geodyna 2350

Car wheel balancer

HOFMANN ®
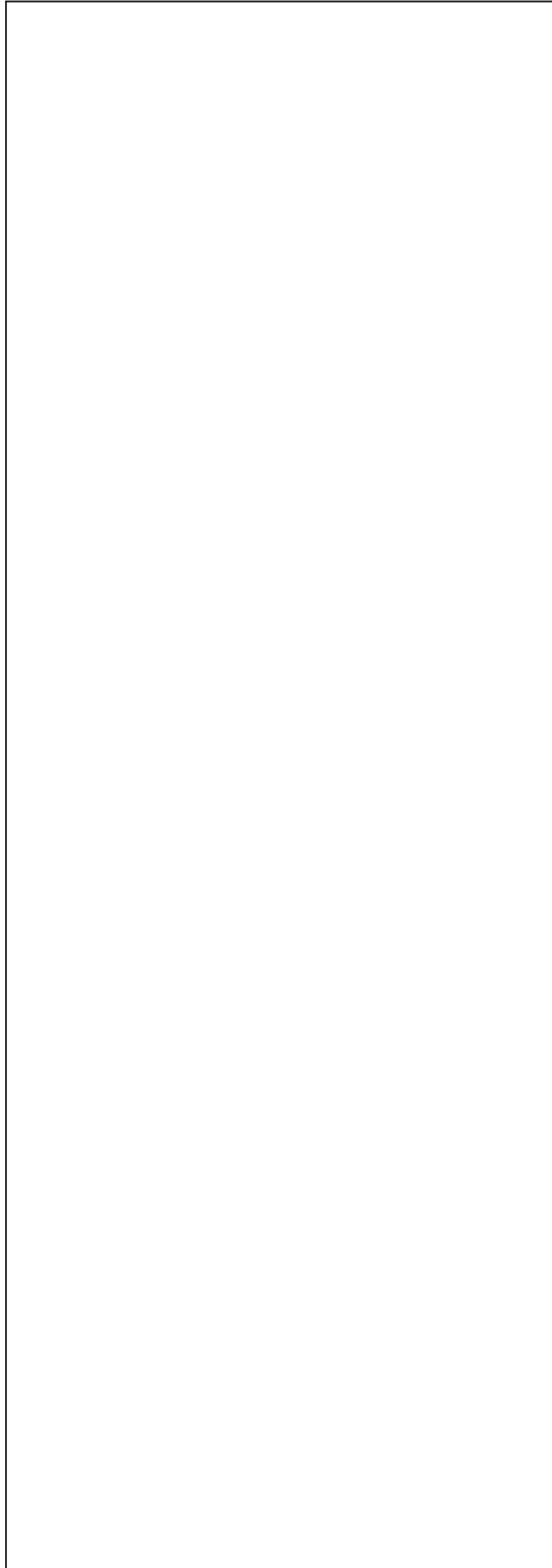
Contents   Page

1. Safety rules and function

1.1 Special hints for the reader

A few special features were used in this manual to facilitate reading and understanding of pictures and written instructions:

 warns the operator of injuries and damage and names the consequences, if the operator does not follow the instructions.

signals the operator where to act.

Safety rules are highlighted in grey.

 Arrow showing where to look

 Arrow showing the direction to move

1.2 Scope of application

The off-the-vehicle wheel balancer is designed for static and/or dynamic balancing of car and light-truck wheels weighing up to 150 lbs and having an overall diameter of 44". An optional wheel guard is available especially for balancing wheels with a rim di-ameter of more than 20", but not mandatory for wheels of less than 20" rim diameter as the balancer has a maximum speed of 98 rpm only. With optional wheel guard the maximum wheel di-ameter is reduced to 37".

In addition to conventional balancing operations, irregular run-ning conditions of the wheel caused by geometric deformations of the rims and unbalances of the tires, hence unsmooth ride, can be identified, improved or, if possible, even eliminated. By exact adjustment of the two wheel components relative to each other optimum wheel running conditions or at least balance weight minimisation can be achieved.
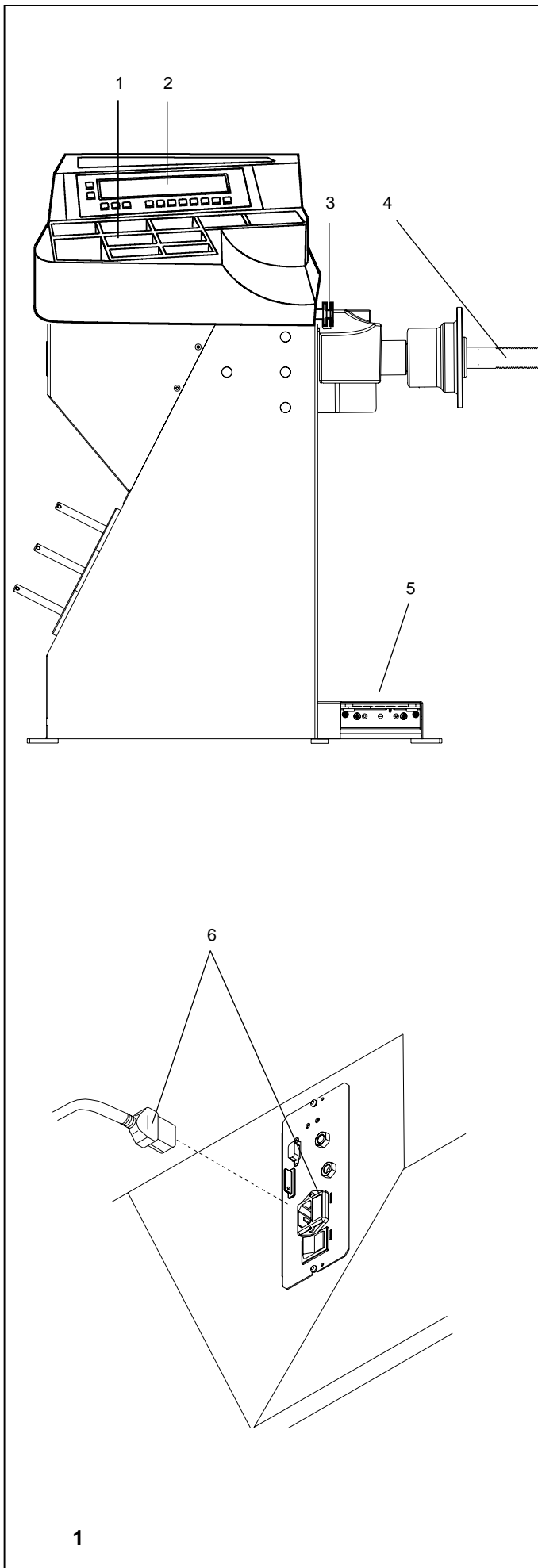
Safety rules and function

Fig. 1 View of wheel balancer

Front view
1 Function keys and display
2 Weight tray
3 Gauge arm for distance rim/machine
4 Main arbor
5 Pedal for main shaft lock

Rear view
6 Power switch and line cord

1.3 General safety rules

Only properly trained and authorised personnel shall be allowed to operate the wheel balancer.

The machine must not be used except for the scope of application and in the way specified in this manual. Unauthorised changes and modifications to the machine re-lievefromany liabilityfor damagesand injuriesthat mightre-sult therefrom.

On no account should safety features be removed or made inoperative.

In general any work on the electrical system such as fitting of a plug or changing of connections, if necessary, must be carried out by a qualified electrician in line with relevant national standards and the regulations of the local power station.

It should be noted that working with technical equipment may involve an unforeseeable acceptable risk.

Therefore the operator should eliminate such dangers in advance by proper and wise behaviour.

The following special points should be observed:

Use technical equipment for its specified scope of applica-tion only.

Always use suitable and proper equipment and tools.

Follow the instructions, notes and technical data of the ma-chine manufacturer or manufacturer of the wheels to be bal-anced.

Wear suitable protective clothing and accessories (e. g. goggles, safety shoes, helmet).

For further safety rules to be observed, please refer to the individual chapters.

1.4 Description of function

Display and key pad
The display and key pad are arranged on the ergonomic front panel.

Distance gauge arm
The distance between left correction plane and machine is determined by means of an integrated gauge arm with scale. The readingshownonthescaleisalsoenteredviathekeypadinthe same way as for rim diameter and rim width.

Entry of rim diameter and rim width is via the key pad, whereby the relative function key is held pressed while the wheel is ro-tated to change the desired value. On releasing the key the chosen input is stored.

The input range is identical with the working range of the machine (see§15. Technical data).

Balancing modes
Readings in different balancing modes (weight position on the rim)canbegivenonthedisplay,dependingonthetypeofwheel to be balanced (car, light truck, PAX, steel or alloy rim). Measuring run and measured values
All measurements are taken and stored in one run during the automatic program. On completion of measurement two aud-ible signals are given.

Amountsandlocationsofunbalancearereadoutseparatelyfor each correction plane.

Main shaft lock
The machine has a pedal-operated main shaft lock which is used to retain the wheel in the correction position so that the balance weights can be fitted. This lock is designed only to fa-cilitateori-entationofthewheelandmustnotbeusedforbraking the main shaft.

Store wheel profiles
Wheel profiles permit the storage of values for wheels that are balanced frequently in order to save having to enter the wheel data etc. each time. It is possible to store up to 4 wheel profiles.

Error codes
Errors in operation or failures in the electronic or mechanical system are signalled via respective error codes (see§11. Error codes).

Readjustment by the operator
If several measuring runsare necessaryto balancea wheelbe-cause balance weight size and position have to be adjusted re-peatedly, this is often due to insufficient measurement accu-racy. In such case the operator has the possibility of readjusting the machine (see§13. User calibration).

Optional wheel guard
As the maximum speed of the wheel during balancing is below 100 rpm a wheel guard is not mandatory in Germany, however an optional wheel guard can be supplied. With mounted wheel guard, the electronic unit can be programmed via code C13 so that measurement is started by closing of the guard.

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SW 13

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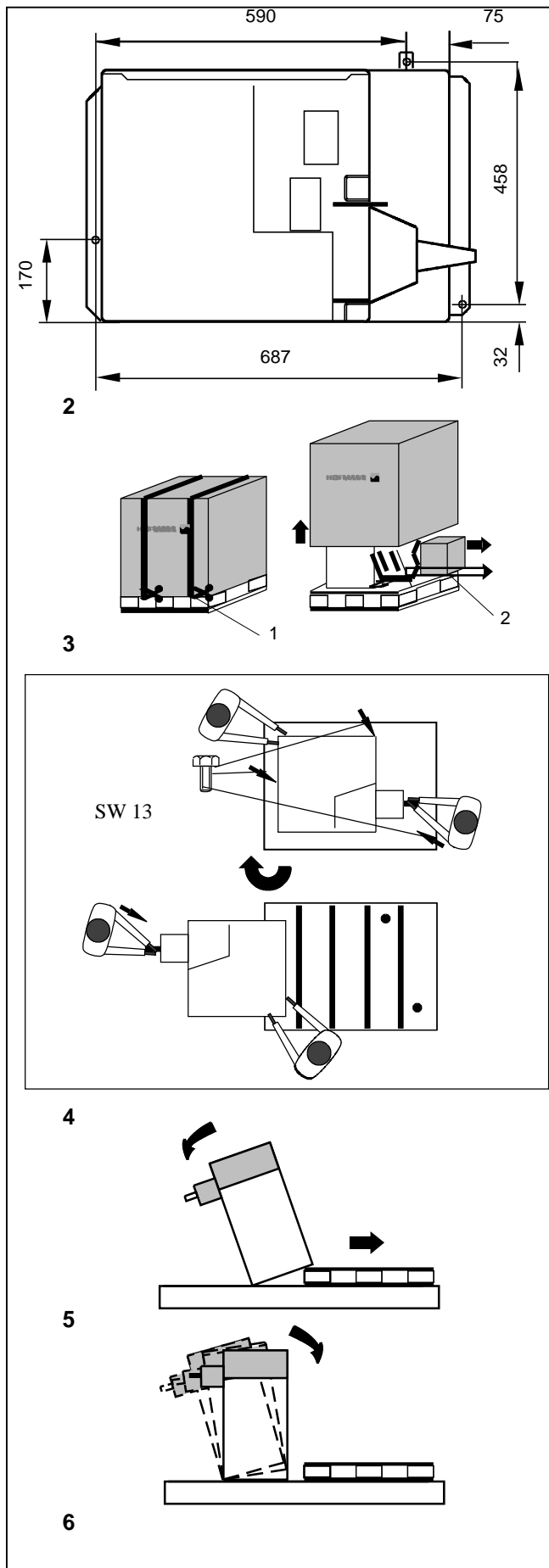
2. Installation of the machine

When choosing the site, Health and Safety at Work regulations and the regulations on working environment should be taken into account.

The wheel balancers can be installed on any firm and level ground. For the weight and space requirement of the machines refer to §15. Technical data. For installation on an upper floor, check and observe the permissible load capacity of the floor. It is recommended, though not absolutely necessary, that the machine be secured to the floor. For this purpose three holes (Fig. 2) are provided in the base of the machine by which the latter is fixed on the floor with 3/8" anchor bolts. Fig. 2 shows the center-to-center distance of the holes. Make sure that the ma-chine has a stable position, i.e. that it is supported on three seatings. If not, ensure three-point contact on ground by insert-ing appropriate spacers between the floor and machine base.

For transport the wheel balancer is provided with special pack-ing (on pallet).

2.1 Unpacking the machine

The machine should be unpacked by two persons.

Note

When unpacking the machine make sure that the pedal fitted on the machine base and the whole pedal assembly is not dam-aged.

Cut the strips of the packing (Fig. 3, item 1), lift off the packing and set aside the small parts packed in the sep-arate small box (Fig. 3, item 2).

Use a 1/2" wrench to unscrew the three hexagon screws

which hold the machine on the pallet (Fig. 4, arrows).

Lift the machine by tube of the vibratory system and turn

around by 180 degrees on the pallet (Fig. 4).   Then

lower one side of the machine laterally on the floor (Fig. 5).

Remove the pallet from underneath the machine and gently lower the entire machine onto the floor (Fig. 6).

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5 4

3 2
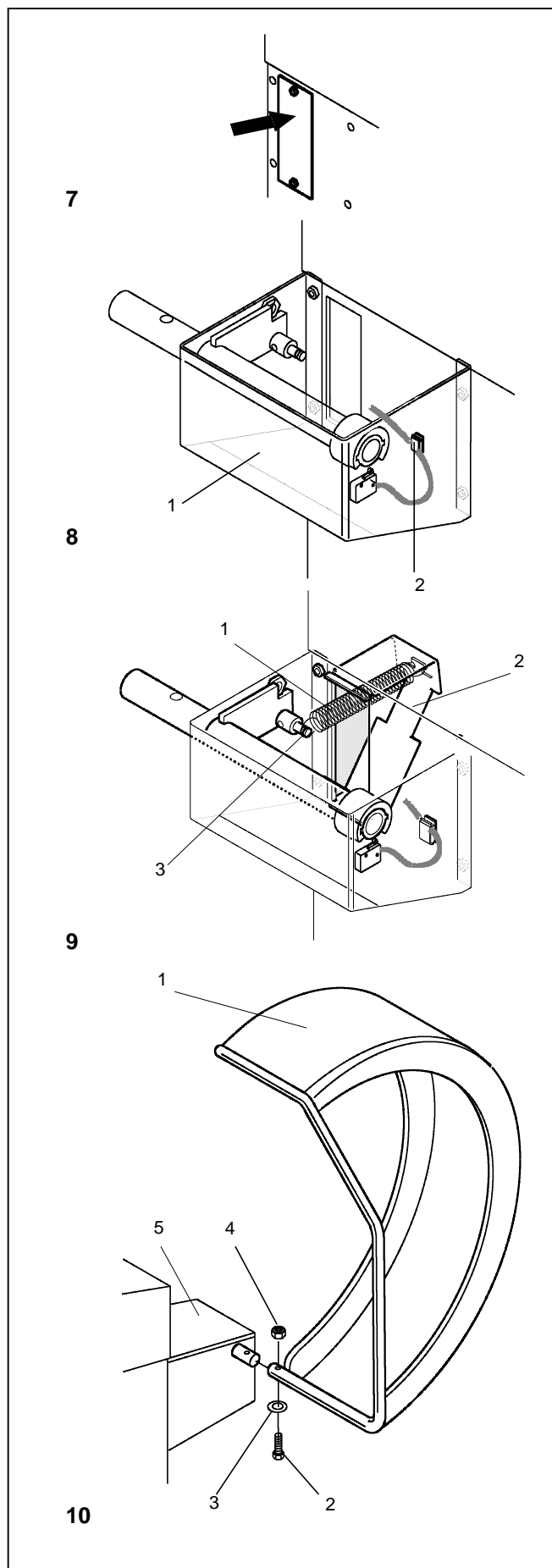
2.2 Fit (optional) wheel guard and holder

The holder for the optional wheel guard is fitted on the rear of the wheel balancer, the wheel guard itself is fitted on the right of the balancer.

Switch off the balancer.

Undo the two M5 hexagon head screws and remove the rear cover plate of the wheel balancer(Fig.7,arrow).

Fit the pre-assembled wheel guard holder(Fig. 8, item 1)to the outside of the cabinet using the 4 hexagon bolts M8. Reach into the opening in the cabinet, pull out the lead

withpluglocatedtotherightoftheopeningandconnectit with the plug of the wheel guard switch.
Replace the plug connector into the cabinet.

Stick the adhesive clip(Fig. 8, item 2)on the rear of the cabinet in a central position relative to the wheel guard holder and insert the connecting lead of the microswitch.

Fit the wheel guard spring(Fig.9,item1)into the spring holder(Fig.9,item2).

Pass the holder for the wheel guard spring through the ope ning,tiltingitintheprocess,andthenfititverticallyso that the recesses in the holder are located in the cabinet panel. Extend the wheel guard spring and fit it into the bolt on the

wheel guard arbor(Fig.9,item3).
Slide the wheel guard(Fig. 10, item 1)on the arbor and

raiseituntilthefasteningholesofwheelguardandwheel guard arbor coincide.
Insert the M10 setscrew(Fig. 10, item 2)with washer

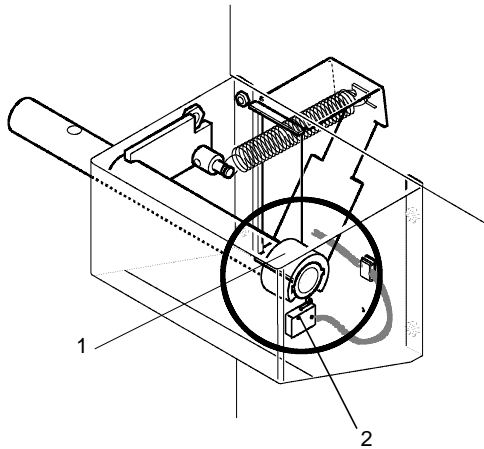(Fig.10,item3)frombelow,andtightenthe hexagonnut (Fig. 10, item 4)and washer.

Turn on the wheel balancer at the switch.
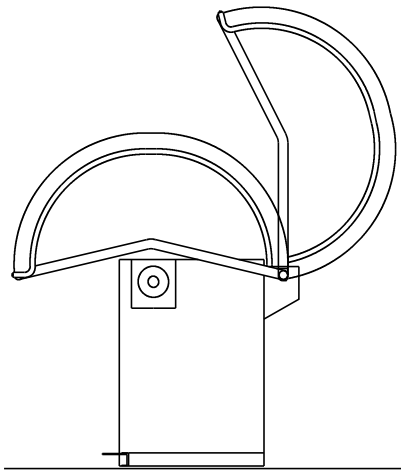
Check wheel guard switch for correct setting:

When the wheel guard is open the wheel guard switch must be pressed. The balancer must not start.

Place the cover(Fig. 10, item 5)onto the holder for the wheel guard arbor and fasten by means of tapping screws.

11

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Correct the switch point of the wheel guard switch If the measuring run is not started (preset with C13), check the switch point as follows:

Unscrew the cover from the holder of the wheel guard arbor.

Undo the setscrew on the switch ring(Fig. 11, item 1).

Adjust the switch ring so that it is contacting the tongue of the microswitch underneath(Fig 11, item 2) and the measuring run is started on closing the guard (Fig. 12).

Re-tighten the setscrew.

Place the cover onto the holder for thewheel guardarbor and tighten with tapping screws.

The optional wheel guard influences the following modes of operation:

- The measuring run is started by closing the wheel guard (code C13).

- The wheel is braked on lifting the wheel guard during a measuring run (code C5).

These modes of operation can be changed either permanently, or only as long as the machine is switched on, by means of codes (see§10. Changing modes of operation).

3. Electrical connection

In general any work on the electricalsystem suchas fittingof aplugorchangingofconnections,ifnecessary,mustbecar-ried outby aqualified electricianin linewith relevantnational standards and the regulations of the local power station.

Electrical standard equipment and drive motor of the wheel balancer are provided for operation on 50/60 Hz, 100-120 V (-15 %, +10 %).

The connecting cable of the machine is designed as a separate power cord. For connection to the power mains thecable isprovided with a NEMA 5-15P (U.S.) or C22.2 No. 42 (Canada) plug.

Fusing is by the customer before the plug connector, using a 15 amp circuit breaker.

The electrical diagram is illustrated in§16.

The machine operates internally on a line voltage of 230 V because the voltage is regulated by an integrated transformer.

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14

15

4. Controls and displays

Fig. 13 Overview

1 STARTkey Start a mea-
    suring run
2 STOPkey
    - Interrupt the measuring run
    - Delete an error code

    - If input of a mode of operation is completed with the
STOP key, the new state is deselected automatically and
the former state is re-established. 3 Function keys (seeFig.
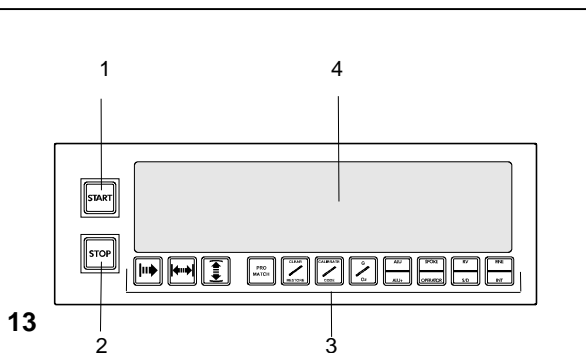14to16)
4 Display (seeFig. 17to20)

Fig. 14 Function keys on the left

1 Function key fordistance rim / machine
2 Function key forrim width
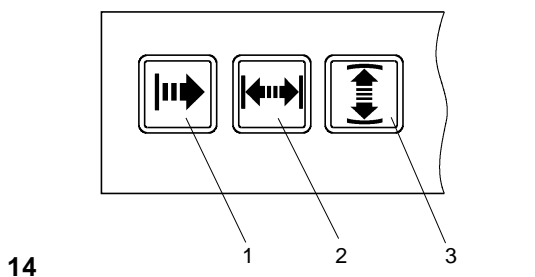3 Function key forrim diameter

Fig. 15 Function keys in the middle

4 PRO MATCH

    - Starts an optimisation program (LED PRO MATCH
      lights).
    - In the Pro-Match program:
      enter valve position.

5 CLEAR/RESTORE

    CLEAR(key pressed briefly): Setting the factory adjusted
    modesofoperation.Allsettingsaredeletedandthedisplay
    returns to standard.
    RESTORE(key pressed for 3 seconds): Restores all
    modes the way they were before clear was pressed.

6 CALIBRATE/CODE

    CALIBRATE(keypressed briefly):Sets themachine
    inthe user calibration mode (see§13. User calibration).
    CODE(key pressed for 3 seconds): Switches to changing
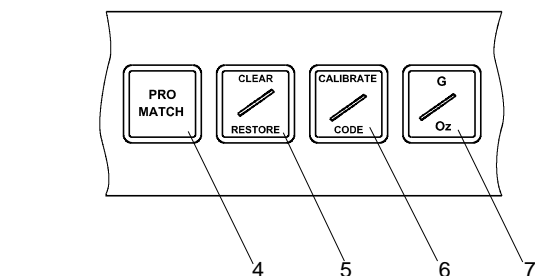   modes of operation.

7G/OZ
    Switches over the weight unit for unbalance readings
    (grammes or ounces).

    G   Readings in grammes
    Oz Readings in ounces

    When the machine is switched on the weight unit set with
    code C3 is active.

16a

Fig. 16aFunction keys on the right

8 ALU/ALU+toggle key (ALU key) for balancing modes.

ALU(key pressed on top):
Toggles through the ALU and standard balancing modes. While in any ALU mode the ALU status LED lights.
ALU+(key pressed on bottom):
Sets the machine in the ALU+ mode. This enables the automatic distance gauge arm to measure first the left-hand distance and then the righthand hidden weight. Pressing this key disables one-plane and patch balancing and en-ables only hidden weight balancing.

First push: Enables lefthand hammer-on weight and lights lefthand hammer-on LED for balancing mode ALU 3P in wheel position display.
Second push:Enableslefthandadhesiveweigh tandlights lefthand adhesive weight LED for balancing mode ALU 2P.
Third push: Returns to standard balancing.

9 SPOKE/OPERATOR

SPOKE:Entersthenumberofspokesforthehiddenspoke placement mode.
Keep the key pressed on top and rotate the wheel to set, or change, the number of spokes.
When the key is pressed without rotating the wheel, the current setting is entered.
OPERATOR:Recalls and stores wheel profiles.
RCL:Keep the key pressed on bottom. RCL (recall) comes up in the left-hand section of the display and 1 comes up in the right-hand section for the first wheel profile to be stored.
Keep the key pressed on bottom and rotate the wheel. Profiles 2 through 4 are read out in the right-hand display. The stored wheel profile is entered once the key is released.
STO:If a wheel profile is to be stored, keep on pressing thekeyaftertherclreadingshavecomeupandcontinue rotating the wheel. Now STO (store) comes up in the left-hand display, and#1through 4 can be set in the right-hand display by rotating the wheel. The current profile is stored once the key is released.

10 RV-S/D

RV(key pressed on top):
Changes the fine resolution to increments for RV/Light truck.
- Switches resolution to 2 instead of 1/4 ounce.
- Switches suppression minor unbalance readings to a selectable value (using service code).
ReadoutsstayinRVmodeuntildeselectedby pressingthe key again.
S/D(key pressed on bottom):
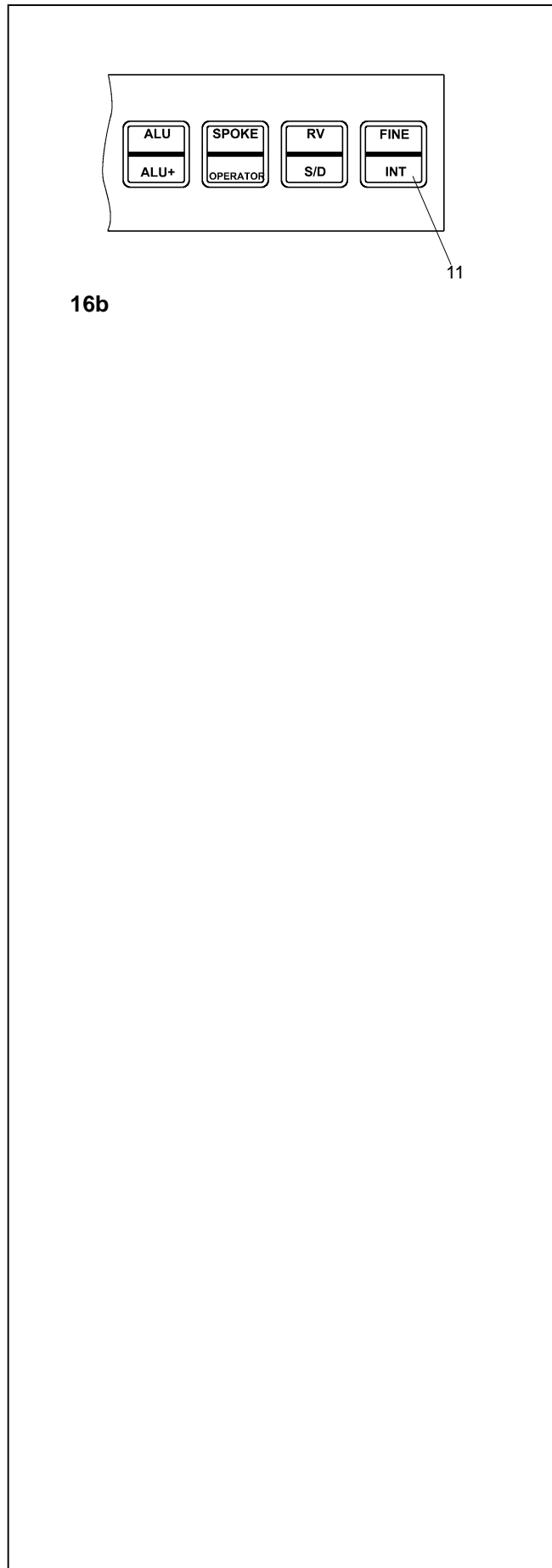- Function key to select display of dynamic or static unbalance (S/D key).

16b

Fig. 16bFunction keys on the right

11 FINE/INT

FINE(pressed on top):
- Show amount reading with higher resolution:
  1 gramme instead of 5 grammes or 0.05 oz instead of
  0.25 oz (only for as long as the key is pressed)
- Display residual wheel unbalance below the threshold for
  suppression of minor unbalance readings: As long as the
  key is pressed the suppression of minor unbalanceread-
  ingsisswitchedoffandtheactualunbal-ance in the wheel is
  read out.
- Display unbalance for standard balancing mode: if balanc-
  ing mode Alu 1 to Alu 5 is selected, press and hold the
  FINE key and then press the function key for balancing
  mode (ALU, ALU+). The unbalance readings switch
  over to those for standard balancing mode and the rela-
  tive rim symbol appears.
- In the OP and Un programs the FINE key serves as
  change-over key.
INT(pressed on bottom):
  Switches to the patch balance mode.
  All wheel data must have been entered. In addition
  the height-to-width ratio specified on the tire has to be
  en-tered by pressing the diameter key and rotating the
  wheel.
  Readout display changes to single-plane. Both location
  displaysareactiveandworkin parallel.Distance anddi-ame-
  ter dimensions have no effect and are preset to nominal
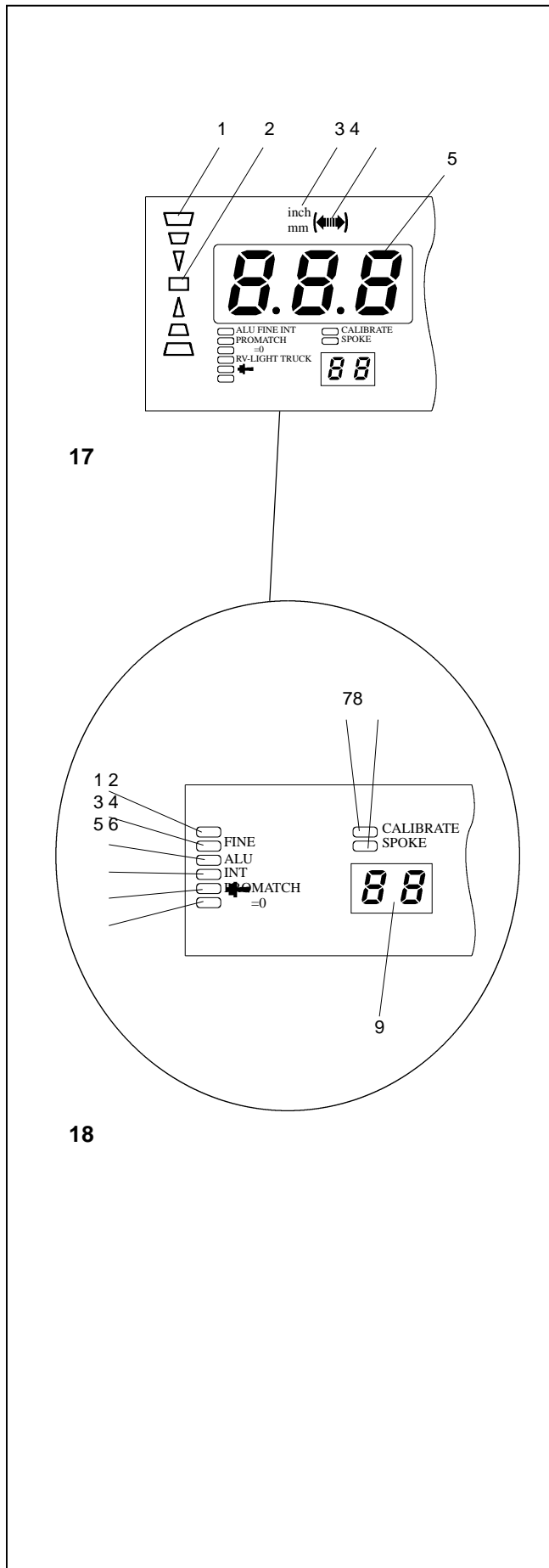 values. All special functions are inactive and cannot be
  selected.

Controls and displays

17

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Fig.17 Display panel - left section

1 Direction indicatorof left correction plane

2 Indicates whencorrection position in the left correction planehas beenreached.

3 Inch/mm
The unit of measurement (inch or mm) is chosen by using therimwidthkey.

4 Rim width Symbol Lights whenever width key is pressed.

5 Digital Display for left correction planeto show: -r
im width
- amount of unbalance of left correction plane
- amount of static unbalance
- error codes
- C codes
- balancing mode in plain language (upon operation of ALU key)
- STO, RCL of wheel profiles

Note:Error codes are read out in both digital displays.

Fig. 18 Status LEDs

1ALU: Any ALU balance mode is selected

2FINE: FINE key is pressed (cancels supression of small imbalances). Display changes to normal resolution as soon as key is released.

3INT:Patch Balance is selected. All special functions (including FINE) are inactive and cannot be selected.

4 PRO MATCHis selected.
5   =0Compensation run has been carried out

6 RV/LIGHT TRUCKresolution is selected.

7 CALIBRATE: Operator calibration mode is entered or programmable interval is reached.
The LED is automatically activated after 5000 measuring runs and alerts the operator that operator calibration is recommended. The LED remains on until the operator completes the operator calibration.

8 SPOKE: Hidden spoke placement (HSP) mode is se-lected.

9 Number of spokes
Number of spokes for hidden spoke placement. Holding the SPOKE key pressed rotate the wheel to set the number of spokes between 3 and 12.

19

Fig.19 Display panel - central section

1 Measuring run indicators flash alternately in
   top and bottom panel
   - during measurement after pressing the START key
   - during PRO MATCH

2 Possibleweight fitting positions LEDs change with suc-
   cessive pushs of the ALU key.

3 Valve stems
   - Topvalvestemflashesduring PROMATCH whenvalve must
     be positioned perpendicular to the main shaft.
   - After the valve has been placed perpendicular to the main
     shaft and the PRO MATCH key is pressed, the LED is
     turned off.

4 SAPE symbol
   - Asthedistanceleverismovedthefirstbarandgradually the
     remaining bar segments light up. On reaching the correc-
     tion position, the segment furthest to the right lights up
     and the speaker beeps.
   - The symbol lights up when the weight fitting position is
     first entered and later relocated.

Note

When the wheel is rotated manually, the SAPE symbol will not
light up.

5ALU+ lights whenever ALU+ is
   chosen.

6OK

   lights whenever in two-plane mode both imbalance read-
   outs are 0.00.
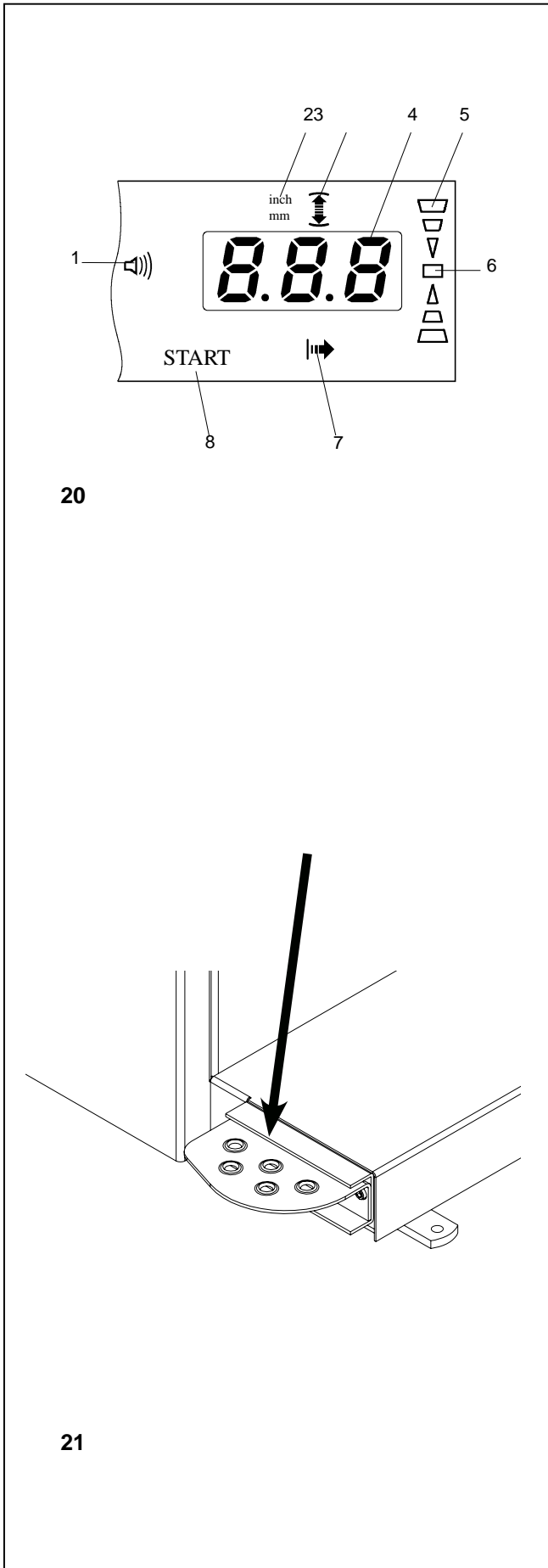
Controls and displays

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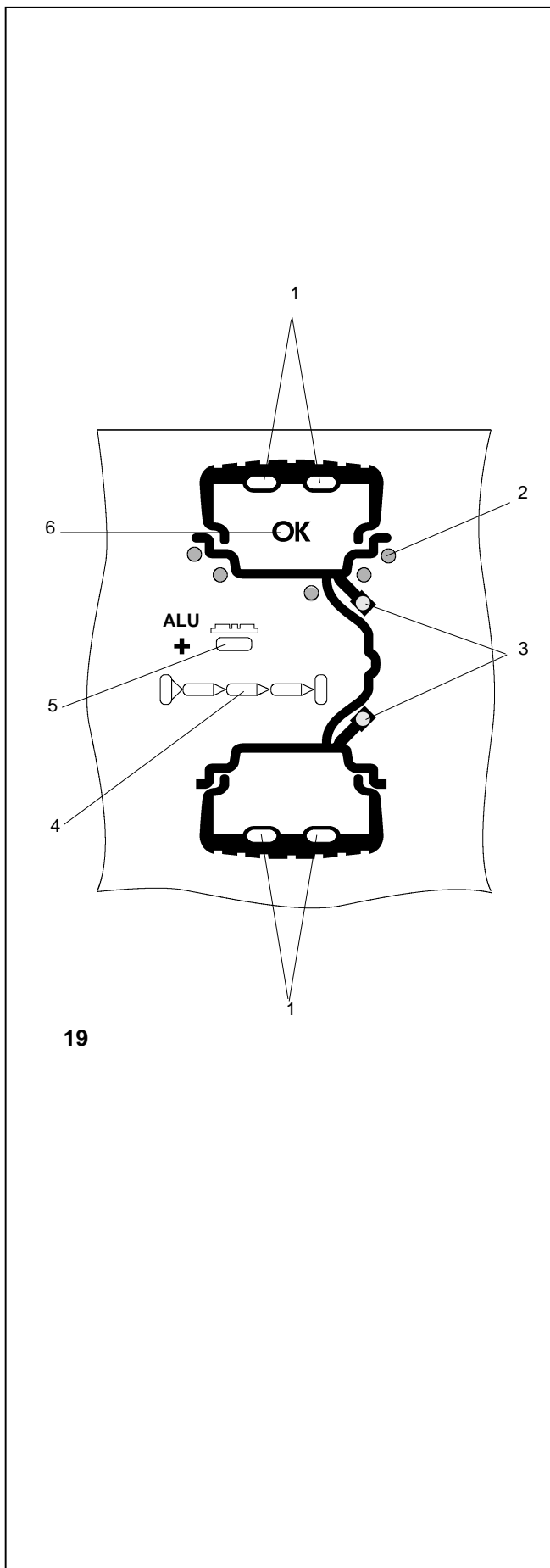
Fig.20 Display panel - section on the right

1 Loudspeaker

2 inch/mm
   The unit of measurement (inch or mm) is chosen by using the rim diameter key.

3 Rim diameter lights whenever diameter key is pressed.

4 Digital display of right correction plane to show:
   - rim diameter
   - distance rim/machine (always in mm)
   - amount of unbalance of right correction plane
   - state of modes of operation or preset limit values

5 Direction indicator of right correction plane

6 Indicates when correction position in the right correc-tion plane has been reached.

7 Distance machine/left correction plane lights whenever dis-tance key is pressed or distance gauge arm is moved.

8 START
   flashes when the START key is to be pressed during pro match and operator calibration.

Fig. 21 Pedal for main shaft lock

This lock is designed only to facilitate orientation of the wheel and must not be used for braking the main shaft.

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The main shaft is locked when the pedal is depressed. This fa-cilitates tightening or untightening of the clamping nut and re-tains the wheel in the correction position for correct fitting of the balance weights.

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5. Turning on the machine

When switched on by the mains switch(Fig. 22, item 1)the electronic unit performs a number of self-tests. On successful completion of these tests a melodious three-tone signal is given. OK is read out on the displays, and the code number of the program version is briefly viewed on the display; then both displays show wheel dimensions which were entered before and are still stored in the electronic memory.

As long as the machine is carrying out the self-tests, no inputs and no other operations whatsoever must be made. During this starting phase the machine must not be subjected to even the slightest vibration.

The electronic unit is factory-adjusted to the following modes of operation, which are available after turning on:

- car wheel with nominal dimensions in inches, width 6.5 and diameter 15.0

- entry of rim data in inches

- display of amount of unbalance in 1/4 ounce increments

- suppression of minor unbalance readings (limit set to 1/4 ounce)

- compensation of adapter unbalance switched off

- start of measuring run by START key

Error codes at power on

Ifanerrorcodeoccursitmustbeacknowledgedbypressingthe STOP key. No audible signal is given.

The following malfunction codes may occur at power-on:

E900 - Fig. 23
Unknown machine model.

E901 - Fig. 24
The machine is not calibrated.

E89 - Fig. 25
A key is jammed at power-on.

> Find and release the jammed key, call service if necess-ary.

H82 - Fig. 26
The self-test was disturbed (e.g. by rotating the wheel). The message is displayed for 3 seconds, after which the measurement is repeated (max. 10 times), or aborted bypress-ing the STOP key.

E3 - Fig. 27
Distance gauge arm is not in home position.

> Move gauge arm to its home position. Press the STOP key to continue.

28

E   92

29

E   145

30

C 10   800

31

C 10   801

32

C 10   804
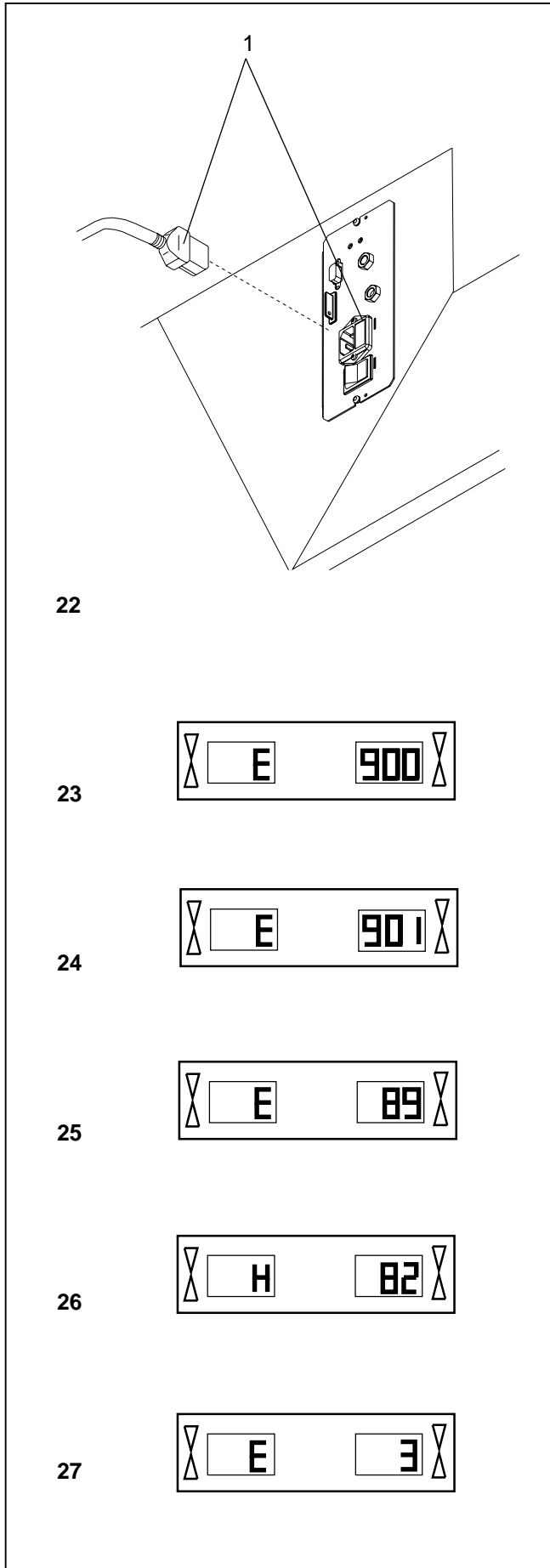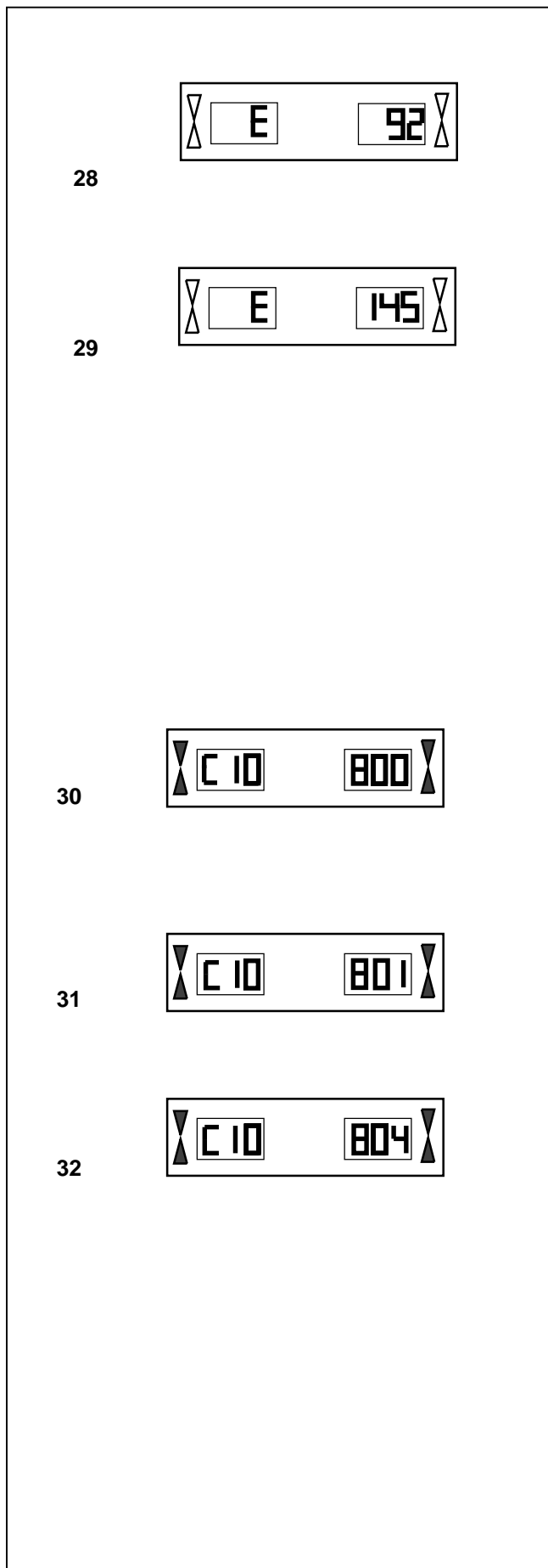
E92 - Fig. 28

During the second attempt the distance gauge arm was still not in the home position. The gauge arm is rendered inoperative.
Wait 3 seconds, or press the STOP key to continue.

E145 - Fig. 29

The contents of both permanent memories are different (but both contain valid data).

Fatal error codes

The self-test program has detected an error and displays an alphanumeric code consisting of six digits and/or letters.

Note

The displayed error codes refer only to the internal line voltage of the machine.

C10 800 - Fig. 30

Line voltage too low. Balancing is feasible if the motor can drive themain shaftto themeasuring speed.Wheel datamay belost. Connect the machine to 110-125 V AC.

C10 801 - Fig. 31

Line voltage too high. Damage to the electronic unit of the machine is likely!

Turn off machine immediately.

Damage is not covered under warranty.

C10 804 - Fig. 32

Line voltage too high. Damage to the electronic unit of the machine is likely!

Turn off machine immediately.

Damage is not covered under warranty.

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33.1

33.2

6. Clamping the wheel

6.1 Fitting the wheel adapter on the main shaft

Fig. 33 Fitting the wheel adapter

33.1   MZV-4 cone adapter for rims with center bore loca-
        tion, or at least sufficiently accurate center bore. Vari-
        ous accessories are available for this wheel adapter.

33.2   Adapters for closedrims, orfor studhole locatedrims.
        Various accessories are available for this wheel
        adapter.

1 Cone of the main shaft
2 Basic body of the wheel adapter
3 Fastening screw (width across flats 14 mm)

Before fitting the wheel adapter clean the cone of the main
shaft(Fig. 33, item 1)and the inner cone of the wheel
adapter.

Slide the wheel adapter onto the cone of the main shaft
so that the head of the hexagon socket head cap screw
attached to the end of the cone engages with one of the
recesses in the basic body of the adapter(Fig. 33, item 2).
Tighten the wheel adapter using the fastening screw (Fig.

33, item 3).

6.2 Performing a compensation run

All clamping and centring means are balanced in our works to
within a certain tolerance.

To compensate for any residual unbalance that might be left in
the clamping means, it is recommended that an electrical com-
pensation run be performed (also see§10. Changing modes of
operation). This mode cannot be transferred into the perma-nent
memory.

This mode of operation is retained until deleted via code C4, by
starting an Pro-Match run or readjustment, or by switching off
the machine.

Press and hold the CODE key (Fig. 15, item 6) and rotate
the main shaft to set C4 in the display.   Press the START
key.

The compensation run takes longer than a regular measuring run.
Once the compensation run is completed, C4 is read out in the
left display, 1 is read out in the right display, and the symbol for
compensation (Fig. 18, item 5) lights up.

When another clamping means is used:

Repeat the compensation run or

Cancel compensation by pressing and holding the FINE key
(Fig. 16b, item 11) and rotating the wheel, or by switching
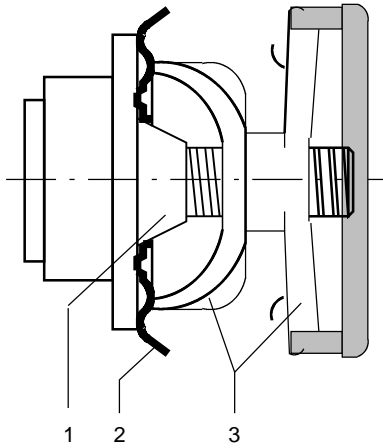the machine of for a few seconds.

In the right display, 0 is read out.

Clamping the wheel

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1　2　　　3

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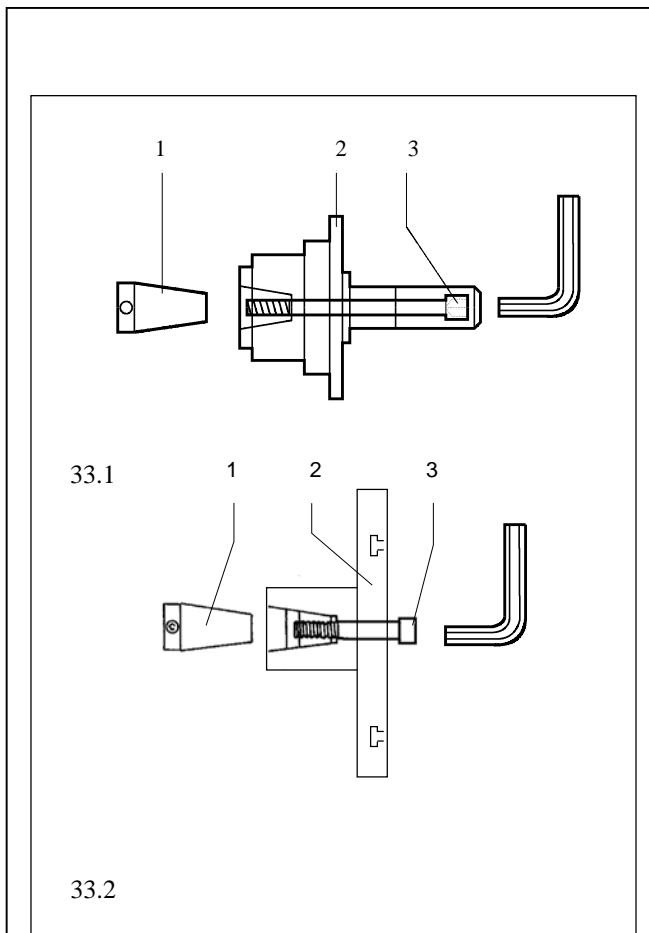
6.3 Clamping car and light-truck wheels

Fig. 34 Cone adapter to clamp center bore located wheels

1 Cone
2 Rim
3 Clamping head with clamping nut

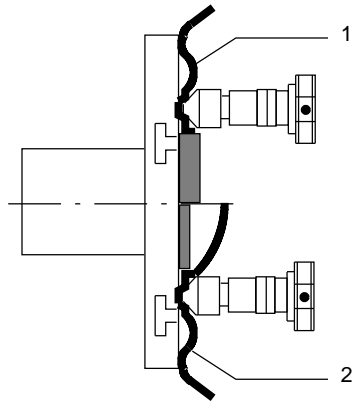Fig. 35 Universal clamping adapter for clamping stud hole lo-

cated wheels or wheels with closed rim.

1 Rim with center bore (center bore location)
2 Closed rim

36

## 7. Entry of balancing mode and wheel size

For determination of unbalance the following inputs have to be made:
- balancing mode(weight fitting position on rim)
- wheel size(wheel widthanddiameter)
- distancebetween machine and left correction plane

The wheel dimensions to be entered are usually given on the rim. Rim diameter is also given on the tire.

Rim width and diameter are always entered by pressing and holding the relativefunction key **(Fig.36, item2 or3)**androtating the wheel until the desired value is read out. On releasing thefunctionkeytheinputisretaineduntil anotherinput ismade.

The distance between left correction plane and machine is usually entered using the integrated gauge arm, but may also be entered by pressing and holding the function key for dis-tance **(Fig. 36, item 1)** and rotating the wheel until the desired value is read out. On releasing the function key the input is re-tained until another input is made.

Entry of balancing mode and wheel size

37

38
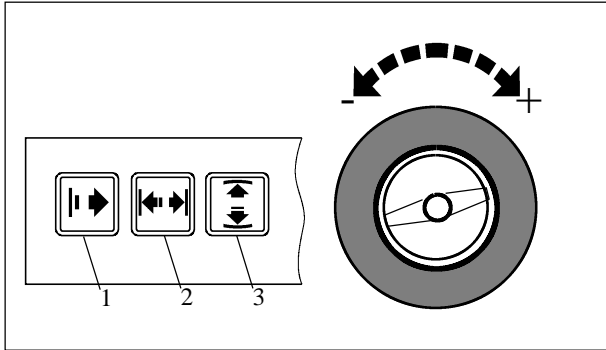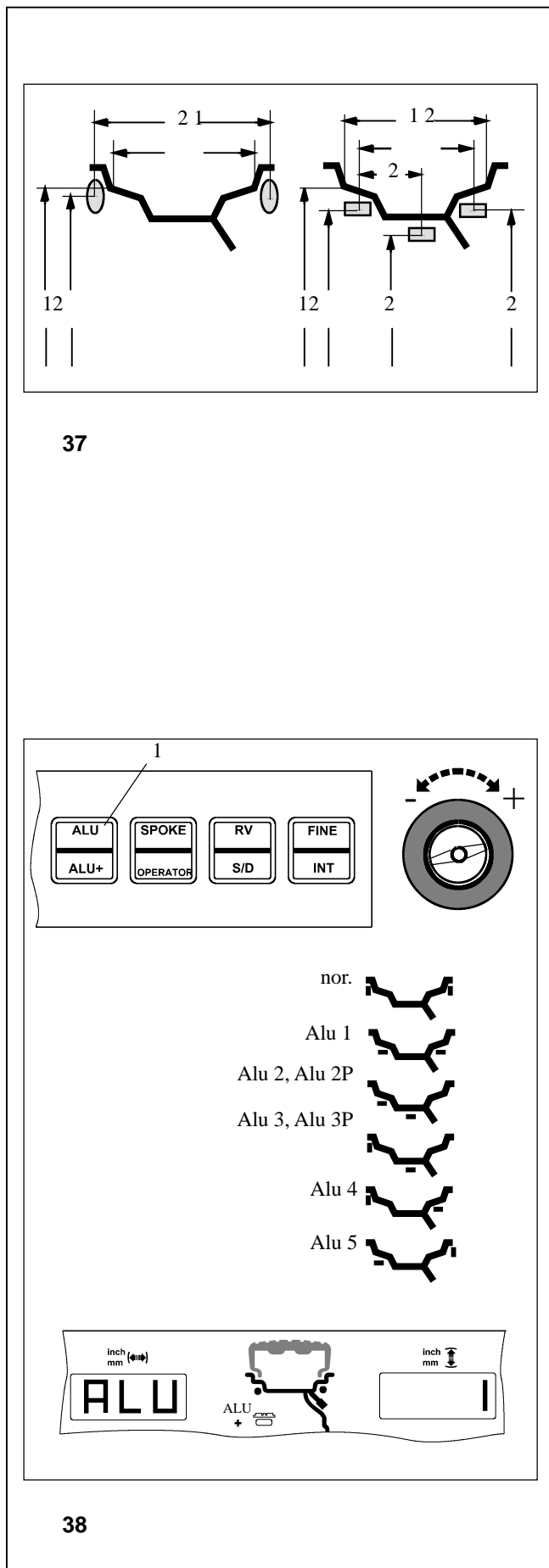
7.1 Balancing modes

The use of different types on a standard (alloy) wheel and the resulting different fitting positions of the weights on the rim produce differences between the rim data which have been en-tered and the actual correction dimensions.

Fig. 37 Possible positions of the balance weights
    - nominal rim data/actual correction data

1 Nominal rim dimensions to be entered
2 Actual correction data (center of gravity of weights) which are used for determination of unbalance

The mode chosen is read out on the display, showing the relative rim symbol(Fig. 38), or on the digital displays when the ALU key is pressed (reading e. g. Alu 1).

> Press and hold the ALU key(Fig. 38, item 1)and rotate the wheel to set the desired balancing mode (weight fit-ting positions -Fig. 38).
>
> Release the ALU key as soon as the desired mode is read out.

Fig. 38 Rim symbols showing weight fitting positions

nor. Standard balancing mode where hammer-on weights are attached to the rim flanges - always set when the machine is turned on.

Alu 1 Fitting of adhesive weights to the bead seats

Alu 2 Adhesive weights - hidden adhesive weight attached (Alu 2P)in the rim so as not to impair the decorative appearance of alloy wheels or to balance PAX wheels

Alu 3 Hammer-onweightonlefttrimflange,adhesiveweight (Alu 3P)attached in hidden position in the rim disc

Alu 4 Hammer-onweightonlefttrimflange,adhesiveweight attached to right bead seat

Alu 5 Hammer-on weight on right rim flange, adhesive weight attached to left bead seat

Entry of balancing mode and wheel size

39

40

41
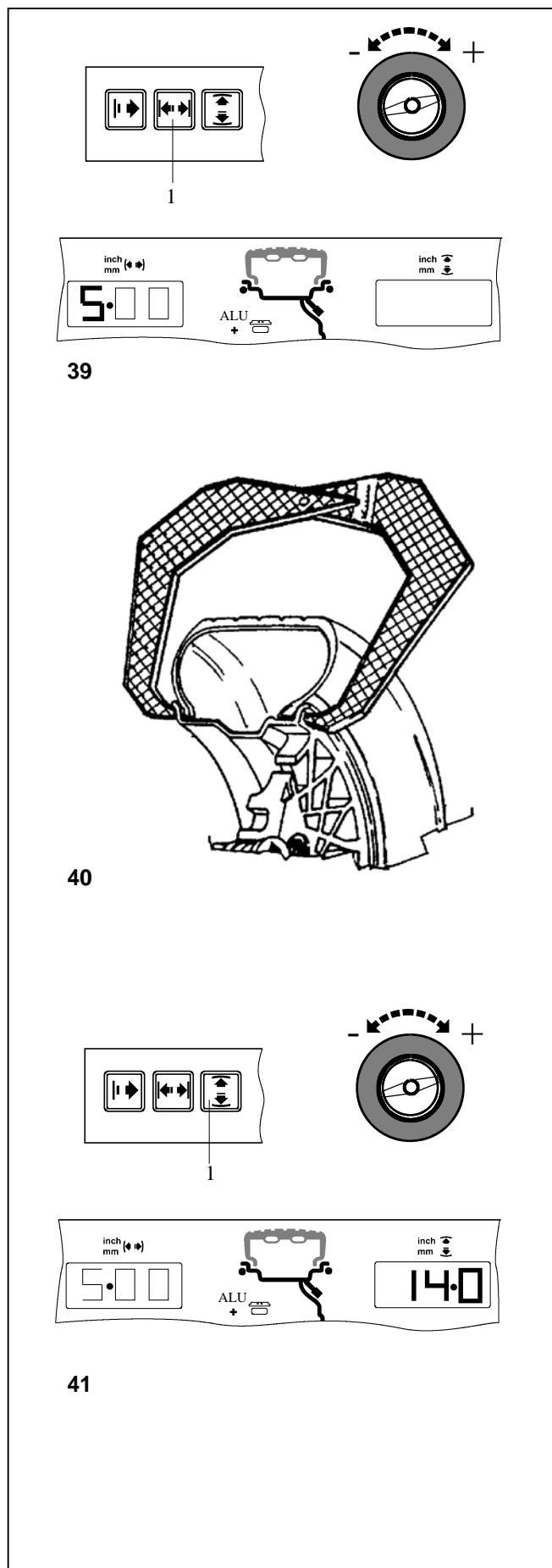
7.2 Input of wheel dimensions for the standard balancing mode If several wheels with identical wheel size are balanced in suc-cession, it is only necessary to enter the data for the first wheel. It will remain stored until new entries are made.

7.2.1 Determination and input of rim width

Use the rim width callipers (Fig. 40) .

Fig. 39 Input of rim width

To enter the rim width, press and hold the relative func-tion key(Fig. 39, item 1).

Rotate the wheel while the key is pressed in order to set the value for the rim width on the display, and then re-lease the key.

7.2.2 Determination and input of wheel diameter

Note the wheel diameter on the rim or tire.

To enter the wheel diameter, press and hold the function key(Fig. 41, item 1).

Rotate the wheel while the key is pressed in order to enter the diameter.
Having made the input release the function key.

42
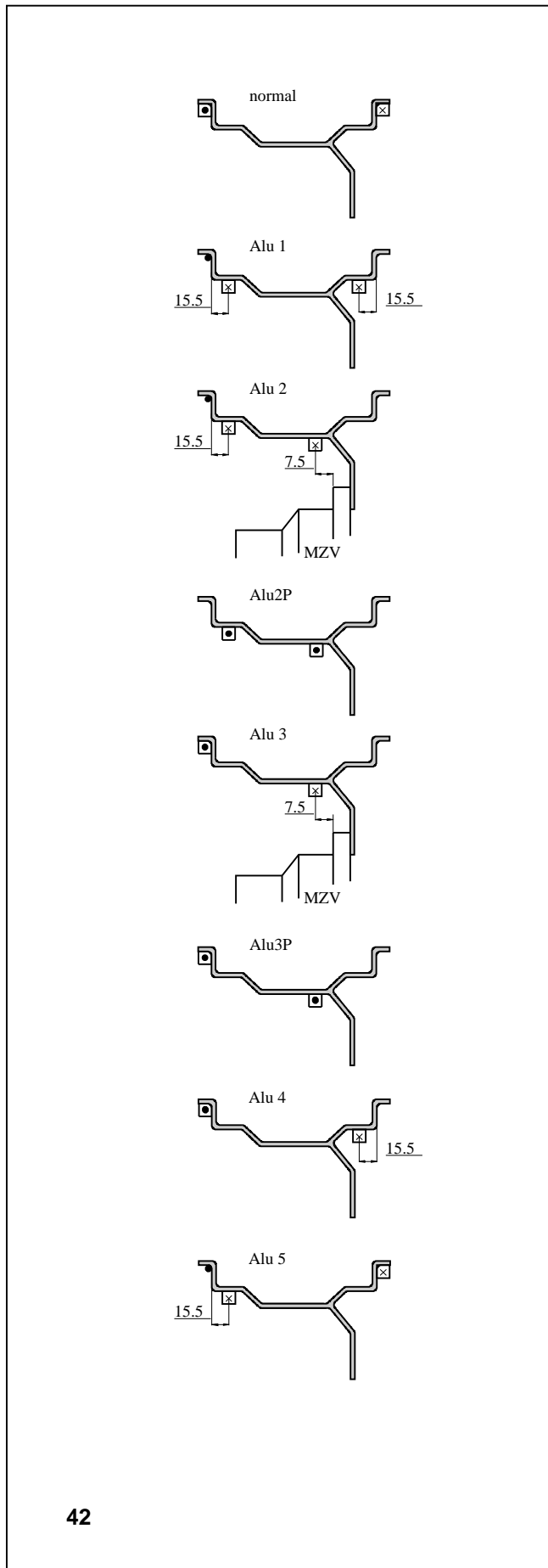
7.2.3 Gauge head applications

In order to be able to determine unbalance in a single measur-ing run, the rim dimensions have to be entered correctly.

Fig. 42shows correct application (with and without adhesive weight) of the gauge on various rims and for various weight positions. There are either one, or two positions where the gauge has to be applied.

normal Standard balancing mode where hammer-on weights are attached to the rim flanges

Alu 1   Attachment of adhesive weights to the bead seats

Alu 2   Adhesive weights - adhesive weight on bead seat, hidden adhesive weight attached in the rim; the cor-rection planes for the adhesiveweights arede-termined automatically by the machine

Alu 2P Adhesive weights - adhesive weight on bead seat, hidden adhesive weight attached in the rim; the correc-tion planes for the adhesive weights can be determined exactly

Alu 3   Hammer-onweightonleftrimflange,adhesiveweight attached in hidden position in the rim; the correction plane for the adhesive weight is deter-mined automati-cally by the machine

Alu 3P Hammer-onweightonleftrimflange,adhesiveweight attached in hidden position in the rim; the correc-tion plane for the adhesive weight can be determined exactly

Alu 4   Hammer-onweightonleftrimflange,adhesiveweight attached to right bead seat

Alu 5   Hammer-on weight on right rim flange, adhesive weight attached to left bead seat

Point of application of gauge arm Given weight position

• Point of appliction of gauge arm = weight position

⊠

◉

43

AP1

44
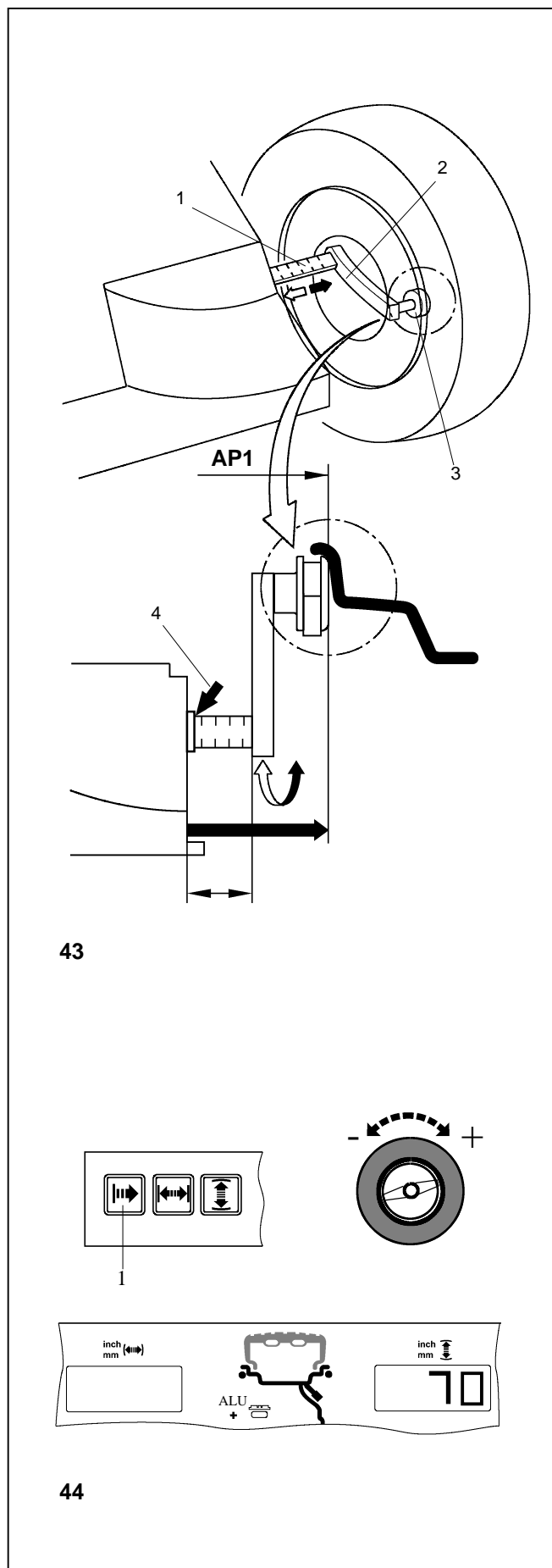
7.2.4 Determination of distance rim/machine Forthebalanc ingmodesnor.,Alu1,Alu2,Alu 3,Alu 4and Alu5 the correction dimensions are derived from the dimensions by subtraction or addition of correction values.

Fig. 43 Gauge arm for distance rim/machine

1 Scale for distance, mm only
-scale with 2 mm graduations 2
Gauge arm with pointer
3 Pointer
4 Reference edge for distance reading

Automatic determination of distance rim/machine

> Pull the gauge arm(Fig. 43, item 2)out of the cabinet, apply the gauge(Fig. 43, item 3)on the rim flange as shown inFig. 43and hold in that position.

As the distance lever is moved, the first bar and gradually the re-maining bar segments light up. On reaching the correction position the segment furthest to the right lights up and the speaker beeps.

> Re-place the gauge arm in its home position.

Upon operation of the key the distance can be read out once again.

Manual input of distance rim/machine

If automatic determination of the distance rim/machine is not possible (error code E92), the distance can be determined manu-ally in balancing modes normal, Alu 1, Alu 2, Alu 3, Alu 4 and Alu 5.

Attention

In balancing modes Alu 2P and Alu 3P manual input of the dis-tance rim/machine will produce an incorrect measurement re-sult.

> Pull the gauge arm(Fig. 43, item 2)out of the cabinet, apply the gauge(Fig. 43, item 3)on the rim flange as shown inFig. 43and hold in that position. Notethedistanceshownonthescale(Fig. 43, item 4).

> Return the gauge arm to its home position.

> Press and hold the key for distance(Fig. 44, item 1).

> Holding the key pressed, rotate the wheel to enter the dis-tance previously read from the scale.   Release the key.

By pressing the key the distance can be viewed once again.

a

AP1

AP2

b

c

d

45
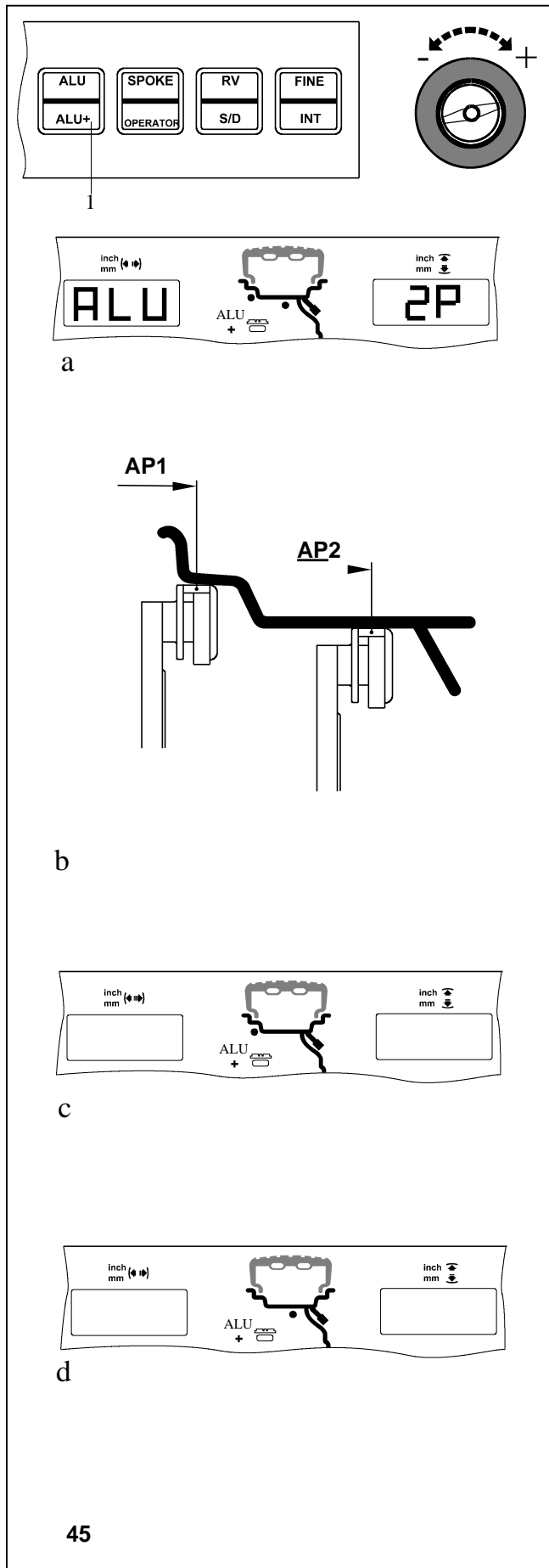
7.2.5 Determining the position of the hidden weights
(Alu 2P)

Note

Enter rim width before determining the position of the weights.

Fig. 45 Scanning of the exact correction dimensions

1 ALU+ key
a Selection of balancing mode Alu 2P
b Measurement procedure
c Application position AP1
d Application position AP2

To set the desired balancing mode press and hold the ALU+ key(Fig. 45, item 1).

Holding the key pressed rotate the wheel until mode Alu 2P is shown (Fig. 45 a- the left weight symbol is dis-played as long as the key is pressed).
Release the ALU+ key as soon as the desired balancing mode is read out.

To determine the gauge application positionAP1, pull the distance gauge arm out of the cabinet, apply the gauge on the rim in the center of the intended weight position as shown inFig. 45b, item AP1and hold in that position.

The symbol for the outer weight is viewed on the display (Fig. 45c).

Approachthegaugetoapplicationpositon AP2andhold in that position.

The symbol for the inner weight is viewed on the display (Fig. 45d). An audible signal is given when the distance has been stored.

Return the distance gauge arm to its home position.

Start the measuring run.

46
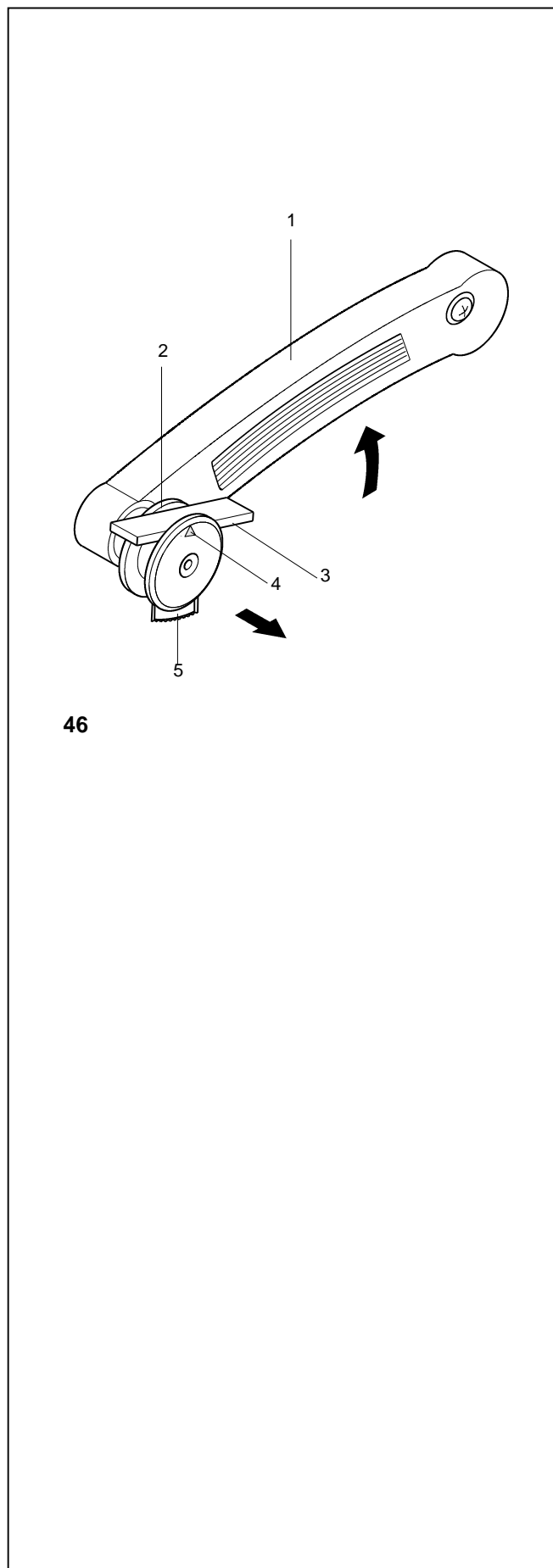
Fitting of balance weights

Index the wheel to the exact correction position in the left correction plane. On reaching the correction position only the two arrow-heads light up (see§8.1 Measure-ment). Press thepedal ofthe mainshaft lockto holdthe wheelin this position.

Clean the position before attaching the adhesive weights.

Select an adhesive weight forAP1and adjust it to the wheel radius by bending.

Raise the gauge arm(Fig. 46, item 1)and pull the hold-ing ring of the gauge(Fig. 46, item 2)inwards.

Insert the adhesive weight(Fig. 46, item 3)into the gauge with the protective tape facing upwards to the arrow(Fig. 46, item 4).

Press the adhesive weight firmly into the gauge and re-move the protective tape from the weight.

Pull the gauge arm towards application positionAP1.

The display shows the dimension for the first distance, which decreases as the gauge is approached. At 0±1 an audible sig-nal is given to show thatAP1has been reached.

Swing the gauge arm out towards the rim and press the weight firmly against the rim using the ejector(Fig. 46, item 5).

Swing the gauge arm in and return it to its home position.

Firmly press the adhesive weight on the rim by hand.

Fit the second adhesive weight forAP2in the same manner.

47
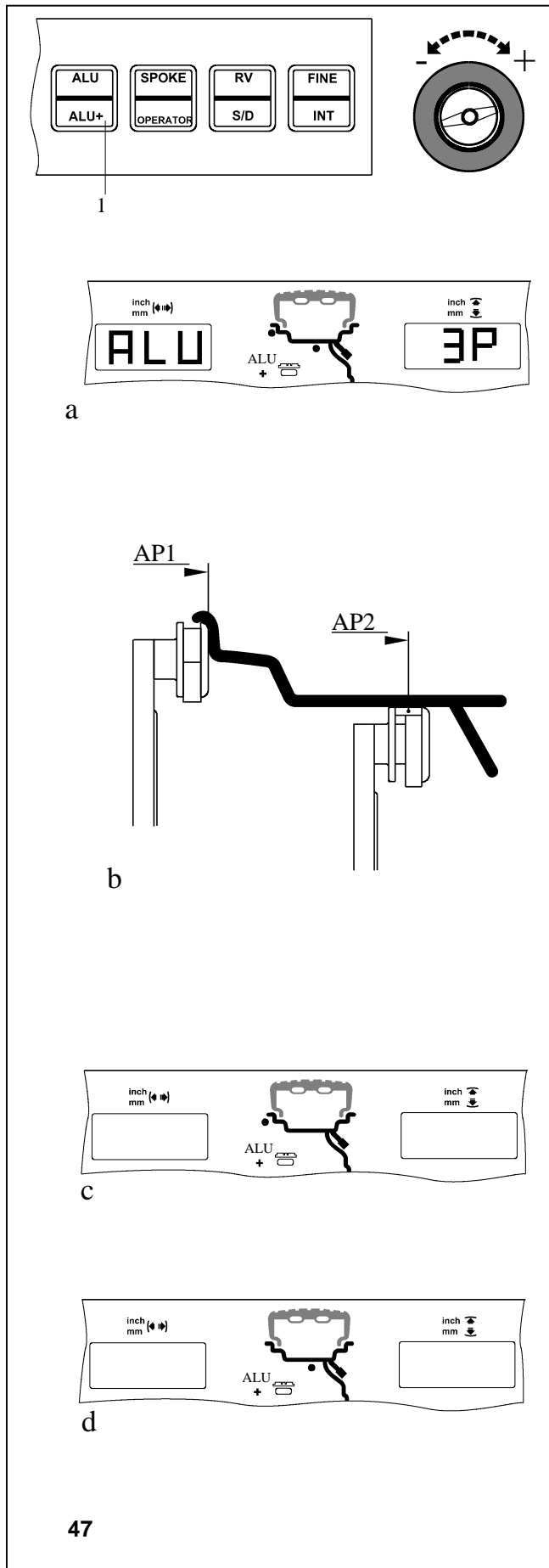
7.2.6 Determing the position of the hidden weights (Alu 3P)

Note

Enter rim width before determining the position of the weights.

Fig. 47 Scanning and input of the exact correction dimensions

1 ALU+ key
a Selection of balancing mode Alu 3P
b Measurement procedure
c Application position AP1
d Application position AP2

To set the desired balancing mode press and hold the ALU+ key(Fig. 47, item 1).

Holding the key pressed rotate the wheel until mode Alu 3P is shown (Fig. 47a- the left weight symbol is dis-played as long as the key is pressed).
Release the ALU+ key as soon as the desired balancing mode is read out.

To determine the gauge application positionAP1, pull the distance gauge arm out of the cabinet, apply the gauge on the rim in the center of the weight position as shown inFig. 47b, item AP1and hold in that position.

The symbol for the outer weight is viewed on the display (Fig. 47c).

Approachthegaugetoapplicationposition AP2 andhold in that position.

The symbol for the inner weight is viewed on the display (Fig. 47d). An audible signal is given when the distance has been stored.

Return the distance gauge arm to its home position.

Start the measuring run.

Entry of balancing mode and wheel size

48
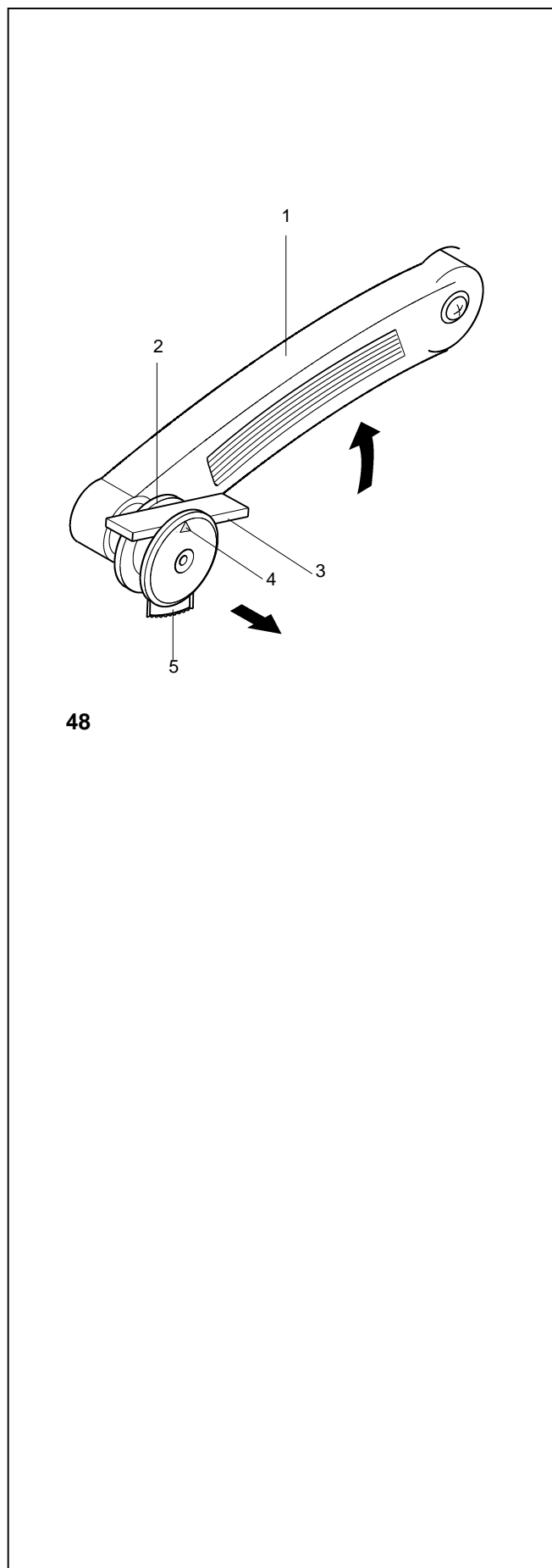
Fitting of balance weights

The weight for AP1 is a hammer-on weight and is attached at 12:00 o'clock to the main shaft after indexing the wheel, as in the normal mode. The gauge arm stays in its home position.

The adhesive weight for AP2 is fitted as described below:

Index the wheel to the correction position in the left correction plane. On reaching the correction position only the two arrow-heads light up (see §8.1 Measurement). Press the pedal of the mainshaft lock to hold the wheel in

this position.

Clean the position before attaching the adhesive weights.

Select an adhesive weight and adjust it to the wheel radius by bending.

Raise the gauge arm (Fig. 48, item 1) and pull the holding ring of the gauge (Fig. 48, item 2) inwards.

Insert the adhesive weight (Fig. 48, item 3) into the gauge with the protective tape facing upwards to the arrow (Fig. 48, item 4).

Press the adhesive weight firmly into the gauge and re-move the protective tape from the weight.

Pull the gauge arm towards application position AP2.

The display shows the dimension for the first distance, which decreases as the gauge is approached. At 0±1 an audible sig-nal is given to show that AP2 has been reached.

Swing the gauge arm out towards the rim and press the weight firmly against the rim using the ejector (Fig. 48, item 5).

Swing the gauge arm in and return it to its home position.

Firmly press the adhesive weight on the rim by hand.
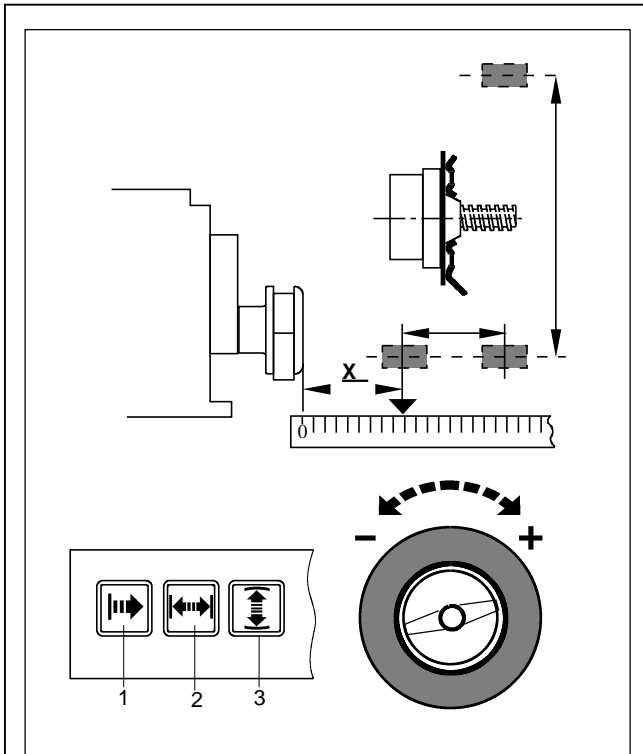
49

7.2.7 Special balancing operations

If none of the programmable balancing modes can be used:

> Measure the distance and the actual correction dimensions (center of gravity of balance weight to be attached) directly on the wheel(Fig. 49).
>
> Press and hold the key(Fig. 49, item 1-3)and rotate the wheel to set the values in mm.
>
> Release the key as soonas thedesired valueis readout.

7.2.8 Input for display of static unbalance

For wheels which should only be balanced statically, only the correction diameter has to be entered. Input is made as for standard wheels.

> Press and hold the diameter key and rotate the wheel to set the diameter values.
>
> Release the key as soonas thedesired valueis readout.

7.2.9 Store wheel profiles

Wheel profiles permit the storage of values for wheels that are balanced frequently so that the wheel data need not be entered again and again. This function is particularly useful for shops that frequently handle the same wheel types.

It is possible to store up to 4 wheel profiles via codeC18and to select previously stored profiles via codeC17(see§10. Changing modes of operation).

The following values are stored: -

Wheel dimensions

- Values measured with the gauge arm
- Weight positions
- Positions for relocation

> Press and hold OPERATOR key (on bottom).
>
> RCL comes up in the left-hand section of the display and 1 comes up in the right-hand section for the first wheel profile to be stored. Keep the key pressed on bottom and rotate the wheel. Profiles 2 through 4 are read out in the right-hand display. The stored wheel profile is entered once the key is released.
> If a wheel profile is to be stored,keep onpressing thekey aftertheRCLreadings havecome upand continuerotat-ingthewheel.NowSTO(store)comesupintheleft-hand display, and No. 1 through 4 can be set in the right-hand display-byrotatingthewheel.Thecurrentprofileisstored once the key is released.

7.2.10 Correction of inputs after measurement

Upon operation of the FINE key the electronic unit accepts the new input, processes it and then reads out the corrected measured data without need to repeat the measuring run.

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8. Balancing the wheel

Preparations:

- Compensation run carried out, if necessary (see § 6.2).

- Wheel correctly clamped (see § 6.3).

- Balancing mode chosen (see § 7.1).

- Distance and rim dimensions entered (see § 7.2).

If several wheels of identical nominal rim dimensions are balanced in succession, it is only necessary to enter the data for the first wheel. The inputs will remain stored until new data is entered.

8.1 Measurement

Start the measuring run (by pressing the START key or closing the guard, depending on adjustment).   Index the wheel into correction position following the

direction indicated (Fig. 52, item 1).

On reaching the respective correction position only the center element of the direction indicator is lit (Fig. 53, item 1).

In this position attach a balance weight in the correction position at the top of the rim, at 12:00 o'clock (Fig. 53, item 3).

For correct fitting of the balance weights see Fig. 54, 56 and 59.

Fig. 53 Example of display and correction of the righthand correction plane

1 Display of correction position -only the center element lights up 2 Display of amount of unbalance
3 Position of balance weight on rim

54

55
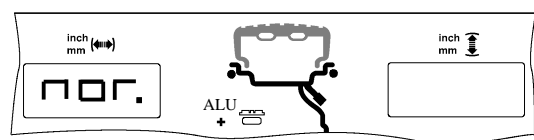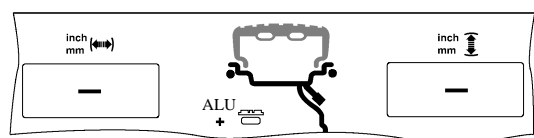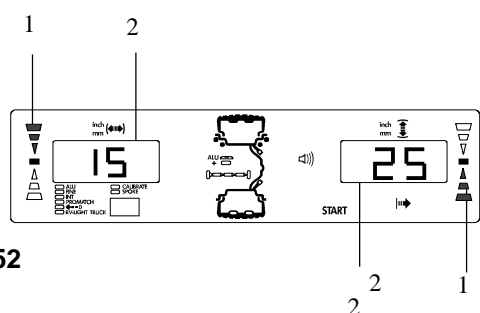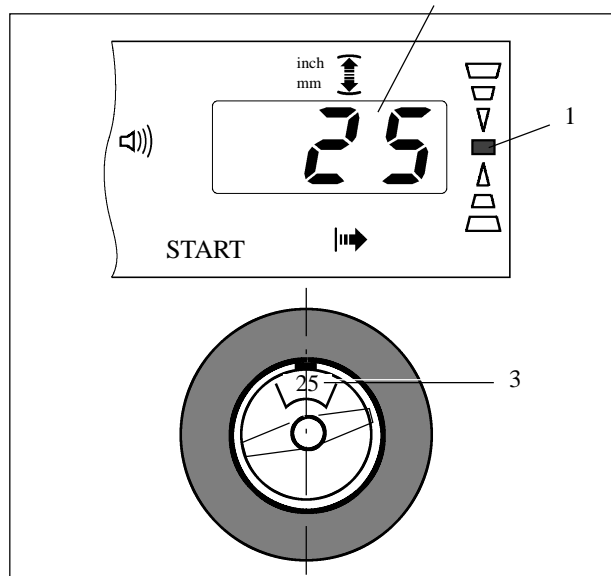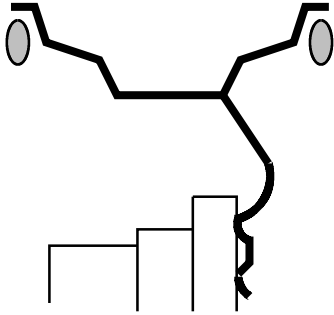
8.2 Fitting the balance weights correctly

Attachingofbalancingweightsforthebalancingmodesnormal, Alu 1, Alu 2, Alu 3, Alu 4, and Alu 5 is specified and illustrated in this paragraph.

Fitting of balance weights for the balancing modes Alu 2P and A lu3Pisspecifiedandillustratedinparagraphs7.2.5and7.2.6.

8.2.1 How to attach hammer-on weights

If necessary, index the wheel to the exact correction position in the righthand correction plane. On reaching the correction position only the two center elements of the direction indicators light up(Fig. 53,item 2). Press thepedal ofthe mainshaft lockto holdthe wheelin this position.

Attach the hammer-on weight in the correction position

at the rim flange at 12:00 o'clock(Fig. 54).

After balancing carry out a check run (see§8.3).
8.2.2 How to fit adhesive weights using the gauge

Note
If an error code H20 is read out when the gauge arm is approached to the rim, there are no data forre-locating thecorrection plane (see§11. Error codes). This means that either an error was made in applying the gauge arm, or the adhesive weight cannot be fitted on the rim using the gauge head. In this case refer to§8.2.3.

If necessary, index the wheel to the exact correction position in the left correction plane. On reaching the correction position only the two center elements of the dirction indicators light up(Fig. 53, item 1).

Press thepedal ofthe mainshaft lockto holdthe wheelin this position.

Clean the wheel before attaching the adhesive weights.

Select an adhesive weight of the indicated size and adjust it to the wheel radius by bending.

Raise the gauge arm(Fig. 55, item 1)and pull the holding ring of the gauge(Fig. 55, item 2)inwards.

Insert the adhesive weight(Fig. 55, item 3)into the gauge with the protective tape facing upwards to the arrow(Fig. 55, item 4).
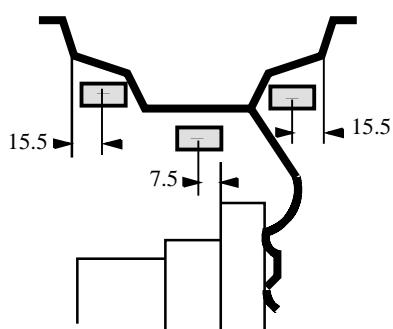
Press the adhesive weight firmly against the gauge and

remove the protective tape from the weight.
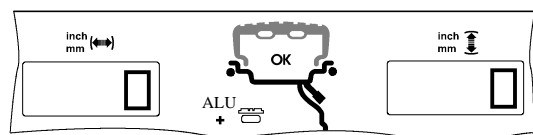
Pull the gauge arm towards application position.

The display shows the dimension for the first distance, which decreases as the gauge is approached. At 0±1 an audible signalisgiventoshowthatthecorrection planehas beenreached.
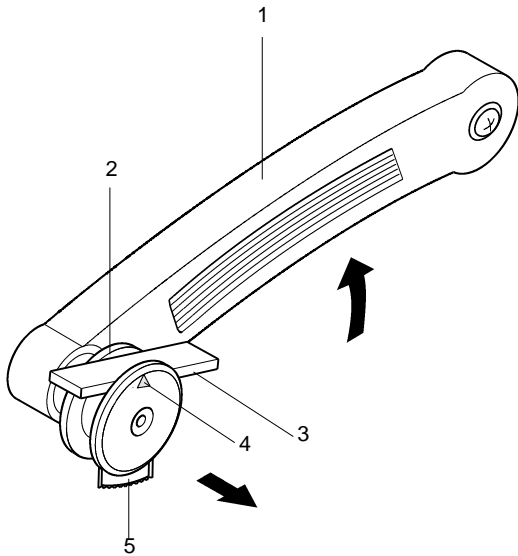
Swing the gauge arm out towards the rim and press the weight firmly against the rim using the ejector(Fig. 55, item 5).

Swing the gauge arm in and return it to its home position.

Firmly press the adhesive weight on the rim by hand.

8.2.3 How to fit adhesive weights based on given dimensions

Ifthecorrectionpositionsarenotaccessiblewiththegaugearm and the rim dimensions have been entered using the function keys and rotating the wheel:

Fit adhesive weights in the given positions according to the balancing mode. Make sure to observe the given positioning dimensions(Fig. 56)

56

8.3 Check run

When the balance weights are fitted, start a check run.

On completion of the check run when the wheel is perfectly balanced, both digital displays show 0 and the OK indicators come up(Fig. 57).

Note

If both amount readings are 0, but there is no OK reading, dynamic unbalances below the tolerance limit (suppression preset to 1/4 ounce) add to a static unbalance above the toler-ance limit. These residual unbalances are read out upon oper-ation of the FINE key (Fig. 16b, item 11) and should then bebal-anced.

57

58

59.1

59.2

59.3

59.4

59
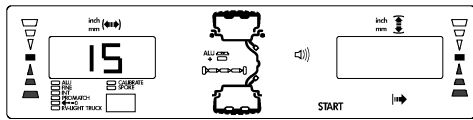
8.4 Static unbalance

To display static unbalance press the key to select the display of static unbalance (S/D key; Fig. 14, item 6). The amount of unbalance is then read out at the left digital dis-play.Thedirectiontobeindexedandthecorrectionpositionare indicated by both direction indicators(Fig. 58).

For correction diameter and possibilities of correction of static unbalance seeFig. 59.

Recommendations for fitting balance weights for static unbalance correction

Hammer-on weights

Figures 59.1-59.3illustrate how hammer-on weights can be fitted.

With large static unbalance (e. g. 1 ounce) divide the unbalance into two equal parts(Fig. 59.1).

With small static unbalance fit the balance weight either in the outer or inner correction plane(Fig. 59.2 and 59.3).

Adhesive weights

When adhesive weights are used, or both types are mixed:

For balancing modes Alu 2 and Alu 3 fit a balance weight in hidden position inside the rim; in this case the correc-tion diameter for static unbalance correction lies inside the rim(Fig. 59.4).

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61

62

9. Hidden spoke placement

When spoked wheels are balanced, the hidden spoke place-ment mode allows balance weights which would have to be at-tached between two spokes according to the measured unbal-ance to be placed in hidden position behind two spokes adjacent to the unbalance location (see example, **Fig. 60**). After a measuring run the electronic unit automati-cally calcu-lates the positions behind the spokes and reads the balance weight locations on the display panel.

The operating steps for the hidden spoke placement mode are described and illustrated below.

9.1 How to proceed

The **h**idden **s**poke **p**lacement (HSP) mode is activated auto-matically in Alu 2, Alu 2P, Alu 3 and Alu 3P balancing modes.

9.2 Choice of balancing mode, choice of hidden spoke place-ment mode and input of wheel data

Press and hold the ALU key or the ALU+ key(Fig. 61, item1)androtatethewheeltosetbalancingmodeAlu 2, Alu 2P, Alu 3 and Alu 3P (weight positions -Fig. 61, item 3). Press and hold the SPOKE key(Fig. 61, item 2)on top and

rotate the wheel to set, or change, the number of spokes. The spoke LED lights upand thenumber ofspokes isdisplayed (Fig. 62). The number of spokes can be chosen between 3 and

12.

63

64

65

66

67
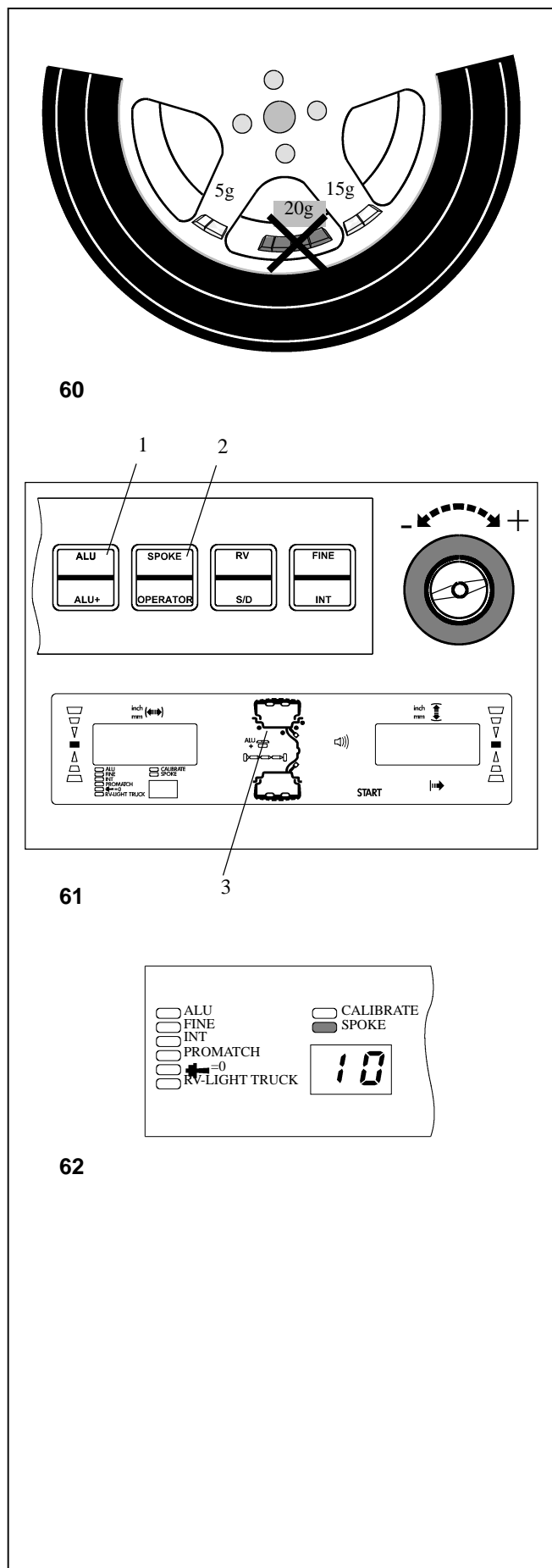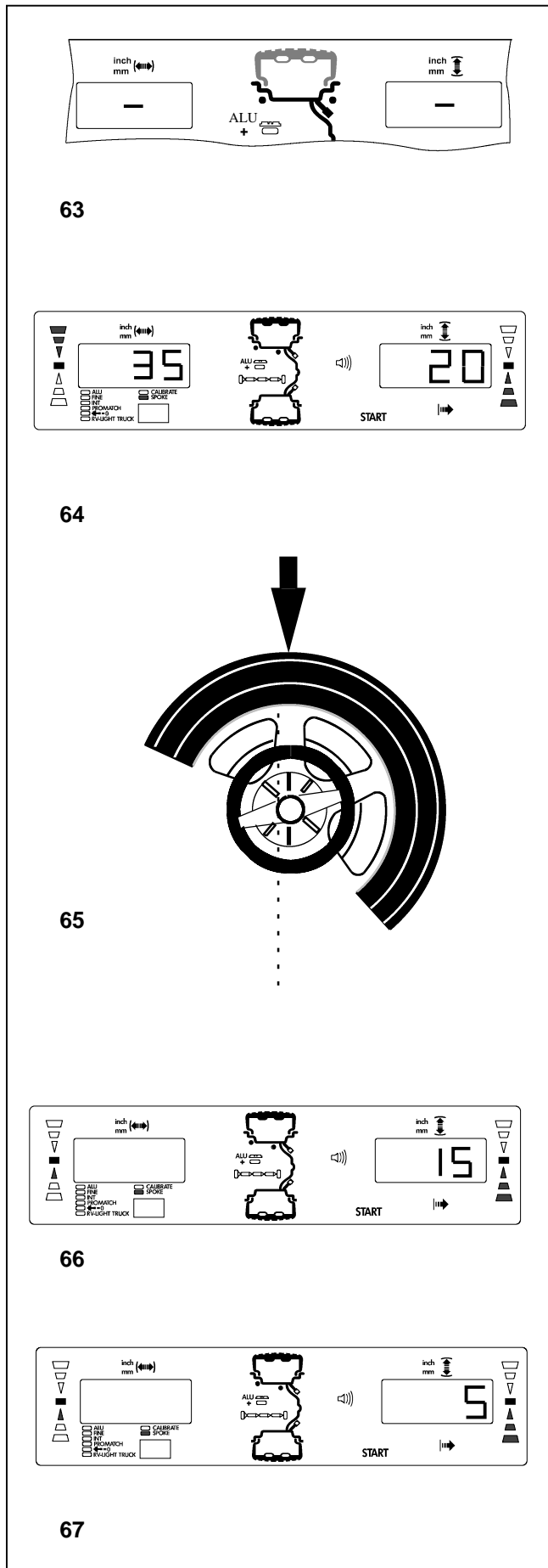
9.3 Correction of measured unbalance

Press the START key.

The measuring run is carried out.

During measurement one middle segment is read out on each of the digital displays(Fig. 63).

Aftermeasurementthemachinestopsautomatically,thewheel is braked down to standstill and the display is as shown in Fig. 64.

This shows the unbalance measured in each correction plane and the direction towards the correction position on the direc-tion indicator.

How to fit adhesive weights on the left side of the rim disc

Clean the wheel before attaching the adhesive weights.

Fit adhesive weights on the left side of the rim asdes-cribed in§8.2.

How to fit a hidden adhesive weight

Rotate the wheel so that a spoke is at 12:00 o'clock (Fig. 65,

arrow).

In this position press the ALU key for balancing mode (Fig. 61, item 1).

The divided amount of unbalance of the hidden spoke placement is read out for the first adhesive weight in the right correction plane(Fig. 66); in the example 15 g.

Note

The small arrow on the left-hand side in Fig. 66 indicates the shortest way to index the position of the other adhesive weight.

Index the wheel to the exact position for correction in the firstcorrectionpositionandholdthewheelinthisposition with the main shaft lock.

Clean the wheel before attaching the adhesive weights.

Attach a weight in the position (in the example 15 g, Fig. 66).

The divided amount of unbalance of the hidden spoke place-ment is read out for the second adhesive weight in the right cor-rection plane(Fig. 67); in the example 5 g.

Fit the second weight behind the spoke in the same way.

Hidden spoke placement

To return to the undividedreading ofunbalance forleft andright correction plane (Fig. 64):

Briefly press the ALU key (Fig. 61, item 1). The unbalances for left and right correction plane are read out. The program hidden spoke placement mode is still active as long as Alu 2, Alu 2P, Alu3 or Alu 3P are set.

To leave the hidden spoke placement and reset the electronics to the conventional balancing mode:

Press and hold the ALU key.
Rotate the wheel to set a balancing mode other than Alu 2, Alu 2P or Alu 3, Alu 3P.

or

In the reading"Wheel data"press twice the key for bal-ancing mode and set number of spokes to zero.

68

69

10. Changing modes of operation

Inputs and readings when a mode of operation is changed (Fig. 68 - example code C2)

Press and hold the CODE key.

The C code that was last set is displayed.

Rotate the wheel to set the desired code (e. g. 2) in the display.

Release the CODE key when the desired code is read out.

C and code number 2 are read out in the left digital display. The right digital display shows the present state of this code, e. g. 0 for switched off.

If the desired state is already read out:

Press the CODE key to return to the basic reading (Fig. 69),or abort by pressing STOP.

If the desired state has to be set:

Press and hold the FINE key.

Rotate the wheel to set the desired state (e. g. 1) in the display. For some codes a given value can be set. Release the FINE key when the desired code or value is read out.

Press the CODE key to acknowledge the input and to re-turn to the basic reading(Fig. 69), or abort by pressing STOP.

Quit the modes of operation and return to normal working mode:

Press the STOP key.

Having completed the input of mode of operation it will remain stored until the machine is switched off with the main switch, or until a new input is made.

The changed modes can also be stored permanently with code C10, so that they are not cancelled when the machine is switched off but are retained in a permanent memory for future use until a new input is made and stored.

CodeC4Compensation of the clamping means cannot be stored in the permanent memory.

The possible changes of codes and the necessary inputs are described in the following.
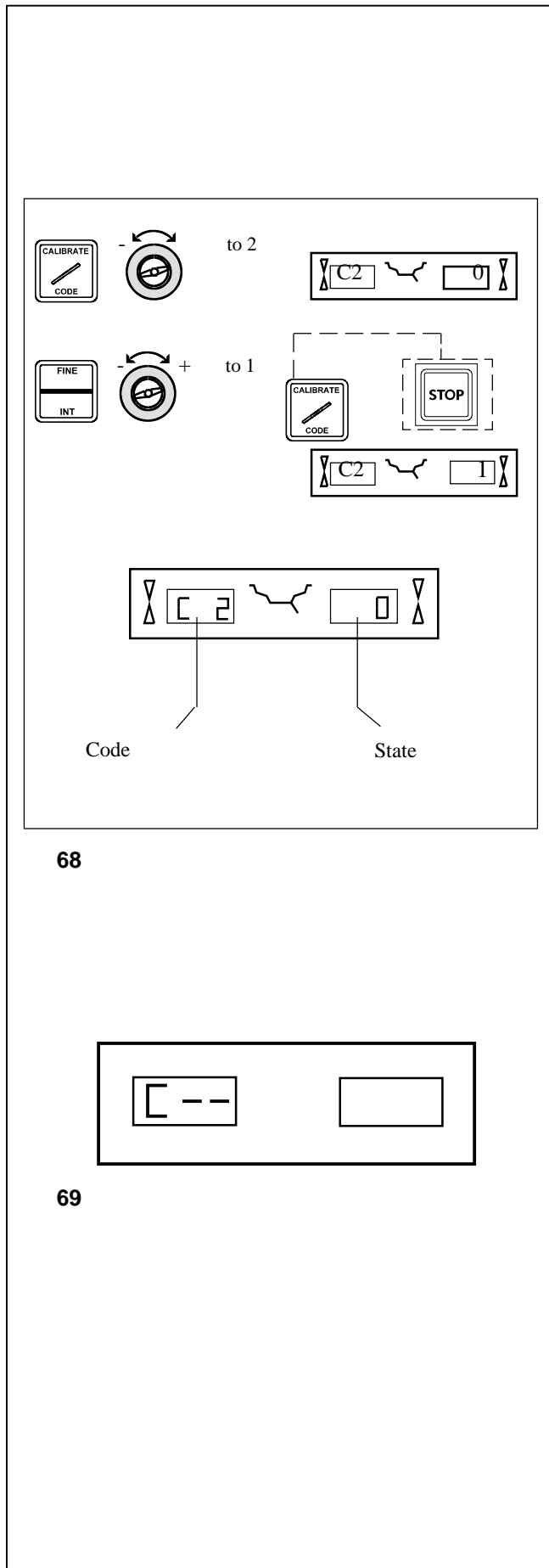
Changing modes of operation

70

Code C0

Fig. 70 Setting the factory-adjusted modes of operation (see§5.)

CLEAR(key pressed briefly): Setting the factory adjusted modes of operation. All settings are deleted and the display returns to standard.
RESTORE(key pressed for 3 seconds): Restores all modes thewaytheywerebeforeclearwaspressed(provided

they were stored previously).

71

Code C1

Fig. 71 Selecting the resolution of unbalance readings in 1 or 5 g, or 0.05 or 0.25 oz increments

$0*$ = 5 g (0.25 oz) increments

1 = 1 g (0.05 oz) increments

The selected mode of operation can be transferred to the permanent memory.

72

Code C2

Fig. 72 Selecting suppression of minor unbalance readings 0

= Suppression off

$1*$ = Suppression on

The selected mode of operation can be transferred to the permanent memory.

$*$ = Factory adjusted mode

Input: Code/state	Display: Code/state

73

74

CALIBRATE CODE — to 4   C4   0

START

Compensation run completed   C4   1

- -

After the mesuring run

FINE INT — to 0   C4   0

75

CALIBRATE CODE — to 5   C5

FINE INT — to 0   C5   0

CALIBRATE CODE

FINE INT — to 1   C5   1

CALIBRATE CODE
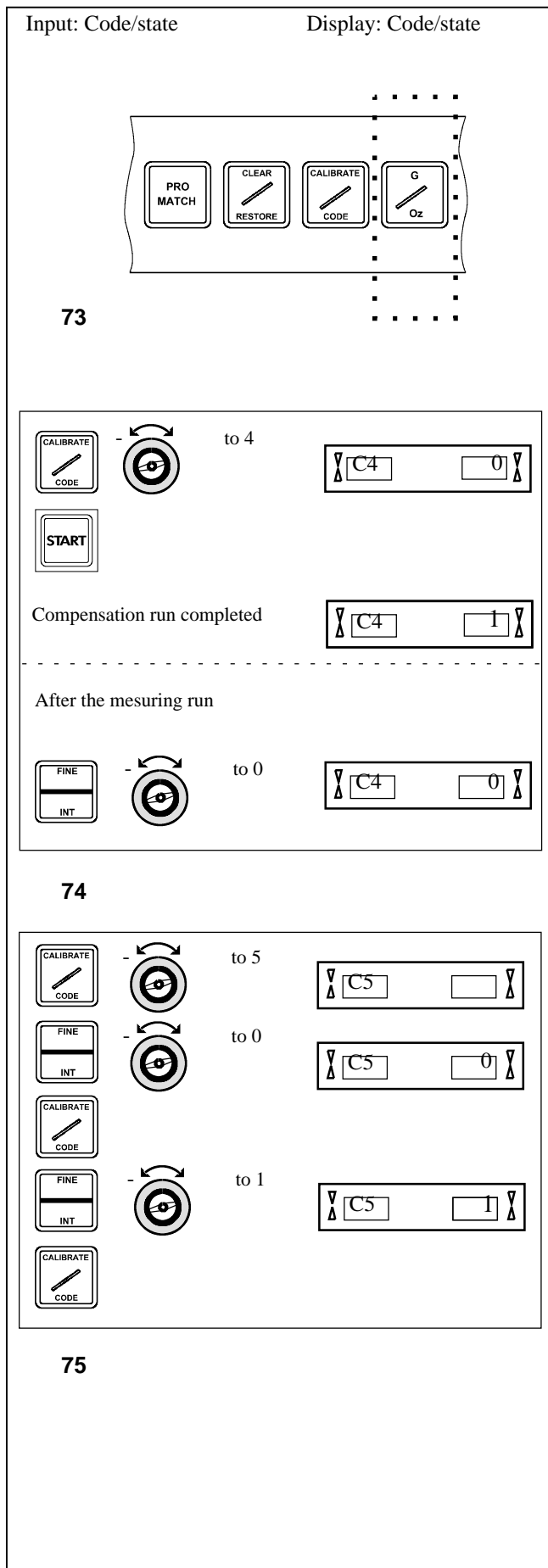
Code C3

Fig. 73 Selecting unbalance readings ingrammes orounces,

active when the machine is switched on 0

= Readings in grammes 1* = Readings in ounces

The selected mode of operation can be transferred to the permanent memory.

Code C4

Fig. 74 Electrical compensation of residual unbalance in the wheel adapter

Measurement with increased precision (this mode cannot be transferred into the permanent memory).
Compensation has to be cancelled and carried out once again when the wheel adapter is exchanged.
Resetting the status to 0 cancels the compensation of adapter unbalance.
The compensation is cancelled by calibration, or readjustment of the machine, by Pro-Match, or when the machine is turned off.

0   = Carry out compensation

1   = Compensation completed; compensation run LED lights up

0   = Compensation after the mesuring run switched off again

Code C5

Fig. 75 Braking of the wheel when the (optional) wheel guard is opened during the measuring run

If the mode is set to   he wheel rotates when the wheel guard (option) is open.

⚠ Caution! Rotating wheel may swing away objects and draw in clothes.
Injuries are possible.

Wear safety goggles and tightly fitting working clothes.
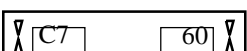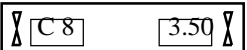
Make sure that the wheel is not blocked by tools or the like.

0 =   No braking

1* = Braking

The selected mode of operation can be transferred to the permanent memory.

* = Factory adjusted mode

Input: Code/state	Display: Code/state

76

Code C6

Fig. 76 Number of revolutions per measuring run
5 to 25 revolutions possible,
factory-set to 10*

Example: change to 7 revolutions per measuring run

Note

Reducing the number of measurement revolutions will reduce the accuracy of measurement. The selected mode of operation can be transferred to the permanent memory.

77

Code C7

Fig. 77 Volume of audible signal
Scale of volume 0 to 100 (low - high),
factory-adjusted to 50*

Example: set volume to 60

The volume is not changed before the CODE key is pressed for quitting the mode.

The selected mode of operation can be transferred to the permanent memory.

78

Code C8

Fig. 78 Selecting the limit (threshold) value for suppression of minor unbalance readings in grammes, or ounces. The unit (gms or oz) depends on the settings made by G/OZ key (C3).

Grammes:

Range 3.50 to 20.0 g
Factory-adjusted to 3.5 g
Read out limit, e. g. 3.50 g

Select another limit, e. g. 5.50 g

Ounces:
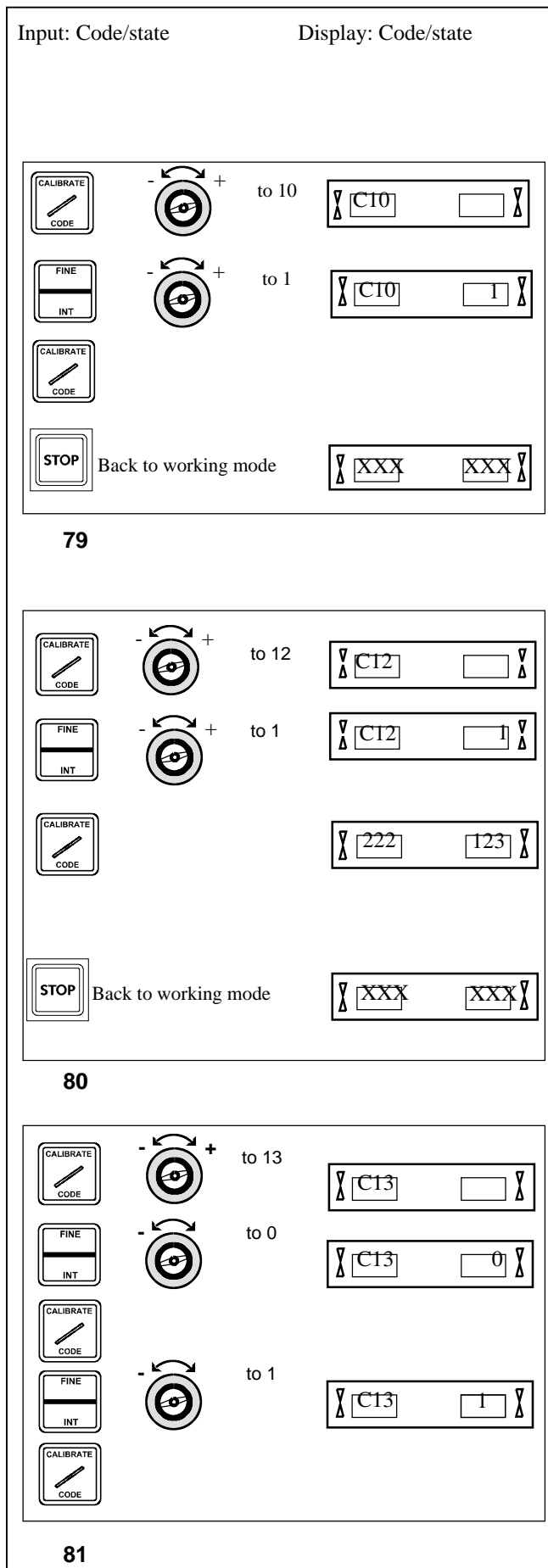Range 0.25 to 2.00 oz
Factory-adjusted to 0.25 oz

Read out limit, e. g. 0.25 oz Select

another limit, e. g. 0.50 oz

The selected mode of operation can be transferred to the permanent memory.

* = Factory adjusted mode

Changing modes of operation

Input: Code/state	Display: Code/state

79

80

81

Code C10

Fig. 79 Storing the selected mode of operation in the permanent memory

0* = No storage

1 = Data are stored in the permanent memory

Store in the permanent memory - a three-tone signal is given to acknowledge acceptance.

If the mode stored in the permanent memory is to be changed, enter the desired state (e. g. on or off) for the mode in question and transfer it via code C10 into the permanent memory (not possible for code C4).

Code C12

Fig. 80 Readings of numbers of measuring runs Example:

222,123 measuring runs so far performed By pressing the FINE

key and rotating the wheel the following counters can be displayed:

1 = Total number of measuring runs
2 = Number of measuring runs where balance quality was considered OK
3 = Number of Pro-Match performed
4 = Number of measuring runs in service mode
5 = Number of measuring runs since the last calibration

Maximum count is 999,999 runs. Once this number is reached, the counter is reset to zero.
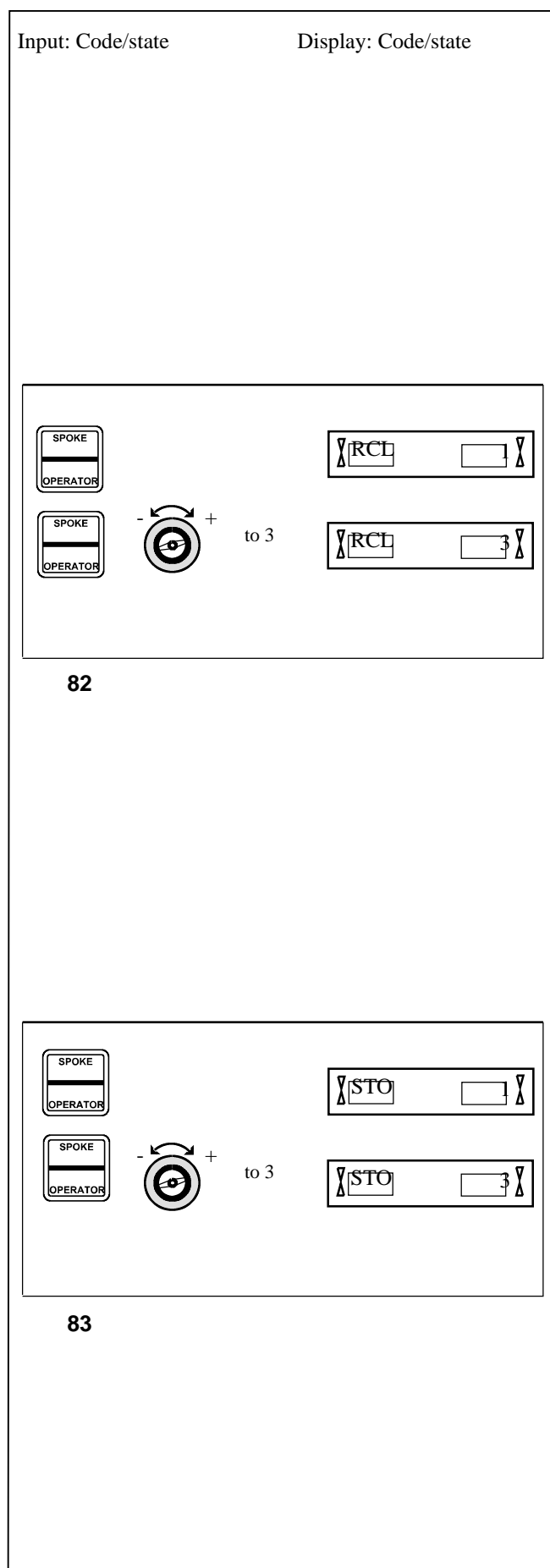Code C13

Fig. 81 Starting the mesuring run by closing of (optional) wheel guard

0* = Start via START key 1 =

Start via wheel guard

The selected mode of operation can be transferred to the permanent memory.

* = Factory adjusted mode

Input: Code/state	Display: Code/state

82

83

Code C14

Readjustment of the machine by the operator

See§13. User calibration.

Code C17

Fig. 82 Select previously stored wheel profile

Load a previously stored wheel profile. This replaces the previously valid settings.

> Keep the OPERATOR key pressed on bottom. RCL (re-call) comes up in the left-hand section of the display and 1 comes up in the right-hand section for the first wheel profile to be loaded.

> Keep the key pressed on bottom and rotate the wheel. Profiles2through4arereadoutintheright-handdisplay. The stored wheel profile (e. g. 3) is entered once the key is released.

The following information is available(if applicable):

- Nominal wheel dimensions

- Values measured with the gauge arm

- Weight positions

- Positions for relocation

SeealsoC18
Code C18

> Ifawheelprofileistobestored,keeponpressingtheOP-ERATOR key after the RCL readings have come up and continue rotating the wheel. Now STO (store) comes up in the left-hand display, and No. 1 through 4 can be set in the right-hand display by rotating the wheel. The current profile is stored once the key is released.

It is possible to store up to 4 wheel profiles.

The following values (if available) are stored:

- Nominal wheel dimensions
- Values measured with the gauge arm
- Weight positions
- Positions for relocation

SeealsoC17

Operation manual geodyna 2350

Input: Code/state   Display: Code/state
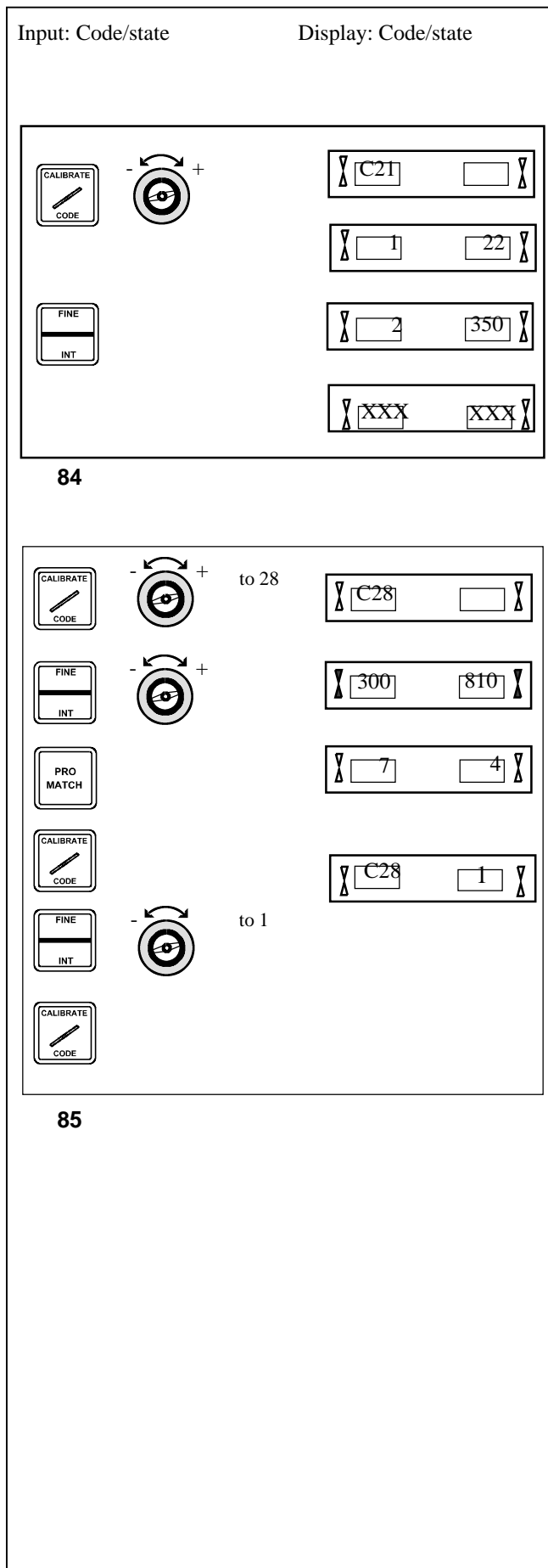
Code C21

Fig. 84 Display of spell program version and model number

Example: Spell program version 1.22 for model 2350.

> Release CODE key to display program version.
>
> Press on FINE key to display model number.

84

Code C28

Fig. 85 Select one of the 10 stored error codes and clear the error memory

The last 10 different error codes are written to the error memory so that they can be called up and reportedby theoperator ofthe wheel balancer, e.g. for remote diagnosis of malfunctions. The most recent error code is written to memory location 1 and the previous error codes are shifted to the higher memory loca-tions.

> Select one of the 10 malfunction code messages.
>
> Press the PRO MATCH key to display the memory loca-tion (left) and number of incidents (right), e.g. error code on memory location 7 occurred 4 times
>
> Press the CODE key for the 2nd step. 0

= Do not clear the error memory

1 = Clear error memory

85

86

87

88

89

90

91

92

11. Error codes

Errors in operation	-	Error code E
Warnings	-	Error code H
Fatal error code	-	300 or C10

E1 - Fig. 86

Rim dimensions were entered incorrectly, or incompletely.

When the error code is read out, enter data once again.

E2 - Fig. 87

Wheel guard (optional) is not closed.

E3 - Fig. 88

Distance gauge arm is not in home position.

E5 - Fig. 89

Range of electrical compensation exceeded
(wheel adapter has unacceptable unbalance).

Press STOP key.

Check wheel adapter, repeat compensation run.

E6 - Fig. 90

The calibration weight was not attached for readjustment.
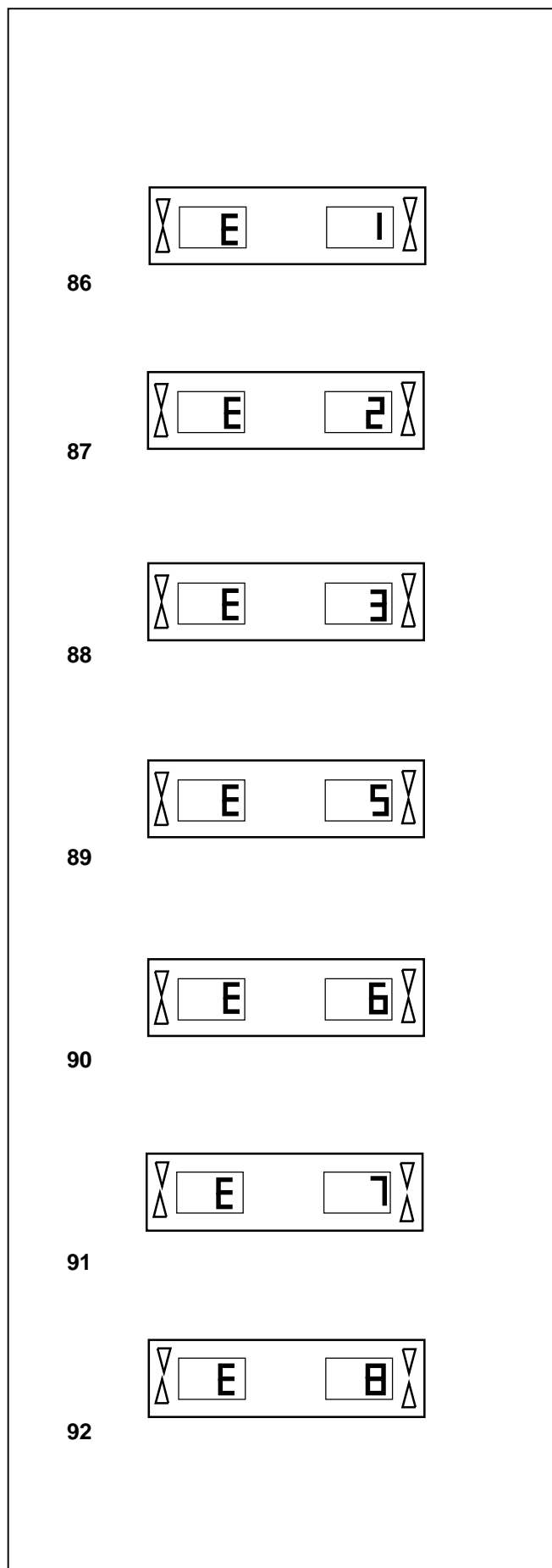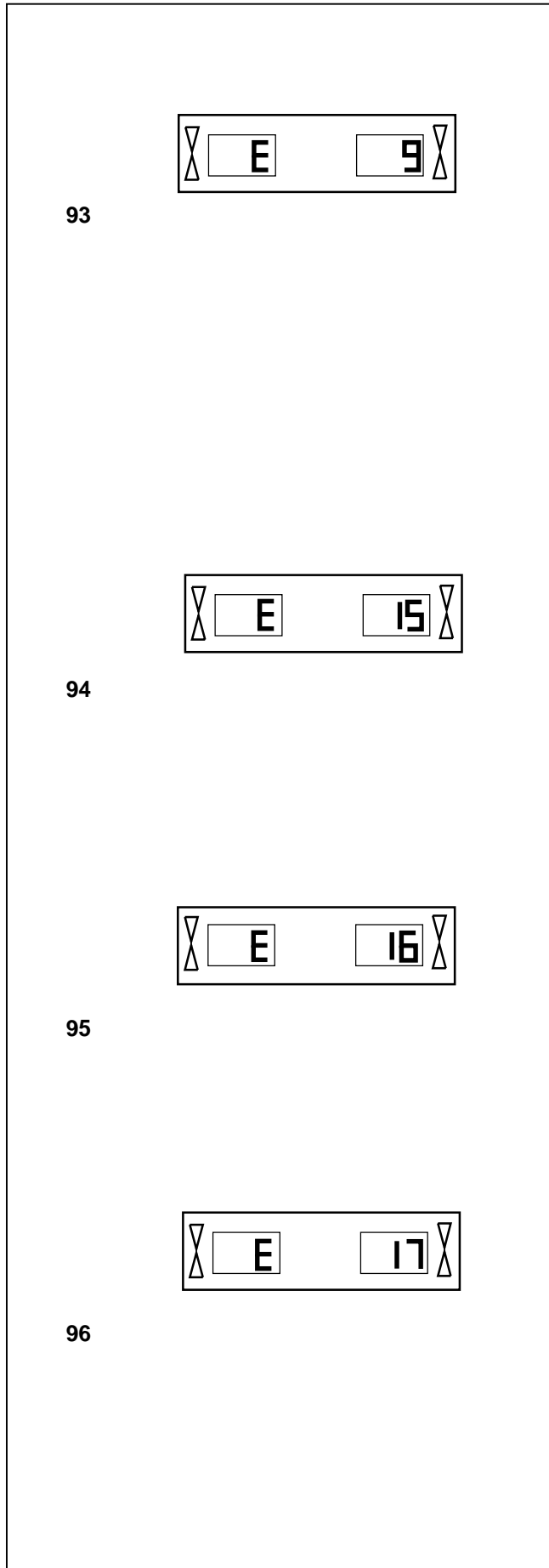
Press STOP key.

Repeat readjustment.

E7 - Fig. 91

With this wheel type it is not possible to choose a balancing mode.

E8 - Fig. 92

Valve position was not entered (error code only in Pro-Match program).

Position valve at 12:00 o'clock and press the PRO MATCH key.

Operation manual geodyna 2350

93

94

95

96

E9 - Fig. 93

Pro-Match/minimisation was carried out incorrectly.

1. Wheel was not exactly centered on the wheel adapter dur-
ing every run.
2. Tire was mounted eccentrically on the rim for at least one
time.
3. Valvepositionwasincorrectlyindexedforatleastonetime, and
entered incorrectly.
4. Wrong mark (single or double mark) was used for refer-ence
when readjusting the tire.
5. Wheel got out of place on the wheel adapter during the
measuring run.

6. Wrong wheel dimensions were entered.

Repeat the Pro-Match procedure.
E15 - Fig. 94

Readjustment is out of range.

During readjustment values were determined which exceed, or
fall below, the adjustment value.

Press the CODE key to transfer the corrective terms into the
permanent memory.

Call for the service technician to readjust the machine.
E16 - Fig. 95

During the first readjustment run by the operator the calibration
weight was attached by mistake.

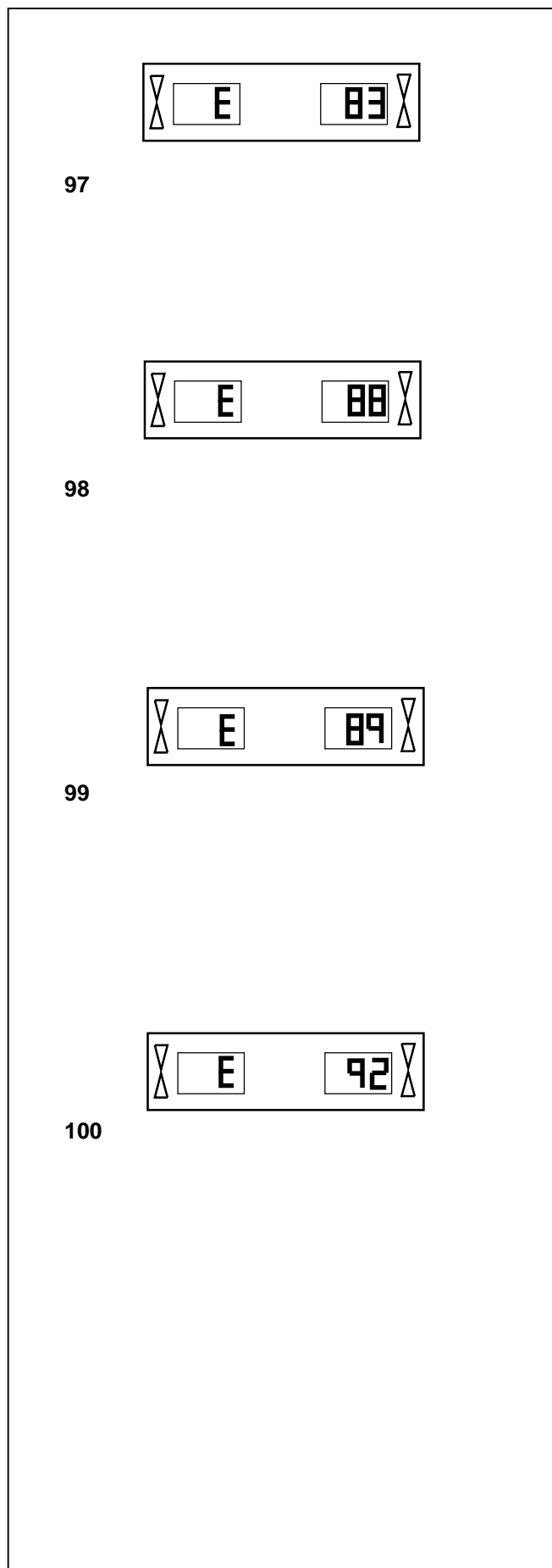Unscrew the calibration weight and start the measuring run

again.
E17 - Fig. 96

Wheel slips on the wheel adapter.
The clamping nut is not tight, the main shaft accelerates too
quickly. The machine will stop.

Firmly tighten the clamping nut, or if the wheel is very
small press the START key a little bit longer.

E83 - Fig. 97

During a measuring run the measured data have been unusable because of the effect of outside vibrations.   Make sure the machine is on a solid floor and repeat the

measuring run again.

97

E88 - Fig. 98

The rotating speed of the main shaft exceeds the limit.

98
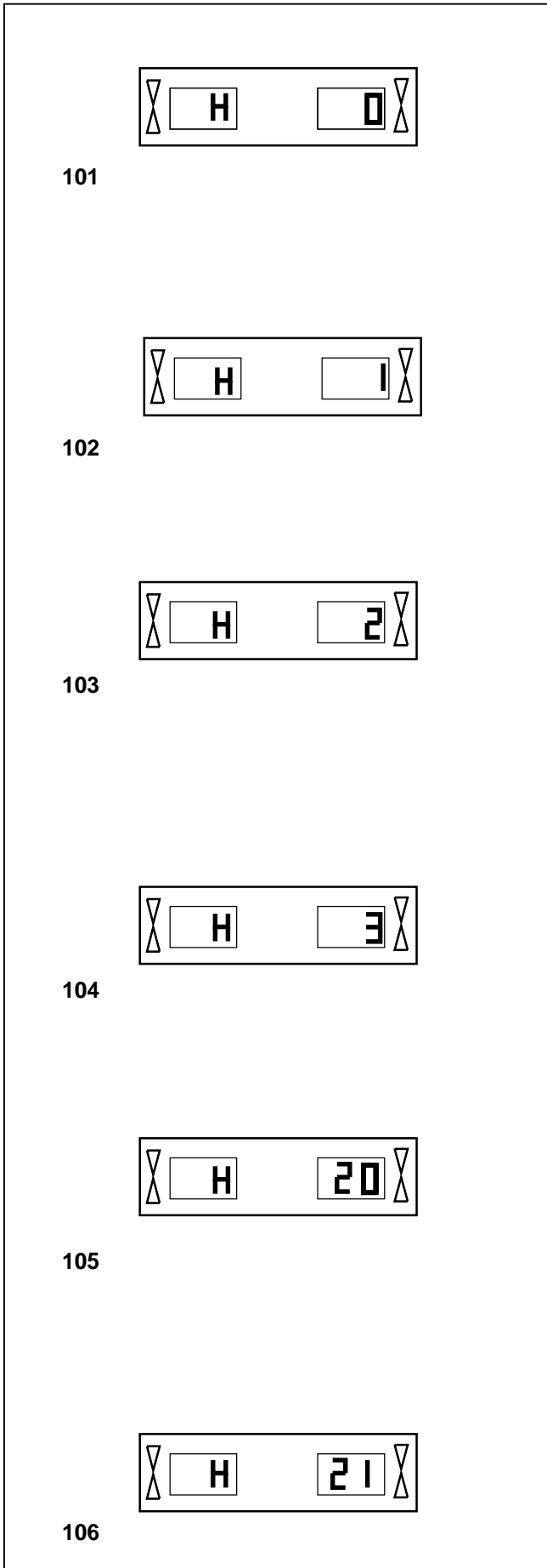
E89 - Fig. 99

A key is stuck at power-on.

Find and release the key, or call service.

99

E92 - Fig. 100

Distance gauge arm defective.

Call service.

As long as the gauge arm is defective, enter by pressing the distance key and rotating the wheel (see§7.2).

100

Error codes

101

```
H          0
```

H0 - Fig. 101

Wheel running conditions cannot be improved by Pro-Match.

102

```
H          I
```

H1 - Fig. 102

Further Pro-Match not recommended but feasible.

103

```
H          2
```

H2 - Fig. 103

Weight minimisation is recommended, Pro-Match can achieve no further improvement.

104

```
H          3
```

H3 - Fig. 104

Pro-Match not recommended.

105

```
H          20
```

H20 - Fig. 105

Correction plane cannot be re-located with the gauge arm.

> Measure the correction plane and switch to dynamic unbalance reading.

106

```
H          21
```

H21 - Fig. 106

The indexed position is not the one for the correction plane in which the adhesive weight is to be fitted with the gauge arm.

Indexthecorrectpositionforthiscorrectionplanepriorto

Error codes

107
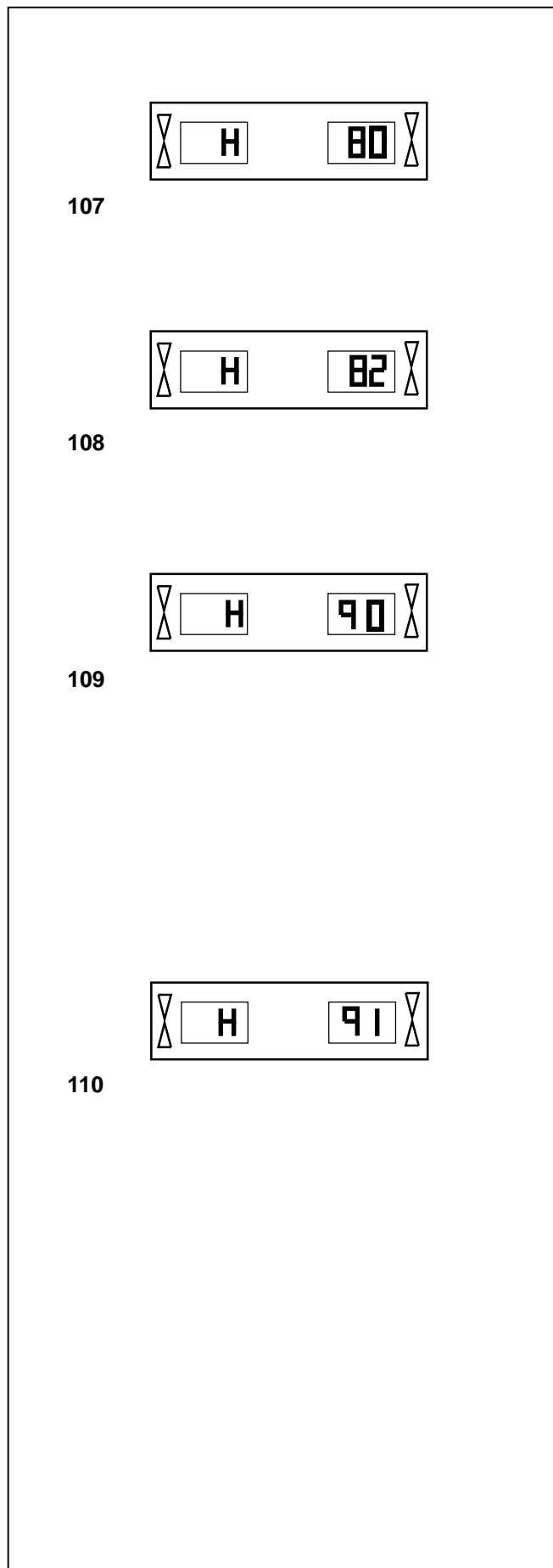
H80 - Fig. 107

Readjustment feature not stored in the computer or lost from memory. Consequently readjustment by the operator is not possible.

 Press STOP key; error code is deleted.

 Call service for calibration of the machine.

108

H82 - Fig. 108

The self-test was disturbed (e.g. by rotating the wheel).

 The message is displayed for 3 seconds, after which the measurement is repeated (max. 10 times), or aborted by pressing the STOP key.

H90 - Fig. 109

109

Thewheelwasacceleratedtooslowlyordeceleratedtooslowly after a measuring run.
If the main shaft does not reach the required speed, check whether the shaft with mounted wheel can not rotate freely or whether the weight of the wheel is excessive. In this case:

 Release main shaft lock.

 Make sure that the shaft with mounted wheel can rotate freely.

 Turn the wheel by hand and then press on START key.

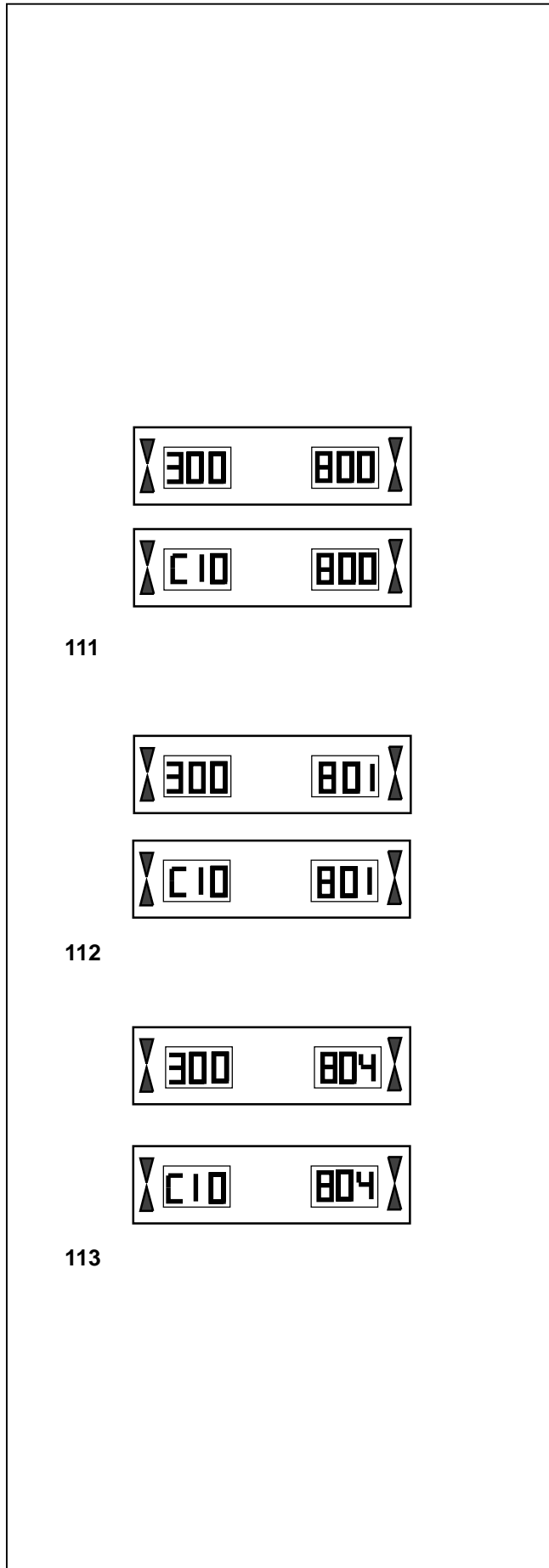 If the error cannot be remedied: call service.

110

H91 - Fig. 110

Speed variations during measuring run. The main shaft lock may be operated.

 Release main shaft lock.

 Make sure that the shaft with mounted wheel can rotate freely.

 Repeat the measuring run.

Operation manual geodyna 2350

Error codes

111

112

113

Fatal error codes

The display shows an alphanumeric code consisting of six di-gits and/or letters. When messages are read out starting 300XXX the error occurred during the internal operational check, if it is C10XXX it occurred during the self-test after the machine was switched on.   If necessary, call service.

Note

The displayed error codes refer only to the internal line voltage of the machine.

300 800 or C10 800 - Fig. 111

Line voltage too low. Balancing is feasible if the motor can drive themain shaftto themeasuring speed.Wheel datamay belost.
Bring the line voltage to within a range of 110 - 125 V AC.
300 801 or C10 801 - Fig. 112

Line voltage too high. Damage to the electronic unit of the machine is likely!

          Turn off machine immediately.
Damage is not covered under warranty.
300 804 or C10 804 - Fig. 113

Line voltage too high. Damage to the electronic unit of the machine is likely!

          Turn off machine immediately.
Damage is not covered under warranty.

Error messages by means of acoustic signals

Errormessagescanalsobeindicatedbymeansofacousticsig-nals.
The service technician can locate and eliminate the corresponding error by means of the number of tones, their fre-quency and duration (long/short) and the length of the pauses.

          Switch off the machine.
          Call service.

12. Pro-Match/ Weight minimisation

12.1 General

Pro-Match, the optimisation program, is an improvement of the matching procedure.

Tire and rim are adjusted to each other on the basis of unbal-ance test results. This produces reduction of lateral and radial run-out and of radial and lateral force variation, as well as re-duction of balance weight size.

If Pro-Match is not desired, it is possible to achieve weight mini-misation.

This is possible when there is no deformation of the rim, but where unsmooth ride is only due to non-uniform mass distribu-tion in the tire. In this case the unbalance present in the rim can be adjusted relative to the unbalance present in the tire so that the unbalances compensate for each other and the smallest pos-sible balance weight can be determined.

12.2 General instructions for the Pro-Match/ weight minimisation programs

It may be necessary to interrupt the Pro-Match/minimisation program by pressing the STOP key. The electronic unit will store the current program step, the rim dimensions and all measure-ments taken so far.
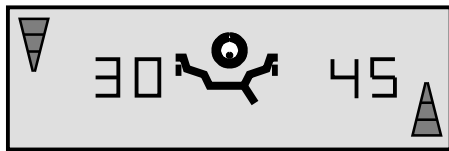
To continue with the Pro-Match/minimisation program, press the OP and CODE keys in succession. The program then con-tinues at the step where it was interrupted, using the initial data inputs and measured data.

If a measuring run is interrupted by operation of the STOP key the machine will switch back to the previous program step. Pro-Match/minimisation is then continued by entering the valve position of the wheel with the PRO MATCH key.
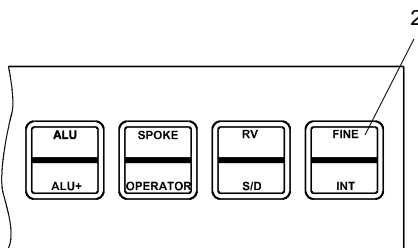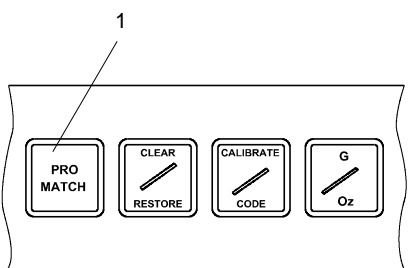
After interruption by operation of the STOP key the readings refer to the unbalance of the latest measuring run.

To start the Pro-Match/minimisation program anew after an in-terruption, it is only necessary to press the PRO MATCH key.
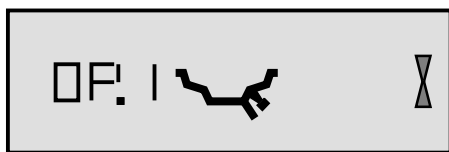
During Pro-Match/minimisation a measuring run always has to be started with the START key.
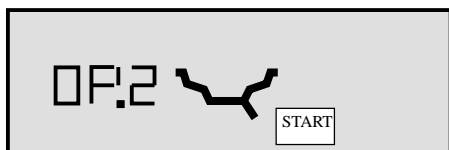
114

115

116

117

12.3 Pro-Match program

The sequence of operations for the Pro-Match program and for the minimisation program (code Un) is described below, with the possible readings illustrated in the figures.

Pro-Match

Use of the Pro-Match recommended after a measuring run if the unbalance in left and/or right correction planes and/or static unbalance is greater than 1 ounce (e. g.Fig. 114).

　　　Demount the tire and clamp the rim.

　　　Depress the PRO MATCH key(Fig. 115, item 1).

Reading OP.1(Fig. 116)comes up.
Note that after all readings in which the valve symbol is shown at the rim contour the PRO MATCH key must be pressed to enter the valve position (with the tire valve positioned at 12:00 o'clock) after the tire has been displaced on the rim.

　　　Rotate the tire so that the valve stem is set at 12:00 o'clock.

　　　Depress the PRO MATCH key(Fig. 115, item 1)to enter the valve position.

Reading OP.2(Fig. 117)comes up.
An incorrect valve position input can be corrected by repeating this step.

Weight minimisation (matching)

If no Pro-Match, but only weight minimisation (i.e. without compensation with the rim only) is desired, proceed as follows:

　　　Clamp the tire/rim assembly.

　　　Depress the PRO MATCH key(Fig. 115, item 1).

Reading OP.1 -Fig. 116comes up.

　　　Depress the FINE key(Fig. 115, item 2)to switch over to the minimisation program.

The reading goes to Un.3 (see§12.4, Fig. 127) where you proceed with the program.

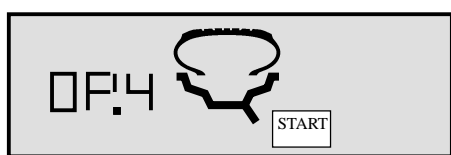　　　At level OP.2 the compensation run can still be omitted.
　　　Again,proceedwiththeprogrambydepressingtheFINE key.

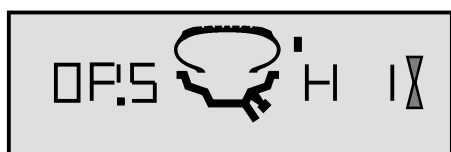As a result the reading goes to Un.4 (see§12.4, Fig. 128) where you continue.
The valve position input of OP.1 remains entered.
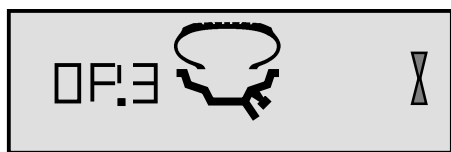
118

119

120

How to continue the Pro-Match program

Press the START key (Fig. 117) to start the compensa-
tion run of rim without tire.

After the measuring run the reading is OP.3(Fig. 118).

Mount the tire and inflate.

Note

For mounting, demounting, readjustment or turning over of the
tire on the rim always apply a sufficient quantity of tire lubricant
ontirebeads,rimflangesandbeadseats.Eachtimethetirehas been
readjusted relative to the rim, inflate tire according to tire manu-
facturesrecommendation.Makesurethemountingguide rib of the
tire is correctly seated.

Clamp the tire/rim assembly on the balancer.

Readjust such that the valve is set to 12:00 o'clock.

Press the PRO MATCH key to enter the valve position.

Reading OP.4(Fig. 119)comes up.

Press the START key.

The measuring run is carried out. After the measuring run two
readings are possible:

OP.5 - H 1(seeFig. 120)
Further Pro-Match is not recommended, but possible.

OP.5 - reference mark(see Fig. 121)
Continue with the Pro-Match program.

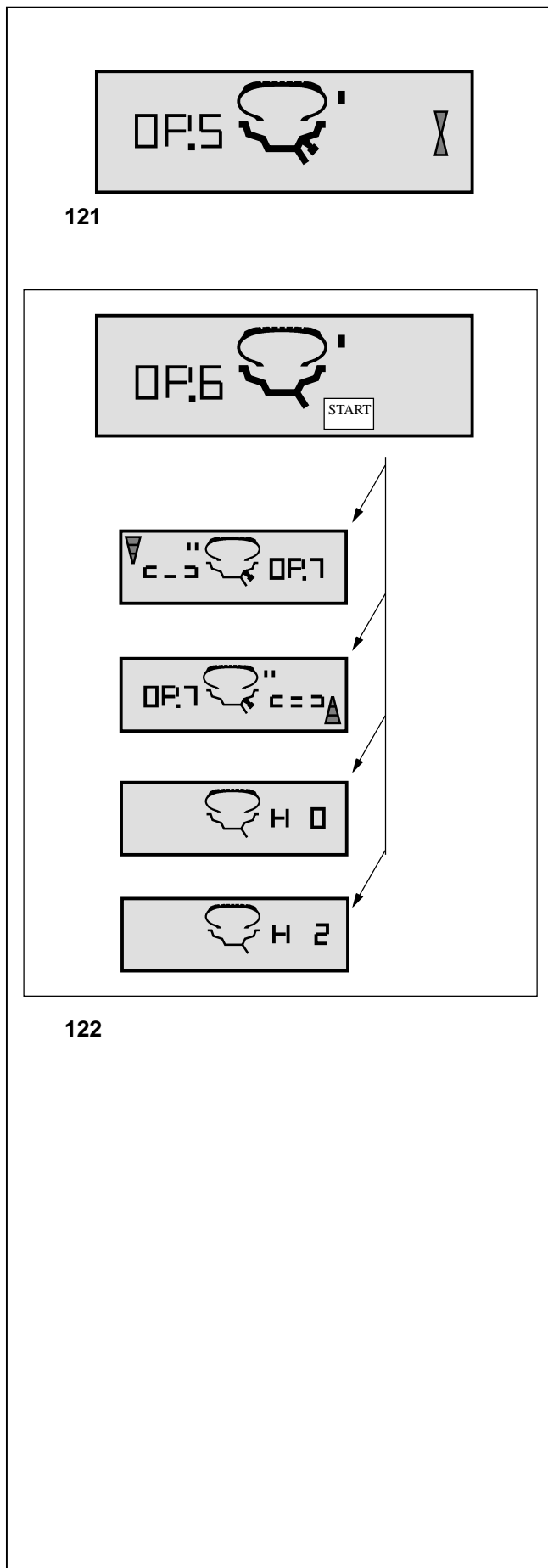Reading OP.5 - H 1 (Fig. 120)

If OP.5 - H 1 is read out further Pro-Match is not recommended.
Inthiscasethemeasureddatadoesnotexceedthelimit forrec-om-
mendation of the Pro-Match program. However, it is poss-ible to
continue Pro-Match so as to improve wheel running conditions
even below the limit value. To continue Pro-Match:
Proceed as specified for reading OP.5 - reference mark (see

next page).

To abort Pro-Match:

Press the STOP key to return to the balancing program and
balance the wheel according to the readings.

121

122

Reading OP.5 - reference mark (Fig. 121)

> After the measuring run index the wheel following the position reading and provide a crayon mark on the right side of the tire at 12:00 o'clock.

> Readjust the tire on the rim such that the tire mark coincides with the valve.

> Clamp the tire/rim assembly on the balancer and rotate the valve stem at 12:00 o'clock.

> Press the PRO MATCH key to enter the valve position.

Reading OP.6(Fig. 122)comes up.

> Press the START key.

After the measuring run four readings are possible:

=== - OP.7(see Fig. 123)
Proceed with the OP program. It is recommended that the tire be turned over on the rim.

OP.7 - ===(see Fig. 124)
Proceed with the OP program. It is recommended that the tire be readjusted on the rim.

H0(see Fig. 125)
Optimum condition has been achieved and cannot be im-proved.

H2(see Fig. 126)
Wheel running conditions cannot be improved. However, it is possible to readjust the tire relative to the rim to obtain a minimisation of balance weights without having an adverse effect on wheel running conditions.

Depending on the readings, there are several possibilities for proceeding with the program. Thesepossibilities aredescribed below.
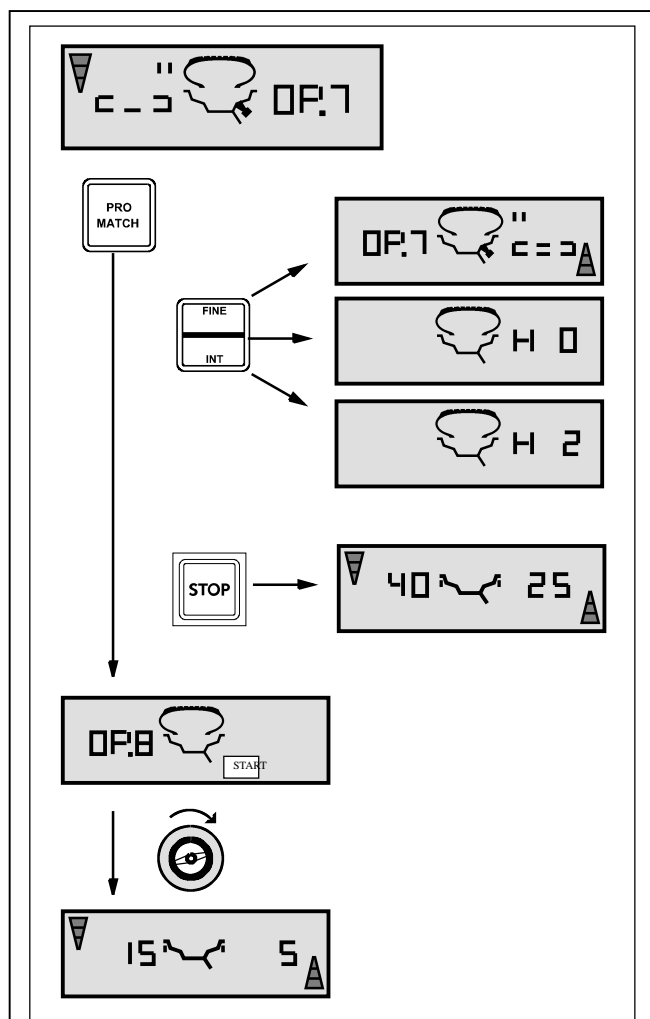
123

Reading === - OP.7 (Fig. 123)

Recommendation to turn tire over on the rim (the left display segments are rotating).

Choice 1 Turn tire over on the rim (standard program)

> Index the wheel to 12:00 o'clock following the left direction indicator and provide a double mark on left side of the tire.

> Remove the wheel from the machine.

> Turn the tire over on the rim and readjust until the double mark coincides with the valve.

> Clamp the tire/rim assembly on the balancer and rotate the valve stem at 12:00 o'clock.

> Press the PRO MATCH key to enter the valve position.

Reading OP.8 comes up.

> Press the START key (check run).

If the Pro-Match run has been carried out correctly following the above sequence of operations, the balancer will return to the balancing mode selected before Pro-Match and read out the dynamic unbalance still left in the wheel (Fig. 123).   Balance the wheel according to the readings.

Choice 2: Do not turn tire over on the rim

Press the FINE key.

The result is then converted.
Reading is OP.7 - = = = (see Fig. 124) or H0 (see Fig. 125) or H2 (see Fig. 126).

> To return to === - OP.7, press the FINE key once again.

Choice 3: Abort Pro-Match

> Press the STOP key to return from the Pro-Match to the balancing program.

The unbalance present in the wheel is read out.

> Balance the wheel according to the readings.

Reading of error code E 9

If E 9 is read out, at least one error was made with respect to the sequence of operations when performing Pro-Match (see §11. Error codes).

> Abort the Pro-Match program by pressing the STOP key and, if desired, start Pro-Match once again.

Operation manual geodyna 2350
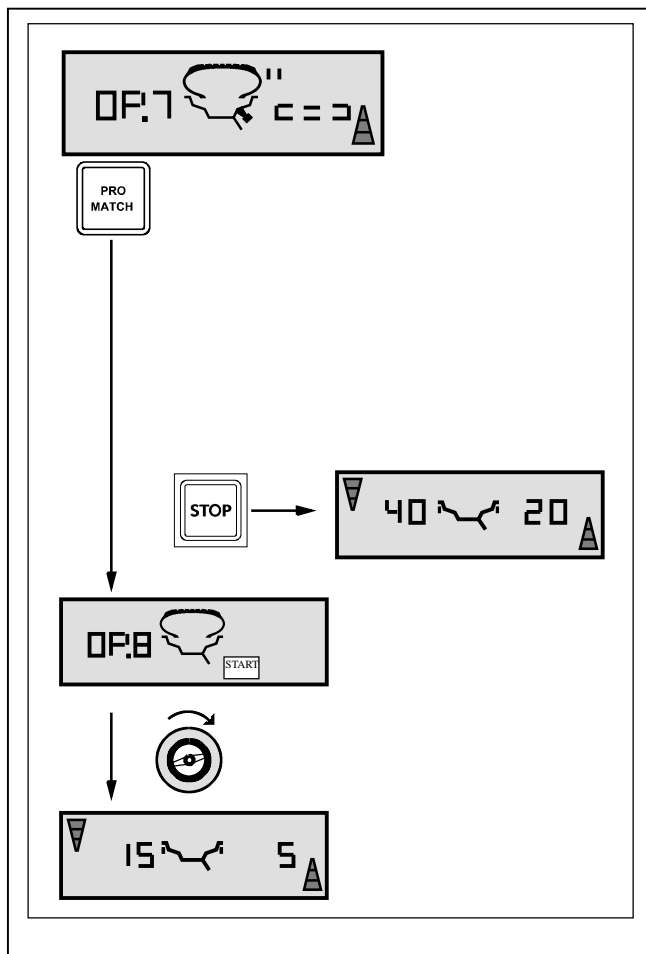
Reading OP.7 - === (Fig. 124)

Recommendation to readjust tire on the rim (the right display segments light up permanently).

Choice 1: Readjust tire on the rim (standard program)

Index the wheel following therightdirection indicator and provide a double mark onrightside of the tire at 12:00 o'clock.

Remove the wheel from the machine.

Readjust the tire on the rim until the double mark co-incides with the valve.

Clamp the tire/rim assembly on the balancer and read-just at 12:00 o'clock.

Press the PRO MATCH key to enter the valve position.

Reading OP.8 comes up.

Press the START key (check run).

If the Pro-Match run has beencarried outcorrectly followingthe above sequence of operations, the balancer will return to the balancing mode selected before Pro-Match and read out the dynamic unbalance still left in the wheel(Fig. 124).

Balance the wheel according to the readings.

Choice 2

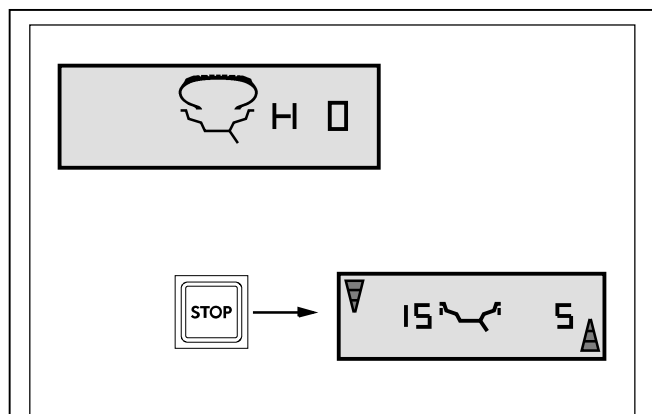Press the STOP key to return from the Pro-Match to the balancing program.

The unbalance present in the wheel is read out.
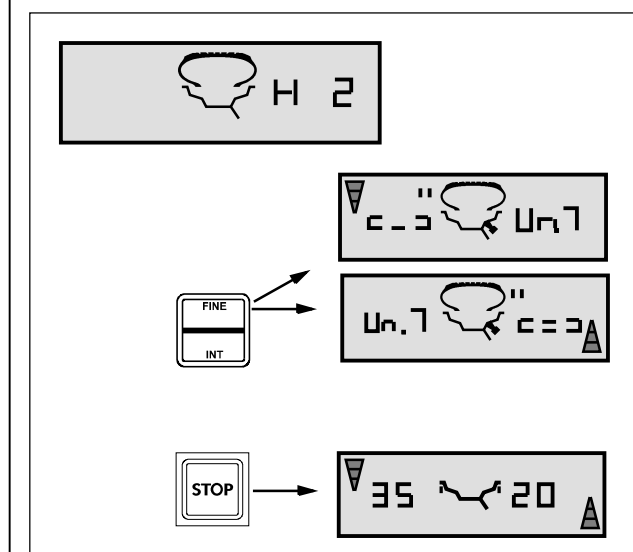
Balance the wheel according to the readings.

Reading of error code E 9

If E 9 is read out, at least one error was made with respect to the sequenceofoperationswhenperformingPro-Match(see§11. Error codes).

Abort the Pro-Match program by pressing the STOP key and, if desired, start Pro-Match once again.

124

Reading H 0 (Fig. 125)

> Press the STOP key to leave the Pro-Match program and return to the balancing program.

The unbalance present in the wheel is read out.

> Balance the wheel according to the readings.

Optimum condition has been achieved and cannot be improved.

Reading H 2 (Fig. 126)

Wheel running conditions cannot be improved. However, it is possible to achieve weight minimisation.

Choice 1: Continue with weight minimisation
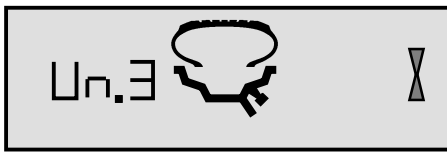
> Press the FINE key to continue in the program.

As a result readings are === - Un.7 (Fig.132) or
Un.7 - === (Fig. 133).
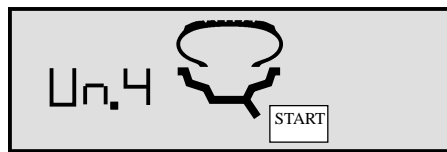
Choice 2: Abort Pro-Match

> Press the STOP key to leave the Pro-Match program and return to the balancing program.

The unbalance present in the wheel is read out.

> Balance the wheel according to the readings.

127

128

129

12.4 Minimisation program

If the compensation run of the rim without tire was omitted and the FINE key was pressed to go directly into the minimisation program (reading Un.3 -Fig. 127), proceed as follows.

Clamp the tire/rim assembly on the balancer.

Readjust such that the valve is at 12:00 o'clock.

Press the PRO MATCH key to enter the valve position.

Reading Un.4 comes up(Fig. 128).

Press the START key.

The measuring run is carried out. After the measuring run two readings are possible:

Un.5 - H 1(seeFig. 129)
Further minimisation is not recommended, but possible.

Un.5 - reference mark(seeFig. 130)
Continue with the Un program.
Reading Un.5 - H 1 (Fig. 129)

If Un.5 - H 1 is read out further minimisation is not recom-mend-

ed. In this case, the measured data does not exceed one ounce. However, it is possible to continue minimisation to achieve an improvement, if only slight.
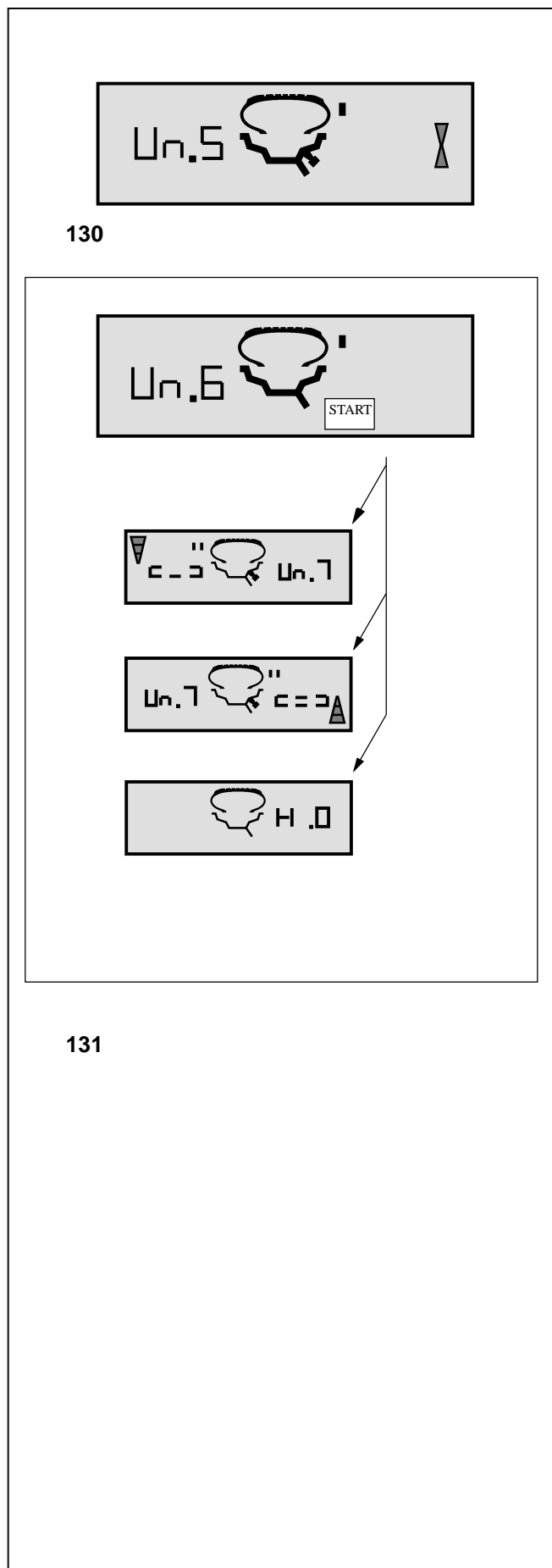
To continue with the minimisation program:

Proceed as specified for reading Un.5 - reference mark

(see next page).

To abort minimisation:

Press the STOP key to return to the balancing program and balance the wheel according to the readings.

130

131

Reading Un.5 - reference mark (Fig. 130)

> After the measuring run index the wheel following the position reading and provide a crayon mark on the right side of the tire at 12:00 o'clock.

> Readjust the tire on the rim such that the tire mark coincides with the valve.

> Clamp the tire/rim assembly on the balancer and readjust such that the valve is at 12:00 o'clock.

> Press the PRO MATCH key to enter the valve position.

Reading Un.6(Fig. 131)comes up.

> Press the START key.

The second measuring run of the tire/rim assembly is started. After the measuring run three readings are possible:

=== - Un.7(see Fig. 132)
ProceedwiththeUnprogram.Itisrecommendedthatthetirebe turned over on the rim.

Un.7 - ===(see Fig. 133)
ProceedwiththeUnprogram.Itisrecommendedthatthetirebe adjusted on the rim.

H0(see Fig. 134)
Optimum condition has been achieved and cannot be im-proved. Depending on the readings, there are several possibilities for

proceeding with the program. Thesepossibilities aredescribed below.
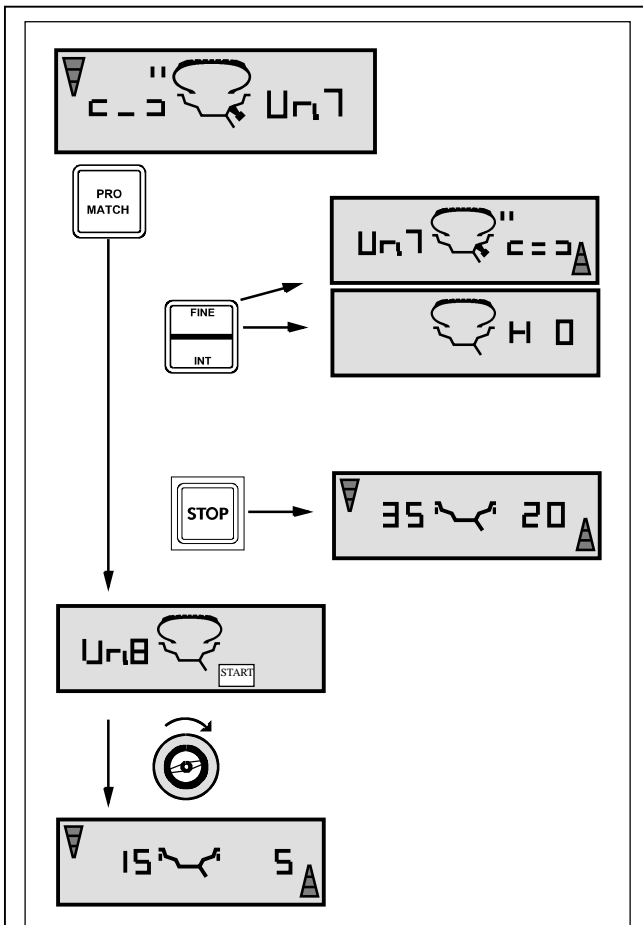
132

Reading === - Un.7 (Fig. 132)

Recommendation to turn tire over on the rim (the left display segments are rotating).

Choice 1: Turn tire over on the rim (standard program)

Index the wheel following the left direction indicator and provide a double mark on the left side of the tire at 12:00 o'clock.

Remove the wheel from the machine.

Turn the tire over on the rim and readjust until the double mark coincides with the valve.

Clamp the tire/rim assembly on the machine and read-just to 12:00 o'clock.

Press the PRO MATCH key to enter the valve position.

Reading Un.8 comes up.

Press the START key (check run).

If the minimisation run has been carried out correctly following the above sequence of operations, the balancer will return to the balancing mode selected before minimisation and read out the dynamic unbalance still left in the wheel (Fig. 132).

Balance the wheel according to the readings.

Choice 2: Do not turn tire over on the rim

Press the FINE key.

The result is then converted.

Reading is Un.7 -= = = (see Fig. 133) or H0 (see Fig. 134).

To return to === - Un.7 (turning over the tire), press the FINE key once again.

Choice 3

Press the STOP key to return from the minimisation to the balancing program.

The unbalance present in the wheel is read out.

Balance the wheel according to the readings.
Reading of error code E 9

If E 9 is read out, at least one error was made with respect to the

sequence of operations when performing Pro-Match (see §11. Error codes).

Abort the Pro-Match program by pressing the STOP key and, if desired, start Pro-Match once again.

Pro-Match/
Weight minimisation

133

134
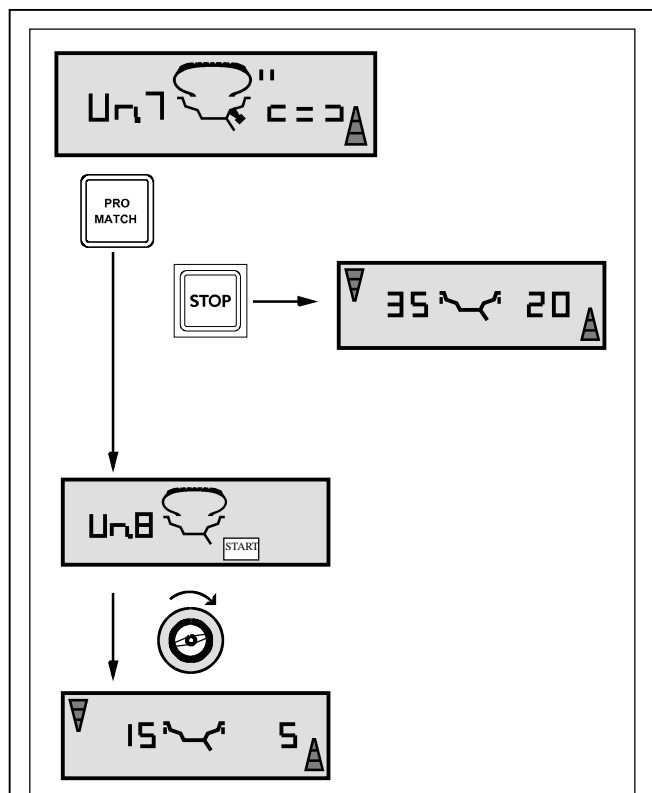
Reading Un.7 - === (Fig. 133)

Recommendation to readjust tire on the rim (the right display segments light up permanently).

Choice 1: Readjust tire on the rim (standard program)

Index the wheel following the right direction indicator and provide a double mark on right side of the tire at 12:00 o'clock.

Remove the wheel from the machine.

Readjust the tire on the rim until the double mark co-incides with the valve.

Clamp the tire/rim assembly on the machine and turn until it is at 12:00 o'clock.

Press the PRO MATCH key to enter the valve position.

Reading Un.8 comes up.

Press the START key (check run).

If the minimisation run has been carried out correctly following the above sequence of operations, the balancer will return to the balancing mode selected before minimisation and read out the dynamic unbalance still left in the wheel (Fig. 133).

Balance the wheel according to the readings.

Choice 2: Do not readjust tire on the rim

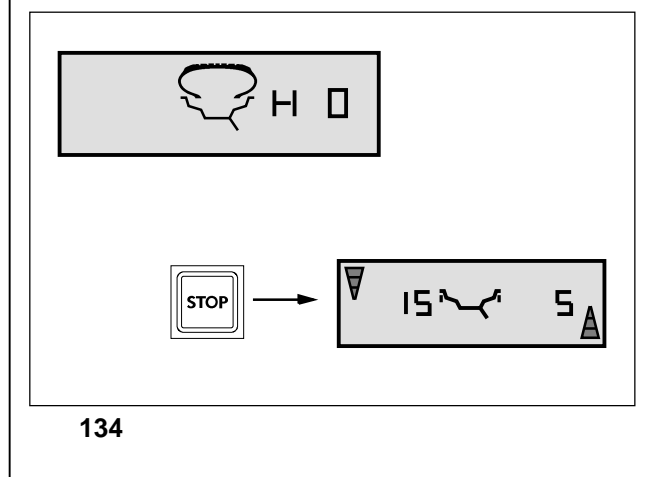Press the STOP key to return from the minimisation to the balancing program.

The unbalance present in the wheel is read out.

Balance the wheel according to the readings.

Reading H 0 (Fig. 134)

Optimum condition has been achieved and cannot be improved.

Press the STOP key to return to the balancing program and balance the wheel according to the readings.

Reading of error code E 9

If E 9 is read out, at least one error was made with respect to the sequence of operations when performing Pro-Match (see §11. Error codes).

Abort the Pro-Match program by pressing the STOP key and, if desired, start Pro-Match once again.

135

136

137

138

139

13. User calibration

If several measuring runsare necessaryto balancea wheelbe-cause balance weight size and position have to be changed re-peatedly, it may be necessary to readjust the machine. For readjustment by the operator a calibration weight is sup-plied with the machine (ref. no. 6418 416 - kept on the rear of the weight tray).
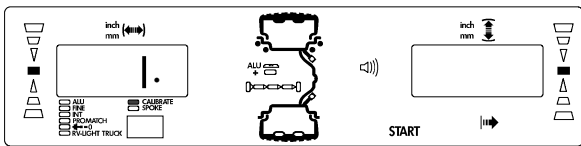
> Important:
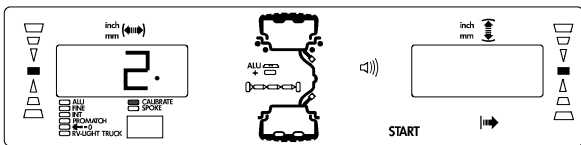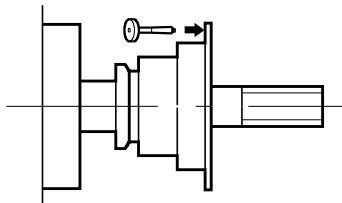> Readjustment must be carried out using the clamping adapter supplied with the machine.
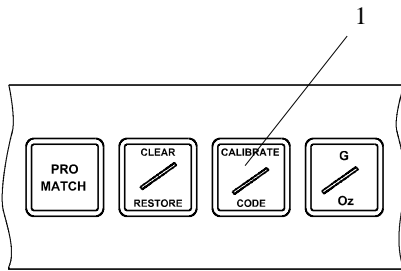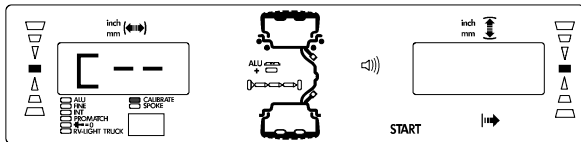
Readjustment(Code C14)

> Makesurenowheelorotherclampingmeansisclamped on the machine.

> Press and hold the CODE key(Fig. 135, pos. 1).

The basic reading C -- is read out(Fig. 136).

> Release the CODE key.

Reading 1. and START are read out(Fig. 137).

> Close the optional wheel guard, and press the START key to carry out a readjustment run.

On completion of the first run reading 2. and START are read out(Fig. 138).

> Screw the calibration weight into the threaded bore pro-vided for this purpose in the basic body of the wheel adapter(Fig. 139).

> PresstheSTARTkeytocarryoutasecondreadjustment runwith thecalibrationweightfittedontheadapter(tode-tect the cor-rection values).

On completion of the processing operation a three-tone signal is given and readjustment is completed. The machine is now opera-tive and the basic readings come back(Fig. 135).

> Remove the calibration weight from the wheel adapter and put it back in its designated place.

140

14. Maintenance

The wheel balancer requires almost no maintenance. Their bearingsaregreasedforlifeandsealed.Thedrivebeltdoesnot requireparticularchecks.Ifdefectsoccurwhichcannotbeeliminated by the user (error codes not mentioned under § 11. Error codes), contact your local Hofmann distributor or Hofmann for service at the numbers listed below.
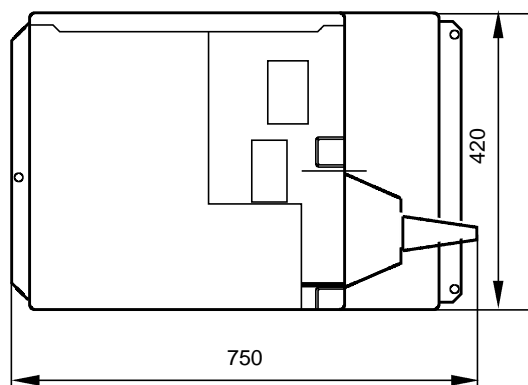
14.1 After-sales service

Please contact your local agent (see last page).

Hofmann - USA
309 Exchange Ave
Conway, AR 72032
Ph: 800 251 4500
Fax: 501 450 2085

Hofmann - Canada
6500 Millcreek Dr.
Mississauga, Ontario L5N4G4
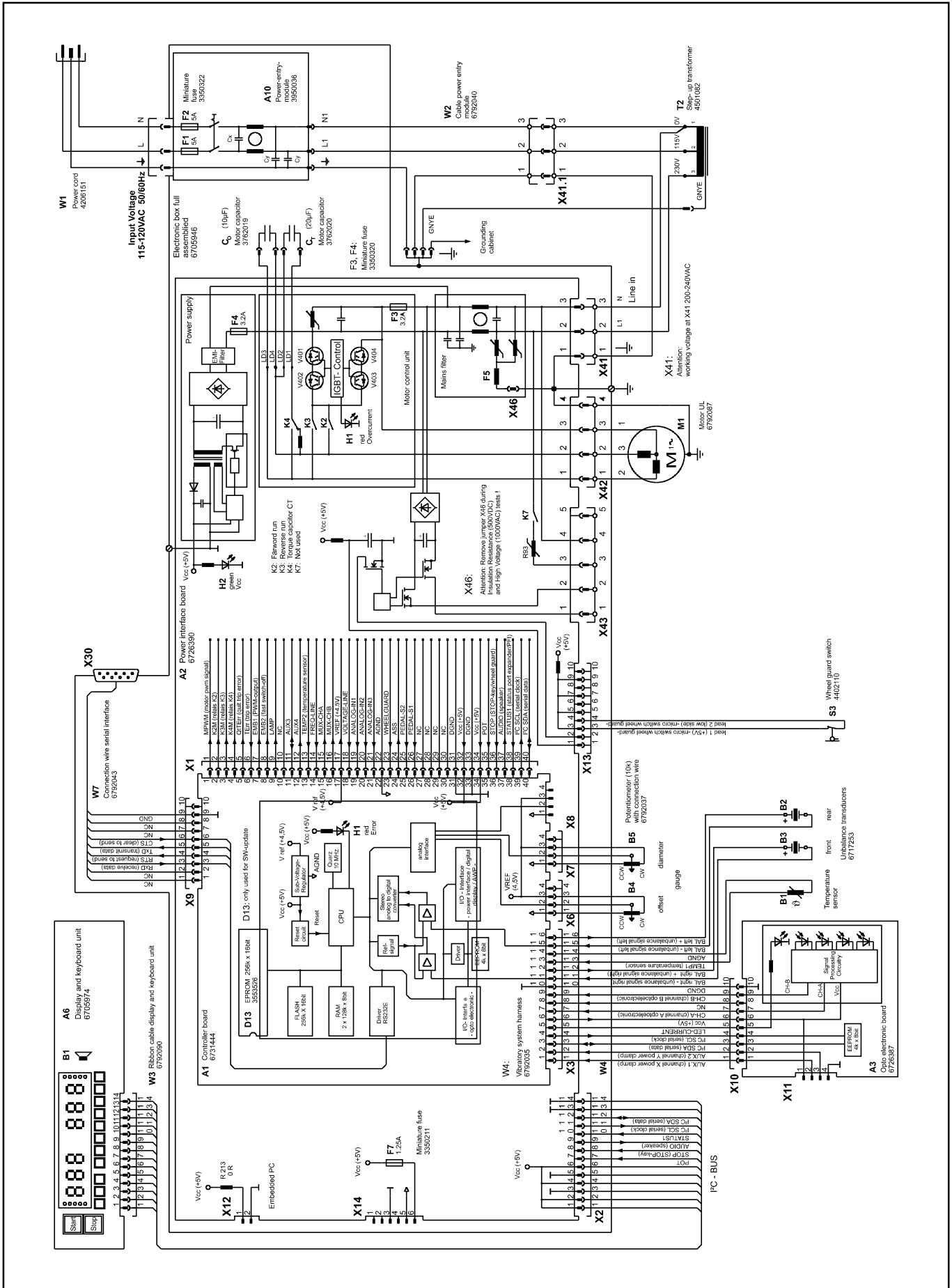Ph: 800 267 2185
Fax: 905 821 2073

15. Technical data

Machine dimensions	see Fig. 140
Height of machine	40 inches
Weight of machine	150 lbs
Power required	115 - 120 V 50/60 Hz
Motor rating	0.12 kW
Balancing speed	98 rpm Measuring
time	7 s Max. unbalance
reading	14 oz Resolution of
amount reading	1/5 g or 0.05/0.25 oz
Resolution of position reading	0.7 deg. Working
temperature	0-50∞C Relative
humidity	5-95 % at 40∞C
Noise level	70 dB (A) Working
range	
Distance rim - machine	0-250 mm
Rim width	1-20 inches
Rim diameter	8-24 inches
Max. wheel diameter	44inches
Max. wheel diameter with optional	
wheel guard	37inches
Max. wheel width	20inches
Max. wheel weight	150 lbs

Fig. 140Dimensions of wheel balancer

Notes

Notes

HOFMANN ®

**Operator's Manual
Covers Hofmann Model 2350
EEWB701D**

Hofmann - USA
309 Exchange Ave
Conway, AR 72032
Ph: 800 251 4500
Fax: 501 450 2085

Hofmann - Canada
6500 Millcreek Dr.
Mississauga, Ontario L5N4G4
Ph: 800 267 2185
Fax: 905 821 2073