DIGITAL
RADIAL PLANIMETER
RADIAL ROOT PLANIMETER

No: 336E

INSTRUCTIONS for measuring of curves in circular charts

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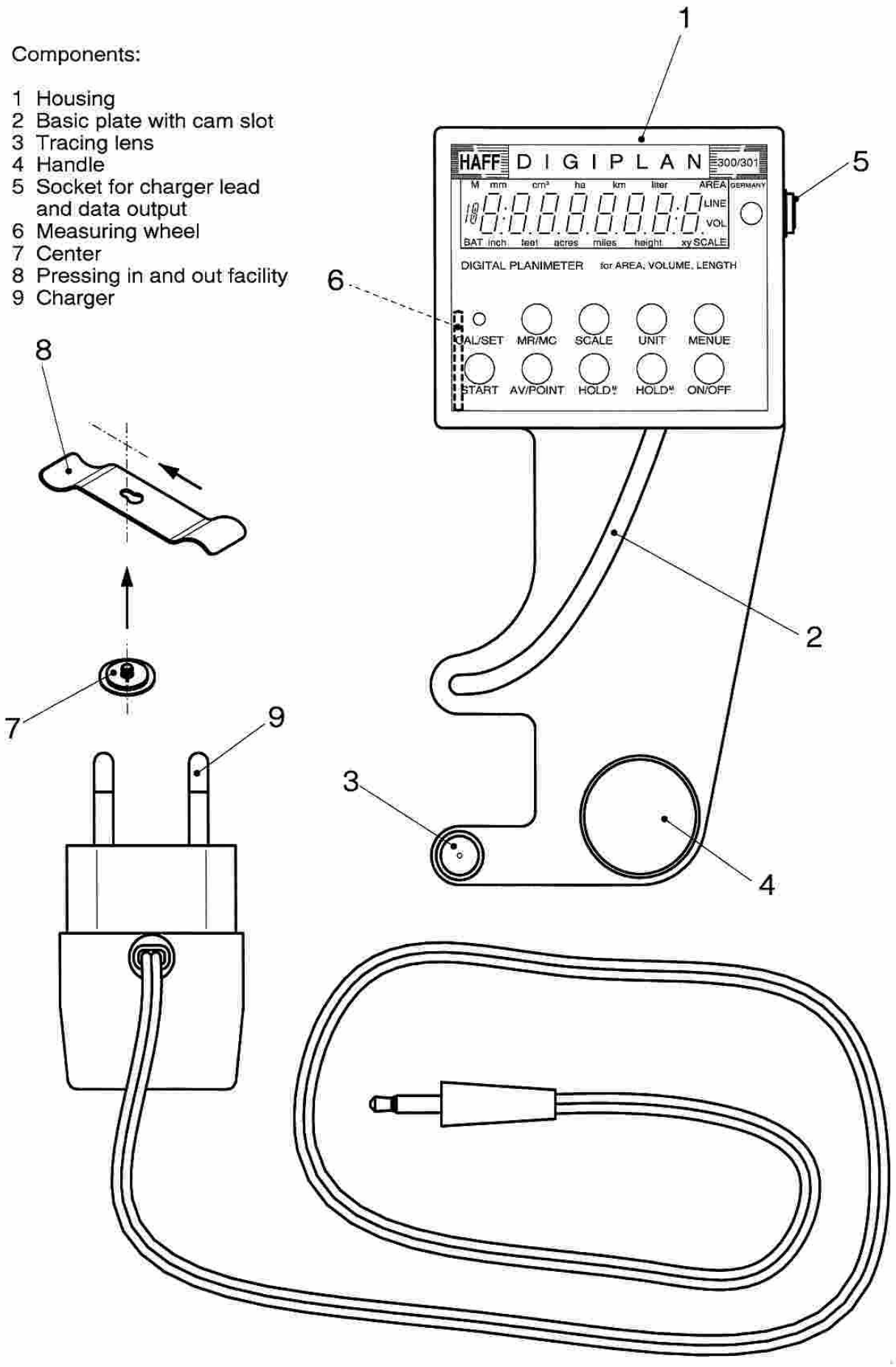
Germany

Components:

1 Housing
2 Basic plate with cam slot
3 Tracing lens
4 Handle
5 Socket for charger lead and data output
6 Measuring wheel
7 Center
8 Pressing in and out facility
9 Charger



Electronics

HAFF uses for all Digital-Planimeter only one kind of electronics and software.
All functions which are not necessary for this Root-Planimeter are slashed.

Scale means instrument factor M.

Pushbottons

ON/OFF	1. Press short - power supply on 2. press long - power supply off
START	Standby for measurement (before each measurement) display: 0.000
MENUE	Select of functions (keep pressing until the required function appears) a) AREA (measuring areas) ~~b) LINE (measuring length)~~ ~~c) VOL (measuring volumes)~~ ~~d) VOL height (thickness of sections for measuring volumes~~ ~~e) x (x scale of different scales x and y)~~ ~~f) y (y scale of different scales x and y)~~ ~~g) Area xy (measuring areas in different scales x and y)~~
HOLD M+	1. The measured value is stored in the memory positively 2. In following functions the value will be changed positively: a) programmable scales and ~~b) „height" of measuring volumes~~
HOLD M-	1. The measured value is stored in the memory negatively 2. In following functions the value will be changed negatively: a) programmable scales and ~~b) „height" of measuring volumes~~
MR/MC	Press once = memory recall Press twice = memory clear
AV/POINT	1. After START and measurement, the average of up to 19 measurements are calculated. Nos. of measurements will be shown in small figures. 2. Position the decimal point
UNIT	1. Two units for each scale can be selected ~~2. Long press = selection of metric or imperial system~~
SCALE	Fixed and programmable scales are recalled in sequence and may be changed with HOLD M+ and HOLD M-
CAL/SET	a) Programmable scales are stored in the memory b) Select of function of calibration and storage of calibration value
♫	„Tone" on pressing a button

Display

00000000	8 digits for measurement value and scales
00	Small two figure digit shows a) the nos. of storage for scales b) the nos. of readings for average value (max. 19) ~~c) the nos. of part volume~~
1 : 1	Scale
mm, cm, m, km, ha, liter	Units metric system
~~inch, feet,~~ acres, miles	~~Units imperial system~~
BAT	Battery low – needs recharging
CAL Ↄ	Calibration ~~long tracer arm necessary~~
~~CAL Ↄ~~	~~Calibration short tracer arm necessary~~
~~CAL~~	~~Calibration length measurement necessary~~
M	Memory in use
-	Value in memory is negative
AREA	Measuring area in use
~~LINE~~	~~Measuring length in use~~
~~VOL~~	~~Measuring volume in use~~
~~AREA xy~~	~~Measuring area with different scales x/y in use~~
~~x, y~~	~~x- or y-scale in use~~
SCALE	In the menuefunction AREA, ~~LINE and VOL~~ the scale may be recalled in sequence and changed with HOLD M+ and HOLD M-
~~VOL height~~	~~Thickness of sections for measuring volumes is shown or may be changed with HOLD+ and HOLD-~~

1. General Description

The HAFF Electronic Planimeter has been manufactured with great care using the latest technology and to the very highest standards. The successful electronic also is used in the HAFF Root- and Radialplanimeters.
Although it is easy to operate please take the trouble to read these instructions carefully.
They explain the various measuring facilities and studying them will ensure that you get the best service from the instrument.

2. Accuracy

The planimeter is a highly sensitive instrument and must be handled carefully.
Because the measuring wheel is designed to move extremely easily it is mounted in very special bearings which must not be subject to compression or shock.
The measuring accuracy of the instrument is $\pm$ 0,2 mm at a diagram height of 100 mm.
Human measuring errors can be reduced by taking the average of up to three readings - see Section 8.
Errors resulting from the work surface can be reduced by calibration- see Section 9.

3. Purpose of the planimeter

The Planimeter is used to determine the „mean height" hm of diagrams of circular charts.

4. Use of the planimeter

The mean height (hm) of circular diagrams is immediately determined by the planimeter.
Whether the radii of the diagram are straight-lined or curved, that does not matter.
Insert the ball pivot of the centre (7) into the slot of the supplied pressing-in facility (8) (spring ends directed downwards), put it onto the drawing board, and press in the point with both thumbs. Then put the diagram chart over the centre, and put the head of the centre into the slot(2) of the planimeter.

5. Value of 1 digit „E" and instrument factor „M"

Both are attached to the instrument.
The instrument factor is already programmed when delivered.

The instrument is ready to use!

5.1. Value of 1 digit „E"

= value of one digit (for a full turn of the chart)

Example:

Numbering of the greatest graduated circle = 100
Number of digits after a circumtracing
of the greatest graduated circle = 5000

Value of 1 digit „E" = 100 : 5000 = 0,02

5.2. Instrument factor „M"

= factor which has to be determined and programmed once to receive the value of 1 digit

$M = \sqrt{\text{value of 1 digit} \times 100.000}$`

Example:

$M = \sqrt{0{,}02 \times 100.000}$` ~ 44,73 (unit m²)

Programming see Section 11

5.3. Measurement of more or less of a full turn of a chart are to be multiplied by the time factor.

Example:

full turn (360°)		24 hours
actual turn (240°)		16 hours
measuring result		20.000
mean height hm	=	20.000 x 24 : 16 = 30.000

6. Circumtracing of diagrams

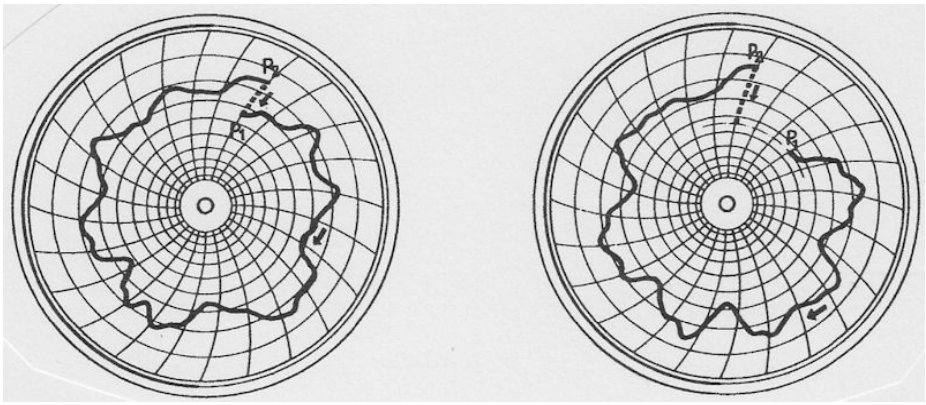
6.1. Curve extends over a full turn of the chart (360°)
If the recorded curve extends over a full turn of the chart, then the initial point (P1) and the final point (P2) must coincide, i.e. the tracer lens must be guided from the final point (P2) of the recorded curve inwards or outwards to the initial point (P1).

If the display at (P1) was set to 0,000 by depressing the „START" key, then, circumtracing of the recorded curve, the mean height (hm) can be read from the display in units of the chart division.

6.2. Curve extends over more or less than a full turn of the chart

If the recorded curve does not cover a full turn of the chart, then the initial and the final point of circumtracing must be equidistant to the centre of the diagram chart, i.e. the tracer lens must be guided from the final point (P2) along the radius line of the chart division inwards or outwards up to the height of the initial point (P1).

The mean height (hm) is obtained by the following manner:
indicated value multiplied by the time factor (5.3)



7. Normal measurement

Activity	**Button**	**Display**	**Remarks**
Switch on	ON	m AREA 18 1 : 44.73	
	if	CAL ↄ	Planimeter is to calibrate (see no. 9)
	if	cm AREA 2 1 : 5	Scale 1 : 5 is active (see no. 11)
DIGIPLAN in measuring position	START	m AREA 0.000	
Measurement 1. area	e.g.	m AREA 24.680	
Next area	START	m AREA 0.000	
Measurement	e.g.	m AREA 42.340	

Addition and subtraction of values are possible, but senseless for Root- and Radialplanimeter

8. Average value AV

To reduce human error, the average of up to 19 readings can be found. The number of readings is shown in small figures left at the display.

Activity	**Button**	**Display**	**Remarks**
1. measurement	START	m AREA 0.000	
measurement		m AREA 47.367	
Transfer of value	AV/POINT	m AREA 1 47.367	
2. measurement	START	m AREA 0.000	
measurement		m AREA 50.378	
Average value of two	AV/POINT	m AREA 2 48.872	
3. measurement	START	m AREA 0.000	
measurement		m AREA 49.878	
Average value of three	AV/POINT	m AREA 3 49.207	
Clear	ON	M AREA 18 44.73	

9. Calibration CAL

The Planimeter is mechanically adjusted and electronically calibrated.

If after tracing a full turn on the greatest circle of the chart, the display doesn't show the value attached to the instrument e.g. 100.000 ± 0,4 %, then the planimeter may be calibrated newly.

If the batteries are fully discharged (display CAL Ↄ) the planimeter has to be calibrated newly.

Calibration

Activity	**Button**	**Display**	**Remarks**
Switch on	ON e.g.	mm VOL 1 1 : 1	etc.
Select menue AREA	MENUE e.g.	mm AREA 1 1 : 1	
Switch to calibrate mode	CAL/SET	AREA CALↃ 4710	last calibration value
DIGIPLAN in measuring position on test area	START	AREA CALↃ 0	
Trace round the greatest circle	e.g.	AREA CALↃ 4800	

The correct value should be 5000.

New calibration value = 4800 : 5000 x 1000 = 960
Move the planimeter till 960 appears in the display.

Store the value	CAL/SET	m AREA 18 1 : 44.73	

This ensures that all subsequent measurements made on this document can be made accurately.

10. Programming of instrument factor M
(Button SCALE means M)

One of the permanently stored scales is to select, which value without point is nearest to wanted scale
The value will be changed by pressing the button „HOLD M+" (increasing) and „HOLD M-" (decreasing).
One short touch the value changes in steps of one. Long pressing the steps will double continuously
e.g. 1 – 2 – 4 – 8 – 16 – 32 – 64 etc.
After interruption the procedure starts again 1 – 2 – 4 ...
The position of the decimal point can be set for 3 places from the right by pressing the „AV/POINT" button.
Then choose the unit by pressing the „UNIT" button.
Programming e.g. M = 1:44.73
Select nearest scale without point 1 : 2500

Activity	**Button**	**Display**	**Remarks**
Switch on	ON e.g.	mm AREA 1 1 : 1	
Select of SCALE	SCALE	mm AREA 1 1 : 1 SCALE	
Select scale which is nearest to the wanted one	SCALE	m AREA 9 1 : 2500 SCALE	
Change value positive	HOLD M+	m AREA 10 1 : 4545 SCALE	Value to high
Change value negative	HOLD M-	m AREA 10 1 : 4473 SCALE	Value o.k.
Position the decimal point (press twice)	AV/POINT	m AREA 10 1 : 44.73 SCALE	
Select of UNIT instrument factor M	UNIT	m AREA 10 1 : 44.73 SCALE	
Fix value in storage no. 18	CAL/SET	m AREA 18 1 : 44.73 SCALE	
Leave SCALE	MENUE	AREA 18 1 : 44.73	Instrument factor „M" is programmed

11. UNIT selection

2 adjacent units can be selected at will. The measurement will automatically shift to the upper unit if the measurement overflows the display using the lower unit.

12. Battery monitoring

The symbol „BAT" indicates that the battery will soon need recharging.

13. Battery charger

The charged battery will allow 50 hours continuous operation.
Charging:
1) Switch off the Planimeter.
2) Plug the charging lead into the socket (5) of the housing.
3) Connect the charger to a 230V AC power supply.
4) Charge a completely flat battery for about 15 hours and pro-rata for partially discharged ones.
   Do not overcharge as this will shorten the life of the battery.
5) Disconnect the charger from the mains.
6) Disconnect the lead from the planimeter.

14. Care of Battery

The power supply is switched off after 1 minute if the measuring wheel is not moved and the display shows ---------. You can restart by pressing the „ON" button. If no buttons are pressed, the display will switch off after 5 minutes. Any measurements which have not been stored in memory will then be lost. The other values such as calibration factor, instrument factor M and memory contents are retained.

15. Display range

= 99999999

16. Incorrect operation

If you make a mistake when tracing, start again by pressing „START".
If you press the wrong button, start again by pressing „ON".
Do not use the instrument with the charger connected.

17. Guarantee

The warranty on the instrument is two years from date of purchase. The warranty is invalid if the planimeter has been opened by an unauthorised person or if it has not been handled in accordance with these instructions.

18. Data output

After pressing the pushbuttons „HOLD M+", „HOLD M-" or „MR/MC" the measured datas can be transmitted to a computer with the interface no. 304.

Since 1835

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