

General Technical Requirements
for
Documentation
GTR-03

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1 Scope of application

This general technical requirement (GTR-3) applies, when not otherwise agreed in writing, for all technical supplies to the Employer including but not limited to: Systems, sub-systems, supply of products and supply of services.

GTR-3 applies to technical documentation of the following types:

- Functional documentation of processes e.g. process diagrams, heat/flow balance diagrams, HAZOP analysis
- Layout and arrangement documentation, e.g. plot plans, 3D models
- Construction documentation, e.g. assembly drawings, piping isometrics, electrical wiring drawings
- Quality and properties of products, e.g. certificates, product data sheets, spare part lists
- Instructions for operation and maintenance of systems and products
- Authority documentation, authority approvals for use
- HSE documentation, e.g. HAZOP analysis, external noise, emissions
- Documentation of tests and commissioning

In addition to requirements defined in this GTR-3, other contractual documents, national legislation requirements and EU directives including latest edition of harmonized standards, shall also be met.

The contractual Scope of Works for documentation including target dates for submission will be specified in the contract based on Appendix 1, List of Typical Documentation Deliverables.

2 Definition of terms and expressions

For application of GTR-3 following definitions of terms and expressions apply:

Term	Definition	Source reference
basic design	part of the product development process in which one or more design proposals are evaluated and the basic documentation for detailed design is prepared	ISO 11442
detailed design	part of the product development process which includes the preparation of the final product definition	ISO 11442
information	knowledge concerning objects, such as facts, events, things, processes, or ideas, including concepts that, within a certain context, has a particular meaning	ISO/IEC 2382-1
document	fixed and structured amount of information intended for human perception that can be managed and interchanged between users and systems	ISO 15519-1
document type	document defined with respect to its specific content of information, function and form of presentation	ISO 15519-1
drawing	technical information, given on an information carrier, graphically represented in accordance with agreed	ISO 10209

Term	Definition	Source reference
	rules and usually to scale	
diagram	drawing showing the functions of the objects composing a system and their interrelations using graphical symbols	ISO 10209
documentation	collection of documents related to a given subject	IEC 82045-1
product	intended or accomplished result of labour or of a natural or artificial process GTR-3 addition: Includes non-physical products e.g. software	IEC 81346-1
object	entity treated in a process of development, implementation, usage and disposal	IEC 81346-1
report	document accounting matters or observations after investigation, consideration or testing	ISO 29845
technical specification	document specifying the requirements to one specific part or for a group of parts with equal characteristics	ISO 29845

3 Reference designation

The Employer uses a KKS (Kraftwerk Kennzeichen System) based reference designation system described in VGB Guideline B105 and B106.

The reference designation system is used for:

- Designation of systems, sub-systems, technical objects, signals, etc.
- Designation of documents

If the supplies include plant specific reference designation in the documents, such reference designation shall fit into the overall plant system.

Employer will instruct the Contractor in the overall plant reference designation system and allocate reference and number series.

4 Document preparation

4.1 Document numbering

IEC 61355-1 standard shall be used for numbering of technical documents.

A document number is unique and shall always include:

- a KKS reference designation
- a separator sign: &
- a Document Classification Code (DCC)
- a serial number
- a letter indicating the revision.

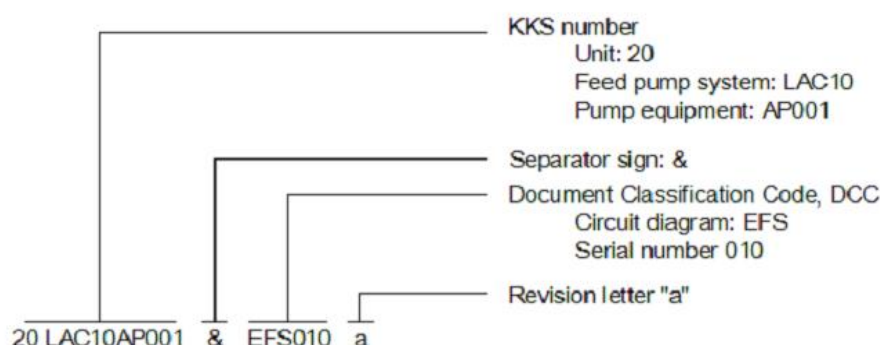


Figure 1 KKS structure

For Amager Powerplant unit 4 this document number will be: **AMV04 LAC10AP001&EFS010A**

In general all documents have to be prepared to cover a separate part of the overall plant divided accordance to the KKS reference designation system.

Document shall be numbed with the lowest possible KKS level that covers all contents of the document.

Examples on KKS levels:

A document covering the complete unit:	AMV01 &(DCC)
A document covering the complete water and steam system:	AMV01 L&(DCC)
A document covering the complete feed water system:	AMV01 LA&(DCC)
A document covering the complete feed water piping system:	AMV01 LAB&(DCC)
A document covering a part of the feed water system:	AMV01 LAB10&(DCC)
A document covering a single valve in the feed water system:	AMV01 LAB10AA001&(DCC)

The first letter in the DCC code indicates the technical area to which the document belongs:

- A: Overall management
- B: Overall technology
- C: Construction engineering (building construction and civil engineering)
- E: Electrical engineering, instrumentation and control engineering (including information and communication techniques)
- M: Mechanical engineering

The second and third code letter in the DCC indicates the document kind main classes and subclasses according to IEC/EN 61355.

The last segment in the DCC is the serial number which contains of 3 numbers. As a general rule, the numbers shall follow the advices in VGB-B103, which means that the last digit in the serial number is “0”. If two or more documents need the same serial number, then use a digit from “1” to “9” for the last digit.

Revision letter

First issue of a document has no revision letter. A _ sign (underscore) are used instead of the revision letter.

The revision status of the document shall be indicated with an uppercase letter from the British English Alphabet starting with A. Each new document get revision letter ‘A’. The next issue is ‘B’. The letters ‘I’, ‘O’ and special national letters shall not be used.

4.2 Electronic documents

Requirements to CAD file formats and 3D CAD models are specified in Employers GTR-17, General Technical Requirements for CAD.

All documents shall be submitted in PDF file format (Portable Document Format).
PDF files shall be without any security settings.

All text in the PDF document shall be searchable with standard Adobe tools, which means that text can not be present as picture fields.

Document sets shall include an interactive table of contents with links to each chapter in the document.

All plant specific documents shall also be submitted in an editable standard file format.

Text and spreadsheet e.g. in Microsoft Office application formats.

Actual software applications, file formats and edition to be submitted shall be agreed on with Employer.

Each single document or document set with a document number shall be submitted in a separate file, so that the documents can be archived in Employers KKS structure based IT system.

A series of single document with same KKS and DCC code and with coherent continuous serial numbers can be submitted in the same file.

File designation shall consist of the document number, e.g.: **AMV01_LBG&MDC001A.ext**

4.3 Metadata for documents

Metadata shall be provided for each document file according to VGB Guideline R171e.

For plant specific documents:

- Revision index
- Date of issue (YYYY-MM-DD)
- Filename
- Document designation (KKS + DCC)
- Author’s document number

- Document status (Draft, AFD, AFC, RFC, As Built)
- Legal owner
- Title of the document (in Danish)

For non plant specific documents as minimum:

- Legal owner
- Title of the document (In Danish)
- Date of issue
- Author's document number

4.4 Language

All operation manuals and operation instructions shall be provided in Danish.

EAM Data for Employers IT maintenance system shall be provided in Danish, except data for maintenance plans that can be in Danish or English.

All other kinds for documents shall be in Danish or British English.

4.5 Coordinate system

Employer's local coordinate system shall be used as location reference in all layout drawings, 3D models, documents and EAM data.

The Employer will submit the information needed for the local coordinate system.

5 Document management

5.1 Requirements to Contractor's document management system

The Contractor shall hold a document management system for preparation, quality assurance, distribution and archiving of all kinds of documents and other deliverables exchanged with the Employer or required by authorities.

The document management system shall as a minimum include written procedures for:

- classification and numbering of documents
- revision management
- quality assurance and approval of documents
- distribution of documents including to/from Employer
- revision / updating of documents especially during fabrication, installation and commissioning
- archiving

Revision of documents

All documents shall include a revision block in front of the document or as a part of the title block with information about:

- Revision index

- Date of issue
- Status
- Description of the changes in headlines
- Initials for: Author, Controlled by, Approved by

Changes from the previous version shall be clearly highlighted in the new version of the document e.g. with yellow marker or with a “revision cloud” around the changes on a drawing.

5.2 Archiving and access to Contractors documentation

The Contractor shall archive a copy of all documentation prepared for the supplies for at least 10 years. The documentation of rejected products shall be available to the Employer until completion of contract.

For EC Directive related projects, Employer shall have access to Contractor's technical dossiers within the 10 year period on request. The access privilege also applies to sub-suppliers.

5.3 Structure of documentation

As described in section 4 the Employer is using a KKS structured database for all technical documents including drawings and 3D models.

IEC 61355-1 standard, Classification and designation of documents for plants, systems and equipment and

VGB Guideline B103 are defining the document designation also based on the KKS structure.

The above standards and guidelines are giving the overall structure based on plant unit, systems, objects/equipments etc.

Unless otherwise agreed with Employer in writing, documentation should be delivered with the following overall structure:

Design:

1. Design: Basic design and detail design documents
2. Layout: Drawings and models
3. CE documentation
4. HSE documents

Operation and maintenance (O&M):

5. Operation and maintenance instructions
6. Installation and commissioning
7. Product data sheets
8. EAM data

Quality (QA):

9. Quality documents: reports and certificates
10. Commissioning test reports etc.

5.4 Submissions of documentation

Each contractual submission of documents shall be documented in a transmission note specifying each document included in the submission.

During contract implementation Contractor's documentation shall be submitted in electronic form.

Documentation for commissioning and final documentation shall be delivered in electronic form as described in section 4 in this document.

In addition the following document kinds shall also be delivered in 3 printed copies:

- Operation manuals and instructions (in Danish)
- Maintenance manuals and instructions
- PFD diagrams
- P&ID diagrams

Printed documentation shall be submitted in ring binders and follow the structure applied in the electronic documentation.

The binders shall be assembled according to the following instructions:

- All dividers shall be in colour and numbered successively. The font size of the number on the dividers shall reflect its level in the table of contents, i.e. the lower the level the smaller the font size
- The first page(s) of each binder shall be a detailed table of contents for the binder in question. There shall also be a table of contents for each divider
- A detailed table of contents shall be prepared for chapters/sections that extend over more than one binder. The table of contents shall be included in each relevant binder and shall list the contents of the entire chapter/section. Moreover, it shall be indicated in which binder each chapter/section can be found
- Each drawing shall be preceded by an introductory sheet. Where there is more than one drawing, a drawing list shall be included. All drawing lists shall include a descriptive text to make it easier for the Client to locate the drawing
- All binders containing documentation shall have the same front page and back. The back of the binder shall state the chapter as well as the number (binder x of y). The design of the front page and the system applied to the back shall be approved by Employer.

Deviations from the above shall in each case be approved by Employer in writing upon written request from the Contractor.

5.5 Document status designation

Below status designation for documentation are defined for management of documentation deliverables from Contractor to Employer.

The Contractor shall set up quality approval procedures to be able to apply actual status on all delivered technical documents and data during the project.

The actual status of a document or drawing shall be clearly indicated in the document. Either in the document title block, revision block or as a "stamp" on the front page.

A document may be subjected to pass all stages or only a few depending on kind for document and of which project phases the deliverable applies to.

Following status designation apply for supply of technical documentation:

- Draft
- Approved for design (AFD)
- Approved for construction (AFC)
- Ready for Commissioning (RFC)
- Final (as built)

Draft

Draft indicates that the document is still under preparation, and that changes to the document are likely to be added.

Approved for design (AFD)

Approved for design indicates that the basic design are approved and “frozen”.

The purpose of basic design is to exchange and “freeze” the technical process design and functionality based on the actual requirement specifications, principles and philosophies.

Basic design is the basis input for detail design of the engineering disciplines civil, piping and mechanical, electrical and instrumentation and control.

Basic design documents have to obtain the status “Approved for Design” (AFD) through “design reviews” in the project.

It is not necessary to include details in basic design that are dependent on the final layout, component product etc. and do not cause changes to the basic design later on.

After status “Approved for design” these documents are only to be updated with more details during the later detail design, as built etc.

Approved for construction (AFC)

Approved for construction indicates that the detail design are approved and “frozen”.

The Purpose of detail design is to exchange and “freeze” the detailed engineering documents for:

- purchase
- fabrication
- construction and installation on site
- Authority documentation and documentation for use,
- commissioning
- operation and maintenance

Detail design is the detailed engineering documents for the engineering disciplines civil, piping and mechanical, electrical and instrumentation and control.

Detail design documents shall obtain the status “Approved for Construction” (AFC) through “design reviews” in the project.

After status “Approved For Construction” these documents are only to be updated for status “as built” after construction and commissioning.

Ready for Commissioning (RFC)

Ready for commissioning indicates that the documents are updated after construction and approved for commissioning to commence.

The purpose of ready for Commissioning is to exchange and “freeze” the data and documents necessary to perform tests and commissioning.

Ready for Commissioning documents shall contain all data and documents for commissioning in the latest version approved for commissioning, e.g.:

- functional documentation, e.g. Functional descriptions, Cause & Effect diagrams etc.
- documentation for operation and maintenance
- HSE documentation
- QA Documentation, Approvals from authorities and notified bodies, Certificates etc.
- data and documents to perform and document the tests and commissioning

If Employer do not assesses the Ready for Commissioning documentation to be adequate, the tests and commissioning are not allowed to start up.

Final

Final indicates that the documents have been updated “as built” after construction and commissioning.

Final documentation shall contain all final documentation in the absolute final updated version.

Documents that are not completed and updated to the final version will be handled as contract deviations

5.6 Redlines

Employer can accept that Contractor mark up corrections directly on drawings or document with clearly red colures mark ups (redlines).

Redlines shall be indicated with a “revision cloud” around the corrections and a text with information about date and initials for the responsible person for the correction.

Redlines are accepted on documents as follows:

- Updating of documents after construction to be “Ready for commissioning”
- Updating of documents after commissioning to “as built” until the final updated documentation is delivered

6 Scope of documentation

A documentation matrix is illustrated in Appendix 1, List of Typical Documentation Deliverables.

The matrix includes typical documentation deliverables divided in 6 main engineering disciplines:

- Process
- Civil

- Mechanical
- Electrical
- Automation
- HSE

6.1 Documentation deliverables

A specific List of Documentation Deliverables will be prepared for each contract, specifying the actual deliverables for the specific contract.

If no specific documentation deliverables for the actual project or delivery are specified in the contract, all relevant documentation specified in Appendix 1, List for Typical Document Deliverables, shall be provided.

In addition to requirements defined in this GTR-3, other contractual documents, national legislation requirements and EU directives including latest edition of harmonized standards, shall be met.

Appendix 3 specifies requirements for the data and document kinds which is not described elsewhere in this General Technical Requirement.

Where no specific requirements are listed in this General Technical Requirement, general accepted standards and practices for Power Plant industries shall be used.

The Contractor is responsible to raise any questions or doubts about the scope/standard of the specific documentation for the Employer, for clarification before contract.

6.2 Process Criticality Index

Scope and form of the technical documentation are depending upon the actual “Process Criticality Index” of the specific part of the Power Plant.

In Appendix 1, List of Typical Documentation Deliverables, are shown the required documentation depending on the Process Criticality Index.

The actual Process Criticality Index for the supplied systems or components shall be determined together with the Employer as a part of basic design.

The “Process Criticality Index” is divided into 4 levels:

PCI 1: Main process systems

Interruption of these systems will result in immediately stop of the entire Power Plant.

No remedial actions can be taken to avoid a stop of the entire Power Plant.

PCI 2: Primary auxiliary systems

Interruption of these systems will result in a stop of the Power Plant within a relative short period, or an reduced load.

Remedial actions are possible to take within minutes or few hours.

PCI 3: Secondary auxiliary systems

Interruptions of these systems will normaly not result in a stop of the Power Plant or reduced load. Remedial actions are possible to take within days.

PCI 4: Supporting systems

Interruptions of these systems will not affect the operation of the Power Plant.

Remedial actions are always possible to take.

6.3 EAM Data

Data information about operation and maintenance of components, systems and plants shall be delivered for implementation in the Employer's EAM IT System (EAM = Enterprise Asset Management).

- Object data (basic and class data)
- Data for Maintenance Plans
- Data for spare parts and bill of materials
- Reference to object related documents

Exchanges of information from Contractor to Employer's EAM System are managed with an IT database supplied by Employer.

The key entrance in the database is the object reference designation (KKS).

Contractor shall fill in information of his supplies in the database.

Appendix 2 specifies EAM data to be supplied by the Contactor.

6.4 Object description

As a part of the basic EAM Data an explanatory objects description has to be provided in Danish.

The description can include a maximum of 40 characters in total.

The description shall also be used on the labelling of objects in the plant.

Employer has a collection of standard abbreviations that shall be used for the description.

The description shall be composed with as much process information as possible after the following syntax:

1. Type of object or measuring, e.g. PUMP or PRESSURE (TRYK)
2. Preposition, e.g. IN, AFTER, BEFORE, ON, AT, etc.
3. Object, e.g. PUMP
4. Location in the process, e.g. LAB10

Example: PRESSURE AFTER PUMP LAB10 (TRYK EFTER PUMP LAB10)

Example: VENT BEFORE TANK LBU20 (VENT FØR TANK LBU20)

6.5 Product Data Sheets

Product Data Sheets shall be supplied for:

- all equipment and spare parts for the delivery that the Employers shall keep in stock
- all equipment and spare parts in systems with Process Criticality Index 1 or 2 (see section 6.5)

A Product Data Sheet covers all the exactly same pieces of equipment and spare parts for this piece of equipment.

The purpose of Product Data Sheets is:

- To be able to order a replacement of the complete piece of equipment either by the original manufacturer or by an alternative supplier
- To be able to order spare parts for the equipment

The Product Data Sheet shall therefore include all relevant data such as:

- Manufacturer Company
- Originally manufactures product no. (for reordering)
- Type, Size, variant type, connection info etc.
- Materials
- Design process data
- Design Codes, Standards etc.
- Dimensional drawing with position ID numbers for spare parts
- HOFOR EAM Spare Part number

6.6 Spare Part numbering

The Contractor shall number each Product Data Sheet (equipment) and spare parts for each piece of equipment with a unique EAM Spare Part number.

The spare part number is a combination of:

1. A main group number
2. A sub group number
3. A serial number

Employer will submit the predefined picklist's for main and sub group numbers, and a number series for the unique serial number.

6.7 Bill of materials

For each Product Data Sheet the Contractor shall deliver a bill of materials with individual spare parts for the actual piece of equipment.

The Contractor shall number each bill of materials with a unique EAM Bill of materials number. The Employer will submit an interval of numbers for numbering.

6.8 Operation and maintenance manuals

Operation and maintenance manuals have to be prepared and delivered in accordance to VGB R171e, Provision of Technical Documentation for Power Plants.

VGB R171e Appendix D, Stipulations for Content, Structure and Layout of Operating Manuals for Overall Plant, Systems/Plant Sections, describes requirements for operation manuals for Overall Plant, Systems/Plant Sections.

User guides incl. operation and maintenance manuals for equipment should also follow the requirements wherever possible, but are in general to be compiled in accordance with the relevant international regulations (e.g. the EU Machinery Directive).

For plant specific documentation references to the actual object designation system (KKS) shall be implemented directly in the manuals.

For description of maintenance, service, replacements and tests etc., the intervals or measure points that trigger the maintenance action shall be stated clearly.

Data for all maintenance plans and actions shall be delivered as EAM data as described in Appendix 2.

6.9 Data for RCM

For equipment in process systems with Process criticality index 1 or 2 the Contractor shall deliver data for RCM (Reliability Centred Maintenance) according to Employers GTR-18.

6.10 Commissioning documentation

Documentation ready for commissioning and of the commissioning activities are described in Employers GTR-19, Commissioning.

6.11 Quality (QA)

The Contractor shall deliver a quality manual and a quality activity plan according to Employers GTR-1 Quality, as a part of the delivery.

The Contractor shall deliver documentation for quality of equipment, materials and activities performed during the project e.g.:

- CE Declaration of conformity
- Declaration of incorporation according to the EC machinery directive
- Risk assessments
- Hazard assessments
- Non conformity reports
- Material certificates for equipment and materials
- Manufacturer test certificates
- Test reports
- Test certificates
- Environment certificates
- Inspection certificates
- Quality test certificates
- Acceptance protocols
- Calibration verifications
- Welding records, heat treatment record and welder qualification
- Noise measurement records
- Vibration measurement records
- Etc.

7 Appendices

Appendix 1, List of Typical Documentation Deliverables

The list below shows the typical documentation deliverables for each Engineering discipline.
The actual scope will be specified in a separate contract document based on these lists.

ID	List of Typical Documentation Deliverables For Process Engineering	Type	DCC	For Process Critically Index ≤	Basic Design (AFD)	Detail Design (AFC)	For Comm. (RFC)	Final doc. (As Built)
1.0	Process Documentation							
1.1	Process Flow Diagrams (PFDs)	Design		3	AFD	U	U	F
1.2	Process criticality index, Classification list	Design		N/A	AFD			F
1.3	Process Data Sheet for main equipment	Design		3	AFD	U	U	F
1.4	Process Interface list	Design		N/A	AFD	U		F
1.5	Heat and mass balance diagrams	Design		N/A	AFD	U	RFC	F
1.6	Process and Instrumentation Diagram (PIDs)	Design		3	AFD	AFC	RFC	F
1.7	System descriptions	Design		3	AFD	AFC	RFC	F
1.8	Cause/effect Diagrams	Design		3	AFD	AFC	RFC	F
1.9	Process Data Sheets for all process equipment	Design		3	AFD	U		F
1.10	For Demolition. Marked up on P&ID's	Design		3		AFC		F
1.11	HAZOP analysis, Hazard and operability study report	Design		N/A	AFD	AFC	U	F
1.12	Functional Safety risk analysis and classification	Design		2	AFD	AFC	U	F
1.13	CE Documentation overall	CE		N/A		P	RFC	F
1.14	EAM Data for measurement points	O&M		3	AFD	U	RFC	F
1.15	Commission	O&M		3			RFC	F

Special requirements or remarks for documentation kinds (ID no.) are listed in Appendix 3.

AFD: Approved for design, AFC: Approved for construction, RFC: Ready for commissioning, U: Updated, F: Final

ID	List of Typical Documentation Deliverables For Civil Engineering	Type	DCC	For Process Critically Index ≤	Basic Design (AFD)	Detail Design (AFC)	For Comm. (RFC)	Final doc. (As Built)
2.0	Civil Documentation							
2.1	3D Plant Design / GA	Layout		N/A	AFD	AFC		F
2.2	Underground installations	Layout		N/A		AFC		F
2.3	Drainage and sewer, principle	Design		N/A	AFD	AFC		F
2.4	Concrete structures	Design		N/A		AFC		F
2.5	Steel structures	Design		N/A		AFC		F
2.6	Roads and pavements	Design		N/A		AFC		F
2.7	Buildings	Design		N/A	AFD	AFC		F
2.8	HVAC installations	Design		N/A	AFD	AFC		F
2.9	Acoustic design, calculations and tests	Design		N/A	AFD	AFC		F
2.10	Lifts for personnel and goods	Design		N/A		AFC		F
2.11	Closing/blinding of holes and perforations.	Design		N/A		AFC		F
2.12	Fire fighting facilities	Design		N/A	AFD	AFC	RFC	F
2.13	Operation & Maintenance (O&M)	O&M		N/A			RFC	F
2.14	EAM Data for Maintenance Plans	O&M		N/A			RFC	F
2.15	Commissioning	O&M		N/A			RFC	F

AFD: Approved for design, AFC: Approved for construction, RFC: Ready for commissioning, U: Updated, F: Final

ID	List of Typical Documentation Deliverables For Mechanical Engineering	Type	DCC	For Process Critically Index ≤	Basic Design (AFD)	Detail Design (AFC)	For Comm. (RFC)	Final doc. (As Built)
3.0	Mechanical Documentation							
3.1	Layout main process equipment	Layout		N/A	AFD			
3.2	3D Plant Design	Layout		N/A		AFC		F
3.3	Piping specs	Design		N/A	AFD			F
3.4	Valve specs	Design		N/A	AFD			F
3.5	Painting specs	Design		N/A	AFD			F
3.6	Insulation specs	Design		N/A	AFD			F
3.7	Detailed construction drawings for mechanicals	Design		3		AFC		F
3.8	Mechanical typicals	Design		3		AFC		F
3.9	Piping isometrics for construction	Design		N/A		AFC		F
3.10	Piping stress analysis	Design		N/A		AFC		F
3.11	Piping details, supports etc.	Design		N/A		AFC		F
3.12	Piping data on P&ID's	Design		3		AFC	RFC	F
3.13	Piping line list	Design		3		AFC		F
3.14	Mechanical Interface specifications	Design		N/A		AFC		F
3.15	Fire fighting installations	Design		N/A	AFD	AFC	RFC	F
3.16	Steel galleries, stairways and service platforms	Design		N/A		AFC		F
3.17	Cranes etc. for service	Design		N/A		AFC		F
3.18	Mechanical data and drawings for civil engineering	Design		N/A		AFC		F
3.19	Welding instructions	Design		N/A		AFC		F
3.20	ATEX Documentation	CE		N/A	AFD	AFC	RFC	F
3.21	PED Documentation	CE		N/A	AFD	AFC	RFC	F
3.22	CE Documentation mechanical components	CE		N/A			RFC	F
3.23	QA Documentation	QA		N/A			RFC	F
3.24	Operation & Maintenance (O&M)	O&M		3			RFC	F
3.25	Lubrication Lists	O&M		4			RFC	F
3.26	List of recommended spare parts	O&M		3		AFC	RFC	F
3.27	EAM data for Mechanical components	O&M		3	AFD	AFC	RFC	F
3.28	EAM Product DS for spare parts in Stock	O&M		N/A			RFC	F
3.29	EAM Product DS for all components	O&M		2			RFC	F
3.30	EAM Data for Maintenance Plans	O&M		3			RFC	F
3.31	Data for RCM analyses	O&M		2			RFC	F
3.32	Commissioning	O&M		N/A			RFC	F

AFD: Approved for design, AFC: Approved for construction, RFC: Ready for commissioning, U: Updated, F: Final

ID	List of Typical Technical Documentation For Electrical Engineering	Type	DCC	For Process Critically Index ≤	Basic Design (AFD)	Detail Design (AFC)	For Comm. (RFC)	Final doc. (As Built)
4.0	Electrical Data							
4.1	3D Plant Design / GA	Layout		N/A		AFC		F
4.2	Single line diagrams	Design			AFD	AFC	RFC	F
4.3	Functional descriptions	Design			AFD	AFC	RFC	F
4.4	Interface drawings and descriptions	Design			AFD	AFC		F
4.5	Documentation electrical components	Design				AFC		F
4.6	Documentation electrical systems	Design				AFC		F
4.7	Cables lists	Design				AFC		F
4.8	Grounding and potential equalization	Design				AFC	RFC	F
4.9	Technical calculations	Design				AFC	RFC	F
4.10	"For demolition" Marked up on diagrams	Design				AFC		F
4.11	ATEX documentation	CE				AFC	RFC	F
4.12	CE Documentation electrical components	CE					RFC	F
4.13	QA Documentation	QA					RFC	F
4.14	Installation and commissioning manual	O&M				AFC	RFC	
4.15	FAT and SAT documentation	O&M						F
4.16	Set files and associated software	O&M					RFC	F
4.17	Operation & Maintenance (O&M) Documentation	O&M		3			RFC	F
4.18	List of recommended Spare Parts	O&M		2		AFC	RFC	F
4.19	Data sheets (DS) for Cable trays, type, size etc.	O&M		4		AFC		F
4.20	EAM Product DS for spare parts in stock	O&M		N/A			RFC	F
4.21	EAM Product DS for all components	O&M		2			RFC	F
4.22	EAM Data for Electrical components and cables	O&M		4	AFD	AFC	RFC	F
4.23	EAM Data for Maintenance Plans	O&M		4			RFC	F
4.24	Data for RCM analyses	O&M		2			RFC	F
4.25	Commissioning	O&M					RFC	F

AFD: Approved for design, AFC: Approved for construction, RFC: Ready for commissioning, U: Updated, F: Final

ID	Technical Documentation For Automation	Type	DCC	For Process Critically Index ≤	Basic Design (AFD)	Detail Design (AFC)	For Comm. (RFC)	Final doc. (As Built)
5.0	Automation Documentation							
5.1	Instrument data on P&ID's	Design		N/A		AFC	RFC	F
5.2	DCS Function groups for automatic controls	Design		3	AFD	AFC	RFC	
5.3	Functional / logic diagrams	Design		3		AFC	RFC	F
5.4	Block diagrams	Design		3		AFC	RFC	F
5.5	3D Plant Design / GA	Layout		N/A		AFC		F
5.6	Component data list for instruments	Design		N/A	AFD	AFC		
5.7	List of Profibus connected equipment	Design		N/A	AFD	AFC		
5.8	Automation Typical	Design		N/A	AFD	AFC	RFC	F
5.9	Measurement arrangements (Hook-up)	Design		N/A	AFD	AFC	RFC	F
5.10	Automation Interface Specifications	Design		N/A	AFD	AFC		F
5.11	Cable lists	Design		N/A		AFC		F
5.12	Wiring diagram/Loop diagram	Design		N/A		AFC		F
5.13	Operation & Maintenance (O&M)	O&M		3			RFC	F
5.14	List of recommended spare parts	O&M		2		AFC		F
5.15	EAM Data for Instruments	O&M						
5.16	EAM Product DS for spare parts in stock	O&M		N/A			RFC	F
5.17	EAM Product DS for all components	O&M		2			RFC	F
5.18	EAM Data for Maintenance Plans	O&M		3			RFC	F
5.19	Data for RCM analyses	O&M		2			RFC	F
5.20	Commissioning	O&M					RFC	F

AFD: Approved for design, AFC: Approved for construction, RFC: Ready for commissioning, U: Updated, F: Final

ID	Technical Documentation For HSE	Type	DCC	For Process Critically Index ≤	Basic Design (AFD)	Detail Design (AFC)	For Comm. (RFC)	Final doc. (As Built)
6.0	HSE Documentation							
6.1	Energy optimizing	HSE		N/A	AFD	AFC		F
6.2	HAZID/Risk Register	HSE		N/A			RFC	
6.3	Noise mapping internal/external	HSE		N/A	AFD	AFC	RFC	F
6.4	Material Safety Data Sheet (MSDS)	HSE		N/A		AFC	RFC	F

Appendix 2, EAM Data

For Employer's EAM System the Contractor shall supply data input for:

- 1. Object data:** (in Danish)
Basic data (for all KKS tags)

Class data:
 - Mechanical Components (MSK)
 - Measuring Points (MAA)
 - Transmitters (GIV)
 - Electrical Components (ELF)
 - Cables (KAB)
 - Junction boxes (UNF)
 - Electronic component (ELE)
 - Piping (ROL)
 - Pipe Supports (ROB)
- 2. Data for maintenance plans** (Danish or English)
- 3. Data for spare parts and bill of materials** (in Danish)
- 4. References to associated documents and data**

1. Object data

EAM Data: Basic data

EAM Data	Description	Example	Discipline
Reference designation	KKS tag no.	AMV01 ECA20AF001-M01	
Description	Short description in Danish of the object with use of Employers standard abbreviations	MOTOR TRANSPORTØR VEST SILOLOFT	
Class	Object class for EAM system	ELF	
Building			
Location	Geographic location in the plant (module/level)	F11/30	
Safety	ATEX		
Documents	Document references		

EAM Data: Mechanical (Class: MSK)

EAM Data	Description	Example	Discipline
Function group	Group of objects with a functional connection.	LCY01	Automation
Process critically index	According to section 6.2 in this GTR	1	Mechanical
Design temperature	Same data as on P&ID	115	Mechanical
Design pressure	Same data as on P&ID	25	Mechanical
Oper. temperature	Same data as on P&ID	100	Mechanical
Oper. temperature	Same data as on P&ID	19	Mechanical
Unit temperature	Same data as on P&ID	°C	Mechanical
Unit Pressure	Same data as on P&ID	Bara	Mechanical
Medium	Process medium e.g. water, Oil, Steam, instr. air, etc.	Water	Mechanical
Dimension	Nominal diameter [mm]	DN50	Mechanical
Conn. Pipe diameter extn.	External diameter for connection	60,3	Mechanical
Mech. typical	Mechanical typical/standard	E401A	Mechanical
Remark	Text field		

EAM Data: Measuring Points (Class: MAA)

EAM Data	Description	Example	Discipline
Function group	Group of objects with a functional connection.	LCY01	Automation
Process critically index	According to section 6.2 in this GTR	1	Mechanical
Medium	Process medium e.g. water, Oil, Steam, instr. air, etc.	Water	Mechanical
Measure range	Indication of FROM and TO values and UNIT	0-600 °C	Mechanical
Codes for signal use	Alphabetic code for signals used. Same data as on P&ID	TIC	Mechanical
Design pressure	Same data as on P&ID	25	Mechanical
Oper. Pressure	Same data as on P&ID	80	Mechanical
Unit pressure	Same data as on P&ID	Bar	Mechanical
Design temperature	Same data as on P&ID	115	Mechanical
Oper. temperature	Same data as on P&ID	100	Mechanical
Unit temperature	Same data as on P&ID	°C	Mechanical
Remarks	Text field		

EAM Data: Transmitters (Class: GIV)

EAM Data	Description	Example	Discipline
Function group	Group of objects with a functional connection.	LCY01	Automation
Process critically index	According to section 6.2 in this GTR	1	Automation
Measuring range	Process parameter FROM and TO values and UNIT	0-600 °C	Automation
Signal output	Signal output FROM and TO and UNIT	4-20 mA	Automation
Transducer typical	Transducer typical/standard	C501	Automation
Remarks	Text field		

EAM Data: Electrical (Class: ELF)

EAM Data	Description	Example	Discipline
Function group	Group of objects with a functional connection.	LCY01	Automation
Process critically index	According to section 6.2 in this GTR	1	
Electrical typical	Electrical typical/standard	D 271	Electrical
Supply type	Power Supply type (N=normal, S=UPS)	N	Electrical
Consumer type	Code for consumer type	HE3 = 3-phase heating element	Electrical
Effect [kW]		110	Electrical
Voltage (V)		380 V	Electrical
Switch board	Motor Control Center MCC	85CA15H001	Electrical
Nominal current [A]		200 A	Electrical
Fuse size		60A	Electrical
Relay range [A]	Relay range FROM and TO	0,8-1,2/0,95	Electrical
Rotation	Direction of rotation for motors (H=CW, V=CCW)		Electrical
Start-up time [s]	For pumps, fans etc. Seconds in which the relevant equipment reaches normal rotational speed.	18	Electrical
Start current (A)	Current at start up	1340 A	Electrical
Remarks	Text		

EAM Data: Cables (Class: KAB)

EAM Data	Description	Example	Discipline
Function group	Group of objects with a functional connection.	LCY01	Electrical
Dimension	Cable dimension	5 X25	Electrical
Cable type	Short letter code for cable type		Electrical
From object	From KKS no.		Electrical
To object	To KKS no.		Electrical
From location	Geographic location in the plant (module/level)	F11/30	Electrical
To location	Geographic location in the plant (module/level)	F11/30	Electrical
Remarks	Text field		

EAM Data: Junction boxes (Class: UNF)

EAM Data	Description	Example	Discipline
Remarks	Text field		

EAM Data: Electronic Component (Class: ELE)

EAM Data	Description	Example	Discipline
Remarks	Text field		

EAM Data: Piping (type: ROL)

Only piping according to PED Category 2 and 3.

EAM Data	Description	Example	Discipline
Function group	Group of objects with a functional connection.	LCY01	Automation
Process critically index	According to section 6.2 in this GTR	1	
Dimension DN	Same data as on P&ID	DN 50	Mechanical
Design pressure	Same data as on P&ID	25	Mechanical
Unit pressure	Same data as on P&ID	Bar	Mechanical
Design temperature	Same data as on P&ID	115	Mechanical
Unit temperature	Same data as on P&ID	°C	Mechanical
PED Category	For requirements to construction verification etc.	Category II, contr. class C	Mechanical
WEA Order no. 100	According to Danish Working Environment Authority Executive order no. 100: Y/N (Yes/No)	Y	Mechanical
Remarks	Text field		

EAM Data: Piping Supports (Class: ROB)

Only Supports and hangers of spring or constant type.

EAM Data	Description	Example	Discipline
Function group	Group of objects with a functional connection.	LAY01	Automation
Manufacture	Spring/Constant hanger Manufacture	LISEGA	Mechanical
Type	Type of spring or constant hanger	351127	Mechanical
Travel	Working travel in mm	15 mm	Mechanical
Oper. load	Calculated load when plant in operation	5 Kn	Mechanical
Install. load	Calculated load when plant not in operation	3 Kn	Mechanical
Point travel	Calculated support point travel and direction	20 MM up	Mechanical
Position hot	Calculated position within travel range of pipe support in hot cond.	15 mm	Mechanical
Position cold	Calculated position within travel range of pipe support in cold cond.	25 mm	Mechanical
X-movement	Calculated movement in direction X	20 mm	Mechanical
Y-movement	Calculated movement in direction Y	15 mm	Mechanical
Z-movement	Calculated movement in direction Z	25 mm	Mechanical
Remarks	Fri tekst		

2. EAM Data for Maintenance Plans

The Contractor shall deliver input to EAM Maintenance Plans for all required preventive maintenance for the expected technical lifetime of the delivered equipment, including checks and adjustments.

For equipment with PCI 1 and PCI 2, the Contractor shall prepare a proposal for the RCM analysis process, which is then approved by the Employer. This shall be done before developing a Maintenance Plan (see Employers GTR 18). For components in systems with PCI 1 or 2 an RCM analysis will always be the basis for the preparation of one or more Maintenance Plans

The Employer will supply an ID no. for each EAM Maintenance Plan on request.

The Contractor shall deliver a reference/mapping between actual KKS no. and ID no. for the associated Maintenance Plan.

(Part of EAM Data for objects/KKS)

A Maintenance Plan can include different “activities” which will be “called” and carried out separately when the first of following “counter targets” for the activity are met:

- Calendar time interval
- Operation time interval
- Measuring point #1 = target
- Measuring point #2 = target
- Etc.

After the maintenance activity has been carried out, all counter targets will be reset.

Each activity includes a “checklist” with points to do or check during the activity.

A Maintenance Plan shall include informations as follows:

Maintenance Plan	Activity and checklist	Measuring point	Remarks
ID no. [number]			To be supplied by Employer
Name [text]			To be coordinated with Employer
	Name activity #1		To be coordinated with Employer
	Statutory [Y/N]		
	Start date [dd.mm.yy]		
	Interval operation time [h]		
	Interval calendar time [h]		
	Checklist	Measure point #1	
	1. To do	Max or Min	
	2. To do	Unit	
	3. To do	Target	
	4. To do	Measure point #2	
	Etc.	Etc.	
	Estimated manhour [h]		
	Spare Part #1 [SP no.]		Reference to Spare Part number
	Pieces of SP #1		
	Spare Part #2 [SP no.]		Reference to Spare Part number
	Pieces of SP #2		
	Etc.		
	Name activity #2		
	Etc.	1. do or check [text]	
		2. do or check [text]	

3. EAM Data for spare parts and bill of materials

EAM data for spare parts:

- Spare part number
- Description (in Danish)
- Manufacture
- Type
- Manufacture product no. (for re-ordering)

EAM data for Bill of materials

- Bill of materials number
- Description/title (in Danish)
- All spare part numbers included in the Bill of materials

4. References to associated documents and data

The Contractor shall supply references/links from each EAM object/KKS tag to all relevant documents and data for the object, such as:

- PFD and P&ID's
- Documents e.g. O&M Manual
- Drawings
- Bill of materials
- Maintenance Plan
- Etc.

Appendix 3, Specific Requirements for Data and Documents

This appendix includes specific requirements for the data and document kinds listed in Appendix 1, List of Typical Documentation Deliverables, which is not described elsewhere in this General Technical Requirement.

ID 1.1	Process Flow Diagrams (PFD)
Standards, references	Diagrams according to ISO 14084 Part 1 and Part 2. Letter codes according to ISO 15519 Part 2.
Paper format	A1-A3
Special Requirements	Letter height in A3 printed format shall be $\geq 1,8\text{mm}$.

ID 1.2	Process Criticality Index, Classification list
Standards, references	Employers GTR-3
Paper format	A4
Special Requirements	List showing the specific Process Criticality Index for each 3 letters KKS Function designation (including function name) in the actual Scope of Supply.

ID 1.3	Process Data Sheet for main equipment
Standards, references	
Paper format	A4
Special Requirements	<p>Process Data Sheet containing relevant design and operation process data for main equipment, e.g:</p> <ul style="list-style-type: none"> - Design data - Operation data (in relevant load points) - Ambient design data <p>Examples of process data:</p> <ul style="list-style-type: none"> - Media - Flow - Pressure (bara) - Temperature - Effect - Capacity/volumen - Etc.

ID 1.4	Process Interface list
Standards, references	N/A
Paper format	A4
Special Requirements	<p>List with relevant process data for all supply limits/Interfaces</p> <p>Each interface point shall be numbered and shown on the corresponding PFD's and P&ID's until the "as built" version.</p>

ID 1.6	Process and Instrumentation Diagram (PIDs)
Standards, references	Diagrams according to ISO 14084 Part 1 and Part 2. Letter codes according to ISO 15519 Part 2.
Paper format	A3
Special Requirements	<p>Process diagrams – Block diagrams (BOD), Process flow diagrams (PFD), Process and instrumentation diagrams (PID), Process control diagrams (PCD) and Typical diagrams (TYD), shall be prepared on basis of ISO 14084 Part 1 and Part 2.</p> <p>Letter codes for process variables and control functions shall follow ISO 15519 Part 2.</p> <p>Final controlling objects like pumps, fans and control valves shall not be allocated PCI symbols as illustrated in ISO 15519 Part 2.</p> <p>Process and instrumentation diagrams shall be drawn for printing in A3. Letter height in A3 printed format shall be $\geq 1,8\text{mm}$.</p>

ID 1.7	System descriptions
Standards, references	
Paper format	A4
Special Requirements	<p>Part of basic design.</p> <p>The document shall describe all relevant information of the process system needed for detail design of all relevant engineering disciplines, such as:</p> <ul style="list-style-type: none"> - Purpose of the system - Process prerequisites - Process interfaces - Design and Operation conditions - Capacities, loads, effects etc. - Normal operation - Start and stop - Abnormal conditions - Safety functions - All process limits for automation and safety functions - Reference to P&ID's - Reference to Cause & Effect scheme - Etc.

ID 1.8	Cause/effect Diagrams
Standards, references	
Paper format	A2 (printable in A4)
Special Requirements	<p>Part of Basic Design.</p> <p>Together with P&ID's and Function descriptions the basis for programming of automation.</p>

ID 1.9	Process Data Sheets for process equipment
Standards, references	According to ID 1.3 in this section.
Paper format	
Special Requirements	

ID 1.10	For Demolition. Marked up on P&ID's
Standards, references	N/A
Paper format	N/A
Special Requirements	If existing process equipment shall be demolished as a part of a project, the exact equipment to be removed shall be illustrated on existing P&ID's with a revision cloud accompanied with a highlighted "FOR DEMOLITION" stamp.

ID 1.12	Functional Safety risk analysis and classification
Standards, references	According to VGB-S-008-S-00-2011-03-EN – First Edition 2012.
Paper format	A4
Special Requirements	Functional safety should be described and documented according to VGB-S-008-S-00-2011-03-EN – First Edition 2012. In this VGB Standard Fig. 4, page 15 "Risk graph from EN 50156-1 figure 9" shows how to document a specific SIL-level. This figure is to be used as a template.

ID 3.7	Detailed construction drawings for mechanicals
Standards, references	
Paper format	
Special Requirements	For maintenance and overhauls in the future the Contractor shall deliver detailed drawings for all mechanical equipment and components. The drawings shall as a minimum include information for: <ul style="list-style-type: none"> • All mechanical parts, including internal parts • All dimensions and tolerances for all mechanical parts • Material and material number for all parts • Welding details and details of joining parts • Design codes • Weights • Details for mounting and support • Details for surface treatment

ID 4.2	Single Line Diagrams
Standards, references	
Paper format	A1-A4/pdf/dwg
Special Requirements	Single Line Diagrams containing relevant design data for main components.

ID 4.5	Documentation electrical components
Standards, references	
Paper format	A3-A4/pdf/dwg
Special Requirements	Documentation for electrical components containing: Wiring diagrams, terminal lists, dimensional drawings, data sheets, ect.

ID 4.6	Documentation electrical systems
Standards, references	
Paper format	A3-A4/pdf/dwg
Special Requirements	Documentation for electrical systems containing: Single line diagrams, interface diagrams, cable lists, ect.

ID 4.7	Cables list
Standards, references	
Paper format	A4/MS Excel
Special Requirements	Cable lists showing: Cable number, cable type, form position, to position, connection terminals, description, etc.

ID 4.9	Technical calculations
Standards, references	
Paper format	A4/pdf
Special Requirements	Technical calculations such as: Voltage drop, short circuit, design studies, selectivity, back up, etc.

ID 4.11	ATEX documentation
Standards, references	Harmonised standards according to the ATEX directive
Paper format	A4/pdf
Special Requirements	ATEX documentation containing: Calculations of intrinsically safe circuits, certificates, zone calcification, ect.

ID 4.12	CE Documentation electrical components
Standards, references	Harmonised standards according to the machinery directive
Paper format	A4/pdf
Special Requirements	CE documentation containing: Technical dossier incl. risk assessment, declaration of conformity, declaration of incorporation of partly completed machinery, etc.

ID 4.13	QA Documentation
Standards, references	
Paper format	
Special Requirements	E.g. Type test certificates for main components and parts.

ID 4.16	FAT and SAT documentation
Standards, references	
Paper format	
Special Requirements	Test schedule shall be presented and approved before the tests are carried

ID 4.17	Set files and associated software
Standards, references	
Paper format	
Special Requirements	Set files and associated software for all programmable devices: Frequency converters, protection systems, voltage regulators, excitation systems, etc.

ID 4.25	Data for RCM analyses
Standards, references	According to Employers GTR-18
Paper format	
Special Requirements	

ID 5.2	DCS Function groups for automatic controls
Standards, references	To split the DCS into function groups a list is needed
Paper format	A4 / MS Excel
Special Requirements	

ID 5.3	Functional / logic diagrams
Standards, references	Cause & Effect document can be used here. If Cause & Effect not is used, the Employer shall approve the documentation kind.
Paper format	A3 / MS Excel/Word
Special Requirements	

ID 5.4	Block diagrams / Group control, Sequences etc.
Standards, references	List with description of functions. Sequence see example xx
Paper format	A3 / MS Excel/Word
Special Requirements	

ID 5.5	3D Plant Design / GA
Standards, references	Location of e.g. Junction boxes
Paper format	
Special Requirements	

ID 5.6	Component data list for transmitters, switches, valves etc.
Standards, references	Data sheets
Paper format	A4 / MS Excel and pdf
Special Requirements	

ID 5.7	List of Profibus connected equipment
Standards, references	Divided into groups according to ID5.2, marked with bus type (DP, PA)
Paper format	A4 / MS Excel
Special Requirements	

ID 5.8	Automation Typicals
Standards, references	To engineer the DCS systematic we will encourage using typicals, to ease the work with software and hardware. The Employer can assist if it's wanted.
Paper format	A3
Special Requirements	

ID 5.9	Measurement arrangement (Hook-up)
Standards, references	According to VGB B103 Appendix A, Fact sheet TC060.
Paper format	A3
Special Requirements	

ID 5.10	Automation Interface Specifications
Standards, references	Interface scheme for electrical equipment in tender.
Paper format	A3 / pdf
Special Requirements	

ID 5.11	Cable lists
Standards, references	Minimum fields : cable number and type, from position, to position
Paper format	A4 / MS Excel
Special Requirements	

ID 5.12	Wiring diagram/Loop diagram
Standards, references	Is engineered on basis of ID 5.8 by Employer
Paper format	A3 / pdf/dwg
Special Requirements	

ID 5.20	Data for RCM analyses
Standards, references	Employers GTR-18
Paper format	
Special Requirements	

ID 5.21	Commissioning documentation
Standards, references	According to Employers GTR-19 – Annex 6, 7 and 9
Paper format	A3 / MS Excel/Word/pdf
Special Requirements	