Instrument Accuracy: % of Span vs % of Reading

Error band of an instrument from an accuracy given as a percentage of span, of full scale or of reading, at a reading, and the error as a share of the reading.

Method: Definitions of accuracy classes (IEC 60770, ISA-51.1 terminology)

Input parameters

Unit system: SI

Parameter	Value	Unit
Lower range value	0	
Upper range value	100.00	
Reading	20.000	
Accuracy as a share of span	0.50000	%
Accuracy as a share of reading	0.50000	%

Calculated results

Parameter	Value	Unit
Error band by % of span (±)	0.50000	
Error band by % of reading (±)	0.10000	
Span accuracy as a share of the reading	2.5000	%

Notes for this case

- A %-of-span instrument is far less accurate at the bottom of its range: choose the range so normal readings are in the upper half.

Formula and method

$$e_s = a_s\,(x_{hi} - x_{lo}), \quad e_r = a_r\,|x|$$

Variables

x_{lo}	Lower range value	-
x_{hi}	Upper range value	-
x	Reading	-
a_s	Accuracy as a share of span	-
a_r	Accuracy as a share of reading	-
e_s	Error band by % of span (±)	-
e_r	Error band by % of reading (±)	-
e_s/x	Span accuracy as a share of the reading	-

Method and standards

Definitions.

Assumptions and limits

- Accuracy statement only; at a zero reading the relative value is not shown.

References

- Definitions of accuracy classes (IEC 60770, ISA-51.1 terminology)

Report details

Report reference	FCC-ZD1R-S9Y6 (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/instrumentation/signals-calibration/instrument-accuracy-span-reading

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.