

Important Transducers Formulas PDF



Formulas Examples with Units

List of 24 Important Transducers Formulas

1) Area of Detector Formula ↻

Formula

$$A = \frac{D_n^2}{D_t^2 \cdot \Delta f}$$

Example with Units

$$4.2314 \text{ m}^2 = \frac{2^2}{1.375^2 \cdot 0.5 \text{ Hz}}$$

Evaluate Formula ↻

2) Capacitance of Amplifier Formula ↻

Formula

$$C_{\text{amp}} = C_g - C_t - C_{\text{cable}}$$

Example with Units

$$0.04 \text{ F} = 0.08 \text{ F} - 0.03 \text{ F} - 0.01 \text{ F}$$

Evaluate Formula ↻

3) Capacitance of Cable Formula ↻

Formula

$$C_{\text{cable}} = C_g - (C_t + C_{\text{amp}})$$

Example with Units

$$0.01 \text{ F} = 0.08 \text{ F} - (0.03 \text{ F} + 0.04 \text{ F})$$

Evaluate Formula ↻

4) Capacitance of Transducer Formula ↻

Formula

$$C_t = C_g - (C_{\text{amp}} + C_{\text{cable}})$$

Example with Units

$$0.03 \text{ F} = 0.08 \text{ F} - (0.04 \text{ F} + 0.01 \text{ F})$$

Evaluate Formula ↻

5) Change in Irradiation Formula ↻

Formula

$$\Delta H = \frac{\Delta R}{\Delta S}$$

Example with Units

$$30.1724 \text{ W/m}^2 = \frac{35 \Omega}{1.16}$$

Evaluate Formula ↻

6) Change in Resistance Formula ↻

Formula

$$\Delta R = \Delta H \cdot \Delta S$$

Example with Units

$$34.8 \Omega = 30 \text{ W/m}^2 \cdot 1.16$$

Evaluate Formula ↻

7) Current Generator Capacitance Formula ↻

Formula

$$C_g = C_t + C_{\text{amp}} + C_{\text{cable}}$$

Example with Units

$$0.08 \text{ F} = 0.03 \text{ F} + 0.04 \text{ F} + 0.01 \text{ F}$$

Evaluate Formula ↻



8) Detectivity Formula

Formula

$$D_t = \frac{R_d}{E_n}$$

Example with Units

$$1.3752 = \frac{15.1_{A/W}}{10.98_v}$$

Evaluate Formula 

9) Detectivity of Transducer Formula

Formula

$$D_t = \frac{snr}{D}$$

Example with Units

$$1.3774 = \frac{15}{10.89_m}$$

Evaluate Formula 

10) Efficiency of transducer Formula

Formula

$$\eta_{tr} = \frac{\Delta T}{\Delta T_{rise}}$$

Example with Units

$$1.25 = \frac{20_k}{16_k}$$

Evaluate Formula 

11) Input Signal of Transducer Formula

Formula

$$D = \frac{V_o}{R_t}$$

Example with Units

$$10.896_m = \frac{18.85_v}{1.73_{V/m}}$$

Evaluate Formula 

12) Noise Equivalent of Bandwidth Formula

Formula

$$\Delta f = \frac{D_n^2}{D_t^2 \cdot A}$$

Example with Units

$$0.5037_{Hz} = \frac{2^2}{1.375^2 \cdot 4.2_{m^2}}$$

Evaluate Formula 

13) Normalized Detectivity Formula

Formula

$$D_n = (A \cdot \Delta f)^{0.5} \cdot D_t$$

Example with Units

$$1.9926 = (4.2_{m^2} \cdot 0.5_{Hz})^{0.5} \cdot 1.375$$

Evaluate Formula 

14) Output Signal of Transducer Formula

Formula

$$V_o = D \cdot R_t$$

Example with Units

$$18.8397_v = 10.89_m \cdot 1.73_{V/m}$$

Evaluate Formula 

15) Responsivity of Detector Formula

Formula

$$R_d = \frac{V_{rms}}{P_{rms}}$$

Example with Units

$$15.1111_{A/W} = \frac{81.6_v}{5.4_w}$$

Evaluate Formula 



16) Responsivity of Transducer Formula ↻

Formula

$$R_t = \frac{V_o}{D}$$

Example with Units

$$1.7309 \text{ v/m} = \frac{18.85 \text{ v}}{10.89 \text{ m}}$$

Evaluate Formula ↻

17) Rise in Temperature Formula ↻

Formula

$$\Delta T_{\text{rise}} = \frac{\Delta T}{\eta_{\text{tr}}}$$

Example with Units

$$16 \text{ K} = \frac{20 \text{ K}}{1.25}$$

Evaluate Formula ↻

18) RMS Incident Power of Detector Formula ↻

Formula

$$P_{\text{rms}} = \frac{V_{\text{rms}}}{R_d}$$

Example with Units

$$5.404 \text{ W} = \frac{81.6 \text{ V}}{15.1 \text{ A/W}}$$

Evaluate Formula ↻

19) RMS Noise Voltage of Cell Formula ↻

Formula

$$E_n = \frac{R_d}{D_t}$$

Example with Units

$$10.9818 \text{ V} = \frac{15.1 \text{ A/W}}{1.375}$$

Evaluate Formula ↻

20) RMS output Voltage Detector Formula ↻

Formula

$$V_{\text{rms}} = R_d \cdot P_{\text{rms}}$$

Example with Units

$$81.54 \text{ V} = 15.1 \text{ A/W} \cdot 5.4 \text{ W}$$

Evaluate Formula ↻

21) Sensitivity of LVDT Formula ↻

Formula

$$S_{\text{lvdt}} = \frac{V_o}{D}$$

Example with Units

$$1.7309 \text{ v/m} = \frac{18.85 \text{ v}}{10.89 \text{ m}}$$

Evaluate Formula ↻

22) Sensitivity of Photoresistive Transducer Formula ↻

Formula

$$\Delta S = \frac{\Delta R}{\Delta H}$$

Example with Units

$$1.1667 = \frac{35 \Omega}{30 \text{ W/m}^2}$$

Evaluate Formula ↻

23) Size of Output Signal Formula ↻

Formula

$$V = \frac{\text{snr}}{D_t}$$

Example with Units

$$10.9091 \text{ V} = \frac{15}{1.375}$$

Evaluate Formula ↻



24) Temperature Difference Formula

Formula

$$\Delta T = \Delta T_{\text{rise}} \cdot \eta_{\text{tr}}$$

Example with Units

$$20\text{ K} = 16\text{ K} \cdot 1.25$$

Evaluate Formula 



Variables used in list of Transducers Formulas above

- **A** Detector Area (Square Meter)
- **C_{amp}** Amplifier Capacitance (Farad)
- **C_{cable}** Cable Capacitance (Farad)
- **C_g** Current Generator Capacitance (Farad)
- **C_t** Transducer Capacitance (Farad)
- **D** Input Displacement Signal (Meter)
- **D_n** Normalized Detectivity
- **D_t** Transducer Detectivity
- **E_n** Root Mean Square Noise Voltage of Cell (Volt)
- **P_{rms}** Root Mean Square Incident Power of Detector (Watt)
- **R_d** Detector Responsivity (Ampere per Watt)
- **R_t** Transducer Responsivity (Volt per Meter)
- **S_{lvdt}** LVDT Sensitivity (Volt per Meter)
- **snr** Signal to Noise Ratio of Output Signal
- **V** Output Signal Size (Volt)
- **V_o** Transducer Output Signal (Volt)
- **V_{rms}** Root Mean Square Voltage Output (Volt)
- **Δf** Noise Equivalent Bandwidth (Hertz)
- **ΔH** Irradiation Change (Watt per Square Meter)
- **ΔR** Resistance Change (Ohm)
- **ΔS** Photoresistive Transducer Sensitivity
- **ΔT** Temperature Difference (Kelvin)
- **ΔT_{rise}** Temperature Rise (Kelvin)
- **η_{tr}** Transducer Efficiency

Constants, Functions, Measurements used in list of Transducers Formulas above

- **Measurement: Length** in Meter (m)
Length Unit Conversion 
- **Measurement: Temperature** in Kelvin (K)
Temperature Unit Conversion 
- **Measurement: Area** in Square Meter (m²)
Area Unit Conversion 
- **Measurement: Power** in Watt (W)
Power Unit Conversion 
- **Measurement: Frequency** in Hertz (Hz)
Frequency Unit Conversion 
- **Measurement: Capacitance** in Farad (F)
Capacitance Unit Conversion 
- **Measurement: Electric Resistance** in Ohm (Ω)
Electric Resistance Unit Conversion 
- **Measurement: Temperature Difference** in Kelvin (K)
Temperature Difference Unit Conversion 
- **Measurement: Electric Field Strength** in Volt per Meter (V/m)
Electric Field Strength Unit Conversion 
- **Measurement: Electric Potential** in Volt (V)
Electric Potential Unit Conversion 
- **Measurement: Potential Gradient** in Volt per Meter (V/m)
Potential Gradient Unit Conversion 
- **Measurement: Irradiation** in Watt per Square Meter (W/m²)
Irradiation Unit Conversion 
- **Measurement: Responsivity** in Ampere per Watt (A/W)
Responsivity Unit Conversion 



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