

# Reading Error Worksheet

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*Uncertainty Analysis for Engineers and Scientists: A Practical Guide*  
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This worksheet guides the user through the determination of the standard reading error and 95% confidence limits for the reading of a scale or from a digital readout. The standard reading error  $e_{s,reading}$  may be used in propagation of error calculations of derived quantities.

Device name:			
Measured Quantity: (give symbol)			
Representative value:		(include units)	Quantity, or Not Applicable
issue	contribution to error		
Reading error, $e_R$ :	<i>Sensitivity</i> (from manufacturer or rule of thumb)	How much signal does it take to cause the reading to change?	1
	<i>Resolution</i> : limitation on marked scale or digital readout	Half smallest division or decimal place	2
	<i>Fluctuations</i> with time of observation	(max-min)/2	3
		Maximum of 1, 2, & 3:	$e_R =$
Standard reading error:		$e_{s,reading} = e_R/\sqrt{3}$	$e_s =$ (units)
		95% level of confidence based on reading error:	$\pm 2e_s =$ (units)

*Note:* If a quantity is supplied by, for example, a manufacturer, with no indication of the uncertainty, we do not use this worksheet. Instead, see the Calibration Error worksheet.

*Rule of thumb for sensitivity:* 1 (optimistic) or 15 (pessimistic) times the last retained digit. The optimistic choice assumes any minor change is sensed; the pessimistic choice assumes that the manufacturer has displayed two uncertain digits.