

# INTERNATIONAL STANDARD

# ISO 14661

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**AMENDMENT 1**  
2002-11-01

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## Thermal turbines for industrial applications (steam turbines, gas expansion turbines) — General requirements —

AMENDMENT 1: Data sheets for thermal  
turbines for industrial applications

iTeh **STANDARD PREVIEW**

*Turbines thermiques pour applications industrielles (turbines à vapeur,  
turbines à dilatation de gaz) — Prescriptions générales —*

*AMENDEMENT 1: Feuilles de données pour turbines thermiques pour  
applications industrielles*

<https://standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3bf59775/iso-14661-2000-amd-1-2002>



Reference number  
ISO 14661:2000/Amd.1:2002(E)

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this Amendment may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

Amendment 1 to International Standard ISO 14661:2000 was prepared by Technical Committee ISO/TC 208, *Thermal turbines for industrial application (steam turbines, gas expansion turbines)*.

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# Thermal turbines for industrial applications (steam turbines, gas expansion turbines) — General requirements

## AMENDMENT 1: Data sheets for thermal turbines for industrial applications

*Page v, Foreword*

Replace the last sentence with the following: "Annexes A to D are for information only."

*Page 63*

Add the following data sheets as annex D, before the Bibliography.

*Page 72*

Add the following references to the Bibliography.

- STANDARD PREVIEW  
(standards.iteh.ai)
- [198] ISO 8068, *Petroleum products and lubricants — Petroleum lubricating oils for turbines (categories ISO-L-TSA and ISO-L-TGA) — Specifications*
- [199] ISO 9084, *Calculation of load capacity of spur and helical gears — Application to high speed gears and gears of similar requirements*  
standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3bf59775/iso-14661-2000-amd-1-2002
- [200] IEC 60045-1, *Steam turbines — Part 1: Specifications*
- [201] IEC 60079-0, *Electrical apparatus for explosive gas atmospheres — Part 0: General requirements*

## Table of Contents of annex D

Data Sheet No.	
D.1	Table of Contents of Annex D
D.2	Table of Contents of Annex D ( <i>continued</i> )
D.3	Instructions for Use of the Data Sheets
D.4	List of Data Sheets for the Order/Tender
D.5	List of Data Sheets for the Order/Tender ( <i>continued</i> )
D.6	General Information
D.7	Operating Conditions
D.8	Extreme Operating Conditions
D.9	Special Data for Gas Expansion Turbines
D.10	Fundamental Arrangement of Machines / Direction of Rotation
D.11	Site, Climate, Installation and Erection Data
D.12	Utility Data
D.13	Utility Data ( <i>continued</i> )
D.14	Turbine Casing(s) and Pipe Connections: Forces, Moments, Movements
D.15	Continuing: Working Fluid Connections
D.16	Design features of turbine: General
D.17	Continuing: Materials
D.18	Continuing: Bearings and bearing housings
D.19	Continuing: Shaft seals
D.20	Rotordynamics
D.21	Baseframe (Baseplate) and Soleplates
D.22	Gear units
D.23	Gear units ( <i>continued</i> )
D.24	Gear units ( <i>continued</i> )
D.25	Couplings
D.26	Couplings ( <i>continued</i> )
D.27	Rotor Turning Device
D.28	Piping at the Limit of Supply (Except Oil Piping)
D.29	Continuation of Table D.28 ( <i>continued</i> )
D.30	Condensing Plant
D.31	Gland Steam or Gas System
D.32	Gland Steam or Gas Exhaust System
D.33	Lubricant, Control Fluid and Seal Fluid Systems: Arrangement, General Data, Pumps
D.34	Pumps ( <i>continued</i> )
D.35	Filters, Accumulators ( <i>continued</i> )
D.36	Plate-type Coolers ( <i>continued</i> )

## D.1

Data Sheet No.	
D.37	Tube-type Coolers ( <i>continued</i> )
D.38	Reservoirs ( <i>continued</i> )
D.39	Vapour Extractor, Vapour Separator ( <i>continued</i> )
D.40	Purification System, Jacking Oil Device ( <i>continued</i> )
D.41	Governing system: General Data
D.42	Minimum Input/Output Requirements ( <i>continued</i> )
D.43	Installation, Control Panel, Speed Setpoint Signal, Speed Sensors ( <i>continued</i> )
D.44	Control Valve(s), Electro-hydraulic Converter(s) ( <i>continued</i> )
D.45	Monitoring, Limiting, and Protecting Devices: Stop Valve(s), Strainer(s)
D.46	Devices against Backflow ( <i>continued</i> )
D.47	Overspeed Trip System ( <i>continued</i> )
D.48	Overpressure Protecting Systems ( <i>continued</i> )
D.49	Extent and Functions (Working Fluid System) ( <i>continued</i> )
D.50	Extent and Functions (Lubricating and Control Fluid System) ( <i>continued</i> )
D.51	Extent and Functions (Miscellaneous Systems) ( <i>continued</i> )
D.52	Extent and Functions (Position Measurements) ( <i>continued</i> )
D.53	Material Tests and Inspections: Turbine Components
D.54	Piping ( <i>continued</i> )
D.55	Further Tests and Inspections: Turbine Components
D.56	Mechanical Running Test at the Shop
D.57	Miscellaneous Further Tests and Inspections
D.58	Preparation for Shipment and Storage: Paint Coating, Preservation
D.59	Packing, Storage at Site ( <i>continued</i> )
D.60	(Blank data sheet without title, Title to insert, if necessary)

## D.2

## Annex D (informative)

### Data sheets for thermal turbines for industrial applications

Typical examples of “Data sheets for thermal turbines for industrial applications” are shown in this annex, in which the title of each data sheet is abbreviated as “Data Sheets for Industrial-type Turbines”.

#### Instructions for the use of the data sheets

The set of data sheets is conceived in such a manner that the blank forms can be used for all three steps of a project (first step: Tender; second step: Purchasing; third step: As-built documentation). The information about which step a set of data sheets is related to is to be marked on sheet D.6, line 13. The relation of the individual data sheet to the cover sheet is to be seen by means of the dates written at the foot of each individual data sheet.

For a proper functioning of the system, it is important that each step of the project begin with new originals. By doing this, it is ensured that the last revision documents the final state of the project step in concerned. This is valid for each data sheet.

The complete table of contents (data sheets D.1 and D.2) is a listing of all existing data sheets. Because of the fact that each individual data sheet is not necessary in each case, and that it may happen that one certain data sheet dealing with a certain topic offers insufficient space (e.g. more extractions than provided for on the blank), a page numbering besides the numbering of the blank forms is necessary. For this reason the tender/order related table of contents (D.4 and D.5) presents a column named “Page(s)”, where the consecutive numbering of the pages used has to be written down. This numbering has to be transformed to the individual pages (found at the head of each page the right side). By doing this, the user of the data sheets always has control of the completeness of the data sheets on hand.

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To ensure the topicality of the state of revision, and to enable control of this, the table of contents presents a column named “Rev” (revisions).


The state of revision of each individual data sheet has to be transferred to the table of contents.

The provisions, as described above, result in a complete survey and the possibility of control of the state of the data sheets of a project.

With respect to quality management (ISO 9001), each data sheet has to be signed by the person in charge of the project. The check of the correct selection of data sheets and of the correct contents shall be attested by a signature on the data sheets D.4 and D.5. The same is valid for the release of the data sheets.

To do his job, the supplier needs a minimum of information from the purchaser. This information is marked as a uniformly grey background on the data sheets. There are some, rather rare, cases where it is not possible to state on the blank data sheets at this early stage, whether the purchaser or the supplier should give the information. If, for a certain project, this information is to be given by the purchaser, then it has to be given to the supplier together with the starting information. The data fields concerned are marked on the data sheets by a grey shading, consisting of numerous vertical lines:

 uniformly grey background;

 grey shaded by vertical lines.

To obtain a general view of the data sheets concerned, look at the table of contents. In this table the data sheets concerned are marked in the column “Data Sheet No.” by grey shading.

#### D.3



These data sheets contain a maximum of data. Nevertheless, it may happen in exceptional cases that additional data are necessary. In most of the cases only a fraction of the data listed in the data sheets is really necessary, because the purchaser may not be interested or because those data are already embodied in other documents.

Therefore the following is valid.

At the tender, only rather few data are available for the supplier, and the purchaser needs also only rather few data. Therefore it is intended that the purchaser mark the data required by him in the tender on the data sheets by putting an "X" at the place where the required data are designated, in the column "Info". The data sheets concerned should be marked in the same manner on the table of contents.

The same applies analogously to the states of purchasing and as-built documentation. It is strongly recommended that the purchaser and supplier agree upon the extent of data to be documented on the data sheets.

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Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES							Rev.
	List of Data Sheets for the Tender/Order						Page: of:	
Purchaser:	Project:			Supplier:				
Ref. No.	Ref. No.			Ref. No.				
Data Sheet No.	C o n t e n t s						Page(s)	
D.1	Table of Contents of annex D							
D.2	Table of Contents of annex D (continued)							
D.3	Instructions for Use of the Data Sheets							
D.4	List of Data Sheets for the Tender/Order							
D.5	List of Data Sheets for the Tender/Order (continued)							
D.6	General Information							
D.7	Operating Conditions							
D.8	Extreme Operating Conditions							
D.9	Special Data for Gas Expansion Turbines							
D.10	Fundamental Arrangement of Machines / Direction of Rotation							
D.11	Site, Climate, Installation and Erection Data							
D.12	Utility Data							
D.13	Utility Data (continued)							
D.14	Turbine Casing(s) and Pipe Connections: Forces, Moments, Movements							
D.15	Working Fluid Connections (continued)							
D.16	Design features of turbine: General							
D.17	Materials (continued)							
D.18	Bearings and bearing housings (continued)							
D.19	Shaft seals (continued)							
D.20	Rotordynamics							
D.21	Baseframe (Baseplate) and Soleplates							
D.22	Gear units							
D.23	Gear units (continued)							
D.24	Gear units (continued)							
D.25	Couplings <a href="https://standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3b59775/iso-14661-2000-amd-1-2002">https://standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3b59775/iso-14661-2000-amd-1-2002</a>							
D.26	Couplings (continued)							
D.27	Rotor Turning Device							
D.28	Piping at the Limit of Supply (Except Oil Piping)							
D.29	Table D.28 (continued)							
D.30	Condensing Plant							
D.31	Gland Steam or Gas System							
D.32	Gland Steam or Gas Exhaust System							
D.33	Lubricant, Control Fluid and Seal Fluid Systems: Arrangement, General Data, Pumps							
D.34	Pumps (continued)							
D.35	Filters, Accumulators (continued)							
D.36	Plate-type Coolers (continued)							
D.37	Tube-type Coolers (continued)							
D.38	Reservoirs (continued)							
D.39	Vapour Extractor, Vapour Separator (continued)							
D.40	Purification System, Jacking Oil Device (continued)							
D.41	Governing system: General Data							
D.42	Minimum Input/Output Requirements (continued)							
D.43	Installation, Control Panel, Speed Setpoint Signal, Speed Sensors (continued)							
D.44	Control Valve(s), Electro-hydraulic Converter(s) (continued)							
The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.								
Revision	Original	A	B	C	D	E	F	G
Prepared								
Checked								
Proofed								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES								Rev.
	List of Data Sheets for the Tender/Order (Continued)						Page:	of:	
	Purchaser:			Project:			Supplier:		
	Ref. No.			Ref. No.			Ref. No.		
	Data Sheet No.	C o n t e n t s						Page(s)	
	D.45	Monitoring, Limiting, and Protecting Devices: Stop Valve(s), Strainer(s)							
	D.46	Devices against Backflow <i>(continued)</i>							
	D.47	Overspeed Trip System <i>(continued)</i>							
	D.48	Overpressure Protecting Systems <i>(continued)</i>							
	D.49	Extent and Functions (Working Fluid System) <i>(continued)</i>							
	D.50	Extent and Functions (Lubricating and Control Fluid System) <i>(continued)</i>							
	D.51	Extent and Functions (Miscellaneous Systems) <i>(continued)</i>							
	D.52	Extent and Functions (Position Measurements) <i>(continued)</i>							
	D.53	Material Tests and Inspections: Turbine Components							
	D.54	Piping <i>(continued)</i>							
	D.55	Further Tests and Inspections: Turbine Components							
	D.56	Mechanical Running Test at the Shop							
	D.57	Miscellaneous Further Tests and Inspections							
	D.58	Preparation for Shipment and Storage: Paint Coating, Preservation							
	D.59	Packing, Storage at Site <i>(continued)</i>							
	D.60	(Blank data sheet without title, Title to insert, if necessary)							
<p><b>iTeh STANDARD PREVIEW</b>  <b>(standards.iteh.ai)</b></p> <p>ISO 14661:2000/Amd 1:2002  <a href="https://standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3bf59775/iso-14661-2000-amd-1-2002">https://standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3bf59775/iso-14661-2000-amd-1-2002</a></p>									
The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.									
Revision	Original	A	B	C	D	E	F	G	
Prepared									
Checked									
Proofed									
Date									

D.5

DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES										Rev.	01	
General Information										Page:	of:	
Info	Purchaser:			Project:			Supplier:				02	03
	Ref. No.			Ref. No.			Ref. No.				04	05
	Applicable to <input type="radio"/> Tender <input type="radio"/> Purchase <input type="radio"/> As-built										06	07
	Space for general remarks:										08	09
	<p><b>iTeh STANDARD PREVIEW</b>  <b>(standards.iteh.ai)</b></p> <p><u>ISO 14661:2000/Amd 1:2002</u>  <a href="https://standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3bf59775/iso-14661-2000-amd-1-2002">https://standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3bf59775/iso-14661-2000-amd-1-2002</a></p>										10	11
											12	13
											14	15
											16	17
											18	19
											20	21
											22	23
											24	25
26											27	
28											29	
The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.										30	31	
Revision	Original	A	B	C	D	E	F	G		32	33	
Prepared										34	35	
Checked										36	37	
Proofed										38	39	
Date										40	41	
										42	43	
										44	45	
										46	47	
										48	49	
										50	51	
										52	53	
										54	55	
										56	57	
										58	59	

Info	<b>DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES</b>								Rev.	
	<b>Operating Conditions</b>						Page:	of:		01
	Purchaser:		Project:		Supplier:				02	
	Ref. No.		Ref. No.		Ref. No.				03	
	Ref. No.		Ref. No.		Ref. No.				04	
	Ref. No.		Ref. No.		Ref. No.				05	
	Ref. No.		Ref. No.		Ref. No.				06	
	Type of driven machine: <span style="border: 1px solid black; padding: 2px;"> </span>								07	
	Operating points (3.8)								08	
	Guarantee point(s) (3.8.2)								09	
	Power output coupling, resp. generator terminal								10	
	<input type="checkbox"/> Turbine <input type="checkbox"/> Gear <input type="checkbox"/> Generator <sup>b</sup> (kW)								11	
	Speed of coupling to driven machine (min <sup>-1</sup> )								12	
	Prohibited speed ranges of driven machine: (min <sup>-1</sup> )								13	
	Inlet		mass flow <sup>b</sup> (t/h) <sup>e</sup>						14	
			absolute pressure ( ) <sup>c</sup>						15	
			temperature (°C)						16	
	Exhaust		mass flow (t/h) <sup>e</sup>						17	
			absolute pressure ( ) <sup>c</sup>						18	
			temperature <sup>d</sup> (°C)						19	
			wetness <sup>d</sup> (%)						20	
	Extraction 1		<input type="checkbox"/> controlled <input type="checkbox"/> uncontrolled						21	
			mass flow (t/h) <sup>e</sup>						22	
			absolute pressure ( ) <sup>c</sup>						23	
			temperature (°C)						24	
	Extraction 2		<input type="checkbox"/> controlled <input type="checkbox"/> uncontrolled						25	
			mass flow (t/h) <sup>e</sup>						26	
			absolute pressure ( ) <sup>c</sup>						27	
			temperature (°C)						28	
	Extraction 3		<input type="checkbox"/> controlled <input type="checkbox"/> uncontrolled						29	
			mass flow (t/h) <sup>e</sup>						30	
			absolute pressure ( ) <sup>c</sup>						31	
			temperature (°C)						32	
	Induction 1 <sup>a</sup>		<input type="checkbox"/> controlled <input type="checkbox"/> uncontrolled						33	
			mass flow (t/h) <sup>e</sup>						34	
			absolute pressure ( ) <sup>c</sup>						35	
			temperature (°C)						36	
	Reheated fluid <sup>a</sup>		mass flow (t/h) <sup>e</sup>						37	
			absolute pressure ( ) <sup>c</sup>						38	
			temperature (°C)						39	
	Heat rate (3.2.3)		(kJ/kW·h)						40	
	Steam rate (3.2.4)		(kg/kW·h)						41	
	<sup>a</sup> For more extractions, reheatings or inductions, or for more operating points, take an additional sheet D.7. <sup>b</sup> Purchaser: Please specify whether the power output or the inlet mass flow only <sup>c</sup> Please indicate whether the unit is bar or kPa or MPa <sup>d</sup> For wet steam: The declaration of exhaust temperature is not necessary. Temperature and wetness only for information <sup>e</sup> If in an individual case (kg/s) is requested, then the users may change by hand (t/h) to (kg/s).								42	
	Is reverse rotation caused by the driven machine possible: <span style="border: 1px solid black; padding: 2px;">yes <input type="checkbox"/> no <input type="checkbox"/></span>								43	
	Provisions with respect to a possible reverse rotation: .....								44	
	For gas expansion turbines:    Operating point ..... refers to gas composition ..... (Gas composition, see sheet D.9)    Operating point ..... refers to gas composition ..... Operating point ..... refers to gas composition ..... Operating point ..... refers to gas composition .....								45	
	The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.								46	
	Revision	Original	A	B	C	D	E	F	G	47
	Name									48
	Date									49

D.7

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES							Rev.	01
	Extreme Operating Conditions				Page:    of:				02
Purchaser:	Project:			Supplier:				03	
Ref. No.	Ref. No.			Ref. No.				04	
								05	
								06	
								07	
								08	
								09	
			Minimum	Rated	Maximum continuously			10	
Operating speed <sup>a</sup>	(min <sup>-1</sup> )							11	
(same location as indicated on sheet E.5)								12	
Inlet	absolute pressure	( ) <sup>b</sup>						13	
	temperature	(°C)						14	
Exhaust	absolute pressure <sup>c</sup>	( ) <sup>b</sup>						15	
	wetness	(%)						16	
Extraction 1	mass flow	(t/h)						17	
	absolute pressure	( ) <sup>b</sup>						18	
	temperature	(°C)						19	
Extraction 2	mass flow	(t/h)						20	
	absolute pressure	( ) <sup>b</sup>						21	
	temperature	(°C)						22	
Extraction 3	mass flow	(t/h)						23	
	absolute pressure	( ) <sup>b</sup>						24	
	temperature	(°C)						25	
Induction 1	mass flow	(t/h)						26	
	absolute pressure	( ) <sup>b</sup>						27	
	temperature	(°C)						28	
Reheating 1	mass flow	(t/h)						29	
	absolute pressure	( ) <sup>b</sup>						30	
	temperature	(°C)						31	
Limits of variation of rated conditions according to IEC 60045-1 required	<input type="checkbox"/> yes <input type="checkbox"/> no		<input type="checkbox"/> yes <input type="checkbox"/> no		<input type="checkbox"/> yes <input type="checkbox"/> no			32	
NOTE - These data are individual extreme values that cannot be combined in each case.									33
<sup>a</sup> Not to be specified for generator drives.									34
<sup>b</sup> Please indicate whether the unit is bar or kPa or MPa.									35
<sup>c</sup> Only valid for backpressure turbines.									36
									37
									38
									39
									40
									41
									42
									43
									44
									45
									46
									47
									48
									49
									50
									51
									52
									53
									54
The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.									55
Revision	Original	A	B	C	D	E	F	G	56
Name									57
Date									58

D.8

Info	<b>DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES</b>								Rev.	
	<b>Special Data for Gas Expansion Turbines</b>						Page:    of:		01	
	Purchaser:		Project:			Supplier:			02	
									03	
									04	
									05	
	Ref. No.		Ref. No.			Ref. No.			06	
									07	
	Gas designation:								08	
	Different compositions of gas				A	B	C	D <sup>a</sup>	09	
	Relative humidity of live gas								10	
	Constituents of gas		<sup>b</sup>	Symbol	Mol.mass	Mol. %	Mol. %	Mol. %	Mol. %	
									11	
									12	
									13	
									14	
									15	
									16	
									17	
									18	
									19	
									20	
									21	
	Relative molecular mass (kg/kmol)								22	
	Gas constant (kJ/(kg·K))								23	
	Specific heat capacity (kJ/(kg·K))								24	
	Reference temp. for spec. heat capacity (°C)								25	
	Temperature limitations due to process conditions								26	
	maximum (°C)								27	
	minimum (°C)								28	
	<sup>a</sup> For additional different compositions, take an additional sheet D.9.								29	
	<sup>b</sup> Please mark in this column by letters the basic properties of the gas:								30	
	S = solid impurities		I = inflammable			C = corrosive			31	
	T = toxic								32	
	<a href="https://standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3bf59775/iso-14661-2000-amd-1-2002">https://standards.iteh.ai/catalog/standards/sist/62b36161-971f-4983-b6f0-19ae3bf59775/iso-14661-2000-amd-1-2002</a>								33	
									34	
									35	
	Restrictions on materials to be used:								36	
									37	
									38	
									39	
									40	
									41	
	Limitations on leakage rate:								42	
									43	
									44	
									45	
									46	
									47	
	Reference values for thermodynamic characteristics:								48	
									49	
									50	
									51	
									52	
									53	
									54	
									55	
	Revision	Original	A	B	C	D	E	F	G	56
	Name									57
	Date									58