

# BRIX ANALYZER AND FLUID DENSITY BRIX SENSOR

ACCURATELY SENSES BRIX AND DENSITY IN KG/M<sup>3</sup> WITH VACUUM, LEVEL AND TEMPERATURE COMPENSATION



**DENSITY BRIX SENSOR GUARANTEES EXCELLENT PROCESS EFFICIENCY AND INCREASES PROFITS**

## BRIX ANALYZER CUM CONTROL SYSTEM

DISPLAYS BRIX  
DISPLAYS FLUID DENSITY IN KG/M<sup>3</sup> WITH  
WITH LEVEL, TEMPERATURE, AND VACUUM  
COMPENSATION



## FLUID DENSITY SENSORS:

A24FDSRS1

A24FDSRS2

A24FDSRS3

A24FDSL



## APPLICATIONS IN THE SUGAR INDUSTRY:

- BRIX OF SYRUP, MASSECUTE, AND MELT OF ALL BATCH PANS, VERTICAL AND HORIZONTAL CONTINUOUS PANS, MOLASSES CONDITIONERS, SUGAR MELTERS
- BAUME OF MILK OF LIME
- PLEASE SEE OUR BRIX ANALYZER BROCHURE FOR SUGAR PROCESS, REFINERY, AND DISTILLERY APPLICATIONS

## APPLICATIONS IN DISTILLERIES, BREWERIES, WINERIES:

- BRIX OF SLOPE OR SPENT WASH
- BRIX OF MOLASSES
- BRIX OR WORT OF FERMENTATION TANKS
- BRIX OF MUST, WINE

## FOOD AND BEVERAGES INDUSTRIES

- BRIX OF SAUCE, SLURRY, FRUIT PULP

## APPLICATIONS IN DAIRY INDUSTRY:

- DENSITY OF MILK, SKIMMED MILK

## APPLICATIONS IN THE PULP AND PAPER INDUSTRY:

- DENSITY OF PULP

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### APPLICATION IN SUGAR PROCESS OR SUGAR REFINERY:

#### FOR MEASURING FLUID-DENSITY-BRIX OF MASSECUTE / SYRUP / SLOPE / MELT / LIQUOR / MAGMA / SEED IN:

- VERTICAL AND HORIZONTAL CONTINUOUS VACUUM PAN (VKT OR CVP) CHAMBERS
- BATCH-TYPE VACUUM PANS (GRAINING, AND DROPPING PANS) OF A, B, AND C MASSECUTES.
- SUGAR MELTERS AND MOLASSES CONDITIONERS
- EVAPORATOR BODIES
- OPEN PANS OR BOILING VESSELS IN KHANDSARIS OR MINI SUGAR PLANTS / JAGGERY OR MUSCOVADO PLANTS
- BOILING VESSELS IN JAGGERY OR MUSCOVADO PRODUCTION
- LIME BAUME MEASUREMENT

### APPLICATION IN OTHER PROCESS INDUSTRIES:

**THE FLUID-DENSITY-BRIX ANALYZER SENSES THE DENSITY OF ANY FLUID. HENCE IT HAS NUMEROUS APPLICATIONS IN A RANGE OF PROCESS INDUSTRIES.**

- **FOOD & BEVERAGES:** IN VESSELS OR PANS FOR MONITORING THE CONSISTENCY OF SAUCES / SLURRIES / PASTES ETC.
- **CHEMICAL / PHARMA / FERTILIZERS:** IN THICKENING / THINNING VESSELS OR PANS FOR MONITORING THE CONSISTENCY OF CHEMICAL SLURRIES / PASTES
- **DISTILLERIES:** IN FERMENTATION / MATURATION VESSELS AND SLOPE / SPENT-WASH EVAPORATORS FOR MONITORING BRIX
- **BREWERIES:** IN FERMENTATION VESSELS FOR MONITORING BRIX FERMENTATION VESSELS, MATURATION TANKS

### INNOVATIVE FEATURES FOR EASE OF OPERATION AND TO SAVE ON INSTALLATION COST AND MATERIALS:

- **FLUID-DENSITY AND LEVEL AND TEMPERATURE COMPENSATED DENSITY-BRIX ARE DERIVED BY THE BUILT-IN FLUID-DENSITY-BRIX EQUATION**
- **BUILT-IN 3-POINT AUTO/MANUAL STATION TO SELECT CONTROL OUTPUT FROM:**
  - SELECTOR SWITCH FOR LOCAL PID OUTPUT OR DCS/PLC PID OUTPUT
  - MANUAL OUTPUT FOR TROUBLESHOOTING
  - **THIS FEATURE SIMPLIFIES INSTALLATION BY ELIMINATING THE NEED FOR A JUNCTION BOX AND EXTRA WIRING.**
- **BUILT-IN CONTROL LOGIC WITH YEARS OF SUGAR PROCESS & REFINERY EXPERIENCE**
  - HIGHLY ACCURATE FUZZY LOGIC PID CONTROLLER DEVELOPED ESPECIALLY FOR PROCESS FLOW CONTROL APPLICATIONS.
  - BATCH PAN CONTROL LOGIC BUILT ESPECIALLY FOR BATCH-TYPE VACUUM PAN OPERATIONS
  - BUILT-IN PID CONTROL LOOP (BRIX VALUE IS INTERNALLY TAKEN AS PROCESS VARIABLE)

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## SALIENT FEATURES OF FLUID-DENSITY-BRIX ANALYZER SYSTEM:

- FLUID-DENSITY TYPE BRIX ANALYZER SYSTEM TARGETS SENSING THE FLUID-DENSITY OF LIQUIDS, SLURRIES, OR SYRUPS LIKE SUGAR MASSECUITE, SUGAR SYRUP, SUGAR MELT, LIQUORS, AND MOLASSES.
- THE MOTORIZED FLUID-DENSITY SENSOR IS SPECIALLY DESIGNED TO BE INSERTED IN A VESSEL TO STIR THE FLUID MEDIA AND MEASURE ITS FLUID-DENSITY WHICH CAN BE EXPRESSED IN SIMPLE TERMS AS THE TIGHTNESS OR THINNESS OF A FLUID MEDIA. IT CAN ALSO BE INFORMALLY REFERRED TO AS THE CONSISTENCY OF THE FLUID AND IS A MECHANICAL PROPERTY OF A FLUID.
- MOTORIZED SENSOR'S TORQUE AND POWER WHICH IS REQUIRED TO STIR THE FLUID VARIES WITH VARYING FLUID-DENSITY. SO THE MOTORIZED FLUID-DENSITY SENSOR'S POWER CONSUMPTION IS DIRECTLY PROPORTIONAL TO THE FLUID'S DENSITY.
- THE VARIATION IN SENSOR'S POWER CONSUMPTION IS SENSED BY THE FLUID-DENSITY TYPE BRIX ANALYZER'S HIGHLY ACCURATE SENSING CIRCUITRY, THIS VALUE IS MEASURED AND PROCESSED IN THE **FLUID-DENSITY-BRIX EQUATION**, TO DERIVE THE ACTUAL VALUE OF **DENSITY IN KG/M<sup>3</sup> AND TEMPERATURE, LEVEL AND VACUUM COMPENSATED BRIX VALUE**.
- **COMPENSATED BRIX VALUE IS DISPLAYED OR TRANSMITTED AS 4-20mA CURRENT OUTPUT.**
- EASY AND USER-FRIENDLY CALIBRATION AND ONLINE COMPENSATION.

## BASIC SCIENCE BEHIND FLUID-DENSITY-BRIX:

- **FLUID-DENSITY:** THE DENSITY OF A PARTICULAR FLUID.
- **DENSITY IS DEFINED AS "MASS PER UNIT VOLUME," MEANING** THE MASS CONTAINED IN A FIXED VOLUME. IT IS DENOTED BY " **$\rho$** ", A GREEK LETTER CALLED "**RHO**".
- **DENSITY:** CAN BE DERIVED USING THE FORMULA " **$\rho = M/V$** " WHERE  **$\rho$**  IS THE FLUID-DENSITY, M IS THE MASS AND V IS VOLUME. THE UNIT TO MEASURE FLUID-DENSITY IS **KG/M<sup>3</sup>** (KILOGRAM PER CUBIC METER).
- **BRIX:** THIS IS THE PERCENTAGE MEASUREMENT BY SUCROSE WEIGHT IN PURE WATER SOLUTION.
- **THE MOST POPULAR WAYS OF MEASURING BRIX ARE:**
  - **HYGROMETRIC AND REFRACTOMETRIC (LAB METHODS)**
  - **HIGH-FREQUENCY OR RADIO-FREQUENCY CONDUCTIVITY TYPE BRIX SENSING. THIS ANALYZER SENSES THE CHANGE IN AMPLITUDE OF THE SIGNAL PROPAGATED IN THE MEDIA WHICH IS PROPORTIONAL TO THE MEDIA'S WATER CONTENT.**
  - **MICROWAVE TYPE BRIX SENSING. THIS ANALYZER SENSES THE PHASE SHIFT OF THE SIGNAL PROPAGATED IN THE MEDIA WHICH IS PROPORTIONAL TO THE MEDIA'S WATER CONTENT.**
  - **YUTECH'S INNOVATIVE FLUID-DENSITY BRIX SENSOR, SENSES THE MOTORIZED STIRRER'S POWER REQUIRED TO STIR THE MEDIA AND SENDS THIS SIGNAL TO BRIX ANALYZER, WHERE, A COMPLEX MATHEMATICAL EQUATION WITH LINEARIZATION AND COMPENSATION FORMULAE ACCURATELY DERIVES TEMPERATURE, LEVEL AND, VACUUM COMPENSATED BRIX AND DENSITY IN KG/M<sup>3</sup>.**
- WHILE CONDUCTIVITY OR MICROWAVE METHODS MEASURE THE FLUID'S ELECTRICAL CHARACTERISTIC, THEY ARE SUCCESSFUL IN MEASURING BRIX OF "B AND C" MASSECUITE IN CVP, BRIX OF SUGAR MELT, AND BRIX IN A MOLASSES CONDITIONER UNIT.
- "A" MASSECUITE HOWEVER, HAS A MIX OF MATERIALS LIKE SYRUP, MELT AND MOLASSES WHOSE PURITIES ARE DIFFERENT, THIS AFFECTS THE FLUID OR MEDIA'S ELECTRICAL CHARACTERISTIC WHICH IS VARIABLE FOR MASSECUITES OF DIFFERENT PURITY THUS ADVERSELY AFFECTING BRIX MEASUREMENT.
- FLUID-DENSITY MEASUREMENT USES A MOTORIZED STIRRING SENSOR AND PROVES VERY SUCCESSFUL, AS IT DIRECTLY MEASURES THE FLUID'S DENSITY (TIGHTNESS OR THINNESS) IRRESPECTIVE OF ITS ELECTRICAL CHARACTERISTICS.

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## FLUID DENSITY BRIX ANALYZER TECHNICAL SPECIFICATIONS:

PRODUCT CODE: A15FDACFM1230 / A24FDACFMEM1230

- POWER SUPPLY: 85 - 265 VAC, 50 – 60HZ
- INPUTS:
  - FLUID-DENSITY SENSOR
  - RTD PT100 TEMPERATURE SENSOR
  - 8-POINT LEVEL SENSORS (CONDUCTIVITY-BASED DIGITAL SWITCH TYPE)
  - 4-20MA: INPUT FROM VACUUM TRANSMITTER (OPTIONAL, NOT A PART OF STANDARD SUPPLY)
  - 4-20MA: INPUT FROM DIFFERENTIAL PRESSURE TRANSMITTER WITH EXTENDED DIAPHRAGM WITH CAPILLARY TUBES (OPTIONAL, NOT A PART OF STANDARD SUPPLY)
- OUTPUTS:
  - TRANSMISSION OUTPUTS: 4-20MA, BRIX OUTPUT, AND 4-20MA, LEVEL OUTPUT (REQUIRED FOR BATCH PAN APPLICATION)
  - PID CONTROL OUTPUT: 4-20MA FOR BRIX CONTROL
  - 2 POTENTIAL-FREE RELAY OUTPUTS
- DISPLAY:
  - FOR PRODUCT CODE - A15FDACFM1230: 7-SEGMENT LED DISPLAY
  - FOR PRODUCT CODE - A24FDACFMEM1230: 7-SEGMENT LED DISPLAY AND LCD DISPLAY
- ENCLOSURE: FIELD MOUNTED MS POWDER COATED, INGRESS PROTECTION CLASS IP67
- COMMUNICATION:
  - ETHERNET: MODBUS TCP/IP (PRODUCT CODE: A24FDACFMEM1230)

## FLUID DENSITY SENSOR TECHNICAL SPECIFICATIONS:

PRODUCT CODE: A24FDSRS1, A24FDSRS2, A24FDSRS3

- TYPE: MOTORIZED FLUID DENSITY SENSOR
- POWER SUPPLY: 24VDC FROM THE ANALYZER (NOT TO BE CONNECTED TO ANY EXTERNAL SOURCE).
- BUILT-IN THERMOWELL WITH RTD PT100
  - MATERIAL OF CONSTRUCTION: SS304 / SS316L
- PTFE SHEATHED CONDUCTIVITY PROBE 8 NOS.: SS304 / SS316L WITH PTFE SHEATH
  - MATERIAL OF CONSTRUCTION:
- MATERIAL OF CONSTRUCTION:
  - WETTED ROTARY PARTS: SS304 / SS316L
  - WETTED STATIONARY PARTS: MS CHROME PLATED / SS304 / SS316L
- FOR FOOD-GRADE, SS-304 FULL SENSOR BODY: ADD FGSS TO THE PC. EX: A24FDSRS3FGSS
- FOR ACIDIC CHEMICALS, SS-316L FULL SENSOR BODY: ADD SSL TO THE PC. EX: A24FDSRS3SSL

## FLUID DENSITY SENSOR MODEL GUIDANCE FOR VARIOUS APPLICATIONS:

A24FDSRS1: BATCH PAN, VERTICAL CONTINUOUS PAN

A24FDSRS2: HORIZONTAL CONTINUOUS PAN

A24FDSRS3: EVAPORATOR, FALLING FILM EVAPORATOR, JUICE AND SYRUP MIXING VESSEL, SUGAR MELT, MOLASSES CONDITIONER, LIME BAUME

A24FDSRS3FGSS: BREWERIES, FOOD & BEVERAGES, DAIRY

A24FDSRS3FGSSL: CHEMICALS, DISTILLERY SLOPE / SPENTWASH

A24FDSL: SWITCHING LEVEL SENSOR

PLEASE GIVE INFORMATION OF MEDIA BRIX RANGE, DENSITY RANGE, pH, TEMPERATURE

PLEASE VISIT OUR WEBSITE [www.yutechautomation.com](http://www.yutechautomation.com).

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