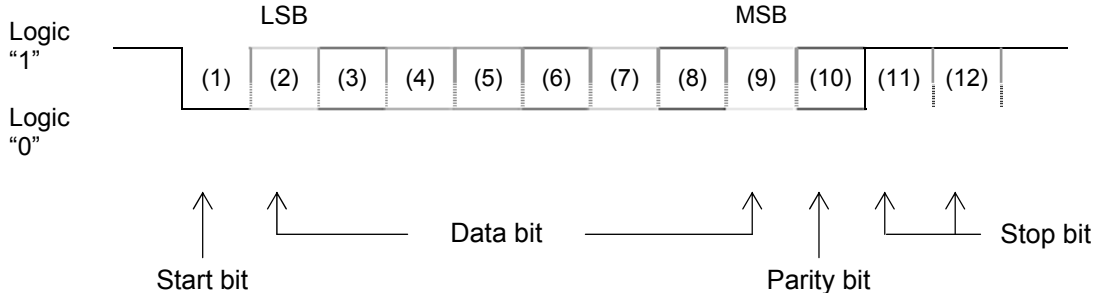
14.2 Printer interface (unidirectional data exchange)

Pin allocation of balance output plug:

Pin nr.	Signal	Input/Output	Function
1	EXT.TARE	Input	External tare function
2	-		
3	-		
4	TXD	Output	Transmit data
5	GND	-	Signal ground
6	-	-	
7	-	-	
8	-	-	
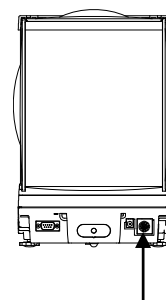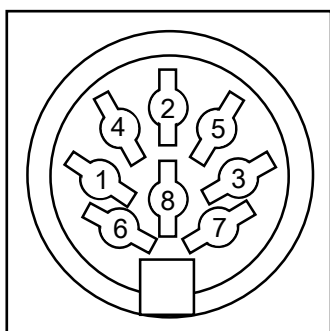
14.3 Description of interface

The selection of a certain operating mode allows you to set the output format, the output control, the transmission speed and the parity bit. The different options are described in **chpt. 10.1.5** under "parameter for serial interface".

14.4 Data output

14.4.1 Format for data transmission

You may customise the format of data transmission according to your requirements (7-digit data format / extended 7-digit data format). See menu overview chpt. 10.2.

Setting ex-works:

7-digit data format, consisting of 16 characters, including terminator; CR=0DH, LF=0AH (CR=weighing balance reverse / LF=vertical spacing). A parity bit can be appended. The oblique "/" is printed just before the last digit.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
P1	D1	D2	D3	D4	D5	D6	D7	D8	D9	U1	U2	S1	S2	CR	LF

14.4.2 Signs

P 1 = 1 word

P 1	Code	Significance
+	2 B H	Data is 0 or positive
-	2 D H	Data is negative

14.4.3 Numeric data

D 1 to D 8   8 words with 7-digit format

D 1 bis D 8	Code	Significance
0 - 9	30 H – 39 H	Data 0 to 9
●	2 EH	Decimal point, position not fixed
Sp	20 H	Space character, leading cero suppressed

14.4.4 Units

U 1, U 2 = 2 characters

U1	U2	ASCII code		Significance	Display
M	G	4DH	47H	Milligram	mg
(SP)	G	20H	47H	Gramm	g
C	T	43H	54H	Carat	ct
O	Z	4FH	5AH	Ounce	oz
L	B	4CH	42H	Pound	lb
O	T	4FH	54H	Troy ounce	oz t
D	W	44H	57H	Pennyweight	dwt
G	R	4BH	52H	Grain	GN
T	L	54H	4CH	Tael (Hong Kong)	tl
T	L	54H	4CH	Tael (Singapore, Malaysia)	tl Top right
T	L	54H	4CH	Tael (Taiwan)	tl Bottom right
M	O	4DH	4FH	Momme	mom
t	o	74H	6FH	Tola	to
P	C	50H	43H	Parts counting	Pcs
(SP)	%	20H	25H	Percent determination	%
(SP)	#	20H	23H	Freely programmable weighing unit	#

14.4.5 Output weighing data in operating mode

S 1 = 1 word

S1	Code	Significance	
L	4CH	Goods to be weighed below tolerance limit	1- or 2 end points
G	47H	Goods to be weighed within tolerance range	
H	48H	Goods to be weighed above tolerance limit	
1	31H	Limit 1	3- or 4 end points
2	32H	Limit 2	
3	33H	Limit 3	
4	34H	Limit 4	
5	35H	Limit 5	
T	54H	Total (add-up)	File Type
U	55H	Average piece weight (piece counting / weight value (weighing)	
(SP)	20H	No rating	
d	64H	Gross	

14.4.6 Data status

S 2 = 1 word

S 2	Code	Significance
S	53 H	Data stabilized *
U	55 H	Data not stabilized (fluctuating) *
E	45 H	Data error, all data apart from S 2 not allowed. Balance indicating error (o-Err, u-Err)
sp	20 H	No special status

14.4.7 Interval data output

When an interval output is started or stopped, this will result in the output of a header or footer line.

Header
- consisting of 15 characters (CR=0DH, LF=0AH)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Footers
- Two line feeds are inserted.

14.4.8 Output time

1	2	3	4	5	6	7	8
h	h	:	m	m	:	s	s

 ∗ hh: Hours (00-23), mm: Minutes (00-59) min: Seconds (00-59) s:

14.5 Input commands

14.5.1 Feedback
The format for the feedback can be set under menu item **[77 rES]**.

(1) [A00/Exx Format]

Menu item **[77 rES 1]**

Consisting of 5 characters including the terminators (CR, LF).

1	2	3	4	5
A1	A2	A3	CR	LF

A1	A2	A3	ASCII code			
A	0	0	41H	30H	30H	Free from error
E	0	1	45H	30H	31H	Error message
E	0 9	0 9	45H	30H 39H	30H 39H	Additional error deviant E01

(2) ACK/NAK Format

Menu item **[77 rES 2]**

Consisting of 1 character, without terminator.

1
A1

A1	ASCII code	
ACK	06H	Free from error
NAK	15H	Error message

14.5.2 External tare command

C1	C2	ASCII code		Description	Value	Feedback
T	(SP)	54H	20H	• Taring • Zeroing	None	A00: Execution successful E01: Error E04: Taring / zero not possible, admissible range exceeded.

14.5.3 Remote control instructions

C1	C2	Code		Significance	Feedback
O	0	4FH	30H	No data output	A00: Free from error E01: Error message E02: Interval error (OA or OB only)
O	1	4FH	31H	Continuous data output	
O	2	4FH	32H	Continuous data output stable weighing values	
O	3	4FH	33H	Output for stable and instable weighing values after pressing PRINT key	
O	4	4FH	34H	Output for stable weighing value after previous relief of balance	
O	5	4FH	35H	One output for stable weighing value. No output for stable weighing values. Renewed output after stabilization	
O	6	4FH	36H	One output for stable weighing value. Continuous output for instable weighing values.	
O	7	4FH	37H	Output of stable weighing values after pressing PRINT key	
O	8	4FH	38H	Single immediate output*	
O	9	4FH	39H	Single output after stabilization*	
O	A	4FH	41H	Single immediate output after a determined interval*	
O	B	4FH	42H	Single immediate output after a determined interval and a stable weighing value*	

* Do not operate the **PRINT**-key whilst using these remote control commands (would interrupt data transmission). If data transmission is interrupted disconnect weighing balance briefly from mains.

English

Remarks:

- The performance delivered by the output control via the commands "O0~O7" or setting the weighing balance functions is the same.
- Models "O8 and O9" are specifically designed for input commands.
- Once a command of "O0~O9" has been executed its status will remain enabled until the next command is given. However, after turning off the weighing balance output control returns to initial setting.

15 Printer mode

The following conditions must be met to provide successful communication between the weighing balance and the printer.

- Use a suitable cable to connect the weighing balance to the interface of the printer. Faultless operation requires an adequate KERN interface cable.
- Communication parameters (Baudrate, bits and parity) of weighing balance and printer have to match, see chpt. 10.1.5 "Settings for serial interface".

15.1 How to issue an adjustment protocol

For menu settings **[** F ı GLP ı **]** and **[** F ı out ı **]**, see chpt. 10.1

An adjustment protocol is issued after completing an adjustment/adjustment test. For sample protocols see chpt. 15.3.

15.2 ISO/GLP/GMP – compliant output for weighing data

Quality assurance systems require printouts of weighing results as well as of correct adjustment of the balance stating date and time and balance identification. The easiest way is to have a printer connected.

1. For menu setting [*F1 GLP 1*] and [*F2. od. 1*], see chpt. 10.1	
2. Output header prior to weighing. Keep **PRINT**-key pressed until [*HEAd*] appears. HEAd ⇨	GOTTL. KERN & SOHN TPYE: AEJ220-4M S/N 081853001 ID START DATE: 28.19.2008 TIME: 16:16
3. Output weighing data via **PRINT**-key. For details see chpt. 15.3.	+050.005/8 G U
4. Output footer. Keep **PRINT**-key pressed until [*Foot*] appears. Foot ⇨	END DATE: 28.19.2008 TIME: 16:17 SIGNATURE ****************************

ℹ   Do not press any key during data output [⇨].

15.3 Printout examples

- Standard printout "weighing data"

```
+050.005/8 G U
        ↓  ↓ ↓
        1  2 3
```
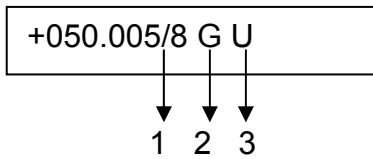
1. „/"   Tag auxiliary display (verifiable models only)
2. „G"   Weighing unit "gram" (For display of additional units see chpt. 14.4.4)
3. "U"   unstable

```
+100.005/8 CT d S
         ↓  ↓  ↓ ↓
         1  2  3 4
```
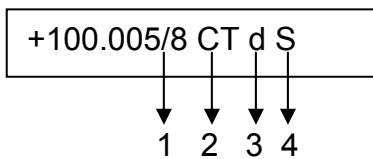
1. „/"   Tag auxiliary display
2. „G"   Weighing unit "carat"
3. "d"   Gross
4. "S"   stable

- ISO/GLP/GMP – compliant adjustment protocols

"Adjustment with internal weight"	Adjustment with external weight

CALIBRATION********
 	
DATE: 28.19.2008
TIME: 16:16
GOTTL. KERN & SOHN
TPYE:
          AEJ220-4M
S/N   081853001
ID   101
 	
CAL.INTERNAL
REF:
    220.000[0] g
 	
COMPLETE
DATE: 28.19.2008
TIME: 16:17
 	
SIGNATURE
 	
****
	CALIBRATION*********
	
	DATE: 28.19.2008
	TIME: 16:16
	GOTTL. KERN & SOHN
	TPYE:
	          AES120-4M
	S/N 081873001
	ID 1214 A
	
	CAL.EXTERNAL
	REF:
	    100.0000 g
	
	COMPLETE
	DATE: 28.19.2008
	TIME: 16:17
	
	SIGNATURE
	
	*****************************

"Adjustment test with internal weight"	Adjustment test with external weight

CAL.TEST**************
 	
DATE: 28.19.2008
TIME: 16:16
GOTTL. KERN & SOHN
TPYE:
         AEJ220-4M
S/N   081853001
ID   101
 	
CAL.INT.TEST
REF:
    220.000[0] g
DIFF:
    -000.041[3] g
 	
COMPLETE
DATE: 28.19.2008
TIME: 16:17
 	
SIGNATURE
 	
****
	** CAL.TEST **************
	
	DATE: 28.19.2008
	TIME: 16:16
	GOTTL. KERN & SOHN
	TPYE:
	         AES120-4M
	S/N 081873001
	ID 1214 A
	
	CAL.EXT.TEST
	REF:
	    100.0000 g
	DIFF:
	    -000.0007 g
	
	COMPLETE
	DATE: 28.19.2008
	TIME: 16:17
	
	SIGNATURE
	
	*****************************

16 Service, maintenance, disposal

16.1 Cleaning

Before cleaning, please disconnect the appliance from the operating voltage.

Please do not use aggressive cleaning agents (solvents or similar agents), but a cloth dampened with mild soap suds. Ensure that no liquid penetrates into the device and wipe with a dry soft cloth.
Loose residue sample/powder can be removed carefully with a brush or manual vacuum cleaner.

Spilled weighing goods must be removed immediately.

16.2 Service, maintenance

The appliance may only be opened by trained service technicians who are authorized by KERN.
Before opening, disconnect from power supply.

16.3 Disposal

Disposal of packaging and appliance must be carried out by operator according to valid national or regional law of the location where the appliance is used.

17 Error messages, troubleshooting guide

In case of an error in the program process, briefly turn off the balance and disconnect from power supply. The weighing process must then be restarted from the beginning.

Fault	Possible cause
The displayed weight does not glow.	• The balance is not switched on.
	• The mains supply connection has been interrupted (mains cable not plugged in/faulty).
	• Power supply interrupted.
The displayed weight is permanently changing	• Draught/air movement
	• Table/floor vibrations
	• The weighing plate is in contact with foreign matter.
	• Electromagnetic fields / static charging (choose different location/switch off interfering device if possible)
The weighing result is obviously incorrect	• The display of the balance is not at zero
	• Adjustment is no longer correct.
	• Great fluctuations in temperature.
	‣ Electromagnetic fields / static charging (choose different location/switch off interfering device if possible)

Error message	Possible cause
o-Err	• Weighing range exceeded
u-Err	• Insufficient preload, e. g. missing weighing pan
b-Err	• Check ambient conditions (draught, vibrations etc.)
d-Err	• Damaged electronics
A-Err	• Internal adjustment automatics defective

Should other error messages occur, switch balance off and then on again. If the error message remains inform dealer.