



# Refractometers

## Features

- Robust metallic construction
- High quality optics
- Eyeiece with dioptic compensation to obtain a sharp image.
- Easy to use, direct read scales
- Calibration adjustment screw.
- Portable, comes complete with carry case, Pasteur pipette and screwdriver.



## REFRACTOMETER SALINITY % AND DENSITY "C-1"

### Applications

Clinical investigations of dissolved solutions. Food industry (vegetables, fruit, fish and shell fish)

### Technical data

- Automatic compensation of:
- Temperature: . . . . .10-30 °C.
- Salinity range: . . . . .0 to 100 %.
- Division scale: . . . . .1 ‰.
- Density: . . . . .1000 - 1070.
- Division scale: . . . . .0.001.
- Part No.** 5901001



## REFRACTOMETER BRIX % INDEX "C-2" and "C-3"

### Applications

Sugar concentration of fruit, juice, gaseous soft drinks, milk, wine, industrial oils etc.

### Technical data

- "C-2" Brix range: . . . . .0 - 32 %.
- "C-3" Brix range: . . . . .28 - 62 %.
- Division scale: . . . . .0.2 %.
- Precision: . . . . .+/-0.2 %.
- Model C-2, **Part No.** 5901002
- Model C-3, **Part No.** 5901003



## REFRACTOMETER, CLINICAL, 2 SCALES "C-6"

### Applications

Protein determinations in serum and specific gravity (density) in urine.

### Technical data

- Proteins in serum: . . . . .1 - 12 g/100 ml.
- Division scale: . . . . .0.2 g/100 ml.
- Urine density: . . . . .1000 - 1040.
- Division scale: . . . . .0.002.
- Part No.** 5901006





# Refractometer digital Abbe 'WYA-S'

## Features

Apparatus equipped with an optical system made up of a telescope with dispersion correction, used to define the division line between dark and bright areas.

Precise optics with automatic temperature compensation displayed as °Brix and sample temperature.

## Applications

Ideal for measuring the refractive index of liquids, solids and sugar concentrations (° Brix), industry: chemical, petroleum, food, pharmaceutical, universities and research etc.

## Measurement range

Refraction index  $n_D$ : 1.3000 - 1.7000  
 Brix Bx - TC: 0 - 95 %  
 Brix Bx: 0 - 95 %

## Measurement range

Refraction index  $n_D$ : +/- 0.0002  
 Brix Bx - TC: +/- 0.1 %  
 Brix Bx: +/- 0.1 %

## Temperature

Working range: 0 - 50 °C.  
 Correction range of Bx, in respect to temperature: 15 - 45 °C.

..... Optimal accuracy .....



Comes complete with dust cover and maintenance box that includes:  
 1 bottle of Naphthalene Bromide,  
 1 calibration standard,  
 1 Hex key,  
 3 lamps 6.3V, 0.25 A.  
 3 fuses 1 A.

Part No.	Height/Width/Depth (external) cm	Power	Weight Kg
5901007	38 18 33	220 V ± 20 V 50 Hz	10

## Control panel



- Technical description
1. Monocular system
  2. Telescope adjustment
  3. Digital display
  4. Mains switch "POWER"
  5. Display push button (READ)
  6. Display push button indicating Brix with temperature correction (Bx - TC).
  7. Display push button indicating the refractive index ( $n_D$ ).
  8. Display push button indicating Brix without temperature correction. (Bx).
  9. Optical control.
  10. Light intensity unit
  11. Refractometer prism.
  12. Display push button indicating temperature. (TEMP).



## Refractometers digital, portable 'DR-101 Brix', 'DR-201 Salinity' and 'DR-301 Urine'

### Applications

#### Model DR-101 Brix.

Ideal for the measurement of the °Brix index in the range of 0-35 % for concentrations of sugar in: fruit, gaseous soft drinks, milk, wine etc.

#### Model DR-201 Salinity.

Ideal for the measurement of salinity g/100g, in the range of 0-28 % in: vegetables, fruit, fish and shell fish etc.

#### Model DR-301 Urine.

For the measurement of the specific gravity (urine density).



### Features

Portable and easy to use.

Digital display of 3 digits.

Determinations using a high precision optical cell with a sample compartment of anti corrosive stainless steel.

Quick response microprocessor: 3 seconds.

Automatic temperature compensation.

Temperature selection push button in °C or °F.

Water resistant case.

Ideal for serial measurements.

Alarm for low voltage.

Disconnects the power if not used for 3 minutes.

Power via a 9 V battery.

Comes complete with a protective cover.

Models	Part No.	Measurement Range	Division Scale	Precision	Temp. Range	Temp. Resolution	Sample Volume	H/W/D (external) cm	Wt Kg
DR-101	5901009	00.0 - 35.0 % Brix	0.1 % Brix	±0.1 % Brix	0 - 40 °C 32 - 104 °F	±1 °C ±2 °F	0.2 ml	50 - 185 - 60	0.25
DR-201	5901010	00.0 - 28.0 % Salinity	0.1 % Salinity	±0.1 % Salinity	0 - 40 °C 32 - 104 °F	±1 °C ±2 °F	0.2 ml	50 - 185 - 60	0.25
DR-301	5901011	1000 - 1050 g/ml	0,1 %	±0,1 %	0 - 40 °C 32 - 104 °F	±1 °C ±2 °F	0,2 ml	50 - 185 - 60	0,25

## Hand microtome 'M-10'

### Features

Cylindrical hand microtome, that can achieve a minimum cut of 10 µm, using a manual advance mechanism.

External milled knob with a micrometer scale of 50 divisions of 10 µm.

Maximum sample section of 20 mm.

Precise internal sample holder with a maximum aperture of 8 mm.

**Part No.** 5900019

Comes complete with a carry case, dissection forceps, Roma probe, blade and a 5 mm thick methacrylate base.

**Request separate catalogue for Bench Top Microtomes**





## Refractometers: RFM100 Series



### RFM100 Range of Automatic Digital Refractometers

The RFM100 is a low cost, fully Automatic Digital Refractometer giving fast, accurate and reliable results. Designed primarily for use in production and quality control in a variety of applications in the food industry.

Designed with the ultimate simplicity in mind, RFM100 Refractometers are intended for use in a single mode with a standard Sugar % (Brix) scale; RFM130 ñ 0-95% scale for syrups, concentrates and finished products; RFM110 ñ 0-50% scale for low concentration measurements. The instruments may be operated in ambient temperatures ranging from 5 to 40°C but all readings are temperature-compensated to 20°C. Operation is simply by way of three press button controls. The robust construction features an artificial sapphire prism surrounded by a shallow stainless steel dish making the prism easy to clean. The external power supply provides a safe low voltage to the Refractometer making it ideal to use in a factory location. The no-moving parts design coupled with self-scanned array technology enhances reliability and maximises repeatability. Both models are supplied with 50 disposable pipettes and an instruction manual. Service contracts are also available upon request.

### Features

- Low cost, fully Automatic Digital Refractometers.
- Fast, accurate and reliable performance.
- Designed primarily for use in production and quality control in a variety of applications in the food industry.
- Use in a single mode with a standard Sugar % (Brix) scale.
- Operated in ambient temperatures from 5°C to 40°C
- All readings are temperature compensated to 20°C
- Simple operation by way of three press button controls
- Easy clean, shallow dish surrounding artificial sapphire prism

### Specifications

Part No.	RFM110	RFM130
Scale	0.50% Sugar	0.95% Sugar
Resolution	0.1% Sugar	0.1% Sugar
Accuracy	±0.1% Sugar	±0.1% Sugar
Reading Time	3.5 seconds	6.5 seconds
Working temperature	5 - 40°C	5 - 40°C
Automatic temperature Compensation	to 20°C	to 20°C

\* Full brochure is available upon request

## Polarimeters: Model D



### Model D Optical Polarimeter

The Model D Polarimeter is an optical instrument used to measure the optical rotation of optically active material such as sugar solutions, glucose drip solutions and sugar in urine. The instrument uses Polaroid filters and a quartz half-wave plate. Typically for use with a Sodium lamp source. The two-part field is viewed through the lower telescope. A balance is achieved by the rotation of the analyser circle (viewed through the upper telescope), until both halves of the field are of equal intensity. The introduction of an optically active sample disturbs the balance, which is restored by rotation of the circle through an angle corresponding to the rotation caused by the sample.

### Part No. Description

31-01	Polarimeter Model D with angular and sugar scales for tubes up to 220mm in length with variable half shadows including one 220mm sample tube and plastic dust cover
	Sodium lamp outfit complete with control gear, lamp mounted on transformer case
59-01	225-250v, 50-60Hz
59-06	105-115v, 50-60Hz Sodium lamp mounted on instrument base
59-03	225-250v, 50-60Hz
59-08	105-115v, 50-60Hz
59-50	Spare sodium lamp bulb
34-10	Quartz control plate approx. 97°C Z ( All control plates may be certified at extra cost )
34-11	Quartz control plate approx. 15°C Z
34-15	Quartz control plate with I.S.S. value above 27°C ( to order)
35-16	Quartz control plate with I.S.S. value above 27°C ( to order)

### Specifications

Measurement can be made using two available scales ; 360°C angular scale with sub-divisions in 1°C, and an International Sugar Scale (ISS) -30°C to +30°C sub-divided to 1°C ISS.

A divided drum enables a reading to 0.01° ISS and by estimation to 0.005° ISS. The instrument can accept tubes up to 220mm in length. Supplied with one 200mm tube. Other tubes are available, prices on application.



## Digital Polarimeters: ADP220 & ADS220 Automatic Digital Polarimeters

### ADP 220 Automatic Digital Polarimeter

The ADP220 is a low cost, general purpose, fully automatic Polarimeter with internal LED light source no spare lamp required. Suitable for measuring the rotation of optically active samples across a wide range of laboratory applications. Illuminated display shows reading and instrument status. Offers standard scales: Angular degrees ( $^{\circ}$ a);  $-30^{\circ}$  to  $+120^{\circ}$  International Sugar Scale (ISS); User Defined Scales, and four modes of temperature compensation: No temperature compensation (ntc); Sugar Temperature compensation (stc); Quartz temperature compensation (qtc) and User Defined Temperature Compensation (utc).

The default range for the angular degree ( $^{\circ}$ a) scale is  $-85^{\circ}$  to  $+85^{\circ}$ . Seven other ranges are available by selection between 0 and  $360^{\circ}$ . Accuracy is better than  $\pm 0.05^{\circ}$ a and better than  $\pm 0.1^{\circ}$ z. A reading of optical density is displayed. Operation is simple. The instrument reads automatically and has touch button control for print, scale change and zero re-setting. Using the RS232 interface and PC software supplied, the instrument can be controlled remotely and data logged in the PC. Results can also be printed directly using the RS232 port.

#### Features

General purpose fully automatic digital Polarimeter  
Internal LED light source no spare bulb required  
Illuminated display shows reading and instrument status  
Instrument offers standard scales: Angular degrees (A);  $-30^{\circ}$  to  $+120^{\circ}$  International Sugar Scale, (z); and User Defined Scales.  
Instrument has four modes of temperature compensation: No temperature compensation (ntc); Sugar Temperature compensation (stc); Quartz temperature compensation (qtc) and User Defined Temperature Compensation (utc).

Default range for angular degree (a) is  $-85^{\circ}$  to  $+85^{\circ}$ . Seven other ranges are available by selection between 0 and  $360^{\circ}$ .

Accuracy: better than  $0.05^{\circ}$ a and better than  $0.1^{\circ}$ z

Display also shows: a reading for optical density of sample, an indication as to the stability of the reading so a measurement can be taken at an optimal point

#### ADP220 Technical Specification

Automatic Digital Polarimeter supplied with one straight centre filling tube (200mm), power supply and instruction manual. Scales  $-90$  to  $+90^{\circ}$ A-30 to  $+120^{\circ}$  ISS Resolution  $0.01^{\circ}$  A  $0.01^{\circ}$ Z Accuracy Better than  $\pm 0.05^{\circ}$ A Better than  $\pm 0.1^{\circ}$ Z Light source LED (589 nm) Interfaces Serial RS232, parallel centronics, Temperature probe

**Part No.** 36-20ADP220

#### Accessories

Quartz Control Plate Quartz control plate calibrated at  $97^{\circ}$ Z or ( $33^{\circ}$  Angular) approx. Supplied with B+S certificate. 34-11 Quartz Control Plate Quartz control plate calibrated at  $15^{\circ}$ Z or ( $5^{\circ}$  Angular) approx. Supplied with B+S certificate.

**Part No.** 34-10

\* Full brochure is available upon request



### ADS 220 Automatic Digital Polarimeter

The ADS220 is a saccharimeter based around the ADP 220 design but with features that suit the particular requirements of the sugar industry. Both instruments can be used in a flow-through configuration, can be linked to a PC or other instruments such as a refractometer.

The ADS220 is fully automatic saccharimeter suitable for measuring the optical rotation and purity of sugar solutions. Operation could not be simpler. Reading occurs automatically when a sample is placed in the chamber. Stabilisation is rapid. Touch-of-a-button gives mode change, print and zero setting. A password can be used to protect the calibration (span) of the instrument. Re-setting can be performed with a standard such as a quartz plate. Automatic Temperature Compensation can be selected to be sugar or quartz.

Results are displayed digitally on the International Sugar (ISS) Scale and can be printed directly or sent to a computer (utilities software provided).

The sample chamber will accept tubes of length up to 220 mm. A fixed temperature probe monitors the sample chamber temperature and a second probe is provided for direct insertion into samples. Water-jacketed tubes can be used for precise temperature control and the chamber lid is designed to accept flow-through tubes.

#### ADS220 Technical Specification

Scale  $-30^{\circ}$  to  $+120^{\circ}$ Z (ISS) Resolution  $0.01^{\circ}$ Z Accuracy  $0.03^{\circ}$ Z Light source LED with interference filter (589 nm) Beam diameter Approximately 4 mm through length of chamber. Temperature Compensation Sugar or Quartz - selectable Interfaces Serial RS232, parallel, temperature probe

**Part No.** ADS 220

Automatic Digital Saccharimeter supplied with one straight centre filling tube (200mm), ADS 220 'Utility' software and instruction manual. Quartz Control Plate **Part No.** 36-21

Quartz Control Plate calibrated at  $97^{\circ}$ Z approx. Certificate supplied. Quartz Control Plate. **Part No.** 34-10

Quartz Control Plate calibrated at  $15^{\circ}$ Z approx. Certificate supplied. **Part No.** 34-11



# Hand Held Refractometers: The Eclipse

## APPLICATION SPECIFIC

### Eclipse Hand-held Refractometers

The New Eclipse range of Hand held Refractometers offers the best in quality and performance at an affordable price.

The Eclipse can be used in the full sun of a fruit plantation or the shade of an engineering plant. The new design makes use of Bellingham & Stanley's experience to produce the most user friendly Refractometer so far. The shape is the result of careful testing to ensure that the key components fit perfectly to ensure high accuracy, simplified operation and easy to clean surfaces. High quality optics combined with precision manufacturing give the optimum operation in the field.

Whether the instrument is being used in the fruit groves of Australia, a soft drinks plant in China or on a frozen airport runway to measure antifreeze solution, the Eclipse Hand Held Refractometer will live up to our world wide reputation for quality and reliability.



#### The main features of the new Eclipse range are:

- \* High precision, clear, easy to read scale.
- \* Automatic Temperature Compensation (option on sugar model 45-91 \* only).
- \* Comfortable eyepiece with smooth adjustment.
- \* Hand grip for comfort and insulation.
- \* Push-on flap (replaceable).
- \* Unique sample dribble feed feature.
- \* Anti-roll supports.
- \* Easy-clean prism.
- \* Simple zero adjust / temperature correction.
- \* Practical and aesthetically pleasing design.
- \* High quality finish.
- \* Low weight balanced design.
- \* Robust construction.

#### Low Volume Models

The following models are equipped with a specially designed prism flap for measuring sample volumes of about 1 micro litre. These instruments can be used for botanists for the study of nectars.

Part No.	Type	Range	Scale Division
45-81	Sugar (Brix) %	0-50	0.2
45-82	Sugar (Brix) %	45-80	0.2

#### Automatic Temperature Compensation.

This instrument automatically compensates according to the variation of Refractive Index of sugar solutions as the temperature changes.

Part No.	45-91
Type	Sugar (Brix) ATC
Measuring Range	0-30°C
Scale Division	1.2
Accuracy	±0.2
Reference Temperature	20°C
Compensation Range	10 - 30°C

\* Full brochure is available upon request.

Part No.	Type	Range	Scale Division
45-01	Sugar % (Brix)	0-15	0.1
45-02	Sugar % (Brix)	0-30	0.2
45-03	Sugar % (Brix)	0-50	0.5
45-04	Sugar % (Brix)	30-60	0.5
45-05	Sugar % (Brix)	45-80	0.5
45-06	Sugar % (Brix)	75-93	0.5
45-08	Sugar % (Brix)	28-65	0.5
45-21	Water in Honey (%)	10-25	0.5
45-22	Wine (°Zeiss)	10-135	0.5
45-23	Wine (°Oeschle-CH)	0-130	1
45-24	Wine (°Oeschle-D)	30-130	1
45-25	Wine - Probable Alcohol (%)	0-21	0.2
	- Sugar % (Brix)	0-50	0.5
45-26	Starch (%)	0-30	0.2
45-41	Refractive Index	1.33-1.420	0.001
45-43	Arbitrary (no units)	0-30	0.2
45-44	Antifreeze - °C protection	0 to -40	5
	- Battery acid SG	1.1-1.35	0.05
45-45	Antifreeze - °F protection	30 to -40	10
	- Battery acid SG	1.1-1.35	0.05
45-62	Salinity (% NaCl)	0-18	0.1
45-63	Seawater (%)	0-180	1
45-64	Clinical -		
	Urine (S.G.)	1-1.040.	0.001
	Serum Protein (g/100ml)	0.16	0.2



## Refractometers: RFM300 Series

### State-of-the-art Technology

RFM300 instruments meet the requirements of the highest precision and repeatability for a wide range of industrial applications. All instruments within the range derive from highly developed designs utilising state-of-the-art technologies and are crafted to the highest quality standards with the best available materials. Common features across the range include: Refractive Index, % Sugar Solids (Brix), additional pre-programmed scales and five user defined scales. Each instrument within the range has extended temperature compensation for use with the Sugar scale and can be linked to a computer and controlled via Windows based program (supplied).

### Features

A range of state of the art fully Automatic Digital Refractometers. Choice of instrument dependant on scale and/or resolution/accuracy requirements.

- \* Refractive Index, % Sugar solids (Brix), additional pre-programmed scales and five user defined scales.
- \* Each instrument has extended temperature compensation.
- \* Can be linked to a computer and controlled via Windows 3.1 (based program).
- \* Easy clean stainless steel sample dish surrounding artificial sapphire prism.
- \* Simple to use, with the touch of a button on the membrane keypad a user can read a sample, print results, change the scale and zero the instrument.
- \* Password protection and reading delay.
- \* Full range of optional flow cells available.
- \* Supplied complete with spare dessicator, 50 disposable pipettes and instruction manual.

### Software includes

- \* A real time clock to enable printing of date & time.
- \* Batch assignment and printing.
- \* Operator identification on printing.
- \* 24 or 40 column printing.
- \* Printing of instrumentation calibration status: serial number, date of last zero/span settings.
- \* Five reading mode: takes five readings and prints results.
- \* Multi reading mode: user pre-sets number of readings to be taken.
- \* Statistical summary printed for multi-readings: min, max, mean, spread and standard deviation.



### Technical Specification

Part No.	RFM320	RFM330	RFM340
Scales	Sugar 0-50% RI 1.33-1.42	Sugar 0-95% RI 1.33-1.54	Sugar 0-95% RI 1.33-1.54
Resolution			
Sugar	0.01%	0.01%	0.01%
RI	0.00001%	0.00001%	0.00001%
Accuracy			
Sugar	±0.03%	±0.03%	±0.03%
RI	±0.00004%	±0.0001%	±0.00004%

### Other scales

Up to 16 scales available including pre-programmed standard scales: Zeiss, Oechsle, Butyro, and Fructose. Customer defined scales programmable by push button entry.

Reading Times	3.5	6.5	6.5
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\* Full brochure is available upon request



## Refractometers : ABB 60 Series

### Model ABB60 DR

The ABB60/DR Refractometer is a direct reading instrument, having a dual scale of Refractive Index and Sugar (Brix). Particularly suitable for the measurement of sugar solutions and sugar content in food and drink products. This instrument incorporates an externally mounted LED light source for sample illumination. Good temperature control can be achieved by circulation of water ideally via a water bath & circulator. The prism temperature can be read from a digital display on the instrument. Instrument comes complete with external power supply, standardisation plate and contact liquid, plastic cover and instructions for use.

### Features

- \* Direct reading instrument
- \* Dual scale; 1.3 / 1.74 Refractive Index in 0.001 increments & 0-95% Sugar (Brix) in 0.5% increments
- \* Particularly suitable for the measurement of sugar solutions and sugar content of food and drink products
- \* Incorporates external mounted LED light source for sample illumination
- \* Temperature control achieved by circulation of water
- \* Prism temperature displayed in digital form
- \* Instrument comes complete with external power supply, standardisation plate and contact liquid, plastic dust cover and instructions for use
- \* Information and demonstrations on this and other instruments within this range are available upon request

### Specifications

Part No.	Model	Scale and Scale Division	
		Sugar % (Brix)	Refractive Index
10-99	60 / DR	0-95 x 0.5	1.30 - 1.74 x 0.001
10-03	60 / 95	0-50 x 0.2 50-95 x 0.1	1.30 - 1.535 x 0.001

The working temperature range for these instruments is from +5 to 75°C

\* Full brochure is available upon request



### Model ABB60 ED

The ABB60/ED is a high accuracy optical Refractometer. Ideal for use in research and development, quality control and other industrial laboratories where the highest accuracy and precision is often sought. Conforms to the requirements of ASTM D1218, widely used throughout the petroleum industry.

### Features

- \* High accuracy model, range 1.30-1.74 (approximately).
- \* Designed for use with monochromatic light source such as the sodium lamp (see accessory, not included in package).
- \* Complete with a computer program (windows based) for conversion of scale readings to Refractive Index (RI) or Brix (%Sugar).
- \* With good temperature control (via a water bath & circulator) and use of a micrometer Vernier scale, an average accuracy of (0.00004 RI) can be achieved.
- \* Prism temperature read from a digital display on the instrument.
- \* Ideal for use in research and development, quality control and other industrial laboratories where the highest accuracy and precision is often sought.
- \* Conforms to the requirements of ASTM D1218, widely used throughout the petroleum industry.
- \* Comes complete with traceable standardisation plate and contact liquid, power supply, sodium D calibration tables, plastic cover and instructions for use.

### Specifications

Part No.	Model	Refractive Index
10-04	60 / ED	1.30 - 1.74 approx.
10-06	60 / LR	1.20 - 1.70 approx.

The working temperature range for these instruments is from +5 to 75°C  
Requires water supply. See Recirculation Baths in Baths section.



## Refractometers : Spectral Sources

Measurements of refractive index and optical rotation are made using light of a specific wavelength and for this purpose monochromatic light sources are required. For many applications the mean sodium D line (589.3nm) is the standard source and, if filtered white light is not suitable, a sodium lamp outfit is required.

A Spectral Lamp Outfit with the appropriate lamp fitted can be used to provide a number of alternative light sources.

### Sodium lamp Outfit.

The horizontally mounted sodium discharge tube is housed in and shielded by a metal enclosure which slides on a vertical post for height adjustment. The post can either be attached to the transformer casing or to a special bracket for mounting on the base of a Model D Polarimeter. The lamp has a working life in excess of 3000 hours.

### Spectral Lamp Outfit

The Spectral Lamp Outfit (see image right opposite) can be used in conjunction with a number of interchangeable lamps to provide a selection of spectral sources: sodium, mercury, mercury/cadmium, cadmium and helium. The lamps are mounted cap down in a metal housing / shield which slides on a vertical post for height adjustment. The supporting post is fixed to the transformer casing.

### Sodium Lamp Outfit ( 35 watt )

**Part No.**

59-01	35w	230v - ±10%, 50/60Hz	Free Standing
59-03			Model D base
59-06	35w	110v - ±10%, 50/60Hz	Free Standing
59-08			Model D base
59-50	Spare lamp		

### Spectral Lamp Outfit ( Free standing Units, excluding lamp )

**Part No.**

59-20	230v - ±10%, 50/60Hz
59-25	110v - ±10%, 50/60Hz

### Interchangeable Lamps for Spectral Lamp Outfit

**Part No.**

59-31	Sodium
59-33	Mercury
59-35	Mercury / Cadmium
59-37	Cadmium
59-39	Helium



Spectral Lamp Outfit



Interchangeable Lamps for Spectral Lamp Outfit

\* Full brochure is available upon request