Pressure Transmitter Total Probable Error (TPE)

Total probable error of a pressure or DP transmitter from reference accuracy, ambient temperature effect and static pressure effect, combined by root sum square.

Method: Root-sum-square combination of specification errors

Input parameters

Unit system: SI

Parameter	Value	Unit
Upper range limit	62.000	kPa
Calibrated span	25.000	kPa
Reference accuracy (% of span)	0.065000	%
Temperature effect, URL part per 28 K	0.025000	%
Temperature effect, span part per 28 K	0.12500	%
Ambient change from calibration	28.000	K
Static pressure zero effect per 69 bar (% URL)	0.10000	%
Line static pressure	69.000	bar

Calculated results

Parameter	Value	Unit
Temperature effect (% span)	0.18700	%
Static pressure effect (% span)	0.24800	%
Total probable error (% span)	0.31733	%
Total probable error	0.079332	kPa
Worst case (arithmetic sum, % span)	0.50000	%

Notes for this case

• Manufacturer specifications give a reference accuracy (% span), an ambient temperature effect as (a % URL + b % span) per 28 K (50 °F), and a static pressure zero effect in % URL per 69 bar (1,000 psi). Each is converted to % of calibrated span and combined by root sum square: TPE = √(e_ref² + e_T² + e_SP²). Turning a high-URL transmitter down to a small span magnifies the URL-based terms. Span effects of static pressure that are calibrated out are excluded; long-term stability can be added as another term.

Formula and method

$$e_T = \left(a_T \frac{URL}{S} + b_T\right)\frac{\Delta T}{28}, \quad e_{SP} = z_p \frac{URL}{S}\frac{p_{st}}{69\ \text{bar}}, \quad TPE = \sqrt{e_{ref}^2 + e_T^2 + e_{SP}^2}$$

Variables

URL	Upper range limit	Pa
S	Calibrated span	Pa
e_{ref}	Reference accuracy (% of span)	-
a_T	Temperature effect, URL part per 28 K	-
b_T	Temperature effect, span part per 28 K	-
ΔT	Ambient change from calibration	K
z_p	Static pressure zero effect per 69 bar (% URL)	-
p_{st}	Line static pressure	Pa
e_T	Temperature effect (% span)	-
e_{SP}	Static pressure effect (% span)	-

TPE	Total probable error (% span)	-
e_{max}	Worst case (arithmetic sum, % span)	-

Method and standards

Total probable error.

Assumptions and limits

- Independent errors; specifications quoted as described.

References

Root-sum-square combination of specification errors

Report details

Report reference	FCC-ARPX-Z41Y (the same inputs always give the same reference)
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Calculator	Pressure Transmitter Total Probable Error (TPE)
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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/transmitter-total-probable-error

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.