Eskom	Specification	Asset Management

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Compiled by	Functional Responsibility	Authorised by
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1. INTRODUCTION

Kriel Power Station is situated approximately 10 kilometres from the town of Kriel in Mpumalanga. Access to the station is by road.

The Power Station comprises of 6 x 500 MW turbo-generator boiler units. Each turbo-generator includes an HP, IP and LP turbine, which exhausts to a surface condenser.

This document serves as the Kriel Technical Specification for Procurement 12 off - Main Turbine condenser 1600mm T1/T2 triple off set metal-seated valves.

2. SUPPORTING CLAUSES

2.1 SCOPE

This specification covers the minimum requirements for the design, manufacture, inspection, testing and supply of the Locally manufactured 12 off main turbine condenser T1/T2 triple offset metal seated 1600mm butterfly valves for Kriel Power Station.

2.1.1 Purpose

The purpose of this document is to provide requirements for scope of work for the design and manufacturing of the 12 off main turbine condenser T1/T2 triple offset metal seated 1600mm butterfly valves inclusive of installation and commissioning.

2.1.2 Applicability

This document shall apply to Kriel Power Station.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems.

[2] EN 1092-1/2 Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 1; Steel Flanges

[3] EN 10204 Metallic Products - Type Of Inspection Documents

[4] OHSACT Occupational Health and Safety Act of 1993

Employer's Specifications

[5] 240-106628253 Standard for Welding Requirements on Eskom Plant

[6] 240-63154109 Standard for Procurement of Large Bore Metal Seated Butterfly Valves

[7] 240-101712128 Standard for Internal Corrosion Protection of Water Systems, Chemical Tanks

[8] 240-105658000 Supplier Contract Quality Management Specification (QM-58)

[9] 240-83539994 Standard for Non-Destructive Testing (NDT) on Eskom Plant

[10] 240-106365693 Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings

Drawing and Documentation Standards

[11] 240-76992014 Project / Plant Specific Technical Documents and Records Management Work Instruction

[12] 240-65459834 Project Documentation Deliverable Requirement Specification

[13] 240-54179170 Technical Documentation Classification and Designation Standard

[14] 240-66920003 Documentation Management Review and Handover Procedure for Gx Coal Projects

[15] 240-86973501 Engineering drawing Standard

2.2.2 Informative

None

2.3 DEFINITIONS

Definition	Description
Pipework	Pipes and fittings are used for the conveyance of steam, water, gases or other fluids.
Valve	A device for shutting-off or controlling the flow of a fluid through a pipe or duct.
Lagging	Insulation used to prevent heat losses, such as from a pipe or pressure vessel.
Cladding	Galvanised thin metal plate used to cover and protect the lagging.

2.3.1 Disclosure Classification

Controlled Disclosure: Controlled Disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
CW	Cooling Water
C&I	Control and Instrumentation
ECM	Engineering Change Management
FAT	Factory Acceptance Test
MTC	Main Turbine Condenser
NCR	Non-conformance Report
NDT	Non-destructive Testing
OD	Outside Diameter
PVC	Polyvinyl Chloride
QCP	Quality Control Plan
RT	Radiography Testing
UV	Ultraviolet

2.5 ROLES AND RESPONSIBILITIES

- AMME- Design, Design Review, Scope of work, Inspections

- Kriel Turbine Engineering – Initiator of project, Acceptance of design and modifications, site engineering function, Design, Design Review, Scope of work, ECM process, Inspections

2.6 PROCESS FOR MONITORING

N/A

2.7 RELATED/SUPPORTING DOCUMENTS

N/A

3. COMPLETE/TOTAL SCOPE OF WORK OVERVIEW

1. The scope of work consists of the valve, gearbox and actuator as a single unit
   - The valve shall be exact same face to face currently installed and same flange drilling as currently fitted
   - Gearbox and actuator orientation shall be exactly same as the current installed preferable Auma actuator and gearbox to be used.
2. The *Contractor* shall include review the CW chemistry analysis in Annexure A and ensure the valve material selected is suitable for this chemistry and operating temperature
3. The exact installation position (unit number) will be determined by the needs of the plant and will be communicated to the Contractor prior to installation.

4. WORKS INFORMATION FOR PROCUREMENT OF LARGE BORE METAL SEATED BUTTERFLY VALVES FOR USE AS COOLING WATER ISOLATION VALVES

4.1 CURRENT EQUIPMENT INFORMATION

4.1.1 Description of the System

Each unit is equipped with a total of four isolating butterfly valves. CW water enters both halves of the condenser cooling water boxes via large, motorised butterfly valves. The two inner valves are the supply lines. The two outer valves are the motorised outlet valves that return water to the cooling towers for cooling. Table 1 below highlight the installed condenser CW isolation valves

Table 1: Condenser T1 & T2 isolation valves

Condenser CW Isolating Valves	
Manufacturer	Boving
Model	DN1600 Butterfly
Nominal bore	1600mm
Face to face	390mm
Flange drilling details	BS 4504 T6/11 40 holes EQUI-SPACED OFF CRS on 1760 PCD 36 Holes Drill ø36 4 Holes and Tapped M30 X42 deep (Please note that the existing drawings indicate M33 bolts. If the Contractor prefer M33 bolts these to be free issued by the Contractor on valve delivery)
Pressure rating	600 kPa
Internal lining	Epoxy
Disc Seal	Rubber

5. ESKOM STANDARDS OMISSIONS AND ADDITIONS

Eskom document 240-63154109 Rev 3 Standard for Procurement of Large Bore Metal Seated Butterfly Valves for use as Cooling Water Isolation Valves will be adhered to. Where the specification offers different options, the contractor must clearly indicate which option is included in the offer. The following amendments to 240-63154109 apply:

- Sections 3.1.3, 7.2, 15.1,16, 17 Do not apply

It remains the responsibility of the successful contractor to perform a site visit after contract award to ensure compliance to these requirements and familiarise himself with the plant layout and to obtain all required measurements.

This scope includes for valve, gearbox and actuator as a single unit. The valves will be exact same face to face as currently installed and same flange drilling as currently fitted as denoted in Table 1. Gearbox and actuator orientation will be exactly same as the current installed valves, preferrable Auma actuator and gearbox to be used

Annexure A contains a typical water chemistry analysis from Kriel CW system.

It is the contractor's responsibility to review the CW chemistry analysis and ensure that the valve material selection is suitable for this chemistry and operating temperature range from 0ºC up to 60ºC.

System operating pressure is 240kPa. Seal tightness test to be done based on a maximum seal shut off of 240 * 1.1kPa thus 265kPa. However, design pressure for pressure bearing items (body and disc) will be 600kPa (please note some drawings indicates PN10. Flange drilling table to be as per site requirements).

Please note the documents required after contract award as specified in section 15.2 of 240-63154109. These documents are to be submitted for review and an opportunity for the Employer to comment on these before approval. Before any material is ordered and start of manufacturing the design will be approved by the Employer. A specific design review and clarification meeting shall be held, in the case where the valves are manufactured by a sub-contractor, both the contractor and sub-contractor shall be present in the meeting.

6. FACTORY ACCEPTANCE TESTING (FAT)

Each valve will be fitted with its own Actuator and gearbox unit before the seat leakage tests. The gearbox end stops will be adjusted during the leakage testing and be sealed with an anti-tampering device (contractor to advise). The actuator torque and limits will be set during this FAT test, and also sealed. The torque to open the valve at full pressure differential will be set during the FAT, and valve will be driven open electrically against the full differential pressure to proof torque output of the actuator to be sufficient.

On the closing cycle the actuator will be programmed to stop on torque and NOT limit on the closing stroke, open stroke is limit.

After the FAT the gearbox and actuator unit will remain in place and be sealed.

Note that the Employer will require access to the sub-contractors workshop in the case where the valves are manufactured by a sub-contractor.

7. ADDITIONAL INFORMATION TO SPECIFICATION 240-63154109

7.1 GEARBOX

In addition to the requirements of section 7.1 as detailed in document 240-63154109, the following will apply. The gearbox to valve spindle connection will be such that whilst the gearbox is fitted to the valve, no dis-engagement of gearbox to valve can occur. This leads to say that NO removable output sleeve will be fitted between valve shaft and gearbox output segment. The keyway will be machined directly into the one-piece gearbox output segment. Reason for disallowing the output sleeve is that failure / removal of the bolts securing the output sleeve to the gearbox segment will lead to the valve being able to free swing as the self-locking feature has thus been removed.

7.2 ACTUATOR

Auma actuators and gearbox are currently installed on site. Contractor to verify C&I and Electrical interfaces on site. Auma actuators and gearbox are preferred, Contractor to advise on the model.

The product offered by the Contractor need to have a direct interface with the existing plant but will be a more modernized design to what is currently fitted, provided it can be fully integrated.

7.3 UNI-DIRECTIONAL VALVES

The valve will be uni directional. The valve preferred valve sealing face will be marked on the rim of the flange. The flange facing the duct will be stamped “duct side” (high pressure when closed) and the other side flange will be stamped condenser side refer to Annexure B.

8. TENDER RETURNABLES

For the purpose of an equitable technical evaluation of the tenders the *Contractor* must provide all documentation as per the requirements below**. All tender returnables given below must be provided.**

A weighted score-card approach is used to evaluate the technical compliance of the tenders against the specifications or ability to perform the work. Tenderers need to have a minimum weighted score of 70% overall or more to technically qualify for further evaluation.

Failure to provide all the required technical tender returnables as detailed in this section, i.e. sections 8.1 and 8.2, will render the tender to be non-responsive, and thus tender will be rejected.

In event that the company trade name changed since 2015 a brief history of company name change history to be included to indicate that same facility manufactured since 2015 (or earlier)

8.1 MANDATORY RETURNABLES

The *Contractor* shall complete table 2 below to provide two (2) verifiable references for locally (South African) manufactured triple offset metal seated butterfly valves for water application with diameters of ≥ 600mm since 2015.[1] Note that the *Employer* may contact the references, in particular if the reference is not Eskom, thus it is the *Contractor's* responsibility to ensure that the contact telephone numbers is up to date. In addition, note that it is important that the table is to be completed, i.e. all empty cells to be populated.

Table 2: References of valves as per above requirements

No	Description	Reference 1	Reference 2
1	Description of valve[2]		
2	Nominal diameter of valve (mm)[2]		
3	Confirm that the reference valve was manufactured and assembled in South Africa (Yes/No)[2]		
4	Purchaser/Client company name		
5	Contact name		
6	Contact telephone number		
7	Year of Manufacture[2]		
8	In the case where the reference valves, as stated in line No 3 above, were manufactured in South Africa by a sub-contractor, state the name of the sub-contractor or Original Equipment Manufacturer who manufactured the reference valves[3]		

Notes:

1. Copies of past Purchase orders will not be accepted as design & manufacture experience. Since this is a gatekeeper, the number of references will not be taken into account, i.e. tenders with more than two references will not be ranked any higher than a tender with only two references.
2. Only triple offset metal seated butterfly valves for water application with diameters of ≥ 600mm manufactured since 2015 will be accepted as valid references.
3. In cases where the valve manufacturer is a sub-contractor to the *Contractor* who submit the tender to the *Employer*, the name of the valve manufacturer to be provided as part of the tender. If this information is not provided the reference will not be accepted. In the case where the valve manufacturer submit the tender directly to Eskom, the response in line No 8 above is N/A.

8.2 RETURNABLES FOR QUALITATIVE EVALUATION

Tenderers need to have a minimum weighted score of 70% overall or more to technically qualify for further evaluation. The Contractor

8.2.1 The Contractor shall complete column 3 in the table 3 below as part of the tender:

Table 3: Basic technical information of the valves offered in the tender

Item	Employer's requirements where applicable	Contractor to complete this column as part of the tender
Face to face dimension (mm)	390	
Flange drilling PCD (mm)	1760	
Number of flange bolt holes	40	
Actuator name & model	Auma preference	
Gearbox name & model	-	

8.2.2 List of deviations or exclusions to the specification as detailed in this document and in 240-63154109. If none a specific and clear statement to be included in the tender stating that the Contractor has no deviations or exclusions.

8.2.3 Quality control plan that indicates all activities during manufacture including all coating activities.

8.2.4 Preliminary coating procedure inclusive of material data sheet of product offered

9. TENDER evaluation criteria

For technical Evaluation, the principles below will apply.

Table 4: Qualitative evaluation criteria

Score	(%)	Definition
5	100	**COMPLIANT** • Meet technical requirement(s) AND; • No foreseen technical risk(s) in meeting technical requirements.
4	80	**COMPLIANT WITH ASSOCIATED QUALIFICATIONS** Meet technical requirement(s) with; • Acceptable technical risk(s) AND/OR; • Acceptable exceptions AND/OR; • Acceptable conditions.
2	40	**NON-COMPLIANT** • Does not meet technical requirement(s) AND/OR; • Unacceptable technical risk(s) AND/OR; • Unacceptable exceptions AND/OR; • Unacceptable conditions.
0	0	**TOTALLY DEFICIENT OR NON-RESPONSIVE**
Note 1: The scoring table does not allow for scoring of 1 and 3. **Note 2:** Foreseen acceptable and unacceptable risk(s), exceptions and conditions shall be unambiguously defined in the relevant Tender Technical Evaluation Strategy.		

Table 5: Mandatory requirements

Criteria	**Yes / No**
Verifiable references of experience in local manufacturing of triple offset metal seated butterfly valves ≥ 600mm since 2015. Reference list to have verifiable contact details.	

Failure to provide the details above will render the tender to be non-responsive, and thus tender will be rejected.

Table 6: Qualitative Criteria

Tenderers need to have a minimum weighted score of 70% overall or more to technically qualify for further evaluation

Item no	**Criteria**	**Weight**	**0**	**2**	**4**	**5**
1.	Exclusions and deviations to the specification	40%	Non responsive	Unacceptable Technical Risk (Refer Table 6)	Acceptable Technical Risk	Fully Compliant
2	Basic compliance as per Table 3:	40%	Non responsive	Unacceptable Technical Risk (Refer Table 8)	Acceptable Technical Risk	Fully compliant
3	Typical QCP (both for coating and manufacturing)	10%	No QCP	Very high level and not detailed QCP	Some minor Omissions	Detailed QCP for both mechanical and coating
4	Preliminary Coating procedure (Inclusive of material data sheet of product offered)	10 %	No procedure	More than two deviances to specification	Minor deviance but acceptable risk	Comply with requirements

10. Foreseen Acceptable / Unacceptable Qualifications

10.1 Risks

Table 7: Acceptable Technical Risks

Risk	Description
1.	Alternative materials than 240-63154109 Section 4 – provide statement with back information that alternative is suitable as per water chemistry.

Table 8: Unacceptable Technical Risks

Risk	Description
1	Face – face differ by more than 5mm unless one of the options in section 3.1.2 of 240-63154109 is selected by the Contractor and clearly mentioned in the tender.
2.	Disc to spindle connection does not comply with criteria as per scope (Section 3.5 of Doc 240-63154109).
3.	Non triple off set metal seal design or not designed for water application.
4.	No Mechanical Lockout offered (Section 8 of Doc 240-63154109).
5.	Removable output sleeve on gearbox is not allowed
6.	Non self-locking gearbox (Section 7.1 of 240-63154109)
7.	Valve not locally manufactured in South Africa
8.	Flange drilling different from the flanges on site
9.	Insufficient proof of experience in manufacturing of triple offset metal seated butterfly valves ≥ 600mm
10	Gearbox and actuator orientation per valve not similar as to what is currently installed on the plant
11	Two verifiable references as requested in section 8.1 either not provided or could not be verified by the *Employer.*

11. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
Francois du Preez	Corporate Consultant, Generation Engineering
Senamile Nzama	Engineer, Generation Engineering
Herman Van Niekerk	Senior Consultant, Generation Engineering
Stefan Erasmus	Chief Technologist, Generation Engineering
Gontse Mathibedi	Condenser and Cooling Tower System Engineer, Turbine Plant Engineering, Kriel Power Station
Thembelani Ndlumbini	Turbine Plant Engineering Manager, Kriel Power Station
Abia Makgai	Senior Technician, Turbine Maintenance, Kriel Power Station

12. REVISIONS

Date	Rev.	Compiler	Remarks
June 2021	0.1	S Nzama	First Draft Document for Comments Review Process
30 June 2021	0.2	S Nzama	Final Draft Document after Comments Review Process including lesson learned from Majuba Power Station
July 2021	1	S Nzama	Final Document for Authorisation and Publication
November 2022	2	S Nzama	Incorporating lesson learned from the tender evaluation

13. DEVELOPMENT TEAM

The following people were involved in the development of this document as per Section 11.

14. ANNEXURES

Annexure A: Water Chemistry analysis

Table 9: Water Chemistry analysis

Description	North side*	South side*
CCPP ($CaCO_3$ Precipitation Potential)	45.75	33.17
Calsium Hardness as $CaCO_3$ (mg/l)	199.61	306.00
Chemical oxygen demand (COD)	126.00	89.83
Chloride (mg/l)	189.33	151.90
Cycles of concentrations	24.90	21.26
Electrical conductivity @ 25°C µS/m	2470.67	2499.21
Fluorine (mg/l)	2.89	2.26
M Alkalinity	163.85	134.92
Mg Hardness as $CaCO_3$ (mg/l)	392.58	331.74
NH_4 (mg/l)	4.14	2.15
Nitrate (NO_3) as N (mg/l)	5.82	4.68
P Alkalinity	10.20	4.10
pH @ 25 °C	8.62	8.39
Potassium (mg/l)	81.63	67.04
SiO_2 (mg/l)	18.80	11.80
SO_4 (mg/l)	753.02	795.50
Sodium (mg/l)	288.39	258.82
Total Hardness as $CaCO_3$ (mg/l)	592.19	638.68
Total suspended solids	32.04	-
Turbidity (NTU)	20.67	22.92

*Average data (10/01/2020 - 10/03/2020)

ANNEXURE B: VALVE SEALING DIAGRAMS FOR MARKING OF PRESSURE SIDE

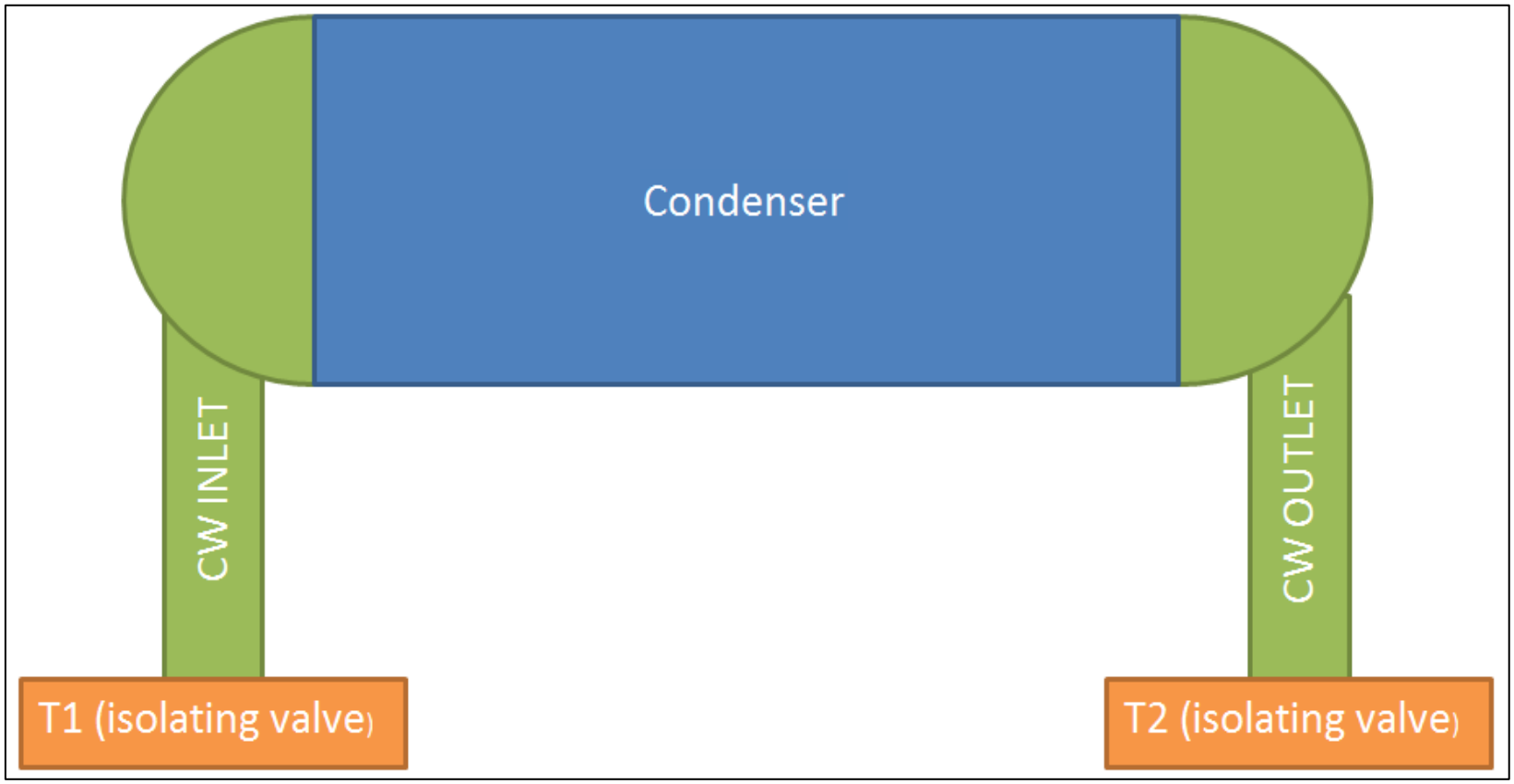

Figure 1 Condenser-duct-valve arrangement indicating the anticipated orientation of valves

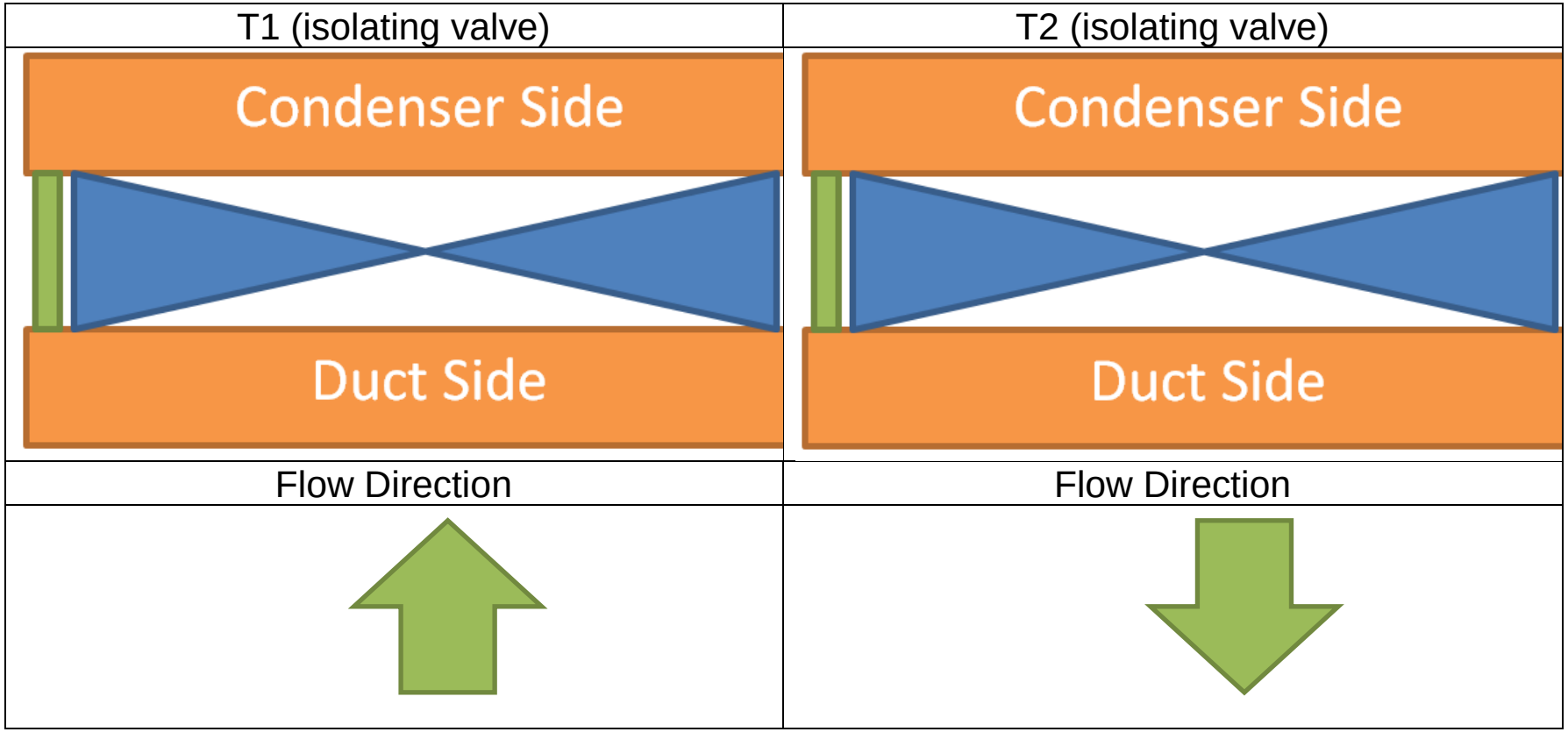

Figure 2 Arrangement indicating valve flange markings with the anticipated orientation at installation