



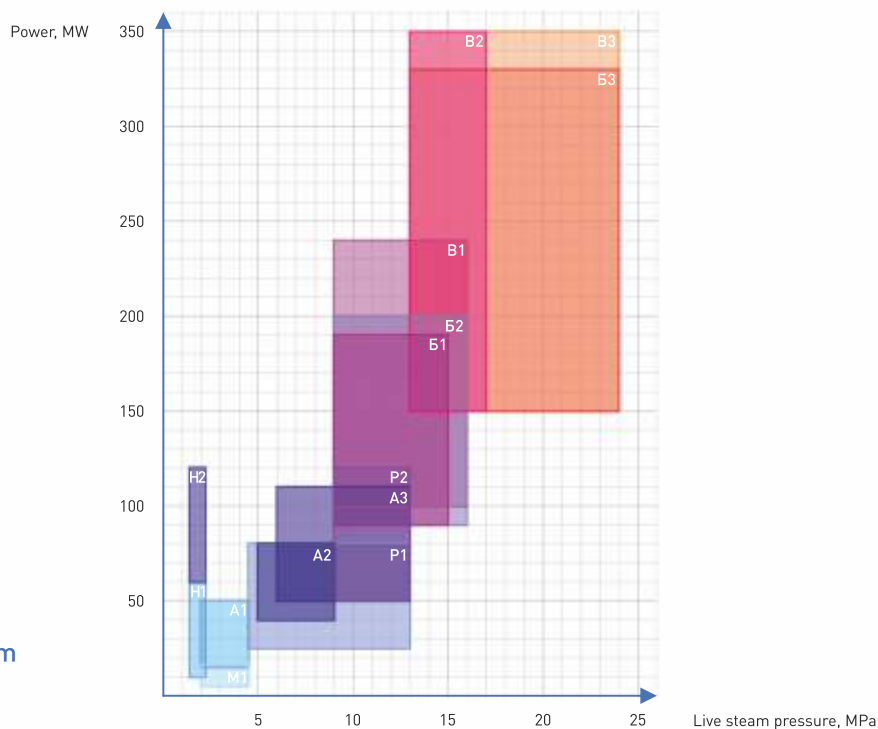
URAL
TURBINE
WORKS



ROTEC

Over the last decade, the **Ural Turbine Works** has developed over ten entirely new steam turbines. The main feature of these turbines is that they don't fit into any model range previously considered a series one. The same turbine design can be used in directly contrary types, for example, the main turbine assemblies could be used both for purely condensing turbine unit and for steam turbine unit with high heat extraction. Alternatively, the turbine of the same design can be used for a wide power range. Thus to implement the optimum turbine types and models classification the Ural Turbine Works has introduced the new designation – classes. Each turbine class implies the inclusion of a certain set of design features united by a single indivisible application in a particular turbine.

Classification of steam turbines for CHP



Class	Live steam pressure, MPa		Electric power, MW	
	Start of range	End of range	Start of range	End of range
Main classes				
A.1	2,0	4,5	14	50
A.2	4,9	8,8	40	80
A.3	5,9	12,8	50	110
Б.1	8,8	14,7	90	190
Б.2	8,8	15,7	90	200
Б.3	12,8	23,5	150	330
Б.1	8,8	15,7	100	240
Б.2	12,8	23,5	150	350
Б.3	12,8	23,5	150	350
Additional classes				
H.1	1,4	2,2	10	60
H.1.1	1,4	2,2	10	60
H.2	1,4	2,2	60	120
P.1	4,5	12,8	25	80
P.2	8,8	12,8	50	120
M.1	2,0	4,5	5	16

CLASS A.1.

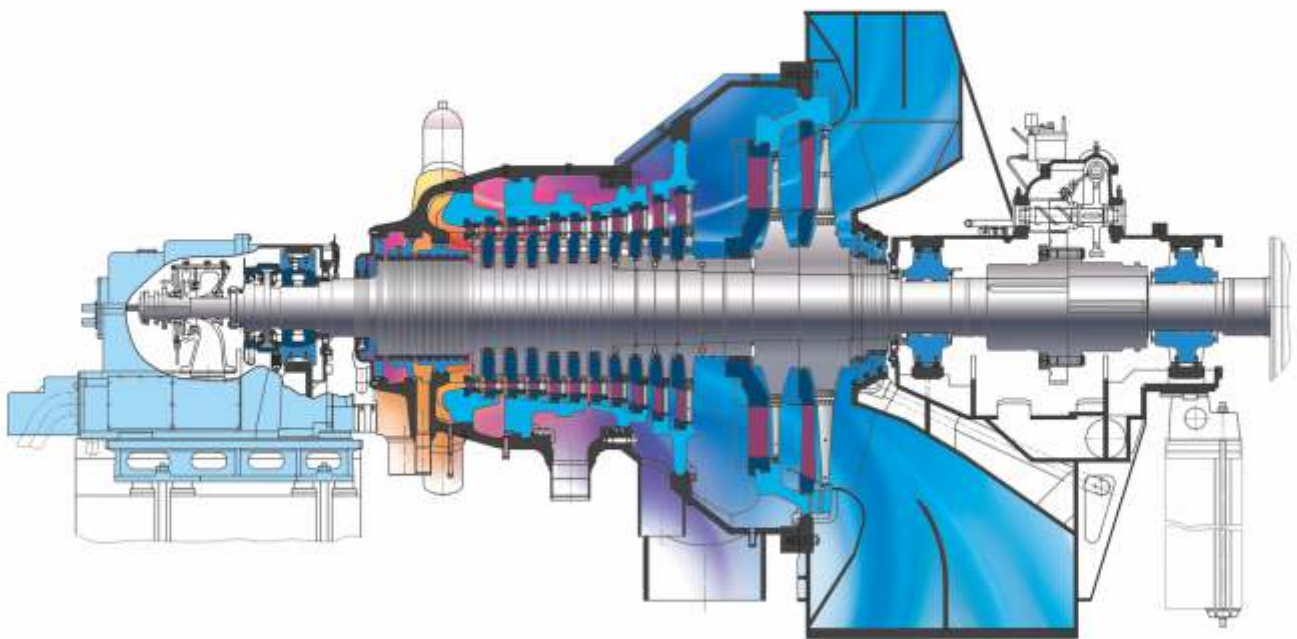
Class A.1: single-casing turbines with straight steam flow arrangement for live steam pressure from 2.0 to 4.5 MPa (20-45 kgf/cm²), power ranged from 15 to 50 MW. Last stage blade with the length from 430 to 660 mm (17-26 in) can be used. Throttle control with an external valve unit or several units is used. The turbine is designed either with the radial exhaust to one water-cooled condenser, or with the axial exhaust to the air cooling condensing unit. The casing has a combined construction – the steam inlet part is cast, the middle part is welded and forged, and the exhaust part is welded. There is an option to organize steam bleedings both for a single-stage controlled heat extraction with a capacity from 50 to 100 Gcal/h and for industrial needs with a capacity of up to 40 t/h.

A.1 Class Turbines. Specification

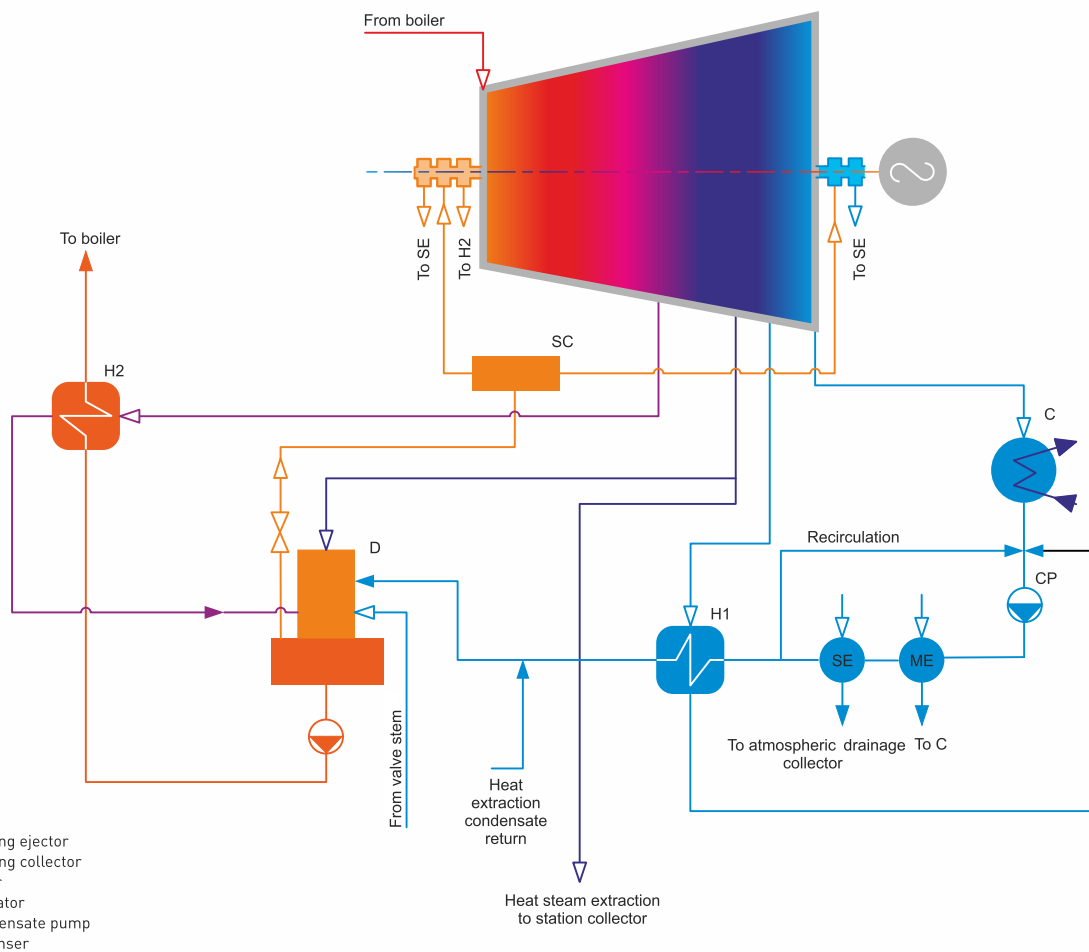
Characteristics	Values
Main type of the turbine	Cogeneration / condensing
Basic design feature	Single-cylinder with a straight steam flow
Steam distribution type	Throttle
Electricity output range, MW	15-50
Main steam characteristics:	
- Pressure, MPa	2,0-4,5
- Temperature, °C	250-450
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage delivery water heating
- Maximum heating load, Gcal/h	50-100
- Steam extraction flow rate, t/h	100-200
Capability of steam extraction for industrial use:	
- Flow rate, t/h:	up to 40 t/h
- Scheme	Non-controlled steam bleeding
- Guaranteed pressure, MPa	0,8-1,6
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	5000-8000
- Heat exchange surface area, m ²	1700-3100
Turbines of this class	T-42/50-2,9



Turbine Longitudinal Cross Section T-42/50-2,9



Turbine Heat Balance Diagram T-42/50-2,9

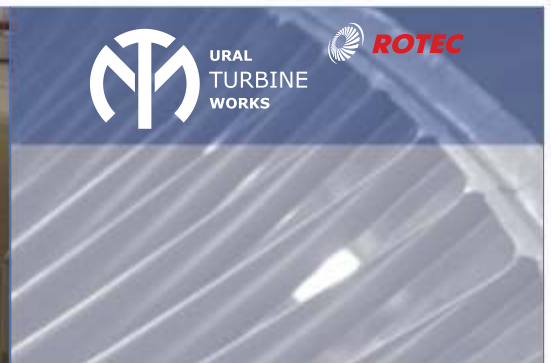


CLASS A.2.

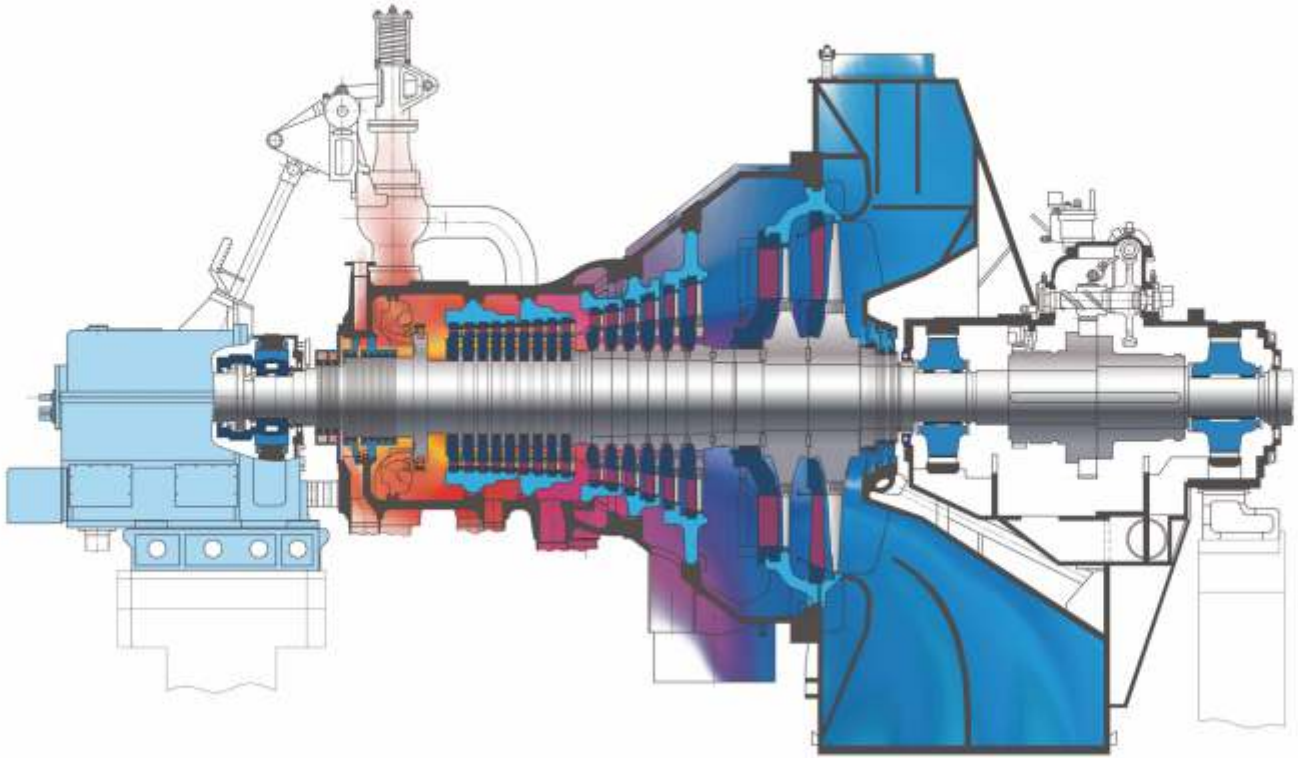
Class A.2: single-casing turbines with straight steam flow arrangements for pressure from 4.9 to 8.8 MPa (50-90 kgf/cm²), last stage blade with the length from 430 to 660 mm (17-26 in) can be used, capacity range is from 40 to 80 MW. Throttle control featuring the remote valve unit or several units, moreover, multiple steam nozzle control with control valve installed on the casing can be implemented. The turbine is supposed to come with the radial exhaust to one water-cooled condenser, the version with the axial exhaust to the air cooling condensing unit also exists. The casing is a combined one – the steam inlet part is cast, the middle part is welded and forged, the exhaust part is welded. In the front part, the casing rests on the remote front bearing unit, in the rear part the casing rests on the rear transverse frame and side frames in the area of the exhaust part. The turbine features the possibility to organize single-stage controlled heat extraction with a capacity from 50 to 140 Gcal/h, industrial steam bleeding with a capacity from 50 to 150 t/h.

A.2 Class Turbines. Specification

Characteristics	Values
Main type of the turbine	Cogeneration / condensing
Basic design feature	Single-casing with a straight steam flow
Steam distribution type	Throttle / nozzle
Electricity output range, MW	40-80
Main steam characteristics:	
- Pressure, MPa	4,9-8,8
- Temperature, °C	400-555
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage / double-stage delivery water heating
- Maximum heating load, Gcal/h	50-140
- Steam extraction flow rate, t/h	100-280
Capability of steam extraction for industrial use:	
- Flow rate, t/h:	50-150 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,8-2,0
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	5000-8000
- Heat exchange surface area, m ²	1700-3100
Turbines of this class	ПТ-30/40-8,8/1,3, Т-50/60-8,8, Т-60/65-8,8, К-63-8,8

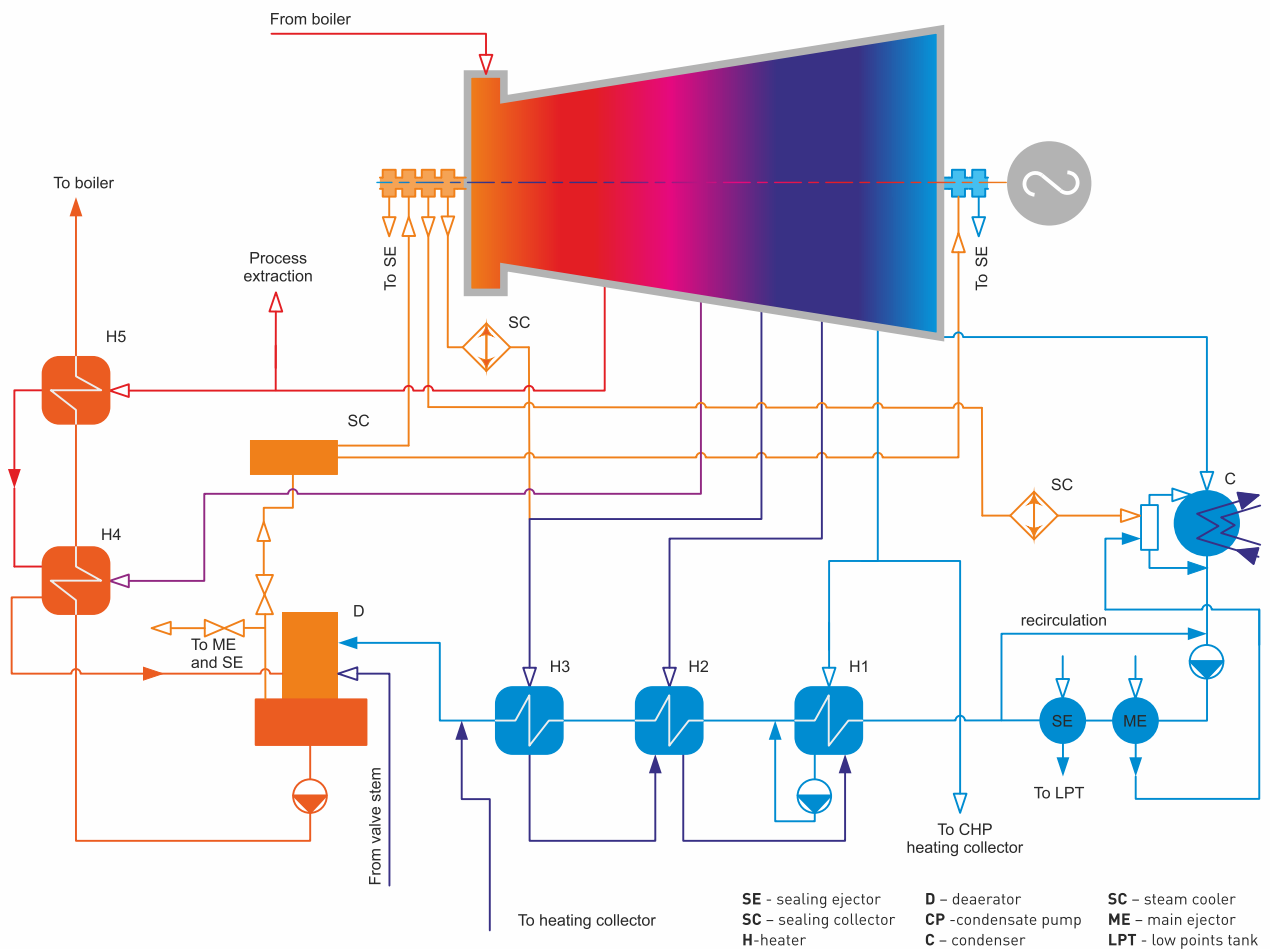


Turbine Longitudinal Cross Section T-60/65-8,8



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Turbine Heat Balance Diagram T-60/65-8,8

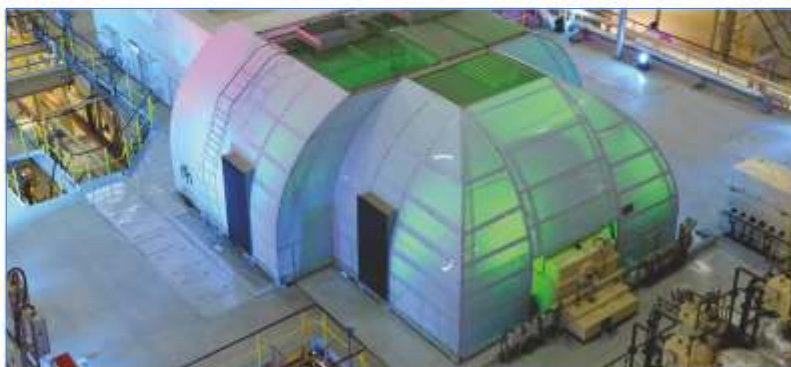


CLASS A.3.

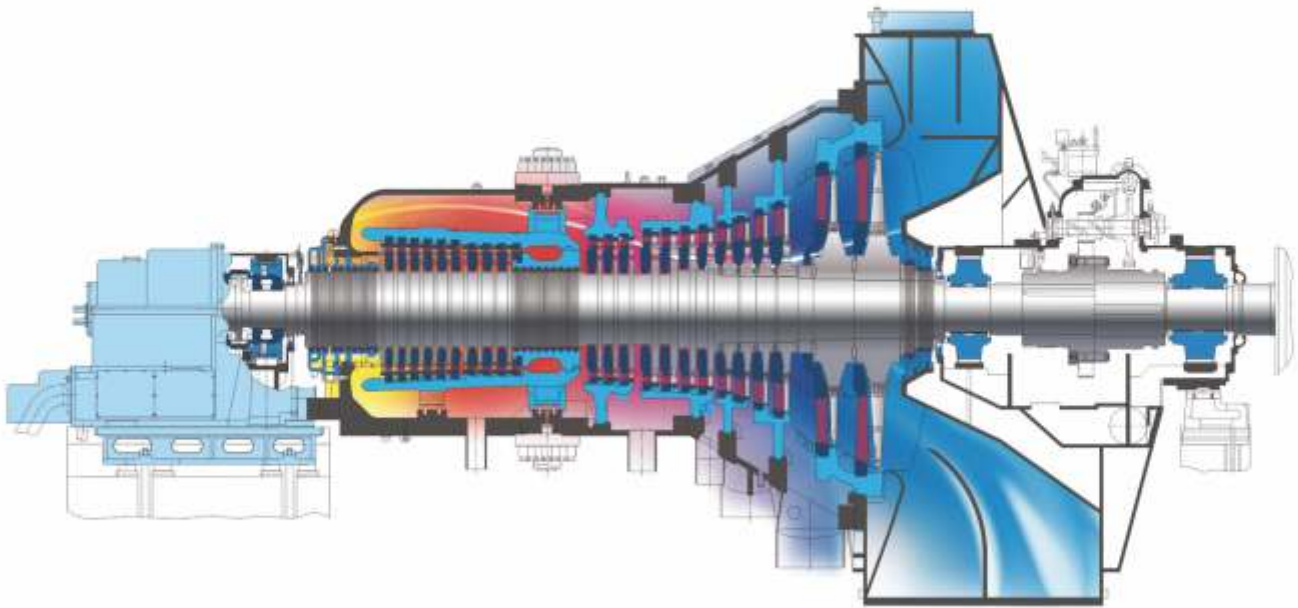
Class A.3: single-casing turbines with reverse steam flow arrangement with internal casing and inter-body space. Inter-body space can be used both for steam supply (for example, for use in combine cycle plant units) and for steam extraction (for example, for regeneration or industrial steam extraction). The capacity range is from 50 to 110 MW, live steam pressure is from 5.9 to 12.8 Mpa (60-130 kgf/cm²), last stage blade with the length from 430 to 660 mm (17-26 in) can be used. Throttle control featuring the remote valve unit or a nozzle with arrangement of control valve on the casing based on the assumed operating conditions. The turbine is supposed to come with both the radial exhaust to one water-cooled condenser and the axial exhaust to the air cooling condensing unit. The turbine features the possibility to organize single-stage or double-stage controlled heat extraction with a capacity from 50 to 190 Gcal/h, as well as control and uncontrolled industrial steam bleeding with a capacity from 50 to 250 t/h.

A.3 Class Turbines. Specification

Characteristics	Values
Main type of the turbine	Cogeneration / condensing
Basic design feature	Single-casing with a loop-type steam flow, with the inner casing
Steam distribution type	Throttle / nozzle
Exhaust casing type	Radial / axial
Electricity output range, MW	50-110
Main steam characteristics:	
- Pressure, MPa	5,9-12,8
- Temperature, °C	400-560
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage / double-stage delivery water heating
- Maximum heating load, Gcal/h	50-190
- Steam extraction flow rate, t/h	100-370
Capability of steam extraction for industrial use:	
- Flow rate, t/h:	50-250 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,8-2,0
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	8000-13500
- Heat exchange surface area, m ²	3100-6000
Turbines of this class	T-63/76-8,8, KT-63-7,7, K-60-12,8, K-65-12,8, K-85-8,0

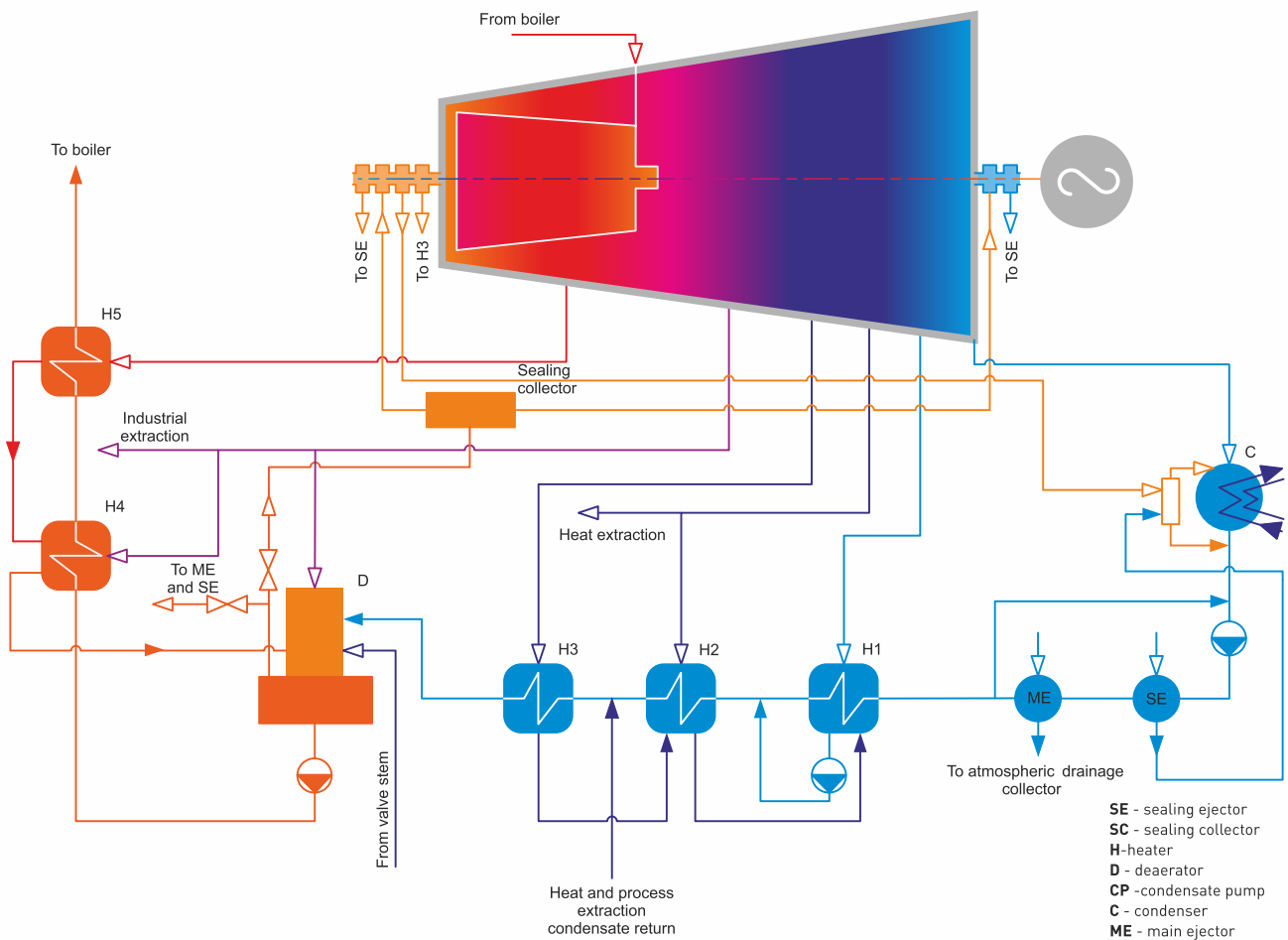


Turbine Longitudinal Cross Section K-65-12,8



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Turbine Heat Balance Diagram K-65-12,8



TURBINES FOR PRODUCTION CYCLE AND WASTE RECYCLING

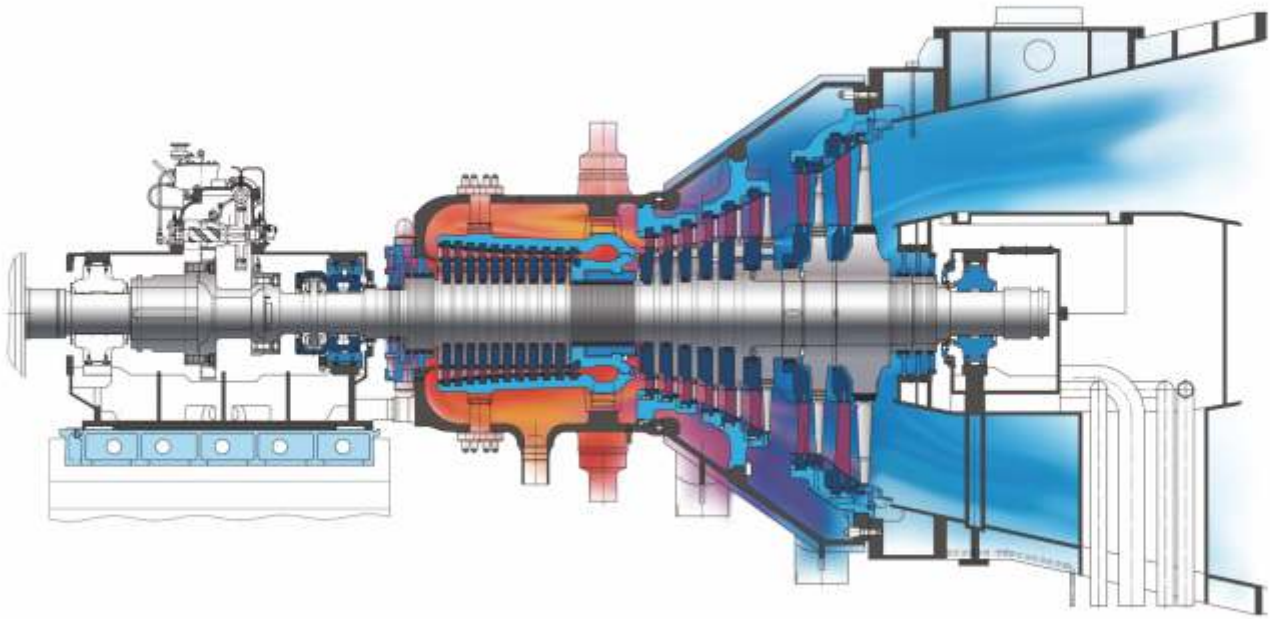
The Kp-77-6.8 turbine is an advanced model of a new platform which can serve as a base for designing and manufacturing of turbines with a capacity up to 100 MW, which are intended for operation both as part of “waste-to-energy” plants, in combined cycle, and simple cycle. A key feature of the turbine is its low-pressure part design featuring the exhaust casing of the axial type.

The turbine belongs to the class of turbines A.3. Turbines of class A.3 – single-casing turbines of two-case construction with the reverse of steam flow. The turbine can be used in projects with rated electric power from 50 to 100 MW with parameters of live steam pressure from 6 to 10 MPas, with the temperature from 400 to 555 °C. At application in combine cycle plant with the double-pressure heat recovery steam generator for a supply of steam of a circuit of LP both the intercase space, and the branch pipes which are available in a casing intended for selections of steam at a steam-power cycle can be used. In construction of the turbine several cameras from which selections of steam for balance of plant, including heating extraction for heating of heating-system water can be carried out are organized.

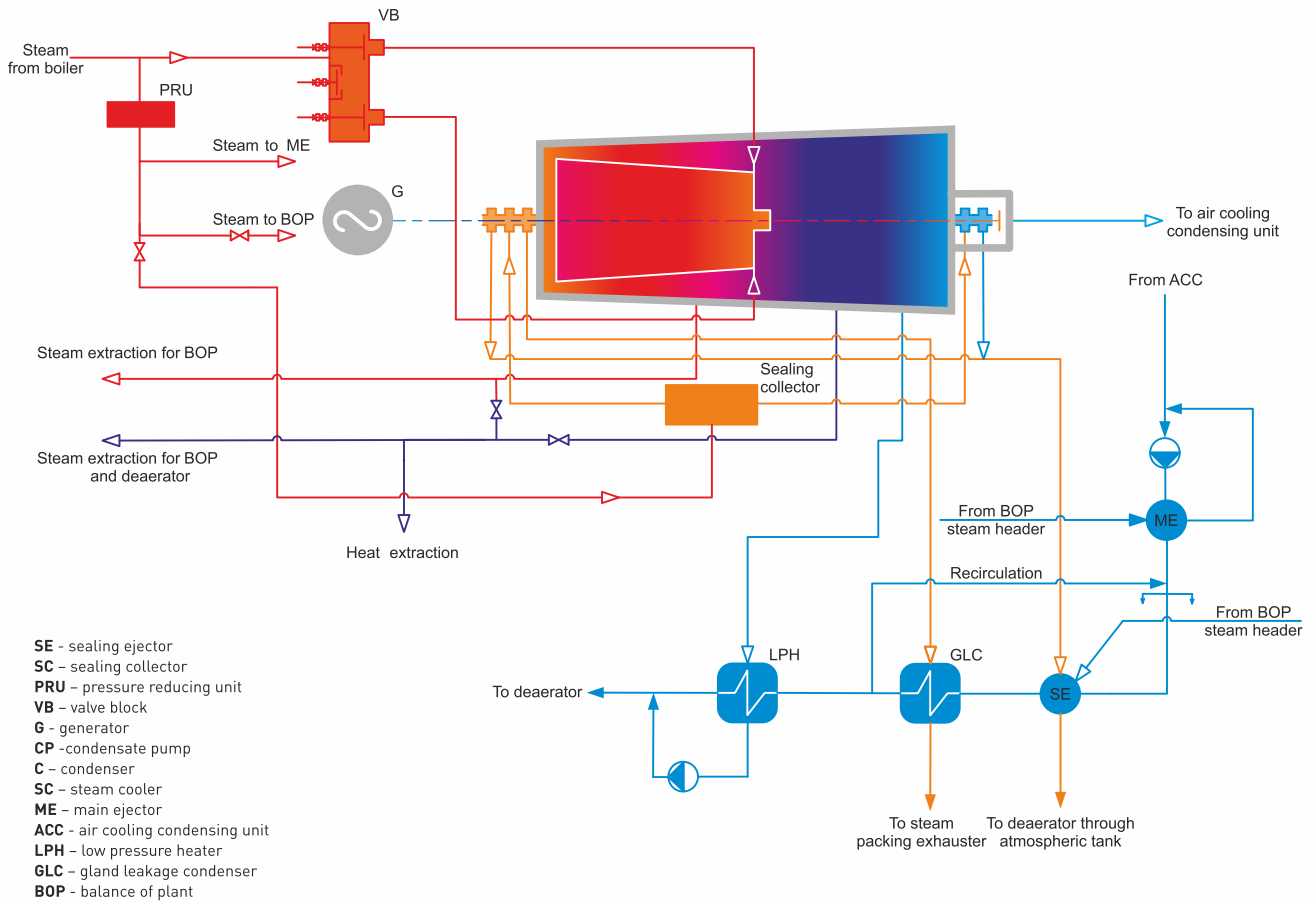
The turbine can be operated either with an air cooling condensing unit (ACU) or in combination with a water-cooled condenser.



Turbine Longitudinal Cross Section Kn-77-6,8



Turbine Heat Balance Diagram Kn-77-6,8



CLASS B.1.

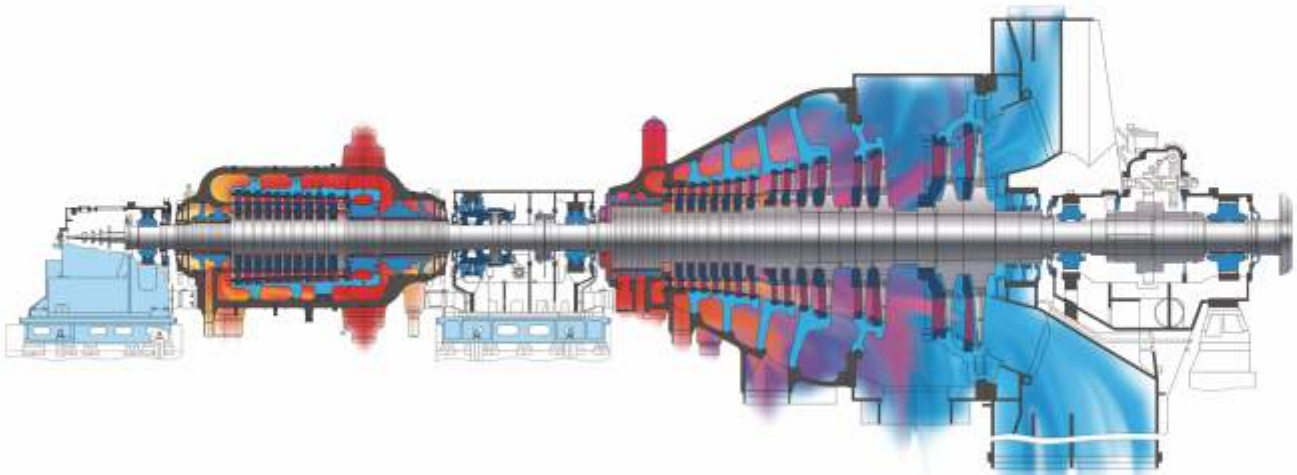
Class B.1: two-casing turbines with the high-pressure and low-pressure casings. The low-pressure casing features blade carrier design, in case the availability of extractions from the casing is required or cartridgeless in case there is no such need. The separate control stage is not executed. Steam distribution can be both nozzle and throttle based on the assumed operating conditions. The low-pressure casing is made to be straight flow. Steam flows in the high-pressure and low-pressure casings is opposite to compensate axial forces on the pad of thrust and radial bearing. Capacity range is from 60 to 190 MW, live steam pressure is from 8.8 to 14.7 MPa (90-150 kgf/cm²), last stage blade with the length from 550 to 940 mm (22-37 in) can be used. The turbine could be designed with both the radial exhaust to one water-cooled condenser and the axial exhaust to the air cooling condensing unit. The turbine features the possibility to organize single-stage or double-stage controlled heat extraction with a capacity from 100 to 190 Gcal/h, as well as control and uncontrolled industrial steam extraction with a capacity from 50 to 200 t/h.

5.1 Class Turbines. Specification

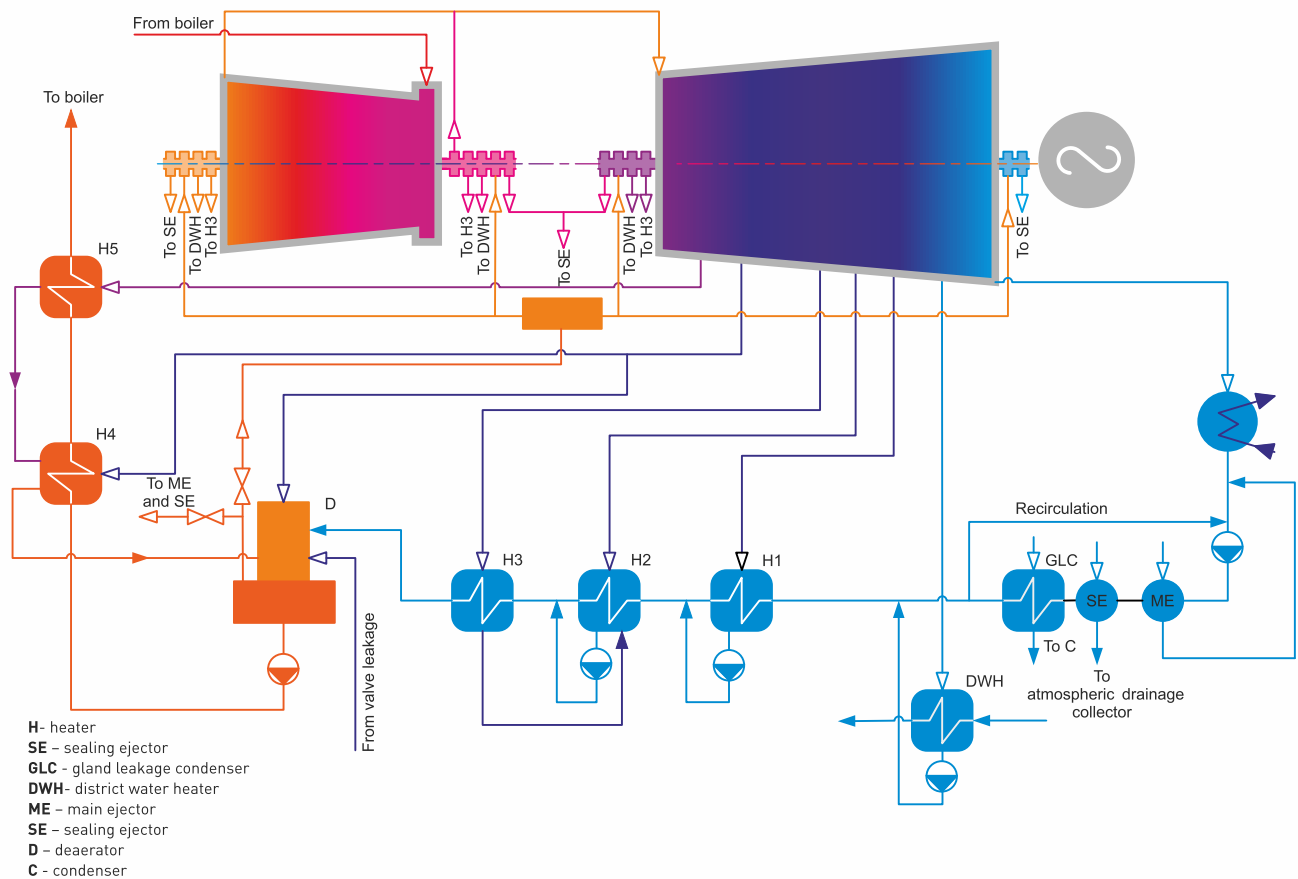
Characteristics	Values
Main type of the turbine	Cogeneration / condensing
Basic design feature	Two-casing with an opposite steam flow in casings
Steam distribution type	Throttle / nozzle
Exhaust casing type	Radial / axial
Electricity output range, MW	60-190
Main steam characteristics:	
- Pressure, MPa	8,8-14,7
- Temperature, °C	500-560
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage / double-stage delivery water heating
- Maximum heating load, Gcal/h	100-190
- Steam extraction flow rate, t/h	190-370
Capability of steam bleeding for industrial use:	
- Flow rate, t/h:	50-200 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,8-2,1
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	8000-13500
- Heat exchange surface area, m ²	3100-6000
Turbines of this class	T-95/105-8,8, ПТ-60-8,9/1,9, ПТ-60-8,8/1,3



Turbine Longitudinal Cross Section T-95-8,8



Turbine Heat Balance Diagram T-95-8,8



CLASS B.2.

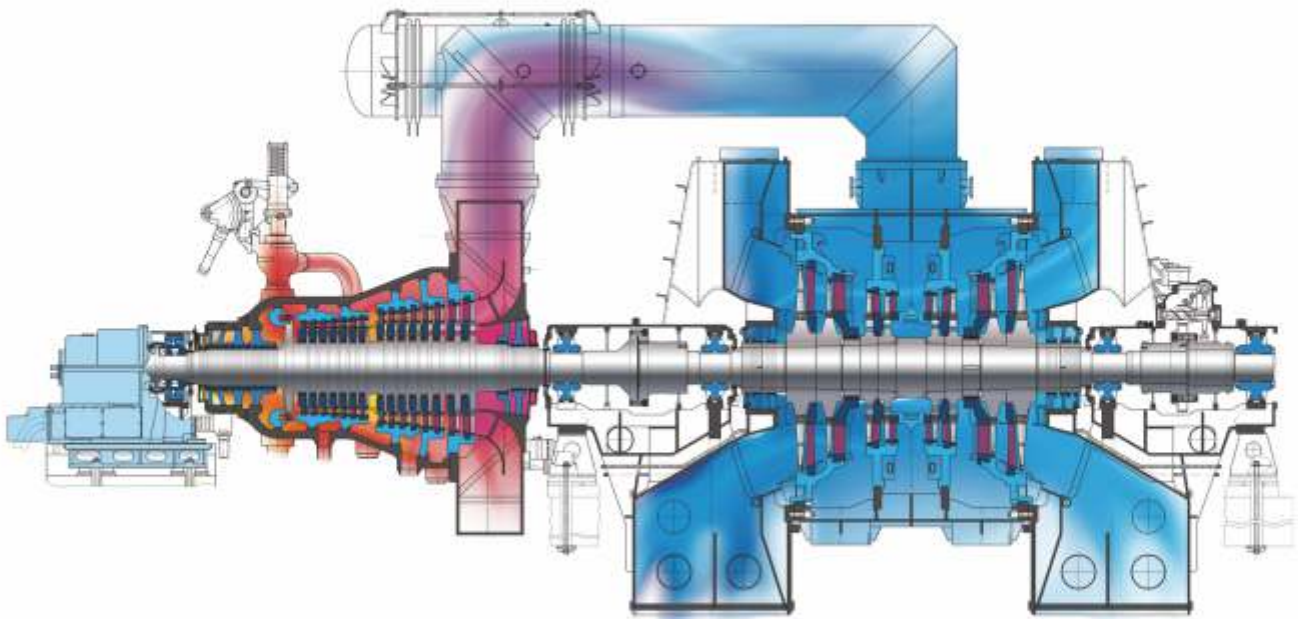
Class B.2: two-casing turbines with the high-pressure and low-pressure casings. The low-pressure casing features blade carrier design, in case the availability of extractions from the casing is required or cartridgeless in case there is no such need. The separate control stage is not executed. Steam distribution can be both nozzle and throttle based on the assumed operating conditions. The low-pressure casing is made to be double-flow symmetrical with two radial exhausts to the condenser group. The capacity range is from 90 to 200 MW, live steam pressure is from 8.8 to 15.7 Mpa (90-160 kgf/cm²), last stage blades with the length from 550 to 940 mm (22-37 in) can be used. The turbine features the possibility to organize single-stage or double-stage controlled heat extraction with a capacity from 100 to 190 Gcal/h, as well as control and uncontrolled industrial steam bleeding with a capacity from 50 to 200 t/h.

5.2 Class Turbines. Specification

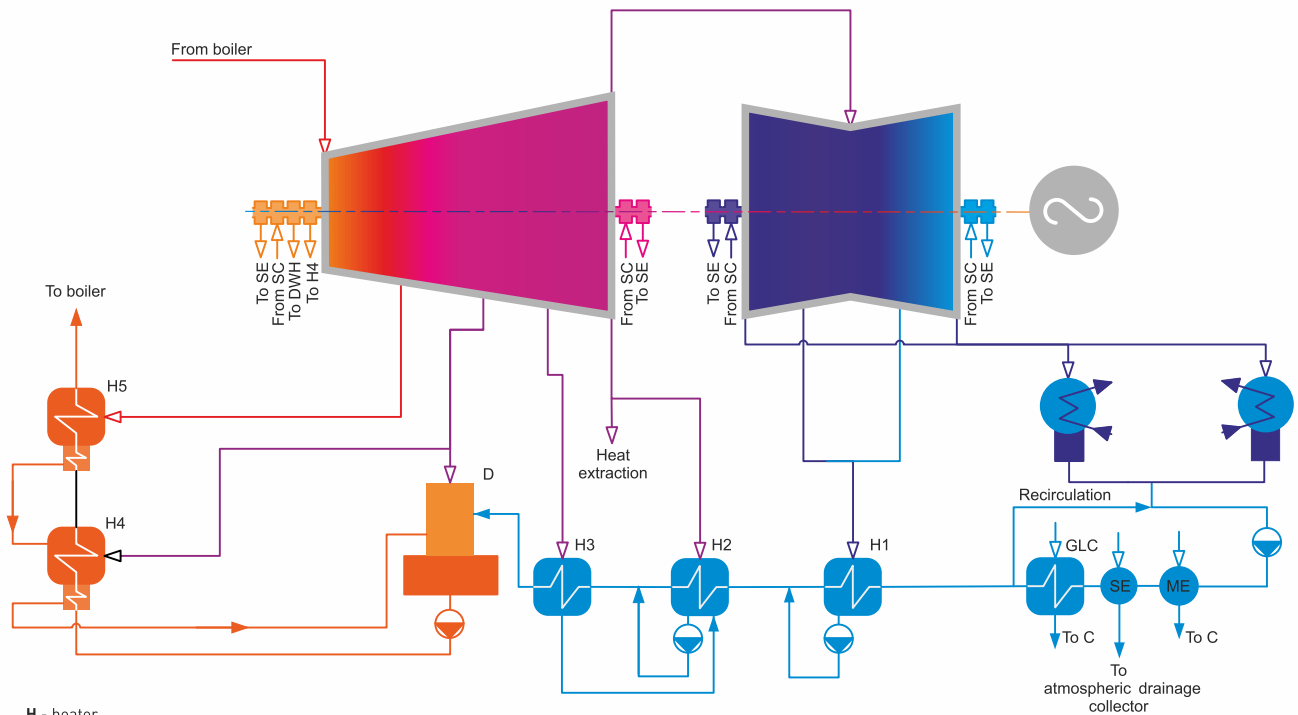
Characteristics	Values
Main type of the turbine	Cogeneration / condensing
Basic design feature	Two-casing, HPC with vane carriers and a straight steam flow, LPC double-flow casing
Steam distribution type	Throttle / nozzle
Electricity output range, MW	90-200
Main steam characteristics:	
- Pressure, MPa	8,8-15,7
- Temperature, °C	500-560
Capability of steam reheating	Yes
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage / double-stage delivery water heating
- Maximum heating load, Gcal/h	100-190
- Steam bleeding flow rate, t/h	190-370
Capability of steam bleeding for industrial use:	
- Flow rate, t/h:	50-200 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,8-2,1
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	16000-28000
- Heat exchange surface area, m ²	6200-14000
Turbines of this class	KT-120-8,8 (project)



Turbine Longitudinal Cross Section KT-120-8,8



Turbine Heat Balance Diagram KT-120-8,8



- H - heater
- D - deaerator
- SE - sealing ejector
- SC - sealing collector
- GLC - gland leakage condenser
- C - condenser

CLASS B.3.

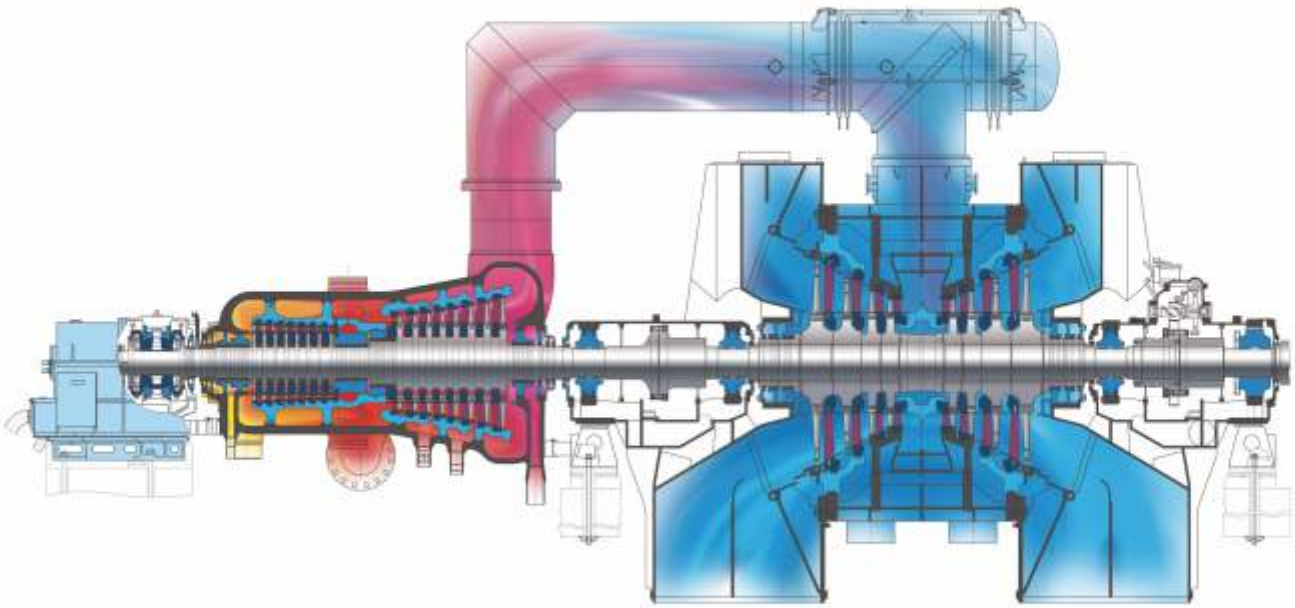
Class B.3: two-casing turbines with the high-pressure and low-pressure casings. In this case, the high-pressure casing is made to be double-casing with an internal casing featuring a reversed flow arrangement and steam removal from the inter-body space for resuperheating (if any) and subsequent steam supply from resuperheating into the casing center into the inter-body space. Steam distribution can be both nozzle and throttle based on the assumed operating conditions. The low-pressure casing is made to be double-flow symmetrical with two radial exhausts to the condenser group. The capacity range is from 150 MW to 350 MW, live steam pressure is from 12.8 to 23.5 MPa (130-240 kgf/cm²). The turbine can also feature a third low-pressure circuit steam supply (for example, for CCP) into bypass pipes from the high-pressure to the low-pressure casing. The turbine features the possibility to organize single-stage controlled heat extraction with a capacity from 100 to 250 Gcal/h, as well as uncontrolled industrial steam extraction for a balance of plant with a capacity of up to 100 t/h.

B.3 Class Turbines. Specification

Characteristics	Values
Main type of the turbine	Cogeneration/ condensing
Basic design feature	Two-casing, HPC with a loop-type steam flow with the inner casing and steam delivery from the inner casing space to reheating, LPC has double-flow casing
Steam distribution type	Throttle / nozzle
Electricity output range, MW	150-350
Main steam characteristics:	
- Pressure, MPa	12,8-23,5
- Temperature, °C	540-570
Capability of steam reheating	Yes
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage delivery water heating
- Maximum heating load, Gcal/h	100-250
- Steam extraction flow rate, t/h	190-480
Capability of steam bleeding for industrial use:	
- Flow rate, t/h:	up to 100 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,8-2,1
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	16000-28000
- Heat exchange surface area, m ²	6200-14000
Turbines of this class	K-200-12,8 (project)

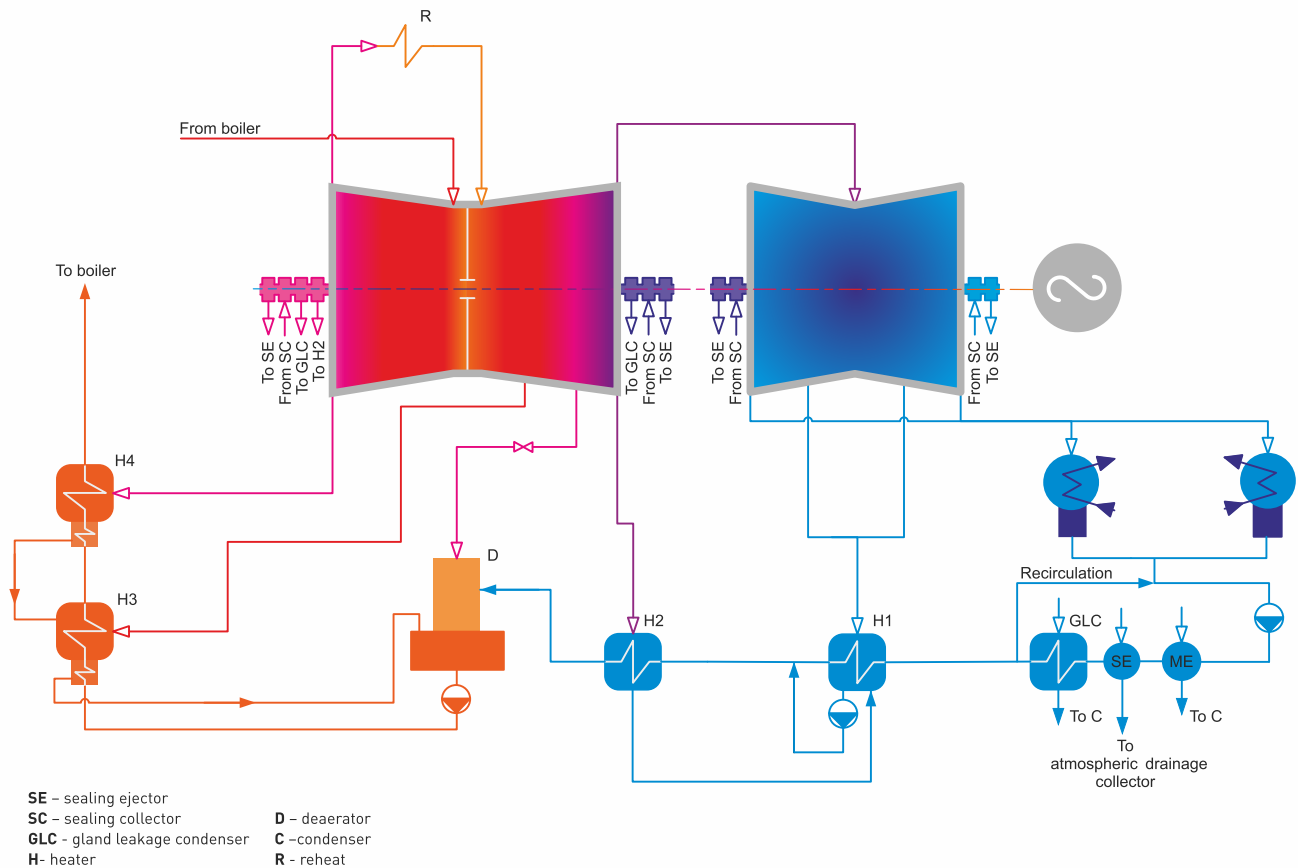


Turbine Longitudinal Cross Section K-200-12,8



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Turbine Heat Balance Diagram K-200-12,8



CLASS B.1.

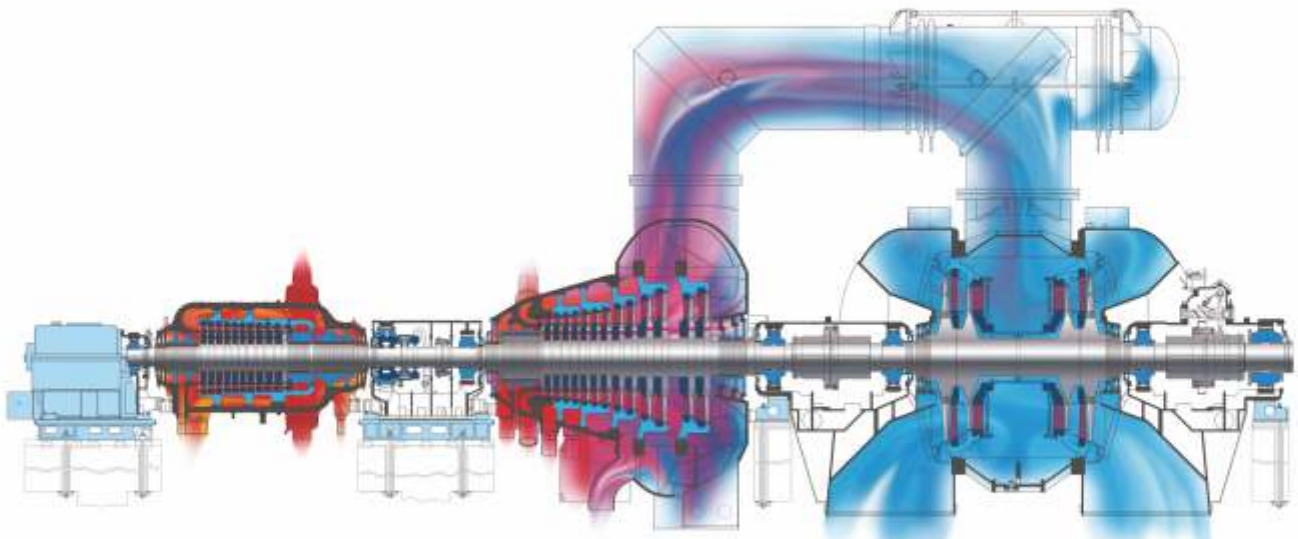
Class B.1: three-casing turbines with the high-pressure, intermediate-pressure, and low-pressure casings. The high-pressure casing features blade carriers design. The separate control stage is not executed. Steam distribution can be both nozzle and throttle based on the assumed operating conditions. The intermediate-pressure casing is made with straight flow blade carrier design. Steam flows in the high-pressure and low-pressure casings are opposite to compensate axial forces on the pad of thrust and radial bearing. Steam supply from the hot resuperheating can be arranged at the intermediate-pressure casing. The low-pressure casing is made to be double-flow symmetrical with two radial exhausts to the condenser group. The capacity range is from 100 to 240 MW, live steam pressure is from 8.8 to 15.7 MPa (90-160 kgf/cm²), last stage blades with a length from 550 to 660 mm (22-26 in) can be used. The turbine features the possibility to organize single-stage or double-stage controlled heat extraction with a capacity from 100 to 190 Gcal/h, as well as control and uncontrolled industrial steam extraction with a capacity of up to 150 t/h.

B.1 Class Turbines. Specification

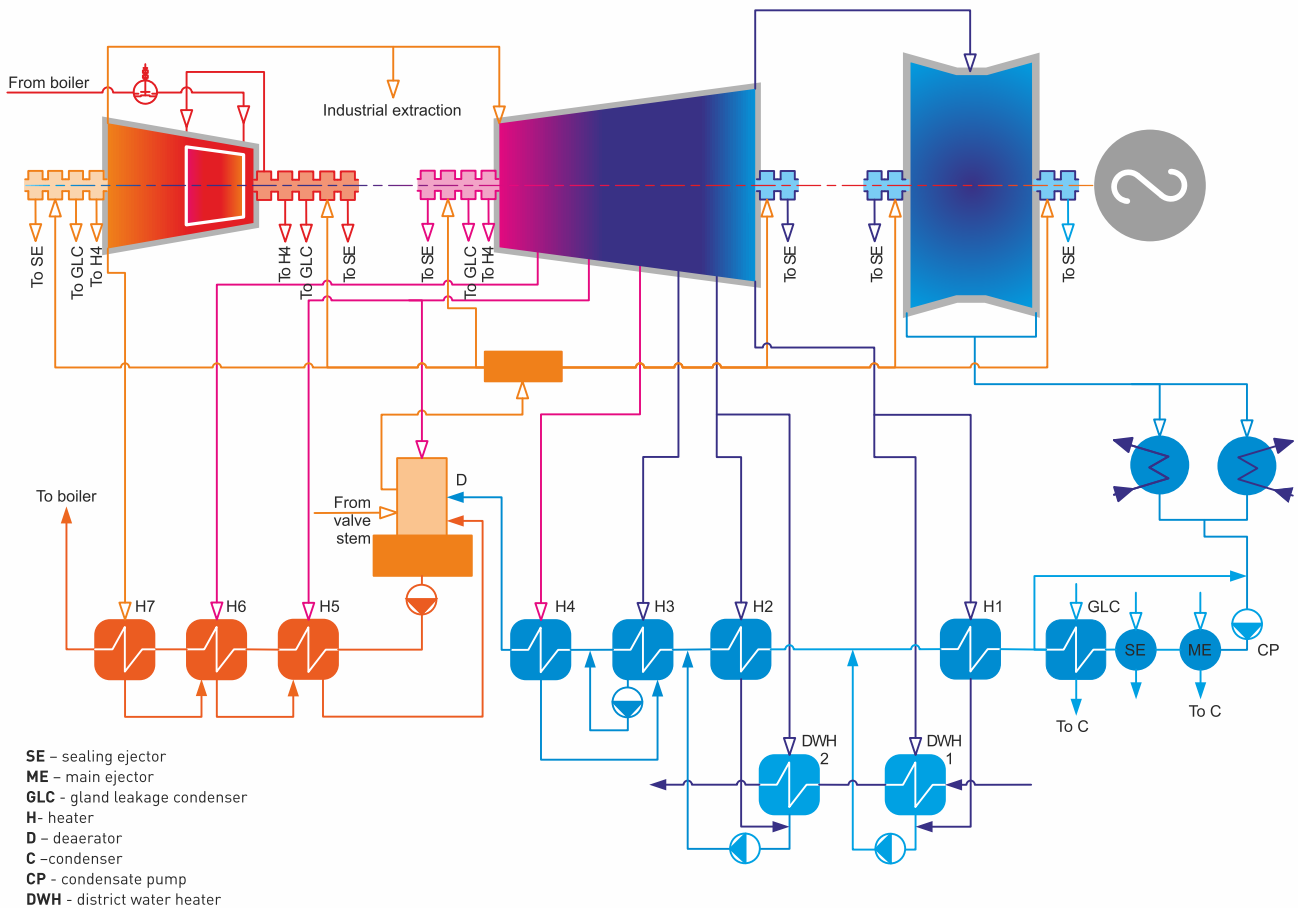
Characteristics	Values
Main type of the turbine	Cogeneration / condensing
Basic design feature	Three-casing, HPC and LPC with an opposite steam flow in casings, LPC has double-flow casing
Steam distribution type	Throttle / nozzle
Electricity output range, MW	100-240
Main steam characteristics:	
- Pressure, MPa	8,8-15,7
- Temperature, °C	500-570
Capability of steam reheating	Yes
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage / double-stage delivery water heating
- Maximum heating load, Gcal/h	100-190
- Steam bleeding flow rate, t/h	190-370
Capability of steam extraction for industrial use:	
- Flow rate, t/h:	up to 150 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,8-2,1
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	16000-28000
- Heat exchange surface area, m ²	6200-14000
Turbines of this class	T-120/130-12,8-8MO, T _n -115/130-12,8



Turbine Longitudinal Cross Section Tn-115/130-12,8



Turbine Heat Balance Diagram Tn-115/130-12,8



CLASS B.2.

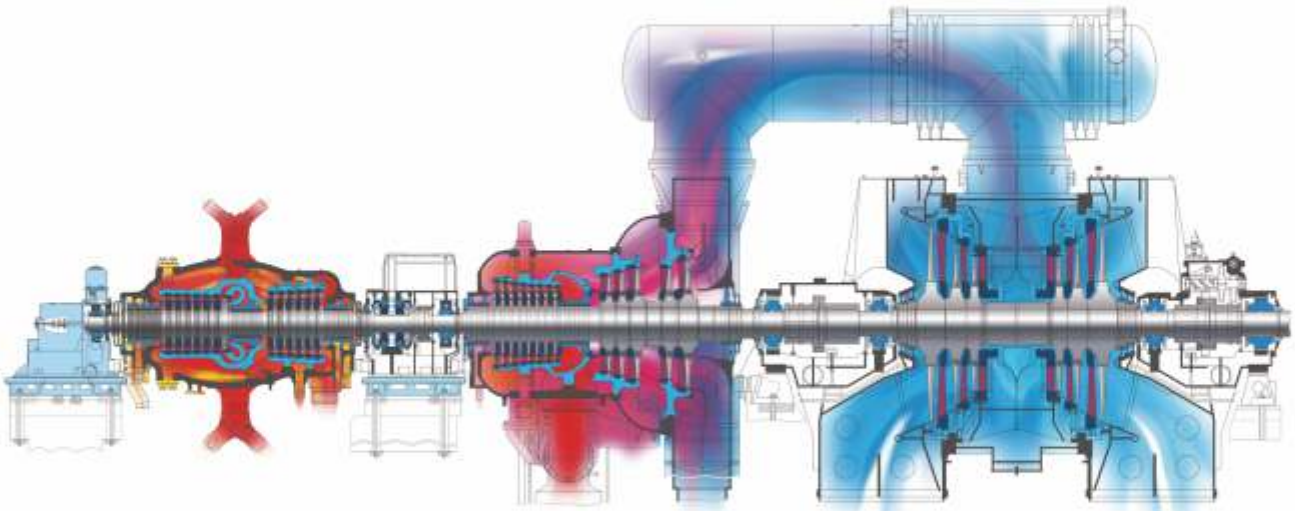
Class B.2: three-casing turbines with the high-pressure, intermediate-pressure, and low-pressure casings. The high-pressure casing is made to be double-casing with an internal casing. Steam distribution can be both nozzle and throttle based on the assumed operating conditions. Steam is supplied into the casing center, the steam flow diagram in the high-pressure casing feature reversed flow arrangement. Steam from the high-pressure casing can be supplied both into the intermediate-pressure casing and into the cold resuperheating. The intermediate-pressure casing features reversed flow design. The low-pressure casing is made to be double-flow symmetrical with two radial exhausts to the condenser group. The capacity range is from 150 to 350 MW, live steam pressure is from 12.8 to 23.5 MPa (130-240 kgf/cm²), last stage blades with a length from 660 to 940 mm (26-37 in) can be used. The turbine features the possibility to organize single-stage or double-stage controlled heat extraction with a capacity from 120 to 370 Gcal/h, as well as control and uncontrolled industrial steam bleeding with a capacity of up to 250 t/h.

B.2 Class Turbines. Specification

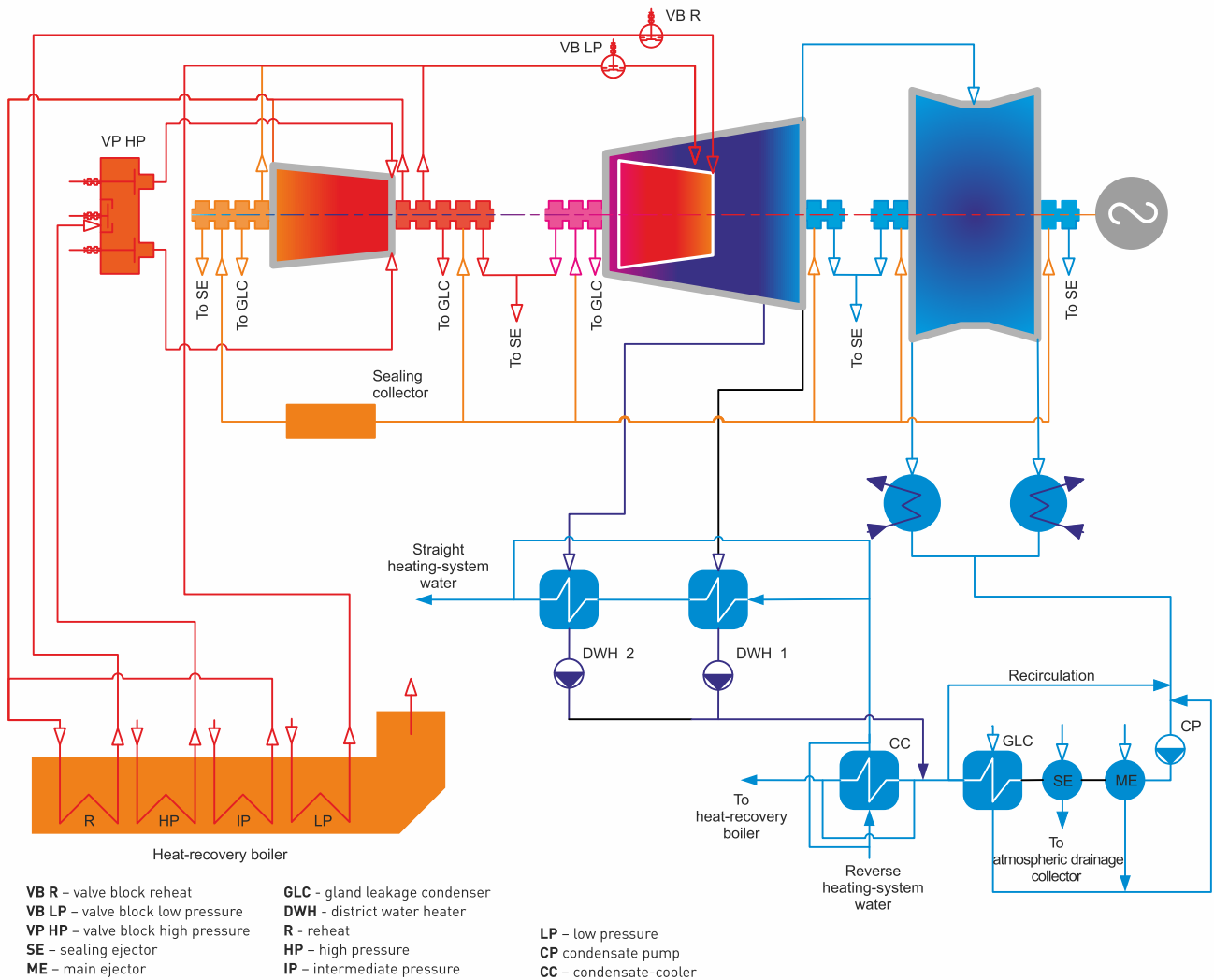
Characteristics	Values
Main type of the turbine	Cogeneration / condensing
Basic design feature	Three-casing, HPC with a reversed steam flow with the inner casing and steam delivery from the inner casing space to reheating, IPC with a reversed flow, LPC has double-flow casing
Steam distribution type	Throttle / nozzle
Electricity output range, MW	150-350
Main steam characteristics:	
- Pressure, MPa	12,8-23,5
- Temperature, °C	540-570
Capability of steam reheating	Yes
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage / double-stage delivery water heating
- Maximum heating load, Gcal/h	120-370
- Steam extraction flow rate, t/h	230-710
Capability of steam bleeding for industrial use:	
- Flow rate, t/h:	up to 250 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,8-2,1
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	16000-45000
- Heat exchange surface area, m ²	6200-22000
Turbines of this class	T-113/145-12,4



Turbine Longitudinal Cross Section T-113/145-12,4



Turbine Heat Balance Diagram T-113/145-12,4



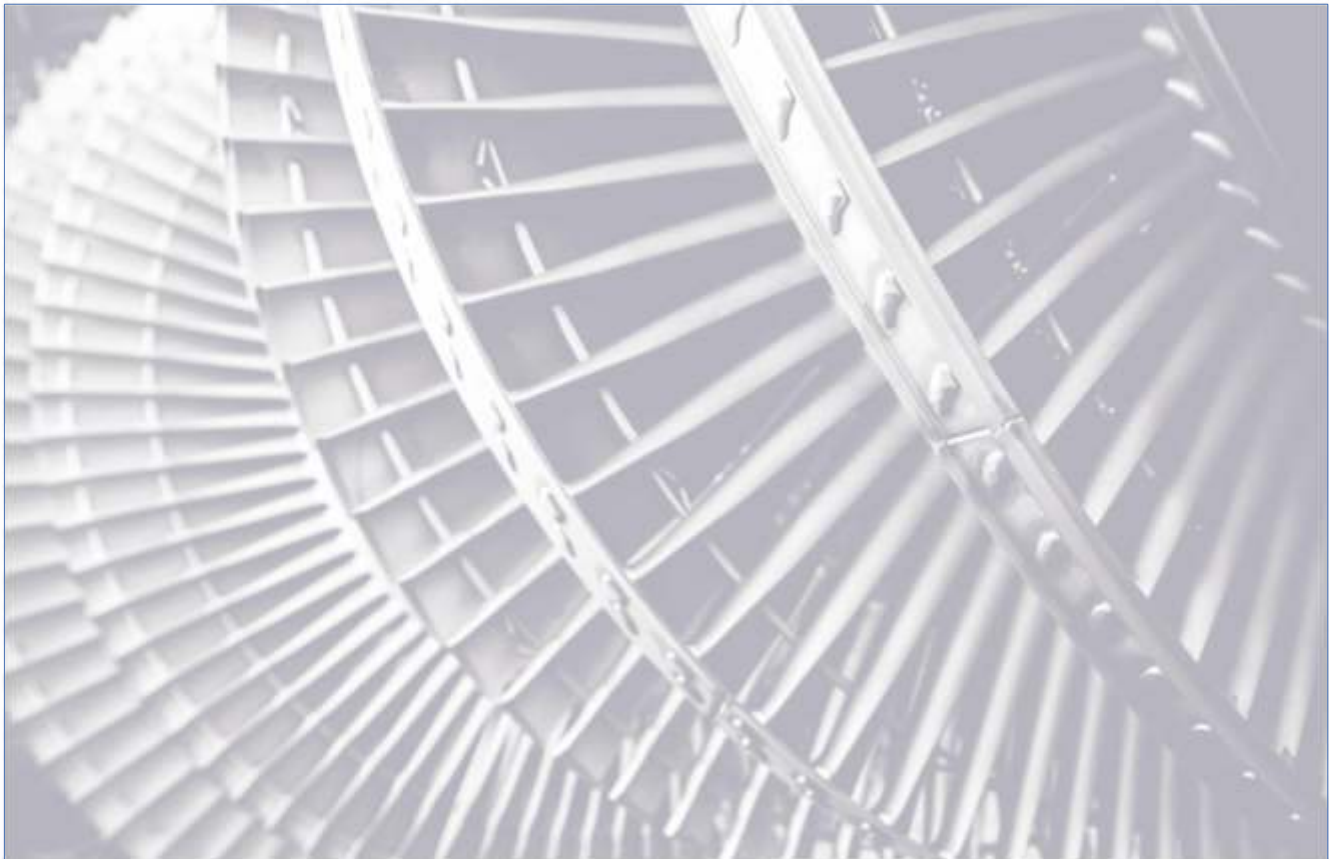
CLASS B.3.

Class B.3: three-casing turbines with the high-pressure, intermediate-pressure, and low-pressure casings. The high-pressure casing is made to be double-casing with an internal casing. Steam distribution can be both nozzle and throttle based on the assumed operating conditions. Steam is supplied into the cylinder center, the steam flow diagram in the high-pressure casing features reversed flow arrangement. Steam from the high-pressure casing can be supplied into both the intermediate-pressure casing and the cold resuperheating. The intermediate-pressure casing has straight flow arrangement and has one turbine LP part section from which steam is supplied into the condenser. The other part of steam is directed from the intermediate-pressure casing into the low-pressure casing which is made as double-flow symmetrical with two radial exhausts per condenser. The capacity range is from 200 MW to 350 MW, live steam pressure is from 12.8 to 23.5 Mpa (130-240 kgf/cm²). The turbine features the possibility to organize single-stage or double-stage controlled heat extraction with a capacity from 120 to 370 Gcal/h, as well as control and uncontrolled industrial steam bleeding with a capacity of up to 250 t/h.

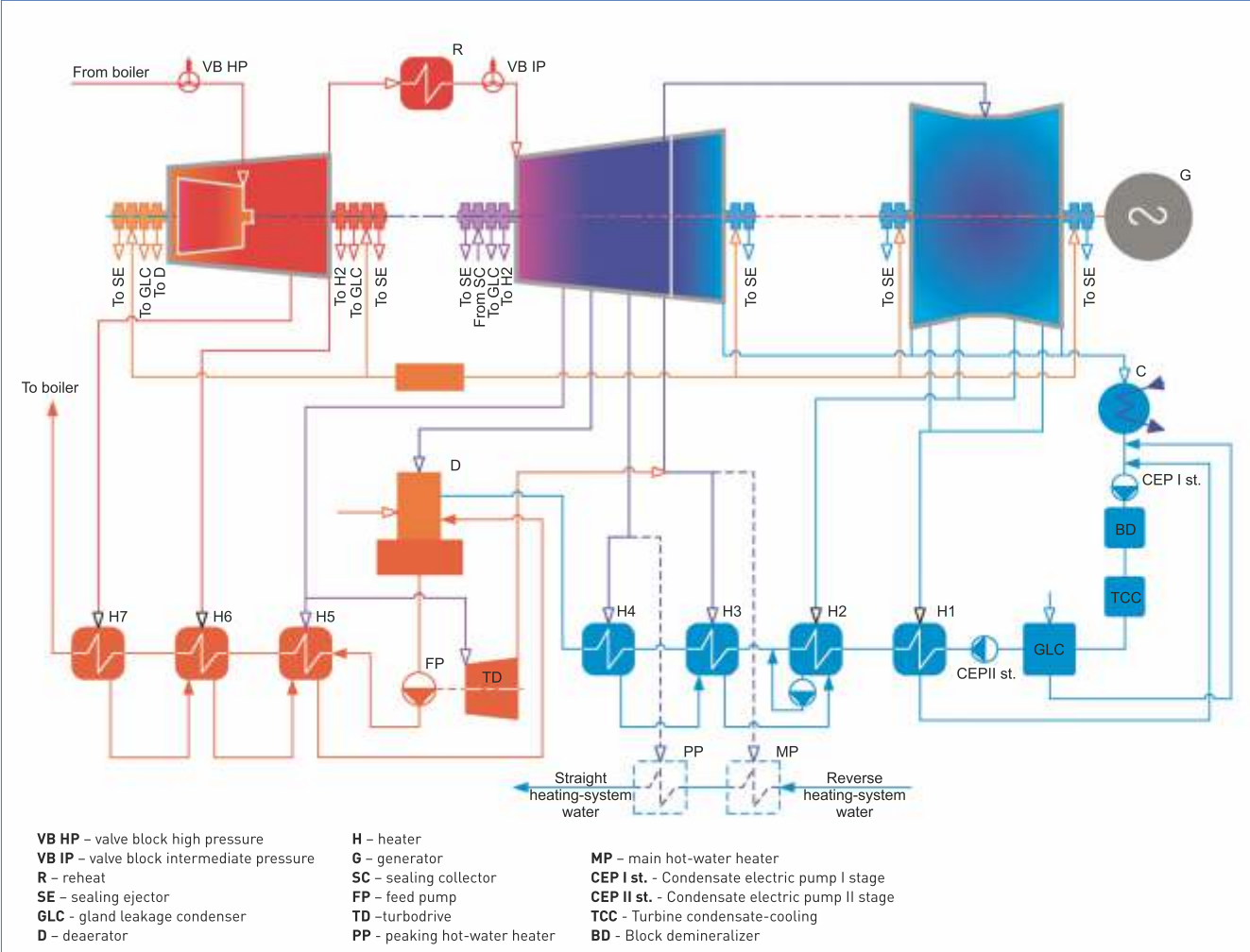
B.3 Class Turbines. Specification

Characteristics	Values
Main type of the turbine	Cogeneration / condensing
Basic design feature	Three-casing, HPC with a reversed steam flow with the inner casing and steam delivery from the inner casing space to reheating, IPC with a straight steam flow and one exhaust of a low-pressure part, LPC has double-flow casing
Steam distribution type	Throttle / nozzle
Electricity output range, MW	200-350
Main steam characteristics:	
- Pressure, MPa	12,8-23,5
- Temperature, °C	540-570
Capability of steam reheating	Yes
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage / double-stage delivery water heating
- Maximum heating load, Gcal/h	120-370
- Steam bleeding flow rate, t/h	230-710
Capability of steam bleeding for industrial use:	
- Flow rate, t/h:	up to 250 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,8-2,1
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	22000-45000
- Heat exchange surface area, m ²	10000-22000
Turbines of this class	K-350-23,5 (project)





Turbine Heat Balance Diagram K-350-23.5



CLASS H.1.

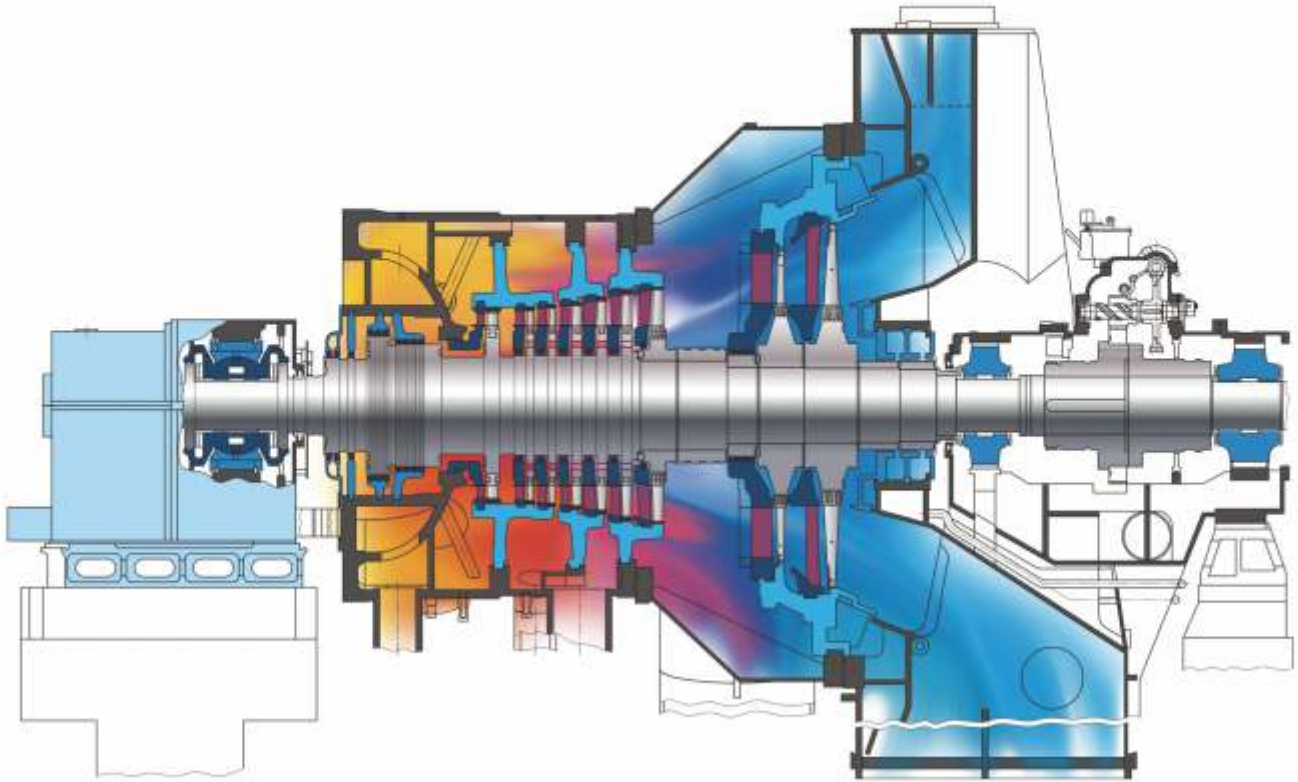
Class H.1: single-casing turbines feature straight steam flow arrangement of low-pressure live steam the turbine from 1.4 to 2.2 MPa (14-22 kgf/cm²), capacity range is from 10 to 60 MW, last stage blade with a length from 550 to 660 mm (22-26 in) can be used. The turbine is assumed with both the radial exhaust to one water-cooled condenser and the axial exhaust to the air cooling condensing unit. The turbine body is made as welded or welded and forged.

H.1 Class Turbines. Specification

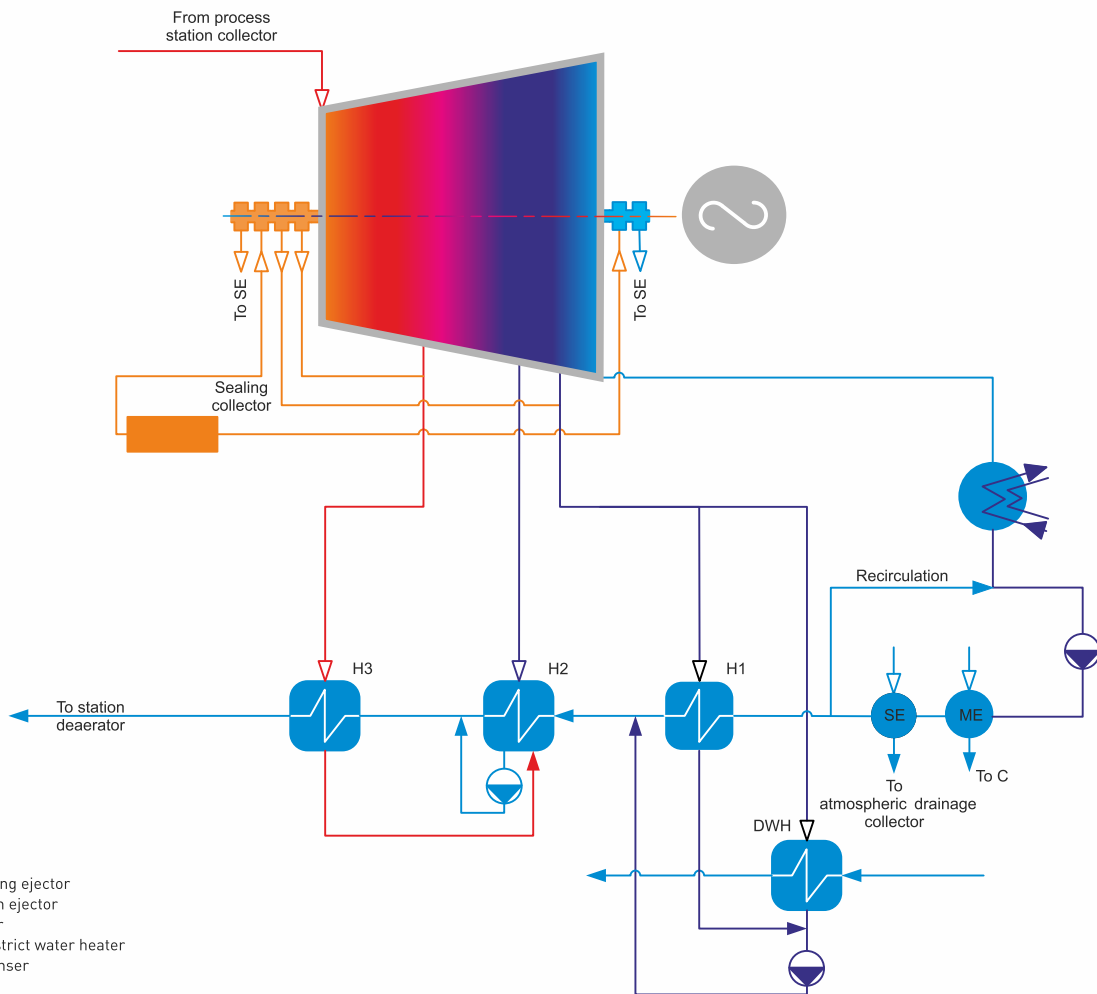
Characteristics	Values
Main type of the turbine	Bottom-type; cogeneration / condensing
Basic design feature	Single-casing with a straight steam flow, welded casing
Steam distribution type	Throttle
Exhaust casing type	Radial / axial
Electricity output range, MW	10-60
Main steam characteristics:	
- Pressure, MPa	1,4-2,2
- Temperature, °C	280-400
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage / double-stage delivery water heating
- Maximum heating load, Gcal/h	50-120
- Steam bleeding flow rate, t/h	100-230
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	5000-8000
- Heat exchange surface area, m ²	1700-3100
Turbines of this class	T-35/55-1,6, K-55-1,6 (project)



Turbine Longitudinal Cross Section T-35/55-1,6



Turbine Heat Balance Diagram T-35/55-1,6



CLASS H.1.1.

Class H.1.1: single-casing turbines with double-flow casing featuring two radial exhausts per one condenser or condenser group. The live steam pressure of the turbine is from 1.4 to 2.2 Mpa (14-22 kgf/cm²), capacity range is from 10 to 60 MW, last stage blade with a length from 550 to 660 mm (22-26 in) can be used.

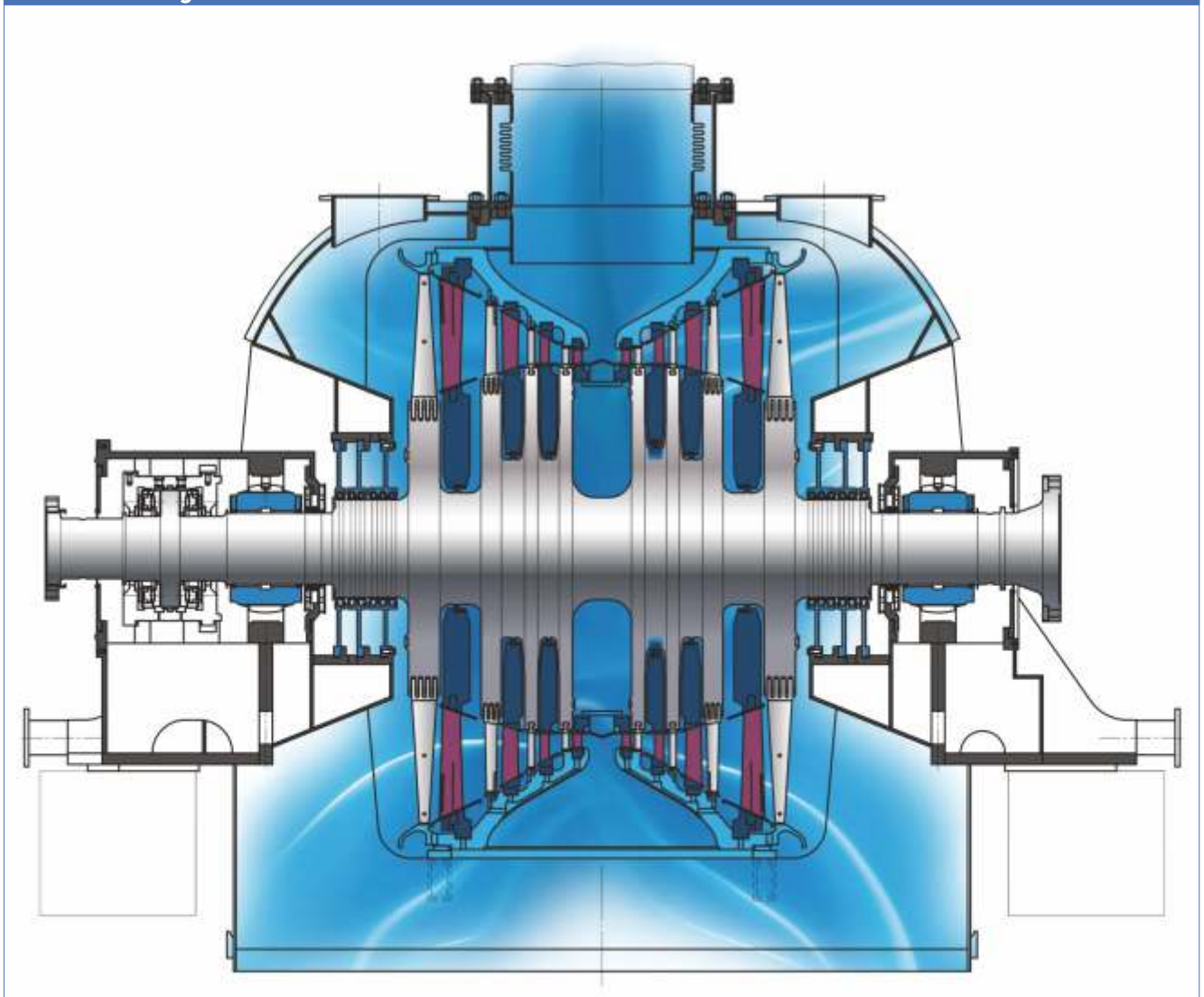
H.1.1 Class Turbines Specification

Characteristics	Values
Main type of the turbine	Bottom-type; cogeneration
Basic design feature	Single-casing with a double-flow symmetrical wheel spaces
Steam distribution type	Throttle
Exhaust casing type	Radial
Electricity output range, MW	10-60
Main steam characteristics:	
- Pressure, MPa	1,4-2,2
- Temperature, °C	280-400
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	5000-8000
- Heat exchange surface area, m ²	1700-3100
Turbines of this class	LPT-17, K-60-1,6 (project)





Turbine Longitudinal Cross Section LPT-17



CLASS H.2.

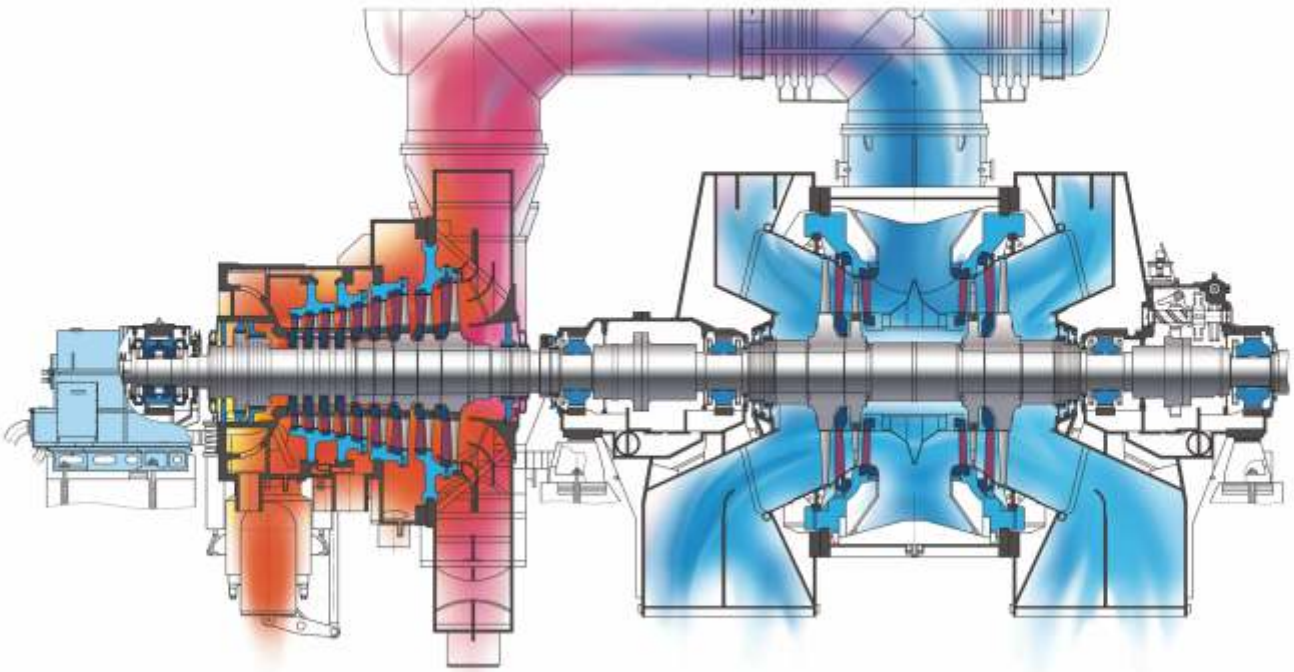
Class H.2: double-casing turbines for low pressure live steam the turbine is from 1.4 to 2.2 Mpa (14-22 kgf/cm²), capacity range is from 60 to 120 MW. The turbine intermediate-pressure casing features straight flow design. It can be welded or welded and forged. The low-pressure casing is made to be double-flow symmetrical with two radial exhausts to the condenser group. The turbine features the possibility to organize single-stage or double-stage controlled heat extraction with a capacity from 100 to 280 Gcal/h.

H.2 Class Turbines. Specification

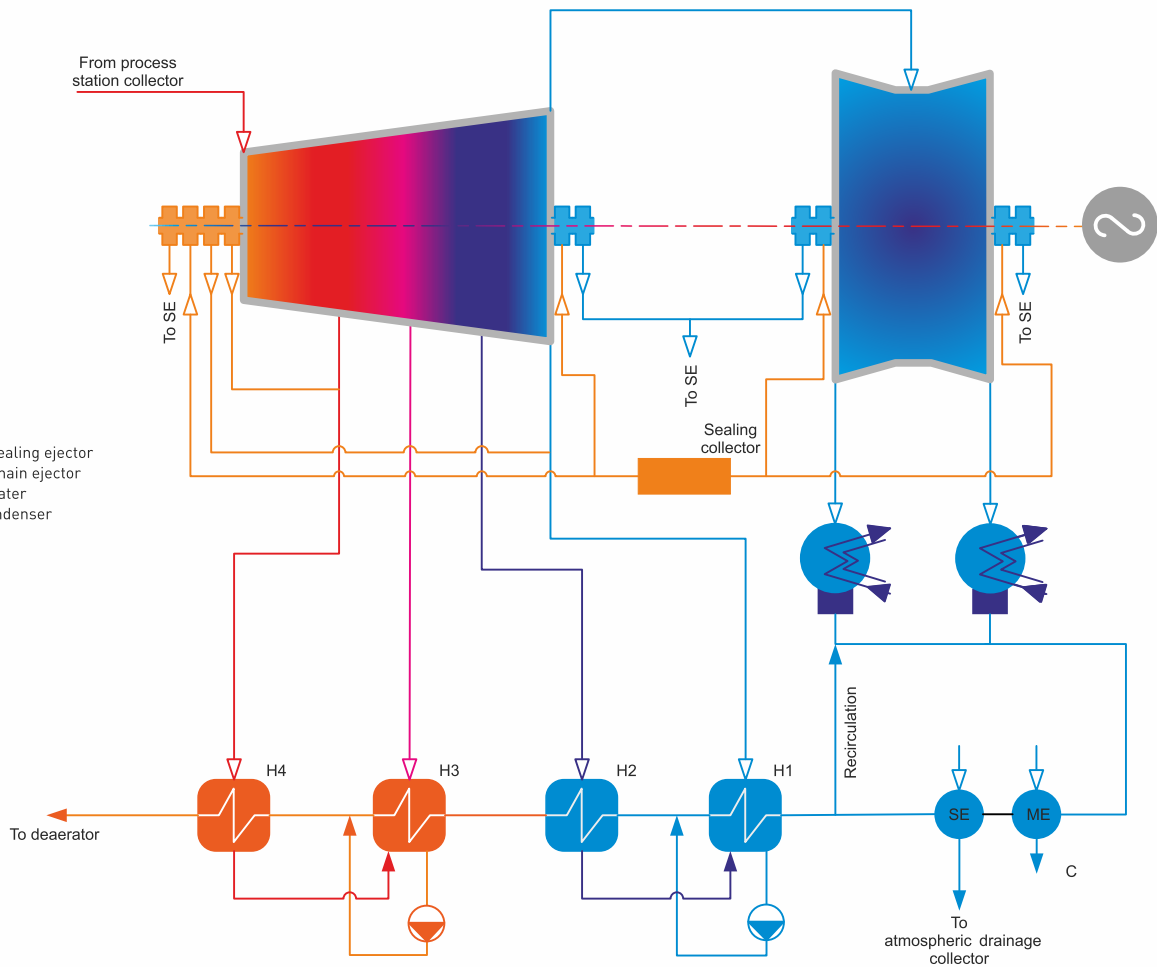
Characteristics	Values
Main type of the turbine	Bottom-type; cogeneration / condensing
Basic design feature	Two-casing with a straight steam flow in the intermediate-pressure casing, LPC has double-flow casing
Steam distribution type	Throttle
Exhaust casing type	Radial
Electricity output range, MW	60-120
Main steam characteristics:	
- Pressure, MPa	1,4-2,2
- Temperature, °C	280-400
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage / double-stage delivery water heating
- Maximum heating load, Gcal/h	100-280
- Steam bleeding flow rate, t/h	200-550
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	16000-27000
- Heat exchange surface area, m ²	6000-12000
Turbines of this class	K-110-1,6, T-70/110-1,6 (project)



Turbine Longitudinal Cross Section K-110-1,6



Turbine Heat Balance Diagram K-110-1,6



CLASS P.1.

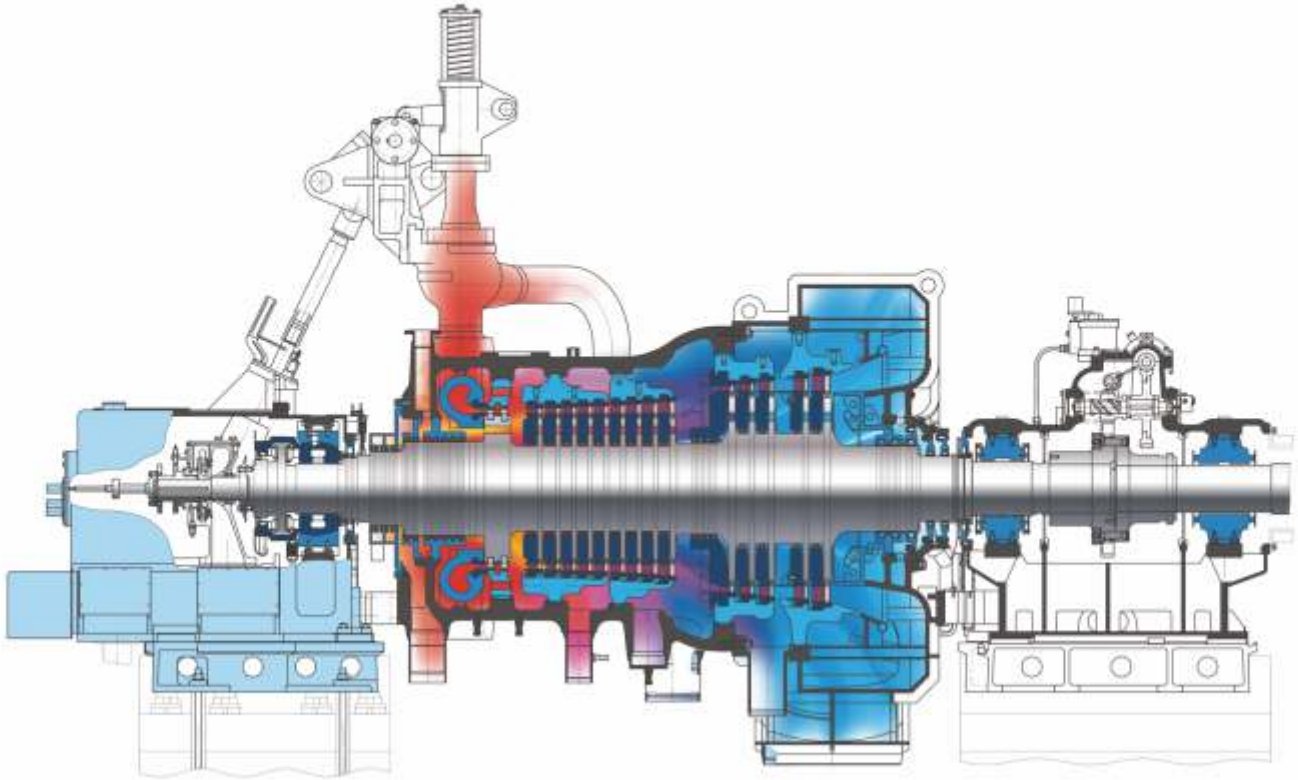
Class P.1: single-casing back-pressure turbines with a straight steam flow in the casing. Capacity range is from 25 MW to 80 MW, live pressure is from 4.5 to 12.8 MPa (45-130 kgf/cm²). The turbine exhaust can be organized both for industrial header and for heat extraction generations. The front and rear bearings are made in the remote separate bodies resting on the proper foundation frames. The turbine features the possibility to organize single-stage controlled heat extraction with a capacity of up to 150 Gcal/h (back-pressure), as well as controlled and uncontrolled industrial steam bleeding for balance of plant with a capacity of up to 200 t/h.

P.1 Class Turbines. Specification

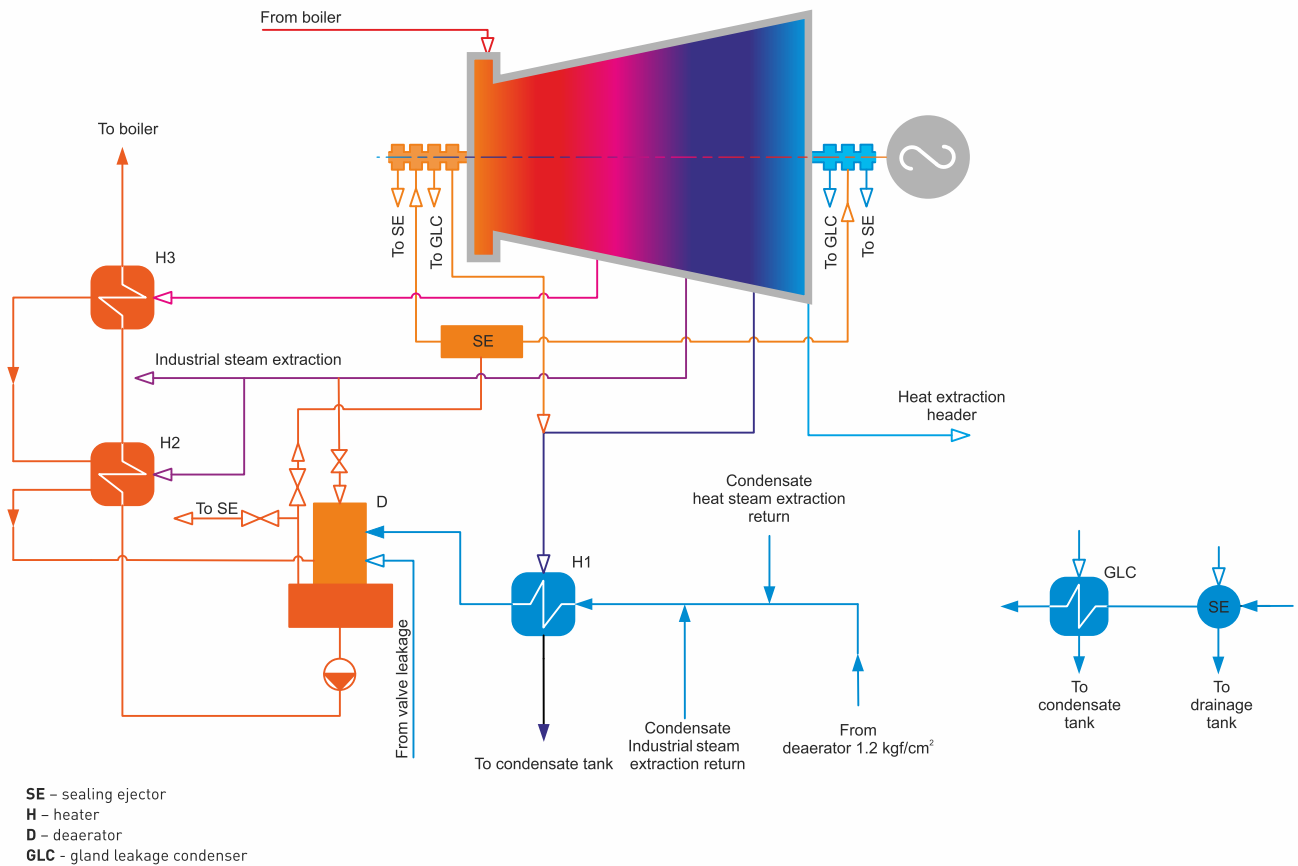
Characteristics	Values
Main type of the turbine	Back-pressure
Basic design feature	Single-casing with a straight steam flow
Steam distribution type	Throttle / nozzle
Electricity output range, MW	25-80
Main steam characteristics:	
- Pressure, MPa	4,5-12,8
- Temperature, °C	400-560
Capability of steam bleeding for heating:	
- Scheme	Controlled steam bleeding; Single-stage delivery water heating
- Maximum heating load, Gcal/h	50-150
- Steam extraction flow rate, t/h	100-290
Capability of steam ebleeding for industrial use:	
- Flow rate, t/h:	50-200 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,13-3,4
Back-pressure	To the industrial / to heating
Turbines of this class	ПР-30-8,8/1,0/0,13, P-38-12,8/3,4, P-40-12,8/3,1



Turbine Longitudinal Cross Section ПР-30-8,8/1,0/0,13



Turbine Heat Balance Diagram ПР-30-8,8/1,0/0,13



Class P.2.

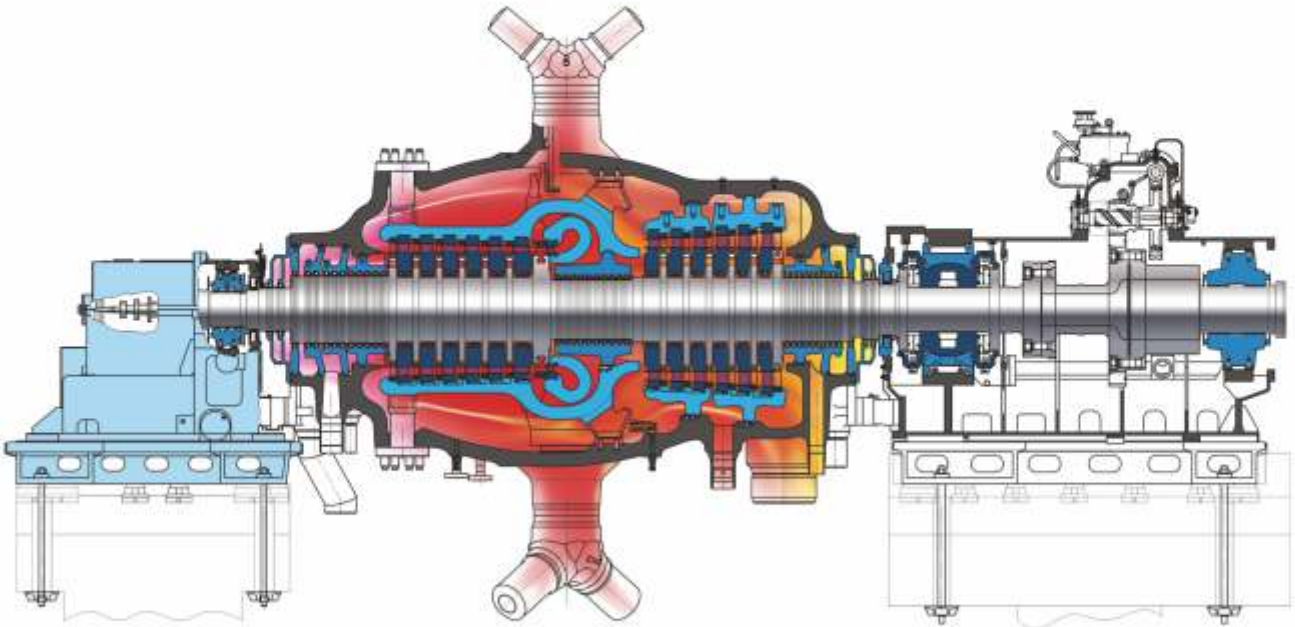
Class P.2: single-casing back-pressure turbines featuring reverse steam flow arrangements with the internal casing and inter-casing space. Capacity range is from 50 MW to 120 MW, live steam pressure is from 8.8 to 12.8 MPa (90-130 kgf/cm²). The turbine exhaust is arranged for an industrial header with a capacity from 400 to 700 t/h.

P.2 Class Turbines. Specification

Characteristics	Values
Main type of the turbine	Back-pressure
Basic design feature	Single-casing with reversed flow casing
Steam distribution type	Throttle / nozzle
Electricity output range, MW	50-120
Main steam characteristics:	
- Pressure, MPa	8,8-12,8
- Temperature, °C	500-560
Capability of steam bleeding for industrial use:	
- Flow rate, t/h:	400-700 t/h
- Scheme	Non-controlled / controlled steam bleeding
- Guaranteed pressure, MPa	0,8-2,1
Back-pressure	To the industrial header
Turbines of this class	P-100-12,8/1,5, P-50-12,8/1,3 (project)

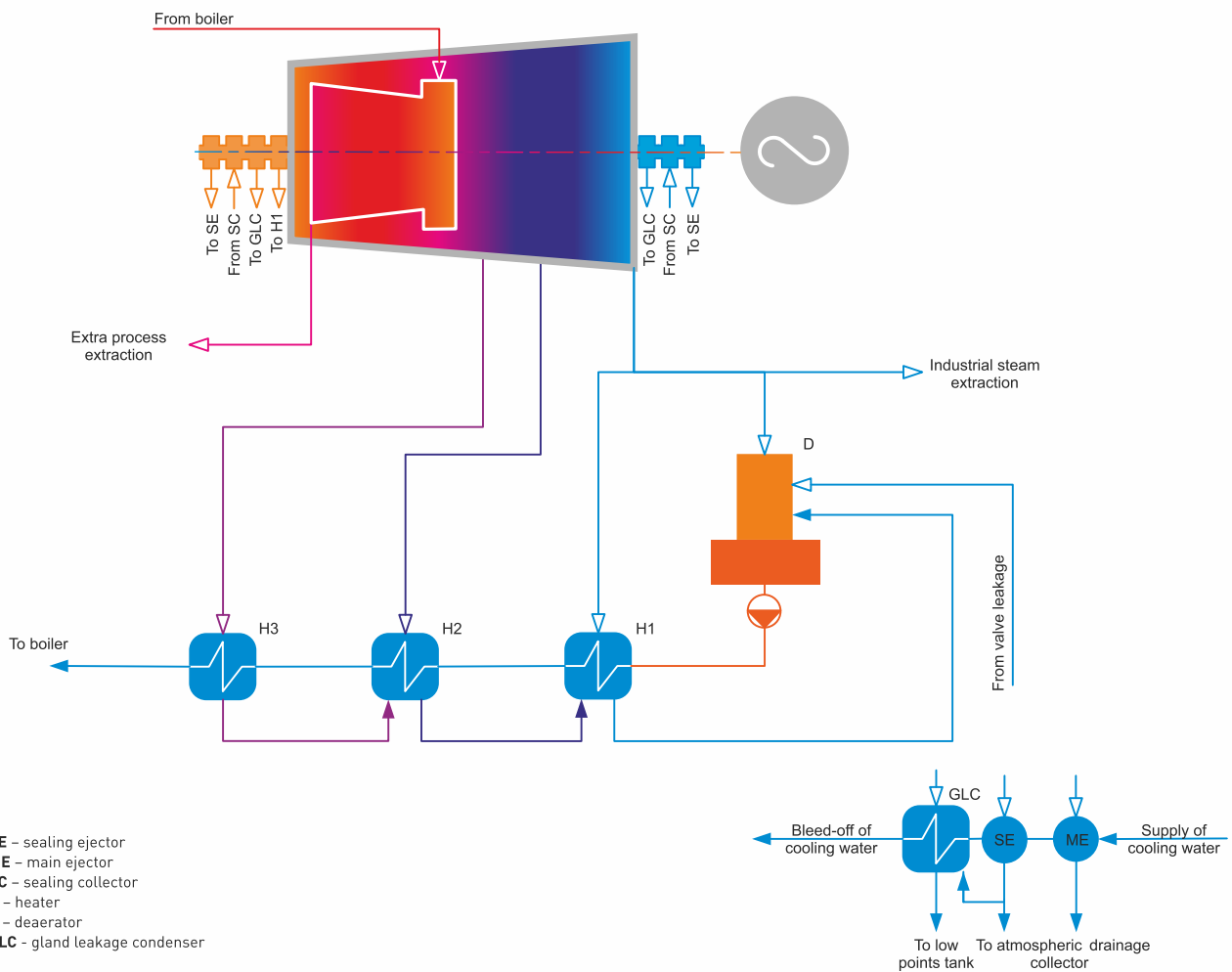


Turbine Longitudinal Cross Section P-100-12,8/1,5



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Turbine Heat Balance Diagram P-100-12,8/1,5



CLASS M.1.

Class M.1: single-casing turbines with straight steam flow arrangement for pressure from 2.0 to 4.5 MPa (20-45 kgf/cm²), capacity range is from 5 to 16 MW. The turbine is assumed with both the radial exhaust to one water-cooled condenser and the axial exhaust to the air cooling condensing unit. The turbine is installed on a single frame and delivered as single-module assembly. The turbine features the possibility to organize single-stage controlled heat extraction with a capacity of up to 20 Gcal/h, as well as uncontrolled industrial steam bleeding for balance of plant with a capacity of up to 40 t/h.

M.1 Class Turbines.Specification

Characteristics	Values
Main type of the turbine	Cogeneration / condensing
Basic design feature	Single-casing with a straight steam flow; the turbine is mounted on a single frame and shipped in a single module assembly
Steam distribution type	Throttle
Exhaust casing type	Radial / axial
Electricity output range, MW	5-16
Main steam characteristics:	
- Pressure, MPa	2,0-4,5
- Temperature, °C	250-450
Capability of steam bleeding for heating:	
- Scheme	Non-controlled steam bleeding; Single-stage delivery water heating
- Maximum heating load, Gcal/h	20
- Steam bleeding flow rate, t/h	up to 40
Characteristics of the main condenser:	
- Cooling water flow rate, m ³ /h	1000-5500
- Heat exchange surface area, m ²	800-2500



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