DOMINO

Doble Moisture-In-Oil Sensor

DOMINO™ Technical Specifications

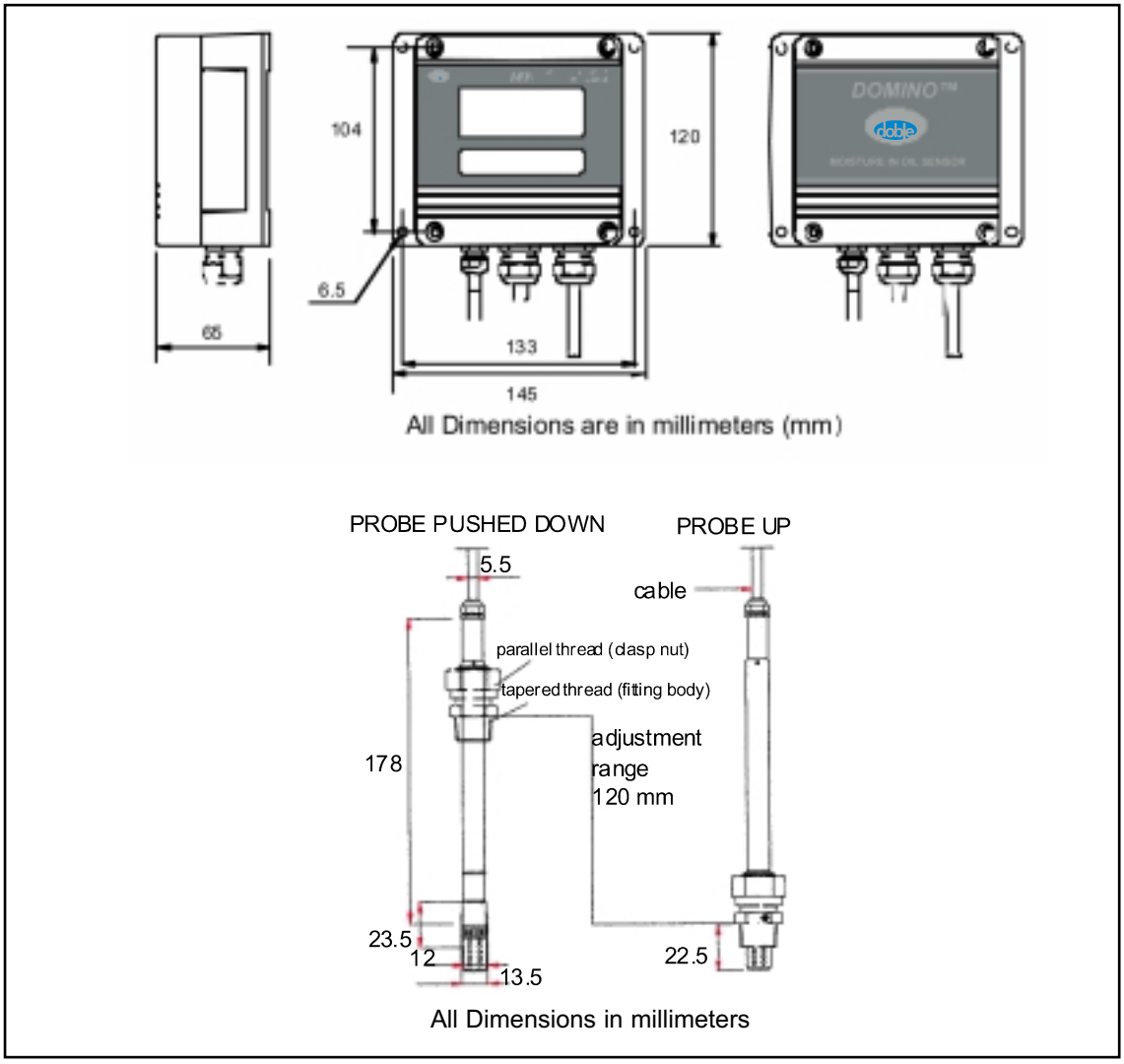
DOMINO continuously measures moisture content and temperature of electrical insulating liquids such as transformer oils.

Models and Description

Features	*DOMINO* 161	*DOMINO* 162	*DOMINO* 165	*DOMINO* 165-10	*DOMINO* 263	*DOMINO* 264	*DOMINO* 264-10	*DOMINO PORTASAMPLER*
Displayed Values (ppm, % RS, Temperature)	√	√	√	√	√	√	√	√
Display and Keypad		√	√	√	√	√	√	√
Operating Voltage	24 VDC	24 VDC	24 VDC	24 VDC	115/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC
Analog Outputs	2	2	2	2	2	2	2	2
Default Analog Settings	4-20 mA RS & Temp.	4-20 mA RS & Temp.	0-5 V ppm & Temp.	4-20 mA ppm & Temp.	4-20 mA RS & Temp.	4-20 mA RS & Temp.	4-20 mA RS & Temp.	4-20 mA RS & Temp.
Outputs Scalable Within	0-20 mA, or 0-10 V	0-20 mA, or 0-10 V	0-20 mA, or 0-10 V	0-20 mA, or 0-10 V	0-20 mA, or 0-10 V	0-20 mA, or 0-10 V	0-20 mA, or 0-10 V	0-20 mA, or 0-10 V
RS 232C	√	√	√	√	√	√	√	√
Alarm Relay			√	√				
Probe Plumbing Connection	1/2-14 ISO (BSPT) or 1/2-inch NPT							
Probe Cable Length	56 cm 22 inch	56 cm 22 inch	2 m 79 inch	10 m 394 inch	56 cm 22 inch	2 m 79 inch	10 m 394 inch	2 m 79 inch
Transformer Mounting Bracket	√	√			√			
Portable Accessories								√
Operating Manual	√	√	√	√	√	√	√	√

DOMINO Moisture-In-Oil Sensor

Transmitter Enclosures: Models with and without Displays are Shown



Mechanics

Housing Material .....G-AlSi12 (DIN 1725)
Housing Classification .....IP 65 (NEMA 4)
Sensor Protection .....Stainless steel filter
Housing Dimensions .....145 x 120 x 65 mm
(4.7 x 5.7 x 2.5 inches)

Probe Dimensions (See Figure) .....length 170 mm,
13.5 mm diameter
(6.69 x 0.53 inches diameter)

Probe Adjustment Range .....120 mm (4.72 inches)
Probe Cable Diameter .....5.5 mm (0.22 inches)

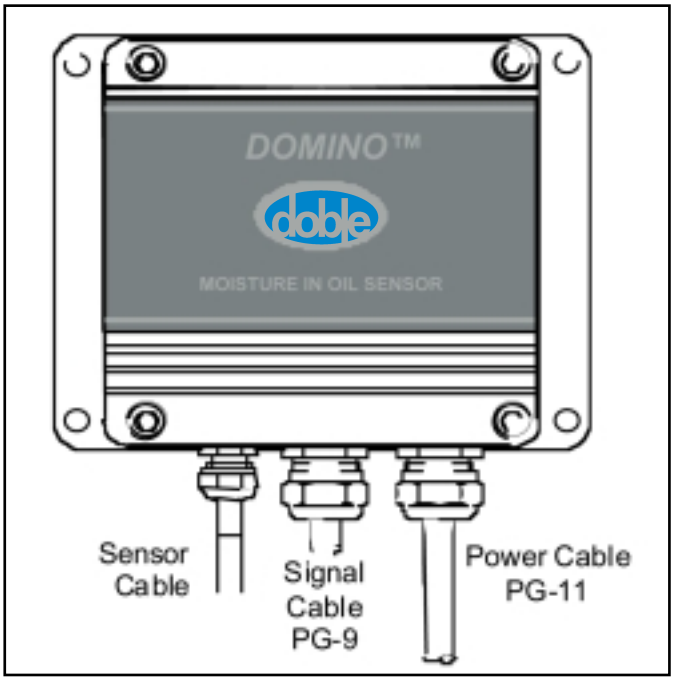
Weight of Basic Transmitter and Probe (without Display Cover
and Power Supply Module) .....1300 g (2.86 pounds)
Weight of Display Cover .....420 g (0.93 pounds)
Weight of Power Supply Module .....240 g (0.53 pounds)

Parts List:

Manual press tool
5mm hex wrench
Fitting adapter
ISO (BSPT) to MNPT adapter
Manual
Transformer Mounting Bracket*

The mounting bracket is not supplied with **DOMINO Models 165, 165-10, 264, 264-10, and PortaSampler but is also available separately.*

Cabling and Conduit Connections



Conduit Connections:
Signal Cable .....PG-9 (adapt to PG-11, convert to ½-inch NPT)
Power Cable.....PG-11 (PG-11 to ½-inch NPT)

Recommended Power Cable
(115/230V).....Two conductor with braided shield.
Cable jacket to be rated for outdoor use.
Cable diameter: 7…10 mm (0.28…0.39 inches).

Recommended Signal Cable.....Braided shield cable, AWG 20
stranded wires, 7…10 mm (0.28…0.39 inches) diameter.
Cable jacket to be rated for outdoor use.

Minimum Number of Wires Necessary for Signal Cable:
2 analog channels, serial bus, and 24 VDC power. . . . . 9 wires
2 analog channels and serial bus . . . . . 7 wires
2 analog channels and 24 VDC power . . . . . 6 wires
Serial bus and 24 VDC power. . . . . 5 wires

Recommended Plumbing Connection to Access Valve

Countries using American sized connections (United States and Canada)…Reduce to ½-inch NPT, use ***DOMINO*** supplied NPT/ISO adapter

Countries using ISO (BSPT) sized connections…Reduce to ½-14 ISO 7/1 thread (BS 21, DIN-2999, JIS B0203), use ***DOMINO*** supplied fitting body

Countries using metric sized connection…Reduce and convert from metric to either ½-inch NPT or ½-14 ISO 7/1 thread.

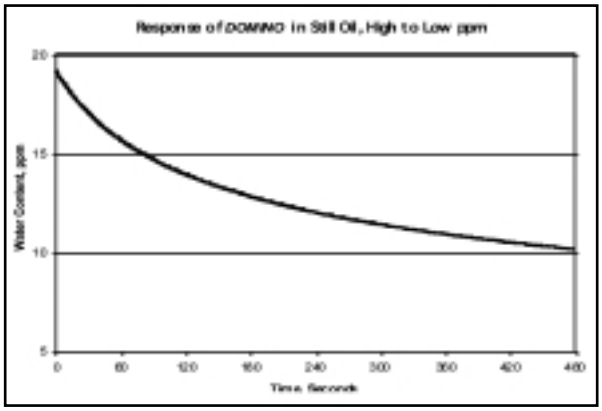
Use either brass, bronze, iron or stainless steel plumbing connections.

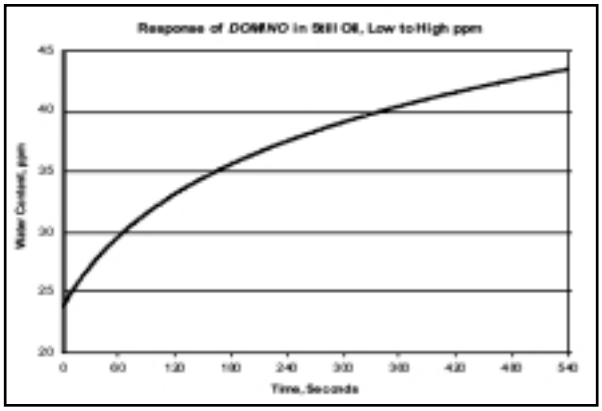
Oil Flow Rates

Maximum flow rate ***DOMINO*** probe subjected to…2271 liters per minute (600 gallons per minute)

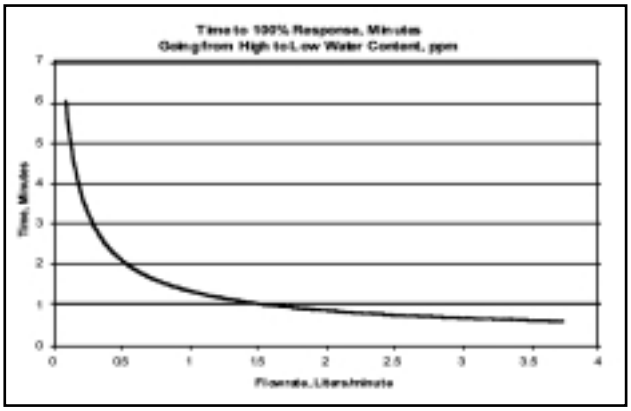
DOMINO Response Time

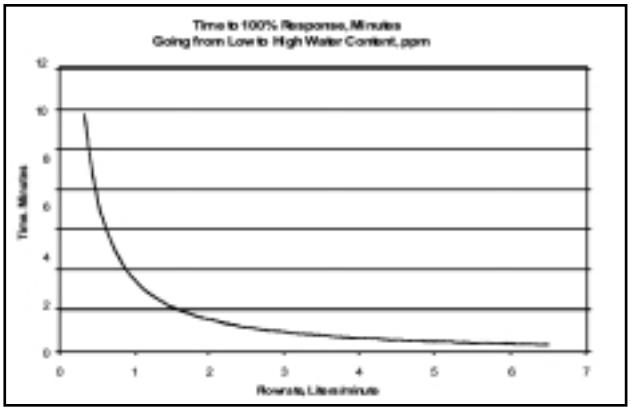
The graphs below indicate the time it takes to reach 80% of the final value and indicate the operation of the sensor in still oil. Experiments were conducted at 25 °C. As temperatures increase, the response time decreases.





The graphs below indicate the time it takes to reach 100% of the final value and indicate the operation of the sensor in flowing oil. Experiments were conducted at 25 °C. As temperatures increase, the response time decreases.





Electrical Testing

Testing performed on entire product (Transmitter, probe and cable, and 115/230V power supply where appropriate):

Test Description:	Result:
EN61000-4-8 Power Frequency Magnetic Field degree Immunity Test, Test Level: 100 amps/meter	Pass
Doble Power Frequency Magnetic Field Immunity Test, Test Level: 3200 amps/meter	Pass
Doble High Voltage Field Immunity Test, Test Level: 140 kV/meter	Pass

The following emission and immunity tests were performed according to standards EN50081-1 and EN500822-2.

Test Description:	Result:
EN55022 (class B), Radiated Interference	Pass
EN55022 (class B), Conducted Interference	Pass
EN61000-3-2, Harmonic Currents	Pass
EN61000-3-3, Voltage Fluctuations	Pass
EN61000-4-2: 1995 (criteria B), Electrostatic Discharge	Pass
EN61000-4-4: 1995 (criteria B), Electrical Fast Transients	Pass
ENV50204: 1995 (criteria A), GSM Field Immunity	Pass
ENV50140: 1993 (criteria A), RF Radiated Fields	Pass
ENV50141: 1993 (criteria A), RF Conducted Fields	Pass

Testing performed on 115/230V-power supply only loaded with 240-ohm resistor:

Test Description:	Result:
High Pot Isolation Tests, 2500 V RMS, 60 Hz for 1 minute	Pass
IEC 61000-4-2, Electrostatic Discharge Test, Contact Test at 8 kV	Pass
IEC 61000-4-5, Impulse Test, Line to Neutral	2500 V

Vibration Testing

IEC 68-2-6-Fc, 10-150 Hz Frequency	Pass

Relative Saturation\PPM

Measuring range of relative saturation .....0...100%
Accuracy (including nonlinearity and repeatability)
Maximum achievable accuracy when calibrated
against high quality, certified humidity standards.....±1% RS (0...90%)
±2% RS (90...100%)
When calibrated against salt solutions
(ASTM E 104-85) .....±2% RS (0...90%)
±3% RS (90...100%)

Concentration, calculated (parts per million) .....ppm (mg/Kg)
Response time (90 %) at +20 °C in still air
(stainless steel filter), clean sensor .....10 seconds
Sensor .....thin film polymer sensor

Temperature

Measuring Range .....-40...+180°C
Typical Accuracy of Electronics at +20 °C (+68 °F) .....±0.1°C
Typical Temperature Dependence Of Electronics .....0.005°C/°C
Temperature Sensor .....Pt 100 RTD 1/3

Pressure

Pressure Range of the
DOMINO Probe .....0…2 MPa (0…20 bar, 0…290 psi)

Vacuum Withstand Testing

Level achieved with full ***DOMINO***
probe assembly under test.....14 microns

Analog Outputs

Analog Outputs (2)
Selectable.....Scaleable within
0…20 mA, or 0…10 V

*Default setting on **DOMINO** models 161, 162, 165-10, 263, 264, 264-10, and PortaSampler is 4…20 mA. Default setting on **DOMINO** model 165 is 0…5 V*

DOMINO PortaSampler

Units with a Display

User Interface .....3 keys and 4 LEDs inside the
housing or local display keypad

Display.....2 x 16 character alphanumeric
high-contrast, wide view angle LCD

Character Height .....3.85 mm (0.15 inches)

Keyboard .....1 x 4 keypad

LCD Operating Temperature Range.....0…+50°C
LCD Readability .....-20…+50°C
LCD Survivability.....-40…+50°C

Electronics

Connections.....screw terminals, 0.5 mm2 (22 AWG),
stranded wire recommended

Operating Voltage .....24 VDC (20...28 V)
115/230 VAC with power supply module (90…132 V, 187…264 V)

Frequency Range .....47…63 Hz

Operating Power Consumption.....100 mA maximum
(24 VDC, 90…132 V, 187…264 V)

Power-up Power Consumption .....300 mA maximum
(24 VDC, 90…132 V, 187…264 V)

Recommended External Load for Current Outputs .....<500 W
0...1 V Voltage Output .....>2 kW (to ground)
0...5 And 0...10 V Voltage Outputs.....>10 kW (to ground)

Operating Temperature (Electronics) .....-40...+60°C
With Display Cover.....-20...+50°C
With Power Supply Module .....-40...+45°C
Storage Temperature.....-40...+70°C

Warranty

Product will be free of defects in workmanship and material for a period of one-year from the date of purchase.

All ***DOMINO*** sensors are CE Marked

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DOMINO