TECHNICAL DOCUMENTATION

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METTLER TOLEDO

# Service manual

# Electronic Analytical Balances METTLER AT series

Current status of the service manual, see section E.

AT100

AT200

AT201

AT250

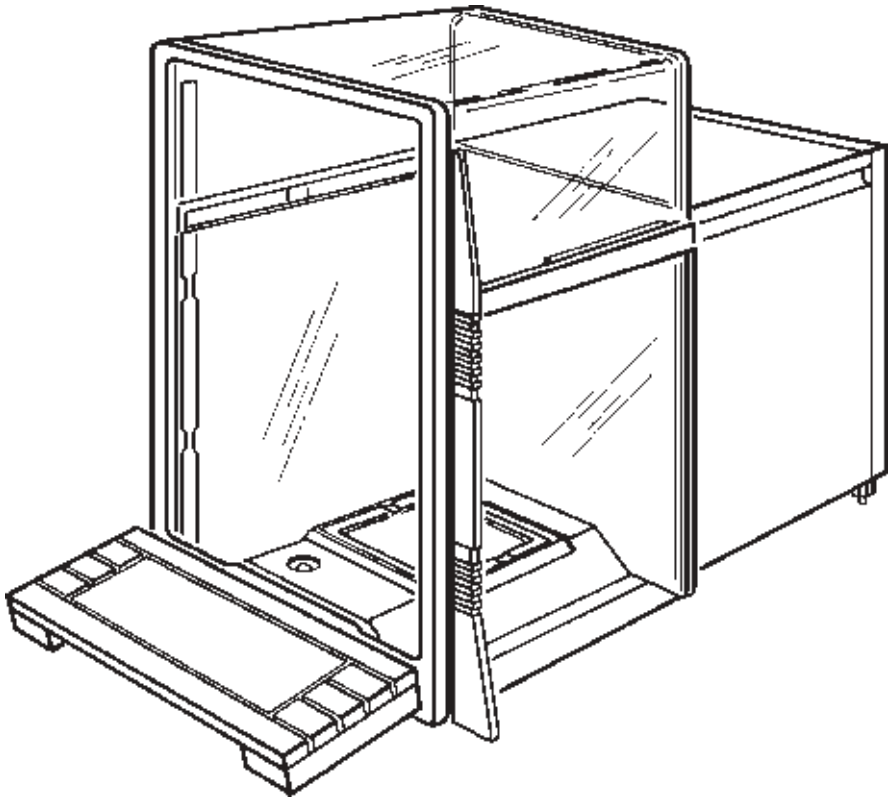
AT261

AT20

AT400

AT460

AT21 Comparator



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Edition: September 1996

## Spare parts

General
Exploded view diagram
Interconnection diagram, block diagram
Spare parts list

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## Checking

Tolerances
Control instructions
List of software Pacs
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Troubleshooting
Error messages

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Disassembly and assembly of parts
Special instructions regarding parts
Settings and adjustment

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## Service bulletins

Supplements

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## Data section

Component diagrams and schemes
Interconnection diagram

## Contents Page A

# 1. General

– The service manual contains instructions for the customer service.
– A knowledge of the operation of the balances is presupposed.

# 2. Organization of the service manual

– To facilitate your search for a particular topic, the service manual has been subdivided into different sections.
– The sections each have a table of contents according to requirements.
– At the top of each page is the section designation, the page number and the abbreviated designation of the service manual. The ME No. of the service manual and the issue date can be found at the bottom of each page. The first page of each section is always numbered 1.

# 3. How to use this documentation efficiently

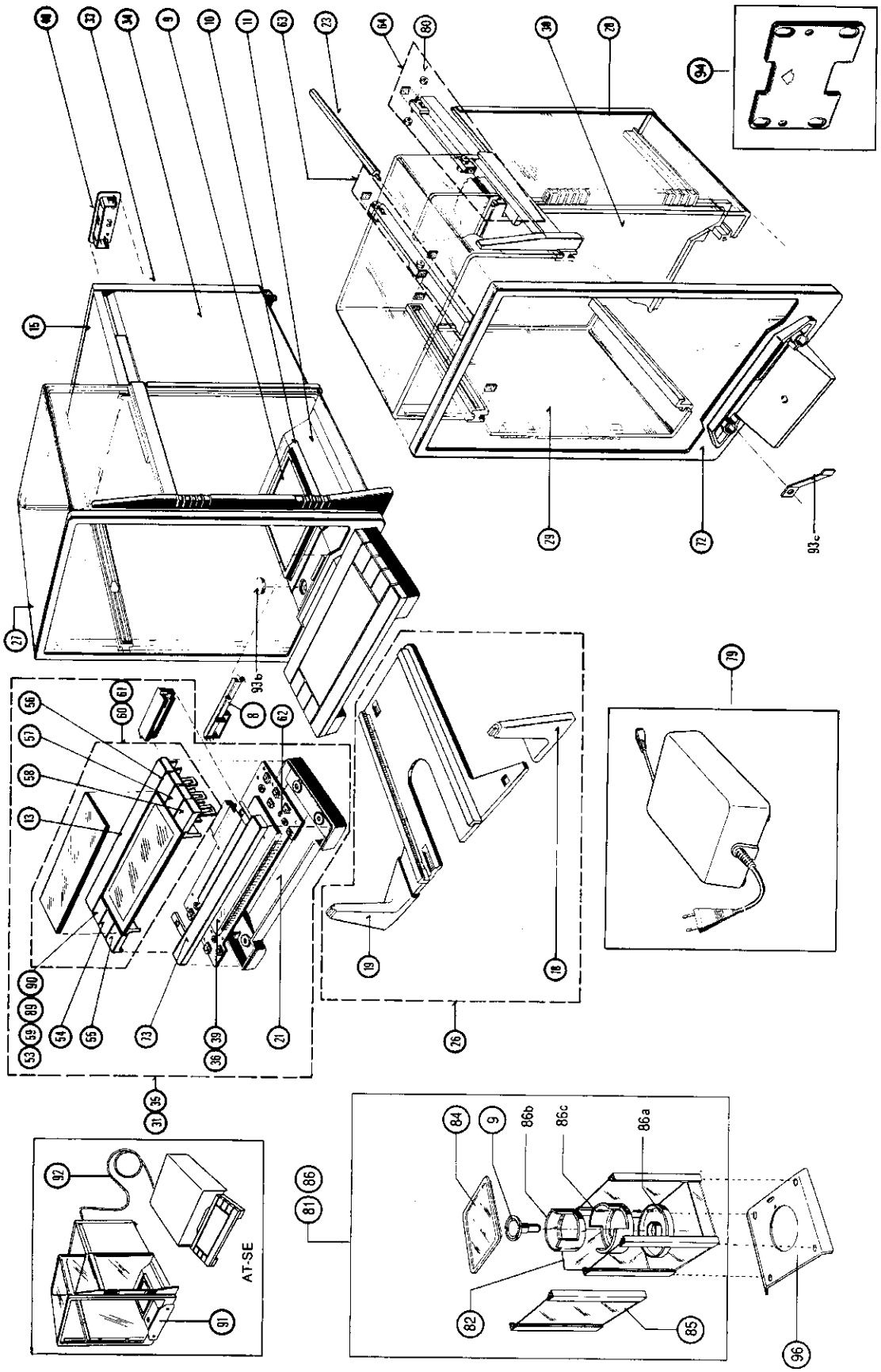
– The exploded view diagrams serve as an assembly and orientation aid as well as for the determination of spare part numbers.
– Spare parts must be ordered using the information in the spare parts list. Starting from the item numbers in the exploded view diagrams, the order numbers can easily be found in the spare parts list.

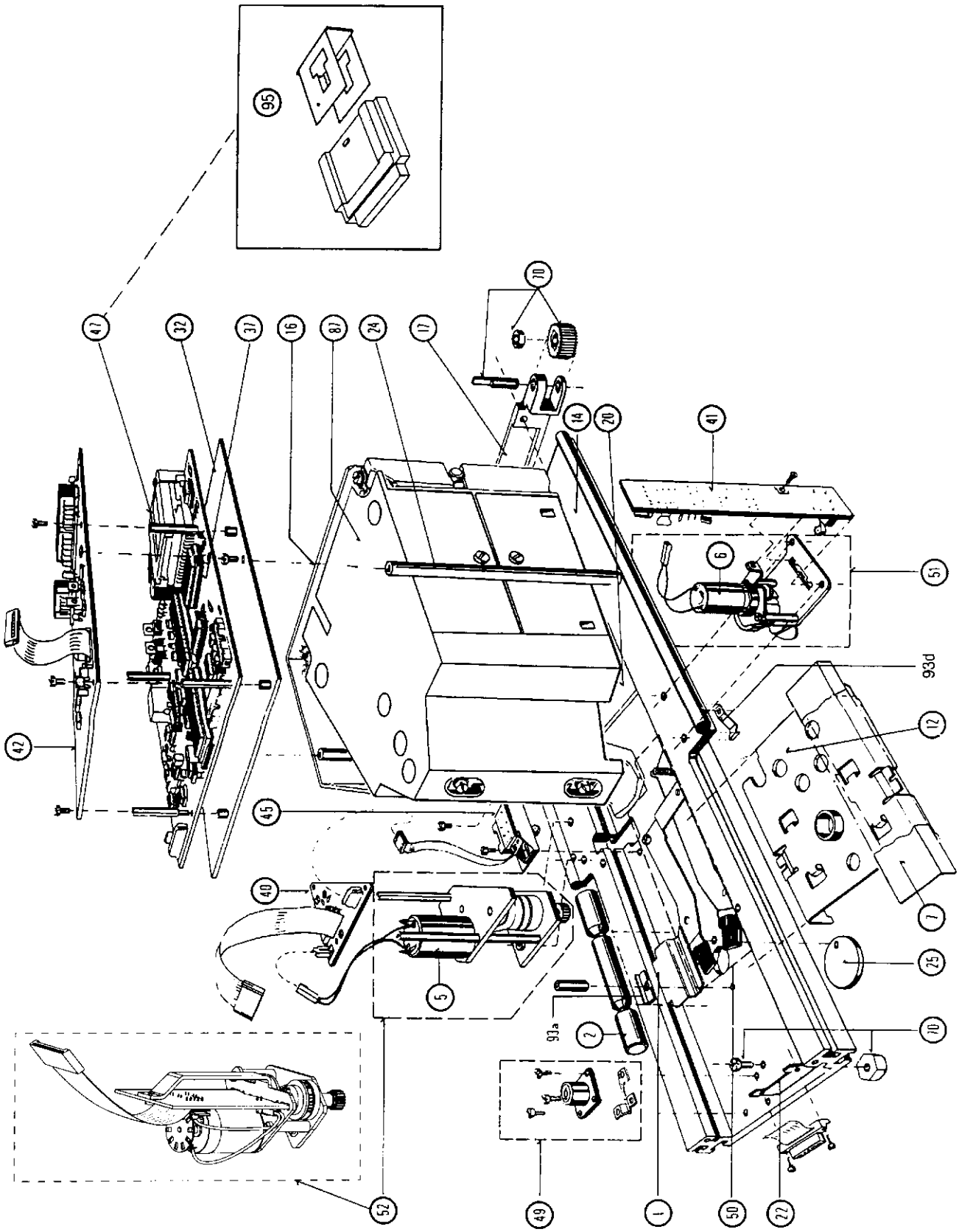
# 4. Tools and working aids

In addition to the normal set of mechanic's tools (screwdriver, engineer's wrench, etc.) the following tools and instruments are needed:

| No . | Designation | ME-No. |
|---|---|---|
| 1 | ServicePac AT | 73622 |
| 1 | Terminal ServicePac - M | |
| 1 | * Set of weights (class E2) | 73337 |
| 1 | Operating instructions (bidirectional data interface METTLER AT balances) | 704018 |
| 1 | Multimeter with DC,<br>AC and ohm range<br>(FLUKE No. 8022A) | 73568 |
| 1 | Soldering iron 25…30 watt | 73561 |
| | Soldering wire ø 0.7 mm | 73564 |
| | Desoldering braid | 73565 |
| 1 | Soder removing tool | 73005 |
| 1 | Vernier caliper | 73567 |
| 1 | Phillips screwdriver (Phillips screws PB size 0) | 73624 |
| 1 | Spray bottle (draft shield cleaner) | 70518 |
| 1 | Socket wrench with handle (3.5 mm) | 73194 |
| 1 | Display cable (for AT20 level adjustment, see item 43 in spare parts list) | 210546 |

* A similar weight set can also be used.
* Absolute weight error of the individual weights must be known and should be checked periodically.


AT-SE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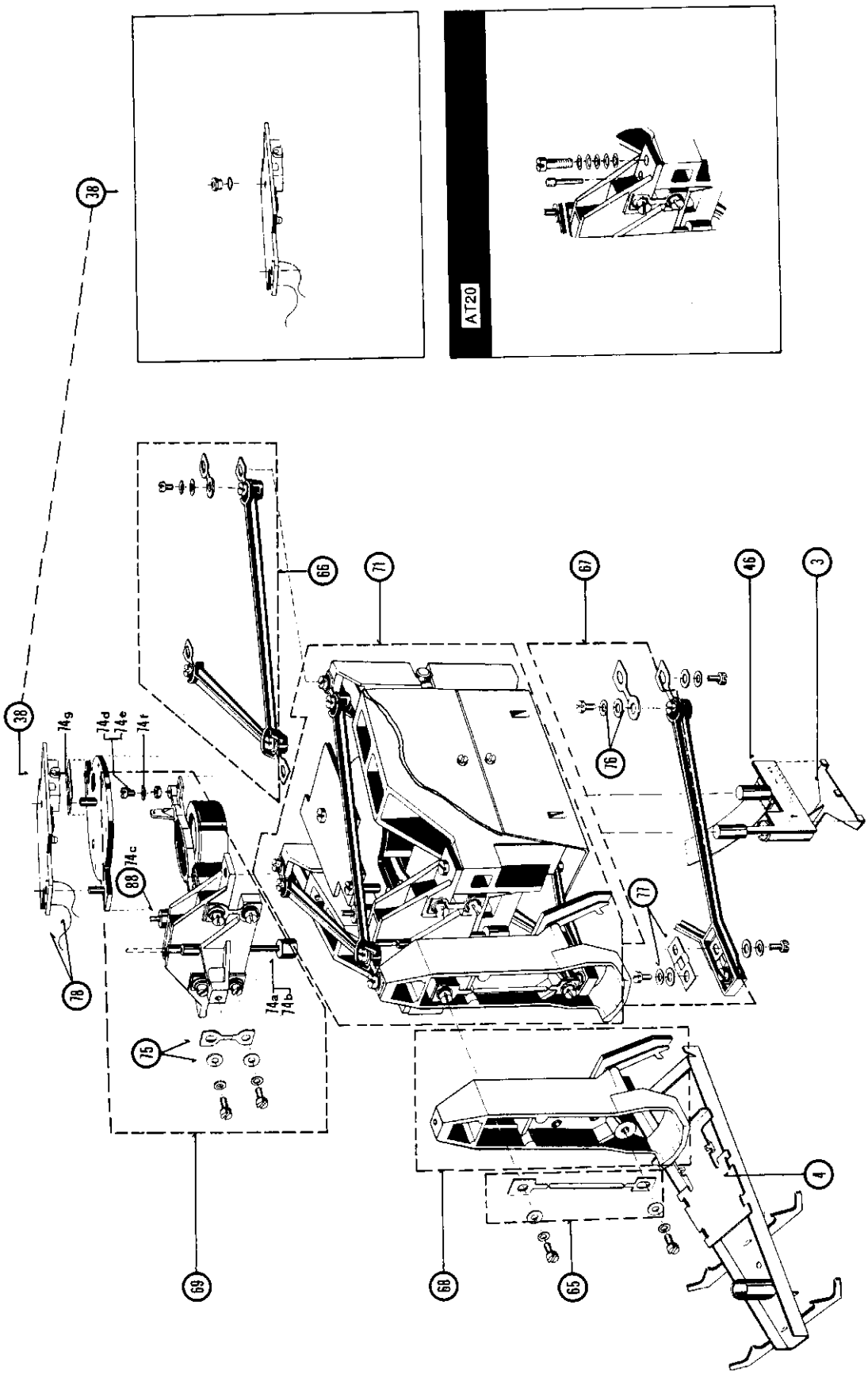
AT20
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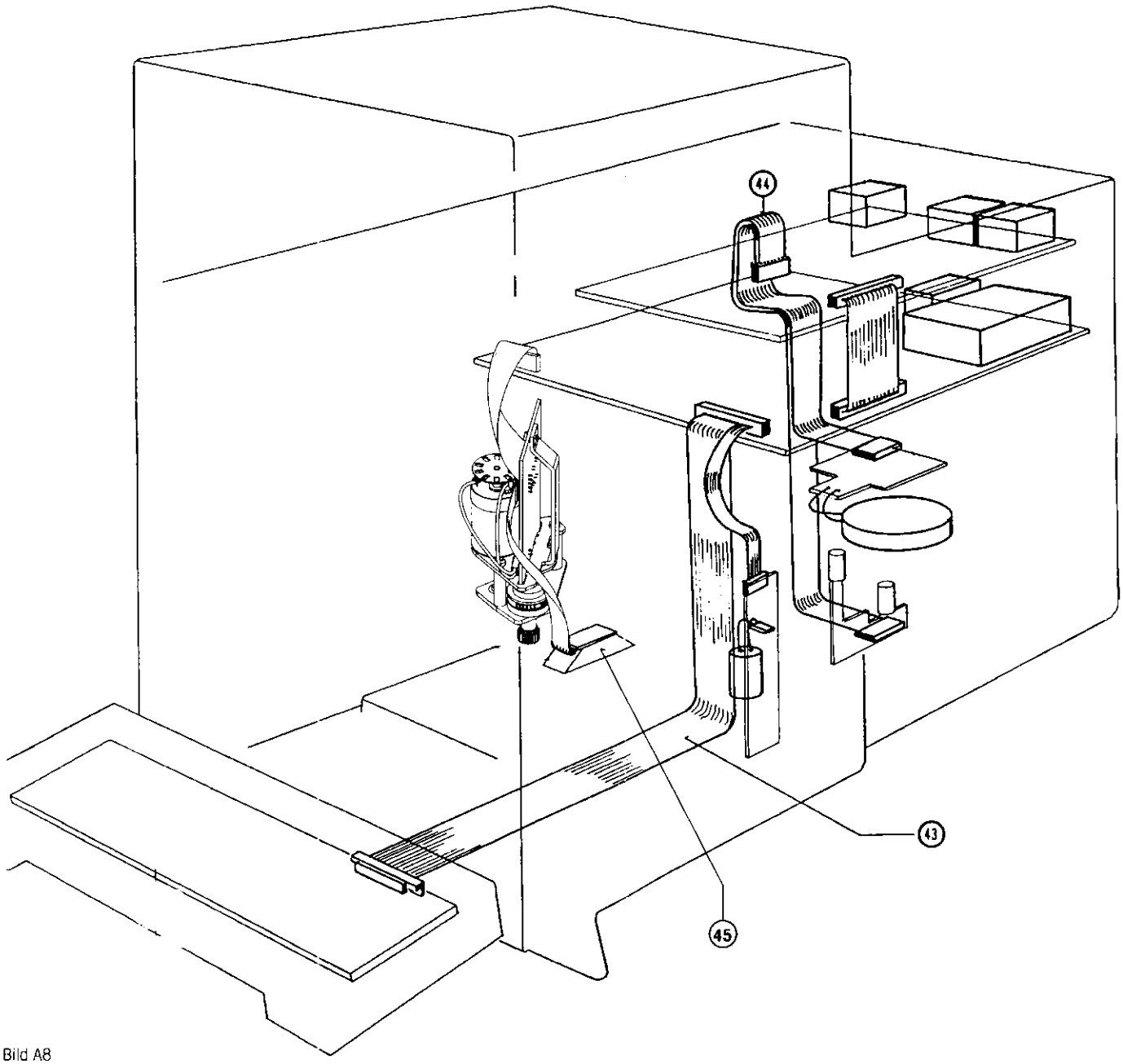


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# 7. Spare parts list for AT-Balances

| Spare parts | | | AT100 AT200 | AT250 | AT201 AT261 | AT400 AT460 | AT20 |
|---|---|---|---|---|---|---|---|
| **Item** | **Designation** | | **Order No.** | **Order No.** | **Order No.** | **Order No.** | **Order No.** |
| 1 | Weight guide | | 210054 | 210054 | 210054 | 210054 | 210054 |
| 2 | Calibration weight | | 210058 | 210058 | 210058 | 210058 | **210185** |
| | | AT100 | 210078 | | | | |
| 3 | Holder | | 210076 | 210076 | 210076 | 210076 | 210076 |
| 4 | Cantilever arm | | 210089 | 210089 | 210089 | 210184 | 210229 |
| 5 | Door motor, complete, old 1) | | ~~600136~~ | ~~600136~~ | ~~600136~~ | ~~600136~~ | ~~600136~~ |
| 6 | Calibration motor, complete 2) | | ~~210120~~ | ~~210120~~ | ~~210120~~ | ~~210120~~ | ~~210120~~ |
| 7 | Cable shielding | | 210134 | 210134 | 210134 | 210134 | 210134 |
| 8 | Ventilation grid | | 210144 | 210144 | 210144 | 210144 | 210144 |
| 9 | Weighing pan | | ~~210159~~ **11100846** | ~~210159~~ **11100846** | ~~210177~~ **11100846** | ~~210193~~ **11100847** | 210269 |
| 10 | Draft cover | | 210161 | 210161 | 210161 | 210161 | |
| 11 | Cover, complete | | 210165 | 210165 | 210165 | 210165 | 210165 |
| 12 | Overarm | | 210166 | 210166 | 210166 | 210166 | 210166 |
| 13 | Model plate | AT100 | 210203 | | | | |
| | | AT200 | **210635** | | | | |
| | | AT250 | | 210201 | | | |
| | | AT201 | | | **210637** | | |
| | | AT261 | | | **210639** | | |
| | | AT400 | | | | **210641** | |
| | | AT460 | | | | **210643** | |
| | | AT20 | | | | | **210631** |
| 14 | Housing base | | 210301 | 210301 | 210301 | 210301 | 210301 |
| 15 | Housing cover | | 210303 | 210303 | 210303 | 210303 | 210303 |
| *16 | Shroud | | 210173 | 210173 | 210173 | 210173 | 210173 |
| 17 | Leveling screw support | | 210312 | 210312 | 210312 | 210312 | 210312 |
| 18 | Slider, lower right | | 210318 | 210318 | 210318 | 210318 | 210318 |
| 19 | Slider, lower left | | 210319 | 210319 | 210319 | 210319 | 210319 |
| 20 | Screening plate | | 210322 | 210322 | 210322 | 210322 | 210322 |
| 21 | Display base | | 210345 | 210345 | 210345 | 210345 | 210345 |
| 22 | Connector bracket | | 210346 | 210346 | 210346 | 210346 | 210346 |
| 23 | Connecting bolt | | 210349 | 210349 | 210349 | 210349 | 210349 |
| *24 | Shroud support | | 210174 | 210174 | 210174 | 210174 | 210174 |
| 25 | Rotary slide | | 210357 | 210357 | 210357 | 210357 | 210357 |
| 26 | Guide plate, complete | | 600325 | 600325 | 600325 | 600325 | 600325 |

1) Items 5, 40 and 52 have been replaced by "door drive, complete", item 52.

* Items 16 and 24 must be replaced together if the length of the shroud support is 116 mm. Replace singly if the length is 118 mm!

**Changed numbers are in bold print (Sept. 2001)**

| Item | Spare parts<br>Designation | AT100<br>AT200<br>Order No. | AT250<br>Order No. | AT201<br>AT261<br>Order No. | AT400<br>AT460<br>Order No. | AT20<br>Order No. |
|---|---|---|---|---|---|---|
| 27 | Top glass, complete | 600326 | 600326 | 600326 | 600326 | 600326 |
| 28 | Side glass right, complete | 600327 | 600327 | 600327 | 600327 | 600327 |
| 29 | Side glass left, complete | 600328 | 600328 | 600328 | 600328 | 600328 |
| 30 | Partition, complete (with glass) | 600329 | 600329 | 600329 | 600329 | 600329 |
| 31 | Display, LCD mounted | | 600331 | 600331 | | 600331 |
| 32 | Cover, complete | 210176 | 210176 | 210176 | 210176 | 210176 |
| 33 | Rear wall, complete | 210375 | 210375 | 210375 | 210375 | 210375 |
| 34 | Side wall, complete (for both sides) | 210376 | 210376 | 210376 | 210376 | 210376 |
| 35 | Display, VFD mounted | 600332 | | | 600332 | |
| 36 | Display PCB, LCD | 600333 | 600333 | 600333 | 600333 | 600333 |
| 37 | CPU board | 210510 | 210510 | 210510 | 210510 | 210510 |
| 38 | Detector PCB | 600115 | 600115 | 600115 | 600115 | 600115 |
| 39 | Display PCB, VFD | 600334 | 600334 | 600334 | 600334 | 600334 |
| 40 | Door motor PCB 1) | ~~600335~~ | ~~600335~~ | ~~600335~~ | ~~600335~~ | ~~600335~~ |
| 41 | Calibration motor PCB 2) | ~~600336~~ | ~~600336~~ | ~~600336~~ | ~~600336~~ | ~~600336~~ |
| 42 | Interface PCB | 210544 | 210544 | 210544 | 210544 | 210544 |
| 43 | Display cable | 210546 | 210546 | 210546 | 210546 | 210546 |
| 44 | Cell cable | 210547 | 210547 | 210547 | 210547 | 210547 |
| 45 | Switch housing, complete | 600337 | 600337 | 600337 | 600337 | 600337 |
| 46 | Sensor PCB | 210704 | 210704 | 210704 | 210704 | 210704 |
| 47 | Standard memory cassette | 600338 | 600338 | 600338 | 600338 | 600338 |
| 48 | Cassette cover | 34314 | 34314 | 34314 | 34314 | 34314 |
| 49 | Level, complete | 600000 | 600000 | 600000 | 600000 | 600000 |
| 50 | Adjustment plate, complete | 600001 | 600001 | 600001 | 600001 | 600001 |
| 51 | Calibration drive, complete | 600002 | 600002 | 600002 | 600002 | 600002 |
| 52 | Door drive, old 1)<br>Door drive, complete | ~~600003~~<br>210763 | ~~600003~~<br>210763 | ~~600003~~<br>210763 | ~~600003~~<br>210763 | ~~600106~~<br>210763 |
| 53 | Keys "0,1/0,01", set of 10 | | 600004 | 600004 | | |
| 54 | Keys "Menu", set of 10 | 600005 | 600005 | 600005 | 600005 | 600005 |
| 55 | Keys "Select 1", set of 10 | 600006 | 600006 | 600006 | 600006 | 600006 |
| 56 | Keys "Umschalten", set of 10 | 600007 | 600007 | 600007 | 600007 | 600007 |
| 57 | Keys "Print", set of 10 | 600008 | 600008 | 600008 | 600008 | 600008 |
| 58 | Keys "Select 2", set of 10 | 600009 | 600009 | 600009 | 600009 | 600009 |
| 59 | Keys "Cancel", set of 10<br>AT400 | 600010 | | | 600010 | |

1) Items 5, 40 and 52 have been replaced by "door drive, complete", item 52.
2) Items 6 and 41 have been replaced by "calibration drive, complete", item 51.

| Item | Spare parts<br>Designation | AT100<br>AT200<br>Order No. | AT250<br>Order No. | AT201<br>AT261<br>Order No. | AT400<br>AT460<br>Order No. | AT20<br>Order No. |
|---|---|---|---|---|---|---|
| 60 | Holder with glass, LCD | | 600011 | 600011 | | 600011 |
| 61 | Holder with glass, VFD | 600012 | | | 600012 | |
| 62 | Push buttons, set of 10 | 600315 | 600315 | 600315 | 600315 | 600315 |
| 63 | Extension left, complete | 600014 | 600014 | 600014 | 600014 | 600014 |
| 64 | Extension right, complete | 600015 | 600015 | 600015 | 600015 | 600015 |
| 65 | Set of links, comprising:<br>6 links<br>12 Belleville spring washers | 600319 | 600319 | 600319 | 600319 | 600319 |
| 66 | Guide upper, mounted | 600322 | 600322 | 600322 | 600322 | 600110 |
| 67 | Guide lower, mounted | 600323 | 600323 | 600323 | 600323 | 600111 |
| 68 | Hanger mounted | 600321 | 600321 | 600321 | 600103 | 600109 |
| 69 | Lever and yoke mounted | 600320 | 600320 | 600320 | 600102 | 600108 |
| 70 | Set of screw feet, comprising:<br>1 front feet<br>1 cheese head scr. M4 x 8 Ms vn<br>2 leveling screw<br>2 leveling screw bolt<br>2 6KT-05MU M6 St nr | 600013 | 600013 | 600013 | 600013 | 600013 |
| 71 | Weighing cell, mounted | 600100 | 600100 | 600100 | 600104 | 600105 |
| 72 | Front frame, complete (with glass) | 600330 | 600330 | 600330 | 600330 | 600330 |
| 73 | Key, front (Re-Zero key) | 600324 | 600324 | 600324 | 600324 | 600324 |
| 74 | Small parts set for sell, comprising:<br>a) 4 counterweights<br>b) 2 counterweights<br>c) 4 taring weights<br>d) 4 washers 3,2/6 x 1,5 Ms<br>e)12 washers 3,2/6 x 0,5 Ns unm<br>f) 4 counterbalance weights<br>g)10 stop plates | 600112 | 600112 | 600112 | 600112 | 600112 |
| 75 | Set flexible bearings/lever<br>6 flexible bearings<br>12 spring washers | 600127<br>While the old flexible bearings can not be mounted with the new shoulder screw, the old screws can be used with the new flexible bearings! The superseded flexible bearing set No. 210065 can still be used for balances with old flexible bearings. | 600127 | 600127 | 600127 | 600127 |
| 76 | Set flexible bearings/guide<br>6 flexible bearings<br>12 spring washers | 600317 | 600317 | 600317 | 600317 | 600317 |
| 77 | Set flexible bearings/lower front guide<br>6 flexible bearings<br>12 spring washers | 600318 | 600318 | 600318 | 600318 | 600318 |
| *78 | Set of 10 conductor strips 5 cm | *43540 | | | | |

* This strips are the same as those for the AE balances (item 63 in spare parts list for AE)!

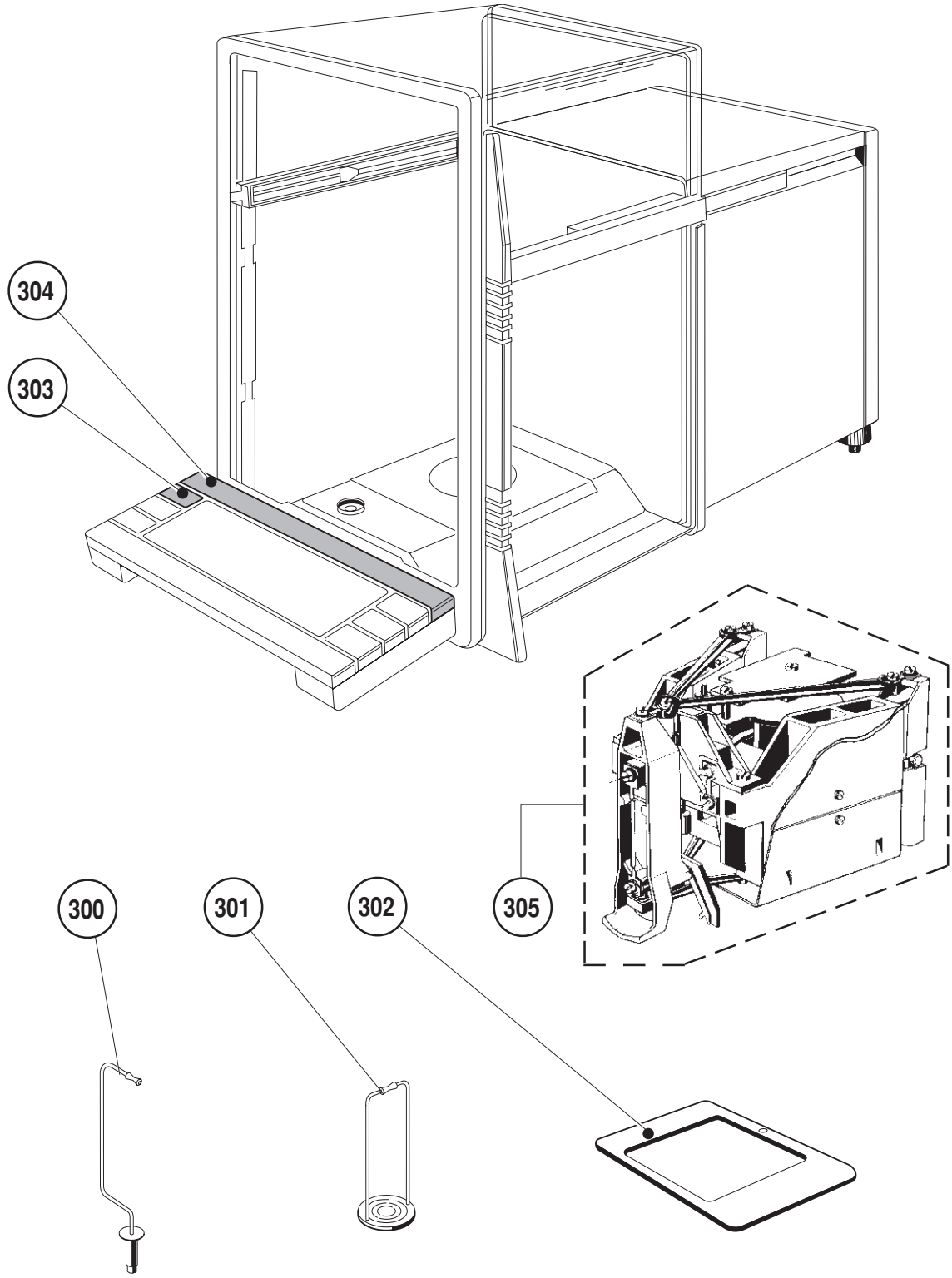
| Item | Spare parts Designation | | AT100 AT200 Order No. | AT250 Order No. | AT201 AT261 Order No. | AT400 AT460 Order No. | AT20 Order No. |
|---|---|---|---|---|---|---|---|
| 79 | Power supply | Europe | 210390 | 210390 | 210390 | 210390 | 210390 |
| | | USA | 210391 | 210391 | 210391 | 210391 | 210391 |
| | | Australia | 210392 | 210392 | 210392 | 210392 | 210392 |
| | | GB | 210393 | 210393 | 210393 | 210393 | 210393 |
| | | Switzerland | 210456 | 210456 | 210456 | 210456 | 210456 |
| | | Italy | 210457 | 210457 | 210457 | 210457 | 210457 |
| | | Denmark | 210458 | 210458 | 210458 | 210458 | 210458 |
| 80 | Rollers (set of 10) | | 210334 | 210334 | 210334 | 210334 | 210334 |
| 81 | Inner glass draft shield, assembled | | | | 210270 | | * 210270 + 210279 +600107 |
| 82 | Side glass | | | | 210273 | | 210273 |
| 83 | Side glass, 20 mm | | | | 210274 | | 210274 |
| 84 | Top glass | | | | 210275 | | 210275 |
| 85 | Side wall, complete, packed | | | | 600101 | | 600101 |
| 86 | Micro draft shield<br>a) Draft shield base<br>b) Inner element<br>c) Outer element | | | | | | 600107 |
| 87 | Screening plate, upper | | 210172 | 210172 | 210172 | 210172 | 210172 |
| 88 | Adjustment weight AT20 | | | | | | 210215 |
| 89 | Key "1/0,1", set of 5 | AT460 | | | | 210238 | |
| 90 | Key "10/2", set of 5 | | | | | | 210239 |
| 91 | Front frame with glass AT-SE | | 210686 | 210686 | 210686 | 210686 | 210686 |
| 92 | Cable AT-SE (5m) | | 210688 | | | | |
| 93 | Small parts set for balance, compr.:<br>a)10 washer<br>b) 4 covers<br>c) 4 contact springs<br>d) 4 retaining springs<br>6 cheese-head sc. M4 x 12 Ms front<br>2 cheese-head sc. M3 x 5 Ms front | | 600113 | 600113 | 600113 | 600113 | 600113 |
| 94 | AC adapter holder | | 210385 | 210385 | 210385 | 210385 | 210385 |
| 95 | Retaining bracket for memory cass. | | 34169 | 34169 | 34169 | 34169 | 34169 |

* The draft shield base fitted under No. 210270 should be unscrewed and replaced by that with No. 210279.

| Spare parts | | AT100 AT200 | AT250 | AT201 AT261 | AT400 AT460 | AT20 |
|---|---|---|---|---|---|---|
| **Item** | **Designation** | **Order No.** | **Order No.** | **Order No.** | **Order No.** | **Order No.** |
| 96 | Draft shield base | | | 210271 | | 210279 |
| | Foam padding | 210405 | 210405 | 210405 | 210405 | 210405 |
| | Demo cover | 210406 | 210406 | 210406 | 210406 | 210406 |
| | Carrying strap | 210408 | 210408 | 210408 | 210408 | 210408 |
| | Package fastener | 210171 | 210171 | 210171 | 210171 | 210171 |
| | Handle | 41294 | 41294 | 41294 | 41294 | 41294 |
| | Reinforcing | 41298 | 41298 | 41298 | 41298 | 41298 |
| | Wrapping | 50558 | 50558 | 50558 | 50558 | 50558 |
| | Export foam cushioning | 210404 | 210404 | 210404 | 210404 | 210404 |
| | Export carton | 210407 | 210407 | 210407 | 210407 | 210407 |

# 8. Spare parts diagram AT Comparator balances

Supplementing the existing AT exploded view diagrams



# 9. Spare parts list AT Comparator balances

Supplementing the existing AT spare parts list

| | Comparator spare parts | AT21 | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Designation** | **Order No.** | **Order No.** | **Order No.** | **Order No.** | **Order No.** |
| 300 | Support bracket | 222066 | | | | |
| 301 | Suspension bracket | 222067 | | | | |
| 302 | Weight holder | 222068 | | | | |
| 303 | Key "10/1$\mu$g" | 210240 | | | | |
| 304 | Model strip AT21 | 210247 | | | | |
| 305 | Weighing cell, mounted | 600116 | | | | |

## Contents

**Page B**

# 1. Tolerances

## 1.1 Tolerance table

| Balance model | Weighing range | | Read-ability | Cornerload | | Repeatability 1) | | Linearity | | Calibration | | Dead load | Level error 4) | | | | | Fine compens-ation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Normal / Fine | | | Test weight | Toler-rance | Testweight | s ≤ | Testweight | Toler-rance | Test weight **E2*** | Tolerance | | Zero point deviation | | Sensitivity deviation | | | |
| | | | | | | | | | | | | | front/ rear | left/ right | Test weight | front/ rear | left/ right | |
| | | g | mg | g | ± mg | g | mg | g | ± mg | g | ± mg | g | – mg | – mg | g | – mg | – mg | ± mg |
| **AT100** | Normal | 109 | 0,1 | 100 | 0,2 | 100 | 0,07 | 50/100 | 0,2 | 100 | 0,2 | 12...19 | 0,8 | – | 100 | 0,8 | – | 0,2 |
| **AT200** | Normal | 205 | 0,1 | 100 | 0,2 | 200 | 0,07 | 50/100/150/200 | 0,15 | 200 | 0,3 | 12...19 | 0,8 | – | 100 | 0,8 | – | 0,2 |
| **AT201** | Normal | 205 | 0,01 | 100 | 0,2 | 200 | 0,04 | 50/100/150/200 | 0,12 | 200 | 0,3 | 12...19 | 0,8 | – | 100 | 0,8 | – | 0,2 |
| **AT250 DualRange** | Normal | 205 | 0,1 | 100 | 0,2 | – | – | 50/100/150/200 | 0,15 | 200 | 0,3 | 12...19 | 0,8 | – | 100 | 0,8 | – | 0,2 |
| | Fine | 52 | 0,01 | – | – | 50 | 0,015 | 10/20/30/40/50 | 0,03 | – | – | | – | – | – | – | – | – |
| **AT261 DeltaRange** | Normal | 205 | 0,1 | 100 | 0,2 | – | – | 50/100/150/200 | 0,15 | 200 | 0,3 | 12...19 | 0,8 | – | 100 | 0,8 | – | 0,2 |
| | Fine | 62 | 0,01 | – | – | 150+50 2) | 0,04 | – | – | – | – | | – | – | – | – | – | – |
| **AT20** | Normal | 22 | 2 µg | 10 | 6 µg | 20 | 4 µg | 5/10/15/20 | 10 µg | 20 | 25(50) µg 3) | 1,4...2,2 | 0,06 | 0,08 | 10 | 0,08 | 0,08 | – |
| **AT21** | Normal | 22 | 1 µg | 10 | 6 µg | 20 | 4 µg | 5/10/15/20 | 6 µg | 20 | 25(50) µg 3) | 1,4...2,2 | 0,06 | 0,08 | 10 | 0,08 | 0,08 | – |
| **AT400** | Normal | 405 | 0,1 | 200 | 0,4 | 400 | 0,15 | 100/200/300/400 | 0,5 | 300 | 0,5 | 17,5...26 | 1,5 | – | 200 | 1,6 | – | 0,3 |
| **AT460 DeltaRange** | Normal | 405 | 1 | 200 | 0,6 | – | – | 100/200/300/400 | 1,4 | 300 | 1,0 | 17,5...26 | 1,5 | – | 200 | 1,6 | – | 0,5 |
| | Fine | 62 | 0,1 | – | – | 350+50 2) | 0,15 | – | – | – | – | | – | – | – | – | – | – |

E2* = Certified weights ➡ use conventional weight value (see table, added to the weight set)

1) Standard deviation s for 10 weighings (determination by Func 13 "Repro/statistics" of LC-PT45)

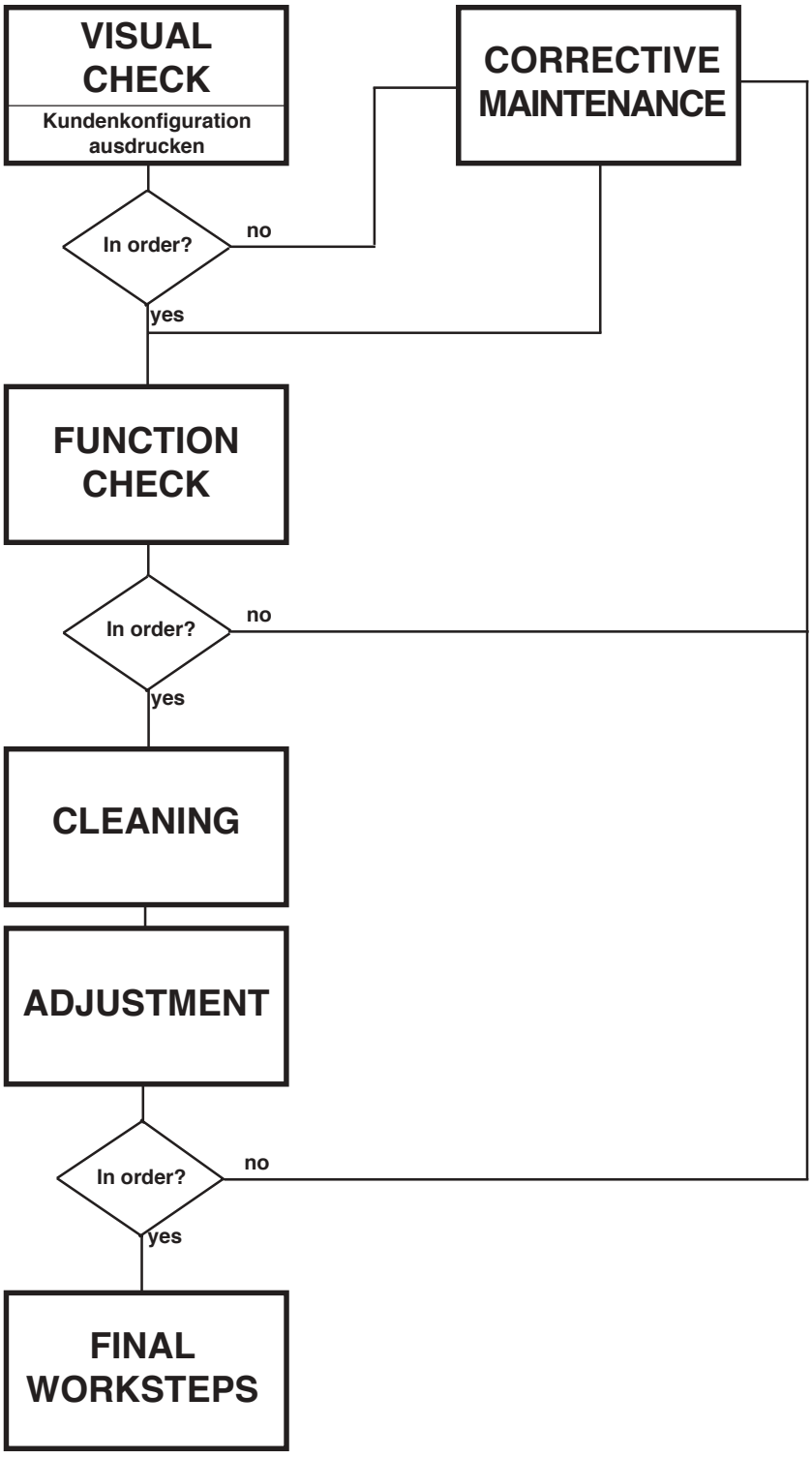
2) Activate the fine range by placing the first weight and taring. Determine the repeatability by subsequently repeated lifting off and placing both weights.

3) 25(50) µg
   - 25: guranteed greatest deviation
   - 50: greatest possible reading error. e.g. when checking the calibration with a different test weight

4) The balance has to be lifted up at front/rear by 0.5 mm. In practice a ruler is placed under the balance.

# 2. Control instructions

## 2.1 Checklist maintenance



## 2.2 Visual check

– Completeness check according to standard equipment.

– Check condition of housing, front glass, draft shield (sliding doors, stop position), weighing pan, display, keypad, leveling feet, AC adapter with cable, as well as level for any increase in size of the air bubble (leak, evaporation).

– Print out customer configuration

## 2.3 Weighing cell parameters

**Check before OPENING the balance housing (use tolerance table B 1.1):**

### 2.3.1 Overload

– The weighing pan should not bottom until the load is considerably (50 g or more) greater than the maximum load. If this requirement is not met, replace cantilever arm (4) (see D 1.9).

### 2.3.2 Cornerload

– If the error is outside the tolerance (see tolerance table B 1.1), the cornerload must be readjusted. (Adjustment instructions, see D 3.1).

### 2.3.3 Reproducibility (see also B 2.7)

– If the value is greater than specified in the table, a check is again performed after cleaning.
If the error is still present, proceed according to page C-4-, point 8.

### 2.3.4 Linearity

– If the deviation is greater than the value in the tolerance table (B 1.1) the balance must be calibrated by means of the internal calibration procedure in which the linearity is redetermined automatically.

### 2.3.5 Temperature compensation (test of temperature adjustment)

This test is used to check whether a new adjustment is necessary, but only for the sensitivity and not for the zero point. **This test need only be performed on very few occasions**, e.g. when replacing the sensor board (ME-210704).

The test can be performed with the StandardPac and also, of course, with the ServicePac.

**Note: This test is meaningful and informative only if the location is suitable and the local conditions are favorable. The test is valueless with poor acclimatization since effects other than the temperature dependence of the cell are measured. This test is not particularly informative. The test would be much more informative if performed in an environmental chamber or in a room where the temperature could be changed.**

**The details apply primarily to the sensitivity (full load) of the balance. The zero point of the AT balances shows a small temperature dependence so that a temperature adjustment on account of zero point drifts usually proves unnecessary. For this reason a temperature adjustment of the balance after replacement of a mechanical part (flexible bearing, link, guide) that effects primarily the zero point and not the sensitivity is not as a rule required.**

**Important: In the setting "CALIN AUto on" (fully automatic self-calibration) of the configuration register, errors due to non-optimum temperature adjustment are corrected.**

**Procedure:**

1. Preparation of the balance:

– Suitable location

– Balance switched on for at least 4 hours

– Cornerload adjusted

– Calibration weights of the weight set acclimatized in the weighing chamber.

2. Key **"Re-Zero"** (taring).
3. Place full load on pan and after 2 minutes read off weight value (G1) and note down.
4. Wait 10 minutes, read off weight value (G2) and note down.
5. If the display changes in the time between 2 and 12 minutes by more than values listed in Tolerance Table B 1.1, a new temperature compensation adjustment must be performed (see D 3.4).

### 2.3.6 Test of calibration motor and mechanics (ServicePac inserted)

**Procedure**:

| | | |
|---|---|---|
| Key | **"WEIGHT UP''** | internal calibration weights are lifted off |
| Key | **"WEIGHT DOWN"** | internal calibration weights are loaded ("both weights") |
| Key | **"WEIGHT DOWN"** | 1st internal weight is loaded (half load) |
| Key | **"WEIGHTDOWN"** | 2nd internal weight is loaded (half load) |
| Key | **"WEIGHT UP"** | Both weights are lifted off (procedure starts afresh) |

### 2.3.7 Calibration (test of calibration factor)

– The balance is equipped with a automatic self-calibration which, however, can also be triggered manually. (See operating instructions.)

– If this result is unsatisfactory a check can be made using the test of the calibration factor (standard calibration):

– Here a check is made to see whether the factor that is stored in EAROM for the internal calibration weights is still in order. The internal weights are calibrated exactly but are not absolutely accurate. If a basic change has been made to the balance, the calibration factor (standard calibration) will no longer be correct. For example: replacement of the calibration weights, new CPU board, in other words a change in very basic components.

  If a part of the weighing cell or one or the boards (sensor, scanning or CPU board) is replaced, it is essential to test the standard calibration.

**Procedure for test of the calibration factor:**

This test can be performed using the StandardPac and, of course, with the ServicePac.

1. Preparation of the balance:

– Balance switched on for at least 2 hours.

– Cornerload adjusted

– Calibration weights of weight set acclimatized in weighing chamber.

2. Key **"CALIBRATION"** The internal calibration is now performed (display **cal int**). (Can also be triggered in the menu with **cal int** (first configure **CALIN auto off**)).

Display **CAL end** The internal calibration is finished.

3. Load own (acclimatized) calibration weights.

4. Read off weight value and compare with target weight. (The target weight must correspond with the weight on the data sheet of the weight set).

5. If the deviation is more than listed in Tolerance Table B 1.1, a standard calibration is necessary (see D 3.6).

## 2.4 Function check

### 2.4.1 Startup, display

– Plug in power cable, switch on balance by pressing key. All segments light up for a few seconds (display test), then 0.0000(0) g appears.

– Lift off weighing pan: All lower segments light up (underload).

– Replace weighing pan and load until the display fades: All upper segments light up (overload).

– Unload weighing pan. Load small weight, tare. Wait until the display shows zero, lift off weight: Negative display.

– Switch off then on again:
The display check is followed by the zero display, depending on the model and the set weighing range: 0.000, 0.0000 or 0.00000. (Error, see C Page -3-).

### 2.4.2 Display test (ServicePac inserted)

– All display segments can be shown simultaneously; this shows whether all segments light up and are hence operational.

**Procedure**:

| | | |
|---|---|---|
| 1. Key | **"Menu"** | **HINtS** appears in the display. |
| 2. Key | **"Select 1"** | **diSPLAY** appears in the display. |
| 3. Key | **"Set"** | All segments light up. |
| 4. Key | **"Off/On"** | Return to the weighing mode (the **"Cancel"** key is not used here). |

### 2.4.3 Keypad test (ServicePac inserted)

– Check of the keypad to see whether the operability of the command triggering is assured.

**Vorgehen:**

| | | |
|---|---|---|
| 1. Key | **"Menu"** | **HINtS** appears in the display. |
| 2. Key | **"Select 1"** | **diSPLAY** appears in the display. |
| 3. Key | **"Select 1"** | The keypad is shown symbolically in the display. |
| 4. Key | **"Set"** | First key flashes in the display. |
| 5. **"Flashing key"** | | Confirm on the display keypad, if OK (beep) the display proceeds to the next key. |
| 6. **"Flashing key"** | | (as described under point 5) until all keys have been checked. |
| 7. Key | **"Off/On"** | Completion of the check and return to the weighing mode. |

#### 2.4.4 Power failure protection

– With balance switched on disconnect power plug and then plug in again. **oFF** appears in the display.

– Press control key briefly: **oFF** fades, segment test and zero display appears.

#### 2.4.5 Taring

– The balance must be capable of being tared to zero with unloaded weighing pan and at full load. (Error, see page C -3-, point 3).

#### 2.4.6 External taring and external data transfer

– Attach hand or foot switch and tare or transfer.

## 2.5 Corrective maintenance

– Disconnect power plug.

– Replacement of damaged and/or defective parts (only with parts that are available according to the spare parts list).

## 2.6 Cleaning

#### 2.6.1 External cleaning of balance

– Generally suitable: dishwashing liquid, agents containing turpentine

– Upper housing: no washing powder, no powerful solvents

– Weighing pan: all solvents, acetic acid, metal polish

– Model plate: no solvents

– Doors: spray bottle (see page A -8-).

#### 2.6.2 Internal cleaning of balance

– Disconnect power plug.

– Dismantle balance housing (see D 7).

– **Never blow air** in the region of the weighing cell! There is a danger of dust penetrating the magnet system.

– Remove dust with a brush (moisten slightly if need be) or with a soft cloth (nonfibrous).

**Ensure that there are no brush hairs or dust fibers in the vicinity of moving parts.**

## 2.7 Rechecking

– Since there is a danger that foreign bodies could penetrate the weighing cell during cleaning, it is necessary to check the reproducibility of the balance.
By repeated pressing and raising of the weighing pan (check the weighing results constantly) check whether the reproducibility is still within the tolerance shown in Table B 1.1.
(Error rectification, see page C -4-, points 8/9).

## 2.8 Final worksteps

– Insert StandardPac.

– Install draft cover (10) and weighing pan (9).

– Attach peripheral units.

– Level balance and calibrate.

– Set menu and configuration in accordance with customer's wishes or use rESEt in the configuration to set both to the basic setting.

– Switch off balance using control key (STANDBY) before switching off the power supply voltage.

# 3. List of software Pacs (EPROM 64k x 8)

## 3.1 Principle of balance display when “power on”

### 3.1.1 Display when “**power on**”

**Example**:

**1st Display cycle** **Std. 10. 1. 01**

Cassette type
Type of software
Software generation
Software-Index

**2nd Display cycle** **At 100.** ⓪

Balance model
If applicable: Software index of basic model (display active depending on version)

**3rd Display cycle** **3. 06. 02**

Software index of basic type
National code (customer code)
Software index (specific to country or customer)

**Legend:**

**1st display:**

| | | |
|---|---|---|
| Cassette type, e.g. | Std. | Standard cassette |
| | SEt. | Service-TypePac |
| | SEr. | ServicePac |
| Type of software | 00…FF | |
| Software generation | 0…F | see B 3.1.2 |
| Software index | 00…FF | |

**2nd display:**

| | | |
|---|---|---|
| Balance model | 0…9 | see list of models |

**3rd display:**

| | | |
|---|---|---|
| Software index | 0…F | Index of basic model |
| National code | | see B 3.1.3 |
| Software index | 00…FF | specific to country and customer |

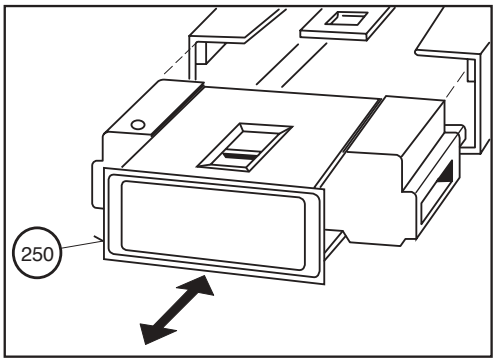
### 3.1.2 Generation (G):

**0** = software AT in experimental stage
**1** = AT
**2** =
**3** =
**4** =
**5** =
**6** =
**7** =
**8** =
**9** =
**A** =
**B** =
**C** =
**D** =
**E** =
**F** =

### 3.1.3 National code (LL):

| | | |
|---|---|---|
| **00** | = | **basic model** |
| 03 | = | France |
| 04 | = | Switzerland |
| 06 | = | Italy |
| 09 | = | Federal Republic of Germany |
| 15 | = | Norway |
| 19 | = | Austria |
| 20 | = | Japan |
| 24 | = | England |
| 32 | = | The Netherlands |
| 33 | = | Belgium |
| 35 | = | Türkey |
| 37 | = | Sweden |
| 38 | = | Australia |
| 39 | = | GDR |
| 40 | = | Denmark |
| 41 | = | South Africa |
| 42 | = | Poland |
| 43 | = | Finland |
| 44 | = | Spain |
| 45 | = | New Zealand |
| 46 | = | Hungary |
| 47 | = | Yugoslavia |
| 48 | = | Canada |
| 49 | = | USA |
| 50 | = | Eire |
| 51 | = | Singapore |
| 52 | = | Pakistan |
| 53 | = | Luxembourg |
| 54 | = | Lybya |
| 55 | = | Israel |
| 56 | = | Argentina |
| 57 | = | Portugal |
| 58 | = | Korea |
| 59 | = | Taiwan |
| 60 | = | Bulgaria |
| 61 | = | Sri Lanka |
| 62 | = | Czechoslovakia |
| 63 | = | China |
| 78 | = | Maghreb (Morocco, Algeria, Tunisia) |
| 79 | = | UdSSR |
| 93 | = | European community |

# 4. ServicePacs




## 4.1 Program cassettes (general)

**The cassettes contain the EPROM. A cassette can be changed by pulling it out by bracket (250).**

The important cassettes here are:

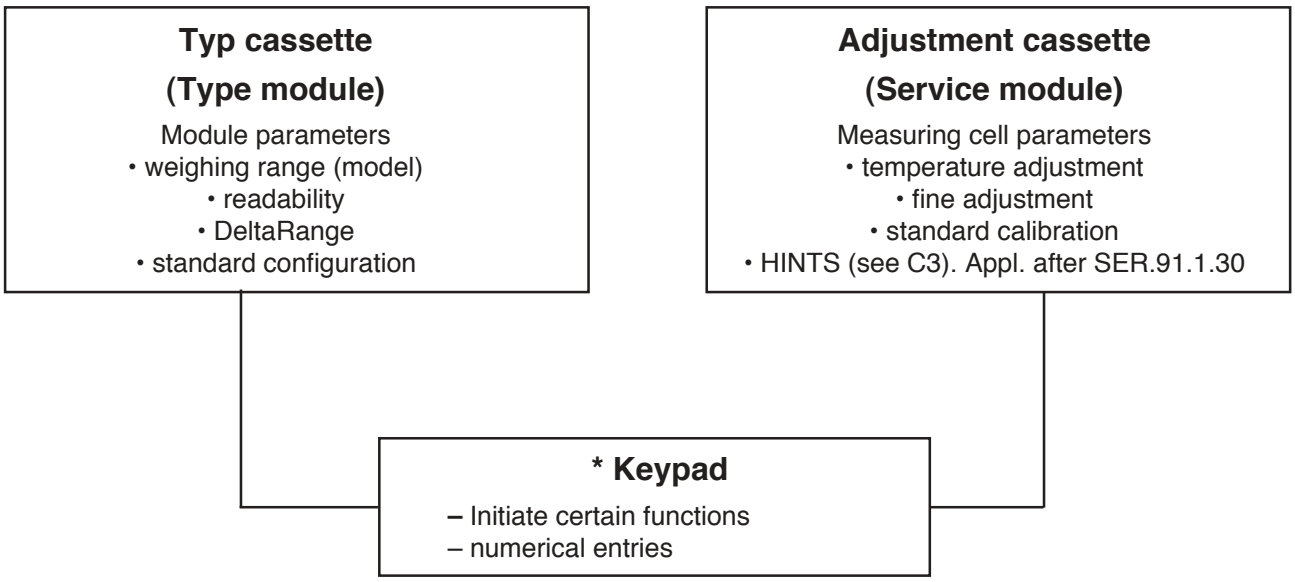
a) Standard cassette (replaceable by Application Pacs).
b) 1 type cassette
c) 1 adjustment cassette
d) Certification cassettes (to national codes, see B 5.).

## 4.2 Function of the two cassettes in the AT ServicePac

a) Loading of the EAROMs (on balance board) with model and measuring cell parameters after board replacement (with type and adjustment cassettes).

b) Overwriting of measuring cell parameters in EAROM after measuring cell replacement (with adjustment cassette).

c) Performance of certain adjustment operations (with adjustment cassette).




* The terminal in the ServicePac-M (PM scales) should be used, but it must be noted that in the older versions a hole is missing in the pin coding. With these versions the GM/GT adapter (included in AT ServicePac) must be used for adjustment.

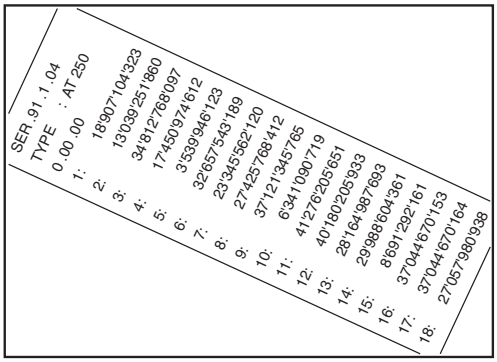
**The model parameters are read in automatically at a keystroke. In cases a) and b) the measuring cell parameters are keyed in as data.**

In case c) the relevant parameters are stored automatically whenever the adjustment procedure is performed.

**Note: With the ServicePac the balance can not be returned to the STANDBY mode by pressing the "Off" key.**

**The balance is always in operation or in the menu.**

## 4.3 Measuring cell parameters




**The measuring cell parameters (balance model, temperature adjustment, fine adjustment as well as the standard calibration factor are represented by 18 numbers (max. 11 digits) and numbered with line numbers 1…18. These numbers are different for each balance. They are printed on a sticker (parameter sticker), which is affixed to a board beneath the cassette compartment that can be accessed by pulling out the cassette cover (rear wall of housing).**

**Parameter stickers specific to the cell are enclosed with each replacement measuring cell - one for each balance model in which the measuring cell can be used. There are 3 different cell models. A cell model for AT100/200/201/250/261 for which 5 different stickers are enclosed. A cell model for the AT400/460 for which 2 stickers are enclosed. A cell model for the AT20 with one sticker. Only 1 sticker is used in each case. After replacement of the measuring cell the sticker should be affixed to a board, found in the housing, and inserted under the balance cassette after removal of the cassette cover (feasible with closed balance).**

### 4.3.1 Adjustment of parameters with ServicePac

Same settings and limits of the load ranges as with StandardPac!

Differing from the factory setting (balance display) with StandardPac:

| | | | |
|---|---|---|---|
| – | Display: | **door Std** | Automatic door operation switched off |
| – | Display: | **Calin auto oFF** | Internal calibration must be triggered by a keystroke |
| – | Display: | **AZ oFF** | Automatic zeroing switched off |
| – | Display: | **unit 2** | Without assignment, instead → (see next line!) |
| – | Key: | **“double arrow”** | Switch key for temperature and dead load |
| | 1. keystroke | | Weight normal (net = N) |
| | 2. keystroke | | Weight with dead load (gross = B) |
| | 3. keystroke | | Temperature display ~ °C (without unit) |
| | 4. keystroke | | Weight normal (restart as for 1st keystroke) |
| – | Key: | **“ReZero”** | Return to normal display (without dead load) |
| – | Key: | **“Print”** | Printing, transfer |
| – | Key: | **“On/Off ”/“Re-Zero”** | Tare (zeroing) |

**Note:**
- **When weighing pan is unloaded the display gross B corresponds to the so-called dead load, i.e. the switch-on zero value (without tare deduction).**
- **When ServicePac inserted the balance can not be switched off with the “On/Off” key!**

### 4.3.2 Entry of parameters (ServicePac inserted)

The sticker data must be reentered if the CPU board or the measuring cell has been replaced and also if the EAROM (on the CPU board) is defective and must be changed.

**Preparatory work:**

– Insert type cassette and enter balance model.

**Note regarding entry procedure:**

– Each entry (line) accepted by the balance is printed out by the printer for checking purposes.

– If the entry is not accepted by the balance after the **"ENTER"** key has been pressed, the same line must be inputted once more.

– The **"CLEAR"** key also allows a correction to be performed as long as the **"ENTER"** key has not been pressed.

– Key **"RESET"** terminates the entry and the data must be reentered from the beginning.

**Entry procedure:**

1. Insert ServicePac
2. Press key **"D IN"**
3. Key in first line
4. Press key **"ENTER"**
5. Key in second line
6. Press key **"ENTER"**
7. .....etc. until all data have been inputted in accordance with the sticker.

#### 4.3.3 Parameter printout (ServicePac inserted)

– Attach printer to the balance (e.g. GA44).

– Press “D out” key on the service keypad. The paper strips should now be printed out according to the illustration (page B -17-).

– Affix data printout to the board provided and store beneath the balance cassette (possible when balance closed).

## 4.4 Consequences for service

– On the enclosed sticker (in the balance) the parameters contain the data for the temperature adjustment, the fine adjustment as well as for the standard calibration.

**With the AT20, the fine compensation is unnecessary! (Lower power consumption)**

– The sticker enclosed with the replacement weighing cell contains only the parameter data for the temperature adjustment and the fine adjustment (without AT20), i.e. after replacement of a cell and entry of the sticker data the standard calibration remains unchanged. It is thus advisable to perform the test of the calibration factor (see B 2.3.7).

– After replacement of the weighing cell and entry of the sticker data the parameters should be printed out in accordance with B 4.3.3.

– In theory a temperature adjustment is needed only on those **odd occasions** when the measuring cell is repaired.

– All adjustments (temperature adjustment, fine adjustment and standard calibration) can be performed in one operation (TC in one operation per temperature level).

## 4.5 Details regarding adjustment

– The adjustment operations are described in Section D 3, “Adjusting the weighing cell”.

**• For the AT20, also Section D 5.**

– The following generally holds:

  • Taring is not necessary before a measurement.

  • Each measurement procedure automatically takes the current zero position of the balance into account.

### 4.5.1 Temperature compensation

The temperature is compensated using 9 measured values:

– 3 different temperatures.

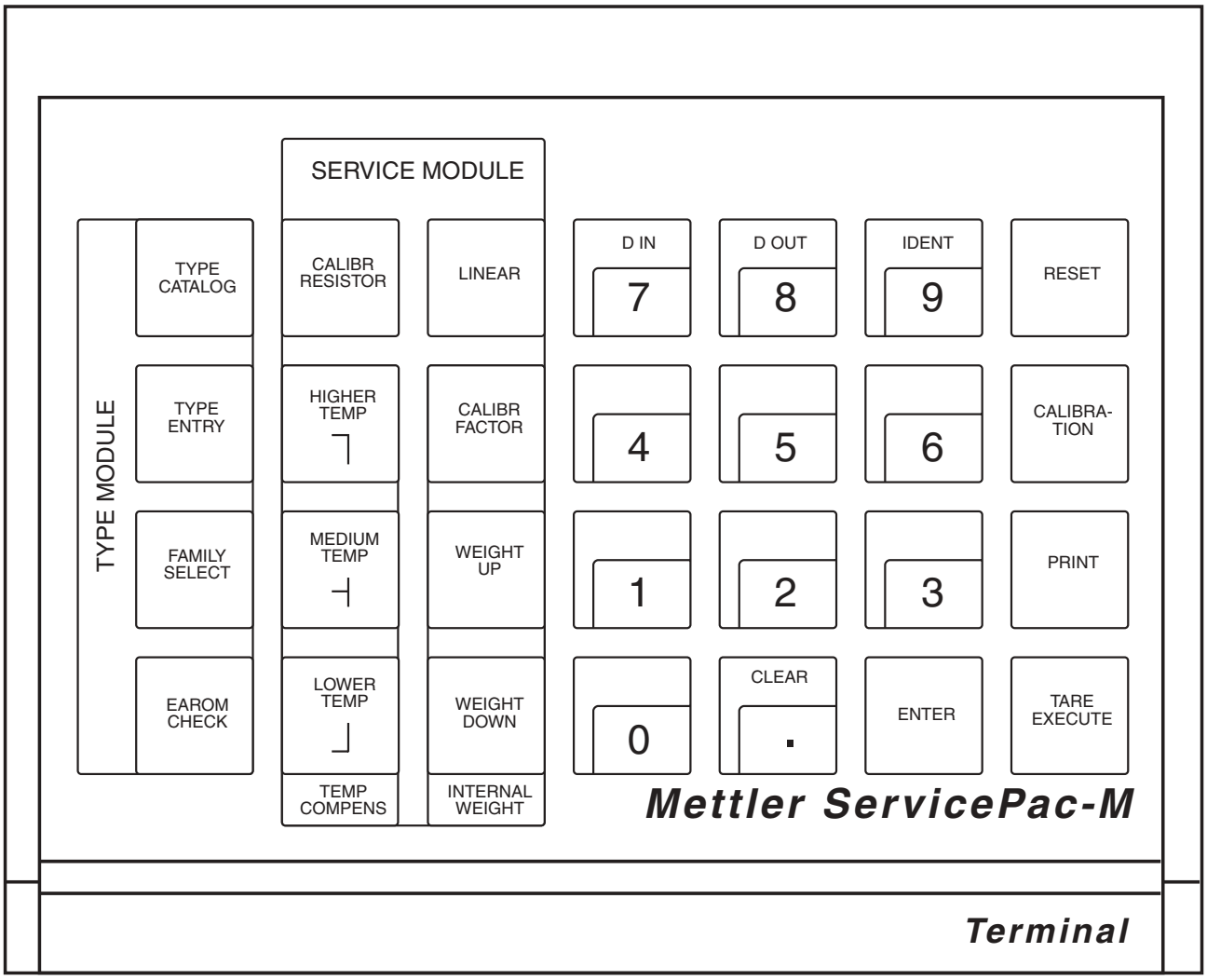
– at each temperature zero load, half load and full load.

– test of the temperature adjustment (see B 2.3.5).

– Perform temperature compensation (see D 3.4).

## 4.6 Key functions

### 4.6.1 Terminal




### 4.6.2 Dark beige keys → (effective with type cassette only)

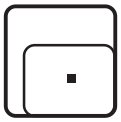
TYPE CATA-LOG — No function at present.

TYPE ENTRY — Start of entry of balance type e.g. AT250 (entry of type via keypad.)

FAMILY SELECT — Selection of balance family, e.g. AT

EAROM CHECK

Checks the operability and contents (without alteration of latter) of EAROM:
Output message, see B 4.10.2



Entry of period (see page B -11-, 2nd display cycle).
No such model at present!

### 4.6.3 Ligth beige keys → (effective with adjustment cassette only)

CALIBR RESISTOR

Adjustment and setting up fine compensation.

LINEAR

Door operation (draft shield drive).

LOWER TEMP

Start of the adjustment cycle at lowest temperature level.
See Section D 3.4

MEDIUM TEMP

Start of the adjustment cycle at medium temperature level.
See Section D 3.4

HIGHER TEMP

Start of the adjustment cycle at highest temperature level.
See Section D 3.4

CALIBR FACTOR

Standard calibration, see D 3.6

WEIGHT UP

Lift off internal calibration weight(s).

WEIGHT DOWN

Load internal calibration weight(s).

CALI-BRATION

Calibration.
Triggering of CALIN Auto or CAL USEr, depending on configuration.

TARE EXECUTE

Taring.

CLEAR ▪

Clearing of current line entry.

D IN

Start of entry of cell parameters.
The next line nubmber (1…18) to be keyed in lights up in the display. The line number does not advance if an input error has been made → repeat entry.

D OUT

Measuring cell parameters stored in EAROM are printed out (e.g. with GA44) in the form of a string of numbers (see Figure, page B -15-).

IDENT

Printer outputs identification of the balance (see B 4.8).

#### 4.6.4 **Brown keys** → (effective with both cassettes)

0-9

Entry of model designation, cell parameters or target standard weight.

ENTER

Closing of each line entry
(with cell parameters after every line).

PRINT

Print command
The display value is printed out.

#### 4.6.5 **Red key** → (effctive with both cassettes)

RESET

Cancellation of current entries.

## 4.7 Filter settings (drop, wave, ASD)

The settings should on principle be effected manually, e.g. change **ASd** when **E.UnSTb** is displayed.

The basic setting on first-time startup of the ServicePac is **middle drop, medium wave** as well as **ASd -1-**.

The settings are changed automatically by the Pac if this should be necessary. The cases listed below operate with changed settings.

### 4.7.1 Temperature adjustment

**ASd oFF** is corrected to **ASd -1-**.

### 4.7.2 Fine adjustment

**Large wave, small drop, ASd -3-**

### 4.7.3 Standard calibration

**ASd oFF** is corrected to **ASd -1-**, all other ASd settings remain in force.

**Note:** If the standard calibration terminates and **"E UnStb"** appears on the display, **the stability detector must be switched to ASd -1-.**

## 4.8 Messages on the printer

On startup the balance sends the printer the message:

| | | |
|---|---|---|
| Printout | **SER. 91.**1.30 | Applicable after April 1990! |
| | **TYPE AT** XXX | |
| | X.XX.XX | |
| | **(TA)** | appears only when taring performed as last step. |

### 4.8.1 Temperature adjustment

| | | |
|---|---|---|
| Key | **"LOWER TEMP"** | |
| Printout | **VALID :LO** | measurement at **LOWER TEMP** concluded and **OK.** |
| Key | **"MEDIUM TEMP"** | |
| Printout | **VALID :LO MED** | measurement at **MEDIUM TEMP** concluded and **OK.** |
| Key | **"HIGHER TEMP"** | |
| Printout | **VALID :LO MED HI** | measurement at **HIGHER TEMP** concluded and **OK.** |
| Printout | **COMPENS OK** | |

**Nothing is printed out if measurement is not in order!**

### 4.8.2 Fine adjustment

**No fine adjustment is necessary with the AT20!**

Key **"CALIBR RESISTOR"**

After completion of the fine adjustment the following appears on the printer:

Printout **F COMP OK** oder **F COMP ABORT** (see also D 3.5)

### 4.8.3 Standard calibration

Key "**CALIBR FACTOR**"

On completion of the standard calibration the following message appears on the printer:

Printout **CAL FACT OK**

### 4.8.4 Measuring cell parameters

Taste **"D IN"**

Each correctly entered line is printed out for checking purposes.

If the inputted data are correct, the following message appears on the printer:

Printout **DATA OK**

## 4.9 Function of TypePac

**Note:** **In contrast to the StandardPac, the TypePac does not report with -OFF- when balance switched on but with the display of the balance model (e.g. AT250). This display must (as with the -OFF- display) be acknowledged by means of the Re-Zero key, the normal display test then runs and the printer prints out the following data:**

**Example:**

| | | |
|---|---|---|
| Display | **AT250** | |
| Key | **"Re-Zero"** | |
| 1st printout | **SET.99.1.01** | (SET = Service TypePac) |
| 2nd printout | **TYPE :AT250** | |
| 3rd printout | x.xx.xx | (see B 3.1.1) |

**Warning:** **If a scale type different from the existing type is entered with the Service-TypePac, all adjustment data (sticker data) are destroyed automatically, the balance is thus no longer temperature compensated.**
**It is thus necessary to reenter the sticker data after entry of a different scale type (see B 4.3.2).**
**If no type is stored, or the CPU board has been replaced, the type display FF 000.0 appears.**
**In this case it is necessary to reenter the data of the balance model.**
**In exceptional cases the temperature adjustment must be again performed (see D 3.4), e.g. if the test of the temperature adjustment (see B 2.3.5) proves to be unsatisfactory.**

### 4.9.1 Entry of the scale type

**Procedure:**

| | | |
|---|---|---|
| Key | **"FAMILY SELECT"** | Selection of the balance family (only AT family at present). |
| Key | "**ENTER**" | Closing of entry. |
| Printout | **FAMILY: AT** | |
| Key | **"TYPE ENTRY"** | Start of the entry of the model (e.g. 250) via the keypad. |
| Key | **"ENTER"** | Closing of the (admissible) entry. |
| Printout | **TYPE :AT** xxx | |

**Note: On error message EtYPE, see page C -8-.**

### 4.9.2 EAROM-CHECK

– The three EAROMs are tested in succession for reading (read **"R"**) and programming (write **"W"**).

– After completion of the test the OK or negative (failed **"F"**) message is printed out.

**Please note: the error message -Err 15,in- may occur on balances with flourescent display (with green numerals and symbols). This message has no meaning in the EAROM CHECK.**

**Example:**

| | | |
|---|---|---|
| Key | **"EAROM - CHECK"** | |
| 1. display | **Test 1.EA** | (VAR) |
| 2. display | **Test 2.EA** | (FIX) |
| 3. display | **Test 3.EA** | (USR) |

Printout 1st line **EAROM CHECK :**

Printout 2nd line **- RW, RW, RW -**

(EAROM 1 read)
(EAROM 1 write)
(EAROM 2 read)
(EAROM 2 write)
(EAROM 3 read)
(EAROM 3 write)

Test **OKAY**

Printout 3rd line **- 11, 22, 33 -**

(EAROM 1 read/okay)
(EAROM 1 write/okay)
(EAROM 2 read/okay)
(EAROM 2 write/okay)
(EAROM 3 read/okay)
(EAROM 3 write/okay)

Test **NEGATIF**

**- FF, FF, FF -**

(EAROM 1 read/failed)
(EAROM 1 write/failed)
(EAROM 2 read/failed)
(EAROM 2 write/failed)
(EAROM 3 read/failed)
(EAROM 3 write/failed)

**After completion of the EAROM CHECK the balance display corresponds to the printout of the 3rd line!**

# 5. Certification cassettes (available to national codes)

**Insert (use) the certification cassette only when the PC board is replaced!**

## 5.1 Servicing a certified balance

**Note:** When a normal service is performed, do not use the certification cassette with an existing certified balance.

## 5.2 Procedure when using the certification cassette

In all cases where the certification cassette is used, proceed as follows:

1. Load type
2. Enter paramter data
3. Insert certification cassette
4. Insert StandardPac (that of the customer)

## Contents

**Page C**

# 1. Troubleshooting

| | Malfunctions and their possible causes | Corrective action |
|---|---|---|
| 1 | **Balance can not be switched on (no display).**<br>– No power supply voltage.<br>– Power cable not connected.<br>– Wrong AC Adapter.<br>– AC adapter or power cable defective.<br>– Board defective.<br>– Internal cables not connected.<br>– Cassette not inserted properly. | A -8- (intercon. diagram) |
| 2 | **Balance can not be switched off.**<br>– Keypad defective.<br>– Microswitch on display board defective.<br>– Display board defective.<br>**Note:** With ServicePac the balance can not be returned to STANDBY mode. | D 1.1.3<br>D 1.1.3 |
| 3 | **Taring not possible.**<br>– See point 2.<br>– Board defective.<br>– Display never stabilizes. | D 1.1.3<br>see OI, section 7.1 |
| 4 | **Individual segments/digits do not light up.**<br>– Display defective.<br>– Check cable and plug connections.<br>– Cassette not inserted properly. | D 1.1.3<br>A -8- (intercon. diagram) |
| 5 | **Weighing cell (beam) never stabilizes.**<br>– Sensor board defective.<br>– Prozessor board defective.<br>– Scanning board defctive.<br>– Cable or plugs defective/not inserted properly.<br>– Check coil connection.<br>– Short circuit of coil to frame. | D 2.4<br>D 1.5/1.5.4<br>D 1.7/1.7.2 (D 2.5)<br>A -8- (intercon. diagram)<br>D 1.8.2 |

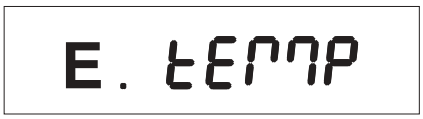
| | Malfunctions and their possible causes | Corrective action |
|---|---|---|
| 6 | **Overload/under load display.**<br>– Remove weighing sample, switch balance offf/on.<br>– Calibration weight loaded.<br>– Calibration mechanism is blocked.<br>– Counterweights are wrong.<br>– Weighing pan or cantilever arm touching, not adjusted properly.<br>– Cantilever arm wrongly adjusted.<br>– Defective board (CPU board).<br>**Note:** see also operating instructions, section 7.3 | <br><br><br>B 2.3.6<br><br>D 1.9<br>D 1.9<br>D 1.5 |
| 7 | **Overload display before attainment of full load.**<br>– Sensor board defective.<br>– see point 6. | <br>D 2.4 |
| 8 | **Erratic change in display.**<br>– Moving part of weighing cell touching.<br>– Loose parts and screws.<br>– Poor plug contacts (cables).<br>– Defective board.<br>**Note:** see also operating instructions, section 7.1 | <br><br>Check screws<br>A -8- (intercon. diagram) |
| 9 | **Hysteresis or unstable display.**<br>– Hair/fiber touching moving part.<br>– Flexible bearing/link disorted, dirty or defective.<br>– Loose screws on weighing cell.<br>– Scanning dirty or defective.<br>– Magnet system dirty.<br>**Note:** see also operating instructions, section 7.1 | <br><br>D 2.2<br>Check screws<br>D 1.7/1.7.2/ (D 2.5)<br>D 1.12 |

| | Malfunctions and their possible causes | Corrective action |
|---|---|---|
| **10** | **Display drift.**<br>– Measurement error.<br>– Weighing sample is hygroscopic. (wood, paper, cardboard, plastic, rubber).<br>– Solar radiation/radiator in the vicinity.<br>– Draft (ari conditioning). Stop position of doors.<br>– Behavior on switching on.<br>– Temperature compensation poor (exception).<br>– Fine compensatioon inadequate (at large weight around 180-200 g).<br>– Flexible bearing/link distorted.<br>– Scanning board defective.<br>– Sensor board defective.<br>– CPU board defective.<br>**Note:** see also operating instructions, section 7.1 | <br><br><br><br><br>D 1.14.5<br><br>D 3.4<br>D 3.5<br>D 2.2<br>D 1.7/1.7.2 (D 2.5)<br>D 2.4<br>D 1.5/1.5.4 |
| **11** | **Corner load not adjustable.**<br>– Flexible bearing at guide defective.<br>– Adjustment deformed through wrong correction.<br>– Bearing distorted when mounted. | <br><br><br>D 2.2 |
| **12** | **Linearity error.**<br>– Corner load setting poor.<br>– Measurement error (chiefly in range 0.01 mg).<br>– Balance not callibrated internally.<br>– Weights were inaccurate.<br>– Scanning loose, defective.<br>– Flexible bearing/link distorted/defective.<br>– Board defective.<br>**Note:** In the region 0.01 mg exact determination of the linearity is possible only under absolutely ideal conditions. | <br>D 3.1.2<br><br><br><br>D 2.5<br>D 2.2 |

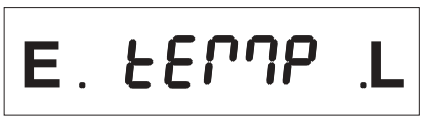
| Malfunctions and their possible causes | | Corrective action |
|---|---|---|
| **13** | **Calibration is not possible.**<br>– Motor defective.<br>– Mikroswitch switching action is not correct.<br>– Lifting mechanism is stricking, overarm poorly adjusted.<br>– Plug-in connections poor.<br>– Board or plud defective.<br>– Teperature unstable.<br>– Weighing result unstable.<br>– Dead load too small.<br>– Weighing pan inadmissibly loaded (more than 10 g). | <br>B 2.3.6<br>D 1.13.2<br><br>A -8- (intercon. diagram)<br>D 1.13.1/1.13.2<br><br><br>D 3.3 |
| | | |

## 2. Error messages


**Calibration motor**
– Defective, sticks.




**Temperature unstable**
– During the calibration.
– During the temperature adjustment.

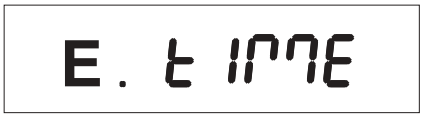



**Temperature too low**
– Raise temperature.
– Routine started too early/late.


**Temperature too high**
– Lower temperature.
– Routine started too early/late.


**Not calibrated**
– **Internal** calibrated must be performed.
– If unsuccessful, possibly VAR EAROM defective.


**Calibration weights outside tolerance**
– Wrong balance model loaded.
– Dead load too high.

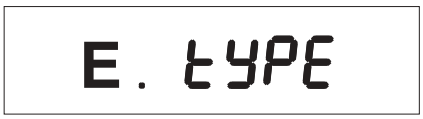



**Timeout**
– Weight on weighing pan not that requested, within ~1 min 40 sec.


**Unstable**
– Surroundings too unstable.
– Change ASd setting, switch to ASd -1-.
(important in the standard calibration)!


**Adjustment parameters**
– Temperature adjustment has not been initialized.
– Load balance model with TypePac.


**Wrong input**
– Press key **"RESET"** and enter data again from the beginning.




**Wrong balance model loaded**
– Load correct balance model and then enter the adjustment data again.

Error 0

**Software error**
– Stack overflow.
– Switch balance off/on.

Error 1

**One Chip RAM**
– Replace CPU board.
– Replace chip.

Error 2

**External RAM**
– Replace chip.

Error 3

**Cassette**
– Replace cassette.

Error 4

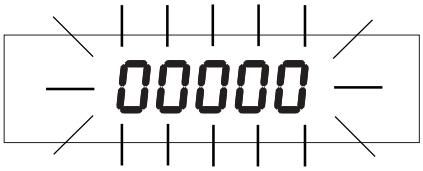
***µ*P timer**
– Change *µ*P timer.

Error 6

**EAROM error**
– CPU board
– Wrong EPROM cassette (software version).

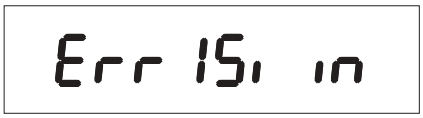
**Triangle symbol flashes after switching on**
– Perform temperature adjustment.

**Asterisk symbol flashes**
– Perform standard calibration.

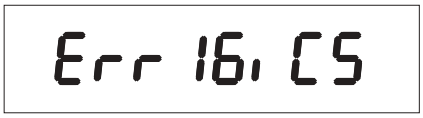



**Display flashes**
- No zero found.
- Software error with STD. 10.1.07 software versions.
- If still not in order, CPU board defective.

## 2.1 Additional error messages with the VFD




**Display data missing**
- This message has no meaning in the EAROM CHECK.
- VFD processor contains no data from balance.
- Check plug-in connections CPU.
- CPU board defective.
- Cassette not inserted.




**ROM checksum**
- Display processor defective.


***µ*P 2 (slave microprocessor)**
- Display processor defective.

## 3. "HINTS" (adjustment cassette SER. 91.1.30 inserted!)

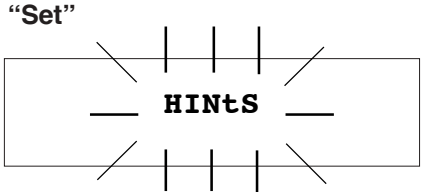
With the command, a few hints regarding possible problems and directions for their rectification are printed out on the printer.

Each error message consists of a one-line designation of the fault and directions comprising one or several lines for rectification. The directions start with a "–".

**Procedure to print out "HINTS" messages:**

1. Key **"MENU"**
2. Key **"Set"**

Display flashes:




Printout:

```
########################
    HINTS
    =====
    Fehlermeldungen

########################
```

Printout on recognized fault:

```
Error(s) detected
– TYPE MODULE
  EAROM CHECK
```

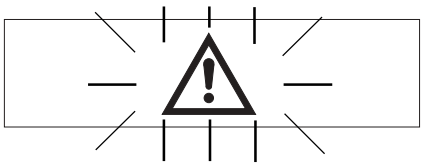
Printout if no fault present of if the fault has not been recognized by the test program:

```
no Errors detected
```

**Following messages are possible:**

– Wrong **temperature compensation data**

Display flashes:

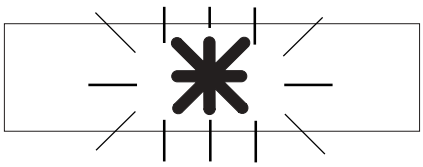


Printout:

```
Temp. Compensation
– D IN
– TYPE MODULE
  FAMILY SELECT
  TYPE ENTRY
  TEMP COMPENS
```

– Wrong **standard calibration value**

Display flashes:



Printout:

```
Standard Calibration
– D IN
– CALIBR FACTOR
```

– Wrong **calibration value:**

Display:


Printout:

```
Calibration
– CALIBRATION
```

– Wrong **fine compensation data**

Printout:

```
Fine Compensation
– D IN
– CALIBR RESISTOR
```

– Wrong **FIX EAROM data**

Printout:

```
FIX EAROM
– TYPE MODULE
  FAMILY SELECT
  TYPE ENTRY
  D IN
```

– Wrong or outdated **typen data**

Printout:

```
Type Data
– TYPE MODULE
  FAMILY SELECT
  TYPE ENTRY
  D IN
```

– Wrong **VAR EAROM data**

Printout:

```
VAR EAROM
– TYPE MODULE
  FAMILY SELECT
  TYPE ENTRY
```

## Contents Page D

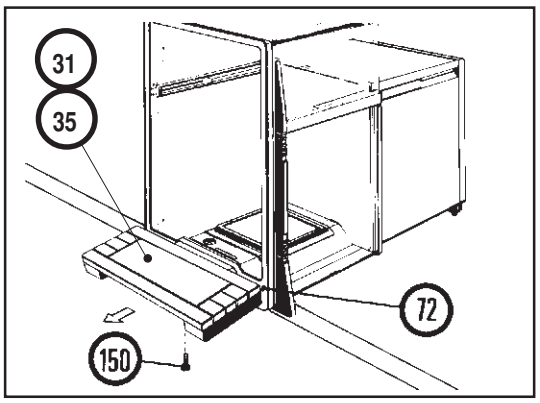
# 1. Disassembly and assembly of parts

**Note:** **The terms assembly gages, stop plates and centering pin refer to tools included in the AT ServicePac!**

## 1.1 Display

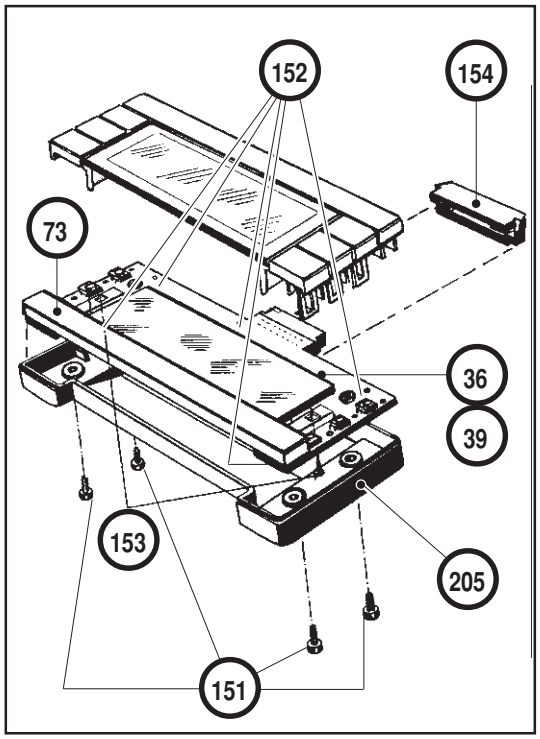
**Warning:** **During disconnection and connection of the display it must be ensured that this has first been disconnected from the power supply. The control unit with the VFD has a µP that will not start up properly if plugged into the live balance. To ensure that no problems or defects whatsoever occur, we advise you always to disconnect the balance from the power supply before unplugging or plugging in the control unit.**

### 1.1.1 Dismantling display (31/35)




– Disconnect power cable.
– Pull balance forward over the edge of the bench until the display is freely accessible from below.
– Undo middle screw (150) and remove.
– Pull off display (31/35) keeping it parallel to balance. (Display is attached to the balance by the connector.)

### 1.1.2 Installing display (31/35)




– Pull balance forwards over the edge of the bench until the projecting part at the front frame (72) is freely accessible from below.
– Keeping display exactly parallel to balance insert from front. (Display is attached to the balance by the connector). Ensure that seal (154) is inserted.
– Attach underneath with screw (150).
– Connect power cable.

### 1.1.3 Replacing display board (36/39)

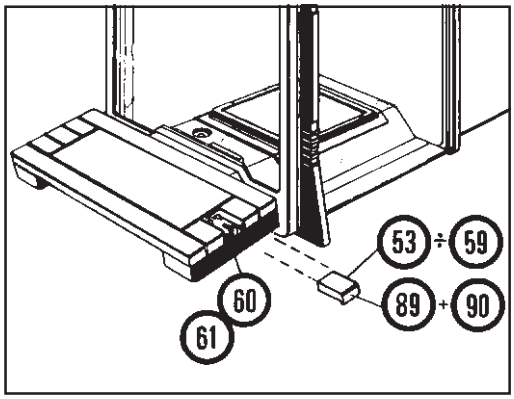
– Dismantle display (see D 1.1.1).
– Remove 4 screws (151) in lower housing (205).
– Loosen model strip from snap fastening and remove.
– Undo 5 Phillips screws (152).
– Pull off 6 latches of key holder from board and remove board.
– Remove Re-Zero key (73) after undoing 2 additional Phillips screws (153) on board.

**Installation is in reverse order!**

– RE-Zero key (see D 1.15)
– Installation of short keys (see D 2.1.1)

### 1.1.4 Changing short keys (53 ÷ 59/89+90)

– Short keys (53 + 59/89+90) are removed by sliding off horizontally to the side. (Can be performed when attached to balance).
– New keys are slid into the key holders (60/61) from the side.

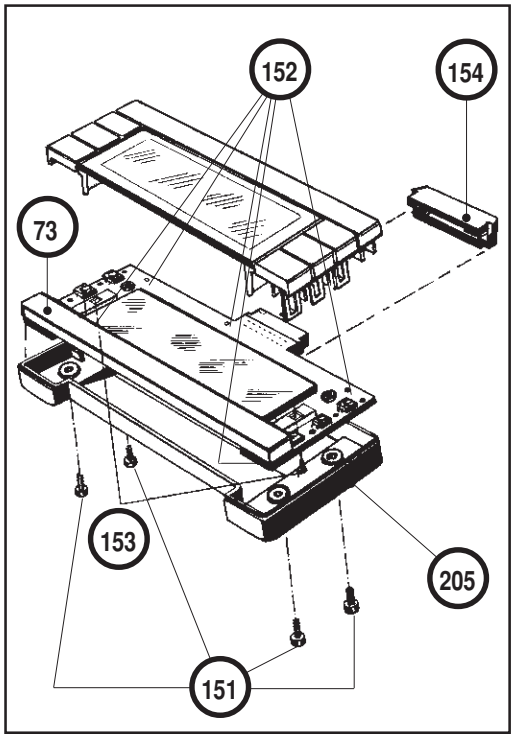



### 1.1.5 Changing Re-Zero key (73)

– Remove display (see D 1.1.1).
– Detach key holder (see D 1.1.6).
– Undo 4 screws (151) and detach lower housing (205).
– Remove Re-Zero key after undoing 2 additional Phillips screws (153) on the board.

**Installation is in reverse order!**

– When tightening the screws ensure that the counterpart (attachment part on key) is not twisted. After fastening, the counterpart can be aligned with the aid of a screwdriver.



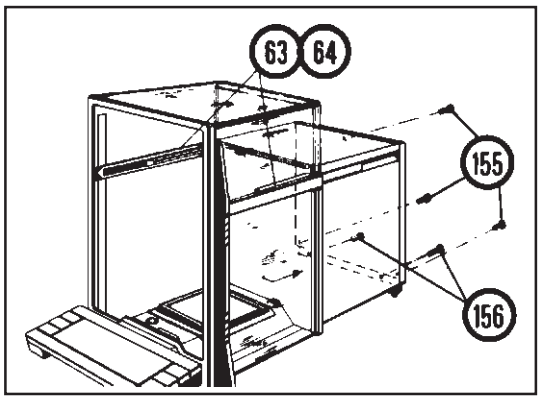

### 1.1.6 Replacing key holder with display glass (60/61)

– Dismantle display board (see D 1.1.3).
– Slide off short keys (53 + 59/89+90) horizontally.

**Installation is in reverse order!**

– Insertion of the short keys (see also D 2.1.1).

## 1.2 Doors

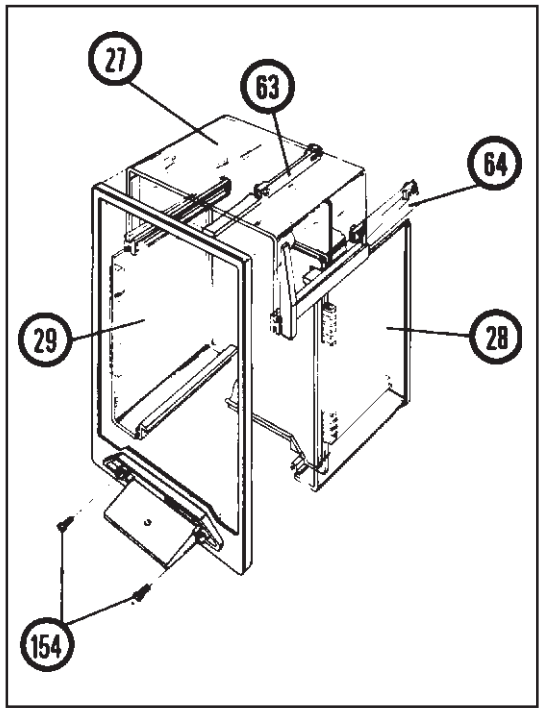



### 1.2.1 Dismantling front frame (72)

– Dismantle display (see D 1.1.1).
– Undo 2 screws (154) at front.
– Hold front frame at frame and carefully pull away from the balance.

### 1.2.2 Dismantling side sliding doors (28/29)

– Undo 3 screws (155) at rear.
– Remove rear wall (33).
– Undo 2 screws (156) on leveling screw support.
– Detach leveling screw support (17).
– Unlatch side sliding doors (28/29).
– Use one hand to stop the ends of the two guide rails (63/64) in which the upper door is slotted.
– Now use the other hand to withdraw the two side doors towards the rear.
– Pull guide plate (26) backwards while raising balance slightly at the rear.
– If other parts of the balance are dismantled the leveling screw support must be reinserted.

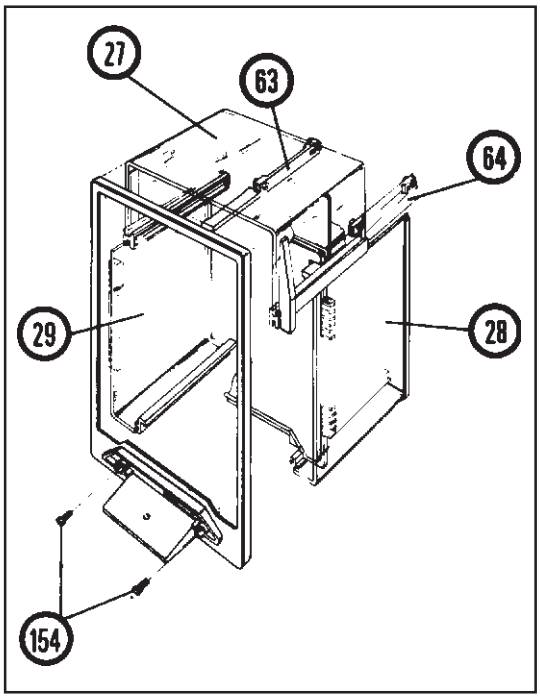


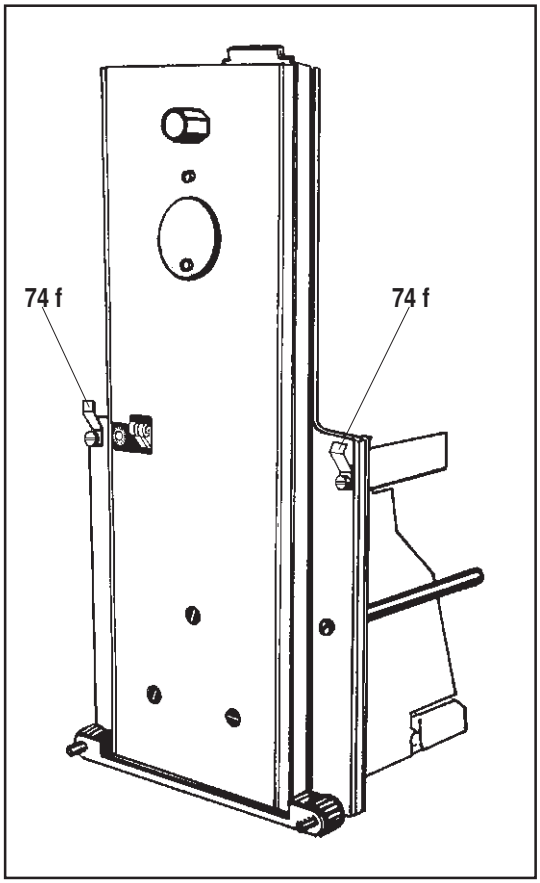

### 1.2.3 Dismantling upper sliding door (27)

– Pull out sliding door (27) together with the two guide rails (63/64) until the front pair of rollers (left and right) project from the guide.
– Before the guide rails are withdrawn completely they must be pressed sideways by hand against the sliding door to prevent them dropping out since they are loosely connected to the glass.
– Remove guide rail (63) carefully to prevent the rollers dropping out.
– Tilt guide rail (64) in extended position by 50° upwards to the side so that the guide is separated from the guide pin and can thus be removed easily.

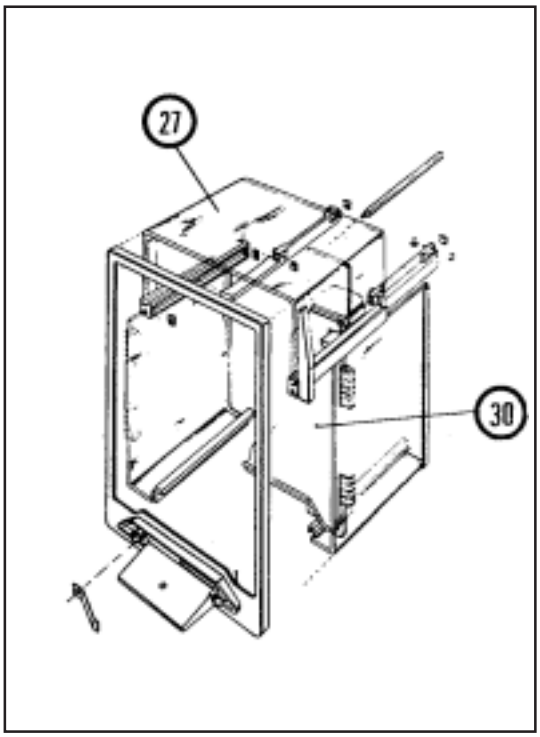
### 1.2.4 Installing doors (27/28/29)

- Installation of the doors is in the reverse sequence.
- The leveling screw support (17) must be dismantled.
- Insert upper sliding door (27) with the two guide rails (63/64) up to the stop.
- Insert guide plate (26) from the rear while lifting up balance slightly.
- Insert side sliding doors (28/29) in any order.
- To install the leveling screw support (17) the balance must be raised slightly.
- Screw on rear wall by means of 3 screws (155).
- Fasten front frame with 2 screws (154).
- Check retaining spring setting (74f).
  The retaining spring must snap in gently shortly before the sliding door closes. (When the upper sliding door is moved backwards the sliding doors at the side [decoupled] must remain closed.) The spring can be adjusted by bending (upwards or downwards).
- Pull balance a short distance over the edge of the bench and insert the display unit (31/35) (with attached seal). Fasten display from below with screw (150).
- Connect power cable.
- Set stop of sliding doors (see D 1.14.5).



## 1.3 Dismantling balance housing




### 1.3.1 Dismantling housing cover (15)

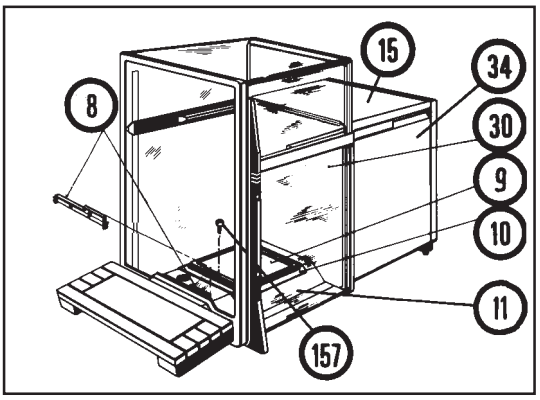
– Dismantle sliding doors at side (see D 1.2.2).
– Housing cover (15) can be dismantled together with the upper sliding door.
– Pull off cover horizontally to rear ensuring that the sliding door does not slide out of the guide.

### 1.3.2 Dismantling side walls (34)

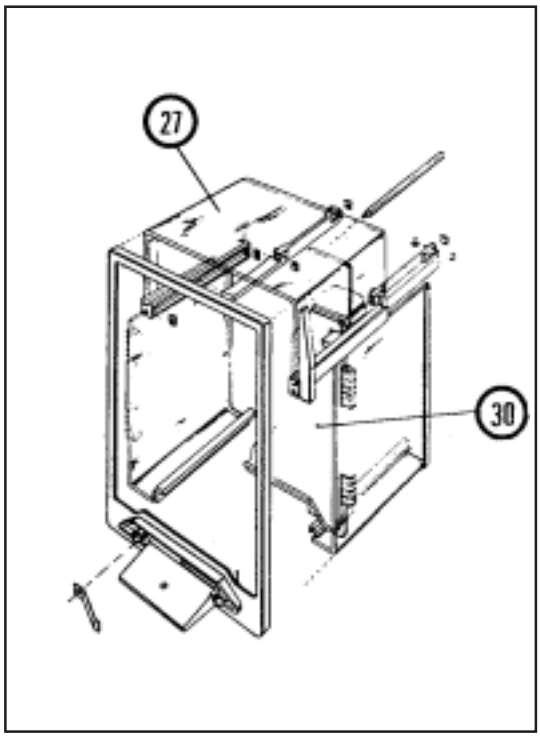
– Pull off side walls to rear.

### 1.3.3 Dismantling partition (30)

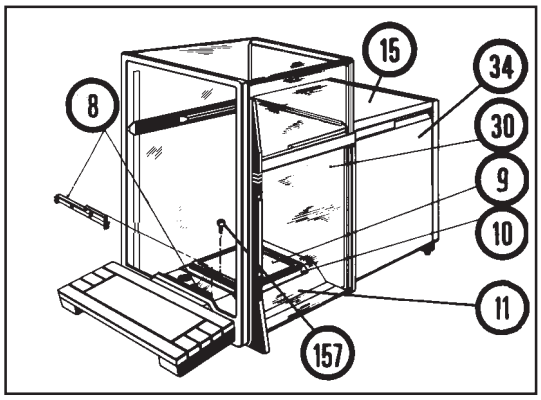
– Remove draft cover (10).
– Lift off weighing pan (9).
– Dismantle front glass (see D 1.2.1).
– Remove cover (11) after undoing screws (157); ensure that the ventilation grill (8) does not drop out.
– Lift out partition (30)..



## 1.4 Assembling balance housing

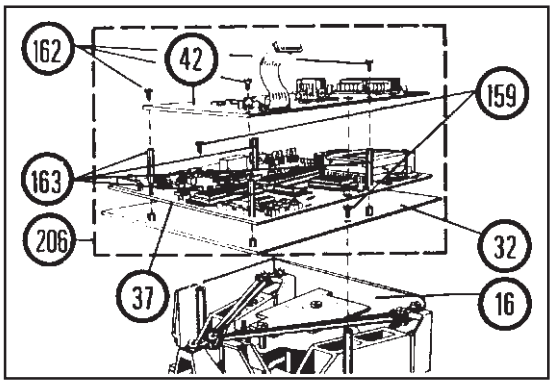



– Insert partition (30) from above in housing base.
  Warning → ensure display cable is not pinched.
– Insert side walls (34) from rear into the guideways and slide up to the partition (30).
– Place housing cover (15) together with the upper sliding door (27) from the rear on the guideways of the two side walls (34) and slide forwards up to the partition (30).
– Insert sliding side doors (28/29) from the rear in any order.
– Lift up balance to order to install the leveling screw holder (17).
– Fasten rear panel (33) using 3 screws (155).
– Insert cover (11) and ventilation grid (8), and loosely tighten screw.
– Fasten front frame (72) at front with 2 screws (154).
– Tighten cover (11) (already in place) with screw (157).
– Pull balance a short way over the edge of the bench and insert the display unit (31/35) (with inserted seal (154)). Fasten the display underneath with screw (150).
– Put on weighing pan (9).
– Insert draft cover (10).
– Connect power cable.



## 1.5 Electrical chassis

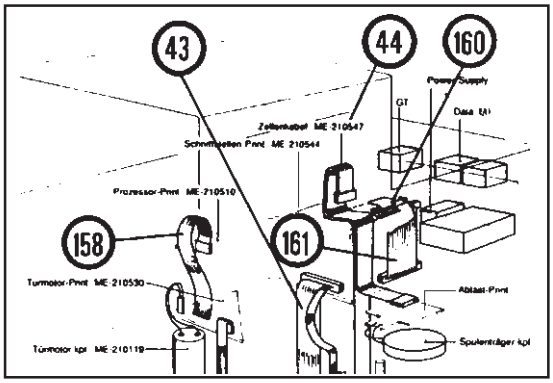
– Dismantling balance housing (see D 1.3)




### 1.5.1 Dismantling complete electrical chassis (206)

– Detach cell cable ME-210547 (44).
– Detach display cable ME-210546 (43).
– Detach cable for door drive motor (158).
– Undo 2 screws (159) on chassis plate (32).
(2 holes in lower circuit board).
– Hold cable holder (160) (cell cable) firmly with one hand and with the other hand raise the entire electrical chassis slightly so that the cable holder can be pulled away to the rear. Then pull the electrical chassis forward.
– Lift off electrical chassis completely.

**Note: If only one board has to be repaired or replaced, there is no need to undo the chassis plate.**




### 1.5.2 Installing complete electrical chassis (206)

– Lower complete electrical chassis (206) onto shroud (16). Before the electrical chassis is finally in position, position the cable with cable holder (160) from the rear next to the chassis plate.
– Screw complete electrical chassis firmly to the stud bolts with the 2 screws (159).
– Insert cable of door motor drive (158).
– Insert display cable (43).
– Insert cell cable (44).

### 1.5.3 Interface board (42)

– Unplug connector of connection cable (161) to CPU board at CPU board.
– Undo 4 screws (162).
– Lift off interface board.

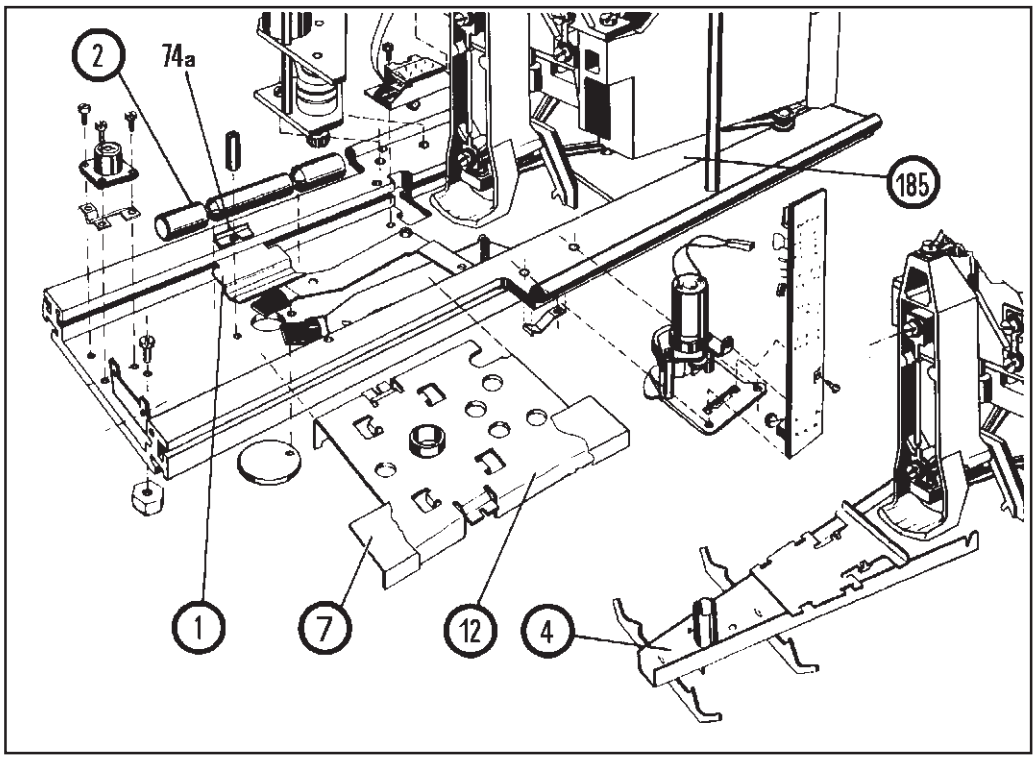
### 1.5.4 CPU board (37)

– Undo 4 stud bolts (163).
– Lift off CPU board (37) from chassis board (32).

**Warning: Before returning the electrical chassis or the CPU board, the Pac and the affix data printout must be removed and retained. After replacement replace Pac and affix data printout.**

**AT20: When replacing the CPU board, in the AT20 case jumper ST8 (connector 8) must be removed! (Different internal resistance in the coil)**

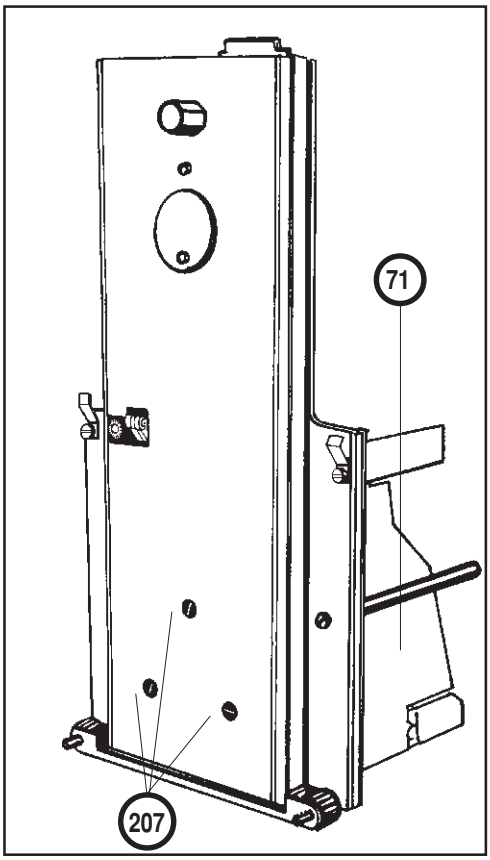
## 1.6 Removing weighing cell (71)




– Dismantle balance housing (see D 1.3).
– Dismantle complete electrical chassis (206) (see D 1.5.1).
– Carefully lift out shroud (16).
– Remove screening plate (7) above display cable.
– Disconnect display cable (43) at calibration board (41).
– Loosen overarm (12) by means of 2 screws. Refasten supports (74a) with the 2 screws to the housing base.
– Carefully remove calibration weights (2) (not with bare hands) and store in a safe place.
– Remove weight guides (1) (2 plates).
– Grip cantilever arm (4) at front and carefully lift up until the back of the cantilever arm at the stop plate becomes free underneath. Now pull out forwards.
– Place balance on its back.
– Remove 3 fixing screws (207) for weighing cell at rear of housing base.
– Hold cell and housing base and return balance to upright position.

**Warning: Hold cell only at casing or screening plate (166+87) to avoid possible damage to the flexible bearings.**

– Carefully lift out weighing cell (71).



## 1.7 Disassembling weighing cell

### 1.7.1 Dismantling link (65), lower guide (67) and upper guide (66)

– Remove weighing cell (see D 1.6) and place on the spacers.

– Remove the two screening plates (87+166).

– Lay weighing cell on its back.

– Remove link (66) [screws 171)], first the lower screw (171a).

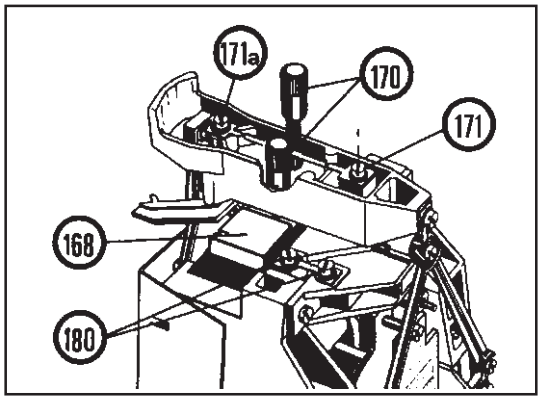
– Undo the 2 screws (169) at the guides (66+67).
Raise hanger (165) slightly. Push assembly gage (168) between hanger and weighing cell.
The stop of the gage must be at the left of the chassis.

– Insert stop plates (181) in the assembly gage and align with yoke (175).

– Using the 2 knurled screws (170) from the ServicePac, connect hanger (165) to the chassis.
Tighten the screws only loosely.

– Remove lower guide (67). First the 2 screws at the chassis (169), then the screw at the hanger (172).

– Turn weighing cell (remains on its back) 180° then remove upper guide (66) in same order as lower guide.




### 1.7.2 Removing hanger (165) and lever with yoke (69)

– Remove link, bottom and upper guide (see D 1.7.1).

– Remove hanger (165) and assembly aids (168/181) after the two knurled screws (170) have been removed.

– Insert threaded bolt (174) from the assembly set at yoke (175) at the front until it is slightly proud of the lever (176).

– Disconnect cell cable connector (44) at detector PCB (38).

– Unsolder the two conductor strips (78) at the detector PCB (38). Free the holes from solder.

**AT20: Unsolder the conductor strips (78) at soldering terminal (at lever)!
Free the holes from solder.**

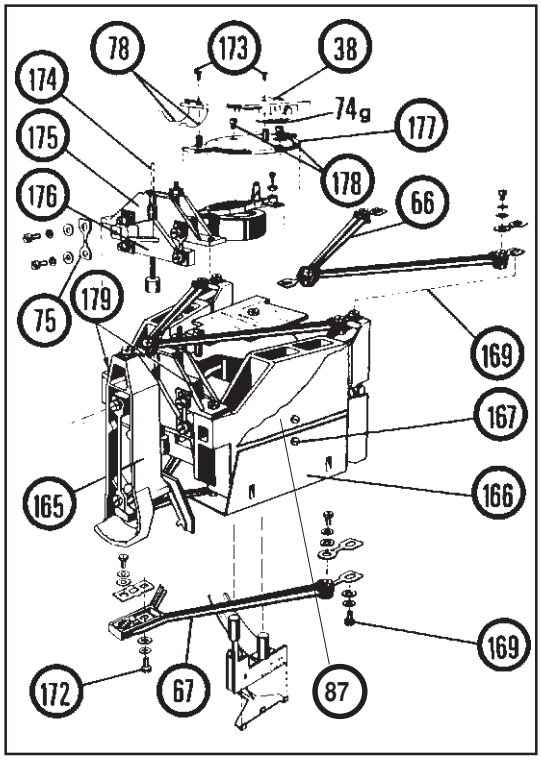
– Remove detector PCB after taking out the 2 screws (173).

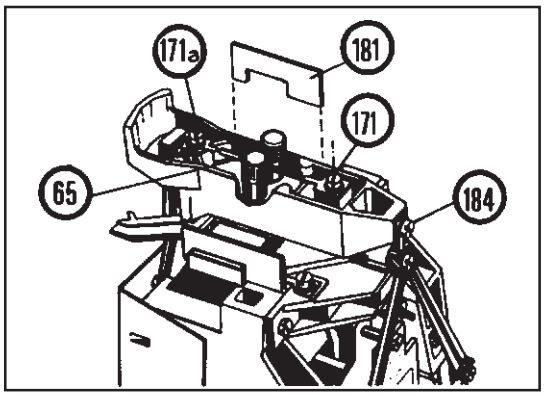
– Remove stop plate (74g).

– Take off cover (177) after undoing and removing the 2 screws (178).

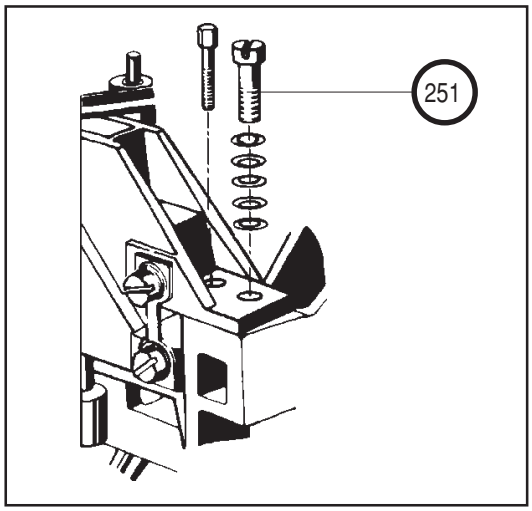
– Remove lever and yoke (69) together after undoing the 2 screws (179) at the yoke.

**AT20: It is essential to first remove brass screw (251) with the Belleville spring washers and then the second screw (see illustration on page D -12-).**



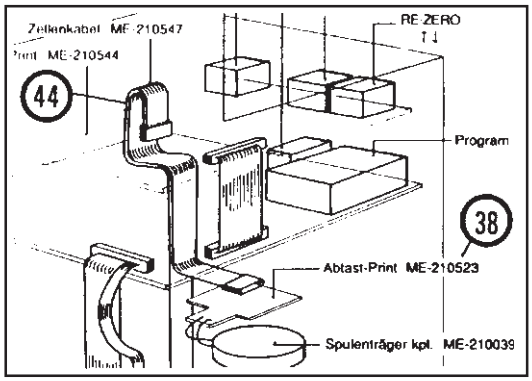
### 1.7.3 Dismantling lever (176) and/or flexible bearings (76)




– Dismantle weighing cell (see D 1.7.1) and place on spacers.
– Pull off connector of cell cable (44) at detector PCB (38).
– Unsolder the 2 conductor strips (78) at detector PCB (38).

**AT20: Unsolder the conductor strips (78) at soldering terminal (at lever)!**
**Free the holes from solder.**

– Remove detector PCB (38) after undoing the 2 screws (173).
– Insert the spacer (183) Ø 2 mm from the ServicePac between the lever (at dead load adjustment) and jacket (182) of the magnet system.
– Remove stop plate (74g).
– Remove cover (177) after undoing and removing the 2 screws (178).
– Insert centering pin.
– Remove the 2 flexible bearings (75) after undoing and removing the 4 screws (180).
– Remove yoke (175) after removing the 2 screws (179).



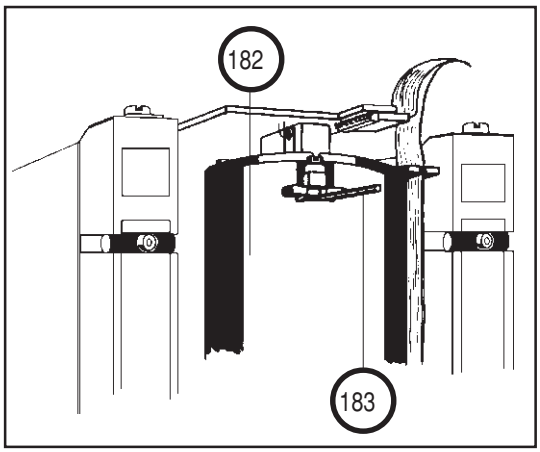

**AT20: It is essential to first remove the brass screw (251) with the Belleville spring washers and then the second screw**

– Remove spacer (183).
– Remove centering pin.
– Remove hanger with the gages.

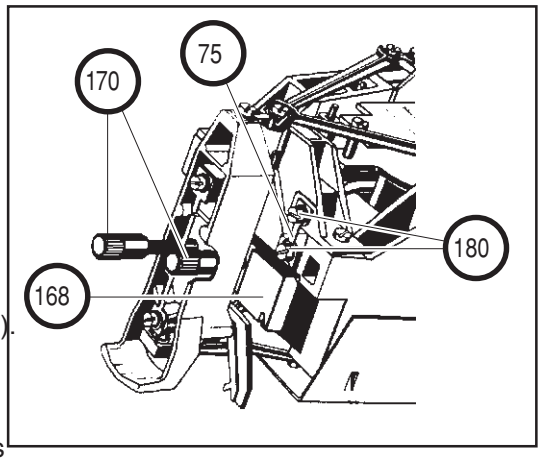
## 1.8 Assembling the weighing cell

### 1.8.1 Assembling lever (176) and/or flexible bearings (75)

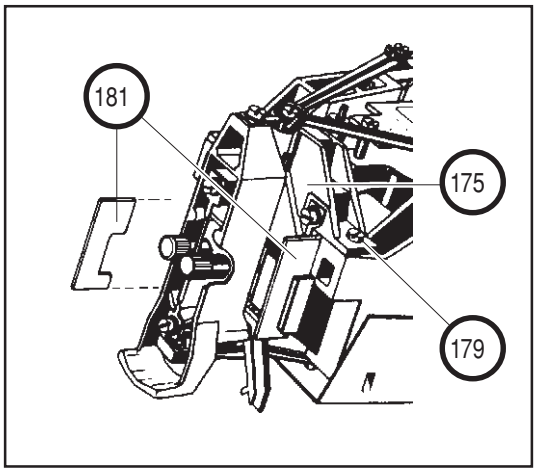
**For AT20, see D 4.1**




– Insert lever (176) from above into the cleaned magnet system.
– Insert centering pin.
– Insert the spacer (183) Ø 2 mm from the ServicePac between the lever (at dead load adjustment) and jacket (182) of the magnet system.
– Mount yoke (175). Front edge of yoke must be flush with front edge of chassis and centered left-right. Now fasten with the 2 screws (179).
– Insert assembly gage (168) as well as the 2 stop plates (181) from the ServicePac with the stop plates lined up at the top of the yoke (175), now fasten with 2 knurled screws (170).
– Fasten flexible bearings (75) lying correctly on the gage (168) (with the oblong hole of the flexible bearing at the top at the yoke) by first tightening the 2 screws (180) at the yoke and then the other two screws (180) (see D 2.2).




– Remove assembly gage (168) and 2 stop plates (181).
– Remove centering pin.
  • Check that the coil play front/back and left/right is even.
  • Procedure when there is no play:
    Undo yoke, insert centering pin and possibly spacer (183) and again the center the mounted lever. Then fasten yoke. Remove centering pin.
– Mount cover (177) and ensure that the 2 conductor strips are not pinched, then tighten cover firmly with the 2 screws (178).
– Insert stop plate (74g).
– Remove spacer (183) at the dead load adjustment.
– Mount detector PCB (38) and loosely tighten with the 2 screws (173) otherwise the mounting sleeve at the detector housing can be pulled out of the riveted joint.
– Solder on the 2 conductor strips (78) (precise curve shape) at detector PCB (38).

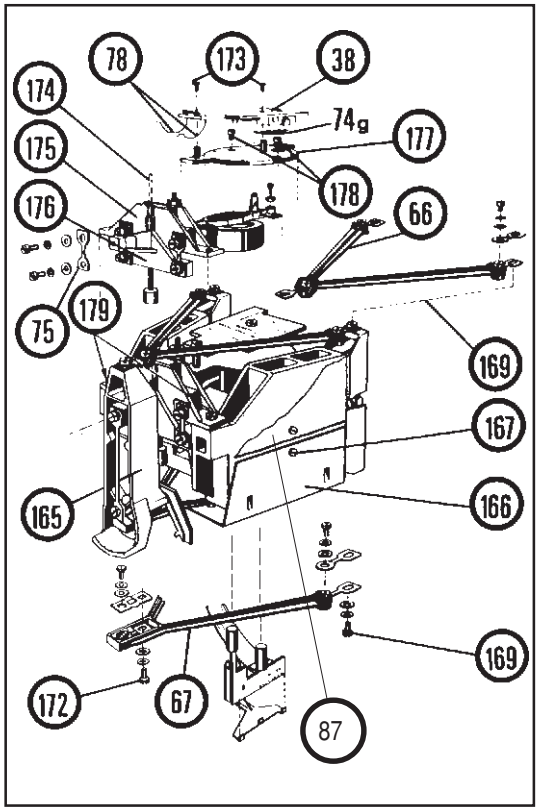


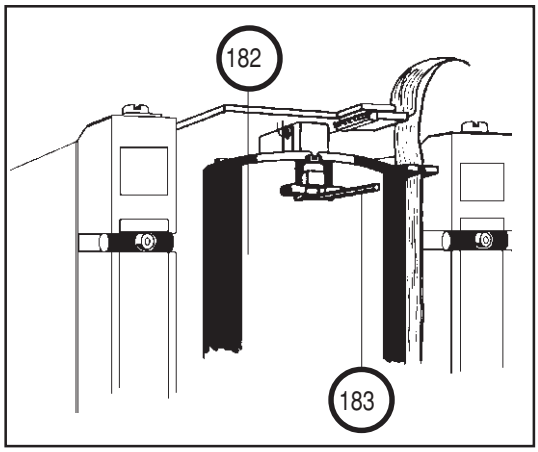

– Plug in connector of the cell cable (44) at detector PCB (38).
– Mount hanger, link and upper and lower guides (see D 1.8.3).
– Install weighing cell (see D 1.9).

### 1.8.2 Installing lever with yoke (69)

**For AT20, see D 4.1**

– Place weighing cell on spacers.
– Carefully insert mounted lever (69) in cleaned magnet system.
– Insert bolt (183), ø = 2 mm, from the assembly gage set between lever (176) and the jacket of the magnet system.
– Insert centering pin (ME-73376) in hole at magnet (with the screw ø 4 mm to the front).
– Insert the two screws (179) for fastening the yoke (69) in the chassis and tighten.
– Remove threaded bolt (174) at yoke.
– Remove centering pin.
  • Check that the coil play front/back and left/right is even.
  • Procedure when there is no play:
    Undo yoke, insert centering pin and possibly spacer (183) and again the center the mounted lever.
    Then fasten yoke.
    Remove centering pin.
– Position cover (177) ensuring that the 2 conductor strips are not pinched, then tighten cover with the 2 screws (178). (Centered at stop.) Check whether scanning indicator is centered at side.
– Insert stop plate (74g).
– Remove bolt (183) at overload stop.
– Place on scanning board (38) and tighten loosely with 2 screws (173), otherwise the mounting sleeve at scanning housing can be pulled out of the riveting.
– Solder on the 2 conductor strips (78) at detector PCB (38). Precise curve shape, they must be mounted unencumbered, not stretched and nowhere close.
– Insert connector of cell cable (44) at scanning board (38).
– Mount hanger, link, top and lower guide (see D 1.8.3).
– Install weighing cell (see D 1.9).



### 1.8.3 Assembling hanger (165), link (65), lower (67) and upper (66) guide

– Lay weighing cell on its back.

– Install assembly gage (168), align at top at yoke (175) using 2 stop plates (181).

– Align hanger (165) at right with assembly gage (168) and tighten with 2 screws (170) at chassis.

– Place weighing cell on fastening bolts.

– Remove threaded bolt (174) at yoke (175) if lever and yoke were removed as a unit.

– Lay on upper lever (66), tighten front screw (184) only loosely, now insert 2 rear screws (169) and also just tighten loosely. First the front screw (184) is tightened then the back 2 screws (169).

– Lay weighing cell on its back.

– Mount lower guide (67) in same order as described for upper guide.

**Warning: The screw heads at the lower guide (67) must when installed face weighing cell (see exploded view diagram)!**

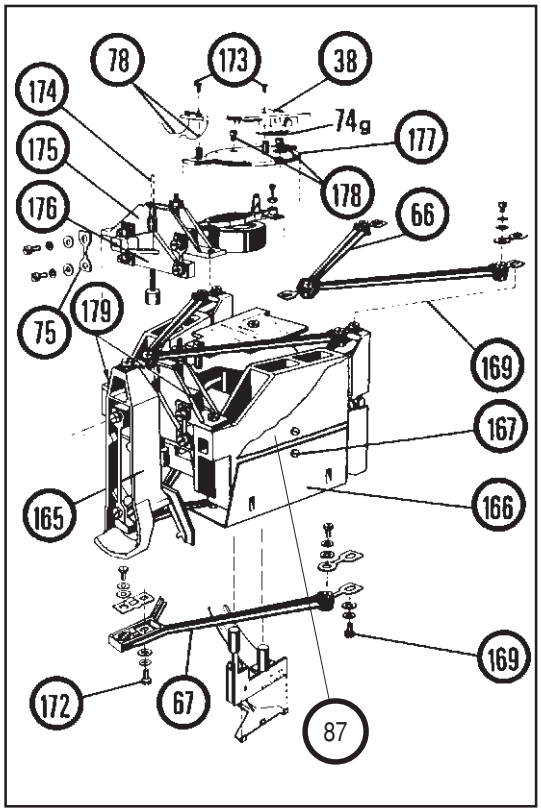
– Loosely tighten link (65) with the oblong hole at hanger at bottom. First the lower screw (171a) for the link attachment is tightened loosely (the screw must be in the middle of the oblong hole), then insert upper screw (171) and tighten both screws firmly.

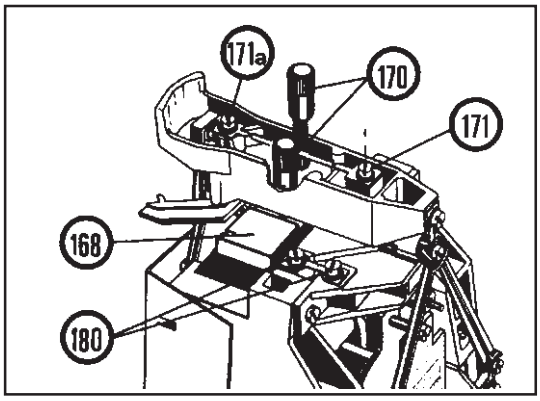
– Detach assembly gages (168/181) and remove after removing the two knurled screws (170).

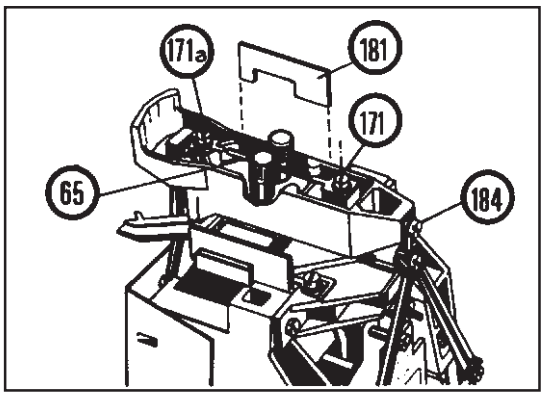
– Fasten screening plate (166) with the 2 screws (167) to the chassis.

– Fasten upper screening plate (87) with the 2 screws (258) to chassis.

– Install weighing cell (see D 1.9).



## 1.9 Installing weighing cell (71)

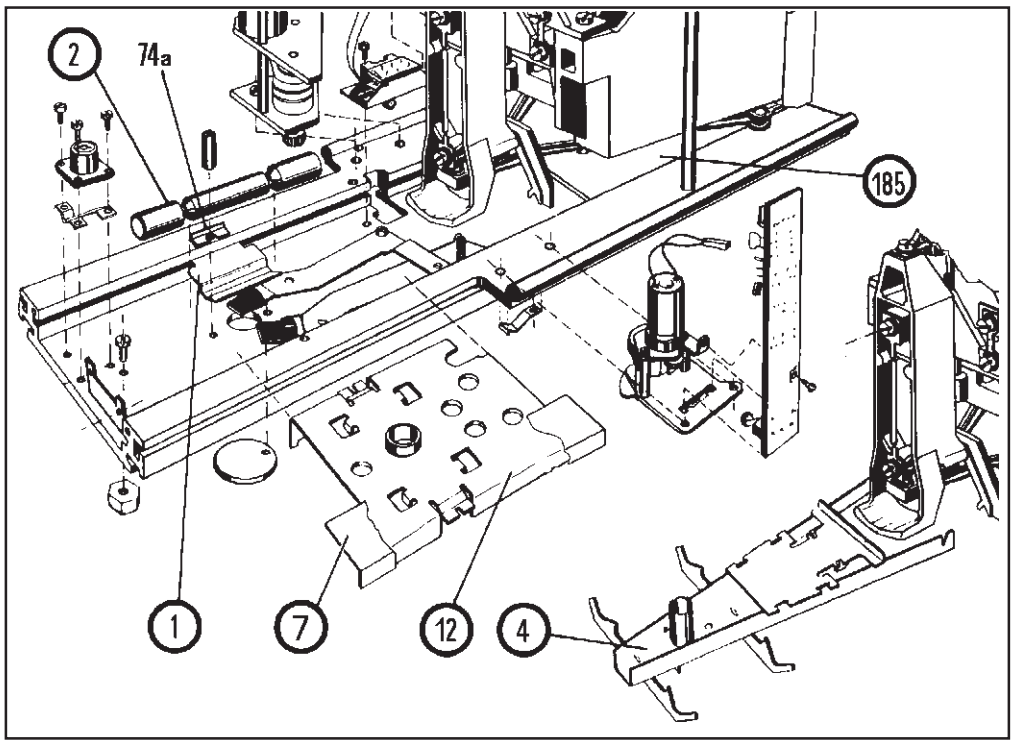
– Place stud bolts of weighing cell (71) from front through the openings in the screening plate (185) on the housing base.

– Pull housing base over edge of bench or tilt it backwards until the 3 screws (207) can be inserted in the stud bolts of the cell from below.

– Insert cantilever arm (4) from front at an angle so that the arm can be suspended without knocking assembling hanger (165).

**Warning:**

- The cantilever arm must be positioned in the middle of the housing base. This position can be adjusted by slight displacement of the weighing cell. (Use overarm (12) as gage!)
- The AT400/460 cantilever arm has been strengthened. If a not strengthened cantilever arm will be replaced by a strengthened one, the top screening plate (87) has to be shortened on the cantilever arm side by 2 mm.




– The separation between housing base and the upper edge of the cantilever arm (4) must be 15 mm; this can be checked with assembly gage (168) with the aid of the sunken depth. To set this distance, it is necessary to loosen the lower screw (171a) at the link (65). Now set the desired distance by shifting cell. On completion of adjustment retighten screw (171a).

– Insert the two weight guides (1).

– Position calibration weights (2).

– Position overarm (12) and set the play using washers (74a) so that there is a small amount of play between the calibration weights and the overarm, then tighten firmly.

**Check:** The weighing pan guide must be able to move back and forth within the sleeve of the overarm (centered).

– Insert display cable (43) at calibration board (41).

– Insert screening plate (7) above display cable.

– Insert shroud (16).

– Mount electrical chassis (206) (see D 1.5.2).

– Secure display unit and perform test (see B 2.3.6).

– Mount balance housing (see D 1.4).

## 1.10 Changing weighing cell (71)

– If the weighing cell (71) can not be repaired or the sensitivity has dropped below the calibratable range, the completely adjusted weighing cell can be ordered as an exchange part. It is supplied with the scanning (38) and the sensor board (46) but without cantilever arm (4) (see exploded view diagram).

– The sticker data must be reentered (see B 4.3.2).

## 1.11 Remarks regarding stripping and reassembly of weighing cell

– If the air gap of the pot magnet has to be cleaned, the weighing cell must be stripped down up to and including dismantling of the yoke and lever (69) (dismantled together) and afterwards again reassembled and adjusted.

– A similar procedure is necessary for the replacement of weighing cell parts that are not accessible externally, but dismantling need not always be performed up to the lever stage (176).

– It thus appears practical to describe the disassembly up to and including the lever (176) (together with yoke 69)) only once.

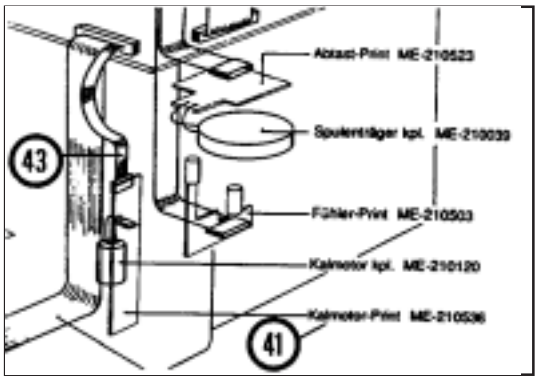
  For the exchange of parts follow the instructions in the appropriate section.

## 1.12 Foreign bodies in magnet air gap and their removal.

– Dust fibers scarcely visible to the naked eye (in the air gap between the field spool and magnet) can cause errors in the reproducibility. More solid particles such as magnetically attracted iron filings or abraded metal dust from the air can lead to a stoppage of the moving system. In relatively simple cases this can result in permanent fluctuation of the measuring cell since as a consequence of mechanical friction it never achieves the actual rest point but is constantly overcompensated.

– An ideal cleaning method is the use of a layer of double-sided adhesive tape wound around a nonmagnetic, narrow metal strip (aluminum, copper, brass).
  When this is inserted in the air gap, magnetic as well as nonmagnetic particles remain attached. The dismantled field coil can also be safely cleaned in this manner.

## 1.13 Calibration drive




– Disconnect power cable.
– Remove cover (see D 1.3.1).
– Dismantle side walls (see D 1.3.2).
– Dismantle complete electrical chassis (206) (see D 1.5.1).
– Lift off shroud (16).

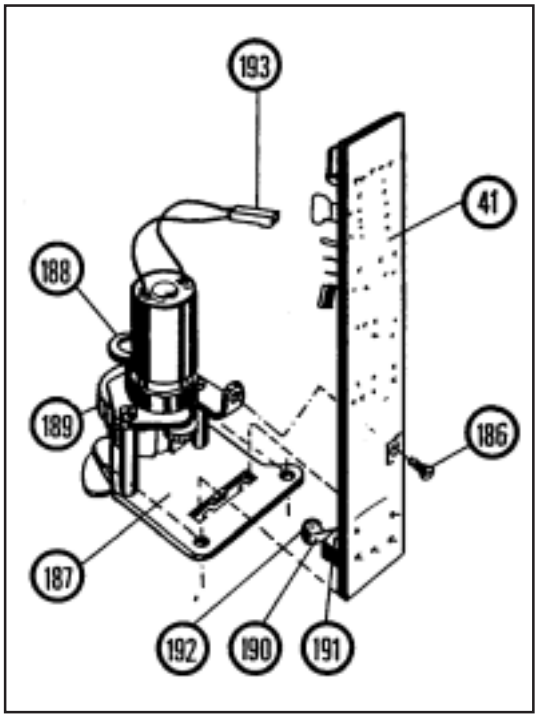
### 1.13.1 Removing board (41)

– Display cable (43); unplug connector at calibration board (41).
– Disconnect connector of connection cable (193) from board (41) to calibration motor.
– Remove calibration board (41) after removing 2 screws (186) at motor support plate. Lift out board from base plate (187).

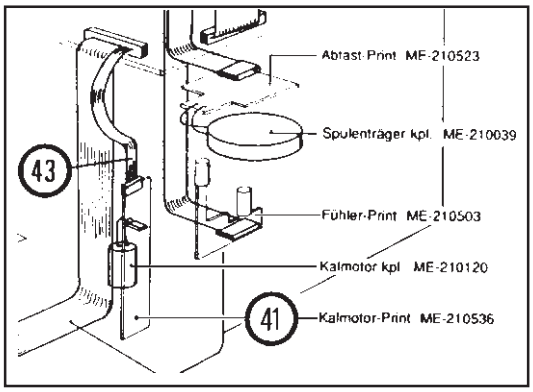
### 1.13.2 Installing board (41)

**Warning: Do not turn toothed gear wheel (189)!**

– Insert calibration board (41) from above in the milled slot of base plate (187) then fasten board using screw (186) to motor support plate (187).
– Check that the switch (191) actually switches by turning the drive wheel (188).
– If the switch noise is not audible the leaf spring (190) at the switch (191) should be bent up until the guide wheel (192) presses firmly against the cam plate.
– Plug in connector of calibration motor connection cable (193).
– Plug in connector of display connection cable (43).
– Check the setting using ServicePac (with balance open).
– Insert shroud (16) from above.
– Install electrical chassis (206) (see D 1.5.2).
– Mount balance housing (see D 1.4).

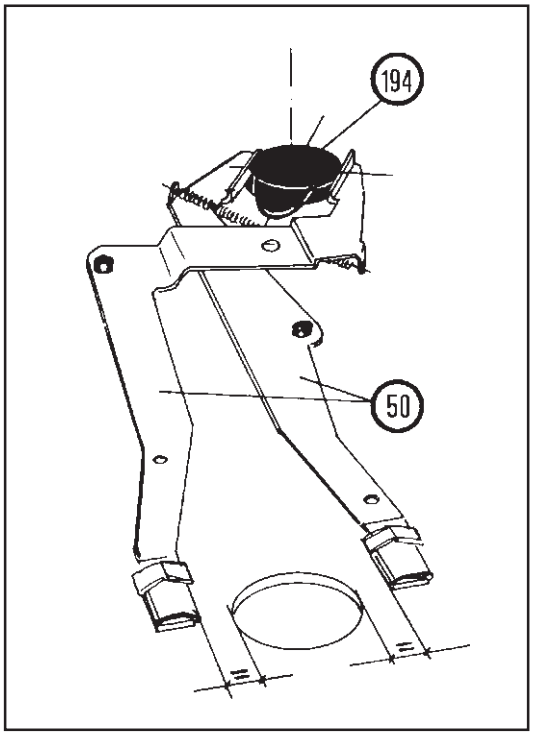


### 1.13.3 Dismantling calibration drive (51)




- Dismantle weighing cell (71) (see D 1.6).
- Display cable (43); unplug connector at calibration board (41).
- Unplug connector of connection cable (193) to calibration motor.
- Dismantle calibration board (41) (see D 1.13.1).
- Detach calibration drive (51) after undoing 2 screws at the base plate (187).
- Remove calibration drive carefully.

### 1.13.4 Installing calibration drive (51, see also D2.7)




- Carefully open completely the two pincers (50) at gearing of calibration drive using two fingers.
- Using the other hand insert the calibration drive (51) so that the two pincers (50) are exactly centered with respect to the opening in the housing plate! (Check using the vernier caliper!)
- The ellipse of the drive (194) must lie at a right angle to the two pincers, the projection points in the direction of the display. Microswitch must be engaged in the indentation.
  - If necessary ,turn drive wheel (188) until the microswitch engages.
- Screw on base plate.
  - Check with the vernier calipers whether the pincers are centered.
  - If necessary, move the base plate.
- After adjustment of the calibration drive, screw to housing base with 2 screws.
- Install calibration board (41) (see D 1.13.2).
- Plug in connector of calibration motor connection cable (193).
- Plug in connector of display connection cable (43).
- Adjust switch (191) (if necessary) by bending up leaf spring (190) at microswitch (see D 1.13.2).

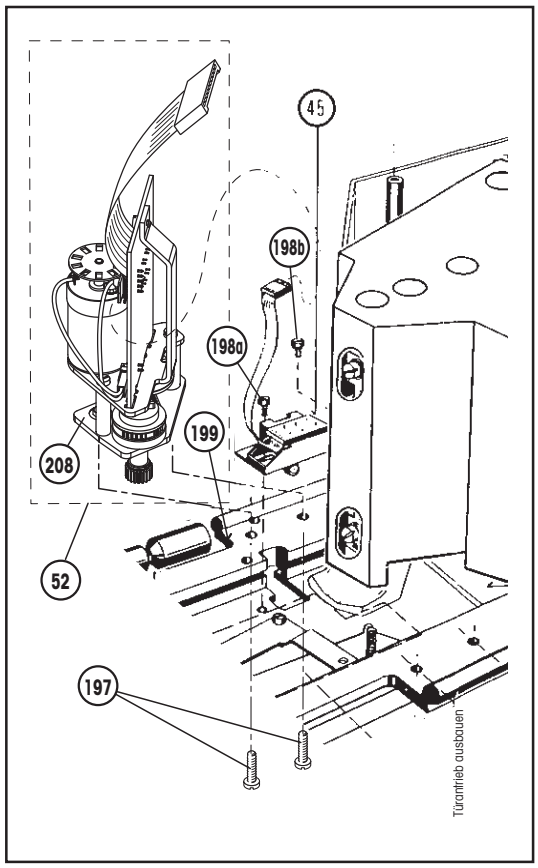
**Warning: Check adjustment with balance open using Servicepac!**

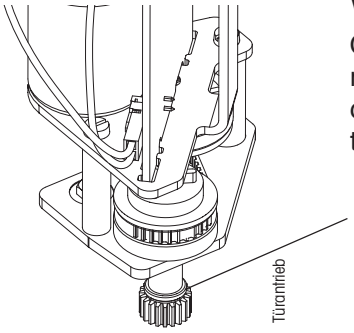
- Install weighing cell (see D 1.9).

## 1.14 Door drive

### 1.14.2 Removing complete door drive (52)

– Dismantle balance housing (see D 1.3).
– Disconnect plug-in connection of switch (45) to complete door drive (52).
– Tilt housing base backwards and undo 2 screws (197) underneath housing base.
– Carefully lift out draft shield drive (52).




**Warning:**

On occasion, the door drive may stick. In this case, a drop of oil has to be added to the gear-weel shaft.

### 1.14.4 Removing switch (45)

– Dismantle balance housing (see D 1.3).

– To pull off the switch (45) it is first necessary to undo the 2 screws (198).

### 1.14.5 Installing switch (45)

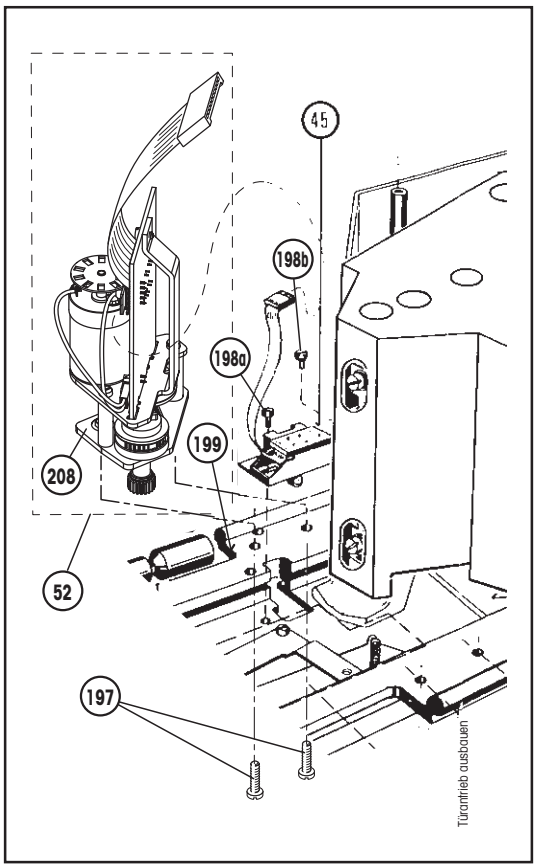
– Place switch (45) on housing base aligned with the slot in the base and fasten temporarily by tightening 2 screws (198) loosely but ensuring that the special screw (198b) is located at the back whereas the front screw (198a) is installed with a washer.

– Mount balance housing (see D 1.4) but without screening plate (11) until the switch setting is fixed, then install screening plate.

**Warning: The switch setting must be adjusted right at the end of the installation, i.e. with assembled housing and inserted sliding doors, but without the screening (11).**

**So that the switch setting can be adjusted, which is performed by sliding the switch (45), it is necessary to first loosen the front screw (198a) slightly.**

**The switch setting is correct when the two sliding doors (28/29) at the front frame (72) come to a stop without a thump (stop position); the front screw (198a) can now be tightened.**

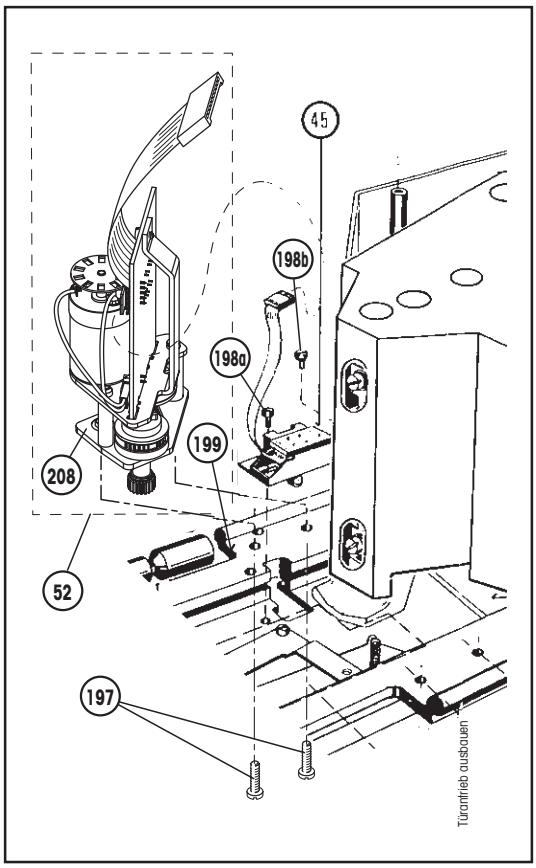


### 1.14.7 Installing complete door drive (52) (see also D 2.6)

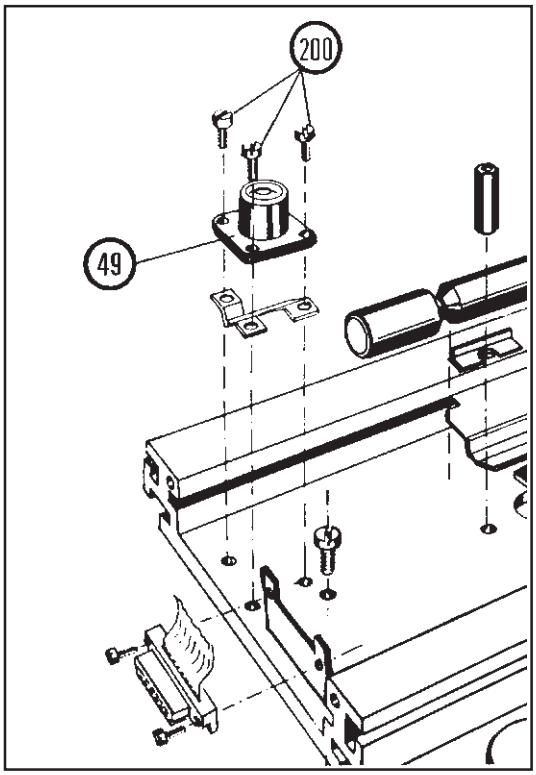
– Detach leveling screw holder (17) by removing 2 screws.
– Remove leveling screw holder.
– Insert guide plate (26) from rear.
– Refasten leveling screw holder (17) with 2 screws.
– Carefully install door drive (52) at switch (45) and tighten loosely with 2 screws (197) underneath (see also D 1.14.5).
– Press guide plate (26) to right (viewed from front) against the housing base.
– Pull door drive (52) gently towards the gear tooth system (to the left, that is away from the balance) of the guide plate (26) and tighten the two screws (197) firmly. (The guide plate should run easily when operated by hand.)
– Plug in connector of switch (45) at complete door drive (52).

**Warning: The base plate (208) must not project at the front over the edge of the housing base (199) otherwise the partition can not be installed**!

– Install complete electrical chassis (206, see D 1.5.2)
– mount balance housing (see D 1.4).



## 1.15 Changing level




### 1.15.1 Dismantling level (49)

– Dismantle front glass (D 1.2.1).
– Remove draft cover (10).
– Lift off weighing pan (9).
– Remove cover (11) after undoing screw (157).
– Remove level (49) after removing 3 screws (200).

### 1.15.2 Installing level (49)

– Check that the work bench is level.
– Position auxiliary level indicator on the housing base and level.
  • Remove auxiliary level indicator.
– Fasten level (49) to housing base with 3 screws (200).
  The screws should be screwed approx. 3 mm into housing base uniformly (alternately).
  The screws must not project at bottom of housing base.
– Place cover (11) in position and fasten with screw (157).
– Put on weighing pan (9).
– Install draft cover (10).
– Mount front glass (see D 1.2.4).

**Warning: After replacement of the level, the balance must be levelled with the auxiliary level indicator.**
**Readjust the level.**
**Calibrate the balance.**

# 2. Special information regarding parts

## 2.1 Display assembly

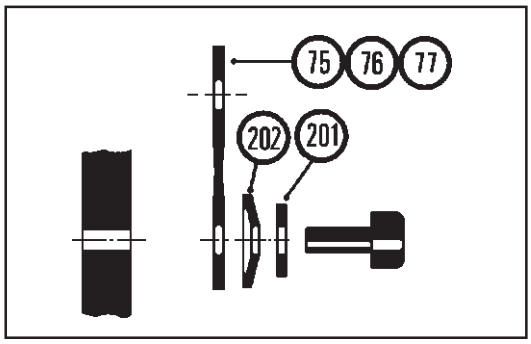
### 2.1.1 Inserting short keys (53 + 59/89+90) (see also D 1.1.4 + 1.1.6)

– When the board is screwed onto the key holder the short keys (53 + 59/89+90) should be parallel to the Re-Zero key (73). This is adjusted by slightly loosening (about 1/4 turn) the 2 Phillips screws (153) after tightening.

### 2.1.2 Attaching display (31/35)

– If the display is attached (plugged in) it is essential to attach seal (154) to the connector.

## 2.2 Flexible bearings (75/76/77) and link (65)




– Buckled, twisted or bent flexible bearings or link are the cause of nonlinearity and usually hysteresis. Bent flexible bearings also render adjustment of cornerload errors impossible.

– Deformed flexible bearings or link should in general be replaced for their material structure has undergone such alteration that they can no longer be made functional by proper alignment.

– Even if only one of the two flexible bearings (75/76) is damaged, it is essential to replace both flexible bearings.

– Flexible bearings and link are mounted on all attachment points with a Belleville spring washer (202) such that its outer edge lies on the flexible bearing/link (reason: avoidance of torsional strain).

– Flexible bearings and link are also provided with an additional washer (201) (ME-76553/washer 4.3/8 x 0.8 Ms fr) at all attachment points next to the screw head.

– Always tighten fastening screws only until the washer is flattened (noticeable by abrupt increase in resistance to further tightening of screw).

– When tightening the screws the bearings must on no account turn (transverse stress). Stressing of the flexible bearings and link by pressure (kinking) must be avoided.

– After replacement of a flexible bearing or link and even after loosening and retightening of their fixing screws, reproducibility, cornerload and linearity must be rechecked (tolerances, see B 1.1) and if necessary readjusted. Calibrate the balance according to the operating instructions.

## 2.3 Electrical chassis

– The electrical chassis as a complete unit is not supplied as an replacement part but only as interface and/or as CPU board.

## 2.4 Sensor board

– If the sensor board is replaced, the balance must be readjusted (see D 3.4).

## 2.5 Conductor strips

– The conductor strips are supplied with length 5 cm in sets of 10.
They must first be soldered to the conductor board of the lever (field coil). They are then soldered to the scanning board such that they leave the board vertically and run parallel. The strips must never touch anything between the solder points.

## 2.6 Door drive

– Rattling of draft shield during motorized opening and closing.

– The drive for the opening of the draft shield doors (sliding doors) is fitted with an automatic coupling which allows moth manual and motorized operation.
On frequent change from manual to automatic operation rattling of the draft shield may occur. In most cases this rattling can be rectified by coupling together more than one draft shield element.

– The door drive is also fitted with a friction brake that virtually eliminates rattling.

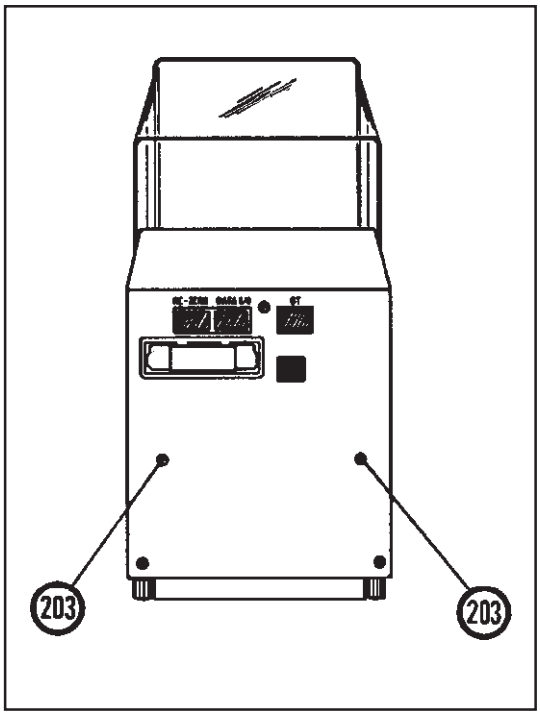
– This friction brake is in the form of a plate and can not be set until the base plate of the drive has been firmly tightened. This plate should act with a gentle pressure in the drive. The contact pressure can be varied by turning the hex bolt.

## 2.7 Lubrication

– Between all moving parts (door guideways, rollers, eccentric, pincers, door drive, slider) made of plastic and metal a film of lubricant has been applied during assembly. The continuity of this lubricant film can be destroyed through contamination and ageing and this can give rise to parts running with difficulty, resination or jerky movements. In such cases the glide surfaces should be cleaned (dry cloth) and relubricated with a slightly viscose silicon grease.

# 3. Adjusting the weighing

## 3.1 Corner load




### 3.1.1 Note

– For checking the corner load use the tolerance table B 1.1.
– If the corner load is grater than 50 mg,

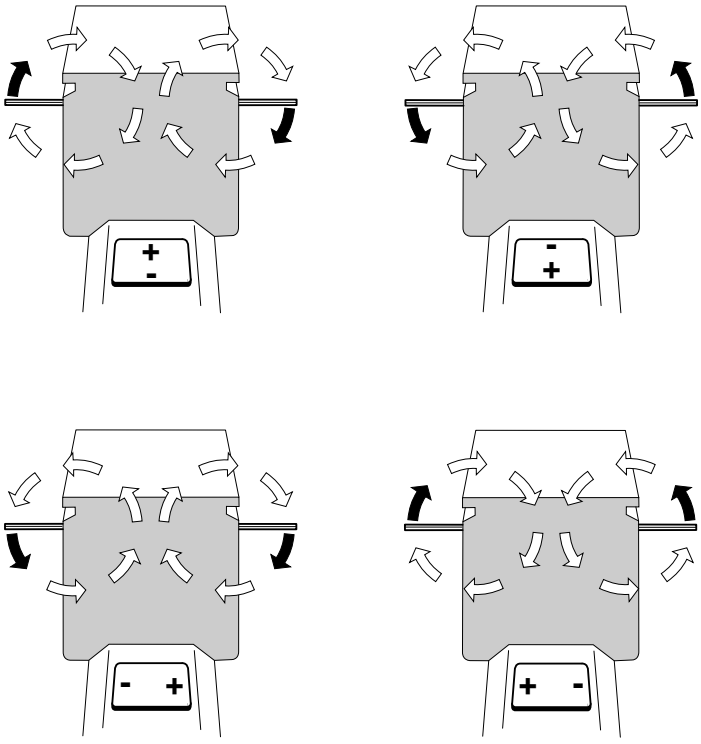
**AT20: larger than 50 µg!**

check for a mechanical fault before adjustment: Check flexible bearing for deformation, replace if need be (see D□2.2).

### 3.1.2 Checking and adjusting

– Undo the 2 screws (203) at the rear. Now insert the 2 Allen keys (in the assembly set) in the two openings (203) and carefully insert in the screw heads.
– Place test weight in accordance with the specifications in the Tolerance Table (see B 1.1) on the weighing pan.
– Tare.
– Move weights to front, back, left and right. Note down displayed values with sign.
– Correct error according to sketch below until it lies within the prescribed tolerances.

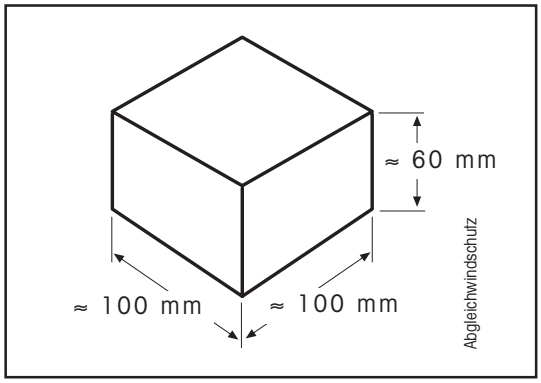
**Note: The two signs in the square (weighing pan) mean two errors (lengthwise/transverse). Always first correct the two errors with the greater deviation.**



## 3.2 Level sensitivity adjustment

**For AT20, see D 5.**

### 3.2.1 Zero point adjustment




– Level balance and if need be check the leveling with test level on housing base and also readjust the level coarsely.
– Tare.
– Lift up balance at front (place 0.5 mm underlay under the front foot) so that the half of the air bubble of the level (49) moves out of the cross at the front.
– If the value is negative the adjustment weight should be turned downward.
  (1 turn = ~ 0.5 mg).
– If the value is positive, turn the adjustment weight upwards.
– The adjustment must be repeated until the value corresponds to the specifications in Tolerance Table B□1.1.

**Note:** This adjustment work is performed with open balance, i.e. without sliding doors and without housing covers. It is necessary to provide the weighing pan with a cover (cardboard box or any other vessel, see dimension diagram) to restrict the influence of drafts to a minimum.

### 3.2.2 Full load adjustment

**With the test weight in accordance with the Tolerance Table (see B 1.1).**

– Tare unloaded balance.
– Load test weight and note displayed value.
  Remove test weight.
– Lift balance up at the front.
  • Place 0.5 mm underlay under front foot.
  View of level: 
– Tare balance.
– Load test weight, compare the value now displayed with the first value.
– If the first value is smaller, turn the rear left and right leveling screws downward (clockwise).
  • 2 grooves ~ 0.1 mg.
– If the first value is greater, turn the rear left and right leveling screws upward (counterclockwise).
– The adjustment must be repeated until the deviation is less than 0.8 mg.
– Readjust the level.
– Finally, check the dead load (see D 3.3).

## 3.3 Dead load

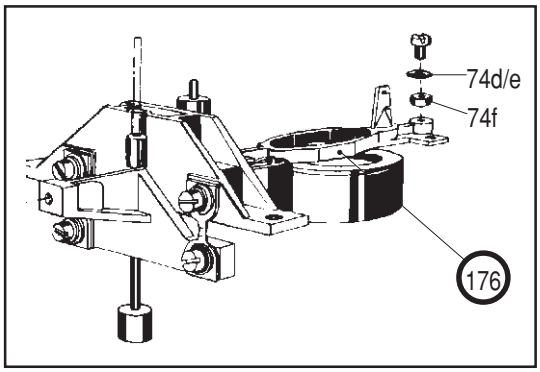
**Note: This work is carried out on the open balance, i.e. without sliding doors and without housing cover. It is necessary to provide the weighing pan with a cover (cardboard box or some type of vessel) to restrict the influence of drafts to a minimum.**

### 3.3.1 Checking dead load (ServicePac inserted)

– Level balance, calibrate and switch off and on with the control key.

– After the display test, the dead load (-S) appears after the switch key has been pressed once (see note on page D-29-). If the dead load is outside the tolerance (see Tolerance Table B 1.1), it must be adjusted according to the details in D 3.3.2.

### 3.3.2 Adjusting dead load (ServicePac inserted)




– With unloaded weighing pan the display shows gross (B) (see B 4.3.1) equal to the dead load; this corresponds to the switch-on zero value.

– If the displayed dead load is too high more weight (74f) should be added at the rear to the lever (176) next to the stop. If the load is too small, correspondingly less weight. Use compensation weight in the small parts set (74); this causes a dead load change of about 3.5 g. Should this not be large enough, nonmagnetic washers can be used.

**• For the AT20, the counterbalance weights (washers) 74 d/e must be used.**

## 3.4 Temperature compensation (ServicePac inserted)

– A temperature adjustment need only be performed on **very few occasions**. In most cases it is better if the sticker data (parameters) of the balance or the relevant cell are entered.

– The replacement of mechanical parts (bearing, link, guide, etc.) primarily affects the zero point behavior, and a temperature adjustment should not be required in such a case.

– Even when a board is changed a temperature compensation is advisable only if the test (B 2.3.5) shows it to be necessary. (Replacement of sensor board can possibly make a new temperature adjustment necessary.)

– On replacement of the sensor board, CPU board or the scanning board a check (see B 2.3.5) should always be made, however, to see whether a new temperature adjustment is necessary. In most cases the previous adjustment data suffice.

**Preliminary work:**

– Enter the correct type with the TypePac; if this has not been carried out the error message **E.PARAM** appears in the display (see C-8-).

**Conditions required for temperature adjustment:**

– Balance well acclimatized.

– Suitable ambient conditions (no drafts).

– 3 measurement temperatures (differing by at least 3 degrees), LOWER, MEDIUM, HIGHER TEMP.

– The order of the measurement temperatures is freely selectable, but it is advisable not to conclude with the medium temperature measurement.

– After the measurements at the third temperature are complete, the balance determines its adjustment constants automatically.

**Note:**

– The **"Double arrow"** key can be used to display the temperature in the balance, the current weight value and the weight value with dead load (zero point load).

  The temperature is displayed without unit characters, the displayed temperature value corresponds only approximately to the temperature in degrees Celsius.

  For this reason the parameter weight unit (**unit 2**) in the configuration register is not accessible with the ServicePac. **Unit 2** is a arbitrary temperature unit in the ServicePac, which does not deviate greatly from the Celsius scale.

– The process currently running can be aborted using the **"RESET"** key.

– Should the adjustment give an unsatisfactory result, the entire sequence must be repeated, including the initial loading of the type parameters by means of the TypePac.
  The adjustment is reinitialized (even if it is not complete) when the type is reentered using the TypePac.
  Single measurements can be performed at any time without reinitializing the adjustment if the temperature conditions are adhered to.

**Example:**

– The adjustment has been performed at the temperatures 18, 22 and 26°C. It is now possible to repeat the measurement at the highest temperature at, for example, 28°C. If the temperature conditions are adhered to the adjustment must not be reinitialized.

If, however, it is desired to repeat the 22°C measurement at 24°C either the entire adjustment must be restarted or first the 26°C measurement repeated at minimum 27°C for all conditions to be fulfilled.

**Procedure for adjustment:**

| | | | |
|---|---|---|---|
| 1. | Key (2x) | **"double arrow"**, | display of first temperature.<br>– Note the temperature value, or → |
| 2. | Key | **"PRINT"** | printout of the temperature value. |
| 3. | Key | **"double arrow"** | press until the weight display reappears. |
| 4. | Key | **"HIGHER TEMP"** | after about one minute the weights are loaded and the temperature and weight values read in. |
| 5. | Display | **WAIT, SAMP, END.** | sequence display. |
| 6. | Expression | **VALID:HI** | with valid measurement. (If measurement invalid no expression.) |
| 7. | Key | **"Re - Zero"** | after the message **END** (display that the work step is complete) confirms the measurement just completed and closes it. |
| 8. | Key | **"MEDIUM TEMP"** | (minimum 3 degrees change in temperature compared with previous measurement!) |
| 9. | Display | **WAIT, SAMP, END.** | sequence display. |
| 10. | Expression | **VALID:HI MED** | |
| 11. | Key | **"Re - Zero"** | |
| 12. | Key | **"LOWER TEMP"** | (further 3 degrees change in temperature compared with previous measurement!) |
| 13. | Display | **WAIT, SAMP, END.** | sequence display. |
| 14. | Expression | **VALID:HI MED LO** | on completion of the measurements at the third temperature the balance calculates and stores the adjustment values for the compensation automatically. |
| | | **COMPENS OK** | after adjustment performed correctly. |
| 15. | Key | **"Re - Zero"** | the balance is again in operational readiness. |

**Procedure following temperature compensation:**

– Perform fine compensation (see D 3.5).

## 3.5 Fine compensation (ServicePac inserted)

After a temperature compensation the so-called fine compensation must be performed. This serves to eliminate small temperature drifts. It is performed automatically by the balance.

**With the AT20, the fine compensation is unnecessary! (lower power consumption)**

The fine compensation is always carried out with the built-in calibration weights.

With the AT400 and AT460 models, the balance also calls for an external 200 g weight (beep sounds, display flashes).

**Procedure for fine compensation:**

– Balance switched on for at least 2 hours.

1. Key **"CALIBR RESISTOR"** Adjustment and control are performed, duration approx. 12 minutes.
2. Display of the remaining temperature drift.
   This value must lie within the tolerances listed in the Tolerance Table (see B 1.1).
3. – If condition is fulfilled **(F COMP OK)** press **"ENTER"** key.
   – If condition is not fulfilled **(F COMP ABORT)** press **"RESET"** key and repeat fine compensation.

## 3.6 Standard calibration (ServicePac inserted)

– Must always be performed when the check (see B 2.3.7) has shown that a standard calibration is required.

**Conditions required for performance of standard calibration:**

– Balance switched on for at least 2 hours
– Suitable location
– Setting **ASd-1–**(stability check)
– Balance leveled
– Cornerload adjusted
– Weight(s) from the weight set acclimatized in weighing chamber.

**Note:** If the standard calibration is terminated with **"E UnStb",** the **stability detector must be reconfigured to ASd-1- or -2-** since, depending on the ambient conditions, ASd-3-, -4- or higher sets too narrow limits.

**Procedure for adjustment:**

1. Note weight value according to data sheet of weight set, e.g. 199.99876 g
2. Key **"CALIBR FACTOR"**
3. Display **WEIGHT**, Enter the value from point 1 (199.99876 g).
4. Key **"ENTER"** Confirm keyed in value.

– The balance now performs a determination of the internal weights itself.

5. Display **199.9988 g** The entered weight (rounded off to 4 places) from point 3 appears on the display.
6. Load weight(s).The balance reads in the weight (beep sounds/display flashes).
7. Display **0.0000g** (beep sounds/display flashes).
8. Remove weight(s).
9. The balance redetermines the internal weights (to eliminate drift).
10. Display **CAL End** the standard calibration is complete and the balance thus calibrated correctly. (Output on printer, see B 4.9).
11. Key **"Re-Zero"**, The balance is again in operational readiness.
12. For checking: internal calibration performed and then checked with external weights.

**On wrong entry:**

Key **"RESET"** Start again at point 2.

**Note:** **After the standard calibration and the subsequent calibration with the internal, built-in weights CAL Int, the fine range of the AT is also calibrated. Possible deviations lie in the accuracy of the weight set, the reproducibility and linearity of the balance. In most cases, however, in the control measurement the disturbances caused by the operator and the local conditions (moisture, temperature, drafts) are greater than the error in the calibration.**

## 3.7. Linearity

– The linearity is redetermined automatically after every calibration (calculated).

## 3.8 Final worksteps

– Remove ServicePac and replace by StandardPac.
– Assemble balance.
– Configure vibration adapter, weighing process adapter and stability detector.
– Set up customer configuration.
– Place on draft cover (10) and weighing pan (9).
– Attach peripheral units.
– Set up balance in accordance with operating instructions.

# 4. Specific to AT20

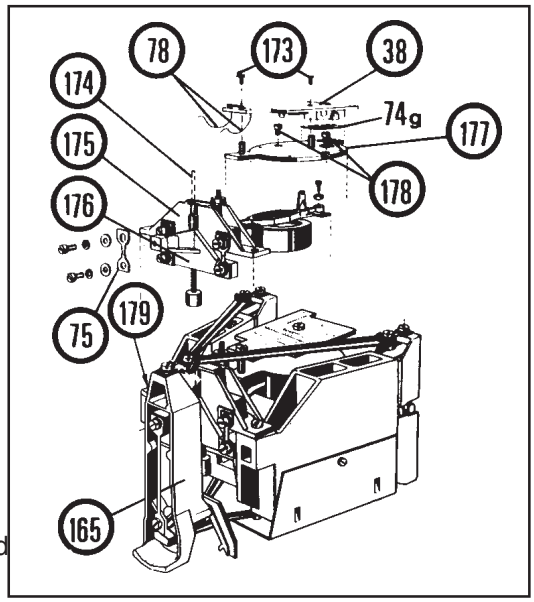
## 4.1 Installing AT20 parts

### 4.1.1 Installing lever (176), yoke (175) and/or flexible bearings (75)

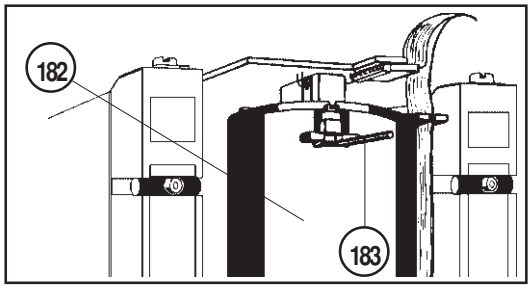
– Insert lever (176) from above into the cleaned magnet system.

– Insert the spacer (183) ø 2 mm from the ServicePac between the lever (at dead load adjustment) and jacket (182) of the magnet system.

– Mount yoke (175) at casing and ensure that the adjustment screw (250) is not projecting.
  • **The stop plate (74 g) should be placed underneath on the right as an assembly aid.**
  • Front edge of yoke must be flush with front edge of chassis.
  • Tighten screw (179) on left side.
  • Screw in brass screw with mounted 5 Belleville spring washers on the side where the stop plate is underneath until it begins to be difficult to turn and then turn an additional 3/4 turn.




– Insert assembly gage (168) as well as the 2 stop plates (181) from the ServicePac. The stop plates must be lined up at the top at the yoke (175). Fasten the entire unit with the 2 knurled screws (170).
  • Remove the 2 stop plates (181).



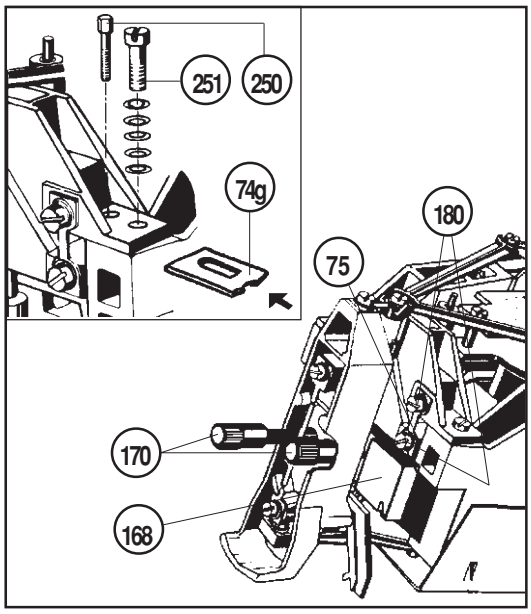

– Fasten flexible bearings (75) lying parallel on the gage (168) by tightening the 4 screws (180) (see D 2.2) ensuring that the oblong hole of the flexible bearings is at the top of the yoke.

– Remove assembly gage (168) after undoing the 2 knurled screws (170).

– Undo 2 screws (179+251) of yoke (175) until the mounted lever (69) can be moved. Center lever so that there is no contact between the spigot of the magnet system and the hole of the lever. (The centering bolt from the ServicePac must be inserted at the spigot of the magnet system!)

– Tighten yoke (175) by first tightening screw (179) on the left side, and then on the right side (with inserted stop plate 74 g) turn the brass screw (251) until it is difficult to turn and then an additional 3/4 turn.

– Screw in adjustment screw (250) until the stop plate (74g) can be pulled off.
  • Then recheck the play.

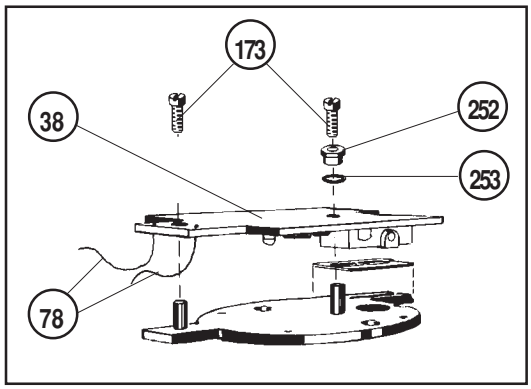



– Mount cover (177) and tighten with the 2 screws (178).

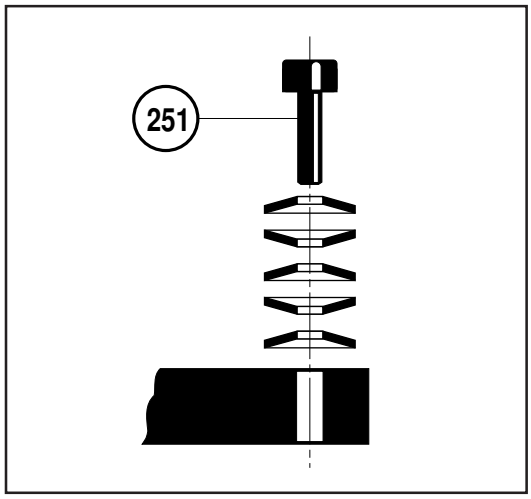
– Install stop plate (74g) at rear at the detector vane.

– Remove spacer (183) at overload stop.

– Mount detector PCB (38) and loosely tighten with the 2 screws (173), otherwise the mounting sleeve can be pulled out of the riveted joint at the detector housing. With the screw at the magnet system, it must be ensured that the collar (252) is inserted with the rubber O-ring (253).
– Solder the 2 conductor strips (78) with precise curve shape onto the soldering terminals
– Plug in the connector of the cell cable (44) at the detector PCB (38).
– Mount hanger, link, upper and lower guide (see D 1.8.3).
– Install weighing cell (see D 1.9).




**Arrangement of the Belleville spring washers and the brass□screw (251)**



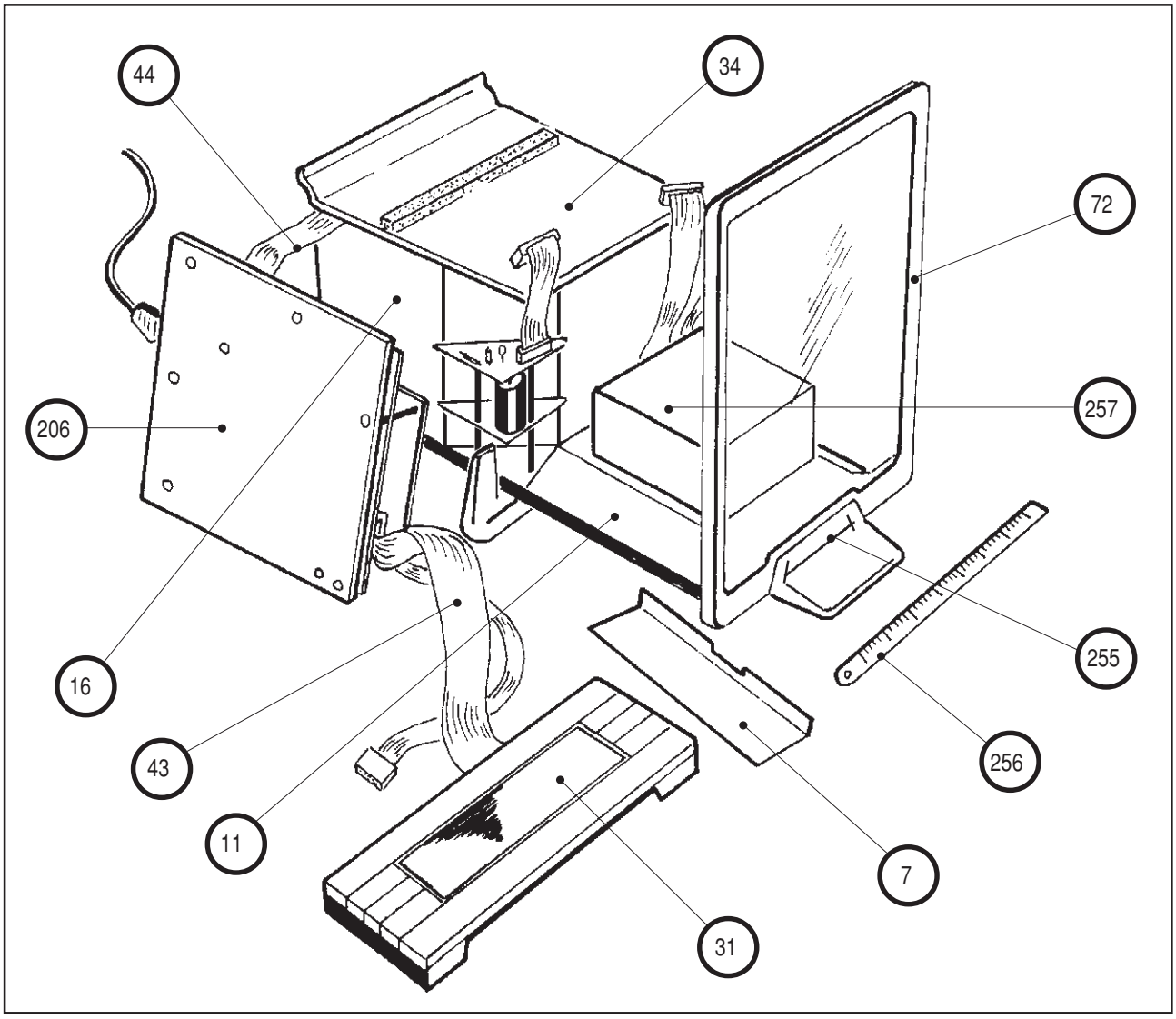
# 5. AT20 level adjustment

**The adjustments are performed in the 10 µg display range.**

**Conditions required for performance of the level adjustments:**

1. Cornerload coarse adjustment with 10 g weight, deviation <50 µg (see D 3.1).
2. The dead load should be 1.4 –2.2 g (see D 3.3).

**Layout of the AT20 for the level adjustment:**




– All walls, cover and glass panes removed with the exception of the front frame (72).
– The upper screen (87) of the cell must be removed.
– Dismantle screening plate (7) of the display cable (used as support), refasten the cover (11).
– Micro weighing pan (9) installed.
– Remove display (31) and cover the opening (255) in the front frame (e.g. with adhesive tape) to prevent any drafts.

– Remove electrical chassis (206) and place to one side of the balance.
  • Plug in cell cable (44) again.
– Plug auxiliary display cable [(43) see list of tools A 4] into electrical chassis (206) and the display (31).
– One side wall (34) is laid on the shroud (16) to prevent any drafts.
– Cardboard cover [(257) see illustration D-27-] is needed to cover the micro weighing pan.

**Required working aids as support:**

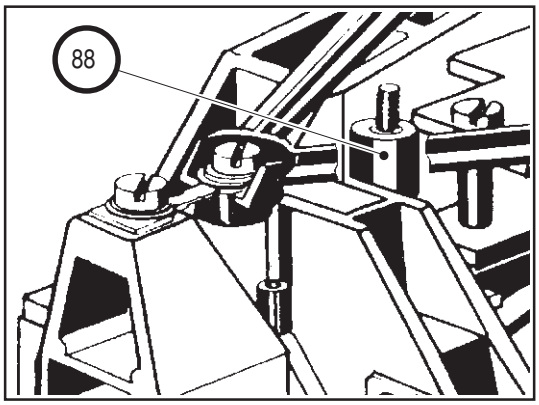
– 0.2 mm support = screening plate of display cable (7).
– 0.5 mm support = metal rule (256).

## 5.1 Adjusting level zero point

– Preadjust cornerload to ±50 µg.
– Display in 10 µg range.
– Check leveling of the balance, set level roughly.

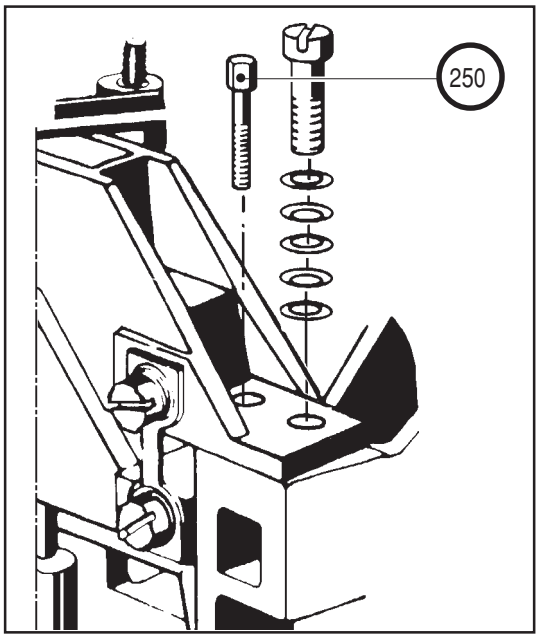
### 5.1.1 Level zero point “front - rear”

– Taring with unloaded weighing pan.
– Lift up balance at front
  • Lay 0.5 mm support (256) under front foot
  View of level: 
– If the value is negative, the adjustment weight (88) must be turned downward.
  • 1 turn ≈ 200 µg
– If the value is positive, the adjustment weight (88) must be turned upward.
– The adjustment must be repeated until the deviation is less than 60 µg.




### 5.1.2 Level zero point “left - right”

– Taring with unloaded weighing pan.
– Lift up balance at right rear.
  • Lay support 0.2 mm (7) under the right leveling screw.
  View of level: 
– If the value is negative, the adjustment screw (250) must be turned downward (clockwise).
  • 1/4 turn = 400 µg
– If the value is positive, the adjustment screw (250) must be turned upward (counter clockwise).
– The adjustment must be repeated until the deviation is less than 80 µg.



## 5.2 Level full load adjustment

– Preadjust cornerload to ±50 µg.
– Display in the 10 µg range.
– Check leveling of the balance, adjust level roughly.
– Work with 10 g test weight.

### 5.2.1 Level full load “front-rear”

– Tare unloaded balance.
– Load test weight and note displayed value.
  Remove test weight.
– Lift balance up at the front.
  • Place 0.5 mm underlay (256) under front foot.
  View of level: 
– Tare balance.
– Load test weight, compare the value now displayed with the first value.
– If the first value is smaller, turn the rear left and right leveling screws downward (clockwise).
  • 2 grooves ~ 10 µg
– If the first value is greater, turn the rear left and right leveling screws upward (counterclockwise).
– The adjustment must be repeated until the deviation is less than 80 µg.

### 5.2.2 Level full load “left-right”

– Tare unloaded balance.
– Load test weight and note displayed value.
  Remove test weight.
– Lift balance up at the rear on the right.
  • Place 0.2 mm underlay (7) under right leveling screw.
  View of level: 
– Tare balance.
– Load test weight, compare the value now displayed with the first value.
– If the first value is smaller, turn the left leveling screw downward (clockwise).
– If the first value is greater, turn the left leveling screw upward (counterclockwise).
– The adjustment must be repeated until the deviation is less than 80 µg.

## Is my service manual really up to date?

A t the bottom right of the title page you will find the date of issue. If you know the date of the latest edition, you can thus see whether your service manual is up to date.

If this is not the case, the latest service bulletin has not been filed. (The service bulletins represent a continuous supplement to the service manual and keep it up to date.)

The service bulletin always includes a new title page for the service manual, new pages and pages to be exchanged, as well as a new contents page for section E. All these documents have the same, latest date of issue at the bottom of the page.

First edition of the service manual "AT": October 1988 (10/88)

## Contents section E — Date of issue

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Telefax **01-944 31 90**
Telex **826150 mig ch**

METTLER TOLEDO

# Service Bulletin AT201/261

## 1. Background information

The AT balance series is being supplemented by the two models AT201 and AT261.
AT201 205 g x 0,01 mg
AT261 205 g x 0,1 mg / 62 g x 0.01 mg DeltaRange
For data and adjustment tolerances, see page B -3-.

## 2. Features

- Special balance pan.
- Additional inner draft shield (available as an accessory for existing models).
- New sensor board as spare part for all models.The existing sensor board ME-210576/V for the AT100/200/250 models can still be used.
- New weighing cell, assembled, as spare part for all models since installation of the new sensor board is the only change. The old weighing cell, assembled, (ME-210090/V), can still be used as a spare part for the existing AT100/200/250 models.
- LCD
- Keypad as AT250

## 3. Service and adjustment

- The service cassettes will be replaced.
  Adjustment cassette → SER. 91.1.20
  Type cassette → SET. 99.1.20

## 4. Function check

The function check is performed in exactly the same manner as that for the existing AT balance models.

## 5. Filing recommendation

Please exchange the following pages in the AT service manual ME-704008:

- Cover
- Section A: Pages -5- (exploded view diagram), -9/10-, -11/12-
- Section B: Pages -3/4-, -5/6-, -13/14-, -15/16-, -19/20-, -21/22-
- Section C: Pages -9/10-
- Section D: Pages -27/28-

Please file this service bulletin in section E.

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# Service Bulletin AT20/400/460

## 1. Background information

The AT balance series has been supplemented by the AT20, 400 and 460 models. The spare parts in the AT-SE Kit have been integrated in the AT spare parts list.

AT20 22 g x 2 µg
AT400 405 g x 0,1 mg

AT460 DeltaRange 405 g x 1 mg / 62 g x 0,1 mg

– Data and adjustment tolerances can be found on page B -3-.
– Standard software for the new models = STD.10.1.11
  • A new feature is the factory setting of the second unit to mg instead of %.
  • When the instrument is switched on, the generation can be recognized by the No 1.
– For all service work, the STD.SW of the customer should be used.
  • After STD.SW 10.1.11, cassettes are installed without write protection.
  • If the new STD.SW cassette 10.1.11 is installed in an old model, afterwards only this cassette can be used (data are changed).

## 2a. AT20 features

*The AT20 is a balance with high sensitivity and thus requlres more extensive adjustment work. All moving parts (measuring cell) are polished to keep the moisture absorption to a minimum.*

– Longer stabilization time
– Special weighing cell
– Flexible cantilever arm
– Calibration weights 2 x 10 g
– Special weighing pan and micro draft shield
– Door drive can not be uncoupled. If the draft shield needs to be opened by hand, disengage the connection between the sliding door and the slide!
– Lever with yoke
  • Special assembly (see D 4.)
– Special level adjustment (see D 5.)
– No fine compensation necessary
– Special hanger
– Detector PCB attachment
– When replacing the CPU board, jumper ST8 (connector 8) must be removed on the replacement board.
– Special adjustment weight

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## 2b. AT400/460 features

– Special weighing cell (different transmission ratio)
  • Supplied as spare part with 2 parameter stickers.
– Rigid cantilever arm
– Lever with yoke (dual transmission)
– Special hanger
– Heavier weighing pan (+90 g tare)
– Special counterweight (characteristic: groove)
– Calibration with 200 g.

## 3. Service and adjustment

– The service cassettes have been replaced.
  • Adjustment cassette SER. 91.1.30
  • Type cassette SET. 99.1.30
– Replacement of the CPU board (ME-21051 ON)
  • For these new models it is necessary to use at least technical level 6 or higher as a spare part! Visible at jumper ST8 (connector 8), see section F/component diagram ME-210510.

## 4. Function check

The function check is the same as for existing AT balance models.

## 5. Filing recommendation

In the AT service manual ME-704008, please exchange or add the following pages:

– Cover
– Section A: Pages -1-, -3/4-, -5÷7- (exploded view diagrams), -9÷13-
– Section B: Pages -1÷8-, -13÷18-, -21÷26-
– Section C: Pages -1-,-7/8-,-11/12-
– Section D: Pages -1÷6-,-9÷16-,-19÷28-,-31÷38-
– Section E: Supplements E1
– Section F: Component diagram ME-210510/Index D

Please also file this service bulletin in section E.

TECHNICAL DOCUMENTATION

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# Service Bulletin AT21 Comparator

## 1. Backgroung information

The AT balance series has been supplemented by the model AT21 Comparator.

The AT21 Comparator is intended for use as a mass comparator.

AT21 22 g x 1 $\mu$g

– Data and adjustment tolerances are the same as those of the AT20, except for the reproducibility (2 instead of 3 $\mu$g).
– Standard software for the new model remains the same = STD. 10.1.11

## 2. Features of the AT21 Comparator

The AT21 Comparator is distinguished from the AT20 by the following points:

**– Software**
- Model designation AT21
- 1 $\mu$g step

**– Mechanical parts**
- Suspended weighing pan.
- The weighing pan can be replaced by that of the AT20. It should be noted that without the suspended weighing pan the reproducibility (cornerload etc.) given in Tolerance Table B 1.1 can not be guaranteed.
- Specific AT21 parts, see pages A 14+15.

**– Specially selected AT20**
- In the final check, the AT21 Comparator weighing cells (ME-600116) are selected from the AT20 weighing cells that have the best specifications in regard to measurement.

## 3. Service and adjustment

Service and adjustment are the same as for the existing AT balance models.

## 4. Function check

The function check is the same as for the existing AT balance models.

## 5. Filing recommendation

In the AT service manual ME-704008 please exchange or add the following pages:

| | |
|---|---|
| – Title page | |
| – Section A: | Pages -1-, -11÷15 |
| – Section B: | Pages -3/4- |
| – Section D: | Pages -27/28-, -37/38- |
| – Section E: | Supplements E1 |

Please file this service bulletin in section E.

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TECHNICAL DOCUMENTATION

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# Service bulletin

# Electronic Analytical Balances METTLER AT series

## Supplement to service manual Electronic Analytical Balances AT series ME-704008

**Filing recommendation:**

Please exchange and file the following pages

- Cover
- Section A: Pages 9–15
- Section E: Service bulletin

P704808

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TECHNICAL DOCUMENTATION

Address **Mettler-Toledo AG, Postfach LAB-300, CH-8606 Greifensee**
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METTLER TOLEDO

# Service Bulletin

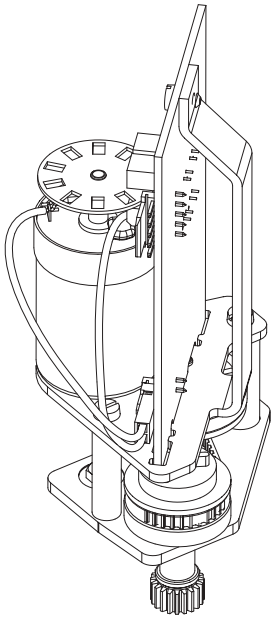
# Electronic Analytical Balances METTLER AT series

### Changes to the service manual 704008

## Purpose of this service bulletin

Updating the service manual:

- Replacement of the present door drive by a new one with elctronic positioning and soft closing operation.
- Supplementing/adapting the tolerance table page B3.
- Integration Service Info 291LAB02 (replacement cantilever arm AT400/460, page D16) and 191LAB01 (jamming of door drive, page D20).
- Correction of instructions for adjustment of level sensitivity, pages D27/28, and for check of dead load, page D28.



Türantrieb

**Filing recommendation:**

- Exchange title page 704007
- Section A: exchange pages 6, 8, 9/10, 11/12, 13/14, 15
- Section B: exchange pages 3/4 and 13/14
- Section D: exchange pages 1/2, 15/16, 19/20, 21/22, 27/28 and 37/38
- Section E: exchange page 1 and add this page at the end

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**Referencelist Service Manual including Service Bulletin for Laboratory Products**
**Actual Status January 1997**

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| AT new Spare Parts list | 704808 | 38.12 | | 4 | 10/90 |
| New door drive | 11780175 | 38.12 | | 5 | 08/90 |
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| | ME-210536 | ES-210534A |
| | ME-210530C | ES210528B |
| | ME-210516A | ES-210514B |
| | ME-210537A | |

# 1. Component diagrams and schemes

| Printed circuit board | Component diagram | Circuit diagram |
|---|---|---|
| CPU board | ME-210510 | ES-210508 (digital)<br>ES-210592 (analog) |
| Interface board | ME-210544 | ES-210542 |
| Display board LCD | ME-210507 | ES-210505 |
| Display board VFD | ME-210526 | ES-210524 |
| Scanning board | ME-211523 | ES-210521 |
| Calibration motor board | ME-210536 | ES-210534 |
| Door motor board | ME-210530 | ES-210528 |
| AC adapter board | ME-210516 | ES-210514 |

| Interconnection diagram | ME-Nr. |
|---|---|
| Sec. cable TNG | 210537 |