

ISO 12242:2012-07 (E)

Measurement of fluid flow in closed conduits - Ultrasonic transit-time meters for liquid

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
3.1	Quantities	1
3.2	Meter design	2
3.3	Thermodynamic conditions	3
3.4	Statistics	3
3.5	Calibration	5
3.6	Symbols and subscripts	5
3.7	Abbreviated terms	7
4	Principles of measurement	7
4.1	Description	7
4.2	Volume flow	9
4.3	Generic description	10
4.4	Time delay considerations	11
4.5	Refraction considerations	14
4.6	Reynolds number	15
4.7	Temperature and pressure correction	15
5	Performance requirements	15
6	Uncertainty in measurement	16
6.1	Introduction	16
6.2	Evaluation of the uncertainty components	16
7	Installation	18
7.1	General	18
7.2	Use of a prover	19
7.3	Calibration in a laboratory or use of a theoretical prediction procedure	19
7.4	Additional installation effects	21
8	Test and calibration	22
8.1	General	22
8.2	Individual testing -- Use of a theoretical prediction procedure	22
8.3	Individual testing -- Flow calibration under flowing conditions	23
9	Performance testing	24
9.1	Introduction	24
9.2	Repeatability and reproducibility	25
9.3	Additional test for meters with externally mounted transducers	25
9.4	Assessing the uncertainty of a meter whose performance is predicted using a theoretical prediction procedure	26
9.5	Fluid-mechanical installation conditions	26
9.6	Path failure simulation and exchange of components	27

10	Meter characteristics	27
10.1	Meter body, materials, and construction	27
10.2	Transducers	29
10.3	Electronics	29
10.4	Software	30
10.5	Exchange of components	31
10.6	Determination of density and temperature	31
11	Operational practice	32
11.1	General	32
2012	11.2 Audit process	32
11.3	Operational diagnostics	34
11.4	Audit trail during operation; inter-comparison and inspection	36
11.5	Recalibration	37
	Annex A (normative) Temperature and pressure correction	42
	Annex B (informative) Effect of a change of roughness	48
	Annex C (informative) Example of uncertainty calculations	52
	Annex D (informative) Documents	65
	Bibliography	67