Base Load Power Hub (BLPH)

NITROGEN GENERATION PACKAGE A-64000
INSTALLATION, OPERATING AND MAINTENANCE MANUAL
(INCLUDING SITE ERECTION INSTRUCTIONS AND PROCEDURES)

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

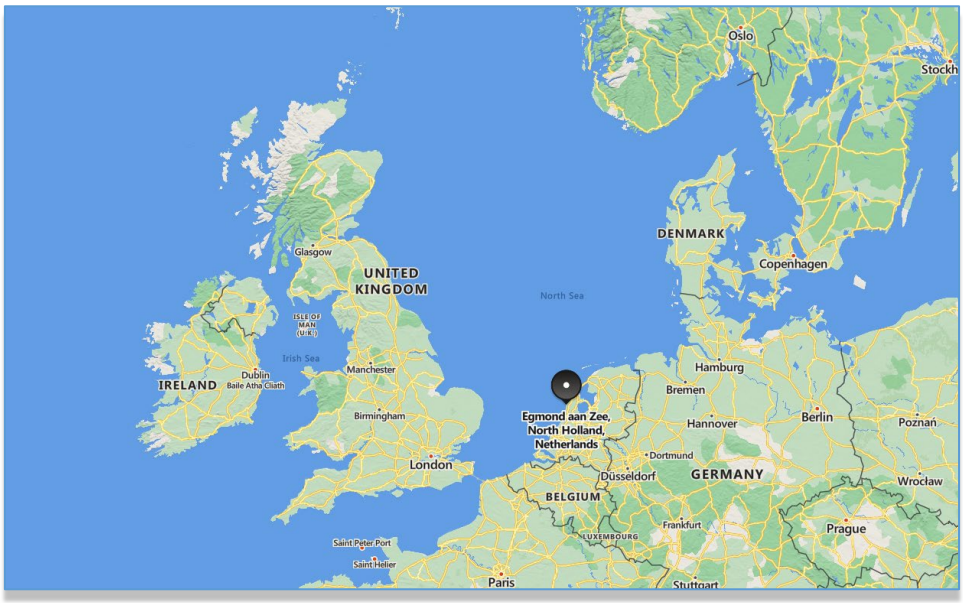


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

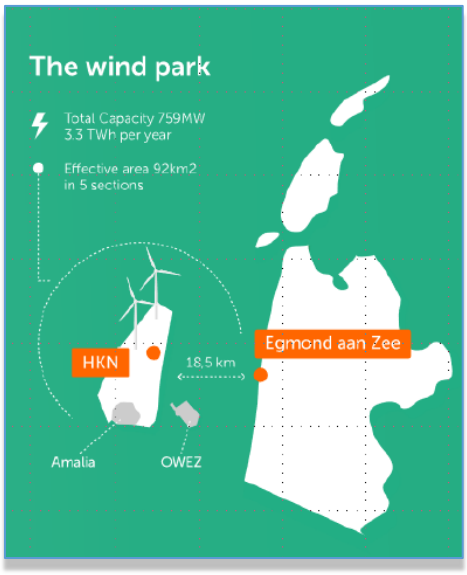


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

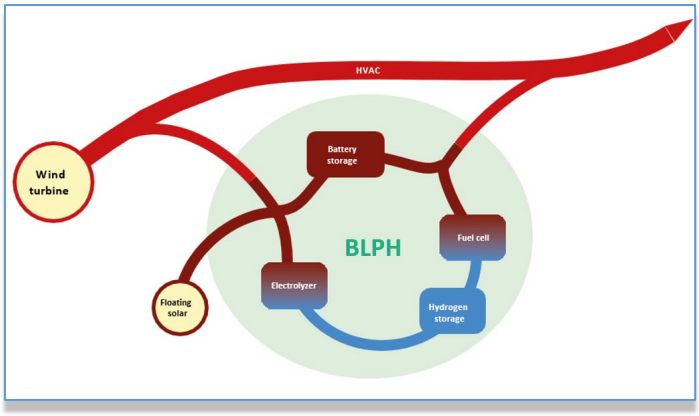


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

This document identifies activities to be carried out for the correct operation of the Nitrogen Generaiton Package.

2.1 REFERENCES

Doc. No.	Description
1724000437-PR-PID-00018	PACKAGE P&ID
1724000437-MAC-DA-00005	CERTIFIED PACKAGE GENERAL ARRANGEMENT AND DIMENSIONAL OUTLINE DRAWINGS (INCLUDING : NAMEPLATE, BASEFRAME, FOUNDATION LOADS, NOZZLES LOADS, NOZZLES LIST, BATTERY LIMITS, CoG)
1724000437-MAC-DG-00009	PACKAGE WIRING DIAGRAM INCLUDING LAYOUT OF PACKAGE CONTROL PANEL

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 - Definitions and Abbreviations

3 SAFETY PRESCRIPTIONS

- The operators must employ safe working practices and observe all related work safety requirements and regulations.
- If any of the following statements does not comply with the applicable legislation, the stricter of the two shall apply.
- Installation, operation, maintenance and repair work must only be performed by authorized, trained, specialized personnel.
- The owner is responsible for maintaining the unit in safe operating condition. Parts and accessories shall be replaced if unsuitable for safe operation.
- All responsibility for any damage or injury resulting from neglecting these precautions, or non observance of the normal caution and care required for transportation, installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.
- Before any maintenance, repair work, adjustment or any other non-routine checks, stop the unit, switch off the voltage and depressurize the Nitrogen Generation package, the filters and the interconnecting piping. In addition, the power isolating switch must be opened and locked.
- Never remove or tamper with the safety devices, guards or insulation fitted on the machine
- The equipment must only be lifted using suitable equipment in accordance with the applicable safety regulations. Loose or pivoting parts must be securely fastened before lifting. It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Lifting acceleration and deceleration must be kept within safe limits. Wear a safety helmet when working in the area of overhead or lifting equipment
- Any blanking flanges must be removed before connecting the pipes
- The electrical connections must correspond to the applicable codes. The package must be earthed and protected against short circuits. A lockable power isolating switch must be installed
- Make sure that no tools, loose parts or rags are left in or on the machine.
- Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine.
- Never operate the package below or in excess of its limit ratings.

4 PROCEDURE FOR ERECTION AND INSTALLATION OF THE EQUIPMENT

4.1 Remove the packing.

4.2 The Nitrogen Generation package is supplied fully installed: no loose components are foreseen.

4.3 Lift the skid baseplate, using an adequate lifting device. Skid baseplate shall be lift by means of lifting lugs welded on the skid baseframe, and placed in its final position, on a properly sized structure, taking care to avoid damages to any installed equipment.
N2 generation package is supplied with all the components already assembled.

WARNING
IT IS NECESSARY TO PROPERLY LEVEL THE BASEPLATES AND TO ASSURE THE CORRECT ALIGNMENT OF MATCHING FLANGES, TO AVOID UNEXPECTED LOADS ON INTERCONNECTING PIPING

4.4 Fix the skid baseplate to the structure by means of the anchor bolts, as shown in the reference drawings.

4.5 Lift the N2 receiver, using an adequate lifting device, by means of the lifting points welded on the vessel. Then place it in its final position, on a properly sized structure.

WARNING
IT IS NECESSARY TO PROPERLY LEVEL THE VESSEL AND TO ASSURE THE CORRECT ALIGNMENT OF MATCHING FLANGES, TO AVOID UNEXPECTED LOADS ON INTERCONNECTING PIPING

4.6 Fix the receiver to the structure by means of the anchor bolts, as shown in the reference drawings.

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4.7 All the components inside the package are cabled according to the Wiring Diagram, document no. 1724000437-MAC-DG-00009.
Power and signal cables (including earthing connection) should be connected by others to the Local Control Panel according to the previous mentioned wiring diagram, document no. 1724000437-MAC-DG-00009.

WARNINGS

TURN OFF MAIN POWER SUPPLY BEFORE ATTEMPTING TO WIRE THE UNIT

IT IS MANDATORY TO WIRE THE UNIT IN COMPLIANCE WITH THE APPLICABLE ELECTRICAL CODES AND LAWS IN FORCE IN THE COUNTRY OF INSTALLATION

ELECTRICAL CHECKS MAY INVOLVE LIVE CONNECTIONS AND SHOULD BE PERFORMED ONLY BY QUALIFIED PERSONNEL

MAKE SURE THAT CABLES ARE PROPERLY SIZED TO HANDLE THE INSTALLED VOLTAGES.

THE UNIT MUST BE EARTHED AND PROTECTED AGAINST SHORT CIRCUITS. A LOCKABLE POWER ISOLATING SWITCH MUST BE INSTALLED

4.8 Recommendation for storage are included in document 1724000437-QC-PRO-00030.

4.9 Instrument air package terminal points shall be connected as shown in P&ID, document no. 1724000437-PR-PID-00018

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5 PROCEDURE FOR PRE-COMMISSIONING

After the installation on site and the complete assembling of the unit, before starting the equipment, pre-commissioning activity can be achieved, as per following steps.

NOTE

PRE-COMMISSIONING ACTIVITIES CAN BE CARRIED OUT BY CUSTOMER PERSONNEL ON SITE, BUT THE PRESENCE OF COES TECHNICIANS IS ADVISABLE

1. Check that all drain and vent pipes are not obstructed. Clean them, if necessary.
2. Check that all tubing is properly connected and tighten compression fittings, if necessary.
3. Check that all interconnecting flanges are correctly tightened.
4. Check all installed component, with particular care to instruments, to verify that they have not been damaged during the installation.
5. Verify that PSA vessels are properly filled with the adsorbent material.
6. Check that air diffusers are correctly installed into PSA vessels nozzles.
7. Check that inlet and outlet air piping are correctly connected to the nitrogen generation package.
8. Check that vent and drain piping (if any) are correctly connected to the nitrogen generation package.
9. Check that all instruments, solenoid valves and limit switches are properly connected and wired to the local control panel.
10. Check that the position of the filters manual isolation valves is according to the pakcage P&ID, document no. 1724000437-PR-PID-00018
11. Package installation according to the package P&ID, document no. 1724000437-PR-PID-00018.
12. Check that instrument interception valves and manifolds are in proper position.
13. Check that instrument air supply valve is open and that instrument air can be correctly supplied to solenoid valves.
14. Check that the internal of local control panel is clean from sand or dust and that no dew is detected.
15. Check that all terminals inside local control panel are correctly wired according to wiring diagram, document no. 1724000437-MAC-DG-00009.
16. Check that earthing connections of instruments, components and package are properly wired.

6 PROCEDURE FOR COMMISSIONING

After the installation on site and the complete assembling of the unit, before starting the equipment, commissioning activity can be achieved, as per following steps.

NOTE

COMMISSIONING ACTIVITIES CAN BE CARRIED OUT BY CUSTOMER PERSONNEL ON SITE, BUT THE PRESENCE OF COES TECHNICIANS IS ADVISABLE

1. Check from DCS that the feedback from electric limit switches installed on pneumatic actuated valves is in compliance with valves failure position.
2. Check from DCS that all the transmitters installed of the nitrogen generation package are correctly wired and the measured values are coherent with the actual conditions.
3. Pressurize the nitrogen generation package up to 2 barg with dry air through inlet terminal point and verify that no leakages at flanged connections are detected. During pressurization for leak check, all actuated valves must stay in their fail position, while all manual valves must be open, except the valves downstream after-filters, which must be closed.
4. Slowly pressurize the nitrogen generation package to normal operating pressure with dry air through inlet terminal, without process nitrogen flow, and verify that no leakages at flanged connections are detected. During pressurization for leak check, all actuated valves must stay in their fail position, while all manual valves must be open, except the valves downstream after-filters, which must be closed.

WARNING

IT IS NOT ALLOWED TO PROCEED WITH MANUAL OPEN/CLOSE OF ACTUATED VALVES IF THE SYSTEM IS TOTALLY OR PARTIALLY PRESSURIZED, BECAUSE OF POTENTIAL DAMAGES TO ADSORBENT MATERIAL AND POSSIBLE SOURCE OF HIGH NOISE LEVEL.

7 NITROGEN GENERATOR

7.1 SAFETY PRESCRIPTIONS

WARNING

ACCIDENTAL NITROGEN BREATHING CAN CAUSE LOW OXYGEN LEVELS IN THE BLOOD AND MAY LEAD TO UNCONSCIOUSNESS AND TO DEATH IN ONLY A FEW BREATHS, WITHOUT ANY SYMPTOM. ALL NITROGEN VENTS MUST ALWAYS BE ROUTED TO SAFE LOCATION.

I. Use the package properly, within rated pressure and temperature limits stated on name plate.

II. Before servicing any valve, fitting or component it is mandatory to depressurize the package completely and to disconnect power supply by means of a manual circuit breaker on feeding line (by others), except for spare equipment items.

III. To insulate the supply voltage, an adequate insulating switch must be fitted on the feeding line.

IV. Nitrogen generator package can work only in ventilated safe area.

V. Assembly and disassembly of any valve, fitting or component of nitrogen generation package must be performed by experienced technicians only.

VI. While PSA is working do not allow unauthorized person near the package, never place any kind of object on PSA, never remove any component.

VII. Never obstruct safety valves exhaust.

7.2 PSA NITROGEN GENERATORS THEORY OF OPERATION

Nitrogen production from air using PSA technology is based on the capability of a special adsorbent, named Carbon Molecular Sieve (CMS), to adsorb oxygen at an higher rate than nitrogen or other gases. If air is send through a CMS bed and is kept in contact with CMS only for short period the difference in adsorption rate will result in a significant removal of oxygen from air and will allow to collect high purity nitrogen from outlet side.

After this period the CMS will start to significantly adsorb also nitrogen and therefore it will no more remove oxygen from air; therefore it is necessary to stop flow through adsorbent bed before reaching this point and regenerate the bed.

Bed regeneration is accomplished by depressurisation to atmospheric pressure; in order to obtain a continuous production of high purity nitrogen two adsorbers, that operate cyclically and alternatively between adsorption and regeneration and a nitrogen buffer drum is provided.

Production capacity and purity are dependant on feed flow-rate, pressure, temperature, and on selected cycle; high pressure and low temperature may result in higher purity and higher product capacity, temperature higher than design or feed pressure lower than design will have a negative impact on product specification, with consequent out of spec nitrogen.

The operating cycle is automatic and is controlled by a PLC.

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7.3 DESCRIPTION OF MAIN COMPONENTS

7.3.1 Nitrogen generator

The nitrogen generator package is provided with no.2 towers PSA type nitrogen generator, C-64001A and C-6400B.

Normally, one tower is in the production phase, while the other tower is regenerating.

Dry air enters the generator and is conveyed to production tower by inlet 2-way valve 64-XV-051 or 64-XV-052, it flows on the active bed, releasing oxygen, and exits from outlet 2-way valve 64-XV-056 or 64-XV-057.

The regenerating tower is depressurized to atmospheric pressure, opening 2-way discharge valve 64-XV-053 or 64-XV-054, to release oxygen through discharge valve and silencer.

A small percentage of nitrogen is drawn downstream the production tower through 2-way valve 64-XV-055 and it is expanded at atmospheric pressure inside regenerating tower.

This nitrogen flow runs through the tower in a counter-current direction, it attracts the residual oxygen present on the active bed and is then vented to atmosphere through discharge valve and silencer.

Afterwards, discharge valve, inlet valve and outlet valve are closed and both vessels are brought to the same pressure through 2-way valve 64-XV-055, for the subsequent change-over phase.

The generator is provided with internal connection for instrument air through valve BLPH-MV-802.

The manual valves installed in the nitrogen generation package are provided with locking devices: they shall be kept in Open or Close position as shown in the package P&ID, document no. 1724000437-PR-PID-00018.

WARNINGS

INSTRUMENT AIR CIRCUIT MUST BE PROPERLY PRESSURIZED
BEFORE SWITCHING THE GENERATOR ON

THE CONTROL PLC CAN'T KNOW THE POSITION OF MANUAL ISOLATION VALVES INSTALLED ON THE PROCESS LINE. ALWAYS CHEK THEIR POSITION TO ASSURE THAT THERE IS THE FLOW OF AIR THROUGH WHEN THE GENERATOR IS SWITCHED ON

7.3.2 AFTER-FILTERS

The nitrogen generator package is provided with no.2 after-filters, item S-64001A/B, installed in parallel configuration.
The package can operate with only one filtering line in operation, but it is possible to use both filters at the same time.
Each filter is provided with a manual drain valve.
The filtering group is provided with a differential pressure transmitter, item 64-PDIT-056: it is advisable to replace the cartridges of the filters when measured pressure drop reaches 0.5 bar.

WARNINGS

REPLACE CARTRIDGE WHEN MEASURED PRESSURE DROP REACHES 0.5 bar,
TO AVOID THE COLLAPSE OF THE CARTRIDGE

INSTALLED CARTRIDGES ARE NOT CLEANABLE TYPE. ALWAYS REPLACE THEM WHEN EXHAUST

7.3.3 MAIN DATA

The nitrogen generator package is designed for the following performances:

- Outlet N2 purity: 97%
- Outlet N2 package flowrate: 50 Nm^3/h
- Outlet N2 package pressure: 8.1 barg

with the inlet conditions as follows:

- Inlet dry air flowrate: 125 Nm^3/h
- Inlet dry air pressure: 9 barg

7.4 OPERATING INSTRUCTIONS AND INFORMATION

7.4.1 Start-up

WARNINGS

INSTRUMENT AIR CIRCUIT MUST BE PROPERLY PRESSURIZED
BEFORE SWITCHING THE GENERATOR ON

Local start-up

a) Place the switch on nitrogen generation package local control panel in "Local" position and verify that lamps 64-XL-001 and 64-XL-002 are switched on

b) Verify that instrument air is available for pneumatic actuated valves, according to commissioning procedure.

c) Press the START push-button 64-HS-001 on local control panel to start the generator: the PLC will start its operation and the different electric components will get enabled as described in the functional description. Verify that PSA RUNNING lamp 64-XL-003 is switched on.

d) Make sure the generator operating cycle is properly carried out and that no alarm condition is highlighted.

e) After the correct start-up, until the measured oxygen level is greater than design value, the nitrogen flow is automatically vented to atmosphere.

f) When the measured oxygen level is lower than set value, the nitrogen flow is automatically provided to the users.

Remote start-up

a) Place the switch on local control panel on ''REMOTE' position and verify the LOCAL/REMOTE STATUS PROFIBUS signal.

b) Give the REMOTE START impulsive command to start the generator: the PLC will start its operation and the different electric components will get enabled. Verify that PSA RUNNING lamp is switched on.

c) Make sure the generator operating cycle is properly carried out and that no alarm condition is highlighted.

d) After the correct start-up, until the measured oxygen level is greater than design value, the nitrogen flow is automatically vented to atmosphere.

e) When the measured oxygen level is lower than set value, the nitrogen flow is automatically provided to the users.

7.4.2 Stop

WARNING

WHEN THE GENERATOR IS STOPPED, THERE IS NO FLOW OF NITROGEN TO USERS

Local stop

a) Press the STOP push-button 64-HS-002 on local control panel to stop the generator. Verify that PSA RUNNING lamp 64-XL-003 is switched off.

b) Cut power supply to the local control panel and verify that lamps 64-XL-001 and 64-XL-002 are switched off.

Remote stop

a) Valid only if the switch on local control panel is on "REMOTE" position.

b) Give the REMOTE STOP impulsive command to stop the PSA operating cycle. Verify that PSA RUNNING lamp 64-XL-003 is switched off.

c) Cut power supply to the local control panel and verify that lamps 64-XL-001 and 64-XL-002 are switched off.

7.5 MAINTENANCE

WARNINGS

DEPRESSURIZE THE PSA COMPLETELY BEFORE SERVICING ANY VALVE, FITTING OR COMPONENT UNDER PRESSURE.

NO MAINTENANCE ACTIVITIES ARE ALLOWED ON ELECTRICAL LIVE CONNECTIONS

REMARKS

A CORRECT MAINTENANCE PROGRAM IS NECESSARY TO ASSURE PROPER WORKING OF NITROGEN GENERATORS: GUARANTEED CONDITIONS ARE SUBORDINATED TO EXECUTION OF MAINTENANCE OPERATIONS.

7.5.1 Six-monthly

1. Replace the cartridge of the after-filters.

Put on line the stand-by filter opening the upstream manual/automated valves and downstream manual valves and isolate the filter to be maintained closing the upstream and downstream manual valves

Depressurize the filter to be maintained opening the manual drain valve and open it to replace the cartridge

2. In order to guarantee the achievement of the process performances, it is recommended to check the level of the carbon molecular sieve in both towers of the nitrogen generators and fill it, if necessary, as per following steps.

- switch the unit off and depressurize the system, then open the DN150 filling nozzle fitted on top head of generator towers
- verify the level of carbon molecular sieve, which should completely fill the nozzle
- add the necessary carbon molecular sieve to completely fill the nozzle, if necessary
- close the blind flange of the DN150 filling nozzle, replacing the gasket, if necessary

Check of carbon molecular sieve to be performed according to the Material Safety Data Sheet (attached) and the equipment datasheet, document no. 1724000437-MAC-DS-00011.

WARNING

IT IS MANDATORY TO OPERATE THE NITROGEN GENERATOR WITH BOTH TOWERS COMPLETELY FILLED WITH CARBON MOLECULAR SIEVE

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7.5.2 Yearly activities

Proceed to the full servicing of process valves, as per following steps:

- switch the unit off and depressurize the system, then dismount all the pneumatic actuated valves
- replace the gaskets of the pneumatic actuated valves, as per dedicated manual
- check the status of the balls of pneumatic actuated valves: replace them as per dedicated manual, if necessary.

Coes recomend yearly carbon molecular sieve replacement, in any case carbon molecular sieve became unavoidable when the design Nitrogen purity (3%) cannot be longer met, as per following steps:

- switch the unit off and depressurize the system, than open the DN150 filling nozzle fitted on top head of generator towers
- open the DN80 emptying nozzle fitted on bottom head of generator towers
- discharge all the carbon molecular sieve contained in the generator towers
- open the DN100 nozzle fitted on bottom head of generator towers and remove the lower piping
- check the internal diffuser fitter between the lower piping and the generator towers: replace the stainless steel mesh if necessary
- install the lower piping and close the DN100 nozzle fitted on bottom head of generator towers replacing the gasket, if necessary
- open the DN100 nozzle fitted on shell of generator towers and remove the upper piping
- check the internal diffuser fitter on the upper piping: replace the stainless steel mesh if necessary
- install the upper piping and close the DN100 nozzle fitted on shell of generator towers replacing the gasket, if necessary
- add the necessary carbon molecular sieve to completely fill the towers, up to the DN150 filling nozzle fitted on top head of generator towers
- close the blind flange of the DN150 filling nozzle, replacing the gasket, if necessary
- switch the unit on and pressurize the system, then let the nitrogen generator work for 30 minutes
- switch the unit off and depressurize the system, then open the DN150 filling nozzle fitted on top head of generator towers
- verify the level of carbon molecular sieve, which should completely fill the nozzle

- add the necessary carbon molecular sieve to completely fill the nozzle
- close the blind flange of the DN150 filling nozzle, replacing the gasket, if necessary

WARNING

IT IS MANDATORY TO OPERATE THE NITROGEN GENERATOR WITH BOTH TOWERS COMPLETELY FILLED WITH CARBON MOLECULAR SIEVE

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7.6 TROUBLESHOOTING

WARNINGS

DEPRESSURIZE THE NITROGEN GENERATION PACKAGE COMPLETELY

BEFORE SERVICING ANY VALVE, FITTING OR COMPONENT UNDER PRESSURE.

NO MAINTENANCE ACTIVITIES ARE ALLOWED ON ELECTRICAL LIVE CONNECTIONS

	PROBLEM	POSSIBLE CAUSE	SUGGESTD SOLUTION
1	High oxygen content of nitrogen	Inlet air water content is higher than expected	Check the correct operation of nitrogen generation package
		Operating parameters out of design range	Adjust user nitrogen consumption to avoid too low pressure and/or too high flow through the generator
		Active material has not been correctly regenerated	Proceed with the regeneration of carbon molecular sieve, keeping the manual valves upstream after-filters closed
		Regeneration phase is not completely achieved	Verify that during operation of generator, there is a suitable flow of air vented through the silencer. No instrument is available to check the vent flow, therefore a manual inspection is recommended.
		Active material is damaged	Replace carbon molecular sieve in both generator towers
		Active material is exhaust	Replace carbon molecular sieve in both generator towers
		Generator by-pass is open	Close by-pass valve (if installed by others)
		Failure on generator operating cycle	Check the correct operation of actuated valves

	PROBLEM	POSSIBLE CAUSE	SUGGESTD SOLUTION
2	Failure of actuated valve	No instrument air pressure to pneumatic actuator	Open instrument air root valves
		Failure of solenoid valve	Replace solenoid valve
		Failure of limit switch	Adjust or replace limit switch
		Failure of pneumatic actuator	Check the pneumatic actuator, service it and replace it, if necessary
		Failure of valve	Check the valve, service it and replace it, if necessary

	PROBLEM	POSSIBLE CAUSE	SUGGESTD SOLUTION
3	Low pressure on nitrogen	Too high flow of instrument air or nitrogen to users	Adjust user nitrogen consumption
		Too low air flow from compressor	See dedicated manual
		Too high air consumption for regeneration of dryer installed upstream nitrogen generator package	Adjust dryer phases times
		Too high pressure drop across dryer installed upstream nitrogen generator package	Change desiccant material in instrument air dryer package
		Too high pressure drop across after-filters	Replace the after-filters cartridge

	PROBLEM	POSSIBLE CAUSE	SUGGESTD SOLUTION
4	High pressure drop across after-filters	Too high nitrogen flow across filter	Adjust user nitrogen consumption to avoid too high flow
		Too low nitrogen pressure at filter inlet	Adjust user nitrogen consumption to avoid too low pressure
		Cartridge saturated with dust	Replace the cartridge

	PROBLEM	POSSIBLE CAUSE	SUGGESTD SOLUTION
5	Dust content in nitrogen	Dust created by generator during normal operation	Replace the after-filters cartridge
		Active material is damaged	Replace carbon molecular sieve in both generator towers

REMARKS

TO AVOID POSSIBLE DAMAGES AND INCORRECT OPERATION OF THE DRYING UNIT,

USE ONLY ORIGINAL COES SPARE PARTS

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Information Sheet

SECTION 1. Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Chemical Name:	**Carbon Molecular Sieve**
Commercial Name:	**CMS-260**
EC number	**231-153-3**
CAS number	**7440-44-0**

1.2. Relevant identified uses of the substance or mixture and uses advised against

Intended use **Adsorbent material for gasses purification**

1.3. Details of the supplier of the safety data sheet

Name	**Coes S.r.l.**
Full address	**Via Pontida 265**
District and Country	**24040 Stezzano (BG) - italy**
	+39 0352050511
	coes@coessrl.com

1.4. Emergency telephone number

For urgent inquiries refer to **+39 0352050511**

SECTION 2. Hazards identification

2.1. Classification of the substance or mixture

The product is not classified as hazardous pursuant to the provisions set forth in EC Regulation 1272/2008 (CLP) (and subsequent amendments and supplements).
Hazard classification and indication:

2.2. Label elements

Hazard pictograms: --

Signal words: --

Hazard statements:

--

Precautionary statements:

--

This product is not subject to hazard labeling pursuant to EC Regulation 1272/2008 (CLP) and subsequent amendments and supplements.

2.3. Other hazards

The substance does not have persistence, bioaccumulation and toxicity (PBT) properties and is not very persistent and very bioaccumulative. (vPvB).

The substance does not have endocrine disrupting properties.

Contact with eyes: May cause irritation.
Skin contact: May cause irritation.
Inhalation: May cause irritation to the respiratory tract. Repeated exposure could cause lung damage.
Ingestion: May cause gastrointestinal symptoms.

SECTION 3. Composition/information on ingredients

3.1. Substances

Contains:

Identification	Conc. %	Classification (EC) 1272/2008 (CLP)
CARBON		
CAS 7440-44-0	100	
EC 231-153-3		
INDEX		

The full wording of hazard (H) phrases is given in section 16 of the sheet.

3.2. Mixtures

Information not relevant

SECTION 4. First aid measures

4.1. Description of first aid measures

Eye Contact: Immediately flush with plenty of water for several minutes; ensure to flush under the eyelids. If symptom of irritation persist, seek medical attention.
Skin Contact: Wash with plenty of water and soap. If symptom of irritation persist, seek medical attention.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Seek medical attention immediately.
Ingestion: Wash with plenty of water. If gastrointestinal symptoms develop seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

No episodes of damage to health ascribable to the product have been reported.

4.3. Indication of any immediate medical attention and special treatment needed

Information not available

SECTION 5. Firefighting measures

5.1. Extinguishing media

SUITABLE EXTINGUISHING EQUIPMENT
The extinguishing equipment should be of the conventional kind: carbon dioxide, foam, powder and water spray.
UNSUITABLE EXTINGUISHING EQUIPMENT
None in particular.

5.2. Special hazards arising from the substance or mixture

HAZARDS CAUSED BY EXPOSURE IN THE EVENT OF FIRE
Do not breathe combustion products.

5.3. Advice for firefighters

GENERAL INFORMATION
Use jets of water to cool the containers to prevent product decomposition and the development of substances potentially hazardous for health. Always wear full fire prevention gear. Collect extinguishing water to prevent it from draining into the sewer system. Dispose of contaminated water used for extinction and the remains of the fire according to applicable regulations.
SPECIAL PROTECTIVE EQUIPMENT FOR FIRE-FIGHTERS
Normal fire fighting clothing i.e. fire kit (BS EN 469), gloves (BS EN 659) and boots (HO specification A29 and A30) in combination with self-contained open circuit positive pressure compressed air breathing apparatus (BS EN 137).

SECTION 6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use breathing equipment if fumes or powders are released into the air. These indications apply for both processing staff and those involved in emergency procedures.

6.2. Environmental precautions

The product must not penetrate into the sewer system or come into contact with surface water or ground water.

6.3. Methods and material for containment and cleaning up

Confine using earth or inert material. Collect as much material as possible and eliminate the rest using jets of water. Contaminated material should be disposed of in compliance with the provisions set forth in point 13.

6.4. Reference to other sections

Any information on personal protection and disposal is given in sections 8 and 13.

SECTION 7. Handling and storage

7.1. Precautions for safe handling

Before handling the product, consult all the other sections of this material safety data sheet. Avoid leakage of the product into the environment. Do not eat, drink or smoke during use.

7.2. Conditions for safe storage, including any incompatibilities

Keep the product in clearly labelled containers. Keep containers away from any incompatible materials, see section 10 for details.

7.3. Specific end use(s)

Information not available

SECTION 8. Exposure controls/personal protection

8.1. Control parameters

Regulatory References:

POL	Polska	Rozporządzenie ministra rozwoju, pracy i technologii z dnia 18 lutego 2021 r. Zmieniające rozporządzenie w sprawie najwyższych dopuszczalnych stężeń i natężeń czynników szkodliwych dla zdrowia w środowisku pracy
GBR	United Kingdom	EH40/2005 Workplace exposure limits (Fourth Edition 2020)

CARBON

Threshold Limit Value

Type	Country	TWA/8h		STEL/15min		Remarks / Observations
		mg/m3	ppm	mg/m3	ppm	
NDS/NDSCh	POL	6				INHAL
WEL	GBR	10				INHAL
WEL	GBR	4				RESP

Legend:

(C) = CEILING ; INHAL = Inhalable Fraction ; RESP = Respirable Fraction ; THORA = Thoracic Fraction.

8.2. Exposure controls

Comply with the safety measures usually applied when handling chemical substances.

HAND PROTECTION
Use protective gloves made of butilic/nitrilic rubber (min. > 0.11 mm; penetration time: > 480 min) (EN 374).

SKIN PROTECTION
None required.

EYE PROTECTION
Use safety glasses with lateral (EN 166).

RESPIRATORY PROTECTION
In case of dust dispersion o higher recommended exposure limits, wear mask with filter P2 (EN 143).

ENVIRONMENTAL EXPOSURE CONTROLS
The emissions generated by manufacturing processes, including those generated by ventilation equipment, should be checked to ensure compliance with environmental standards.

SECTION 9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Properties	Value	Information
Appearance	particulate solid	
Colour	black	
Odour	odourless	
Melting point / freezing point	Not available	
Initial boiling point	Not applicable	
Flammability	Not available	
Lower explosive limit	Not available	
Upper explosive limit	Not available	
Flash point	Not applicable	
Auto-ignition temperature	Not available	
pH	6-9	
Kinematic viscosity	Not available	
Solubility	insoluble in water	
Partition coefficient: n-octanol/water	Not available	
Vapour pressure	Not available	
Density and/or relative density	1,70	
Relative vapour density	Not available	
Particle characteristics	Not available	

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Information not available

9.2.2. Other safety characteristics

Information not available

SECTION 10. Stability and reactivity

10.1. Reactivity

There are no particular risks of reaction with other substances in normal conditions of use.

10.2. Chemical stability

The product is stable in normal conditions of use and storage.

10.3. Possibility of hazardous reactions

No hazardous reactions are foreseeable in normal conditions of use and storage.

10.4. Conditions to avoid

None in particular. However the usual precautions used for chemical products should be respected.

10.5. Incompatible materials

Information not available

10.6. Hazardous decomposition products

Information not available

SECTION 11. Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Metabolism, toxicokinetics, mechanism of action and other information

Information not available

Information on likely routes of exposure

Information not available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Information not available

Interactive effects

Information not available

ACUTE TOXICITY

Does not meet the classification criteria for this hazard class

Oral (rat) LD50 > 2000 mg/kg

SKIN CORROSION / IRRITATION

Does not meet the classification criteria for this hazard class

SERIOUS EYE DAMAGE / IRRITATION

Does not meet the classification criteria for this hazard class

RESPIRATORY OR SKIN SENSITISATION

Does not meet the classification criteria for this hazard class

Respiratory sensitization

Information not available

Skin sensitization

Information not available

GERM CELL MUTAGENICITY

Does not meet the classification criteria for this hazard class

CARCINOGENICITY

Does not meet the classification criteria for this hazard class

REPRODUCTIVE TOXICITY

Does not meet the classification criteria for this hazard class

Adverse effects on sexual function and fertility

Information not available

Adverse effects on development of the offspring

Information not available

Effects on or via lactation

Information not available

STOT - SINGLE EXPOSURE

Does not meet the classification criteria for this hazard class

Target organs

Information not available

Route of exposure

Information not available

STOT - REPEATED EXPOSURE

Does not meet the classification criteria for this hazard class

Target organs

Information not available

Route of exposure

Information not available

ASPIRATION HAZARD

Does not meet the classification criteria for this hazard class

11.2. Information on other hazards

Based on the available data, the substance is not listed in the main European lists of potential or suspected endocrine disruptors with human health effects under evaluation.

SECTION 12. Ecological information

Use this product according to good working practices. Avoid littering. Inform the competent authorities, should the product reach waterways or contaminate soil or vegetation.

12.1. Toxicity

Information not available

12.2. Persistence and degradability

CARBON

Solubility in water 0,1 - 100 mg/l

Degradability: information not available

12.3. Bioaccumulative potential

Information not available

12.4. Mobility in soil

Information not available

12.5. Results of PBT and vPvB assessment

The substance does not have persistence, bioaccumulation and toxicity (PBT) properties and is not very persistent and very bioaccumulative. (vPvB).

12.6. Endocrine disrupting properties

Based on the available data, the substance is not listed in the main European lists of potential or suspected endocrine disruptors with environmental effects under evaluation.

12.7. Other adverse effects

Information not available

SECTION 13. Disposal considerations

13.1. Waste treatment methods

Reuse, when possible. Neat product residues should be considered special non-hazardous waste.
Disposal must be performed through an authorised waste management firm, in compliance with national and local regulations.
Solid residues may be suitable for disposal in an authorised landfill site.
CONTAMINATED PACKAGING
Contaminated packaging must be recovered or disposed of in compliance with national waste management regulations.

SECTION 14. Transport information

The product is not dangerous under current provisions of the Code of International Carriage of Dangerous Goods by Road (ADR) and by Rail (RID), of the International Maritime Dangerous Goods Code (IMDG), and of the International Air Transport Association (IATA) regulations.

14.1. UN number or ID number

Not applicable

14.2. UN proper shipping name

Not applicable

14.3. Transport hazard class(es)

Not applicable

14.4. Packing group

Not applicable

14.5. Environmental hazards

Not applicable

14.6. Special precautions for user

Not applicable

14.7. Maritime transport in bulk according to IMO instruments

Information not relevant

SECTION 15. Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Seveso Category - Directive 2012/18/EU: None

Restrictions relating to the product or contained substances pursuant to Annex XVII to EC Regulation 1907/2006

Contained substance

Point	75

Regulation (EU) 2019/1148 - on the marketing and use of explosives precursors

Not applicable

Substances in Candidate List (Art. 59 REACH)

On the basis of available data, the product does not contain any SVHC in percentage ≥ than 0,1%.

Substances subject to authorisation (Annex XIV REACH)

None

Substances subject to exportation reporting pursuant to Regulation (EU) 649/2012:

None

Substances subject to the Rotterdam Convention:

None

Substances subject to the Stockholm Convention:

None

Healthcare controls

Information not available

German regulation on the classification of substances hazardous to water (AwSV, vom 18. April 2017)

WGK Nwg: Not hazardous to waters

Substance listed in Annex 2

15.2. Chemical safety assessment

Has not been performed / is not yet available a
chemical safety assessment for the substance.

SECTION 16. Other information

LEGEND:
- ADR: European Agreement concerning the carriage of Dangerous goods by Road
- ATE: Acute Toxicity Estimate
- CAS: Chemical Abstract Service Number
- CE50: Effective concentration (required to induce a 50% effect)
- CE: Identifier in ESIS (European archive of existing substances)
- CLP: Regulation (EC) 1272/2008
- DNEL: Derived No Effect Level
- EmS: Emergency Schedule
- GHS: Globally Harmonized System of classification and labeling of chemicals
- IATA DGR: International Air Transport Association Dangerous Goods Regulation
- IC50: Immobilization Concentration 50%
- IMDG: International Maritime Code for dangerous goods
- IMO: International Maritime Organization
- INDEX: Identifier in Annex VI of CLP
- LC50: Lethal Concentration 50%
- LD50: Lethal dose 50%
- OEL: Occupational Exposure Level
- PBT: Persistent bioaccumulative and toxic as REACH Regulation
- PEC: Predicted environmental Concentration
- PEL: Predicted exposure level
- PNEC: Predicted no effect concentration
- REACH: Regulation (EC) 1907/2006
- RID: Regulation concerning the international transport of dangerous goods by train
- TLV: Threshold Limit Value

- TLV CEILING: Concentration that should not be exceeded during any time of occupational exposure.
- TWA: Time-weighted average exposure limit
- TWA STEL: Short-term exposure limit
- VOC: Volatile organic Compounds
- vPvB: Very Persistent and very Bioaccumulative as for REACH Regulation
- WGK: Water hazard classes (German).

GENERAL BIBLIOGRAPHY

1. Regulation (EC) 1907/2006 (REACH) of the European Parliament
2. Regulation (EC) 1272/2008 (CLP) of the European Parliament
3. Regulation (EU) 2020/878 (II Annex of REACH Regulation)
4. Regulation (EC) 790/2009 (I Atp. CLP) of the European Parliament
5. Regulation (EU) 286/2011 (II Atp. CLP) of the European Parliament
6. Regulation (EU) 618/2012 (III Atp. CLP) of the European Parliament
7. Regulation (EU) 487/2013 (IV Atp. CLP) of the European Parliament
8. Regulation (EU) 944/2013 (V Atp. CLP) of the European Parliament
9. Regulation (EU) 605/2014 (VI Atp. CLP) of the European Parliament
10. Regulation (EU) 2015/1221 (VII Atp. CLP) of the European Parliament
11. Regulation (EU) 2016/918 (VIII Atp. CLP) of the European Parliament
12. Regulation (EU) 2016/1179 (IX Atp. CLP)
13. Regulation (EU) 2017/776 (X Atp. CLP)
14. Regulation (EU) 2018/669 (XI Atp. CLP)
15. Regulation (EU) 2019/521 (XII Atp. CLP)
16. Delegated Regulation (UE) 2018/1480 (XIII Atp. CLP)
17. Regulation (EU) 2019/1148
18. Delegated Regulation (UE) 2020/217 (XIV Atp. CLP)
19. Delegated Regulation (UE) 2020/1182 (XV Atp. CLP)
20. Delegated Regulation (UE) 2021/643 (XVI Atp. CLP)
21. Delegated Regulation (UE) 2021/849 (XVII Atp. CLP)
- The Merck Index. - 10th Edition
- Handling Chemical Safety
- INRS - Fiche Toxicologique (toxicological sheet)
- Patty - Industrial Hygiene and Toxicology
- N.I. Sax - Dangerous properties of Industrial Materials-7, 1989 Edition
- IFA GESTIS website
- ECHA website
- Database of SDS models for chemicals - Ministry of Health and ISS (Istituto Superiore di Sanità) - Italy

Note for users:
The information contained in the present sheet are based on our own knowledge on the date of the last version. Users must verify the suitability and thoroughness of provided information according to each specific use of the product.
This document must not be regarded as a guarantee on any specific product property.
The use of this product is not subject to our direct control; therefore, users must, under their own responsibility, comply with the current health and safety laws and regulations. The producer is relieved from any liability arising from improper uses.
Provide appointed staff with adequate training on how to use chemical products.
CALCULATION METHODS FOR CLASSIFICATION
Chemical and physical hazards: Product classification derives from criteria established by the CLP Regulation, Annex I, Part 2. The data for evaluation of chemical-physical properties are reported in section 9.
Health hazards: Product classification is based on calculation methods as per Annex I of CLP, Part 3, unless determined otherwise in Section 11.
Environmental hazards: Product classification is based on calculation methods as per Annex I of CLP, Part 4, unless determined otherwise in Section 12.