

# ISO/TR 52016-4:2024-10 (E)

## Energy performance of buildings - Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads - Part 4: Explanation and justification of ISO 52016-3

<b>Contents</b>		<b>Page</b>
Foreword.....		v
Introduction.....		vi
<b>1</b>	<b>Scope.....</b>	<b>1</b>
<b>2</b>	<b>Normative references.....</b>	<b>1</b>
<b>3</b>	<b>Terms and definitions.....</b>	<b>1</b>
<b>4</b>	<b>Symbols, subscripts and abbreviations.....</b>	<b>1</b>
4.1	Symbols.....	1
4.2	Subscripts.....	2
4.3	Abbreviated terms.....	2
<b>5</b>	<b>Description of the method.....</b>	<b>2</b>
5.1	Output of the method.....	2
5.2	General description of the method.....	2
5.2.1	General.....	2
5.2.2	Distinction between ISO 52016-3 and ISO 52016-1.....	3
5.2.3	Successive steps in the calculation procedures.....	3
5.3	Technologies covered in ISO 52016-3.....	3
5.3.1	General.....	3
5.3.2	Building envelope elements with dynamic solar shading.....	3
5.3.3	Building envelope elements with chromogenic glazing.....	6
5.3.4	Building envelope elements with an actively ventilated cavity.....	6
5.3.5	Types of adaptive building envelope elements not covered in ISO 52016-3.....	9
5.4	Control scenarios.....	10
<b>6</b>	<b>Calculation method.....</b>	<b>11</b>
6.1	Output data.....	11
6.2	Calculation time intervals.....	11
6.3	Input data.....	12
6.3.1	General.....	12
6.3.2	Input data of a simplified adaptive building envelope element.....	12
6.3.3	Input data of a detailed adaptive building envelope element.....	12
6.3.4	Control related input data.....	12
6.3.5	Climatic input data.....	13
6.3.6	Constants and physical data.....	13
6.3.7	Input data from <a href="#">Annex A</a> and <a href="#">Annex B</a> .....	13
6.4	Properties of the adaptive building envelope element.....	13
6.4.1	General.....	13
6.4.2	Simplified or detailed adaptive building envelope element.....	15
6.4.3	Properties of a simplified adaptive building envelope element.....	15
6.4.4	Model and properties of a detailed adaptive building envelope element.....	16
6.5	Connection of the model of the adaptive building envelope element to the model of the thermal zone of ISO 52016-1.....	17
6.6	Selection of control type.....	17
6.7	Modelling of the control of the environmentally activated adaptive building envelope element.....	17
6.8	Modelling of the control scenario for the actively controlled adaptive building envelope element.....	18
6.8.1	General.....	18
6.8.2	Selection of conditions and events.....	18

6.8.3	Selection of sensors.....	19
6.8.4	Selection of methods to identify the conditions or events.....	19
6.8.5	Basic rules for the reference control scenario.....	21
6.8.6	Modelling of the user behaviour.....	22
6.8.7	Reference control scenarios.....	22
6.9	Hourly calculation procedures.....	25
6.10	Post-processing —Performance characteristics.....	25
6.10.1	General.....	25
6.10.2	Thermal comfort score.....	25
6.10.3	Statistics on the use of the different states of the adaptive building envelope element.....	26
<b>7</b>	<b>Quality control.....</b>	<b>26</b>
<b>8</b>	<b>Conformity check.....</b>	<b>26</b>
<b>9</b>	<b>Worked out examples.....</b>	<b>27</b>
9.1	General.....	27
9.2	Purpose.....	27
9.3	Spreadsheet tool.....	27
9.4	Calculation cases.....	27
9.4.1	General.....	27
9.4.2	Building types.....	28
9.4.3	Climates.....	29
9.4.4	Operation and use profile.....	29
9.4.5	Selected adaptive building envelope elements.....	30
9.4.6	Control of adaptive building envelope elements.....	30
9.5	Overview of selected cases and variants.....	30
9.6	Results.....	31
9.7	Conclusions.....	39
9.7.1	General.....	39
9.7.2	Limitations of the spreadsheet tool and example cases.....	39
<b>10</b>	<b>Validation of the calculation procedures.....</b>	<b>40</b>
<b>Annex A (informative) ISO 52016-3 input and method selection data sheet — Template.....</b>		<b>41</b>
<b>Annex B (informative) ISO 52016-3 input and method selection data sheet — Default choices.....</b>		<b>42</b>
<b>Annex C (informative) Reference control scenarios for adaptive building envelope elements with dynamic solar shading or chromogenic glazing.....</b>		<b>43</b>
<b>Annex D (informative) Basic study reference control strategies.....</b>		<b>74</b>
<b>Annex E (informative) Hourly thermal balance model of ISO 52016-1 and the connected adaptive building envelope element.....</b>		<b>82</b>
<b>Bibliography.....</b>		<b>92</b>