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CONTINUOUS AND AUTOMATIC ANALYSIS OF BRIX, DIET, ALCOHOL AND CO₂ ON CARBONATED BEVERAGE PRODUCTION LINES

The Maselli IB-05 Analysis Unit was developed over many years of experience and collaboration with the international soft drink industry. The IB-05 continuously measures on-line the beverage concentration (Brix), % alcohol and carbonation (CO₂ Volumes) for both sugar and diet beverages. It also provides alarm functions, and transmits the measured values for remote display, recording and data acquisition.

It is designed to operate in the high humidity and variable temperature ambient conditions of a beverage bottling plant.

The IB-05 is the basic element of the complete BAS-02 Monitoring and Control System

In its maximum configuration, the BAS-02 system provides continuous Brix, % Alcohol and CO₂ measurement and recording, remote display, automatic control and data acquisition with computer.

The modular BAS-02 system can also be installed in phases, for example starting with only the analysis capability and data acquisition features and adding automatic control later.



The System's basic module



MAIN FEATURES

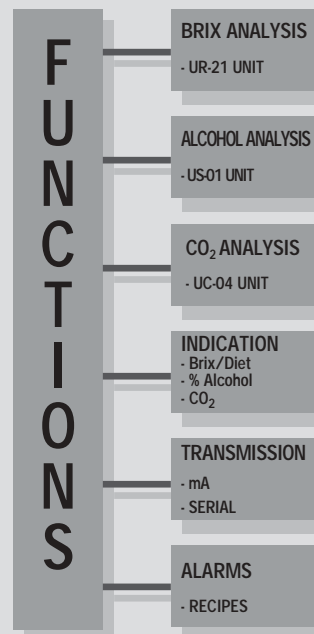
- Stainless steel assembly
- Easy on-line installation
- Product's presence's sensor
- Analysis of sugar, diet and alcoholic soft drinks
- Self-priming pump
- Brix measurement with digital optical sensor
- CO₂ measurement using pressure - temperature
- Alcohol measurement with ultrasonic device
- Automatic temperature compensation
- No measurement drift
- Settable alarms
- User programmable recipes
- Analog and digital outputs
- LCD graphic display
- Easy to operate

The Maselli BAS-02 System has evolved as a result of Maselli's drive to help solve the needs of the modern soft drink industry. Faster and more sophisticated process lines, the need to maintain high product quality standards and rising materials costs all require improved ability to monitor and control the beverage sweetener and carbonation values. Maselli Misure has continually strived to offer products which achieve the two fundamental goals of all beverage processors: consistently high product quality and production cost savings.

The basic module of the BAS-02 System is the **IB-05** Analysis Assembly. This complete analytic unit for continuous beverage monitoring includes the following functions:

analysis of Brix, Alcohol and CO₂
alarms
data transmission

IB-05 Analysis unit



IB-05 Analysis Unit

The **IB-05** Analysis Assembly allows continuous on-line product quality control. It includes:

- A) Brix refractometer analyzer model UR-21
- B) Carbonation analyzer model UC-04
- C) Sound Velocity analyzer model US-01
- D) Stainless steel waterproof control panel
- E) Recirculating sample pump
- F) Sample piping

All components are preassembled and interconnected on a stainless steel frame. The product piping connects the analyzers to the existing beverage line with standard **Tri-Clamp**® ferrules. The unit measures the sugar or other sweetener concentration, the alcohol and the carbonation of the beverage flowing in the product line to the filler. Alarms notify the operator of out-of-specification product conditions. Measured values are transmitted continuously for recording, automatic control or remote data acquisition. The unit requires only electrical power, so that installation on the beverage line is both simple and economical.

Functions

Brix Analysis

The microprocessor-based model UR-21 refractometer measures the Brix concentration of the regular beverages or the % standard of the diet ones. The new CCD digital optical transducer assures high accuracy and repeatability without drift over time. The refractometer measurement is not affected by CO₂ or air bubbles which can introduce errors with density analyzers.

Alcohol analysis

The sound velocity analyzer model US-01 detects the sonic density of the beverage. The value of this parameter is elaborated together with Bx concentration to compute the % alcohol content.

CO₂ Analysis

The dissolved CO₂ concentration is measured by the model UC-04 carbonation analyzer. The analyzer's measurement system is based on Henry's Law, which defines the relationship between the concentration of a dissolved gas and its saturation pressure. A sample of the product is introduced into a measuring chamber, where a mechanical shock releases a small portion of the dissolved CO₂ until the chamber pressure reaches the corresponding saturation pressure. The instrument electronically detects the sample's pressure and temperature, and calculates the Volumes CO₂ present in the beverage. The measurement cycle can be repeated up to 4 times per minute.

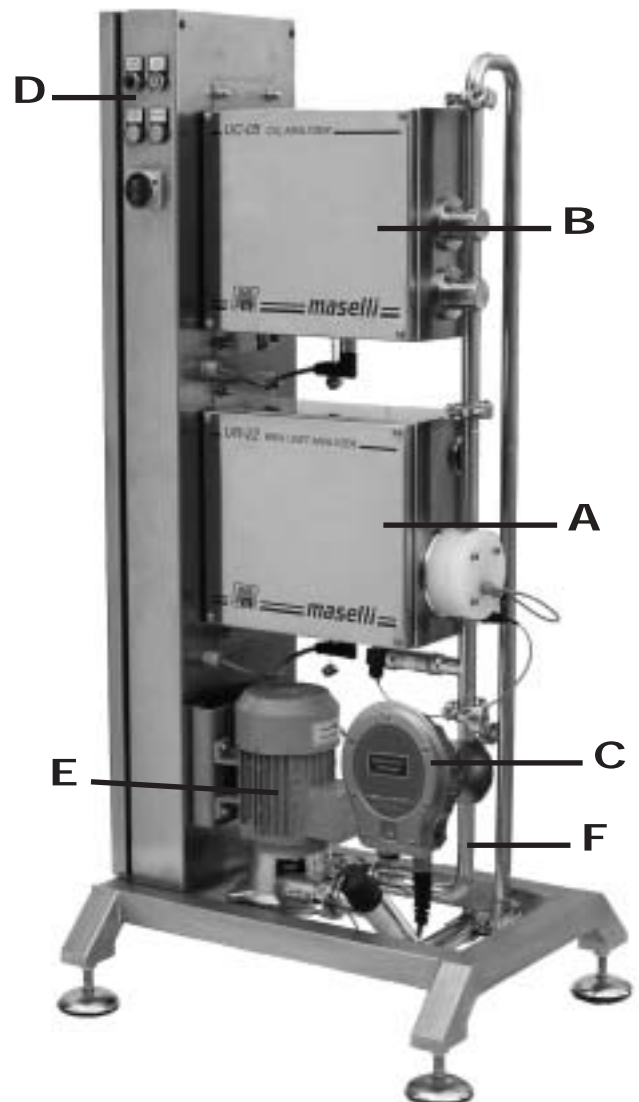
Alarms

In order to simplify managing the alarm setpoints for different flavors, the system's software provides 40 different flavor recipes. The operator can set individual upper and lower alarm setpoints for each flavor code, to be easily recalled whenever that beverage is produced. When the **IB-05** Analysis Assembly detects values that exceed the alarm settings for that flavor, alarm relay contacts close to warn the operator so that he can make proper adjustments to the process. When changing flavors, the operator

needs only to enter the predefined flavor code and the **IB-05** unit will respond with the new alarm setpoints.

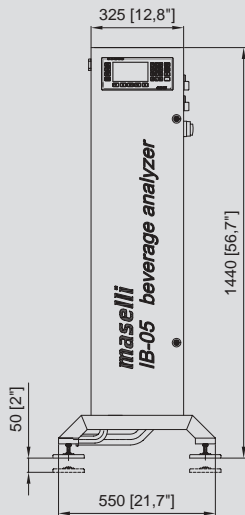
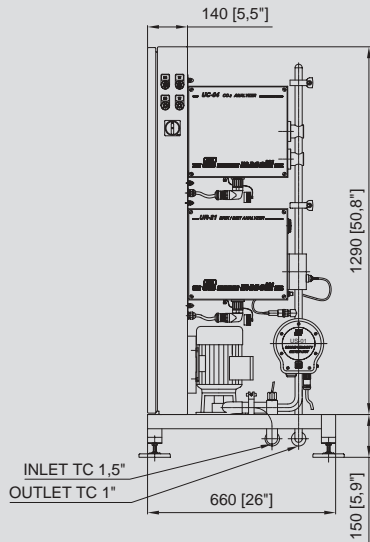
Data transmission

The **IB-05** Analysis Assembly has both analog and serial digital outputs. The **4–20mA** analog outputs are intended primarily for a chart recorder in the lab or process area. The serial outputs are used to send data to a remote display, to the Maselli Brix and CO₂ automatic controller, and to the **MultiLab** remote command and data acquisition software installed on a PC located in the Quality Control laboratory. The serial outputs may also be used to continuously print various data or other information on a printer nearby.



IB05

OVERALL DIMENSIONS



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GENERAL SPECIFICATIONS

TECHNICAL CHARACTERISTICS

Brix Measurement

Measurement Limits:
0...18.5 Brix ("Regular" scale)
0...2000 mBrix ("Diet" scale)
0...200% ("% Standard" scale)

Accuracy:

Regular
Max accuracy 0.1% of the range
 ± 0.02 Brix ("Regular" scale) with ± 10 °C around the working temperature
Diet
Max accuracy 0.15% of the range
 ± 0.003 Brix ("Diet" scale) with ± 2.5 °C around the working temperature

Temperature Compensation:

Automatic from -5 °C... $+35$ °C ($+23$ °F... $+95$ °F);
 -5 °C... $+90$ °C
($+23$ °F... $+203$ °F) for regular beverage

Measurement ranges:

- Brix range (referred to ICUMSA 1974 nD / Brix Conversion Tables)
- "% Standard" range

Alcohol Measurement

Measurements Limits:
0...13% w/w (0...16.5% v/v)

Accuracy*:

± 0.02 w/w

* with CO₂ compensation and on site specific product calibration

Temperature Compensation:

Automatic from -5 °C... $+35$ °C ($+23$ °F... $+95$ °F)

Carbonation Measurement

Measurement Limits:
0...5 v/v (0...10 g/l)

Accuracy:

± 0.05 v/v (± 0.1 g/l)

Measurement Scales:

- v/v (volumes CO₂ / volume beverage)
- g/l (g dissolved CO₂ / liter)

Temperature Compensation:

Automatic from -5 °C... $+35$ °C ($+23$ °F... $+95$ °F)

Interfaces:

(optically isolated)

- Analog:

4 output channels 0...20mA / 4...20mA (max. load 470 Ω)
configurable to the starting and ending range values.
6 input auxiliary channels 0...20mA / 4...20mA

- Digital:

RS 232 / 422 / 485 for connection to:
PC-based Maselli Multilab software "CM00",
Automatic regulator "QC20"
Remote indicator "IRIO"
PC with data acquisition software using "LABTECH" or
OPTO22 protocol communications.

- Input Contacts:

1 input for receiving the Line Stopped status
Inputs for recipes selection by means of an external
PLC (up to 250 products)

- Output Contacts:

8 relay outputs rated for 1A/24V AC/DC for
measurement alarm outputs and generic system alarms

Power Supply:

- AC 3/PE 230/400V $\pm 10\%$ 50Hz $\pm 2\%$; 1200VA
- AC 3/PE 460V $\pm 10\%$ 60Hz $\pm 2\%$; 1200VA

CONSTRUCTION CHARACTERISTICS

Refractometer Prism:

Optical Glass

Refractometer Light Source:

High efficiency LED, electronically compensated

Refractometer Measurement Element:

High resolution CCD

CO₂ Pressure Measurement Element:

Pressure sensor in AISI 316 stainless steel and
Hastelloy® C276

Temperature Measurement Element:

In-line Pt1000 RTD sensor in AISI 316 stainless steel

Input Keypad:

Polyester membrane with tactile domed keys

Display:

Backlighted graphic LCD, 240x128 pixels

Languages:

5 language choices for menus and messages (Italian,
English, German, Spanish, French)

Construction:

- IP64 protection - electrical panel (EN60529)
- IP55 protection - recirculation pump (EN60529)

Recirculation Pump:

Centrifugal pump, self-priming

Connection:

Input / output with Tri-clamp®
(1 1/2" / 1" respectively)

Weight:

125 kg (276 lb)

Materials in contact with the beverage:

- AISI 304-316 stainless steel
- Hastelloy® C276
- Optical glass
- VITON
- EPDM
- TEFLON
- Sanitary rubber
- PVDF
- PE-UHMW
- Polysulfone
- Buna N, clear

BEVERAGE PROCESS LIMITS

Temperature:

-20 °C... $+120$ °C (-4 °F... $+248$ °F)

Pressure:

0...7 bar (0...110 psi) at 20 °C (68 °F)