INTERNATIONAL STANDARD

ISO 14661

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AMENDMENT 1
2002-11-01

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

AMENDMENT 1: Data sheets for thermal turbines for industrial applications

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

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)*.

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.

[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*

[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

D.1

Data Sheet No.	
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*)
D.45	Monitoring, Limiting, and Protecting Devices: Stop Valve(s), Strainer(s)
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D.53	Material Tests and Inspections: Turbine Components
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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 (*continued*)
D.60	(Blank data sheet without title, Title to insert, if necessary)

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.

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.

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.

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.	**Contents**							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								
	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.	**Contents**	Page(s)
D.45	Monitoring, Limiting, and Protecting Devices: Stop Valve(s), Strainer(s)	
D.46	Devices against Backflow (*continued*)	
D.47	Overspeed Trip System (*continued*)	
D.48	Overpressure Protecting Systems (*continued*)	
D.49	Extent and Functions (Working Fluid System) (*continued*)	
D.50	Extent and Functions (Lubricating and Control Fluid System) (*continued*)	
D.51	Extent and Functions (Miscellaneous Systems) (*continued*)	
D.52	Extent and Functions (Position Measurements) (*continued*)	
D.53	Material Tests and Inspections: Turbine Components	
D.54	Piping (*continued*)	
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 (*continued*)	
D.60	(Blank data sheet without title, Title to insert, if necessary)	

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.	01
	General Information		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
					06
					07
					08
					09
					10
					11
	Ref. No.	Ref. No.	Ref. No.		12
	Applicable to ❍ Tender	❍ Purchase	❍ As-built		13
	Space for general remarks:				14
					15
					16
					17
					18
					19
					20
					21
					22
					23
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					52
	The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.				53

	Revision	Original	A	B	C	D	E	F	G		54
	Prepared										55
	Checked										56
	Proofed										57
	Date										58

D.6

DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES

Operating Conditions Page: of:

Purchaser:	Project:	Supplier:
Ref. No.	Ref. No.	Ref. No.

Type of driven machine:

Operating points (3.8)			1	2	3	4 [a]
Guarantee point(s) (3.8.2)			☐	☐	☐	☐
Power output coupling, resp. generator terminal						
☐ Turbine ☐ Gear ☐ Generator [b]		(kW)				
Speed of coupling to driven machine		(min^{-1})				
Prohibited speed ranges of driven machine:		(min^{-1})				
Inlet	mass flow [b]	(t/h) [e]				
	absolute pressure	( ) [c]				
	temperature	(°C)				
Exhaust	mass flow	(t/h) [e]				
	absolute pressure	( ) [c]				
	temperature [d]	(°C)				
	wetness [d]	(%)				
Extraction 1	☐ controlled ☐ uncontrolled					
	mass flow	(t/h) [e]				
	absolute pressure	( ) [c]				
	temperature	(°C)				
Extraction 2	☐ controlled ☐ uncontrolled					
	mass flow	(t/h) [e]				
	absolute pressure	( ) [c]				
	temperature	(°C)				
Extraction 3	☐ controlled ☐ uncontrolled					
	mass flow	(t/h) [e]				
	absolute pressure	( ) [c]				
	temperature	(°C)				
Induction 1 [a]	☐ controlled ☐ uncontrolled					
	mass flow	(t/h) [e]				
	absolute pressure	( ) [c]				
	temperature	(°C)				
Reheated fluid [a]	mass flow	(t/h) [e]				
	absolute pressure	( ) [c]				
	temperature	(°C)				
Heat rate (3.2.3)		(kJ/kW·h)				
Steam rate (3.2.4)		(kg/kW·h)				

[a] For more extractions, reheatings or inductions, or for more operating points, take an additional sheet D.7.
[b] Purchaser: Please specify whether the power output or the inlet mass flow only
[c] Please indicate whether the unit is bar or kPa or MPa
[d] For wet steam: The declaration of exhaust temperature is not necessary. Temperature and wetness only for information
[e] If in an individual case (kg/s) is requested, then the users may change by hand (t/h) to (kg/s).

Is reverse rotation caused by the driven machine possible: yes ☐ no ☐

Provisions with respect to a possible reverse rotation: .....

For gas expansion turbines: (Gas composition, see sheet D.9)
Operating point ..... refers to gas composition .....
Operating point ..... refers to gas composition .....
Operating point ..... refers to gas composition .....
Operating point ..... refers to gas composition .....

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
Name								
Date								

DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES

Extreme Operating Conditions | Page: of:

Purchaser:	Project:	Supplier:
Ref. No.	Ref. No.	Ref. No.

			Minimum	Rated	Maximum continuously
Operating speed [a] (same location as indicated on sheet E.5)		(min^{-1})			
Inlet	absolute pressure	( ) [b]			
	temperature	(°C)			
Exhaust	absolute pressure [c]	( ) [b]			
	wetness	(%)			
Extraction 1	mass flow	(t/h)			
	absolute pressure	( ) [b]			
	temperature	(°C)			
Extraction 2	mass flow	(t/h)			
	absolute pressure	( ) [b]			
	temperature	(°C)			
Extraction 3	mass flow	(t/h)			
	absolute pressure	( ) [b]			
	temperature	(°C)			
Induction 1	mass flow	(t/h)			
	absolute pressure	( ) [b]			
	temperature	(°C)			
Reheating 1	mass flow	(t/h)			
	absolute pressure	( ) [b]			
	temperature	(°C)			
Limits of variation of rated conditions according to IEC 60045-1 required			☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no

NOTE - These data are individual extreme values that cannot be combined in each case.

[a] Not to be specified for generator drives.
[b] Please indicate whether the unit is bar or kPa or MPa.
[c] Only valid for backpressure turbines.

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
Name								
Date								

Info | Rev.

DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES

Special Data for Gas Expansion Turbines | Page: of:

Purchaser:	Project:	Supplier:
Ref. No.	Ref. No.	Ref. No.

Gas designation:							
Different compositions of gas				A	B	C	D [a]
Relative humidity of live gas							
Constituents of gas	[b]	Symbol	Mol.mass	Mol. %	Mol. %	Mol. %	Mol. %
Relative molecular mass			(kg/kmol)				
Gas constant			(kJ/(kg•K))				
Specific heat capacity			(kJ/(kg•K))				
Reference temp. for spec. heat capacity			(°C)				
Temperature limitations due to process conditions							
			maximum (°C)				
			minimum (°C)				

[a] For additional different compositions, take an additional sheet D.9.

[b] Please mark in this column by letters the basic properties of the gas:
S = solid impurities I = inflammable
T = toxic C = corrosive

Restrictions on materials to be used:

Limitations on leakage rate:

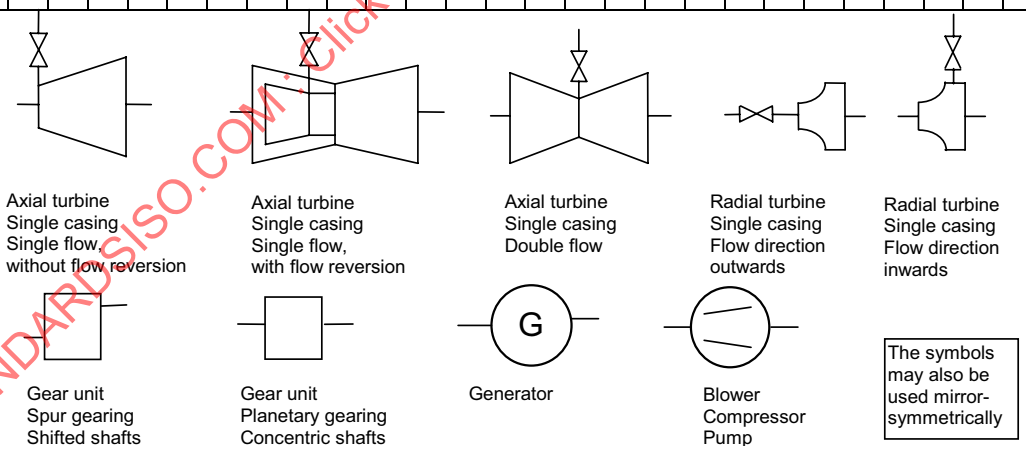
Reference values for thermodynamic characteristics:

Revision	Original	A	B	C	D	E	F	G
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.
	Fundamental Arrangement of Machines / Direction of Rotation		Page: of:	
	Purchaser:	Project:	Supplier:	
	Ref.No.	Ref. No.	Ref.No.	

Fundamental arrangement of machines

For the sketch of fundamental arrangement of machines,please use those symbols presented beneath



The direction of rotation is defined by looking from the turbine coupling to the driven machine.

Direction of rotation of the driven machine: ☐ clockwise ☐ counter-clockwise

Direction of rotation of the turbine: 1. Casing: ☐ clockwise ☐ counter-clockwise

2. Casing: ☐ clockwise ☐ counter-clockwise

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
Name								
Date								

D.10

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Site, Climate, Installation and Erection Data		Page: of:		02
	Purchaser:	Project:	Supplier:		03 04 05
	Ref. No.	Ref. No.	Ref. No.		06

Site data

Geographical location:

Height above sea level:

Barometric pressure	( ) [a]	normal	max.	min. .....
Relative humidity	(%)	normal	max.	min. .....
Ambient temperature outdoors	(°C)	normal	max.	min. .....
Ambient temperature indoors	(°C)	normal	max.	min. .....

[a] Please indicate whether the unit is bar or kPa or MPa.

Earthquake-factor related to the turbine floor:
horizontal: parallel to turbine axis: v =
transverse, to turbine axis: v =
vertical: v =
(The earthquake-factor is defined by $F = v \cdot g \cdot m$ and contains already all correction values.
m = mass of the component concerned
g = acceleration due to gravity (9,81 m/s^2).

Hazardous area classification according to IEC 60079-10:

Area	Class. acc. to IEC 60079-10		
	Zone	Explosion group	Temperature class

Required minimum protection against physical contact, ingress of foreign bodies and of liquid, according to IEC 60529 (IP-Code):

Area	Minimum protection
	IP
	IP
	IP
	IP

Climate [b]

☐ Inland	☐ Near the sea	☐ Desert	☐ Tropics
☐ Very sandy	☐ Very dusty		

Winterization required? ☐ yes ☐ no
Tropicalization required? ☐ yes ☐ no

Corrosive atmosphere due to 1. ..... contents: ..... (mg/m^3)
2. ..... contents: ..... (mg/m^3)
3. ..... contents: ..... (mg/m^3)

Installation [b]

Outdoors without roofing ☐	Indoors not heated ☐
Outdoors with roofing ☐	Indoors heated ☐

Erection and maintenance [b]

Erection crane	☐ built-in	☐ mobile	Load capacity:	kN
Maintenance crane	☐ built-in	☐ mobile	Load capacity:	kN
Max. height of crane hook above turbine floor:			m	
Transport facility on site:	☐ Road	☐ Rail	☐ Water	☐ Air

b If necessary, please specify all details as separate information.
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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.
	Utility Data		Page: of:	
	Purchaser:	Project:	Supplier:	
	Ref. No.	Ref. No.	Ref. No.	

Electricity

		Drivers 1	Drivers 2	Heating	Instrument-ation/Control	Alarm / Shutdown		
Voltage	(V)							
Frequency	(Hz)							
Phase	-							
Power up to	(kW)							
NOTE Tolerances are according to IEC.....								

Auxiliary Steam

		Steam net 1			Steam net 2		
		normal	max.	min.	normal	max.	min.
Live steam, absolute pressure	( ) [a]						
temperature	(°C)						
max. mass flow	(t/h)						
Exhaust steam, abs. pressure	( ) [a]						
[a] Please indicate whether the unit is bar or kPa or MPa.							

Instrument Air

		normal	max.	min.
Absolute pressure	( ) [a]			
Temperature	(°C)			
Dew point	(°C)		X	X
Humidity	(g/kg dry air)			
Max. mass flow	(kg/s)			
Cooler: Fouling factor	(m^2.K·/kW)		X	X
[a] Please indicate whether the unit is bar or kPa or MPa.				

Service Air

		normal	max.	min.
Absolute pressure	( ) [a]			
Temperature	(°C)			
Dew Point	(°C)		X	X
Humidity	(g/kg dry air)			
Max. mass flow	(kg/s)			
Cooler: Fouling factor	(m^2K/kW)		X	X
[a] Please indicate, whether the dimension is bar or kPa or MPa				

Nitrogen

		normal	max.	min.
Absolute pressure	( ) [a]			
Temperature	(°C)			
Dew Point	(°C)		X	X
Humidity	(g/kg dry air)			
Max. mass flow	(kg/s)			
Cooler: Fouling factor	(m^2·K/kW)		X	X
[a] Please indicate whether the unit is bar or kPa or MPa.				

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
Name								
Date								

D.12

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.
	Utility Data (Continued)		Page: of:	
	Purchaser:	Project:	Supplier:	
	Ref.No.	Ref. No.	Ref.No.	

Cooling Water

Inlet pressure (effective)	( ) [a]	
Max. permissible pressure (eff.)	( ) [a]	
Max. permissible pressure drop	( ) [a]	
Inlet temperature - normal	(°C)	
Inlet temperature - min. / max.	(°C)	/
Max. permissible return temp.	(°C)	
Max. mass flow	(m^3/h)	

[a] Please indicate, whether the dimension is bar or kPa or MPa

Water analysis

Solid impurities	

Water quality

Open circuit, with	
Town water	☐
River water	☐
Sea water	☐
Brackish water	☐
Other:	
Closed circuit, with	
Cooling tower	☐
Other:	

Sealing Gas

Gas designation: .....

	normal	max.	min.
Absolute pressure ( ) [a]			
Temperature (°C)			
Dew Point (°C)			
Humidity (g/kg dry gas)			
Volume flow up to (m^3/h)			

[a] Please indicate, whether the dimension is bar or kPa or MPa

Purging Gas

Gas designation: .....

	normal	max.	min.
Absolute pressure ( ) [a]			
Temperature (°C)			
Dew Point (°C)			
Humidity (g/kg dry gas)			
Volume flow up to (m^3/h)			

[a] Please indicate, whether the dimension is bar or kPa or MPa

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Turbine casing(s) and pipe connections: Forces, Moments, Movements		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
	Ref. No.	Ref. No.	Ref. No.		06

Terminal points - external forces [1] and moments [1] and thermal movements (6.3)

	Inlet 1			Inlet 2			Exhaust		
	Force	Moment	Thermal move-ment	Force	Movement	Thermal move-mentt	Force	Moment	Thermal move-ment
	kN	kN·m	mm	kN	kN·m	mm	kN	kN·m	mm
Parallel to shaft									
Vertical									
Horizontal 90° cross-wise shaft									

	Extraction 1			Extraction 2			Extraction 3		
	Force	Moment	Thermal move-ment	Force	Movement	Thermal move-ment	Force	Moment	Thermal move-ment
	kN	kN·m	mm	kN	kN·m	mm	kN	kN·m	mm
Parallel to shaft									
Vertical									
Horizontal 90° cross-wise shaft									

	Extraction 4 [a]			Induction 1			Induction 2 [a]		
	Force	Moment	Thermal move-ment	Force	Movement	Thermal move-ment	Force	Moment	Thermal move-ment
	kN	kN·m	mm	kN	kN·m	mm	kN	kN·m	mm
Parallel to shaft									
Vertical									
Horizontal 90° cross-wise shaft									

[a] For more extractions and inductions, take an additional sheet D.14.

Please indicate the coordination system used:

[1] As agreed between turbine supplier and pipework supplier.

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
Name								
Date								

Info | Rev.

DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES

Working Fluid Connections (*continued*) | Page: of:

Purchaser:	Project:	Supplier:
Ref. No.	Ref. No.	Ref. No.

Working fluid connections (3.3)

	Position [a]	Pipe connection by flange	Pipe connection by welding	Flange [b] Size DN/PN	Flange [b] Type of facing	Flange on casing side prepared for screws	Flange on casing side prepared for studs
Inlet 1		☐	☐			☐	☐
Inlet 2		☐	☐			☐	☐
Cross-over 1		☐	☐			☐	☐
Cross-over 2		☐	☐			☐	☐
Exhaust		☐	☐			☐	☐
Extraction 1		☐	☐			☐	☐
Extraction 2		☐	☐			☐	☐
Extraction 3		☐	☐			☐	☐
Extraction 4		☐	☐			☐	☐
Induction 1		☐	☐			☐	☐
Induction 2		☐	☐			☐	☐
Reheating		☐	☐			☐	☐
		☐	☐			☐	☐
		☐	☐			☐	☐
		☐	☐			☐	☐
		☐	☐			☐	☐
		☐	☐			☐	☐
		☐	☐			☐	☐

[a] According to the relevant drawing.
[b] Material normally the same as for the casing (see sheet D.17). If not, please give handwritten information below the table.

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.
	Design features of turbine: General		Page: of:	
	Purchaser:	Project:	Supplier:	
	Ref. No.	Ref. No.	Ref. No.	

Rotor type: Drum ☐ with, in the low pressure part

integral wheels ☐
built-up wheels ☐
combination of both ☐

Chamber ☐

with integral wheels ☐
built-up wheels ☐
combination of both ☐

Numbers of stages: Total . . . . . .
Related to each casing . . . . . / . . . . . / . . . . . .
or to each section . . . . . / . . . . . / . . . . . .

Final stage: Blade length . . . . . mm
Max. tip speed . . . . . m/s

Bearing span: 1. Casing . . . . . mm
2. Casing . . . . . mm
3. Casing . . . . . mm

Shaft end for coupling: Integral flange ☐ Fitted coupling ☐

Type of coupling fitting:
Cylindrical ☐
Tapered ☐
Not keyed ☐
Single keyed ☐
Double keyed ☐
Hydraulic fit ☐
Thermal fit ☐

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

	Original	A	B	C	D	E	F	G
Name								
Date								

D.16

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Materials (*continued*)		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
	Ref. No.	Ref. No.	Ref. No.		06

	Material designation based on letter / figure symbols	Material according to standard ...
Casings (6.2.2)		
1. Casing or section		
2. Casing or section		
3. Casing or section		
4. Casing or section		
Steam chest		
Nozzle ring		
Shafts		
within 1. casing		
within 2. casing		
within 3. casing		
within 4. casing		
Rotating blades		
Governing stage		
Stages . . . . . to		
Stages . . . . . to		
Stages . . . . . to		
Stages . . . . . to		

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Bearings and bearing housings (6.11) (*continued*)		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
	Ref. No.	Ref. No.	Ref. No.		06

Radial bearings		1. Casing		2. Casing		3. Casing	
		front	rear	front	rear	front	rear
Type of bearing	-						
Manufacturer							
Shaft diameter	(mm)						
Bearing length	(mm)						
Maximum specific load	(N/mm^2)						
Allowable max. spec. load	(N/mm^2)						

Thrust bearing(s) [a]		1. Casing		2. Casing		3. Casing	
		active	inactive	active	inactive	active	inactive
Type of bearing	-						
Manufacturer							
Maximum specific load	(N/mm^2)						
Allowable max. spec. load	(N/mm^2)						
Thrust collar, integral	-						
, replaceable							

[a] In most cases there is only one thrust bearing within a turbine shaft train. Please write your records in the column of the casing concerned.

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Shaft seals (6.8; 6.10) (*continued*)		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
	Ref. No.	Ref. No.	Ref. No.		06

	Outer shaft seals
Type of sealing	☐ Labyrinth ☐ Other Type:
Max. steam /gas leakage to atmosphere (calculated) [a]	
1. Casing, high pressure end	kg/h
, low pressure end	kg/h
2. Casing, high pressure end	kg/h
, low pressure end	kg/h
3. Casing, high pressure end	kg/h
, low pressure end	kg/h

[a] Give information only if specified by the purchaser.

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.
	Rotordynamics (6.12.1)		Page: of:	
	Purchaser:	Project:	Supplier:	
	Ref. No.	Ref. No.	Ref. No.	

Lateral analysis (Annex A.2)
(Calculated values)

Is damped unbalanced rotor response analysis specified? no ☐ yes ☐
If "yes" is marked, the following applies:

	Speed min^{-1}
1. Shaft	
First rigid mode	
Second rigid mode	
First bending mode	
Second bending mode	
2. Shaft	
First rigid mode	
Second rigid mode	
First bending mode	
Second bending mode	
3. Shaft	
First rigid mode	
Second rigid mode	
First bending mode	
Second bending mode	
Train [a]	
First rigid mode	
Second rigid mode	
First bending mode	
Second bending mode	

[a] Only if shafts are rigidly coupled.

For the figures of the different modes, see Figure A.2.

Torsional analysis (Annex A.3)
(for the complete coupled train)

Turbine supplier responsible for the train? no ☐ yes ☐

First critical speed ..... min^{-1}
Second critical speed ..... min^{-1}
Third critical speed ..... min^{-1}
Fourth critical speed ..... min^{-1}

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Baseframe (Baseplate) and Soleplates (6.13)		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
	Ref. No.	Ref. No.	Ref. No.		06

Baseframe or soleplates to be furnished by: .....

Attachment components to be furnished by: ..... [2)]

Extend of baseframe (baseplate):

- under turbine only ☐
- under turbine and gear unit ☐
- under the whole machine set ☐
- under .....

[2)] e.g. anchor bolts, sub-soleplates.

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
Name								
Date								

Info | Rev. | 01

DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES

Gear units (7.2) | Page: of: | 02

Purchaser:	Project:	Supplier:	03–05
Ref. No.	Ref. No.	Ref. No.	06

		Gear unit 1	Gear unit 2
Place of installation		between and	between and
Supplier			
Manufacturer			
Manufacturer's type designation			
Type of gear	Reducer (r) / Increaser (i)	( ) [a]	( ) [a]
	Single stage (1), double stage (2)	( ) [a]	( ) [a]
	Single helical (1), double helical (2)	( ) [a]	( ) [a]
	Planetary gear	yes ☐ no ☐	yes ☐ no ☐
	In- and output shafts offset	☐	☐
	In- and output shafts concentric	☐	☐
Gear to shaft: Integral (i) / shrunk on (s)		( ) [a]	( ) [a]
Max. continuous oper. speed input shaft		min^{-1}	min^{-1}
Max. allow. torque at this speed		kNm	kNm
Trip speed		min^{-1}	min^{-1}
Centre distance		mm	mm
Gear ratio			
Direction of rotation of input shaft [b]			
Direction of rotation of output shaft [b c]			
Maximum torque at input shaft [d]		kN·m	kN·m
Power loss at rated power output [e]		kW	kW
Teeth hardened		yes ☐ no ☐	yes ☐ no ☐
Quality grade of tooth system, acc. to ISO 1328-1			
Application factor			
Safety factor against pitting [f]			
Safety factor for tooth bending strength [f]			
Mass moment of inertia related to input shaft		$kg·m^2$	$kg·m^2$
Breakaway torque related to input shaft		N·m	N·m

[a] Please use the abbreviations as indicated.
[b] For definition see sheet D.10
[c] To be specified by the purchaser, if th.e driven machine is not supplied by the turbine supplier.
[d] Maximum torque related to the maximum power output as defined in subclause 3.2.2.
[e] Rated power output as defined in 3.2.1.
[f] According to ISO 9084.

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.
	Gear units (7.2) (*continued*)		Page: of:	
	Purchaser:	Project:	Supplier:	
	Ref. No.	Ref. No.	Ref. No.	

	Gear unit 1	**Gear unit 2**
Maximum specific axial bearing load	N/mm^2	N/mm^2
Max. allowable specific axial bearing load	N/mm^2	N/mm^2
Type of shaft sealing		
Kind of coupling fitting		
— cylindrical	☐	☐
— tapered	mm/m	mm/m
— not keyed (0) / single keyed (1) / double keyed (2)	( ) [a]	( ) [a]
Method of fitting		
— hydraulic (h) / thermal (t)	( ) [a]	( ) [a]
Oil type required, according to ISO 8068		
Filtration ratio required [b]		
Cleanliness required from lubricant [c]	/	/
Oil flow required	m^3/h	m^3/h
Inlet gauge pressure of oil required	( ) [d]	( ) [d]
Oil supply together with turbine	yes ☐ no ☐	yes ☐ no ☐
— if not, describe the oil supply		
Mass of gear unit	kg	kg

For piping connections, see next page.

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Gear units (7.2) (*continued*)		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
	Ref. No.	Ref. No.	Ref. No.		06

Piping Connections		**Gear unit 1**	**Gear unit 2**
Flanged piping connections			
- Lubricant inlet	DN / PN	/	/
	Type of facing		
- Lubricant outlet	DN / PN	/	/
	Type of facing		
- Vent	DN / PN	/	/
	Type of facing		
- Drain	DN / PN	/	/
	Type of facing		
Welded piping connections			
- Lubricant inlet	Piping acc. to	ISO	ISO
	Outer diameter	mm	mm
	Wall thickness	mm	mm
	Material designation acc. to	ISO	ISO
- Lubricant outlet	Piping acc. to	ISO	ISO
	Outer diameter	mm	mm
	Wall thickness	mm	mm
	Material designation acc. to	ISO	ISO
- Vent	Piping acc. to	ISO	ISO
	Outer diameter	mm	mm
	Wall thickness	mm	mm
	Material designation acc. to	ISO	ISO
- Drain	Piping acc. to	ISO	ISO
	Outer diameter	mm	mm
	Wall thickness	mm	mm
	Material designation acc. to	ISO	ISO
Screwed piping connections			
- Lubricant inlet	Piping acc. to designation	ISO	ISO
	Thread acc. to designation	ISO	ISO
- Lubricant outlet	Piping acc. to designation	ISO	ISO
	Thread acc. to designation	ISO	ISO
- Vent	Piping acc. to designation	ISO	ISO
	Thread acc. to designation	ISO	ISO
- Drain	Piping acc. to designation	ISO	ISO
	Thread acc. to designation	ISO	ISO

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Couplings (7.3)		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
	Ref. No.	Ref. No.	Ref. No.		06

	Coupling 1	Coupling 2	Coupling 3	Coupling 4
Place of installation	between and	between and	between and	between and
Supplier				
Manufacturer [a]				
Manufacturer's type designation [a]				
Type of coupling [a]				
- integral flange type	☐	☐	☐	☐
- flange type, but not integral	☐	☐	☐	☐
- gear type	☐	☐	☐	☐
- flexible-element type	☐	☐	☐	☐
- type of flexible-element coupling [b]				
Max. continuous operating speed	min^{-1}	min^{-1}	min^{-1}	min^{-1}
Maximum torque at this speed	kN·m	kN·m	kN·m	kN·m
Application factor (same as on D.22)				
Trip speed	min^{-1}	min^{-1}	min^{-1}	min^{-1}
Mass moment of inertia [a]	$kg·m^2$	$kg·m^2$	$kg·m^2$	$kg·m^2$
Torsional stiffness [a]	N·m/rad	N·m/rad	N·m/rad	N·m/rad
Coupling mass [a]	kg	kg	kg	kg
Mass of hub on input side [a]	kg	kg	kg	kg
Mass of hub on output side [a]	kg	kg	kg	kg
Mass of spacer	kg	kg	kg	kg
Type of coupling fitting (input side)				
- cylindrical	☐	☐	☐	☐
- tapered	mm/m	mm/m	mm/m	mm/m
- not keyed (0) / single keyed (1) / double keyed (2)	( ) [c]	( ) [c]	( ) [c]	( ) [c]
Type of coupling fitting (output side)				
- cylindrical	☐	☐	☐	☐
- tapered	mm/m	mm/m	mm/m	mm/m
- not keyed (0) / single keyed (1) / double keyed (2)	( ) [c]	( ) [c]	( ) [c]	( ) [c]

[a] To be declared by the supplier of the coupling, if he is not the turbine supplier.
[b] Please use the designations according to ISO 10441.
[c] Please use the abbreviations as indicated.

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.
	Couplings (7.3) (*continued*)		Page: of:	
	Purchaser:	Project:	Supplier:	
	Ref. No.	Ref. No.	Ref. No.	

	Coupling 1	**Coupling 2**	**Coupling 3**	**Coupling 4**
Method of fitting				
- hydraulic (h) / thermal (t)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
Supplier of hydr. install./remov. toolings				
Coupling hub				
- input end, mounted by				
- output end, mounted by				
Oil type required (acc. to ISO 8068)				
Filtration ratio required [b]				
Cleanliness req. from lubricant [c]	/	/	/	/
Oil flow required	m^3/h	m^3/h	m^3/h	m^3/h
Inlet gauge pressure of oil required	bar	bar	bar	bar
Oil supply from				
Coupling guard				
- Supplier				
- For protection against contact only	yes ☐ no ☐	yes ☐ no ☐	yes ☐ no ☐	yes ☐ no ☐
- For protection against contact and sealing leakage of coupling lube oil	yes ☐ no ☐	yes ☐ no ☐	yes ☐ no ☐	yes ☐ no ☐

[a] Please use the abbreviations as indicated.
[b] For definition see ISO 4572.
[c] Specification as code acc. to ISO 4406.

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	
	Rotor turning device (7.4)		Page: of:		
	Purchaser:	Project:	Supplier:		
	Ref. No.	Ref. No.	Ref. No.		

Rotor turning device

Supplier: .....

Manufacturer: .....

Manufacturer's type designation: .....

Type of construction: Manually operated ☐

Electric drive ☐

Voltage: . . . . .(V) Frequency: . . . (Hz) Power: ..... (kW)

Class of explosion protection [3] :

Certification authority: .....

Identification number of certificate: .....

Degree of protection (IP-Code) [4] : .....

Oil hydraulic drive ☐

Continuously working device ☐ Stroking device ☐

Oil pressure: . . . . . ( ) [5] Oil flow: ..... (m^3/h)

Other drive ☐

Type of drive: . . . . . .

Location of installation: .....

Drive speed of device: . . . . . (min^{-1})

Turbine speed during turning device operation: . . . . . (min^{-1})

Change to turning device operation possible without standstill of the turbine shaft: yes ☐ no ☐

Automatic cut-in system: yes ☐ no ☐

Operator station: local ☐ remote ☐

Breakaway torque of the driven machine(s):		(N·m)	>	*related to the point of contact between rotor turning device and shaft*
Breakaway torque of the gear unit(s):		(N·m)	>	
Breakaway torque of the turbine:		(N·m)	>	
Mass moment of inertia of the driven mach.:		($kg·m^2$)	>	
Mass moment of inertia of the gear unit(s):		($kg·m^2$)	>	
Mass moment of inertia of the turbine:		($kg·m^2$)	>	

[3] According to IEC 60079.
[4] According to IEC 60529.
[5] Please indicate whether the unit is bar or kPa or MPa.

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
Name								
Date								

DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES

Piping at the limit of supply (except oil piping) (8.1) Page: of:

Purchaser:	Project:	Supplier:
Ref.No.	Ref. No.	Ref.No.

Designation of pipework	Supplier of the pipework	Tubes, Pipes: Dimensions OD [a] mm	Dimensions T [b] mm	Material: Desi-gnation	Material: acc. to Standard	Prefabrication [c]: a	b	c	d
Inlet 1									
Inlet 2									
Cross-over 1									
Cross-over 2									
Exhaust									
Extraction 1									
Extraction 2									
Extraction 3									
Extraction 4									
Induction 1									
Induction 2									
Reheating									
Piping for shaft seals									
- seal-steam supply									
- seal-gas supply									
Blow-out systems									
- safety and blow-out valves									
- blow-out device [d]									
Condensate - and seal water piping									
Cooling water piping									
Compressed air piping									
Instrument air piping									
Purging gas supply									

NOTE - The make, fabrication and delivery of the water drains shall be the subject of separate special agreements between all the participants involved with the components of the plant exposed to steam

[a] OD = outer diameter
[b] T = wall thickness
[d] For blowing out the inlet, induction, and reheating lines

[c] a completely prefabricated,
b prefabricated with matching lengths,
c mixture of a and b,
d tubes, elbows, fittings as components

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Table D.28 (*continued*)		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
	Ref. No.	Ref. No.	Ref. No.		06

Flanges					
Dimensions		Material			
Size DN / PN	Type of facing	Designation	acc. to Standard	Remarks / comments	
					07–58

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.	01
	Condensing Plant (8.4)		Page: of:		02
	Purchaser:	Project:	Supplier:		03
					04
					05
	Ref. No.	Ref. No.	Ref. No.		06

Condenser

Exhaust flow - normal / maximum	..... (t/h)	..... (t/h)	07 08
Heat to dissipate - normal / maximum	..... (kJ/s)	..... (kJ/s)	09
Condenser pressure - normal / maximum	..... ( ) [5]	..... ( ) [5]	10
Cooling water temperature			11
- Supply	..... (°C)		12
- Return (at rated power output)	..... (°C)		13

[5] Please indicate, whether the dimension is bar or kPa or MPa

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.
	Gland Steam or Gas System (8.5)		Page: of:	
	Purchaser:	Project:	Supplier:	
	Ref. No.	Ref. No.	Ref. No.	

Gland steam system
- without condenser ☐
- with condenser
- vacuum condenser ☐
- atmospheric condenser ☐
- vacuum and atmospheric condenser ☐

System with atmospheric condenser
- Drainage by pipe-loop ☐
- Drainage by a condensate pump driven by an electric motor ☐

System with vacuum or/and atmospheric condenser

Condenser:
- Supplier of condenser .....
- Manufacturer of condenser .....
- Manufacturer's type designation .....
- Cooling water pressure and temperature, see sheet D.13
- Cooling water flow required ..... (m^3/h)
- Cooling water pressure drop ..... ( ) [5]
- Dimensions of cooling water tubes OD [6] ..... (mm) T [6] ..... (mm)

	Material design. based on letter/figure symbols	Material acc. to standard	Remarks / comments (e.g. coating of components)
Tubes			
Tube sheets			
Shell			
Water chamber			

Condensate pumps:

	Pump 1	Pump 2	Pump 3
Supplier			
Manufacturer			
Manufacturer's type designation			
Power absorbed (kW)			
Driver: Electric motor			
- Supplier			
- Manufacturer			
- Manufacturer's type designation			
- Voltage (V)			
- Frequency (Hz)			
- Rated power (kW)			
- Class of explosion protection [a]			
- Certification authority			
- Identification number of certificate			
- Degree of protection (IP-Code) [b]	IP	IP	IP

[a] According to IEC 60079.
[b] According to IEC 60529.

[5] Please indicate whether the unit is bar or kPa or MPa.
[6] OD = outer diameter, T = thickness of wall

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
Name								
Date								

Info	DATA SHEETS FOR INDUSTRIAL-TYPE TURBINES			Rev.
	Gland Steam or Gas Exhaust System (8.5)		Page: of:	
	Purchaser:	Project:	Supplier:	
	Ref.No.	Ref. No.	Ref.No.	

Gland steam or gas exhaust system:

Steam-jet air ejector ☐ Fan ☐ Chimney ☐
- Supplier .....
- Manufacturer .....
- Manufacturer's type designation .....
- Capacity: 100 % ☐ 2 x 100 % ☐

Steam at ejector inlet					
Abs. pressure ( )[a]			Temperature (° C)		
norm.	min.	max.	norm.	min.	max.

[a] Please indicate whether the unit is bar or kPa or MPa

Hogging ejector ☐
- Supplier .....
- Manufacturer .....
- Manufacturer's type designation .....

The purchaser shall put an X in the info-column to indicate where data are required in the supplier's tender.

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Fundamental arrangement of systems

- Combined lubricant and control fluid system ☐
- Combined lubricant, control fluid, and seal fluid system ☐
- Separate systems for lubricant ☐
  control fluid ☐
  seal fluid ☐

General data

	Eff. pressure of supply ( ) [a]	Temperature of supply (°C)	Heat to dissipate (kW)	Steady flow (m^3/h)	Transient flow (m^3/h)	Pressure set safety valve(s) ( ) [a]	Fluid type acc. to ISO ..... [b]	Cleanliness acc. to ISO 4406
Turbine(s) bearings					X			
Turbine control								
Driven machine(s) bearings					X			
Driven machine(s) control								
Gear unit(s)					X			
Coupling(s)								
Shaft seal(s)					X			
Total	X	X				X	X	X

[a] Please indicate whether the unit is bar or kPa or MPa.
[b] For petroleum lubricating oils ISO 8068 is valid.

- Are oil tank heating devices necessary? yes ☐ no ☐ (see sheet D.38)

Pumps (9.4)

Pump equipment of plant:

G = Gear type pump
S = Screw type pump
C = Centrifugal pump

Designations of pumps (9.4.2) [a]	Quantity of pumps installed	Type of pump [b]
Main pump	( )	( )
Stand-by pump	( )	( )
Auxiliary pump	( )	( )
Emergency pump	( )	( )
	( )	( )
	( )	( )
	( )	( )
	( )	( )

[a] Please complete the listing if necessary.
[b] Please use the abbreviations as indicated at the side of the table.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Pumps

	Main pump [a]	Stand-by pump [a]	Auxiliary pump [a]	Emergency pump [a]
Supplier				
Manufacturer				
Manufacturer's type designation				
Flow (m^3/h)				
Discharge pressure [b] ( )				
Minimum suction head at pump inlet [b] ( )				
Power absorbed (kW)				
Driver: Elec. motor (e), turbine (t), direct (d)	( ) [c]	( ) [c]	( ) [c]	( ) [c]
- Supplier				
- Manufacturer				
- Manufacturer's type designation				
- For electric motor:				
- - Voltage (V)				
- - Frequency (Hz)				
- - Maximum power (kW)				
- - Class of explosion protection [d]				
- - Certification authority				
- - Identification number of certificate				
- - Degree of protection (IP-Code) [e]	IP	IP	IP	IP
- For turbine drive:				
- - Steam conditions at inlet (see sheet D.12)				
- - - Steam mass flow (t/h)				
- - - abs. pressure: normal [b] ( )				
minimum [b] ( )				
maximum [b] ( )				
- - - temperature normal (°C)				
minimum (°C)				
maximum (°C)				
- - Steam conditions at outlet (see sheet D.12)				
- - - abs. pressure: normal [b] ( )				
minimum [b] ( )				
maximum [b] ( )				
- - Mass flow of auxiliary steam at worst steam conditions [f] (t/h)				
- - Power at worst steam conditions [f] (kW)				

[a] For more pumps take an additional sheet D.34.
[b] Please indicate whether the unit is bar or kPa or MPa.
[c] Please use the abbreviations as indicated.
[d] According to IEC 60079.
[e] According to IEC 60529.
[f] Worst steam conditions means: Specified minimum inlet steam pressure and temperature and specified maximum exhaust pressure.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Filters (9.5)

	Filter used for			
	Lubricant	Control fluid		
Supplier				
Manufacturer				
Manufacturer's type designation				
Single filter (s) or double filter (d)	( )[a]	( )[a]	( )[a]	( )[a]
Normal operation pressure drop[b] ( )[c]				
Max. permissible pressure drop ( )[c]				
Max. permissible inlet pressure ( )[c]				
Normal filtration rate acc. to ISO 4572				
Material of filter element[d]				
Material of casing[d]				
Material of changeover valves[d]				
Eff. hydraulic test pressure ( )[c]				

[a] Please use the abbreviations as indicated.
[b] For pressure values see 9.5.
[c] Please indicate whether the unit is bar or kPa or MPa.
[d] Please specify material designation and the standard on which it is based.

Accumulators (9.7)

	Accumulator used for			
Supplier				
Manufacturer				
Manufacturer's type designation				
Type of construction: bladder-type (b), diaphragm-type (d), piston-type (p)	( )[a]	( )[a]	( )[a]	( )[a]
Number of accumulators				
Effective volume per accumulator (dm^3)				
Material of casing[b]				
Connections for accumulated medium				
- for flange connections DN/PN	/	/	/	/
- for screwed connections	G	G	G	G
Eff. hydraulic test pressure ( )[c]				

[a] Please use the abbreviations as indicated.
[b] Please specify the material designation and the standard on which it is based.
[c] Please indicate whether the unit is bar or kPa or MPa.

Accessories to the accumulators:

.....
.....
.....
.....
.....

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Plate-type coolers (9.6; 9.6.1; 9.6.2)

		Cooler used for	
Supplier			
Manufacturer			
Manufacturer's type designation			
Number of coolers			
Number of passes per cooler			
Surface per cooler	(m^2)		
Coolant			
- normal inlet temperature	(°C)		
- max. inlet temperature	(°C)		
- max. permissible temperature rise	(°C)		
- eff. max. inlet pressure	( ) [a]		
- max. permissible pressure drop	( ) [a]		
- through flow	(m^3/h)		
- fouling resistance on water side	(m^2·K/kW)		
Medium to cool			
- inlet temperature	(°C)		
- temperature drop	(°C)		
- eff. max. inlet pressure	( ) [a]		
- through flow	(m^3/h)		
Transferable heat flow under worst conditions	(kW)		
Distance between plates	(mm)		
Plate material [b]			
Material of changeover valves [b]			
Connections for coolant: - number			
- DN/PN		/	/
Connections for medium to cool: - number			
- DN/PN		/	/
Test pressure: coolant side	( ) [a]		
- side of medium to cool	( ) [a]		

[a] Please indicate whether the unit is bar or kPa or MPa.
[b] Please specify material designation and the standard on which it is based.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Tube-type coolers (9.6; 9.6.1; 9.6.3)

	Cooler used for	
Supplier		
Manufacturer		
Manufacturer's type designation		
Arrangement vertical (v) or horizontal (h)	( ) [a]	( ) [a]
Number of coolers		
Number of passes per cooler		
Surface per cooler (m^2)		
Coolant		
- normal inlet temperature (°C)		
- max. inlet temperature (°C)		
- max. permissible temperature rise (°C)		
- eff. max. inlet pressure ( ) [b]		
- max. permissible pressure drop ( ) [b]		
- through flow (m^3/h)		
- fouling resistance on water side ($m^2 \cdot K/kW$)		
Medium to cool		
- inlet temperature (°C)		
- temperature drop (°C)		
- eff. max. inlet pressure ( ) [b]		
- through flow (m^3/h)		
Transferable heat flow under worst conditions (kW)		
Tubes: outside diameter (mm)		
- wall thickness (mm)		
- number of tubes per pass		
- effective length (mm)		
Shell: outside diameter (mm)		
- wall thickness (mm)		
Materials: tubes [c]		
- tube sheets [c]		
- shell [c]		
- water boxes [c]		
Surface protection: inside of water boxes		
Connections for coolant: - number		
- DN/PN	/	/
Connections for medium to cool: - number		
- DN/PN	/	/
Test pressure tubes / water boxes ( ) [b]		
- shell ( ) [b]		

[a] Please use the abbreviations as indicated.
[b] Please indicate whether the unit is bar or kPa or MPa.
[c] Please specify material designation and the standard on which it is based.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Reservoirs (9.3)

	Main reservoir	Overhead reservoir		
Location				
- separate (s), base frame (f), bearing housing (b), gear unit casing (g)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
Supplier				
Manufacturer				
Capacity (m³)				
Filling volume [b] (m³)		---		
Capacity between max. and min. operating level (m³)				
Rundown capacity [c] (m³)		---		
Retention time during operation of the machine set (min)				
Free surface of oil (m²)				
Slope of bottom (mm/m)				
Flange of drainage valve DN/PN	/	/	/	/
Type of steel: walls and bottom				
covering				
Internal corrosion protection: yes (y), no (n)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
Type of corrosion protection				
Height above (+) or under (-) turb. axis (m)				
Heating (see sheet D.33): yes (y), no (n)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
- supplier				
- manufacturer				
- electric (e), steam (s)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
- direct (d), heat transfer medium (htm)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
Insulation: yes (y), no (n)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
- supplier				
Supplier of supporting structure				

[a] Please use the abbreviations as indicated.

[b] The filling volume also comprises the volumes which remain normally at standstill within the system.

[c] The rundown capacity shall be large enough to accommodate all the volumes running back to the reservoir normally at shut down and additionally the volume of an overhead reservoir.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Vapour extractor

	Vapour extractor used for			
Supplier				
Manufacturer				
Manufacturer's type designation				
Design type: blower (b), ejector (e)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
Discharge volume (m^3/h))				
Differential pressure ( ) [b]				
Driver for blower: electric motor				
- Supplier				
- Manufacturer				
- Manufacturer's type designation				
- Voltage (V)				
- Frequency (Hz)				
- Maximum power (kW)				
- Class of explosion protection [c]				
- Certification authority				
- Identification number of certificate				
- Degree of protection (IP-Code) [d]				
Driver for ejector: medium				
- Inlet pressure / temperature ( ) [e] / (°C)	/	/	/	/
- Mass flow (kg/s)				

[a] Please use the abbreviations as indicated.
[b] Please indicate whether the dimension is mbar or kPa.
[c] According to IEC 60079.
[d] According to IEC 60529.
[e] Please indicate whether the unit is bar or kPa.

Vapour separator

	Vapour separator used for			
Type of separator				
Supplier				
Manufacturer				
Manufacturer's type designation				
Number of separators				
Volume per separator (dm^3)				
Admission per separator (dm^3/d)				
Allowable operating pressure ( ) [b]				
Allowable operating temperature (°C)				
Max. allowable pressure drop ( ) [c]				
Drainage: automatic (a), manual (m)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
Degassing: electric (e), steam (s)	( ) [a]	( ) [a]	( ) [a]	( ) [a]
temperature (°C)				
Eff. hydraulic test pressure ( ) [b]				
Material in contact with oil				

[a] Please use the abbreviations as indicated.
[b] Please indicate whether the unit is bar or kPa or MPa.
[c] Please indicate whether the unit is mbar or Pa or kPa.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Purification system

		System used for	
Type of purifier			
Supplier			
Manufacturer			
Manufacturer's type designation			
Through flow	(m^3/h)		
Working temperature	(°C)		
Capacity of dirt trap	(kg)		
Water removal rate	(dm^3/h)		
Equipment stationary (s) or movable (mov)		( ) [a]	( ) [a]
Electric motor:			
- Supplier			
- Manufacturer			
- Manufacturer's type designation			
- Voltage	(V)		
- Frequency	(Hz)		
- Maximum power	(W)		
- Class of explosion protection [b]			
- Certification authority			
- Identification number of certificate			
- Degree of protection (IP-Code) [c]		IP	IP

NOTE Usually, the purification system is in parallel to the lube circuit.

[a] Please use the abbreviations as indicated.
[b] According to IEC 60079.
[c] According to IEC 60529.

Jacking oil device (9.4.5)

Does jacking oil device exist: yes ☐ no ☐

Which of the machines shall be jacked? .....

Supplier: .....

Pump:

- Manufacturer: .....
- Manufacturer's type designation: .....
- Max. oil pressure to lift the rotor: ..... ( ) [5)]
- Max. oil flow to keep the rotor lifted: ..... (m^3/h)

Electric drive:

- Voltage: ..... (V) Frequency: ..... (Hz) Power: ..... (kW)
- Class of explosion protection [3)] : .....
- Certification authority: ..... Ident. No. of certificate: .....
- Degree of protection (IP-Code) [4)] : .....

[3)] According to IEC 60079.
[4)] According to IEC 60529.
[5)] Please indicate whether the unit is bar or kPa or MPa.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Governor

Type: mechanical ☐ hydraulic / mechanical ☐ pneumatic / mechanical ☐
electronic: ☐ digital ☐ analog ☐
simplex ☐ redundant (multiprocessor) ☐

Classification (10.2): class 1 ☐ class 2 ☐ class 3 ☐ class 4 ☐

Supplier: .....
Manufacturer: ..... Manufacturer's type designation: .....
Voltage: ..... (V) ± ..... (V) Frequency: ..... (Hz) Power: ..... (W)
Class of explosion protection [3]: .....
Certification authority: ..... Identification number of certificate: .....
Degree of protection (IP-Code) [4] : IP .....
Setpoint adjusting: manual ☐ electric ☐ pneumatic ☐

Range of speed change

Minimum speed: ..... (min^{-1}) Maximum speed: ..... (min^{-1})

Turbine type

Single valve, single stage ☐ Multivalve, single stage ☐
Single valve, multistage ☐ Multivalve, multistage ☐

Driven equipment type

Compressor:	centrifugal	☐	axial	☐
Pump:	centrifugal	☐	axial	☐
Fan: ☐				
Generator:	synchronous	☐	induction	☐

Operating in parallel to the public grid/other generators: yes ☐ no ☐
Other: .....

Controlled variable(s)

Steady-state speed	☐	Inlet pressure	☐	Extraction pressure 1	☐
Frequency	☐	Backpressure	☐	Extraction pressure 2	☐
Effective load	☐	Compr./pump outlet pressure	☐	Extraction flow 1	☐
Power import/export	☐	Compr./pump flow	☐	Extraction flow 2	☐
Auto voltage regulation	☐	Compr./pump inlet pressure	☐	Induction pressure	☐
				Induction flow	☐

Other: .....

Further requirement(s)

Automatic synchronization ☐
Solenoid valve for load shedding (generator drives) ☐
- Voltage ..... (V) Frequency: ..... (Hz)
- Degree of protection (IP-Code) [4]: IP .....
- Normally energized principle ☐ Normally de-energized prinziple ☐
Automatic start-up ☐
- Please specify the conditions / requirements for automatic start-up procedure:
.....
.....
.....

[3] According to IEC 60079.
[4] According to IEC 60529.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Minimum input / output requirements

Binary inputs:		Binary outputs:	
- Start or reset	☐	- Common shutdown	☐
- Normal stop	☐	- Common alarm	☐
- Emergency trip	☐	- Speed sensor alarm	☐
- Raise / lower speed	☐	-	☐
- Enable/disable remote speed setpoint	☐	-	☐
- Ramp to min. contin. operating speed	☐	-	☐
- Enable overspeed test	☐	-	☐
- Enable pressure control	☐	-	☐
- Enable alarm clear / acknowledge	☐	-	☐
- Enable automatic synchronization	☐	-	☐
- Raise / lower cascade	☐	-	☐
-	☐	-	☐
-	☐	-	☐
-	☐		

Analog inputs (4 mA to 20 mA):		Analog outputs (4 mA to 20 mA):		
- Remote speed set point	☐	- Speed		☐
- Effective load	☐	- Speed setpoint		☐
- Power import / export	☐	- Remote speed setpoint		☐
- Inlet pressure	☐	- Effective load		☐
- Back pressure	☐	- Power import / export		☐
- Compressor/pump outlet pressure	☐	- Inlet pressure,	actual value	☐
- Compressor/pump flow	☐		setpoint	☐
- Compressor/pump inlet pressure	☐	- Backpressure,	actual value	☐
- Extraction pressure 1	☐		setpoint	☐
- Extraction pressure 2	☐	- Compr./pump outlet press.,	actual value	☐
- Extraction flow 1	☐		setpoint	☐
- Extraction flow 2	☐	- Compressor/pump flow,	actual value	☐
- Induction pressure	☐		setpoint	☐
- Induction flow	☐	- Compr./pump inlet press.,	actual value	☐
-	☐		setpoint	☐
-	☐	- Extraction pressure 1,	actual value	☐
-	☐		setpoint	☐
		- Extraction pressure 2,	actual value	☐
			setpoint	☐
Other analog inputs:		- Extraction flow 1,	actual value	☐
- Frequency	☐		setpoint	☐
-	☐	- Extraction flow 2,	actual value	☐
-	☐		setpoint	☐
-	☐	- Induction pressure,	actual value	☐
			setpoint	☐
		- Induction flow,	actual value	☐
			setpoint	☐
		- Actuator position		☐
		-		☐
		-		☐
		-		☐

The purchaser shall put an X in the Info column to indicate where data are required in the supplier´s tender.

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Governor installation

Location:	local, at turbine	☐	Mounting:	flush-mounted in panel	☐
	remote, at control room	☐		surface-mounted on panel	☐
	other:	☐		rack-mounted	☐

Governor control panel

Local governor control panel at turbine	required	☐	not required	☐
Remote governor control panel at control room:	required	☐	not required	☐
at other location:	required	☐	not required	☐

Outputs from panel to governor:		Inputs from governor to panel:	
- Start or reset	☐	- Common alarm trip	☐
- Normal stop	☐	- Trip signal	☐
- Emergency trip	☐	- - Lamp	☐
- Raise / lower speed	☐	- - Horn	☐
- Overspeed test	☐	- - Other:	☐
- Ramp to min. cont. operating speed	☐	- Remote setpoint enabled lamp	☐
- Enable / disable remote setpoint	☐	- Speed setpoint indicator	☐
-	☐	-	☐
-	☐	-	☐
-	☐	-	☐

Loss of remote speed setpoint signal

Governor action on loss of remote signal:	
- Freeze-in last value	☐
- Goes to minimum continuous operating speed	☐
- Goes to maximum continuous operating speed	☐
- Other:	☐

Speed sensors for electronic governor (10.4)

- Supplier .....
- Manufacturer .....
- Manufacturer's type designation .....
- Number of speed sensors .....
- Class of explosion protection [3] .....
- Certification authority .....
- Identification number of certificate .....
- Voting logic: 1 out of 2 ☐ 2 out of 3 ☐
  Other: .....
- Number of teeth on toothed wheel for speed sensing: .....

[3] According to IEC 60079.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Control valve(s) [7)]

		Inlet	Induction	behind Extract. 1	behind Extract. 2
Supplier					
Manufacturer					
Manufacturer's type designation					
Number of valves					
Connection to the steam line					
- Flange	Size DN/PN				
	Facing				
- Welding	Outer diameter (mm)				
	Wall thickness (mm)				
	Material designation acc. to	ISO	ISO	ISO	ISO

Electro-hydraulic converter(s) [7)]

		Converter related to valve(s) Inlet	Induction	behind Extract. 1	behind Extract. 2
Supplier					
Manufacturer					
Manufacturer's type designation					
Voltage	(V)	±	±	±	±
Frequency	(Hz)				
Power	(W)				
Class of explosion protection [a]					
Certification authority					
Identification number of certificate					
Degree of protection (IP-Code) [b]		IP	IP	IP	IP
Design simplex (s) or redundant (r)		( ) [c]	( ) [c]	( ) [c]	( ) [c]

[a] According to IEC 60079.
[b] According to IEC 60529.
[c] Please use the abbreviations as indicated.

[7)] For more control valves and converters, take an additional sheet D.44.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Stop valve(s) and strainer(s) [8)]

Stop valve(s) (10.5.2.1):

		Inlet	Induction
Supplier			
Manufacturer			
Manufacturer's type designation			
Number of valves in parallel			
Connection to the steam line			
- Flange	Size DN/PN		
	Facing		
- Welding	Outer diameter (mm)		
	Wall thickness (mm)		
	Material designation acc.to		
Pressure drop at normal operating point [b] ( ) [c]			
Manual actuation: local (l), remote (r)		( ) [a]	( ) [a]
Reset: local (l), remote (r), manual (m), hydraulic (h)		( ) [a]	( ) [a]
Feasibility for checking the stop valve(s): yes (y), no (n)		( ) [a]	( ) [a]
- Location for initiating the test: local (l), remote (r)		( ) [a]	( ) [a]
- Full stroke (f) or partial stroke (p) check		( ) [a]	( ) [a]
- Extent of output restriction			

[a] Please use the abbreviation as indicated
[b] Only valid, if the supplier of the valve is not identical with the turbine supplier
[c] Please indicate, whether the dimension is bar or kPA

Strainer(s) (8.2):

		Inlet	Induction
Opening size of strainer insert (mm)			
Integrated in stop valve(s): yes (y) or no (n)		( ) [a]	( ) [a]
If the strainer is not integrated:			
- Supplier			
- Manufacturer			
- Manufacturer's type designation			
Connection to the steam line			
- Flange	Size DN/PN		
	Facing		
- Welding	Outer diameter (mm)		
	Wall thickness (mm)		
	Material designation acc.to		
- Connection size DN/PN		/	/
- Connection type: flange (f), welding (w)		( ) [a]	( ) [a]
- Pressure loss at normal operating point ( ) [b]			

[a] Please use the abbreviation as indicated
[b] Only valid, if the supplier of the valve is not identical with the turbine supplier

[8)] For more stop valves and strainers, take an additional sheet D.45

The purchaser shall put an X in the info-column to indicate where data are required in the supplier's tender.

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Devices against backflow

Non-return valves:

	Exhaust	Extraction No.	Extraction No.	Extraction No.	Extraction[a] No. .....
Valve: - controlled	☐	☐	☐	☐	☐
- uncontrolled	☐	☐	☐	☐	☐
- semi-controlled	☐	☐	☐	☐	☐
Valve: - single	☐	☐	☐	☐	☐
- duplex, in line	☐	☐	☐	☐	☐
Supplier					
Manufacturer					
Manufacturer's type designation					
Connection to the steam line					
- Flange Size DN/PN					
Facing					
- Welding Outer diameter (mm)					
Wall thickness (mm)					
Material designation acc.to					
Pressure drop at normal operating point ( )[b]					

NOTE An uncontrolled valve is a valve that is opened or closed mainly by the flow. A controlled valve is a valve that is closed and blocked in closed position by an external generated force, if the stop valves are closed.
Usually the stop valves and the controlled non-return valves are closed by spring action as a consequence of a pressure decay in the trip oil system.

[a] For more extractions, take an additional sheet D.46.

[b] Please indicate whether the unit is bar or kPa or MPa.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Overspeed trip system (10.5.1; 10.5.2)

Mode of operation: mechanical ☐ electronic ☐

Trip setpoint: ..... (min^{-1}) ..... (min^{-1})

For electronic systems:

- Supplier
  .....
- Manufacturer
  .....
- Manufacturer's type designation .....
- Voting logic: 1 out of 2 ☐ 2 out of 3 ☐ other:
  .....
- Class of explosion protection [3] .....
- Certification authority
  .....
- Identification number of certificate .....
- Degree of protection (IP-Code) [4] IP .....

- Speed pickups
- - Supplier
  .....
- - Manufacturer
  .....
- - Manufacturer's type designation .....
- - Number of speed pickups .....
- - Class of explosion protection .....
- - Certification authority
  .....
- - Identification number of certificate .....
- - Number of teeth on toothed wheel for speed sensing .....

- Solenoids: de-energized to trip ☐ energized to trip ☐
- Contacts: normally open ☐ normally closed ☐

[3] Acc. to IEC 60079.
[4] Acc. to IEC 60529.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Overpressure protecting systems (10.5.1; 10.5.3)

Safety valves, blow-off-valves, lifting (bursting) disks:

	Overpressure systems Safety valves [a]			Vacuum systems	
	Exhaust	Extract.1	Extract.2	Blow-off valves	Lifting (bursting) disks
Supplier					
Manufacturer					
Type designation					
Setpoint eff. ( )[b]					
Total capacity (kg/h)					
Number of valves					
Flanges DN/PN	/	/	/	/	/
Flange facing					

[a] For more safety devices, take an additional sheet D.48.
[b] Please indicate whether the unit is bar or kPa or MPa.

Pressure switches

	Exhaust	Extract.1	Extract.2		[a]
Supplier					
Manufacturer					
Type designation					
Setpoint eff. ( )[b]					
Class of expl. protect					
Certificat. authority					
Ident. No. of certificat.					
Degr.of prot.(IP-Code)					
Normally energized (e) or de-energized (d)	( )[c]	( )[c]	( )[c]	( )[c]	( )[c]
Connecting thread for impulse line					

[a] For more safety devices, take an additional sheet D.48.
[b] Please indicate whether the unit is bar or kPa or MPa.
[c] Please use the abbreviations as indicated.

The purchaser shall put an X in the Info column to indicate where data are required in the supplier's tender.

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Date								