

## MULTI-CHANNEL AUTOMATIC ANALYSER

The Series 2000 Beer-Malt analyser is a new automatic system designed for continuous analysis of alcoholic beverages.

Maintaining the identity of beers in the international drink industry is important both for the manufacturers and the customers. Strict quality control and standardisation in manufacture are essential requiring improved methods of routine chemical analysis to ensure consistent levels of bitterness and colour.

Traditional manual methods of the Institute of Brewing/European Brewing Convention are often slow and labour intensive. Production laboratories facing increasing workloads for a wider range of chemical analysis see automation and the introduction of more dedicated chemical analysers as a way forward. For the Series 2000 Beer-Malt analyser continuous flow analysis was chosen as the automatic flow method ideally suited for simultaneous analysis of bitterness, colour and pH and other determinands in beer and malt samples.

The capability of the analyser extends to many other components frequently measured by brewing laboratories. Automation in the laboratory for the simultaneous determination of bitterness and colour in a wide range of commercial beers has shown good correlation with the values determined by the reference methods (IOB/EBC international method). The analysis times are approximately 25 samples per hour and values for precision in terms of repeatability and accuracy in terms of standard error of prediction (SEP) are within required tolerances. It only takes 2 minutes from sampling to measurement.

The Series 2000 Beer-malt analyser utilises halogen and ultra-violet light sources for the colour and bitterness analysis. Separation of Iso-octane and aqueous segments in the method is achieved using a hydrophobic membrane to prevent the aqueous phase entering the flow cell. Only 1.5ml of sample and 2ml of Iso-octane is required for the analysis. This greatly reduces assay costs compared with other methods.

The Series 2000 Beer-Malt analyser can be fully automated with the MicroStream data-processor providing full system control in addition to data acquisition. MicroStream is powerful and multi-tasking offering real time analysis where primary data acquisition, graphics, peak detection, calibration and calculation take place in the background so results are produced immediately upon a peak being detected. Results box, chart display and calibration graphs can be viewed by the operator during a run.

### FEATURES

- 80 or 140 place carousel sample changer (or 300 place XYZ)
- Up to 20 channel pump
- 1-2 channel chemistry module
- Plug-in easy change chemistry manifolds
- 1-2 channel detector (UV & Visible Colorimeter)
- MicroStream for Windows data handling

### APPLICATIONS

Burkard have been involved with the analysis of products from the brewing industry for many years. The results described for bitterness and colour in dark and light beers has promoted further development leading to many additional methods. Using the same principles for chemical analysis it can be used for the determination of

- pH
- Nitrate
- Nitrite
- Polyphenols
- Density
- Carbohydrates
- Thiobarbituric Acid Value
- Sulphur Dioxide
- Diacetyl
- Anthocyanogen
- $\beta$ -glucan
- Free Amino Nitrogen
- Ethanol
- Acetaldehyde

### BENEFITS

- Uses small amounts of reagent per test
- Produces fast reliable results compared with manual techniques
- Handles both light and dark beers
- Requires minimal start-up time
- Optional full automatic control, start-up and close-down functions.
- Optionally supplied with convenience components such as a chemical resistant analyser tray with centralising power distribution and reagent racks.

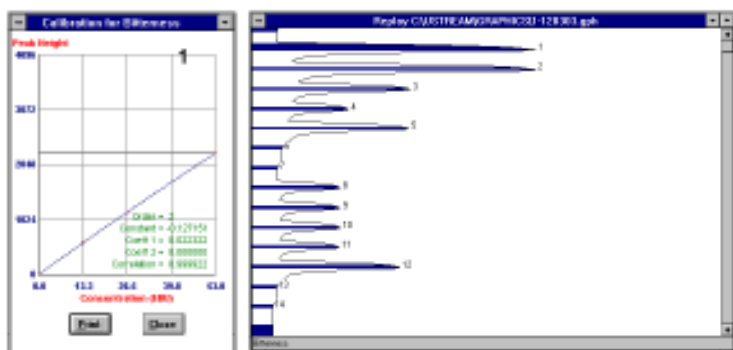
## *Choice of Instrumentation ...*



*... Simple Operation*

## Bitterness method

The analysis is quantified by comparing the signal responses of the samples with a set of standards prepared from three beers of low, medium and high bitterness content that have been analysed by the conventional method. The analysis of 23 beers for bitterness shows a very good correlation between the two methods with a Standard Error of Prediction (SEP) of 1.52. Regression analysis gave a correlation coefficient of 0.9913 and an equation of  $y=0.9959x + 0.3247$ ; table 1 shows these results. The analysis has a linear calibration and this linearity is further demonstrated by taking a beer of high bitterness and analysing serial dilutions. A linear correlation of 0.996 was obtained.



Calibration Graph and Peak Display for Bitterness in Beer

## Colour method

The measurement of colour in beers using the standard Burkard colorimetric detector is made by diluting the beers 1:10 and comparing the absorbance at 430nm with a set of 3 standard beers analysed manually in a spectrophotometer. The comparison of the 23 beers analysed manually and by the Series 2000 Beer-Malt analyser gave a correlation coefficient of 0.9981.

Table 1: Accuracy results - Bitterness (BU)			
Sample	Reference method	Burkard	Difference
1	12.95	12.28	-0.67
2	19.48	19.53	0.05
3	25.50	25.37	-0.13
4	26.33	26.99	0.66
5	16.75	16.75	0.00
6	11.85	11.80	-0.05
7	17.90	17.45	-0.45
8	20.00	21.03	1.03
9	20.08	20.04	-0.04
10	25.55	25.62	0.07
11	22.55	24.03	1.48
12	17.23	16.18	-1.05
13	14.68	15.46	0.78
14	25.18	26.07	0.89
15	20.65	19.55	-1.10
16	15.03	14.49	-0.54
17	9.58	10.68	1.10
18	29.58	29.51	-0.07
19	18.35	19.56	1.21
20	12.58	13.43	0.85
21	9.50	10.56	1.06
22	38.55	39.15	0.60
23	38.28	38.16	-0.12
No. of sample steps	23		
Bias	0.24		
SEP	0.74		
SEP <sub>95</sub>	1.52		

## Servicing

The design of Series 2000 Beer-Malt analysers mean that your servicing routine is minimal. Only the regular change of pump tubes by the user is required for routine operation. Annual and bi-annual service contracts will keep your instrument professionally maintained.

## Consumables

The company maintains a full range of consumables and spares for continuous flow analysis systems.

On site installation and training in the use of the systems is available. Contact Burkard for full details. For details on flow injection systems, continuous flow analysers, data handling systems and specialised process control equipment please contact Burkard Scientific. Burkard Scientific reserves the right to change specification without notice.

SERIES 2000 BEER-MALT ANALYSER SPECIFICATIONS	
<b>Sample Changer</b>	<b>80+, S140 or XYZ</b>
<b>Capacity</b>	Carousel: 8-140 place (sample cups 2ml - 35ml volume), XYZ: 300 place
<b>Sample time</b>	1-999 secs
<b>Wash time</b>	1-999 secs
<b>Sample setting</b>	Keyboard entry
<b>Dimensions</b>	Carousel: 330 x 330 x 200 mm, XYZ: 560 x 480 x 340mm
<b>Supply voltage</b>	110/240V, 50/60Hz (to be specified)
<b>Analysis Module</b>	
<b>Pump speed</b>	30 RPM
<b>Pump capacity</b>	Up to 25 channels
<b>Pump delivery</b>	0.12 - 12 ml/min
<b>Pump tubing</b>	PVC, Viton, Tygon, Silicon
<b>Chemistry tray</b>	Accommodates 6 way 'T' manifold, reaction coils, dialysis and components
<b>Mixing coil</b>	PTFE: 0.6mm I.D., coil lengths: 15, 20, 30, 50 & 80cm
<b>Heating bath (optional)</b>	Temperature variable 30°C-160°C with proportional control and display
<b>Supply voltages</b>	110/240V, 50/60Hz (to be specified)
<b>Detector</b>	<b>Colorimeter</b>
<b>Light sources</b>	Halogen or deuterium (UV)
<b>Flow cells</b>	12mm sq. quartz window (flow through), Burkard non-debubbling flow cells 3, 5, 15 and 50mm path length
<b>Output</b>	Analogue 0-13V with variable gain and damping
<b>Dimensions</b>	410mm x 180mm x 160mm
<b>Supply voltages</b>	110/240V, 50/60Hz (to be specified)
<b>Flat Bed Recorder</b>	
<b>Input sensitivity</b>	0-1, 2, 5, 10, 20, 50, 100, 200, 500mV, 1, 2, 5, 10, 20, 50V. Full scale deflection 250mm
<b>Chart speeds</b>	1, 2, 3, 6, 10, 15, 30, 60cm/min & hr
<b>Dimensions</b>	376 x 425 x 105mm
<b>Supply voltages</b>	240V, 50/60Hz
<b>Data Analyser MicroStream for Windows™</b>	
<b>Computer</b>	Microsoft Windows™ based PC. (Please call for latest spec.)
<b>Processor</b>	Second analogue processor board (ISA) for peak analysis.
<b>Channels</b>	Up to 16 independent channels. Channels distributed in any combination over systems
<b>Speed</b>	Measures narrow (2-10 seconds) and wide (several minutes) peaks at up to 300 peaks per hour per channel
<b>Resolution</b>	Separate 16 bit ADC on each channel gives 0.025% resolution over normal range with x5 extension for over-range samples
<b>Sampler control</b>	Included as standard, also random access control
<b>System control</b>	Options for automatic start-up and close-down
<b>Results output</b>	Configurable print-out modes and export to spreadsheet or database management software
<b>LIMS interface</b>	Configurable bi-directional link to LIMS for worksheet acquisition and down-loading of results
<b>Internal correction</b>	Full baseline and sensitivity drift correction plus carry-over compensation
<b>Supply voltages</b>	110/240V, 50/60Hz

Manufactured by:

Distributed by:

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