



S1 93 81 01 Tata Steel Standard

Regulations governing commissioning,
maintenance and operation of oxygen installations

Author : A.C. Grooten

Issue : March 2013

Version : 3.0

Intended for the location IJmuiden

If this document is changed in the future, the amendments will not be sent to you.
The latest version can be retrieved via Intranet van Tata Steel (ProjectNet) of internet
<https://www.tatasteeleurope.com/ts/nl/gezondheid-en-veiligheid/toegang-en-veiligheid-ijmuiden/voorschriften> .

Information and changes:

Document design	SPME-PTC-MCE-HPM	tel. +31 (0)251-4 95766
Standardisation	ptc-adm@tatasteel.com	tel. +31 (0)251-4 94443

Contents:

1. INTRODUCTION	3
2. SCOPE.....	4
3. SAFETY	5
4. COMMISSIONING OF NEW OR MODIFIED SYSTEMS.....	6
4.1. GENERAL	6
4.2. SAFETY REGULATIONS	6
4.2.1. Checklist.....	6
4.2.2. Commissioning.....	6
5. MAINTENANCE OF OXYGEN SYSTEMS	7
5.1. GENERAL	7
5.2. SAFETY REGULATIONS	7
5.3. TAKING AN OXYGEN INSTALLATION OUT OF OPERATION	7
5.4. COMMISSIONING AN OXYGEN INSTALLATION	8
5.5. PERIODIC INSPECTION.....	8
5.6. CLEANLINESS OF COMPONENTS	8
5.6.1. Visual inspection with white light	8
5.6.2. Inspection using UV-light.....	8
5.6.3. Water break test	9
5.6.4. Detection limits	9
5.6.5. Acceptance criteria:	9
5.7. SEALANTS.....	9
5.8. LUBRICANTS.....	9
5.9. LEAKAGE.....	9
6. OPERATING OXYGEN INSTALLATIONS.....	10
6.1. GENERAL	10
6.2. SAFETY REGULATIONS	10
6.3. OPERATING VALVES	10
7. REFERENCES	11
8. DECLARATION	12
9. ANNEX A: TOOLBOX “WORKING WITH OXYGEN”	13

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 1 of 13

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 2 of 13

1. INTRODUCTION

For both the commissioning of new installations, as well as the maintenance and operation of oxygen installations, one must be aware of the specific properties and hazards of oxygen.

As a result of these special properties and hazards a number of necessary safety measures and regulations are set out in this Tata Steel Standard.

All standards referred to in this Tata Steel Standard are mandatory.

In cases where this Tata Steel Standard does not provide, the Oxygen Commission should be consulted. Also see Tata Steel regulation QHSE 1.06: "Installations for transport and consumption of oxygen".

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 3 of 13

2. SCOPE

The Safety measures and regulations referred to in this standard, in case of maintenance and operation of oxygen systems are applicable to:

- Oxygen pipelines;
- Oxygen storage tanks;
- Monitoring and control equipment with their corresponding impulse and/or control cables of oxygen installations;
- Electric drives of oxygen installations;
- Structural engineering in or near oxygen installations.

In all cases where any doubt exists whether this standard applies, the person responsible of the managing department must be contacted immediately.

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 4 of 13

3. SAFETY

With commissioning, maintaining and operating oxygen installations, one should be aware of the great risks that contact with oil, grease, or any other combustible material will bring. Further contaminants that find their way into the installation like oil, grease, welding beads and combustible materials may cause a fire or explosion at a later point in time.

Given the above, for work in oxygen installations the following safety directives must be strictly observed:

- a) Grease and oil may not be present on the work floor. The presence of combustible material, such as paper, wood, cotton wool, etc, should be limited to the utmost;
- b) Clothing, footwear, tools and hands must be free of grease and oil;
- c) Clothing, which has been in contact with oxygen, must be aired immediately. Keep this clothing away from fire (e.g.: do not light a cigarette);
- d) Personnel conducting maintenance on oxygen installations where oxygen outflow may occur must wear fire resistant garments, e.g. when changing appendages, insertion plates, etc. (e.g.: clothing, which partially consists of synthetic material, may pose a great danger of static electricity!);
- e) The system must be completely free of oil, grease and organic cleaning agents;
- f) Contaminants such as sand and rust must not enter the installation;
- g) The use of material that may leave fibres and steel brushes are prohibited in cleaning operations;
- h) Smoking and open flames are strictly prohibited in the vicinity of oxygen equipment;
- i) Working with welding, cutting, grinding and sparking tools etc, are prohibited in areas where elevated levels of oxygen concentration may occur;
- j) The use of mobile phones or torches is strictly prohibited in places where increased oxygen concentrations can occur;
- k) welding transformers or other electrical tools must never be earthed via components of oxygen equipment;
- l) before entering enclosed spaces, trenches, pits or welding tents a Sample must be taken to determine if the air contains between 19 and 23% oxygen;
- m) When using nitrogen for purging or pressing one must ensure there is sufficient breathable air. One must carry a personal oxygen monitor;
- n) When working with an open flame at least one fire blanket and fire extinguisher must be present;
- o) During maintenance there should be guarded against corrosion by water ingress, condensation or moisture from the air;
- p) The area must be clean and free of obstacles; escape routes are free and well lit;
- q) Work may only be performed by specially trained personnel. One can meet this requirement by attending a special developed toolbox "working with oxygen" (see Annex A) or similar training. This toolbox is to be carried out prior to the work.

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 5 of 13

4. COMMISSIONING OF NEW OR MODIFIED SYSTEMS

4.1. General

The commissioning of new or modified oxygen systems is performed by, or subject to the direct supervision of the department responsible for this installation.

4.2. Safety regulations

Before and during commissioning the commissioning engineer must convince himself that the issues as specified in Section 4.2.1. and 4.2.2 are adhered to.

For other safety regulations, see chapter 3.

4.2.1. Checklist

Before commissioning there should be compliance with the following conditions:

- The installation has been built according to approved diagrams and drawings;
- Shielding is present according to the regulations and drawings;
- All the required test protocols (strength test, density test), as well as approved reports of internal pipe cleaning are present;
- Required commandment and prohibition signs are placed and markings are applied;
- A commissioning plan (work instruction) is available.

4.2.2. Commissioning

During commissioning there should be compliance with the following conditions:

- Instruments, regulations and safeguards must be tested on operation prior to or as part of commissioning.
- Vessels and piping filled with oxygen must be purged with oxygen until 99.5% of the capacity of the system is filled with oxygen. This percentage should be monitored and recorded by means of sampling.
- After purging any venting/purging valves must be closed and blinded.
- For the benefit of commissioning, at all times beforehand a “commissioning plan” must be drafted. This “commissioning plan” must be discussed in advance with all stakeholders and to be fully implemented.

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 6 of 13

5. MAINTENANCE OF OXYGEN SYSTEMS

5.1. General

The work must always be carried out by at least two men.

Under maintenance we understand this to be, only the one on one replacement of components (e.g. appendages, instrumentation, hoses) from an oxygen system. Replacing pipe sections does not belong to this. Refer to Tata Steel Standard S1930001.

Work on oxygen installations may only take place after consultation with and consent of the manager of the facility. This includes entering protected and enclosed areas for the purpose of carrying out maintenance.

Entering enclosed and protected areas of active oxygen equipment for inspections should be limited to the extreme.

5.2. Safety regulations

For maintenance work on oxygen systems one must comply with safety regulations as set out in Chapter 3.

Depending on the circumstances, for example in the vicinity of pressurized oxygen systems, before commencing the work a high level work permit must be obtained, to be issued and released by the installation manager.

5.3. Taking an oxygen installation out of operation

When during maintenance activities there is a risk of outflow of oxygen, the relevant part of the installation must be taken out of operation.

The section to be worked on needs to be separated from the pressure-carrying section by one or more insertion or blind-plates, or by the removal of one or more of the connecting components. Subsequently the oxygen in this pipe section must be purged with compressed air (dry oil-free air), or nitrogen until the oxygen level has dropped to between 19 and 23%.

For the purpose of decommissioning an installation a "safeguard plan" must be drawn up beforehand. This "safe guard plan" should be pre-discussed in advance with all stakeholders and to be fully implemented.

For inspection and adjustment activity on measurement and control equipment, where there is no risk of outflow of oxygen, the installation does not need to be depressurized or taken out of service. Even so there should be the assurance of the operational department that no oxygen flow can take place through this equipment.

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 7 of 13

5.4. Commissioning an oxygen installation

The commissioning of an installation where maintenance has been carried out, is performed by, or done under direct supervision of the department responsible for this installation. For additional requirements, see Chapter 3.

5.5. Periodic Inspection

Oxygen Equipment must be periodically inspected according to paragraph. 4.7.2 and Appendix K of NEN 2078 and the requirements as stated in NEN-EN 15001-2. Within Tata Steel the department SPME-HTD-OPR-HGS-GAS is specialized in performing said inspections and can be engaged to do so.

In addition, the department SPME-PTC-CTY-KDT-DTD coordinates periodic inspections for oxygen systems which have a compulsory registration according to Tata Steel Standard S1300401.

5.6. Cleanliness of components

Components to be fitted into an oxygen installation must be delivered by the supplier, free from oil and grease and a declaration of cleanliness and a "CLEANED FOR OXYGEN SERVICE" label must be provided. Before a component is used the presence of this declaration of cleanliness must be verified. If contamination is discovered or any doubt about the cleanliness, of the component exists then this component must as yet be made free of oil and grease. Until the moment of installing the components they should be well protected from contamination (piping must be sealed of using plastic dust caps, valves must be well wrapped).

Prior to the installation of components, if possible, open parts of the existing installation should be inspected on cleanliness (i.e.: piping at the position of a valve to be replaced). These components are to be inspected by means of two methods. The first inspection is a visual inspection as for the second method can be opted for an inspection with UV light or by means of a so-called "water break test".

5.6.1. Visual inspection with white light

This is the most simple method to detect the presence of dirt or similar. By means of this method small dust particles, oil, grease and moisture can be detected. At the location of the components to be inspected a sufficient bright level of artificial light or natural daylight must be present.

5.6.2. Inspection using UV-light

A UV-light with a wavelength of about 0.37 μm can be used in a dark environment at a distance of about 10 to 20 cm from the surface to be inspected. Many common, but not all hydrocarbons or organic oils fluoresce under UV light. The intensity of the reflection of the different substances is very different. Because not all substances fluoresce in UV light, it is impossible to rely solely on the result of this inspection.

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 8 of 13

5.6.3. *Water break test*

Drinking water or distilled water is to be sprayed as horizontal as possible onto the surface to be inspected. If the quantities of oil or grease are very small, an uninterrupted layer of water will occur, which will remain intact for a few seconds. If larger quantities of oil or grease are present on the surface, the water will rapidly contract into tiny droplets.

5.6.4. *Detection limits*

<u>Test method</u>	<u>Detectable quantities</u>
Visual inspection using white light	500 - 1700 mg/m ²
UV-light	40 - 1500 mg/m ²
Water break test	30 - 60 mg/m ²

5.6.5. *Acceptance criteria:*

Maximum permissible quantity of foreign matter:

- Oil, grease, detergents, organic substances: <500 mg/m²
- No visible rust, welding spatter, dust particles, fibres or loose particles
- No visible presence of moisture (no drops)

5.7. **Sealants**

For sealing materials (including gaskets) See Tata Steel Standard S1930001.

5.8. **Lubricants**

The use of these agents should be kept to a minimum. Only lubricants that are included in the BAM list (M034-1) may be utilized.

5.9. **Leakage**

In case of detection of leakage in a pipeline in service, cause and extent of the leakage must be established forthwith. After this the pipeline must be repaired immediately. If this is not possible the pipeline must be removed from service right away.

It is prohibited to repair a leak in a section of pipeline by means of clamping strips or other temporary repair methods!

When a leak is detected in a pipeline, it is very likely that the sections of pipeline, before and behind this leak are in poor condition also. This means that in some cases a longer length of pipeline must be replaced.

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 9 of 13

6. OPERATING OXYGEN INSTALLATIONS

6.1. General

Under the operation of oxygen systems are understood only those activities in which personnel operate the system in the prescribed manner.

6.2. Safety regulations

When operating oxygen equipment one must adhere to the safety regulations mentioned in Chapter 3.

6.3. Operating valves

When operating valves, pressure pulses and high velocities must be avoided as much as possible. The pressurization of piping and vessels should therefore be executed in a very gradual manner.

In a number of cases these valves are fitted with a bypass. With these valves the differential pressure across said valves must be equalized using this bypass. At a maximum differential pressure of 1 bar the main valve may be opened.

All valves should be periodically tested on function (part of inspection).

Hand Wheels of valves should be operated manually, so without the use of any aids.

The use of oil or grease for freeing the movement of shut-off valves must be kept to a minimum, but it is permissible if the agents used are included in the BAM (M034-1) list.

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 10 of 13

7. REFERENCES

This Tata Steel Standard refers to:

Tata Steel Standards:

S1300401 Ordering, realisation and inspection of new construction, repair or modification of pressure equipment

S1930001 General rules and regulations for oxygen installations

BAM list; M 034-1, latest issue

NEN 2078: Requirements for industrial gas installations

NEN-EN 15001-2 (and): Gas infrastructure - Gas installation Piping with operating pressures greater than 0.5 bar for industrial and non-industrial installations - Part 2: Detailed functional requirements for commissioning, operation and maintenance

Tata Steel regulation QHSE 1.06: "Installations for transport and oxygen consumption"

For the latest versions of the Regulations Quality, Health, Safety and Environment:

<http://www.tatasteel.nl/veiligheid>

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 11 of 13

8. DECLARATION

Version 1.0:

This document replaces the old HO-standard 00.93.81.001.

Version 2.0:

Completely revised version

Version 2.1:

Logo changed and Hoogovens replaced by Corus

Version 3.0:

Completely revised version

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 12 of 13

9. ANNEX A: TOOLBOX “WORKING WITH OXYGEN”



Inhoudsopgave



- Instructie
- Eigenschappen van zuurstof
- Gevaren van zuurstof
- Het werken met zuurstof
- Het repareren van zuurstofapparatuur

TATA STEEL

20-11-2012 2

Tata Steel IJmuiden Projects & Technical Consultancy	S1 93 81 01 Regulations governing commissioning, maintenance and operation of oxygen installations version 3.0 / March 2013
Standard	page 13 of 13