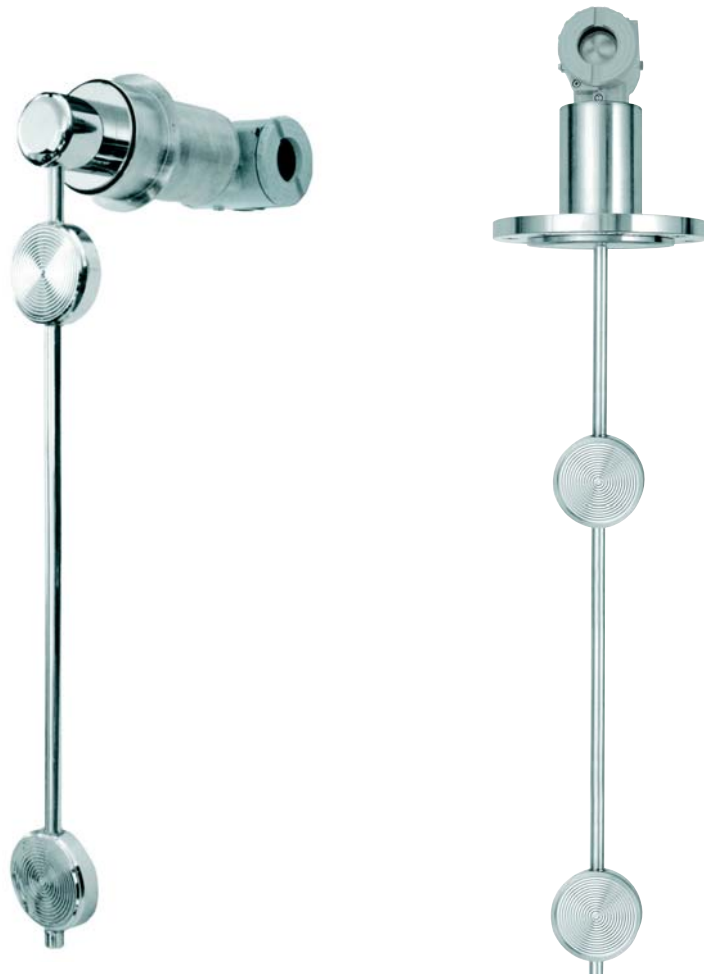


# DT302

## FIELDBUS CONCENTRATION / DENSITY TRANSMITTERS

### Features

- $\pm 0.1$  °Brix or  $\pm 0.0004$  g/cm<sup>3</sup> accuracy.
- Temperature compensation.
- Continuous diagnostics.
- 0.5 to 5 g/ cm<sup>3</sup> range.
- Industrial or sanitary standard connection.
- Weather proof, explosion proof and intrinsically safe.
- Digital LCD indicator.
- Configuration through Fieldbus communication from a PC.
- The control strategy is built from direct instantiation and deletion of function blocks.
- Network master capability.



## Description

The **DT302** is a modern concentration and density transmitter designed to provide a continuous measurement of the concentration in a wide standard units, such as Brix, Baumé, Plato, INPM, etc.. There is an internal temperature sensor to compensate the process temperature variations, automatically. According to application needs, there are two models available: **DT302I** for general purpose and **DT302S** for sanitary applications.

Both models have two mounting types: top mounting (straight type) and side mounting (curved type). Installation may be done either in open or pressurized tanks, or directly in pipes since the **DT302** is suitable for dynamic and static fluids. The Sanitary model uses a Tri-Clamp connection to allow a quick and easy connection and disconnection from the process. Wetted surface meets 3A recommendations so that the probe surface is free of crevices where food or bacteria can be collected. 3A is the most widely accepted sanitary standard in the food, drug and beverage industry.

The digital technology used in the **DT302** enables an easy interface between the field and the control room and several interesting features that considerably reduce the installation, operation, and maintenance costs. The **DT302** is part of Smar's complete 302 Series of Fieldbus devices. Fieldbus is a complete system enabling distribution of the control function to equipment in the field, interconnecting several devices and the user can build control strategies suitable for his application by linking the function blocks. The user may now easily build and overview complex control strategy, just by instantiating or deleting the desired function blocks. Another advantage is the added flexibility, the control strategy may be edited without having to rewire or change any hardware.

The need for implementation of Fieldbus in small as well as large systems was considered when developing the entire 302 Series of Fieldbus devices. They have the common features of being able to act as a master on the network and be configured locally using a magnetic tool, eliminating the need for a configurator or console in many basic applications.

## Function Blocks Table

<i>BLOCK</i>	
<b>RES</b>	<b>RESOURCE</b> - This block contains data that is specific to the hardware that is associated with the resource.
<b>TRD</b>	<b>TRANSDUCER BLOCK</b> - This block converts the primary variables of the physical I/O devices into the proper engineering value requested by the function blocks.
<b>DSP</b>	<b>DISPLAY TRANSDUCER</b> - This block configures what process variables of the function blocks will be displayed in the device LCD panel.
<b>DIAG</b>	<b>DIAGNOSTICS TRANSDUCER</b> - It provides online measurement of block execution time, check of links between blocks and other features.
<b>AI</b>	<b>ANALOG INPUT</b> - This block takes the input data from the transducer block and makes it available to other function blocks. It has scaling conversion, filtering, square root and low cut.

<b>PID</b>	<b>PID CONTROL</b> - This standard block has a lot of valuable features as setpoint treatment (value and rate limiting), filtering and alarm on PV, feedforward, output tracking and others.
<b>APID</b>	<b>ADVANCED PID</b> - It has all the standard features plus: bumpless or hard transfer from a "manual" mode to an "automatic" mode, bias, adaptive gain, PI sampling, deadband for error, special treatment for error, ISA or parallel algorithm,...
<b>ARTH</b>	<b>ARITHMETIC</b> - This calculation block provides some pre-defined equations ready for use in applications as flow compensation, HTG, ratio control and others.
<b>INTG</b>	<b>INTEGRATOR</b> - It integrates a variable in function of the time. There is a second flow input that may be used for the following applications: net flow totalization, volume/ mass variation in vessels and precise flow ratio control.
<b>ISEL</b>	<b>INPUT SELECTOR</b> - This block has four analog inputs that may be selected by an input parameter or according to a criterion as first good, maximum, minimum, middle and average.
<b>CHAR</b>	<b>SIGNAL CHARACTERIZER</b> - It has capability for two signal characterization based on the same curve. The second input has an option for swapping "x" to "y", providing an easy way to use the inverse function, that may be used in signal characterization of readback variables.
<b>AALM</b>	<b>ANALOG ALARM</b> - This alarm block has dynamic or static alarm limits, hysteresis, temporary expansion of alarm limits on step setpoint changes to avoid nuisance alarms, two levels of alarm limits and delay for alarm detection.
<b>TIME</b>	<b>TIMER</b> - This block has four discrete inputs, that are processed by a combination logic. The selected timer processing type operates on the combined input signal to produce a measurement, delay, extension, pulse or debounce.
<b>LLAG</b>	<b>LEAD-LAG</b> - This block provides dynamic compensation of a variable. It is used normally in a feedforward control.
<b>OSDL</b>	<b>OUTPUT SELECTOR / DYNAMIC LIMITER</b> - It has two algorithms: <ul style="list-style-type: none"> <li>- Output selector - selection of output by a discrete input</li> <li>- Dynamic limiter - this algorithm was developed specially for double cross limit in combustion control.</li> </ul>
<b>CT</b>	<b>CONSTANT</b> - It provides analog and discrete output parameters with constant values.
<b>DENS</b>	<b>DENSITY</b> - This block has a special algorithm to calculate the density in different types of engineering units: Plato Degree, INPM, Brix, Baumé and others.



## Technical Characteristics

## Functional Specifications

<b>Communication Protocol</b>	Digital, only. FOUNDATION™ Fieldbus, 31.25 kbit/s, voltage mode with bus power.
<b>Power Supply</b>	Bus powered: 9 - 32 Vdc. Quiescent current consumption: 12 mA.
<b>Indicator</b>	4 ½-digit numerical and 5-character alphanumeric LCD indicator.
<b>Hazardous Area Certifications</b>	Explosion proof, weather proof and intrinsically safe (CENELEC and FM standards pending).
<b>Temperature Limits</b>	Ambient: -40 to 85 °C (-40 to 185 °F). Process: -20 to 150 °C (-4 to 302 °F). Storage: -40 to 100 °C (-40 to 212 °F). Digital Display: -10 to 60 °C (-14 to 140 °F).
<b>Static Pressure Limit</b>	1.7 Mpa (17 kgf/cm <sup>2</sup> ).
<b>Turn-on Time</b>	Approximately 5 seconds.
<b>Update Time</b>	Approximately 0.2 second.
<b>Humidity Limits</b>	0 to 100% RH.

## Performance Specifications

Reference conditions: temperature 25 °C (77 °F), atmospheric pressure, power supply of 24 Vdc, silicone oil fill fluid, isolating diaphragms in 316L SS, and range full-scale calibration.

<b>Accuracy</b>	Range 1: ±0.0004 g/cm <sup>3</sup> (±0.1 °Brix). Range 2: ±0.0007 g/cm <sup>3</sup> . Range 3: ±0.0016 g/cm <sup>3</sup> .
<b>Stability for 3 months</b>	Range 1: 0.021 kg/m <sup>3</sup> . Range 2: 0.083 kg/m <sup>3</sup> . Range 3: 0.521 kg/m <sup>3</sup> .
<b>Ambient Temperature Effect / 10 °C</b>	Range 1: 0.003 kg/m <sup>3</sup> . Range 2: 0.013 kg/m <sup>3</sup> . Range 3: 0.041 kg/m <sup>3</sup> .

<b>Static Pressure Effect (*)</b>	Range 1: 0.001 kg/m <sup>3</sup> . (*) - This is a systematic error that can be eliminated by calibrating at the operating static pressure. Range 2: 0.004 kg/m <sup>3</sup> . Range 3: 0.007 kg/m <sup>3</sup> .
<b>Power Supply Effect</b>	±0.005% of calibrated FS per volt.
<b>Electro-Magnetic Interference Effect</b>	Designed to comply with IEC801 and European Standards EN50081 and EN50082.

### Physical Specifications

<b>Electrical Connection</b>	½ -14 NPT, Pg 13.5 or M20 x 1.5.
<b>Process Connection</b>	Industrial model: 316 SST flange ANSI B16.5, 4" Sanitary model: 304 SST Tri-clamp, 4"
<b>Wetted Parts:</b>	Isolating diaphragms: 316L SST or Hastelloy C276. Probe material: 316L SST or Hastelloy C276 O-ring for Sanitary model: Buna N, Viton™ or Teflon™.
<b>Non-wetted Parts:</b>	Electronic housing: injected low copper aluminum with polyester painting or 316 SST housing, with Buna N o-rings on cover (NEMA 4X, IP67). Fill fluid: Silicone (DC200/20, DC704), Syltherm 800, Glycerin/water or Neobee-M20 Propylene Glycol. Identification plate: 316 SST.
<b>Mounting</b>	Side or Top mounting.
<b>Weight</b>	Sanitary model: 8 kg (18lb) - Industrial model: 14 kg (26lb).

**Note:** Hastelloy is a trademark of the Cabot Corp. Viton and Teflon are trademarks of E. I. DuPont de Nemours & Co. This product is protected by US patent numbers 6,662,653, 6,234,019, D439,855 and 5,827,963

Ordering Code

Sanitary Model



MODEL DT302S SANITARY CONCENTRATION/DENSITY TRANSMITTER

CODE	Range	Minimum span
1	0.5 to 1.8 g/cm <sup>3</sup>	0.025 g/cm <sup>3</sup>
2	1.0 to 2.5 g/cm <sup>3</sup>	0.050 g/cm <sup>3</sup>
3	2.0 to 5.0 g/cm <sup>3</sup>	0.250 g/cm <sup>3</sup>

*Note:* For the concentration units: °Brix, °Plato, °INPM, °GL and °Baumé, specify code 1.

**CODE Wetted Parts Material**

H	Hastelloy C276
I	316L SST
U	Probe in 316L SST and Diaphragms in Hastelloy C276
Z	Others – Specify

**CODE Fill Fluid**

N	Neobee- M20 Propylene Glycol - Food Grade (Compliant with 3A Standard - 7402)
D	DC-704 Silicone Oil
S	DC 200/20 Silicone Oil
G	Glycerin and Water - Food Grade
T	Syltherm 800
Z	Others – Specify

**CODE Local Indicator**

0	Without Indicator
1	With Digital Indicator

**CODE Electrical Connection**

0	½ - 14 NPT
A	M20 X 1.5
B	Pg 13.5 DIN
Z	Others – Specify

**CODE Mounting**

1	Top
2	Side

**CODE Process Connection**

J	Tri-clamp - 4" 300#
Z	Others – Specify

**CODE Wetted O-Rings Material**

B	Buna-N
V	Viton
T	Teflon
Z	Others – Specify

**CODE Tank Adapter**

0	Without Tank Adapter (Supplied by Customer)
1	With Tank Adapter 316 SST

**CODE Tri-Clamp**

0	Without Tri-clamp
1	With Tri-clamp in 304 SST

**CODE Optional Items (\*)**

H1	316 SST Housing
ZZ	Special Options – Specify

DT302S - 1 I N - 1 0 2 - J B 1 1 / \* ◀ TYPICAL MODEL NUMBER

\* Leave it blank for no optional items.

# Ordering Code

## Industrial Model



### MODEL DT3021 INDUSTRIAL CONCENTRATION/DENSITY TRANSMITTER

CODE	Range	Minimum span	
1	0.5 to 1.8 g/cm <sup>3</sup>	0.025 g/cm <sup>3</sup>	<b>Note:</b> For the concentration units: °Brix, °Plato, °INPM, °GL and °Baumé, specify code 1.
2	1.0 to 2.5 g/cm <sup>3</sup>	0.050 g/cm <sup>3</sup>	
3	2.0 to 5.0 g/cm <sup>3</sup>	0.250 g/cm <sup>3</sup>	

CODE	Wetted Parts Material
H	Hastelloy C276
I	316L SST
U	Probe in 316L SST and Diaphragms in Hastelloy C276
Z	Others – Specify

CODE	Fill Fluid
N	Neobee- M20 Propylene Glycol - Food Grade
D	DC-704 Silicone Oil
S	DC 200/20 Silicone Oil
G	Glycerin and Water - Food Grade
T	Syltherm 800
Z	Others – Specify

CODE	Local Indicator
0	Without Indicator
1	With Digital Indicator

CODE	Electrical Connection
0	½ - 14 NPT
A	M20 X 1.5
B	Pg 13.5 DIN
Z	Others – Specify

CODE	Mounting
1	Top
2	Side

CODE	Process Connection Size, Rating and Standard
5 1	4" 150# ANSI B-16.5
5 2	4" 300# ANSI B-16.5
5 3	4" 600# ANSI B-16.5
A C	DN 100 PN25/40 DIN 2526 - FORM D
Z Z	Others - Specify

CODE	Optional Items (**)
H1	316 SST Housing
ZZ	Special Options – Specify

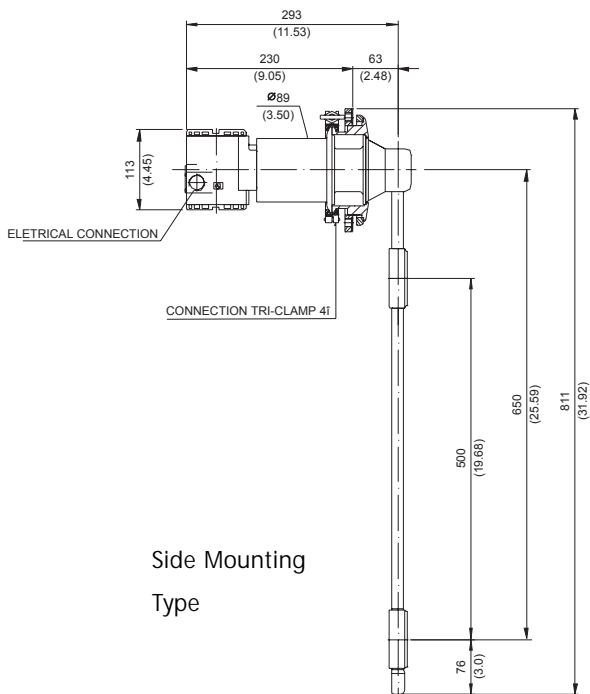
DT3021 - 1 I S - 1 0 1 - 5 1 / \* ◀ TYPICAL MODEL NUMBER

\* Leave it blank for no optional items.

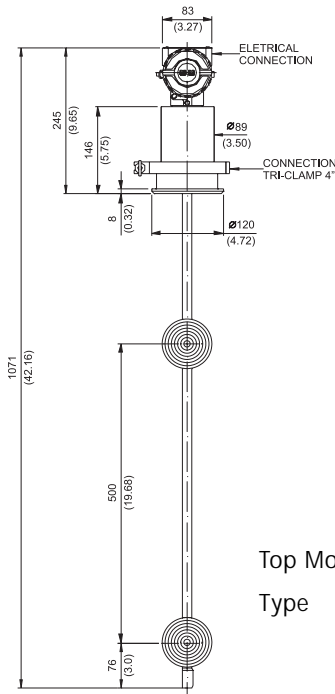
Dimensions

Sanitary Model

Dimensions are mm (inches)



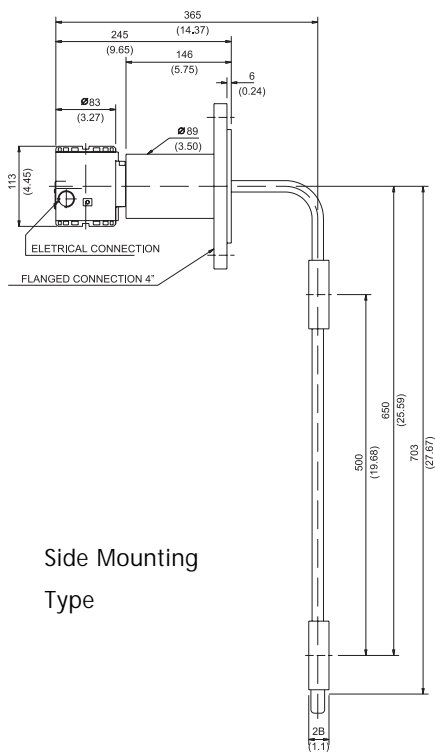
Side Mounting Type



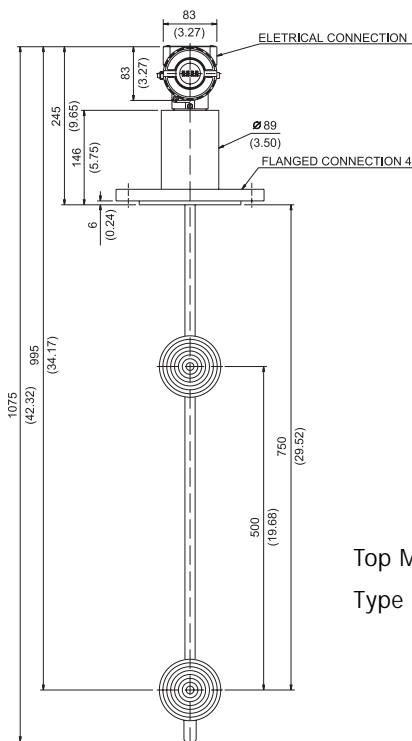
Top Mounting Type

Industrial Model

Dimensions are mm (inches)



Side Mounting Type



Top Mounting Type