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Binary power generation systems –
Part 3-1: Safety requirements – System with less than 500 kW in capacity

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BINARY POWER GENERATION SYSTEMS –

Part 3-1: Safety requirements – System with less than 500 kW in capacity

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IEC 63277-3-1 has been prepared by IEC project committee 126: Binary power generation systems. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
126/68/FDIS	126/74/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63277 series, published under the general title *Binary power generation systems*, can be found on the IEC website.

Future documents in this series will carry the new general title as cited above. Titles of existing documents in this series will be updated at the time of the next edition.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

While the world's binary power generation systems are growing, the IEC 63277 series specifies the performance test methods of binary power generation systems and acknowledges the fair and standardized competition of binary power generation systems.

It is very important to ensure that the binary power generation systems will be operated safely during the operation. Safety requirements are an important theme that should be internationally standardized as well as the performance test methods.

By adding an objective evaluation of safety based on international standards, it is expected that the selection criteria will become more appropriate and that it will have the effect of promoting it worldwide.

This document addresses the safety considerations unique to binary power generation systems and is intended to be one in a series of international standards addressing this new technology.

BINARY POWER GENERATION SYSTEMS –

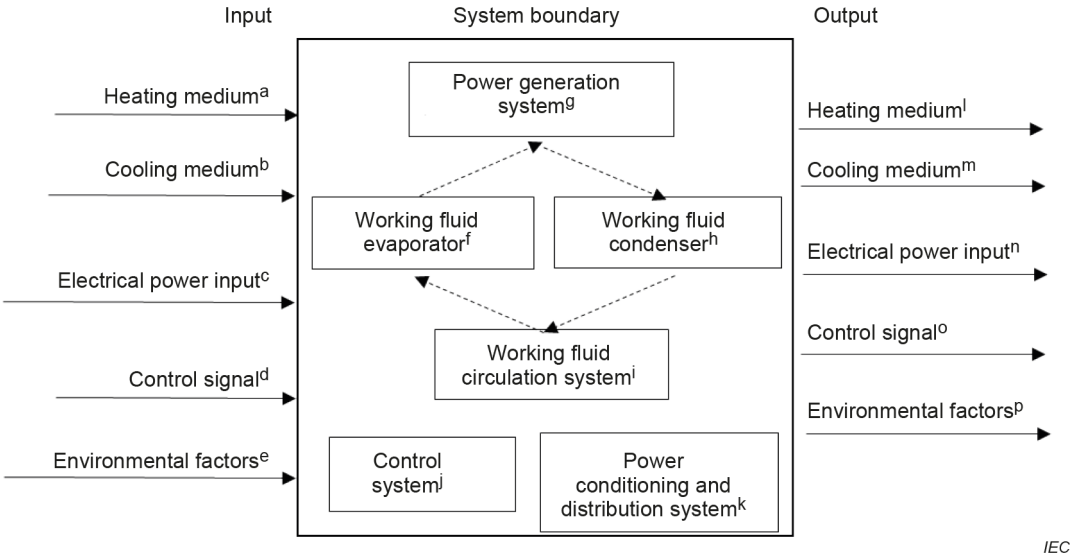
Part 3-1: Safety requirement – System with less than 500 kW in capacity

1 Scope

This part of IEC 63277 describes the safety requirements of binary power generation systems based on organic Rankine cycle (ORC) with less than 500 kW in output capacity.

This document covers significant hazards, hazardous situations, and events, with the exception of those associated with environmental compatibility (installation conditions), relevant to binary power generation systems (ORC), when they are used as intended and under the conditions foreseen by the manufacturer.

A typical binary power generation system is shown in Figure 1.



a	Heat transport medium for working fluid heating, commonly steam or hot water	f	Heat exchanger for evaporating the working fluid using of heating medium	l	Emission of heating medium from the system after heat exchanged
b	Heat transport medium for working fluid cooling, commonly air or water.	g	The system consists from a turbine or expander and a generator, it converts thermal energy of working fluid to electric energy	m	Emission of cooling medium from the system after heat exchanged
c	Electrical input specified by the manufacturer, for controls and other supporting functions	h	Heat exchanger for condensing the working fluid using a cooling medium	n	The power produced from the system and provided to an external load or grid
d	Includes the providing of control signals, setpoint and operation instructions as well as remote access, parameter, software, and firmware updates	i	Pressurization equipment for circulating the working fluid in a closed system	o	The transmission of operational state and other data collected or generated by the system
e	Factors from the surrounding impacting the binary power generation system, such as earthquake, rain, wind, snow, temperature, humidity, and atmospheric condition but also electromagnetic disturbances	j	System(s) that is composed of sensors, actuators, switches, and logic components that maintain the binary power generation system parameters within the manufacturer's specified limits including moving to safe states	p	Factors from the surrounding impacting the binary power generation system, such as emission of noise, vibrations, polluted water and gas, and electromagnetic disturbance
		k	System(s) that adjusts the power generated by the power generation system for transmitting to the outside of boundaries, and System(s) that distributes the power to the load inside of boundaries		

Figure 1 – Typical binary power generation system

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-29-1, *Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases*

IEC 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60335-1, *Household and similar electrical appliances – Safety – Part 1: General requirements*

IEC 60417, *Graphical symbols for use on equipment, available at http://www.graphical-symbols.info/equipment*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60730-1, *Automatic electrical controls – Part 1: General requirements*

IEC 60730-2-6, *Automatic electrical controls – Part 2-6: Particular requirements for automatic electrical pressure sensing controls including mechanical requirements*

IEC 60730-2-9, *Automatic electrical controls – Part 2-9: Particular requirements for temperature sensing controls*

IEC 60730-2-15, *Automatic electrical controls – Part 2-15: Particular requirements for automatic electrical air flow, water flow and water level sensing controls*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61511-1, *Functional safety – Safety instrumented systems for the process industry sector – Part 1: Framework, definitions, system, hardware and application programming requirements*

IEC 61557-1, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 1: General requirements*

IEC 61557-2, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 2: Insulation resistance*

IEC 62040-1, *Uninterruptible power systems (UPS) – Part 1: Safety requirements*

IEC 62061, *Safety of machinery – Functional safety of safety-related control systems*

IEC 62477-1, *Safety requirements for power electronic converter systems and equipment – Part 1: General*

IEC 62477-2, *Safety requirements for power electronic converter systems and equipment – Part 2: Power electronic converters from 1 000 V AC or 1 500 V DC up to 36 kV AC or 54 kV DC*

ISO 3864-2, *Graphical symbols – Safety colours and safety signs – Part 2: Design principles for product safety labels*

ISO 4413, *Hydraulic fluid power – General rules and safety requirements for systems and their components*

ISO 4414, *Pneumatic fluid power – General rules and safety requirements for systems and their components*

ISO 7000, *Graphical symbols for use on equipment, available at http://www.graphical-symbols.info/equipment*

ISO 12100, *Safety of machinery – General principles for design – Risk assessment and risk reduction*

ISO 13709, *Centrifugal pumps for petroleum, petrochemical and natural gas industries*

ISO 13849-1, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*

ISO 13849-2, *Safety of machinery – Safety-related parts of control systems – Part 2: Validation*

ISO 13850, *Safety of machinery – Emergency stop function – Principles for design*

ISO 14847, *Rotary positive displacement pumps – Technical requirements*

ISO 15649, *Petroleum and natural gas industries – Piping*