

# DIN EN ISO 5167-1:2023-08 (E)

## Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements (ISO 5167-1:2022)

---

<b>Contents</b>		<b>Page</b>
<b>European foreword</b> .....		4
<b>Foreword</b> .....		5
<b>Introduction</b> .....		6
<b>1</b>	<b>Scope</b> .....	7
<b>2</b>	<b>Normative references</b> .....	7
<b>3</b>	<b>Terms and definitions</b> .....	7
3.1	Pressure measurement .....	8
3.2	Primary devices .....	8
3.3	Flow .....	9
<b>4</b>	<b>Symbols and subscripts</b> .....	12
4.1	Symbols .....	12
<b>5</b>	<b>Principle of the method of measurement and computation</b> .....	13
5.1	Principle of the method of measurement .....	13
5.2	Method of determination of the required diameter ratio for the selected standard primary device .....	14
5.3	Computation of flow rate .....	14
5.4	Determination of density, pressure and temperature .....	14
5.4.1	General .....	14
5.4.2	Density .....	15
5.4.3	Static pressure .....	15
5.4.4	Temperature .....	15
5.5	Differential pressure flow measurement system .....	16
5.5.1	General .....	16
5.5.2	Primary device .....	17
5.5.3	Impulse lines and transmitters .....	18
5.5.4	Impulse line isolation valves and valve manifolds .....	18
5.5.5	Flow computer .....	18
5.6	Differential pressure flow measurement system design considerations .....	18
5.6.1	Flow rate turndown and stacked transmitters .....	18
5.6.2	Meter calibration .....	18
5.6.3	Permanent pressure loss .....	19
5.6.4	Diagnostics and meter verification .....	20
5.6.5	Overall uncertainty of differential pressure metering system .....	20
<b>6</b>	<b>General requirements for the measurements</b> .....	20
6.1	Primary device .....	20
6.2	Nature of the fluid .....	21
6.3	Flow conditions .....	21
<b>7</b>	<b>Installation requirements</b> .....	21
7.1	General .....	21
7.2	Minimum upstream and downstream straight lengths .....	23
7.3	General requirement for flow conditions at the primary device .....	23
7.3.1	Requirement .....	23
7.3.2	Swirl-free conditions .....	23
7.3.3	Good velocity profile conditions .....	23
7.4	Flow conditioners .....	23
7.4.1	Compliance testing .....	23
7.4.2	Specific test .....	26

<b>8</b>	<b>Uncertainties on the measurement of flow rate</b> .....	<b>26</b>
8.1	General.....	26
8.2	Definition of uncertainty.....	26
8.3	Practical computation of the uncertainty .....	27
8.3.1	Component uncertainties.....	27
8.3.2	Practical working formula.....	27
<b>Annex A</b>	<b>(informative) Iterative computations</b> .....	<b>30</b>
<b>Annex B</b>	<b>(informative) Examples of values of the pipe wall uniform equivalent roughness, <math>k_d</math></b> .....	<b>32</b>
<b>Annex C</b>	<b>(informative) Flow conditioners and flow straighteners</b> .....	<b>33</b>
<b>Annex D</b>	<b>(informative) Differential pressure transmitters, flow range and turndown</b> .....	<b>35</b>
<b>Annex E</b>	<b>(informative) Example of uncertainty calculation for a differential pressure device</b> .....	<b>42</b>
<b>Annex F</b>	<b>(informative) Permanent pressure loss example</b> .....	<b>46</b>
<b>Bibliography</b>	.....	<b>48</b>