BS ISO 14084-1:2015

BSI Standards Publication

Process diagrams for power plants

Part 1: Specification for diagrams

National foreword

This British Standard is the UK implementation of ISO 14084-1:2015.

The UK participation in its preparation was entrusted to Technical Committee TDW/4, Technical Product Realization.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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INTERNATIONAL STANDARD

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Process diagrams for power plants —

Part 1: Specification for diagrams

Schémas de procédés pour centrales électriques —

Partie 1: Spécifications pour diagrammes

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 10, *Technical product documentation*, SC 10, *Process plant documentation*.

ISO 14084 consists of the following parts, under the general title *Process diagrams for power plants*:

— *Part 1: Specification for diagrams*

— *Part 2: Graphical symbols*

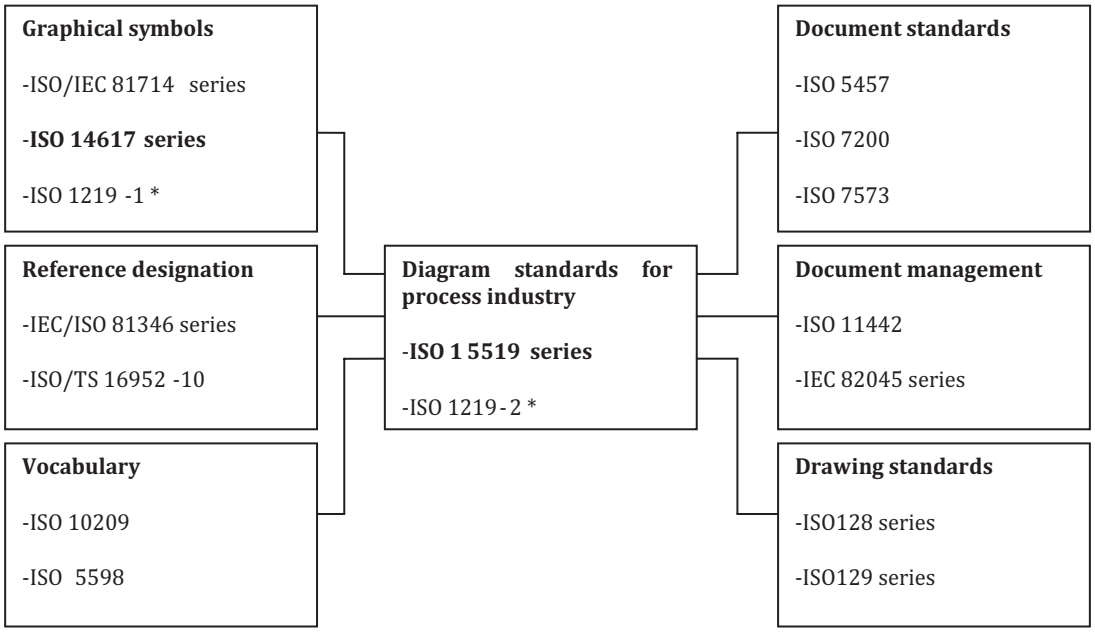
Introduction

0.1 General

This part of ISO 14084 deals with preparation of process diagrams for power plants.

ISO/TC10/SC10 prepares standards for diagrams including graphical symbols which together with standards prepared by other ISO committees and IEC constitute the basis for preparation of diagrams for process industry.

The interrelations between these standards are illustrated in Figure 1. Standards in bold are ISO/TC10/SC10 standards.



NOTE Standards marked * are collective application standards.

Figure 1 — Interrelations between ISO and IEC standards for diagrams for power plants

0.2 Collective application standard

ISO/TC10/SC10 standards:

— ISO 15519 series: Specifications for diagrams for process industry;

— ISO 14617 series: Graphical symbols for diagrams;

These are basic standards, which are general and apply to all fields of applications. Technical committees working in a specific application field are allowed to make extracts and publish them as collective application standards of ISO 15519 series, ISO 14617 series, or both.

0.3 Application fields

This part of ISO 14084 applies to the power plant field, which includes conventional fossil and biomass-fired power plants, hydropower plants, sea wave power plants, wind power plants, nuclear power plants, geothermal power plants, solar power plants, osmosis power plants, incineration plants, and industrial power plants.

0.4 Figures

Figures in this part of ISO 14084 are only examples for illustration of a given rule.

0.5 Reference designation

In this part of ISO 14084, ISO/TS 16952-10 is used for illustration of rules and guidelines for the use of reference designation in process diagrams for power plants.

A summary of ISO/TS 16952-10 is given in Annex C.

NOTE In case of application of another reference designation system, its application in diagrams has to be interpreted analogously.

INTERNATIONAL STANDARD **ISO 14084-1:2015(E)**

Process diagrams for power plants —

Part 1: Specification for diagrams

1 Scope

This part of ISO 14084 specifies types of process diagrams for power plants and rules and guidelines for the preparation and representation of information in such diagrams.

This part of ISO 14084 series is a collective application standard of the ISO 15519 series.

This part of ISO 14084 does not apply to electrotechnical diagrams, which are covered by IEC 61082, and to fluid power diagrams, which are covered by ISO 1219-2.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10209, *Technical product documentation — Vocabulary — Terms relating to technical drawings, product definition and related documentation*

ISO 14617 (all parts), *Graphical symbols for diagrams*

ISO 15519 (all parts), *Specification for diagrams for process industry*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the ISO 15519 (all parts) and ISO 10209, and the following apply.

3.1
block diagram
BLD
overview diagram predominantly using block symbols

[SOURCE: ISO 10209:2012, modified]

3.2
process flow diagram
PFD
diagram illustrating the configuration of a process system or process plant by means of graphical symbols

[SOURCE: ISO 10209:2012, modified]

3.3
process and instrumentation diagram
PID
diagram representing the technical realization of a process system by means of graphical symbols for equipment, process flow path and process measurement, and control functions

Note 1 to entry: The diagram type process and instrumentation diagram, used in this part of ISO 14084, is technically identical with the piping and instrumentation diagram. The argument for change of the designation in this part of ISO 14084 is that the power plant field uses this document type for both fluid and solid material processes. The abbreviation — used in this part of ISO 14084 — for the process and instrumentation diagram is PID which deviates from the traditional used abbreviation P&ID for the piping and instrumentation diagram.

3.4
process control diagram
PCD
diagram representing the configuration of the measuring, control, and actuating functions of a system or sub-system

3.5
typical diagram
TYD
diagram representing the detailed configuration of a complex object by means of graphical symbols

EXAMPLE Pneumatic control valve with positioner, instrument air supply, etc.

4 Basic aspects for process diagrams for power plants

4.1 General

This clause introduces the standard and gives an overview of the topics dealt within the standard. The clause also gives information about topics dealt with in other standards dealing with technical documentation of process plants.

As a collective application standard of ISO 15519-1, the rules and guidelines given in ISO 15519-1 also apply for this part of ISO 14084.

The collective application standard concept allows adding of additional rules and guidelines which apply to the actual application field — in this part of ISO 14084 the power plant field.

4.2 Diagram types and interrelations

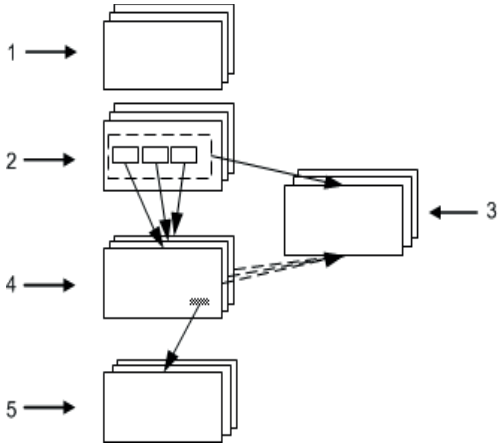
This part of ISO 14084 deals with five types of diagrams for use in the power plant field as listed in Table 1. The table also includes abbreviations used in this part of ISO 14084 and document classification code according to IEC 613551.

ISO 11005 and IEC 61027 provide rules for applying a method of structuring technical information and documentation.

Table 1 — Diagram designation, abbreviation, and coding

Diagram designation	Diagram abbreviation used in this part of ISO 14084	DCC code ref. IEC 61355–1
Block diagram	BLD	FB
Process flow diagram	PFD	FB
Process and instrumentation diagram	PID	FB
Process control diagram	PCD	FA
Typical diagram	TYD	FB

The hierarchical relations between above diagram types are illustrated in Figure 2.



Key

1 block diagram
2 process flow diagram
3 process control diagram
4 process and instrumentation diagram
5 typical diagram

Figure 2 — Hierarchical relations between diagram types for power plants

Description, application, representation of diagrams and their contents are described in Clause 5.

4.3 Life cycle aspects

The diagram types illustrated in 4.2 are all intended to contain differentiated types and amount of information to suit the needs of the actual life cycle stage(s) of a power plant. Figure 3 illustrates the application of four diagram types during major life cycle stages and the graduated application value of the diagrams in the different life cycle stages represented by the width of the bar.

Diagram type	Study	Engineering design phases			Manufacture Installation	Operation Maintenance
		Conceptual	Basic	Detailed		
Block diagram						
Process flow diagram						
Process control diagram						
Process and instrumentation diagram						

Figure 3 — Illustration of life cycle application value of diagrams for power plants

4.4 Contents of information in diagrams

Diagrams shall, depending of type and main application, contain information in the form of

— graphical symbols representing functions, objects, and connections,

— technical information, and

— reference designation

sufficient for “reading” and interpretation functionality of represented system/sub-system without consulting further technical descriptions.

The amount of the complete technical information of an object of which some is represented directly in diagrams and some in item lists or data bases – is a balance of:

— the user of the diagram and the user’s access to technical information in other media, e.g. item lists, data bases;

— the technology used for development of diagrams – traditional 2D CAD or advanced data based development tools with screen access to all information stored in data bases;

— the needs from different user groups access to information to perform their job, e.g. control room personnel, maintenance personnel;

— the differentiating needs in life cycle phases.

5 Diagram types and content

5.1 General

This clause deals for each type of diagram with the following:

— description and application of the diagram;

— specification of basic and additional information;

— representation in diagrams.

Application examples of process diagrams for power plants are given in Annex B.

Explanation of terms used for specification of and requirements to reference designation, are given in Annex C.

5.2 Block diagram (BLD)

5.2.1 Description

Block diagrams are overview diagrams predominately using block symbols.

5.2.2 Application

Block diagrams are used on a superior level for simplified representation of the main processes and main flow of media and energy.

5.2.3 Contents

The block diagram shall contain following basic information. Additional information can be added if required (see Table 2).

Table 2 — Basic and additional information for block diagrams

Aspect	Basic information	Additional information
Graphical symbols and connections	— graphical symbols for process systems represented by frames — connections (functional) with indication of flow direction	— graphical symbols for special objects
Reference designation		— reference designation on breakdown level 1 (See Annex C)
Technical information	— denomination of the process which the frame represents	— ingoing and outgoing mass and energy flows — mass and energy flows between the frames — characteristic operation conditions
Diagram information	— denomination of ingoing and outgoing process media and energy flows — directions of main flows between frames	— denomination of main flows between the frames

5.2.4 Representation

In block diagrams, frames are used to represent processes and connection lines between the frames to represent process media and energy flows.

See example(s) in Annex B.

5.3 Process flow diagram (PFD)

5.3.1 Description

Process flow diagrams are diagrams illustrating the configuration of a process plant or system by means of graphical symbols.

5.3.2 Application

Process flow diagrams are used for project planning and coordination especially in the conceptual/permitting engineering phase and procurement phase.

Process flow diagrams form the basis for the preparation of process and instrumentation diagrams and process control diagrams

A process flow diagram can represent major plant system groups (like boiler-turbine/water steam cycle or a utility system, e.g. central cooling system).

5.3.3 Contents

The process flow diagram shall contain following basic information. Additional information can be added if required (see Table 3).

Table 3 — Basic and additional information for process flow diagram

Aspect	Basic information	Additional information
Graphical symbols and connections	— general graphical symbols for process equipment, valve actuators, PCI symbols for measurement, and actuation — general graphical symbols for connections	— for safety systems and safety equipment — for measuring devices essential for control and supervision of the process including primary control loops — for functionality of main process control objects, e.g. fail safe close for valve actuators, variable speed control of pumps — specific graphical symbols for, for example, valve actuators
Reference designation	— process equipment, process control elements, and connections on breakdown level 1	— process equipment, process control elements and connections on breakdown level 1 and 2,
Technical information		— characteristic operation conditions, e.g. flow rates, pressure, temperature — supplementary operation conditions — characteristic data of equipment — names of essential equipment — design parameters, e.g. pressure, temperature, flow — denomination of drives and characteristic data of drives — dimension of main piping, ducts, etc.
Diagram information	— denomination of ingoing and outgoing systems	— interface between suppliers, partners, etc.

NOTE PCI is the abbreviation for Process Control Information symbol – traditional a circle – in which are specified the type and application of the measured value and the reference designation as described in ISO 15519-2.

5.3.4 Representation

In process flow diagrams, graphical symbols from ISO 14084-2 are used to represent process objects like boilers, turbines, pumps, heat exchangers, and connection lines to represent pipelines.

In process flow diagrams on basic level, conveyors diagrams for transportation of bulk materials can be represented by connection lines.

Redundant process equipment, e.g. three 50% pumps, can be shown with a single graphical symbol and the redundancy shown, for example, with denomination by 3 × 50%.

See examples in Annex B.

5.3.5 Other types of process flow diagrams

Besides the general process flow diagram described in this part of ISO 14084, this diagram type is also used for other application purposes, e.g.

— heat and mass balance diagrams in the form of plotted calculation results of heat balance modelling software;

— water balance diagrams;

— special process flow diagrams for authority permitting application.

5.4 Process and instrumentation diagram (PID)

5.4.1 Description

Process and instrumentation diagrams are diagrams representing the technical realization of a process system by means of graphical symbols for equipment, process flow path and process measurement, and control functions.

5.4.2 Application

Process and instrumentation diagrams are used for detailed engineering of process systems especially piping, conveyance systems, instrumentation, etc., and coordination between mechanical, electrical, and instrumentation engineering.

In operation and maintenance, the process and instrumentation diagram is the "master" document for references to documentation, operation manuals, fault-finding, securing of systems for repair, and maintenance works.

5.4.3 Contents

The process and instrumentation diagram shall contain the following basic information. Additional information can be added if required (see Table 4).

Table 4 — Basic and additional information for process and instrumentation diagram

Aspect	Basic information	Additional information
Graphical symbols and connections	— specific graphical symbols for process equipment incl. prime movers (electrical motors, combustion motors, turbines, etc.), valves incl. actuators, connections, etc. — PCI symbols including letter codes for measurement and control functions and additional information where necessary, e.g. pH for a quality measurement — direction of flow	— supplementary information on graphical symbols, e.g. connections represent equipment of specific function e.g. gear pump — pipe reducers for change of dimensions, compensators, flow straighteners, and mixing paths — inline and built on measurement sensors — details such as heat tracing — connection specifications, e.g. pipe classes, insulation classes
Reference designation	— complete identifying reference designation – at least prefix and breakdown level 1 and 2 - for all equipment, connections, and PCI symbols,	
Technical information	— information of type of process media — design parameters like pressure, temperature, including indication, where design parameters change — dimension of connections, e.g. piping, ducts — identification of safety requirements, e.g. SIL level according to IEC 61508	— denomination of main equipment — operation parameters, e.g. flow, content/ capacity of storages tanks, bunkers — nozzle designation on vessels
Diagram information	— denomination of ingoing and outgoing systems — reference to typical diagrams for process objects, like valves with actuators, etc.	— interface between suppliers, partners, etc. — location information, e.g. building borderline

5.4.4 Representation

In process and instrumentation diagrams, graphical symbols from ISO 14084-2 shall be used to represent process objects like boiler, pumps, heat exchangers, and connection lines to represent pipelines and ducts [see diagram example(s) in Annex B].

Complex process objects like boiler feed pumps, represented in PID diagrams with general graphical symbols not allowing representation of all details, should in addition be represented in a detailed PID diagram, which allows to represent for example bearings with temperature measurement, bearing oil level measurement, vibration measurement, stuffing boxes with details, speed increase gearbox with details. The reference from the general PID to the detailed PID shall be given with a boundary line frame around the general symbol with reference to the detailed PID diagram (see example in Annex B).

5.5 Process control diagram

5.5.1 Description

Process control diagrams are diagrams representing the configuration of measuring, control, and actuating functions of a complete process system or part of a process system.

5.5.2 Application

Process control diagrams are used in the engineering phase for development and optimization of the process system and the control system. The diagrams are also used in operation phase as integrated part of operation manuals.

5.5.3 Contents

The process control diagrams shall contain the following basic information. Additional information can be added if required (see Table 5).

Table 5 — Basic and additional information for process control diagram

Aspect	Basic information	Additional information
Graphical symbols and connections	— general graphical symbols for process equipment, measurement points, and actuated object connected to the control system — graphical symbols for control functions — signal connections between process measurement points, control functions, and actuated objects	— graphical symbols for measurement point sensors, if required for understanding of the function (e.g. material thickness differential temperature measurement)
Reference designation	— reference designation up to breakdown level 1 and 2 – for measurement points and actuated object connected to the control system	— reference designation for other process objects in the PCD
Technical information	— letter codes of the process variables and control functions	— set point values
Diagram information	— designation and denomination of interfaces	— denomination of essential equipment — redundancy of essential process equipment and process control elements

5.5.4 Representation

The process system is only represented in the process control diagram by those objects which are integrated with measurement, control, and actuation and in addition those process objects necessary for understanding and interpretation of the process in question.

The representation of the realization of the configuration shall be illustrated with graphical symbols from ISO 14084-2.

See example(s) in Annex B.

5.6 Typical diagram

5.6.1 Description

Typical diagrams are diagrams representing the detailed configuration of a definite measuring or actuating system which can be referred to in an associated diagram by a simplified graphical symbol and document reference.

5.6.2 Application

Typical diagrams are detailed process and instrumentation diagrams which show the detailed configuration of definite measuring systems, e.g. a transmitter including instrument valves or a definite actuating system, e.g. a pneumatic control valve.

One typical diagram can only represent a definite configuration and interface with the control system.

Objects of identical technical configuration but different interfaces with the control system shall be represented in typical diagrams with separate document identities.

The objects in a typical diagram are allocated reference designation on product level allowing to add in front an individual function oriented reference designations.

5.6.3 Contents

The typical diagram shall contain following basic information. Additional information can be added if required (see Table 6).

Table 6 — Basic and additional information for typical diagram

Aspect	Basic information	Additional information
Graphical symbols and connections	— graphical symbols for objects of which the item, e.g. a pneumatic control valve, are combined of, graphical symbols for measurement and control objects	
Reference designation	— reference designation on product level	
Technical information	— item list	
Diagram information	— simplified graphical symbol showing the representation used in process and instrumentation diagrams	

5.6.4 Representation

Typical diagram includes two representations of the object

— a graphical symbol used in process and instrumentation diagram for representation of the object, e.g. a pneumatic control valve;

— a detailed representation of the complex object by means of graphical symbols and reference designations.

The reference in a process and instrumentation diagram to a typical diagram should be placed in conjunction with the reference designation for the object in concern.

See example(s) in Annex B.

6 Representation subjects

6.1 General

As a collective application standard of the ISO 15519 series, this part of ISO 14084 refers as far as possible to the ISO 15519 series and deals only with subjects which need to be further detailed in order to meet specific needs of the power plant field.

6.2 Document sheet issues

Provisions for preparation of the document sheet, like grid system and modules, lettering, text orientation, lines, etc. are given in ISO 15519-1.

In addition to the provisions given in ISO 15519-1, the following applies for this part of ISO 14084:

— If diagrams are expected to be printed out in reduced format, then the size of lettering, graphical symbols, etc. should be considered when preparing the original in order to secure legibility in the print out size.

6.3 Technical information

The extent of technical information in diagrams depends on the accessibility to technical information about objects represented in the diagram.

— In cases where there are no links between diagram and database, it might be useful to represent more information in the diagram, as e.g. operation personnel need the information “here and now”;

— in case of electronic diagram with access to associated database, the technical information can be limited to reference designation, as technical information can be displayed.

Provisions for representation of technical information like components and devices, flow paths, explanatory notes, etc. can be found in ISO 15519-1.

Additional technical information can be necessary in order to “link” construction drawings and process diagrams, for example nozzle designations as illustrated in Figure 4 using letter N for nozzles. Placement of the technical information for ports and terminals shall be as specified in ISO 15519-1.

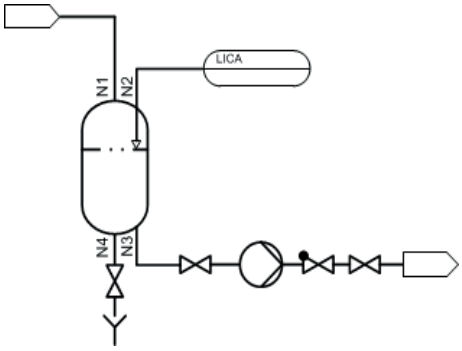


Figure 4 — Examples of additional technical information

6.4 Graphical symbols

6.4.1 General

General rules and guidelines for application of graphical symbols in diagrams are given in ISO 15519-1.

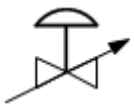
6.4.2 Graphical symbols for power plant diagrams

Graphical symbols for power plant process diagrams are specified in ISO 14084-2.

If a graphical symbol is not included in this part of ISO 14084, the symbol should be designed according to ISO 14084-2, Annex A.

6.4.3 Extension of information

Graphical symbols for objects in diagrams shall contain sufficient information for interpretation of the functionality of the object depending of the detailing of the diagram. A pneumatic control valve in a PFD with basic information requirement should be represented as shown in Figure 5a; while the same valve in a PFD with additional information should be represented as shown in Figure 5b where supplementary symbol for fail safe freeze 659 is added.



a) Control valve with diaphragm actuator

b) Control valve with diaphragm actuator fail freeze

Figure 5 — Examples of basic and additional detailing of graphical symbol for a valve

In Figure 6 are represented three degrees of detailing of graphical symbols for a variable speed pump.

The arrow illustrating adjustability can be placed in front or behind the symbol according to ISO 14617-2 rule R201. In case the main symbol includes additional information, the arrow should be placed behind (see Figure 6b).

a) flow control principle not specified

b) flow control by variable speed electrical motor

c) flow control by electrical motor, speed controlled by a frequency converter

Figure 6 — Examples of different degrees of detailing of a variable flow pump

6.4.4 Combination of graphical symbols

Graphical symbols can be used to change the functionality of another graphical symbol. In Figure 7, the graphical symbol for separator is inserted in a graphical symbol for a pressure vessel, which then is converted into a separator vessel.

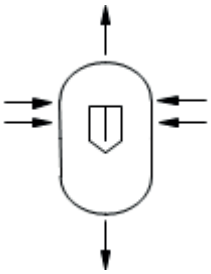


Figure 7 — Combination of graphical symbols

6.4.5 Representation of complex/large objects in diagrams

Large objects like boilers, turbines, flue gas treatment plants, boiler feed pumps, etc. include many objects represented by graphical symbols according to ISO 14084-2.

In order keep the functional overview and same time represent the objects in correct relations to each other, e.g. placement of PCI symbols for measurements, such large object e.g. a flue gas treatment system should be represented with a silhouette.

Figure B.4.1 illustrates a boiler feed pump in detailed process and instrumentation diagram.

ISO 14084-2, Annex B gives further examples of symbols for complex/large objects.

6.5 Connections

6.5.1 General

General rules and guidelines for the application of simplified representation, joints, and intersections, reference to lines continuing on adjacent diagram and objects with two or more connections are given in ISO 15519-1.

6.5.2 Indication of flow directions

Arrows for indication of flow directions shall be placed on connections on regular basis, near to branch connections and object connections (see Figure 8).

Arrowheads for indication of flow can be found in ISO 14084-2.

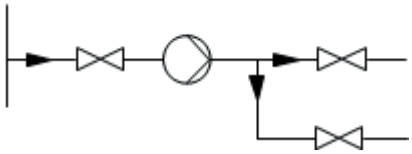


Figure 8 — Examples of arrows for indication of flow direction

6.5.3 Indication of pipe dimension

Pipe dimension should preferably be indicated by using nominal size, DN designation, according to ISO 6708.

In cases where application of the DN designation is inappropriate, e.g. high pressure piping ordered on basis of internal diameter tolerance, then the exact internal diameter shall be specified, e.g. DInternal.

6.5.4 Change of dimension on pipelines

Change of dimension of pipelines shall be indicated with ISO 14617-3, symbol 516: *Change of pipe dimension, pipe reducer*. The symbol shall be used on straight pipelines and to and from process equipment like pumps, valves, etc. (see Figure 9). In case of identical pipe reducers for a valve, the valve dimension might alternatively be indicated. Symbol 516 should not be used to indicate reduced branch connections.

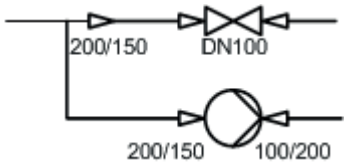


Figure 9 — Examples of representation of change of pipeline dimension

6.5.5 Representation of connection lines

Connection lines, e.g. signal lines in process flow diagrams, can “cross” other clusters of graphical symbols using interruption technique, as illustrated in Figure 10.

The interrupted lines shall be placed in same centreline on either side of the interruption.

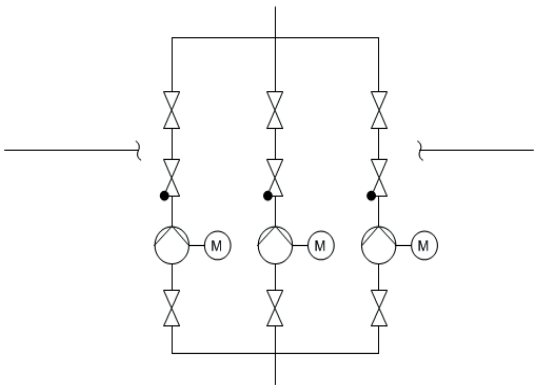


Figure 10 — Interruption of connection lines

Adjacent objects and connection lines not belonging to the functional system represented in an actual diagram and which are significant for the understanding of the overall process, can be represented by dashed double-dotted line as illustrated in Figure 11.

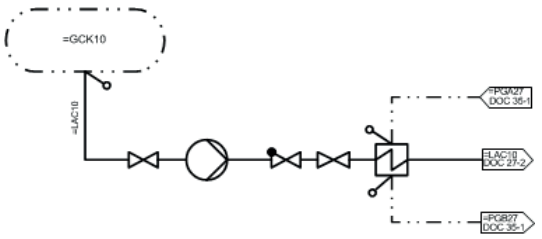


Figure 11 — Representation of adjacent objects in a diagram

6.6 Measurement and control

General rules for representation of measurement and control in diagrams are given in ISO 15519-2.

In process and instrumentation diagrams, all sensors which form part of pressure exposed objects or are built in pressure exposed objects, e.g. pipeline and vessels, shall be represented with a graphical symbol.

6.7 Non-object symbols

Non-object symbols are symbols used in diagrams for supplementary information, e.g. change of pipe class specification, limits of supply between contractors, continuation on another drawing sheet, etc.

If information are placed inside the symbol or attached to the symbol in the form of letter codes or digit codes, then an explanatory note shall be given in same diagram or a diagram cover page.

Examples of non-object symbols are given in informative Annex A.

6.8 Reference designation

6.8.1 General

General rules and guidelines for the application of reference designation in diagrams are given in ISO 15519-1.

6.8.2 Representation and location

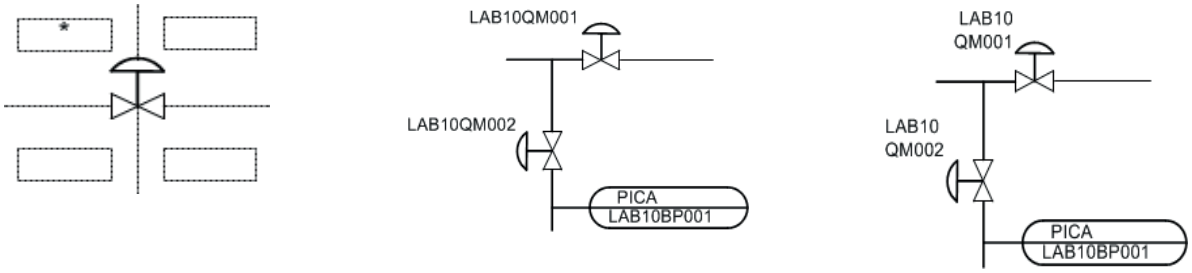
The reference designation shall be placed “off set” as illustrated in Figure 12 a) (see ISO 15519-1), allowing for connection the object.

The reference designation can be represented on a single line [see Figure 12 b)] or as multiple line representation for illustration of the brake down levels, according to ISO/TS 16952-10 [see Figure 12 c)].

The reference designation within Process Control Information symbol shall always be single line representation [see Figure 12 b) and 12 c)].

The location of the reference designation shall secure clear relationship between the object and the reference designation.

NOTE Reference designation can be represented in frames in order to maintain clarity.



a) Optional placement of reference designation — * is preferred **b) Single line representation** **c) Double line representation**

Figure 12 — Allowable RD presentation forms

6.8.3 Reference designations for pipelines

The reference designation shall be placed above the pipeline at the entrance and exit of the diagram and regularly through the diagram for ease navigation.

The start of a new system (breakdown level 1) e.g. branch off of LAB11 from LAB10 (see Figure 13) should be marked with a designation pin for level 1 according to Annex A.

When pipelines within a system are sub-divided in pipeline sections (breakdown level 2) e.g. branch off of LAB11WP002 from LAB11WP001 (see Figure 13), the split-up location should be marked with a closed pin according to Annex A.

NOTE Explanation of "breakdown level" is given in Annex C.

Alternative representation of reference designation for pipelines is illustrated in Annex D.

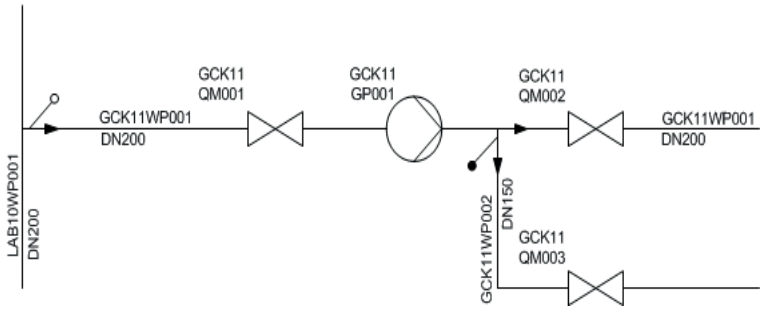


Figure 13 — Representation of RD for pipelines

Annex A
(informative)

Non-object symbols, etc.

The non-object symbols in Table A.1 are symbols which are used for representation of, for example, reference designation, references, or links to other diagrams.

Table A.1 — Miscellaneous non-object symbols

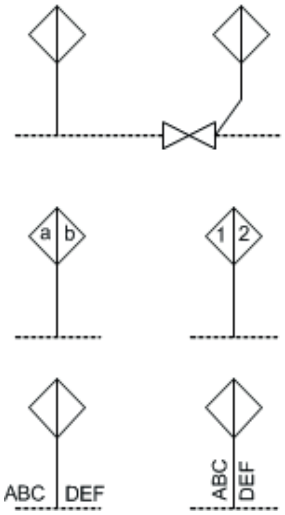
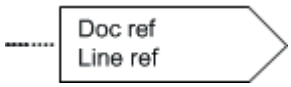
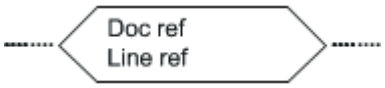
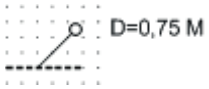
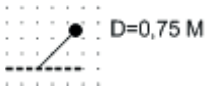
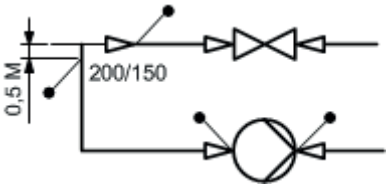
Entry no.	Symbol	Symbol name / description
A.1.1		**Boundary line** Dashed-dotted line according to ISO 128-20 for framing of objects, hazardous arrears, etc. The boundary line is used for objects which are detailed in another diagram or objects which have the same in front reference designation (see ISO 15519-1).
A.1.2		**Limit, general** The limit symbol consists of a diamond vertically separated. The diamond symbol shall be connected to the limit spot with a straight or bended leader line, whichever is appropriate. Information can be placed inside or outside the symbol as illustrated in Figures A.1.2.2 and A.1.2.3.
A.1.3		**Connection reference** Reference information should be placed in two lines within the symbol. Doc ref: Reference to document where the referred connection is represented Line ref: Reference designation for the connecting object on the referred document
A.1.4		**Connection reference — reversible flow** Reference information should be placed in two lines within the symbol. Doc ref: Reference to document where the referred connection is represented Line ref: Reference designation for the connecting object on the referred document

Table A.2 — Representation of change of reference designation

Entry no.	Symbol	Symbol name / description
A.2.1		**Open pin — designation level 1** Indication of change of reference designation between systems - breakdown level 1 - according to ISO/TS 16952-10:— shall be represented by an open pin.
A.2.2		**Closed pin — designation level 2** Indication of change of reference designation between sections - breakdown level 2 - according to ISO/TS 16952-10:— shall be represented by a closed pin.
A.2.3		**Placement of pins** (the illustration applies to both open and closed pins) If change of reference designations is between objects, the pin shall be placed in the interface spot between the objects. If change of reference designations is in a branch connection the pin shall be placed on the branch off object 0,5M from the theoretical branch off point.

NOTE Explanation of “breakdown level” is given in Annex C. Grid system with module size M = 2,5 mm.

Annex B
(informative)

Diagram examples

B.1 General

The diagrams in this Annex are examples of different types of diagrams and application of rules and guidelines given in the normative part of the standard.

NOTE Due to the high reduction of the diagram examples, some information, e.g. reference designation, is not completely shown in order to secure a reasonable readability.

B.2 Overview

This Annex includes following diagram examples:

Figure B.1 Block diagram for water steam system for conventional power plant;

Figure B.2 Process flow diagram for water steam system for conventional power plant;

Figure B.3 Process and instrumentation diagram for feed water system for conventional power plant;

Figure B.4 Detailed process and instrumentation diagram for feed water pump for conventional power plant;

Figure B.5 Process control diagram for feed water flow control;

Figure B.6 Typical diagram for valve with pneumatic actuator, fail to close.

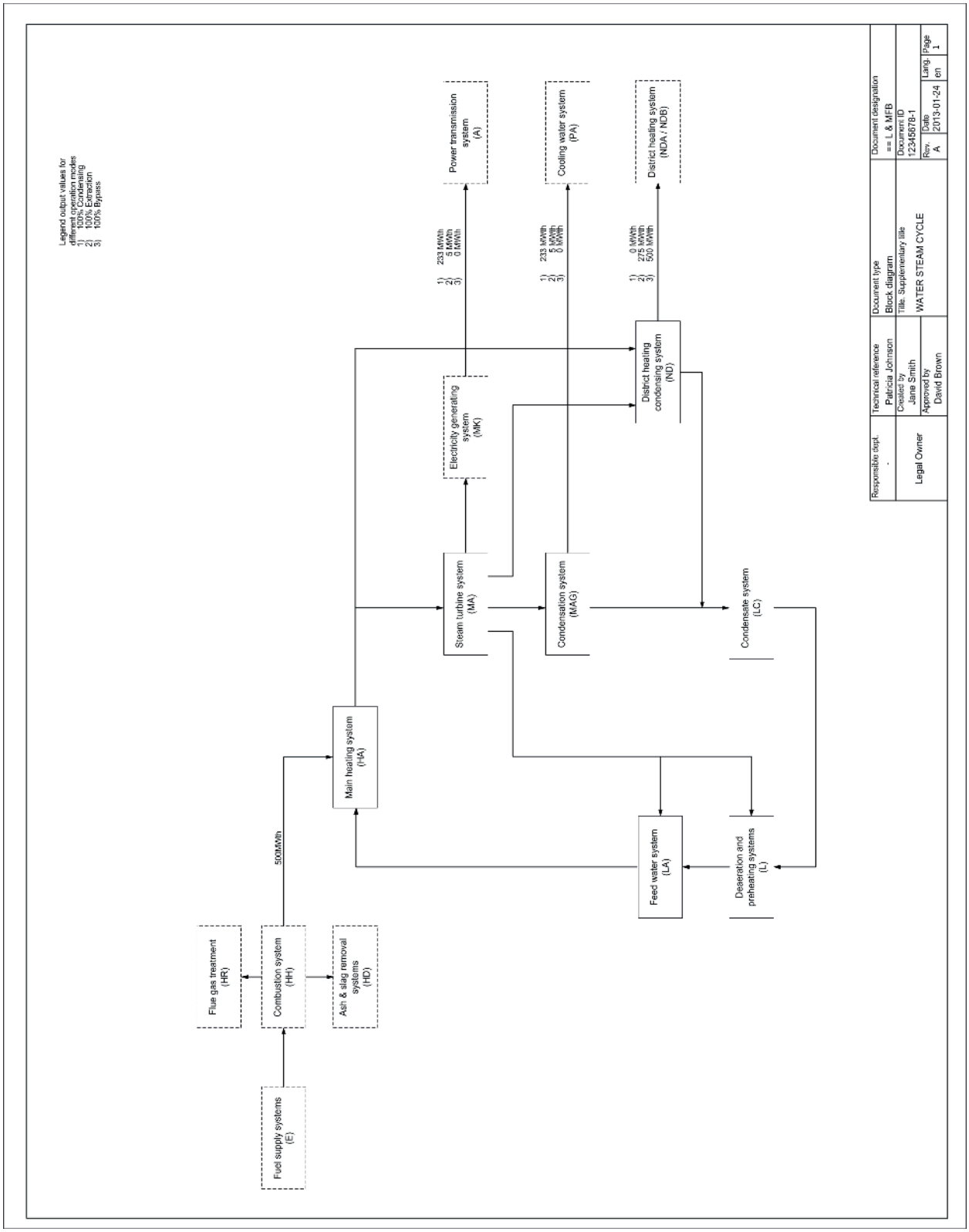


Figure B.1 — Block diagram for water steam system

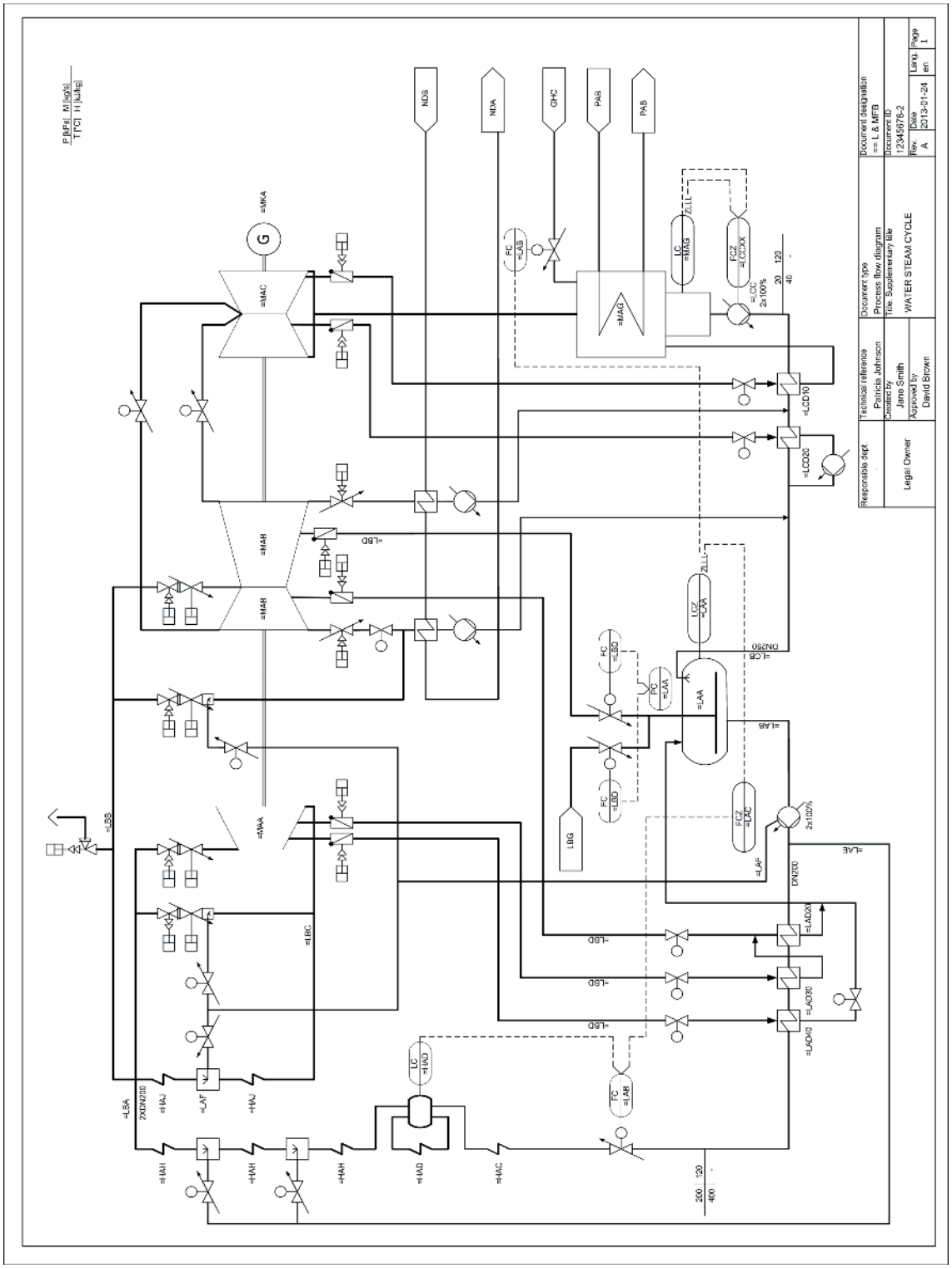


Figure B.2 — Process flow diagram for water steam system

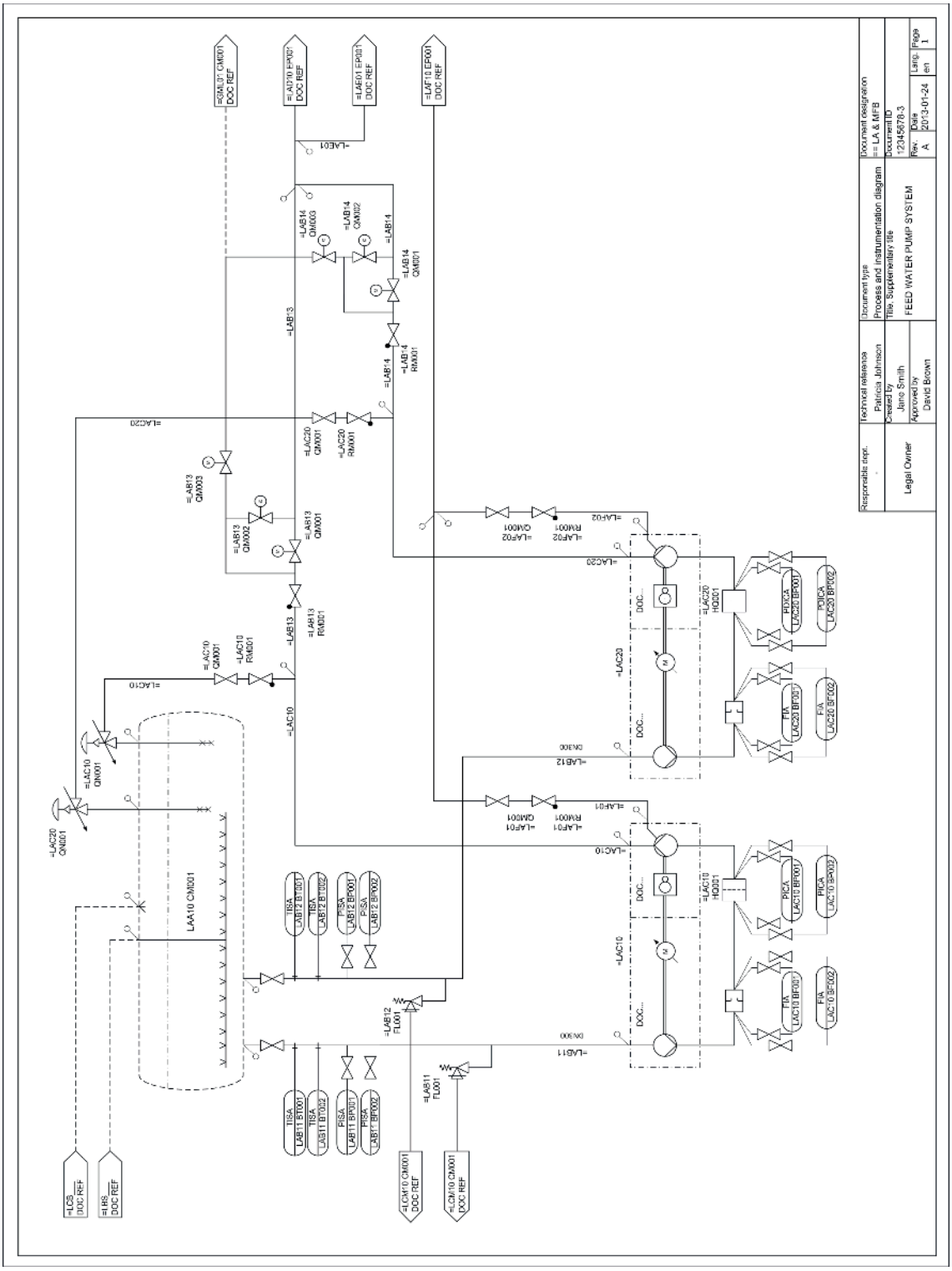


Figure B.3 — Process and instrumentation diagram for feed water system

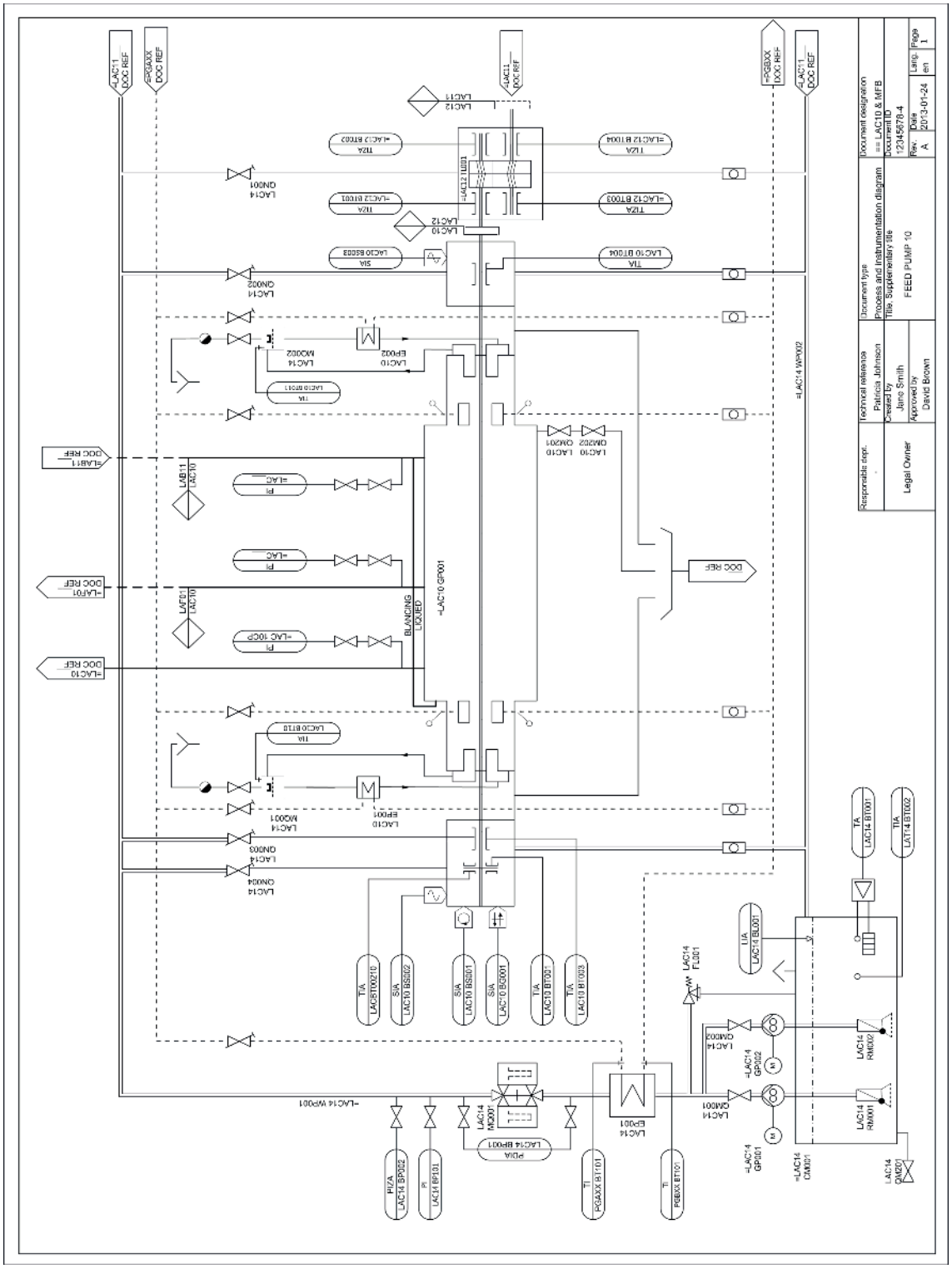


Figure B.4 — Detailed process and instrumentation diagram for a feed water pump

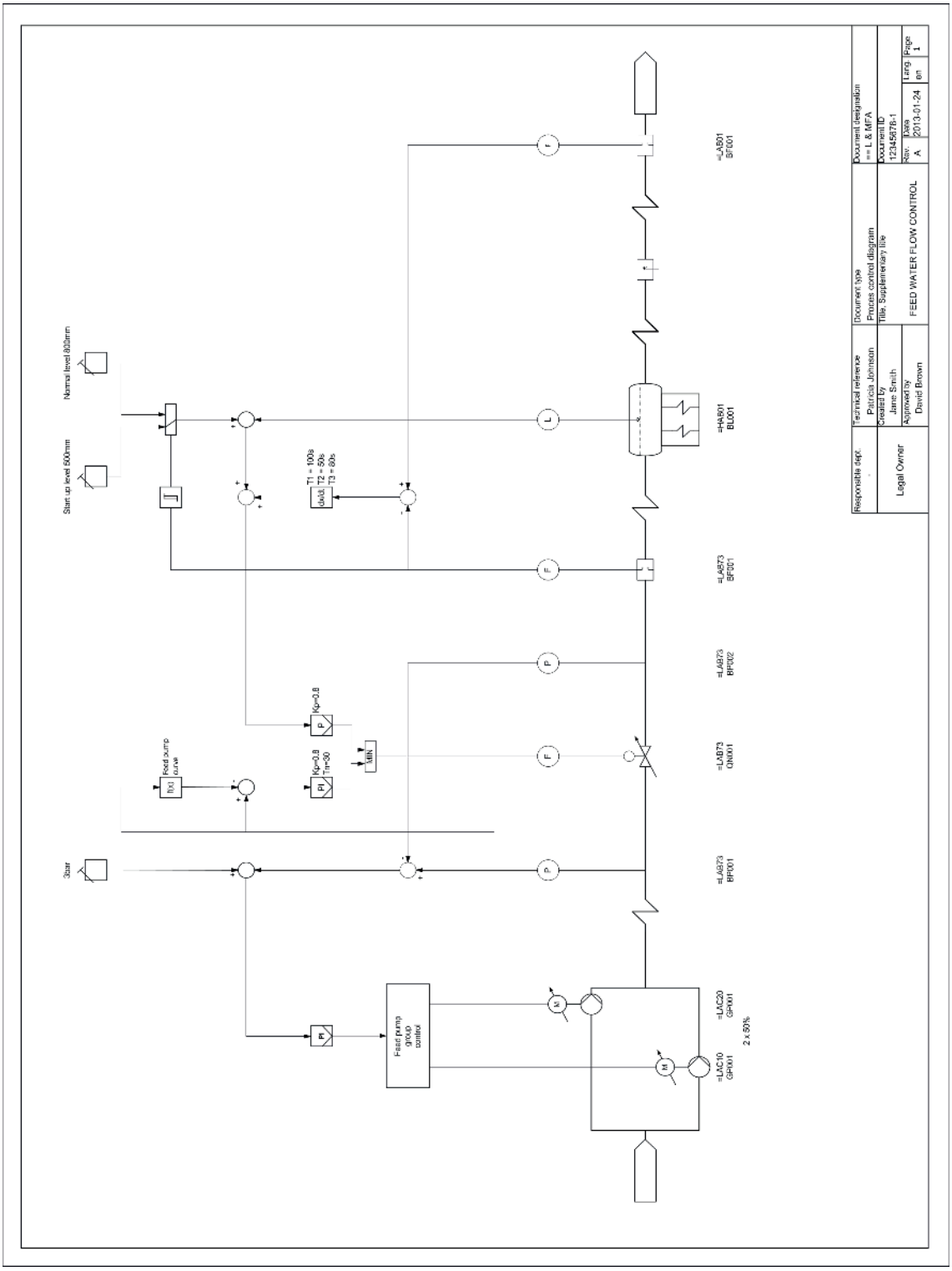
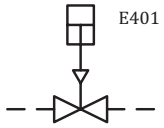


Figure B.5 — Process control diagrams

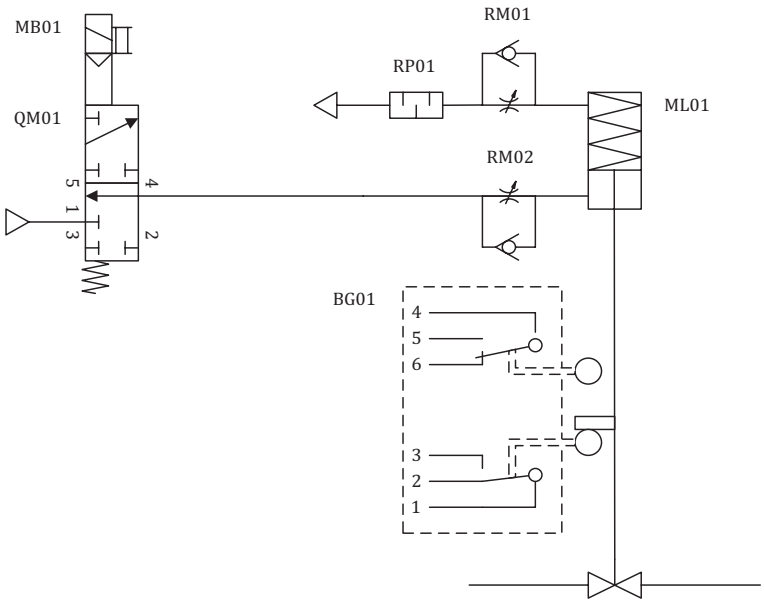
Ref	Description	Note
BG01	Limit switch box	1
MB01	Solenoid, 24 VDC 2.5 W	
ML01	Valve actuator spring closing	
QM01	5/2 Directional control valve	2
RM01/02	Flow control valve, adjustable, reverse free flow	
RP01	Silencer	

Note 1 Limit switch box with 2 x SPDT microswitches, integrated with open/closed visual indicator

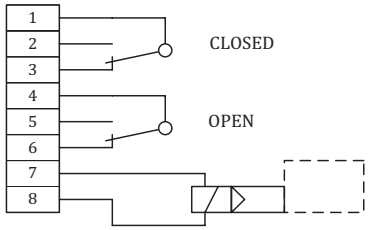
2 Solenoid operated, pilot stage, spring return, manual override, not used ports plugged.



REPRESENTATION IN DIAGRAM.



WIRING DIAGRAM



Responsible dept.	Technical reference	Document type (&)	Diagram type	Document designation
-		MFB	TYD	-

Legal Owner	Created by	Title, Supplementary title	Document number			
		E401 VALVE PNEUMATIC ACTUATOR FAIL-TO-CLOSE	123456789			
	Approved by		Rev.	Date	Lang.	Page
			A	2013-01-24	en	1

Figure B.6 — Typical diagram for valve with pneumatic actuator, fail to close

Annex C
(informative)

Reference designation for power plants

C.1 General

Technical objects in power plants can be assigned an unambiguously identification by using the Reference Designation System for Power Plants (RDS-PP) described in ISO/TS 16952-10.

RDS-PP is based on rules and letter codes of IEC 81346-1, IEC 81346–2, and ISO/TS 81346-3.

Specific stipulations for power plant systems, basic functions, and product classes are defined in the VGB guidelines B101 and B102.

NOTE VGB PowerTech e.V.

An overview of above standards and guidelines are given in Figure C.1.

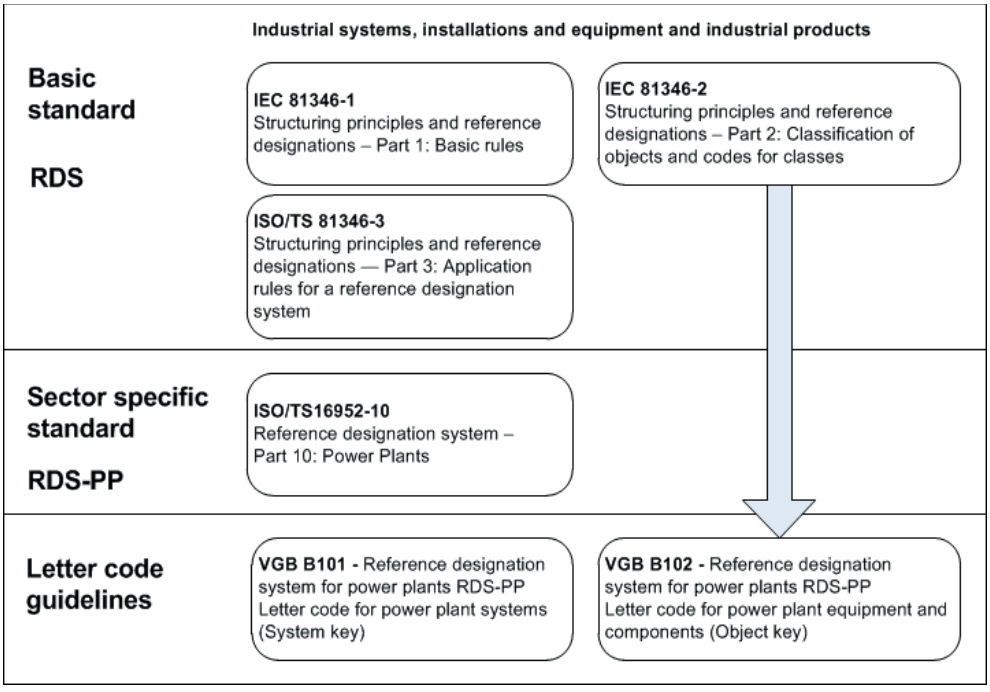


Figure C.1 — Overview of basic and sector specific standards for reference designation

C.2 RDS-PP basic principles

RDS-PP:

— covers all types of power plants;

— is universal for the complete life cycle;

— is valid for all technical disciplines;

— is a language-independent coding.

RDS-PP is structured on viewing the object according to different aspects – which are:

— what an object is intended to do or what it actually does – the function aspect;

— by which means an object does what it is intended to do – the product aspect;

— intended or actual space the object – the location aspect.

C.3 Prefix signs

Prefix signs are used to identify the different types of reference designation aspects (see Figure C.2).

Prefix		Designation	Designation tasks/aspect	Origin of signs/ basics, specified in
1	2			
	#	Number	Conjoint designation	ISO/TS 81346-3
	=	Equals	Function-oriented designation	IEC 81346-1
=	=	Equals-Equals	Functional allocation	ISO/TS 81346-3
	+	Plus	Point of Installation	IEC 81346-1
+	+	Plus-Plus	Location	ISO/TS 81346-3
	-	Minus	Product-oriented designation	IEC 81346-1
	:	Colon	Terminal designation	IEC 61666
	;	Semicolon	Signal designation	IEC 61175
	&	Ampersand	Document designation	IEC 61355-1

Figure C.2 — Prefix signs for reference designation aspects

C.4 Designation blocks

Designation blocks are structured method for designing and representation of the reference designation of an object, which together with the in front prefix sign gives the unique full reference designation (see Figure C.3).

ISO/TS 16952-10 specifies designation blocks for the different aspects specified in Figure C.2.

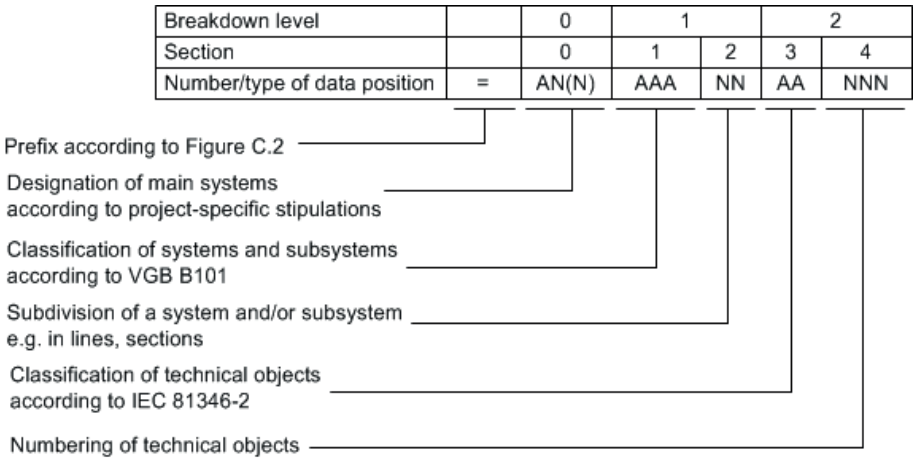


Figure C.3 — Structuring of designation blocks

Annex D
(informative)

Reference designation symbols

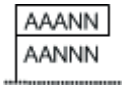
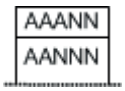
"Flags" can be used as an alternative to the rules for indication of flow in pipelines given in 6.5.2 and reference designation for pipelines on break down level 1 given in 6.8.3.

The break down level 1 reference designation, according to ISO/TS 16952-10, shall be placed within the flag and the break down level 2 reference designation, if used, beneath the flag as illustrated.

Types and application of flags are given in Table D1.

NOTE Explanation of "reference designation breakdown levels" is given in Annex C.

Table D.1 — Types and application of flags

Entry no.	Symbol	Symbol name and application
D1.1		Flag for non-reversible flow. The direction of the flag indicates the flow direction.
D1.2		Flag for reversible flow.

Bibliography

[1] ISO 10628-1, *Diagrams for the chemical and petrochemical industry — Part 1: Specification of diagrams*

[2] ISO 1219-2, *Fluid power systems and components — Graphical symbols and circuit diagrams — Part 2: Circuit diagrams*

[3] ISO/TS 81346-3, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 3: Application rules for a reference designation system*

[4] ISO/TS 16952-10, *Technical product documentation — Reference designation system — Part 10: Power plants*

[5] IEC 61082-1, *Preparation of documents used in electrotechnology — Part 1: Rules*

[6] IEC 61355-1, *Classification and designation of documents for plants, system and equipment — Part 1: Rules and classification tables*

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

[8] IEC 61511 (all parts), *Functional safety — Safety instrumented systems for the process industry sector*

[9] IEC 81346-1, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 1: Basic rules*

[10] IEC 81346-2, *Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 2: Classification of objects and codes for classes*

[11] VGB B101. *Guideline: Reference Designation System for Power Plants RDS-PP*, (www.vgb.org)

[12] VGB B102, *Guideline: Reference Designation System for Power Plants - Letter codes for basic functions and product classes*, (www.vgb.org)

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