Application to vary Environmental Permit No. EB3607KW

J W Waste Recycling Ltd

to include Advetec XO22 Aerobic Biodigestion Unit

[Second Application reflecting change to fully external siting of machine]

January 2024

OPERATIONAL ENVIRONMENTAL MANAGEMENT PLAN

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1.0 INTRODUCTION

1.1 Report Context

Following on from a very similar application made in 2023, J Witt Ltd (aka J W Waste Recycling Ltd.) made some equipment siting alterations meaning that application did not accurately reflect the current disposition of the site. It was withdrawn therefore.

For the first application SLR Consulting Limited (SLR) was instructed by Advetec Holdings Limited (Advetec) to prepare the application to vary JW Waste Recycling Limited's (JW Waste) existing environmental permit (EPR/EB3607KW). [An SR2015 No 6: 75kte; Standard Rules permit to operate a household, commercial and industrial waste transfer station with treatment.

The variation proposed was to include the operation of an Advetec XO22 Biodigestion Unit for the treatment of residual waste generated at JW Waste's Waste Treatment Transfer Station located at JW Waste Recycling Ltd, Newbury Works, Coleford, Radstock, BA3 5RX (hereafter referred to as 'the Site').

The second application for which this is the Operational Environmental Management Plan (OEMP) builds upon the work of SLR and remains largely unchanged except for the location of the Unit, which has since been delivered to site and placed in its desired position (but is not being currently operated)

This is the Site's first OEMP document and it is expected that it will be reviewed and updated on an annual basis or as a result of a number of circumstances including, but not limited to, the following:

- issuance of a varied environmental permit by the Environment Agency (EA);
- a change to an operational process;
- any material change in Site layout;
- a significant substantiated complaint; or
- a change to any legislation or guidance documents applicable to Aerobic Digestion Facilities.

This OEMP document is supplemented by the following documents prepared in support of the environmental permit variation application:

- Application Forms A, B2, B4 and F1;
- Non-Technical Summary (JW_Waste_NTS_30.01.24);
- Site drawings (SLR Ref: 416.064934.00001/Drawings);
- Environmental Risk Assessment (JW_Waste_ERA_30.01.24); and
- Site Condition Report (SLR Ref: 416.064394.00001/SCR).

1.2 Site Location

The Site is located at JW Waste Recycling, Newbury Works, Coleford, Radstock, BA3 5RX, centred on National Grid Reference (NGR) ST 69630 49829. The village of Highbury is located 1km southwest and the City of Bath lies 15km to the northeast. The location is essentially rural though immediately to the

south and west lie a few industrial and commercial properties. Immediately to the north and east lies woodland. The landscape surrounding the Site is primarily comprised of agricultural land, with woodland interspersed.

There are seven areas of Ancient Woodland and a Site of Special Scientific Interest (SSSI) located within 2km of the Site boundary. In addition, there a number of listed buildings, as well as two registered parks and gardens situated within 2km radius of the Site. Further information on the Site's setting can be found in the Environmental Risk Assessment in Section 4 of the application.

The site is accessed via an unnamed road which passes a few residential homes known as Newbury Cottages.

The Site Location is illustrated on Drawing EP1 and the Environmental Permit Boundary is illustrated in Drawing EP2, both can be found in Section 3 of this application.

1.3 Report Structure

This report describes the operating techniques and management system that are implemented at the facility to ensure compliance with the conditions of the EP. The report has been drafted to satisfy the requirements of EA Guidance and is divided into the following sections.

- Section 1 Introduction
- Section 2 Management
- Section 3 Operations
- Section 4 Emissions and Monitoring
- Section 5 Information
- Section 6 Closure

1.4 Document Revision History

Any changes to the OEMP will be labelled in chronological order and the date of the change recorded. All records of the changes will be listed in the revision history table below:

Version	Reason for Revision	Date of Revision	Signature of Site Manager
1.0	First Version of Document Finalised and Released	December 2022	
2.0	To accompany 2nd Permit Application requested by EA to cover Advetec Biodigestion Unit	January 2024	

2.0 MANAGEMENT

2.1 Management System

The management system operated by JW Waste Recycling Ltd will ensure that;

- the risks that the activities pose to the environment are identified;
- the measures that are required to minimise the risks are identified;
- the activities are managed in accordance with the management system; performance against the management system is audited at regular intervals; and
- the Environmental Permit (EP) is complied with.

A summary of the Environmental Management System is included as Appendix C to the application forms in Section 2 of the application.

2.2 Management Structure and Responsibilities

The Site Manager is responsible for day to day operations and compliance with the EP, included as Appendix A to this report.

The XO22 Unit will be loaded only by members of staff who are suitably trained and fully conversant with the requirements of the Environmental Permit regarding:

- waste acceptance and control procedures;
- operational controls;
- maintenance;
- record-keeping;
- emergency action plans; and
- notifications to the EA.

Following manual loading, the machine is designed to be monitored remotely, using telemetric methods, by Advetec personnel. If operational adjustment or maintenance is required then this will be signalled to them and, in conjunction with Site staff, required action will be taken. Operating experience from similar Units elsewhere suggests that this will be mundane and infrequent.

2.3 Technical Competence and Training

The Site is managed by sufficient staff, competent to operate the Site. The management system ensures the following:

- all staff have clearly defined roles and responsibilities;
- records are maintained of the skills required for each post;
- records are maintained of the training and relevant qualifications undertaken by staff to meet the requirement of each post; and
- operations are governed by standard operating instructions.

Operations at the Site will be under the overall control of a technically competent person who holds the relevant Certificate of Technical Competence (COTC) under the Waste Management Industry Training and Advisory Board (WAMITAB) scheme.

An assessment of staff training needs will be carried out to identify the posts for which specific environmental awareness training is needed, and to determine the scope and level of such training. The assessment of training needs is reviewed on an annual basis.

The training programme will ensure that relevant staff are aware of the following:

- regulatory implications of the permit for the Site and their specific work activity;
- all potential environmental effects from operations under normal and abnormal circumstances;
- the need to report deviations from the permit; and
- prevention of accidental emissions and the action to be taken should accidental emissions occur.

2.4 Site Security

In order to prevent unauthorised access, the Site has 24 hour monitored CTTV provision from an external company with links directly to the police and fire services. The site also benefits from a full-length gate which is CCTV covered. Only authorised personnel will have access to the Site via a reception where all visitors must sign in and out.

The Site is inspected at the commencement of each working day. Any defects or damage which compromise the integrity of the fencing or access gates are made secure by temporary repair by the end of the working day. Permanent repairs are affected as soon as practicable.

Results of adverse inspections (i.e. any defects, damage or repairs) are recorded in the Site Diary.

2.5 Permit Surrender

A Site Condition Report is maintained for the Site (SLR ref. 416.064394.00001_SCR). Following the cessation of permitted activities, a review of the Site's condition will be undertaken. Following that review, the Site will be returned to an acceptable state with reference to its condition prior to the commencement of the Company's activities on Site. An application will then be made to the EA to surrender the Site's EP.

2.6 Display of Environmental Permit

A copy of the EP is kept available for reference by all staff and contractors whose work may have an impact on the environment.

2.7 Managing Documentation and Records

Controls are in place to ensure that all documents within the scope of the Environmental Management System (EMS) are issued, revised and maintained in a consistent fashion.

The documents that are included within the scope of the controls are as follows:

- policies;
- responsibilities;
- targets;
- maintenance records;

- procedures;
- monitoring records;
- results of audits;
- results of reviews;
- complaints and incident records; and
- training records.

Records are made and kept up to date on a daily basis to reflect waste received to Site, and will be for on-Site aerobic digestion treatment and resultant digestate floc collected from Site following treatment. All records relating to waste movements are maintained, are readily available on Site and kept for a minimum of 2 years after the waste has been treated and any resulting material removed from Site.

2.8 Reporting Non-Compliance and Taking Corrective Action

Non-compliances detected at the Site will be reported, investigated and rectified. Staff will maintain awareness of non-compliances in the following areas:

- actual or potential non-compliance with conditions of the environmental permit;
- system failure discovered at internal audit;
- suppliers or subcontractors breaking any agreed operating rules;
- incidents, accidents, and emergencies;
- malfunction, breakdown or failure of plant;
- other operational system failure; and
- complaints.

The action taken in response to the non-conformance may include:

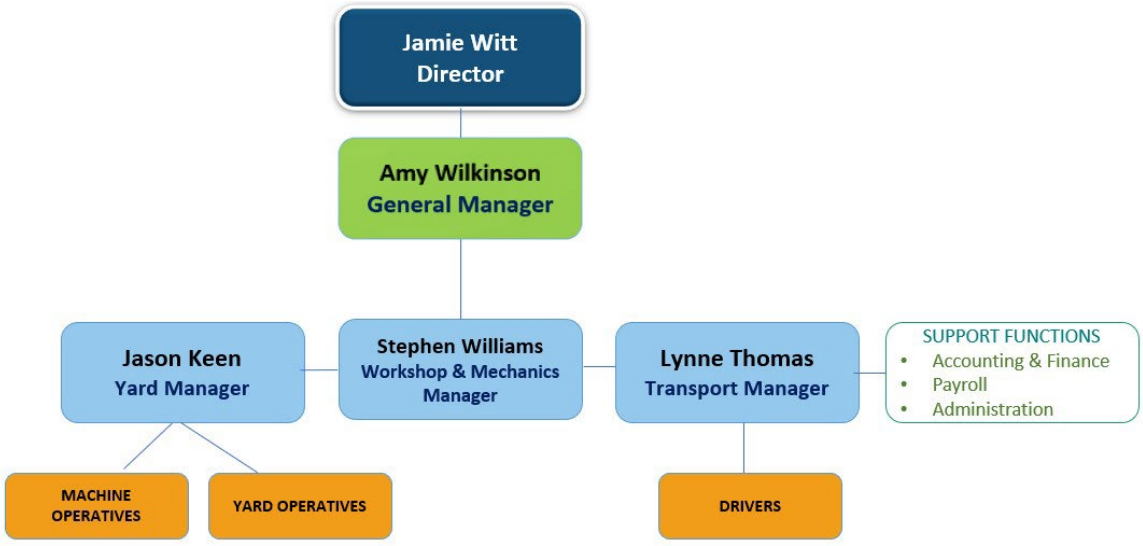
- obtaining additional information on the nature and extent of the non-conformance;
- discussing and testing alternative solutions;
- modifying procedures and responsibilities;
- providing additional resources and further training; and
- discussing remedial or improvement measures with suppliers and contractors (as applicable).

2.9 Auditing and Legal Compliance

As part of the EMS, and set out in that document, are a series of formalised checklists with defined frequency of inspection which are routinely used, and the resulting records kept on site. The progress of corrective and preventative action is monitored.

2.10 Monitoring, Measuring and Reviewing Environmental Performance

A formalised management structure provides for review of environmental performance, and ensures any necessary actions are taken. The management structure consists of the following tiers:



This document is to be updated when there is a change in management structure.

2.11 Operational Control, Preventative Maintenance and Calibration

The EMS contains operational procedures that will ensure effective control of Site operations, the use of approved suppliers and contract services, the maintenance of operational equipment and the calibration of monitoring equipment.

All plant and equipment are subject to a programme of planned preventative maintenance which will follow the inspection and maintenance schedule recommended by the manufacturer.

2.12 Design and Construction Quality Assurance

The site has been in use for a long time, most recently, before JW Waste Recycling's tenure, as a concrete mouldings construction facility.

As the site has evolved, new elements have been designed taking into account recognised standards, methodologies and practices. A risk-based approach is used and appropriate documentation created prepared by competent and suitably qualified persons.

Similarly, construction activities are supervised by competent and suitably qualified people.

2.13 Hazard Identification

Seems to just focus on XO22

The following hazards are identified in the Environmental Risk Assessment (ERA) that was submitted in support of this EP application (reference 416.064394.00001/ERA):

- Odour from loading waste into the aerobic digester;
- Odour from treatment of waste through the aerobic digester;
- Odour from waste storage in the compound;
- Noise from the aerobic digester;

- Dust from vehicle movements transferring residual waste off the site.
- Dust from storage and transfer of waste;
- Bioaerosols released during aerobic digestion;
- Contaminated run off from aerobic digester ;
- Birds, pests and insects attracted to waste stored around the compound and the residual flock produced from the aerobic digester ;
- Litter from waste;
- Mud from vehicle movements;
- Leakage of fuels and oils;
- Fire;
- Flooding; contaminated run-off, and
- Security and vandalism.

The following sections summarise the measures necessary to minimise the potential causes and consequences of accidents, as detailed in the ERA. Overall, the small scale of the aerobic digestor means that environmental risk from the Site is considered to be low.

2.13.1 Odour

Due to the small scale of the aerobic digestion activities (less than 26 tonnes per day), the risk of odour is low.

The digestion process is undertaken aerobically which limits odour generation (e.g. compared to an anaerobic digestion process). The automatically controlled operation ensures that anaerobic conditions will not develop within the vessel.

The aerobic digester is sealed and benefits from a carbon filter, which would abate any odours that might be produced during the process.

Storage areas and the perimeter of the Site are monitored daily for any unacceptable levels of odour. Any odour identified on Site would be recorded in the Site Diary, investigated by the responsible person (the Site Manager) and remediated as soon as possible. To date no such odour has been identified.

The postprocess floc generated by the XO22 Unit will be augered into an adjacent, covered, concrete “Lego” block, holding bay where it will be dry stored until collection from Site.

2.13.2 Noise and Vibration

To date, since occupying the Site, the Company has received no complaints of noise. It is considered unlikely that there will be any significant incremental increase in noise or vibration generated by the aerobic digester due both to the relatively small scale of its activities (less than 26 tonnes per day) and to the enclosed nature of the process.

Noise pollution will be reduced compared to activities without the digester, as transport required to transfer the waste residuals generated on Site will be less frequent.

To ensure that noise and vibrations are limited, the following management techniques will be implemented:

- All plant and machinery will be operated and maintained in accordance with manufacturer’s specifications;
- Machinery will be operated so as to minimise noise;
- Vehicles adhere to a speed limit on Site; and

- Site surfaces are kept in good repair which minimises potential for noise associated with uneven roads.

Daily auditory monitoring will be carried out by Site personnel to identify any unacceptable levels of noise. A record of the inspection findings will be made in the Site diary. Remedial action will be taken in the event that noise from the Site is detected at nearby sensitive receptor locations.

The Site Manager will be responsible for managing emissions of noise on Site.

2.13.3 Dust

The waste transfer station has concrete surfacing and vehicles approach Site over tarmacked roadways, so will not be tracking over dusty roads.

Use of the digester will result in a reduction in vehicle movements thereby reducing the potential for any dust generation from, in particular, departing traffic.

Referring to operation of the aerobic digester, following shredding, waste will be transferred to it via a fully enclosed auger. The digester is also fully enclosed. Storage of the postprocess floc generated by the machine will be in an adjacent covered holding bay.

Waste awaiting processing is always dry stored in accordance with the currently permitted arrangements.

The aerobic digesters will accept approximately 26 tonnes of waste each day. It is therefore a small-scale activity.

Daily visual inspections are conducted by the Yard Manager and if dust is deemed a nuisance mitigation measures are taken. Clearly this is more likely to be a problem in the summer and in the past dust suppression has been required. This has been successful and no complaints have been received about the Company's operations.

2.13.4 Bioaerosols

It is considered unlikely that the aerobic digester will emit significant levels of bioaerosols due to the small scale of the machine's operation involving treatment of up to just 26 tonnes of waste per day. [Ambient monitoring of bioaerosols around Advetec's XO3 Unit at Cribbs Causeway Shopping Centre installation found bio-aerosols to be below levels of detection or very low in all samples.]

The digestion process is undertaken within a sealed vessel, benefiting from a carbon filter. This limits the potential release of bioaerosols from the treatment process.

Daily visual inspections will be undertaken at all areas of the Site to check for conditions potentially affecting bioaerosol release. Records of the findings will be recorded in the Site Diary.

2.13.5 Contaminated Run Off

All wastes accepted onto Site are solid; no liquid wastes are taken. All wastes received are low risk and non-hazardous.

Waste awaiting processing is stored within the Main Building of the Transfer Station in accordance the current permitted arrangements. Waste which has been sorted for subsequent dispatch (glass or wood etc) is stored in holding bays which are to be fitted with a roof-upgrade to ensure that run-off of contaminated rainwater cannot occur. Storage of the postprocess floc generated by the XO22 Biodigestion Unit will be in an adjacent dedicated, covered, holding bay.

The treatment process in the XO22 Unit is exothermic. The heating of the waste during the treatment process will cause it to dry out with the moisture extracted and treated via the carbon filter. Condensate will be vented into the atmosphere. (N.B. The aerobic digestion process itself does not use water.)

The Site Manager will be responsible for implementing risk management measures in accordance with operational and management procedures.

2.13.6 Pests and Scavengers

Waste awaiting processing is stored within the Main Building of the Transfer Station in accordance the current permitted arrangements. Storage of the postprocess floc generated by the machine will be in an adjacent covered holding bay.

Site personnel conduct daily inspections of waste storage areas for signs of scavenging animals.

If scavenging animals are spotted a licenced contractor will be contacted to deal with them and the offending waste type will be investigated and removed if necessary.

The Site Manager is responsible for management of scavenging animals.

2.13.7 Litter

The Site is inspected daily for signs of litter. The Site benefits from good housekeeping. In the event that any litter is identified on site, it is cleared from the affected area.

Loading of waste into the Biodigestion process will be from a machine shovel filled from a pile temporarily stored in the enclosed Main Building. Following shredding, waste will be transferred to the digester via a fully enclosed auger. Storage of the postprocess floc generated by the machine will be in an adjacent covered holding bay. It is not expected that floc will be blown out of this but if, in practice, this should happen then steps will be taken to prevent it.

The Site Manager, aided by the Yard Manager, is responsible for managing emissions of litter on and off Site.

2.13.8 Mud

There is little possibility of transferring mud around site. As said before, surfaces are concreted in the main and approach roads are tarmacked. In addition, all Site vehicles are checked to ensure that they are clean before leaving the Site.

Nothing about the aerobic digester operation will cause mud to be created, transport of the postprocess floc off Site will be infrequent and therefore any risk of mud being transferred as a result of XO22 operation will be minimal.

Good housekeeping will be put in place by the Site Manager, which involves daily cleaning and inspections.

As with dust (2.13.6 above) daily visual inspections are conducted by the Yard Manager and if mud were to be deemed a nuisance then mitigation measures would be taken.

2.13.9 Loss of Containment and Spillage

The dedicated fuel storage on Site is a 5,500 litre bunded tank sited in the Main Building which can only be operated using a key fob.

There is always the potential for fuel spillage from the vehicles moving around the Site, and should this occur then spill kits are available for immediate clean-up.

The Site is routinely monitored for any spillages of any sort. Any incidents identified incidents will be cleaned up, and a record made in the Site Diary.

The Site Manager will be responsible for implementing risk management measures.

2.13.10 Fire

On a waste site fire is an ever-present hazard. Operations are therefore conducted with this in mind. Storage of waste is largely in holding bays created with interlocking precast concrete "Lego" blocks. These are themselves fireproof. Bays are arranged so that one containing combustible material is separated from another by a bay containing non-combustible materials.

Burning of waste never takes place on site: it is forbidden by the Company.

Fire extinguishers are located at strategic points around the site, and are carried on vehicles. Full details of prevention measures and alarms are set out in the Fire Prevention Plan.

Regarding the XO22, an internal temperature monitor continually assesses the temperature of the aerobic digester. The temperature measurements are relayed to Advetec telemetrically. The system is programmed with alerts and alarms to notify Site and Advetec staff of any temperature related risks.

In the event of events such as arson or vandalism the incident is recorded in the Site log and reported to the relevant authority. Site security measures are reviewed and improved where necessary. The Site benefits from fencing with gated access.

2.13.11 Flooding

The Site lies in a Flood Zone 1, which is classified as "Land having a less than 1 in 1,000 annual probability of river or sea flooding". Not only this but the topography around the site is such that there is little likelihood of flooding.

The Site Manager is responsible for the management of the Site in the event of flooding.

2.13.12 Security and Vandalism

In order to prevent unauthorised access, the Site is monitored 24/7 with CTTV provided by a specialist company with links directly to the police and fire services. The site also benefits from a full-length gate which is CCTV covered. Only authorised personnel will have access to the waste compound area.

In the event that damage is sustained repairs would be made by the end of the working day. If, for any reason, this were not to be possible, then suitable steps would be taken to prevent any unauthorised access to the Site and permanent repairs are affected as soon as practicable.

The Site Manager will be responsible for managing security on Site. This includes inspecting the Site at the commencement of each day.

3.0 OPERATIONS

3.1 Process Description

This permit application seeks to vary JW Waste Recycling Limited's (JW Waste) existing Standard Rules, SR2015 No 6: 75kte household, commercial and industrial waste transfer station with treatment (EPR/EB3607KW) to a bespoke permit to include the use of an Advetec aerobic digestor.

Waste management activities as described in the Waste Framework Directive 2008, which are currently undertaken as part of the waste transfer operation on site include:

- D15 - Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced);
- R13 - Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced);
- D14 - Repackaging prior to submission to any of the operations numbered D1 to 13;
- D9 - Physio-chemical treatment not specified elsewhere in Annex IIA which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D8 and D10 to D12;
- R3 - Recycling/reclamation of organic substances which are not used as solvents;
- R4 - Recycling/reclamation of metals and metal compounds; and
- R5 - Recycling/reclamation of other inorganic materials.

The following waste management activities as described in the Waste Framework Directive 2008 will be undertaken at the Site as part of the aerobic digestion process. These include:

- R3 - Recycling or reclamation of organic substances that are not used as solvents;
- R5 - Recycling/reclamation of other inorganic materials; and
- R12 - Exchange of wastes for submission to any of the operations numbered R1 to R 11.

The proposed installation of an XO22 Advetec units on Site comprises the treatment of up to 9,490 tonnes per annum (tpa) of non-hazardous mixed municipal waste in an aerobic digester, to reduce the volume and mass of waste prior to transfer off-site for recovery. The proposed permit variation application includes the following:

- The operation of aerobic digester will take place within JW Waste's Waste Transfer Station for the treatment of mixed municipal waste.

3.2 Waste Types and Storage

Referring specifically to aerobic digestion, initially, JW Waste proposes to install one XO22 unit at the Site which will accept up to 13 tonnes of waste per day, i.e. approximately 4745 tonnes per annum. Following digestion, an approximate mass reduction of 62.5% and volume reduction of 70% is expected, resulting in an approximate output of 4.87 tonnes per day of floc suitable for onwards recovery off-site as Solid Recovered Fuel (SRF).

Depending on the success of the XO22 unit, JW Waste may install another XO22 unit with the potential to accept a further 13 tonnes of waste per day. The Site would then accept up to 26 tonnes of waste per day across two Advetec units which equates to approximately 9490 tonnes per annum.

This permit variation application seeks to allow the treatment of no more than 26 tonnes of non-hazardous waste per day, equating to 9490 tonnes per annum.

Table 1

List of Wastes Proposed for Acceptance into the Biodigestion Unit

List of Waste Code	Description
20	MUNICIPAL WASTES AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES INCLUDING SEPARATELY COLLECTED FRACTIONS
20 03 01	Mixed municipal waste

Post-process floc will be collected into a covered holding bay adjacent to the Biodigestion unit and dry stored until collection / haulage off site.

Storage prior to treatment will be undertaken within external holding bays located on site, this in accordance with the Site's current permitted arrangements. This is illustrated within the J WITTS V6- Site Plan Drawing.

3.3 Site Operations

Table 2 details the ***new*** waste operation activities to be carried out on Site. [All other operations, those currently conducted, will be limited, in nature, to those permitted under an SR2015 No 6: 75kte; Standard Rules permit.]

Table 2 Description of Waste Operations

Activity Reference	Activity Description	Limits of Activity
Aerobic digestion treatment of waste	R3: Recycling or reclamation of organic substances which are not used as solvents R5: Recycling or reclamation of other inorganic materials R12: Exchange of wastes for submission to any of the operations numbered R1 to R11	Treatment of wastes listed in Table 1, consisting of treatment via aerobic digestion process including shredding of waste. No more than 3,650 tonnes of waste shall be treated per year.

Only authorised persons will be allowed access to the Site.

The waste will be loaded into a hopper which connects to a shredder, both of which will be located externally to the building. The RS50 shredder will shred the waste into 80mm^2 particle size, the shredded waste is then augered into the digester, where bacteria and bio-stimulants are automatically dosed into the waste. The digester will be located internally.

The XO22 has four chambers, with an internal mass of 22m^3 at any given point, through which the waste is moved for digestion. Movement is by a centralized shaft with engineered paddles that rotate according to pre-programmed algorithms. The paddles allow the system to stay aerobic while ensuring residence, and index mass throughout the process. A diagrammatic overview of an aerobic digestion process is provided as Figure 1.

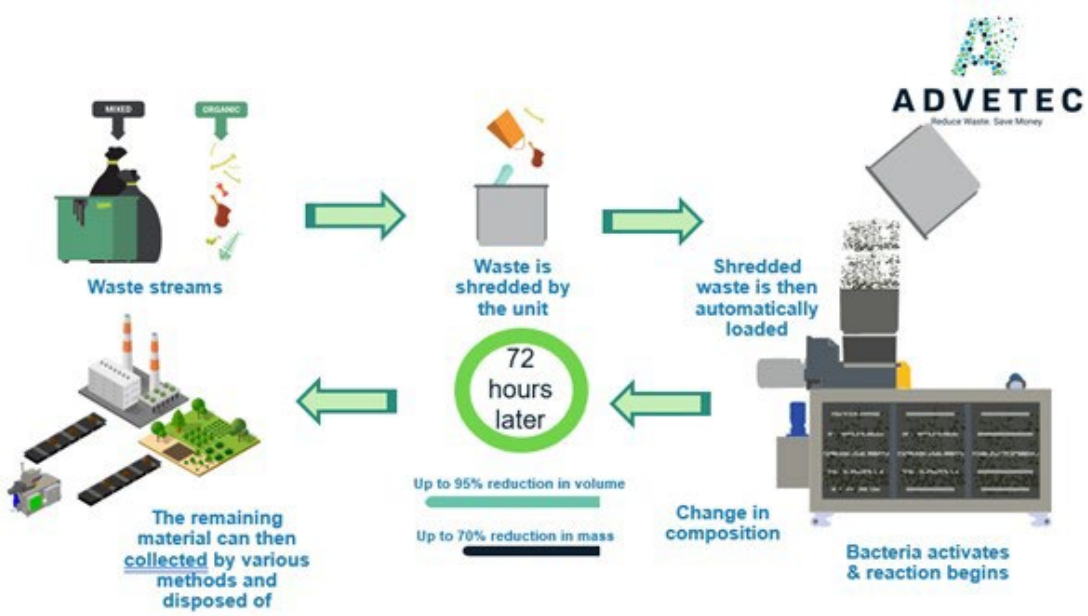


Figure 1 - Aerobic Digestion Process Overview

The only by-products of the aerobic digestion system are water vapour, carbon dioxide and a post-process residue (floc). The process uses exothermic aerobic respiration; therefore, it generates its own heat which is channelled internally back into the process, using a closed-loop heating system. Condensate will be vented into the atmosphere.

The entire aerobic digestion process takes approximately 72 hours to complete, after completion the post-process floc will be collected internally within the main building. It will be collected into a holding bay and dry stored until collection / haulage off site.

Control of the XO22 is accessible via a regulated cloud-based portal. Data points are collected, logged and stored at programmable intervals, including temperature, humidity, rotational speeds, emissions monitoring, power consumption, maintenance schedules. Alert and alarm levels are programmed into the system to notify in the event of system errors or parameters moving out of range. There is also an in-line gas monitoring system which continuously monitors levels of methane (CH_4), carbon monoxide (CO), volatile organic compounds (VOCs) and sulphur dioxide (SO_2), in the event of detection of any of these parameters, an alarm is raised. To mitigate against any possible odours from the aerobic digestion process, an odour abatement system is fitted within the XO22 whereby the by-products (namely, water and carbon dioxide) are vented to the atmosphere through a passive drum scrubber.

3.4 Waste Acceptance

3.4.1 Hours of Operation

The Site is operational from 5am to 5pm, 7 days a week.

3.4.2 Load Inspection and Waste Control

The waste brought to Site undergoes a visual inspection prior to and upon receipt, and is compared with the Waste Transfer Notes etc. If any discrepancies are identified then the waste is either quarantined until they are resolved asap or returned to the sender.

All wastes entering the Site are recorded upon arrival and records of waste accepted for treatment at the Site will be kept, including details on:

- the quantity;
- characteristics;
- List of Waste (LoW) code; and
- delivery date and time.

Waste which is identified to be incompatible with the Site's waste acceptance criteria is also be recorded and separated e.g. asbestos. This waste is quarantined, recorded and removed from Site at the earliest opportunity, either back to the consignor or to a suitably licenced facility. Records of non-compliant waste received at the Site are be kept in the Site diary, and include details on:

- the quantity;
- characteristics;
- List of Waste (LoW) code; and
- delivery date and time.

Wastes are not accepted unless the Site is adequately resourced to receive the waste.

Following receipt, with the aerobic digestion in prospect, extra care will be taken to further segregate out any foreign or incompatible waste from the load chosen as its infeed (e.g. metals).

3.5 Site Infrastructure and Equipment

3.5.1 Site Identification Board

A Site identification board which is easily readable from outside the entrance during hours of daylight is provided at the main Site entrance.

The identification board is inspected at least once per week. In the event of damage or defect that significantly affects the legibility of the board it is repaired or replaced within a timescale agreed with the Environment Agency.

The board displays the following information:

- Site name and address;
- Permit holder;
- Permit number;

- Waste Carriers number;
- Emergency telephone number; and
- Days and hours that the Site is open for operations; and

will display

- Environment Agency national telephone numbers when the board is next changed.

3.5.2 Plant and Equipment

Multiple items of plant and equipment already exist and are used on site, e.g. telehandlers, mechanical shovels, a mobile shredder, conveyor belts, a trommel etc. Additional items for the biodigestion process, will comprise a fixed shredder and one, (perhaps in the future, two) Advetec X022 Aerobic Digester Unit(s)

All items of plant and equipment used on Site are maintained in accordance with manufacturer's recommendations. Spare plant is available in the event of breakdown.

4.0 EMISSIONS & MONITORING

The Site Manager will carry out a daily Site check, as detailed in Appendix B.

4.1 Point Source Emissions

The Site is operated so that there are no point source emissions to surface water, groundwater, or land.

4.1.1 Point Source Emission to Air

There will be just one 'point' source emission to air. This will be from the aerobic digestor via the carbon filter built into the machinery. Water vapour and carbon dioxide are vented through the passive drum scrubber for remediation of possible odours.

There is an in-line gas monitoring system that continuously monitors levels of methane (CH_4), carbon monoxide (CO), volatile organic compound (VOCs) and sulphur dioxide (SO_2) leaving the carbon filter. In the unlikely event of detection of any of these parameters, an alarm is raised.

4.2 Fugitive Emissions

These are not troublesome and consist largely of fine particulate dust arising from waste handling. Such dust is controlled as per 2.13.6 above.

As regards the XO22 operations, these will take place in a completely sealed vessel, meaning the potential for fugitive emissions to escape is considered very low. As this will be such a small scale operation (26 tonnes per day) it is not expected any significant fugitive emissions will arise. Nonetheless, the Site area and perimeter entrances will be inspected on a regular basis to ensure that no fugitive emissions are being produced.

4.2.1 Surface Water and Groundwater

Waste awaiting processing will be stored within holding bays located externally. Waste is stored within the digester while undergoing treatment. Floc generated will be collected internally within the main building. It will be collected into a holding bay and dry stored until collection / haulage off site.

No water is used during the aerobic digestion process and no other additional Site operations will require water.

To ensure that the potential for the accidental release of emissions off Site remains low, the Site area will be inspected regularly to ensure integrity and to check for any spillage of materials. Any defects will be repaired immediately with a temporary solution and fitted with a permanent repair as soon as practicable and to prevent the release of accidental emissions off Site. Any spillages are cleaned up immediately using spill kits that are provided on Site.

4.2.2 Sewer

There are no operational discharges to a sewer and there will be none from use of the aerobic digester.

5.0 RAW MATERIALS RELEVANT TO BIODIGESTION

5.1 Raw Material Selection

The only raw materials used by the aerobic digester are bio-stimulants. Bio-stimulants are added to stimulate bacteria indigenous to the waste stream to optimise the digestion process.

Typical usage levels and methods of storage for raw materials used on Site is shown in Table 3 below.

Table 3 Raw Materials Inventory

Raw material	Physical State	Storage arrangements	Storage capacity (ltrs)	Amount used (litres per year)	Description of how material is used	Environmental Impact
Bio stimulant	Liquid	Onboard tank of capacity	20	80	Added to the aerobic digestion process to aid and optimise digestion	This raw material is a extract from algae, which is classed as non-hazardous poses no known impact (toxicological or ecological risk). Potential negative impact on trade effluent quality if spilled.

5.2 Minimisation of Raw Material Use

There is only one raw material used on Site, as detailed in Section 5.1. The aerobic digestion plant is powered using electricity and does not use any additional fuel. There are no other on-Site processes which require fuel or the use of any raw materials.

The use of bio-stimulants on Site is low due to the small scale (only treating up to 26 tonnes of waste per day) of the activity.

Despite the minimal use of raw materials on Site, the following optimisation techniques are employed

- Preventative and reactive maintenance of processing equipment; and
- Replacement and upgrading of processing equipment, when applicable, in accordance with best practice requirements.

5.3 Water Use

This is very limited on site, mostly to do with what site personnel use individually, and the biodigestion process does not use or require any water.

6.0 ENERGY RELEVANT TO BIODIGESTION

6.1 Current Energy Consumption

Due to the small scale of the Site, minimal energy is required for operations. Energy for the Site is obtained from electricity, supplied to the Site from the National Grid. Each aerobic digestor will use approximately 27 kW/h of electricity. This equates to approximately 11.25kW of electricity used per tonne of waste treated.

The following measures on Site will be implemented to ensure high energy efficiency:

- The purchase of energy efficient equipment, where appropriate;
- Maintenance and operation of equipment in an efficient manner; and
- Continual and periodic review of operations and identification of areas or practices that would result in improved energy efficiency.

6.2 Energy Efficiency Measures

Tables 4 and 5 below summarise the energy efficiency measures currently in place at the installation.

Table 4 Operating, Maintenance and Housekeeping Measures

Operating maintenance and housekeeping measures	Implemented in the installation?	Supplementary Information/ Justification
Air conditioning, process refrigeration and cooling systems maintenance (leaks, seals, temperature control, evaporator/condenser maintenance)	No	These systems are not required on Site
Motors and drivers	Yes	Few motors and drivers are used on site. Regarding the Biodigestion unit, these can be controlled remotely using an installed cloud-based portal. The motors and drivers it use are variable speed devices.
Compressed gas system (leaks, procedures for use)	No	These systems are not required on Site
Steam distribution systems (leaks, traps, insulation)	No	These systems are not required on Site
Space heating and hot water systems	No	These systems are not required on Site

Lubrication to avoid high friction loss	Yes	The equipment will be maintained in accordance with the manufacturer's specifications ensuring relevant components are kept lubricated.
Boiler maintenance	No	A boiler is not required on Site
Variable speed drives on air compressors	No	These systems are not required on Site
Phase optimisation of electronic control motors, such as on the inverters.	Yes	Electronic control motors incorporate phase optimisation.
Other maintenance activities within the installation	Yes	The preventative maintenance system covers all key items of productive plant.

Table 5 Physical Measures

Physical measures	Implemented in the installation?	Supplementary Information/ Justification
Sufficient insulation of steam systems, heated vessels and pipework.	Yes	There are no steam systems on site, and neither are there any heated vessels except the Biodigestion unit. This unit is insulated.
Provision of sealing and containment methods to maintain temperature	Yes	This only applies to the aerobic digestion vessel and this is a sealed unit.
Simple sensors and timers to prevent unnecessary discharge of heated liquids and gases.	Yes	This only applies to the aerobic digestion unit and any collection of data is controlled remotely and monitored using an installed cloud-based portal.

7.0 INFORMATION

All relevant notifications and submissions to the EA regarding the Site are made in writing and will quote the EP reference number and the name of the permit holder.

Records are maintained for at least 2 years, however in the case of off-Site environmental effects, and matters which affect the condition of land and groundwater the records are kept until EP surrender. Duty of Care records are kept for a minimum of 2 years.

7.1 Reporting and Notifications

7.1.1 Changes in Technically Competent Persons

The EA will be informed in writing of any changes in the technically competent management of the Site and the name of any incoming person, together with evidence that such person has the required technical competence.

7.1.2 Waste Types and Quantities

A summary report of waste types and quantities accepted and removed from the Site for each quarter, will be submitted to the EA within 1 month of the end of the quarter unless otherwise required by the EP conditions.

7.1.3 Relevant Convictions

The EA would be notified of the following events:

- JW Waste Recycling Ltd being convicted of any relevant offence; and
- Any appeal against a conviction for a relevant offence and the results of such an appeal.

7.1.4 Notification of Change of Operator's or Holder's Details

The EA will be notified of the following:

- Any change in the operator's trading name, registered name or registered office address; and
- Any steps taken with a view to the company going into administration, entering into a company voluntary arrangement or being wound up.

7.1.5 Adverse Effects

The EA will be notified without delay following the detection of the following:

- Any significant malfunction, breakdown or failure of equipment or techniques;
- Any significant accident;
- Fugitive emissions which have caused, are causing or may cause significant pollution; and
- any significant adverse environmental and health effect.

APPENDIX A

Environmental Permit (to be inserted following issue of permit variation)

APPENDIX B

Daily Site Checklist for Advetec XO22 Biodigestion Unit

Advetec Inc

Advetec XO22

OPERATING AND MAINTENANCE MANUAL

Advetec Inc Web:
www.advetec.com Address:

3737 Roundbottom Rd
Cincinnati
OH 45244

Preface

This manual includes important information in order for the machine to work correctly and safely.

To avoid mistakes and incorrect use, please ensure this manual is available to the operators and personnel involved in using the machine.

The warranty will not be valid unless these instructions are followed.

MACHINE MARKING

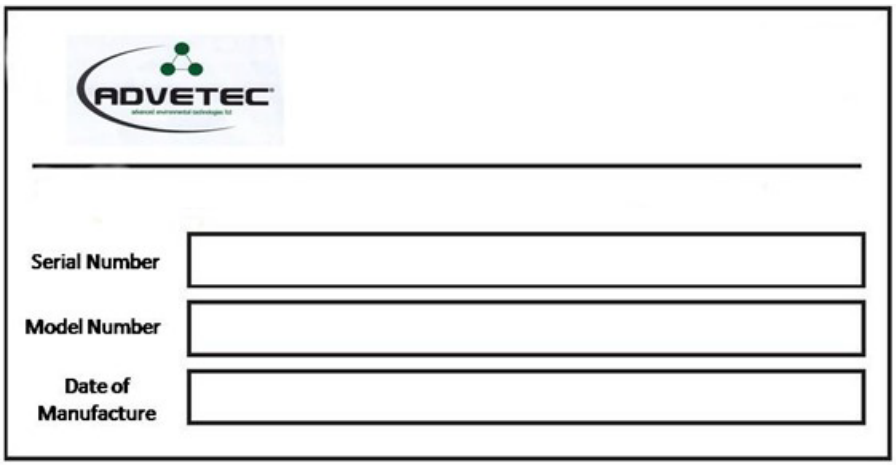


Table of Contents

List of Tables

Abbreviations

Any document specific abbreviations, deemed as likely to be unknown by the document's prerequisites, are contained within the table below.

Abbreviation	Meaning
I/O, IO	Input(s)/Output(s)
OSK	On-screen Keyboard
TAC	The Automation Clinic/Automation Clinic
ADV	Advetec
XO	Exothermic Reactor
PLC	Programmable Logic Controller
HMI	Human-Machine Interface
CSV	Comma-Separated Value (File)
VSD	Variable Speed Drive

Advetec XO22

1 Introduction

This Operating and Maintenance Manual is designed to ensure installers, operators and maintainers achieve effective installation, efficient operation and longest life from the Advetec XO and at all times ensuring the safety of both people and processes.

If there are any questions regarding this equipment or its application, please contact the local Advetec Holdings Ltd distributor, or contact Advetec Inc at the following:

Manufacturer:	Advetec Holdings Ltd Unit 1 Charlton Business Park Midsomer Norton Radstock BA3 4BE United Kingdom	Tel: +44 (0) 01761 433434 Fax: +44 (0) 01761 433365 Email: info@advetec.com
Distributor:	Advetec Holdings Ltd	As above

2 Project Specific Design Criteria

CLIENT NAME:	J Witt Ltd
CLIENT ADDRESS:	Newbury Works Coleford BA3 5RX
CLIENT CONTACT:	Jamie Witt
CONTACT TEL NO. OFFICE:	01761 479444

CONTACT TEL NO. MOBILE:	
CONTACT E-MAIL:	

XO Model Reference:	XO22
Advetec XO Serial Number:	051900221004
Clients Design Throughput	Max: 10,000kg/Day
Type of Feed Stock:	MSW: “PADS”
Unit Maximum Design Throughput	Max: 10,000kg/Day Subject to “PADS”
Performance Criteria: (Expected Reduction)	Subject to Waste stream - PADS

3 Process Overview

The process uses bespoke blend micro-organisms. These strains of bacteria activate at elevated temperatures. Their ability to survive in these adverse conditions means that they have evolved high respiration rates and can consume substantial amounts of organic load very quickly.

As the micro-organisms consume the organic load, they produce two by-products, heat and water. These by-products keep the operating costs of the XO down as the produced heat is utilised by the system.

On initial set-up, the aim is to develop a mature and thriving biomass of bacteria and waste. Once the internal biomass reaches its operating temperature range, the bacteria become fully active and generate heat which is re-used within the process to both sustain it and optimise energy consumption. This enables reduced running costs.

The XO unit provides the optimum environment for the automatic dosing of specialised bacteria and Bio Stimulants. The environment is monitored and controlled with specialist equipment allowing the bacteria

to operate at maximum efficiency. Waste is continuously dosed to provide new feed-stock for the biomass.

The Bio-Stimulant is made from purified natural plant extracts and is absorbed inter-cellularly by the bacteria to enhance an accelerated respiration rate. Fresh bacteria are continually dosed to ensure the biomass always has an active population.

The discharge rate of the digestate from the XO is also controlled to ensure manageable output. The process within the XO is aerobic and as such, the XO process requires aeration to ensure process stability. This is delivered through a paddle system powered by the main motor drive.

4 Ideal Feedstock for the Advetec XO Process

The Advetec XO ideal feedstock is high organic content material. Process compliance is subject to the PreAnalysis Datasheet (PADS). Specific attention is made to the following but not limited to:

The maximum throughput is not exceeded (per 24hr period)
The equipment is maintained in compliance with the maintenance manual
The equipment is operated in compliance with the operations manual
Only trained personnel operate the equipment
The equipment has a compliant power supply

The XO unit itself operates under certain conditions which utilise aerobic bacteria for the digestion of organic content, therefore contamination of bio inhibitors or antibacterial products will have a negative effect on the performance of the equipment and process. In line with the process compliance and warranty the Advetec XO equipment can only be operated within compliance whilst adhering to the levels of contamination indicated in

Table 1: Contaminant Levels

Contaminant	Maximum Daily Composition Limit
Antibiotics	0.25%
Biocides	0.30%
Cleaning Products	0.50%
Acids < pH4	0.25%
Alkaline > pH10	0.30%
Heavy metals	0.50%
Poisons	0.25%
Toxins	0.25%
Enzyme Inhibitors	0.25%

5 Health and Safety Procedures

5.1 Warnings

The following warning symbols are used throughout this manual to describe the type of hazard that may be encountered during the installation, operation or maintenance of this equipment. All personnel should pay special attention to the procedures indicated.

Immediate hazard which WILL result in severe personal injury or death.

Hazard or unsafe practices which COULD result in severe personal injury or death.

Hazards or unsafe practices which COULD result in personal injury or product or property damage.

5.2 Introduction

This Operating and Maintenance Manual is provided to fulfil the responsibilities of Advetec Inc to supply sufficient documentation and instructions to enable the users of the equipment supplied under this contract to operate and maintain the equipment in a safe manner.

The operation and maintenance of this plant and equipment must be carried out in compliance with all current and relevant Health and Safety and Welfare legislation, OSHA 1970.

Your attention is drawn to the following:

a. It shall be the duty of every employee while at work, to take reasonable care for the health and safety of himself and of others who may be affected by his acts or omissions at work and as regards any duty or requirement imposed on his employer or any other person by or under any of the relevant statutory provisions, to co-operate with him so far as is necessary to enable that duty or requirement to be performed or complied with.

b. No person shall intentionally or recklessly interfere with or misuse, anything provided in the interests of health and safety or welfare in pursuance of any of the relevant statutory provisions.

5.3 Health and Safety During Operation and Maintenance

Equipment supplier's documentation will contain Health and Safety instructions pertinent to their equipment. The following instructions are offered as a general guideline and should be strictly observed but not be regarded as complete and exhaustive:

5.3.1 All work shall be carried out by appropriately trained and qualified personnel.

5.3.2 All equipment shall be made safe; this will require isolation from electrical power and/or process wastes. Mains isolators and isolation valves shall be selected and locked in the 'OFF' position before any maintenance work is carried out.

5.3.3 All work on electrical equipment shall be completed in strict compliance with relevant legislation in the country of operation:

5.3.4 Safe access must be provided to relevant parts of the plant and all lifting equipment shall be covered by current certification.

5.3.5 Appropriate protective clothing and equipment shall always be worn.

5.3.6 When working in confined spaces, gas detection equipment and breathing apparatus in accordance with safety procedures, shall be used.

5.4 General Warnings

The following general **WARNINGS** must be observed before any maintenance work is carried out:

HIGH VOLTAGES CAN KILL. BEFORE WORKING ON ANY COMPONENT THAT HAS ELECTRICAL CONNECTIONS:

MAKE SURE THE ELECTRICAL SUPPLY IS ISOLATED

MAKE SURE THE CIRCUIT BREAKERS ARE TRIPPED AND TAGGED

MAKE SURE A PERSONAL LOCK IS INSTALLED TO THE ISOLATION SWITCH ON
THE MOTOR CONTROL CABINET TO PREVENT INADVERTENT CONNECTION OF THE ELECTRICAL SUPPLY

WARNING

WHEN WORKING IN CONFINED SPACES:

MAKE SURE YOU ARE IN CONTACT WITH A SECOND OPERATIVE.

MAKE SURE YOU HAVE THE NECESSARY SAFETY EQUIPMENT AND ARE FULLY TRAINED IN THEIR USE AND OPERATION

Observance of the foregoing health and safety advice will benefit both employees and employers alike in seeking to ensure the safe, efficient and reliable operation of the plant and equipment.

6 TECHNICAL DESCRIPTION AND FUNCTIONAL DESIGN SPECIFICATION

6.1 General

The Advetec XO is designed to be installed on a concrete or level hard standing. The loading of the unit via the feed hopper is required.

The feedstock into the Advetec XO can be loaded in several ways.

6.1.1 Smaller units (Model XO1) are typically manually loaded from the top of the unit via a feed chute.

6.1.2 Model type XO3/ XO6/ XO22 are typically loaded via feed augers depending on the site restrictions. The feed auger then spills the feedstock into a feed hopper which is automatically controlled via the control panel software.

6.1.3 The Advetec XO waste chambers are constructed in grade 304 stainless steel and housed within an exoskeleton.

6.2 Advetec XO Electrical Loadings

The power ratings indicated in Table 2 are maximum load. These figures include the Advetec XO and associated components (i.e. heat pads, fans and monitoring equipment), in addition to an outfeed auger. No other auxiliary items are including in these figures. The Advetec XO does not operate at this power load. Typical operating values are 30% of the maximum load.

During commissioning, or after down-time, higher power is required to (re)establish the biomass. This is infrequent.

Table 2: Typical Power Supply Requirements

XO Model Number (50Hz)	Power Requirements	
	Volts	Kw
XO 1	415	22
XO 3	415	37
XO 6	415	40
XO 22	415	78
XO Model Number (60Hz)	Power Requirements	
	Volts	Kw
XO 1	480	
XO 3	480	
XO 6	480	
XO 22	480	
XO 1	480	

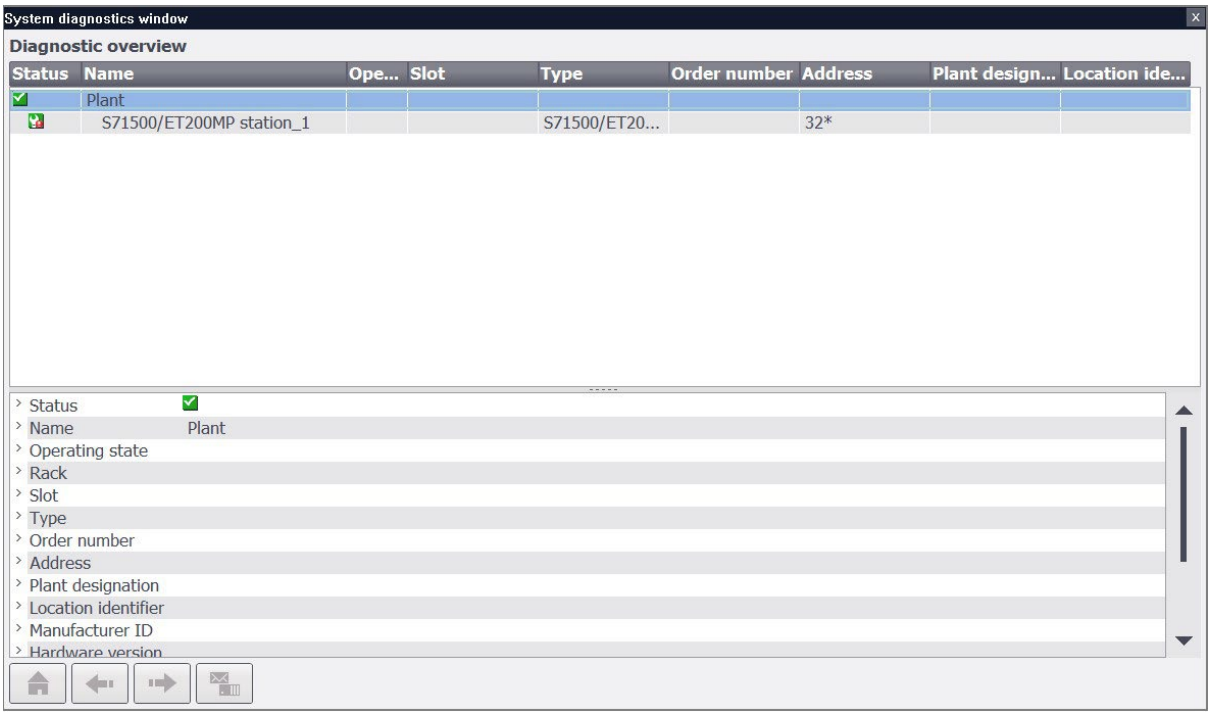
7 HMI Access & General Status Information

Temperatures will display in Celsius or Fahrenheit dependent upon machine location and at the discretion of Advetec.

7.1 Module Diagnostics Indicator

The Module Diagnostics Indicator features on multiple HMI screens. This shows as red if the PLC or any PLC Modules are in fault and shows as green when all modules are healthy. Pressing the indicator at Engineer Level navigates to the System Diagnostics Window.

7.2 System Diagnostics Window



This screen displays system diagnostics information.

7.3 Security

7.3.1 Security Levels

There are five levels of access to the HMI of the XO22 machine and four different users. The HMI works at the lowest level of access when there is no active user. At this access level, only the following screens are accessible.

- The Home Screen
- The Alarms Screen
- The Graphical Overview Screen

No settings or controls relating to the XO22 system are be modifiable without user login. User login takes place through the HMI.

7.3.2 Operator Level

Working at Operator level, in addition to functionalities accessible without logging in, allows a user limited access to the XO22 system. The HMI automatically logs out of Operator level after 5 minutes of inactivity and return the Home screen.

7.3.3 Technician Level

Working at Technician level, in addition to functionalities accessible at Operator Level, allows a user limited access to the settings of the XO22 system. The HMI automatically logs out of Technician level after 10 minutes of inactivity and return the Home screen.

7.3.4 Engineer Level

Working at Engineer level, in addition to functionalities accessible at Technician Level, allows a user advanced access to the settings of the XO22 system. The HMI automatically logs out of Engineer level after 10 minutes of inactivity and return the Home screen.

7.3.5 Admin Level

Working at Admin level, in addition to functionalities accessible at Engineer Level, allows a user complete access to all settings of the XO22 system. The HMI automatically logs out of Admin level after 10 minutes of inactivity and return the Home screen.

7.3.6 Active User Display

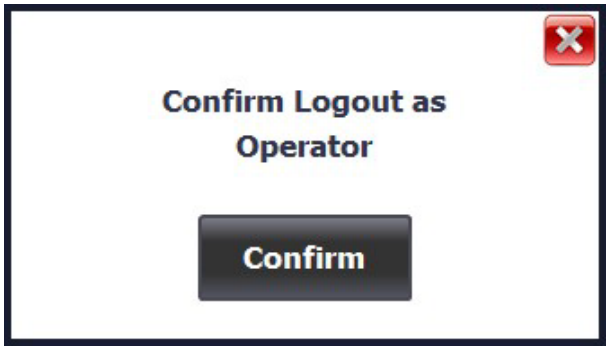
The active user displays at the top of every screen with the exception to the Home screen. This clarifies the level of access that the user currently has.

7.3.7 Login/Logout Pop-up

To produce the Login/Logout pop-up either press the Active User field or navigate to the pop-up via the Main Menu Screen. To exit the pop-up press . To login/logout press the respective button. Note that whilst there in no user logged in the logout button disables.

The Login button produces the Login pop-up so the user may login. Upon a successful login the username shows in the Active User field.

The Logout button replaces the contents of the Login/Logout pop-up with the following confirmation window:

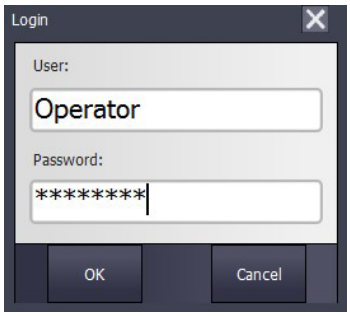


(Note that the Active User features in the place of 'Operator'.)

Logout may be confirmed by pressing 

(Operator) or the user may return to the previous content of the Login/Logout pop-up by pressing  (Operator). Upon logout the Login/Logout pop-up closes, and the HMI navigates to the Home screen. Also note that automatic logout occurs after various fixed durations for given users.

7.3.8 Login Pop-up



The user may login using this pop-up and close the pop-up by pressing either 

or  . To populate the user field and password select the respective field and input data using the Extended OSK. Upon entering data, pressing 

generates an attempt to login and the pop-up closes. Upon a successful login the username shows in the Active User field.

7.4 Status Bar

A status bar features at the top of every screen with exception to the Home Screen. The status bar has the following statuses that display as follows:

Status Bar	Severity/Priority (1=HIGH)	Display Condition
CPU IN STOP	1	The XO22 PLC is in STOP
CPU IN STARTUP	2	The XO22 PLC is in STARTUP.
EMERGENCY STOP ACTIVE	3	The emergency stop was pressed and not released.
ALARM ACTIVE	4	Any alarm is active.
WARNING ACTIVE	5	Any warning is active.
SYSTEM HEALTHY	6	Default Display (no other condition is true).

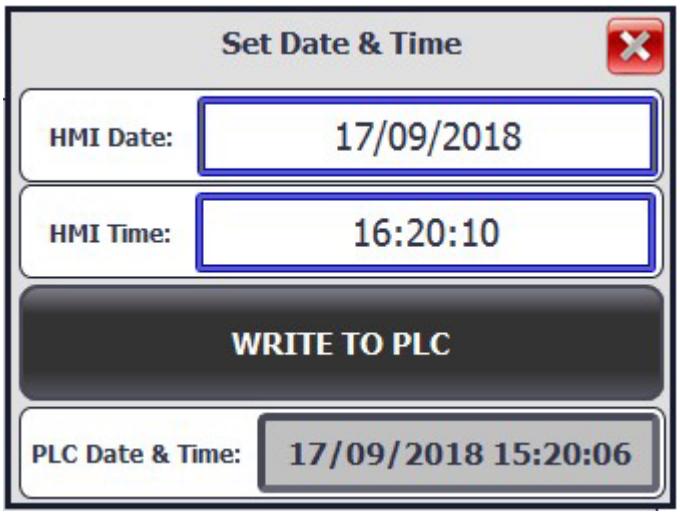
7.5 Time and Date Display

The current HMI time and date features at the top of every screen with exception to the Home Screen. Pressing the Time and Date Display produces the Set Date & Time pop-up. Pressing the Time and Date

Display produces the Set Date & Time pop-up. The time and date will have one of the following formats dependent upon the location of the machine and at the discretion of Advetec:

1. DD/MM/YYYY HH:mm:ss (AM/PM)
2. MM/DD/YYYY HH:mm:ss (AM/PM)

7.5.1 Set Date & Time Pop-up



From this pop-up the HMI Date & Time may be set and then synchronized with the PLC Date & Time (These functions are at Engineer Level). To set the HMI Date or Time select the respective input and use the Numeric OSK to enter data. To synchronize the HMI time with the PLC time press

7.6 Navigation Bar

The following section details several buttons and statuses featured contained along the bottom edge of the HMI screen.

- - See Module Diagnostics Indicator (Engineer).
- - Navigates to the Main Menu screen.
- - Navigates to the Overview screen.
- - Navigates to the Active Alarms screen.
- - Resets all alarms that need acknowledgement (Technician).
- - Navigates to the previous screen (unless stated otherwise).
- - Navigates to the next screen (disabled unless applicable) (Technician).

Also note that other buttons may feature on the Navigation Bar of certain screens.

8 HMI Screens

8.1 Home Screen

Upon start-up of the HMI this screen will display. The Home screen will display the Advetec company logo.

8.2 Enter Button

On RUN the screen waits and displays 'Loading….' whilst obtaining confirmation that a connection is present between the PLC and the HMI.

During this time the ENTER button does not display. Pressing the ENTER button navigates to the Menu screen.

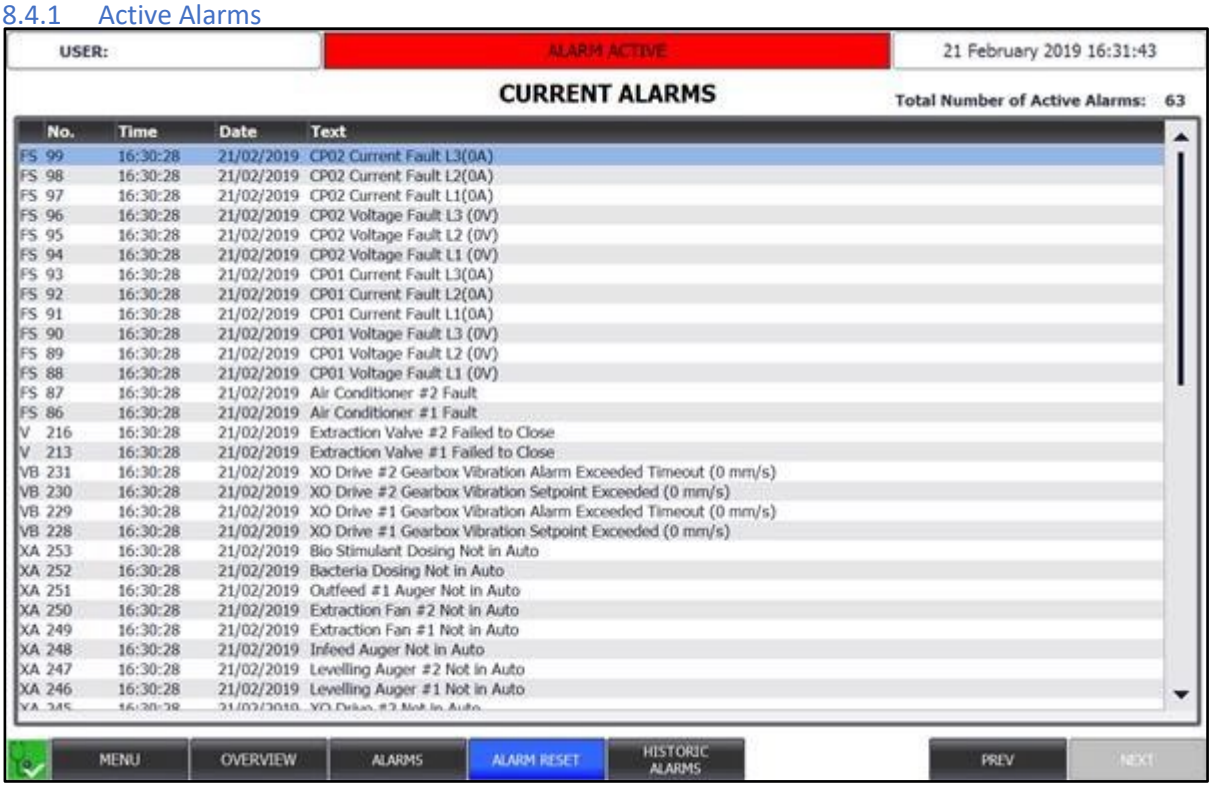
8.3 Main Menu Screen

The Main Menu screen feature several buttons which have various functions:

- HOME - Navigates to the Home screen.
- OVERVIEW - Navigates to the Overview screen.
- LOGIN / LOGOUT - Produces the Login/Logout pop-up.
- ALARMS - Navigates to the Active Alarms screen.
- SETTINGS - Navigates to the Settings screen At Technician Level.
- I/O STATUS - Navigates to the IO Menu screen.

8.4 Alarms

8.4.1 Active Alarms



The Active Alarms screen chronologically displays all currently active alarms and any inactive unacknowledged alarms that need acknowledgement.

Pressing the 

button at Engineer Level, navigates to the Historic Alarms screen.

8.4.2 Historic Alarms

The Historic Alarms screen shows a list of all alarms that have occurred since Runtime start.

8.4.3 Controlling Alarm Logging

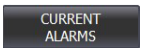
The user can stop and start data logging of alarms from this screen by pressing the 

buttons respectively. Whilst Data logging is stopped, the 

status indication displays as opposed to the 

indication. Alarm logging control requires Engineer Level access.

8.4.4 Further Buttons

Pressing the 

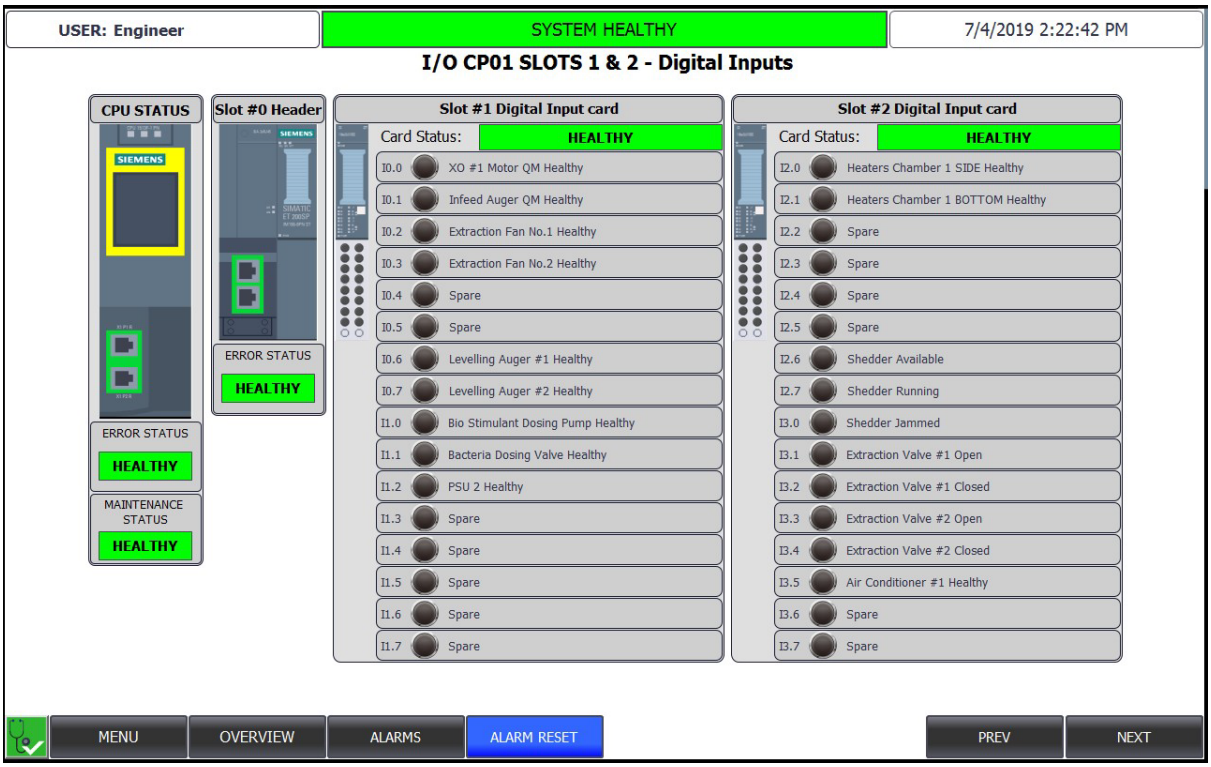
button at Technician Level navigates to the Active Alarms Screen. See Appendix A for a complete list of Alarms.

8.5 IO Status

8.5.1 IO Menu

This screen shows the status of all PLC Modules and I/O. From the I/O Menu screen individual I/O status and settings screens are accessible by selecting the respective modules.

8.6 Digital Inputs



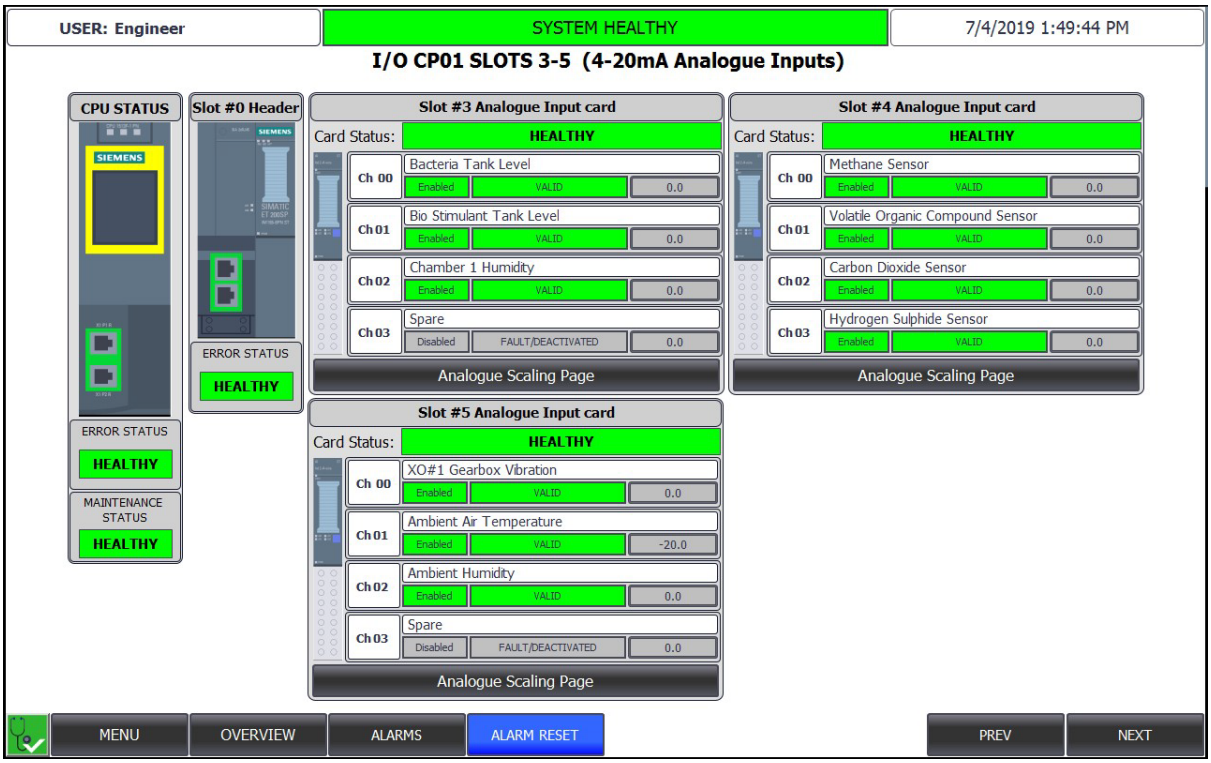
This screen shows the status of the Digital Input. The input status indicator shows the status (energised ( )/de-energised ( )) of each input next to its respective label.

The NEXT button is enabled on this screen and navigates to the screen relating to the P)LC module(s) in the next slot.

Note that the fault status of each card, and the fault and maintenance statuses of the XO PLC display on this screen. These status indications either show as ‘Healthy’ (Fault inactive) or ‘Fault’ (Fault active).

8.7 Analogue Inputs

8.7.1 Analogue Inputs Screens

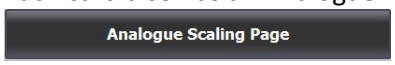


These screens show the status and values of the Slot 3-5 Analogue Inputs. For a complete list of Analogue Input screens see Appendix C. Each card consists of 4 or 8 Analogue Channels. The following information displays for each channel:

- Name of The Input
- Enabled/Disabled Status
- Analogue Input Status
- Present Value

The Analogue Input Status has the following states:

- - The channel is enabled.
- - The channel is disabled.

Each card also has an Analogue Input Scaling Screen which is accessible at Engineer level by pressing the 

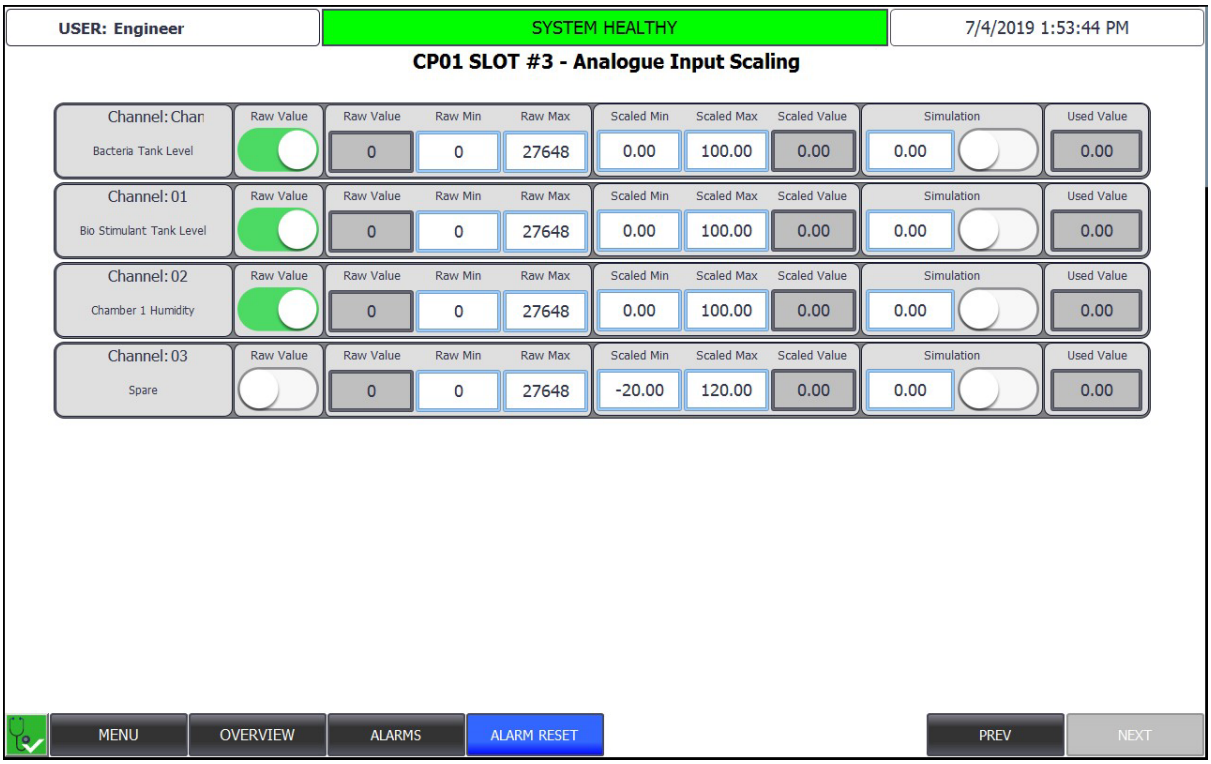
button.

The 

button is enabled on this screen and navigates through the Analogue Input screens. Upon reaching the last Analogue Input screen the next button navigates to the XO PLC – Slot 11-12 – Digital Inputs screen.

Note that the fault status of each card, and the fault and maintenance statuses of the XO PLC display on this screen. These status indications either show as ‘Healthy’ (Fault inactive) or ‘Fault’ (Fault active).

8.7.2 Analogue Input Scaling Screens



The user may change any numeric data outlined in blue by selecting the relevant input field and using the Numeric OSK. For a complete list of Analogue Scaling screens see Appendix B.

8.7.3 Scaling

The screens are separated by individual PLC slots and allow scaling from a Raw Value (between a predefined Raw Min and Raw Max) to a Scaled Value (between a pre-defined Scaled Min and Scaled Max) for each Analogue Input Channel. The Scaled Value then becomes the Used Value throughout the PLC program and HMI unless the Simulation toggle-switch is enabled. In this case, the user may change the Simulation Value and the used value changes to match it.

8.7.4 Simulation

The Raw Value Field shows an Analogue Underflow by changing orange. If an Analogue Overflow occurs, the Raw Value Field will change red.

8.7.5 Enable/Disable

If the user disables a channel, then this will disable any corresponding alarms.

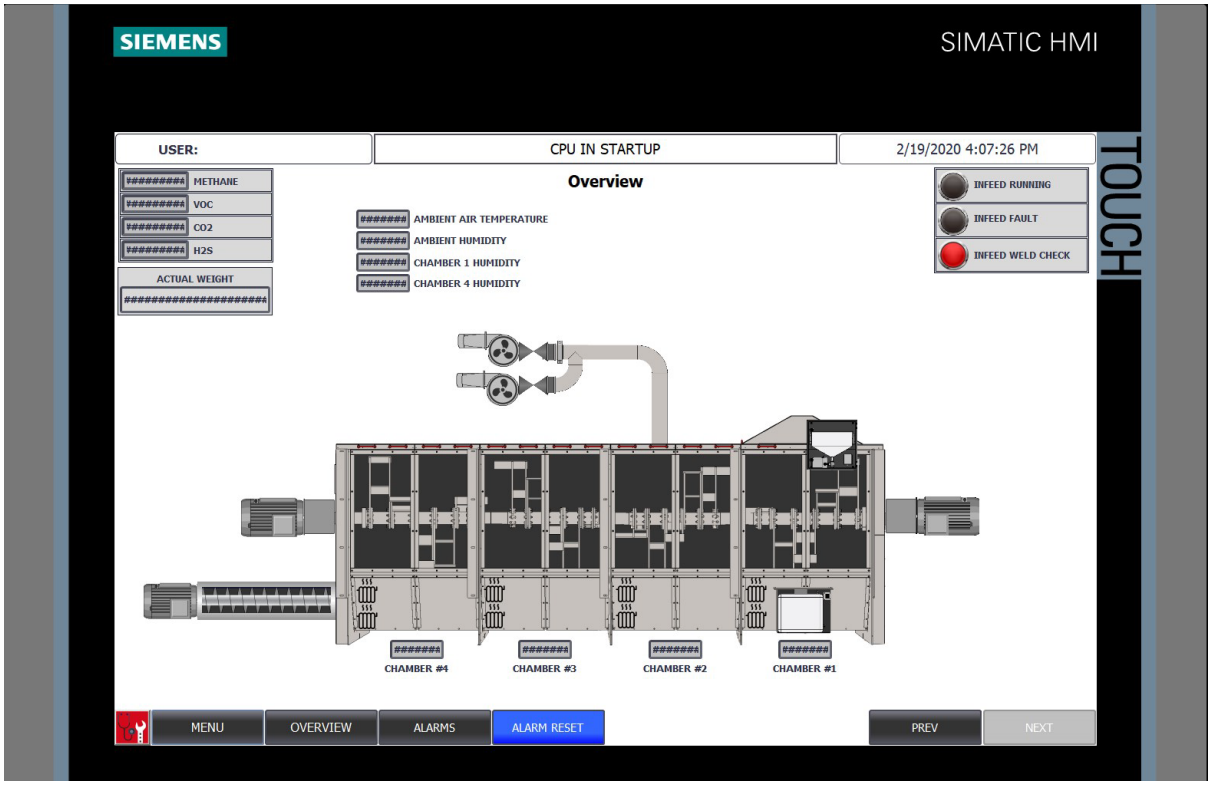
8.7.6 CP01 Slot 14 – Siwarex Weighing System

Information from this module features on a dedicated Settings screen. See the relevant Settings screen for further details.

8.7.7 CP01 Slot 13 & CP02 Slot 11 – Energy Monitoring System

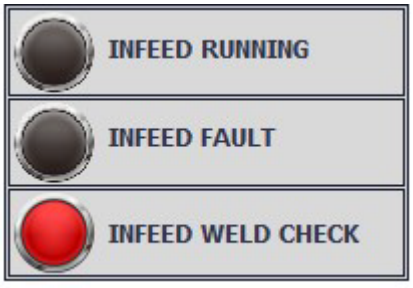
The Energy Monitoring System needs 2 further PLC modules. Information from this module features on a dedicated Settings screen. See the relevant Settings screen for further details.

8.8 Overview Screen



The HMI features an Overview screen that displays a graphical representation of the XO22 machine. The statuses of individual components display on this screen. Any augers, fans and the XO Drive shafts animate individually when running and depict the direction of each VSD.

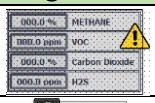
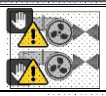
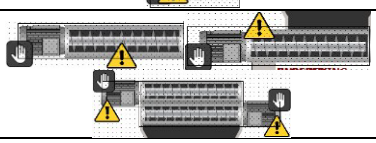
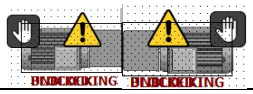
The Infeed system signals are also displayed showing the following information.



- Infeed running is the digital input status from the infeed control panel for running feedback.
- Infeed fault is the general fault status of the infeed control panel.
- Infeed weld check is the feedback from the infeed control panels contactors when de-energised, if the weld check displays red then the contactors contacts have welded shut and as such the circuit will be permanently energised.

8.9 Hot-keys

The overview also features ‘hot-keys’ on all graphically displayed components. When the user presses a hot-key the HMI displays any settings relating to the respective component.

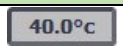
Settings Hot-Key	Settings Pop-up	Security Level Required
	See the Gas Monitoring Settings.	Technician
	See the Extraction Fans Settings.	Operator
	See the respective Auger(s) Settings.	Operator
	See the respective Heating Settings.	Operator
	See the Dosing Control Settings.	Operator
	See the XO Drives Settings.	Operator

8.10 Displayed Values

All values that display on the HMI have an associated status and change colour according to any associated faults, warnings, overflows or underflows.

8.11 Chamber Temperatures

The Chamber #1, Chamber #2, Chamber 3 and Chamber #4 Temperatures display on the HMI Overview with the following statuses.

Status Description	HMI Overview Field Colour
Healthy	
Underflow	
Overflow	
Under temperature	
Over Medium Threshold	
Over High Threshold	

8.11.1 External Ambient Sensors

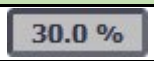
External Ambient values display on the HMI Overview screen with the following statuses:

AMBIENT AIR TEMPERATURE SENSOR VALUE	
Status Description	**HMI Overview Field Colour**
Healthy	
Underflow	
Overflow	
Alarm/ Warning	

AMBIENT HUMIDITY SENSOR VALUE	
Status Description	**HMI Overview Field Colour**
Healthy	
Underflow	
Overflow	

8.11.2 Chamber Humidity Sensors

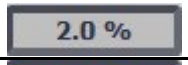
The Chamber #1 Humidity and Chamber #4 Humidity display on the HMI Overview screen with the following statuses.

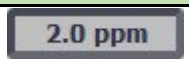
Status Description	HMI Overview Field Colour
Healthy	

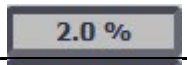
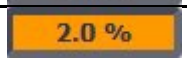
Underflow	
Overflow	

8.12 Gas Monitoring

Gas Monitoring values display on the HMI Overview screen with the following statuses. A warning triangle also displays next to the HMI Overview fields when any Gas Consent Exceeded Alarm activates.

METHANE SENSOR VALUE	
Status Description	**HMI Overview Field Colour**
Healthy	
Underflow	
Overflow	
Alarm/Warning	

VOC SENSOR VALUE	
Status Description	**HMI Overview Field Colour**
Healthy	
Underflow	
Overflow	
Alarm/Warning	

CO2 SENSOR VALUE	
Status Description	**HMI Overview Field Colour**
Healthy	
Underflow	
Overflow	
Alarm/Warning	

H2S SENSOR VALUE	
Status Description	**HMI Overview Field Colour**
Healthy	
Underflow	
Overflow	
Alarm/Warning	

8.13 Actual Weight

The weight, as measured by the Load Cells and Siwarex Module, displays on the HMI Overview screen.

8.14 Further Status Indications

8.14.1 General

The following status indicators may be active on this screen and correspond to the adjacent system component:

-  - The component is in hand/manual mode.

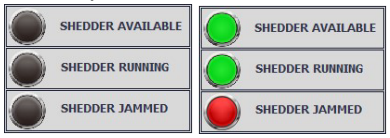
-  - The component is in fault/a related warning is active. This indication flashes on and off every second when active.
- **BLOCKED** - There is a blockage within the component's throughput.
- **UNBLOCKING** - The component is unblocking in Anti-Blockage Mode.

8.15 Component

The graphical overview screen shows the status of all featured components by changing the colour of their respective graphic.

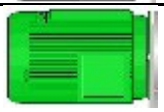
8.16 Shredder Feedback

The status of the Shredder Feedback signals displays on the HMI Overview. A green/red status shows that the respective Shredder Feedback signal is active.



8.17 Levelling Auger #1

Levelling Auger #1 has the following status. This status displays on the HMI Overview screen.

Status Description	HMI Indication
Stopped	
Running	
Fault	

8.17.1 Levelling Auger #2

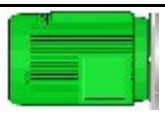
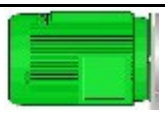
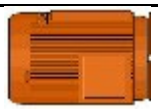
Levelling Auger #2 has the following status. This status displays on the HMI Overview screen.

Status Description	HMI Indication

Stopped	
Running	
Fault	

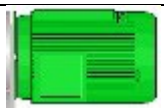
8.18 Infeed Auger and Outfeed Auger

The Infeed & Outfeed Augers have the following statuses. These statuses display on the HMI Overview screen. A warning triangle also displays on the HMI Overview graphic when the auger is not Healthy and the auger shaft () animates when in the Forward or Reverse state to clearly display the augers direction.

Status Description	HMI Indication
Stopped	
Forward (Running)	
Reverse (Running)	
Warning	
Fault	

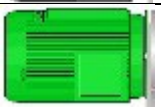
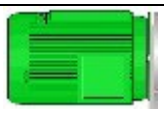
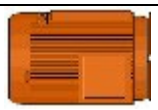
8.19 XO Drive #1

The XO Drive #1 has the following status. This status displays on the HMI Overview screen. A warning triangle also displays on the HMI Overview graphic when the XO Drive #1 is not Healthy and the XO shaft () animates when in the Forward or Reverse state to clearly display the augers direction.

Status Description	HMI Indication
Stopped	
Forward (Running)	
Reverse (Running)	
Warning	
Fault	

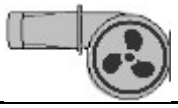
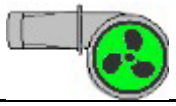
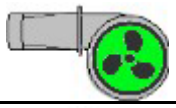
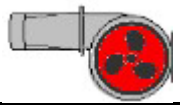
8.20 XO Drive #2

The XO Drive #2 has the following status. This status displays on the HMI Overview screen. A warning triangle also displays on the HMI Overview graphic when the XO Drive #2 is not Healthy and the XO shaft () animates when in the Forward or Reverse state to clearly display the augers direction.

Status Description	HMI Indication
Stopped	
Forward (Running)	
Reverse (Running)	
Warning	
Fault	

8.21 Extraction Fans

The Extraction Fans have the following statuses. These statuses display on the HMI Overview screen. A warning triangle also displays on the HMI Overview graphic when the respective Extraction Fan is not Healthy, or Extraction Valve is in fault. Each Extraction Fan animates in the Forward or Reverse state to clearly display the fans direction.

Status Description	HMI Indication
Stopped	
Forward (Running)	
Reverse (Running)	
Fault	

8.22 Extraction Valves

The Extraction Valves have the following statuses. These statuses display on the HMI Overview screen. A warning triangle also displays on the HMI Overview graphic when the respective Extraction Fan is not Healthy, or Extraction Valve is in fault.

Status Description	HMI Indication
Closed	
Open	
Fault	

8.23 Chamber Heating Statuses

There are 4 chambers associated with the XO6 machine. These all have visually identical heater statuses. These statuses display on the HMI Overview screen. A warning triangle also displays on the HMI Overview graphic when the respective chamber is in fault.

Status Description	HMI Indication
Off	

On	

8.23.1 Individual Heater Statuses

There are 31 individual heater statuses, each one relating to one of the heaters. These are all visually identical. These statuses display on the HMI Overview screen.

Status Description	HMI Indication
Off	
On	
Fault	

8.24 Bacteria Dosing Valve

The Bacteria Dosing Valve has the following status. This status displays on the HMI Overview screen.

Status Description	HMI Indication
Closed	
Open	
Warning	
Fault	

8.25 Bio Stimulant Dosing Pump

The Bio Stimulant Dosing Pump has the following status. This status displays on the HMI Overview screen.

Status Description	HMI Indication
Stopped	
Running	
Warning	
Fault	

8.25.1 Dosing Tanks

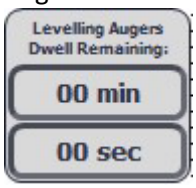
Dosing tank graphics fill to their level in blue. When empty an ↓ arrow appears on the tank. A warning triangle will also display on the respective dosing system if the tank is at Low Level or the dosing system is in fault.

8.26 Drive Direction & Dwell Duration Indications

When the respective drive is in Auto then the following duration indications may display next to the drive.

8.27 Levelling Augers

When the Levelling Augers are off due to their Auto cycle then the following will display next to the augers and count down the remaining dwell time.



8.28 Infeed Auger

When the Infeed Auger is off due to its Auto cycle then the following will display next to the auger and count down the remaining dwell time.

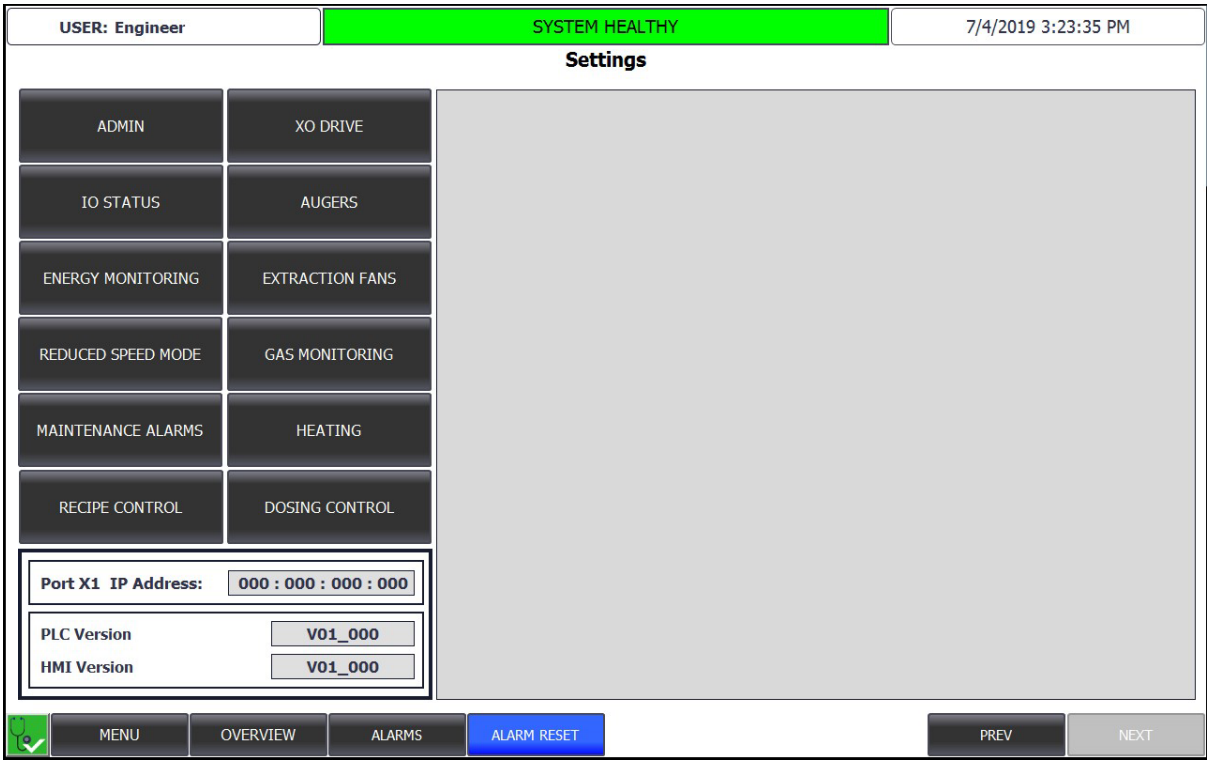
8.29 XO Drive

When in Auto, all durations relating to the XO Drive will count down as displayed below. Only the countdown relevant to the XO Drives current state within its XO cycle will display next to the drive.

8.30 Outfeed Auger

When the Outfeed Auger is off due to its Auto cycle then the following will display next to the auger and count down the remaining dwell time.

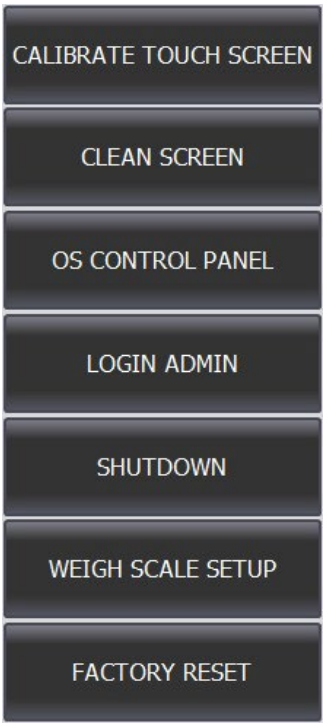
8.31 Settings Screen



The Settings screen has several settings including elevated level features. Screen specific buttons tint grey when selected. For further details on available functionalities, see the subsections that follow.

8.32 Admin Functions

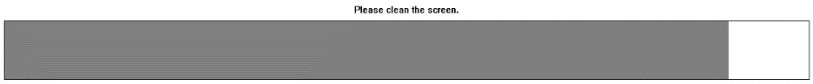
Pressing the ADMIN button toggles on and off the following buttons:



8.32.1 Calibrate Touch Screen

This button produces a calibration screen that allows for Calibration of the HMI touchscreen.

8.32.2 Clean Screen

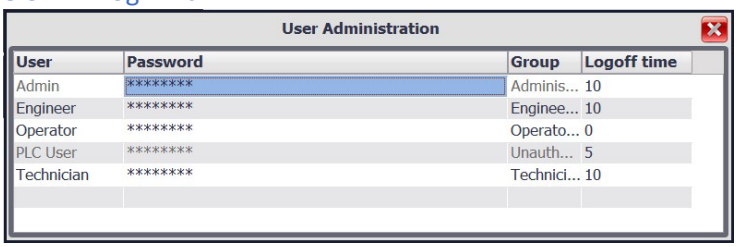


This button produces the following progress bar on a white screen for 30 seconds. The grey-filled section of the progress bar decreases as time elapses. This allows time for the user to clean the HMI screen.

8.32.3 OS Control Panel

Pressing this button accesses the Control Panel of the HMI.

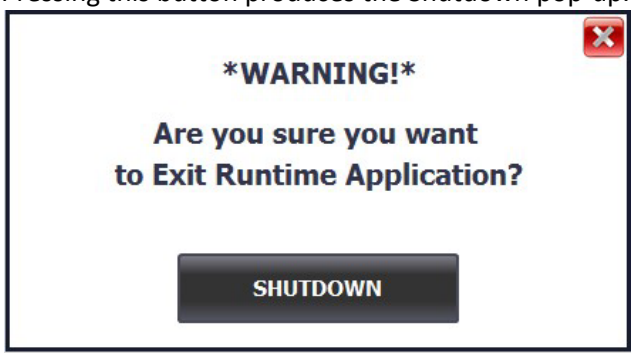
8.32.4 Login Admin



This button produces the User Admin pop-up. From this pop-up usernames, passwords, security clearance and automatic logoff time are parameterizable using the Extended and Numeric OSKs. Automatic logoff time is in minutes and disabled whereby '0'. To close the pop-up, press the button.

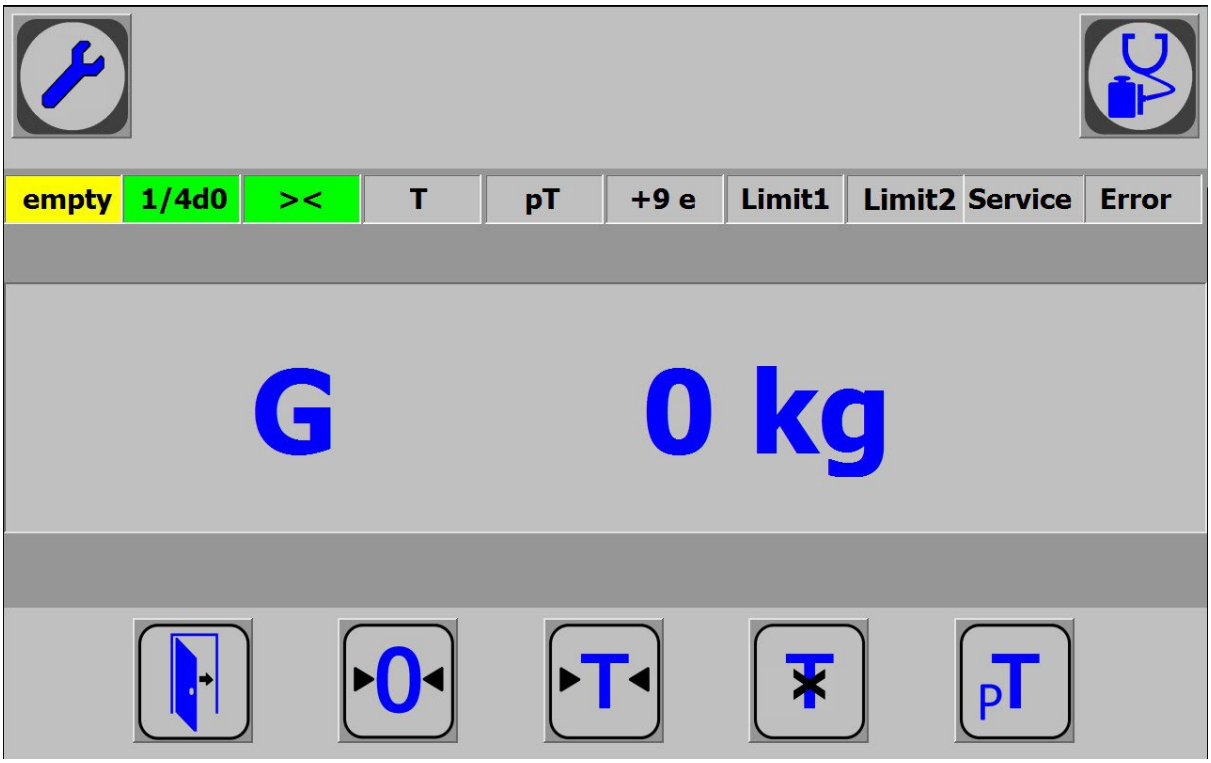
8.32.5 Shutdown

Pressing this button produces the Shutdown pop-up.



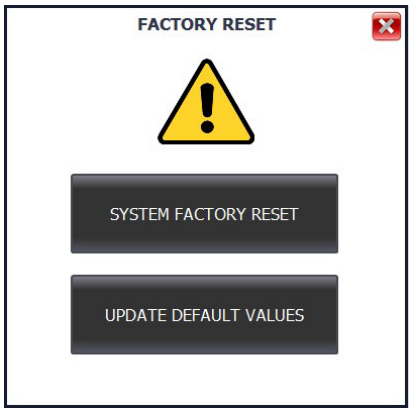
To exit the HMI Runtime Application press SHUTDOWN at Engineer Level. To close the pop-up, press the button.

8.32.6 Weigh Scale Setup



Weigh Scale Setup takes place upon the XO22 commissioning and only trained personnel will ever need to work with these screens. To exit the screen, press the  button. For further information see the Siwarex HMI Operation Manual.

8.32.7 Factory Reset



Pressing the 

button at Admin Level overlays the Confirm Factory Reset Pop-up on top of the Factory Reset Settings.

Pressing the 

button at Admin Level overlays the Update Default Values Pop-up on top of the Factory Reset Settings.

8.33 Confirm Factory Reset Pop-up

Pressing the CONFIRM button at Admin Level resets the XO to its saved default values.

Pressing the CANCEL button or the button closes the pop-up.

8.34 Update Default Values Pop-up

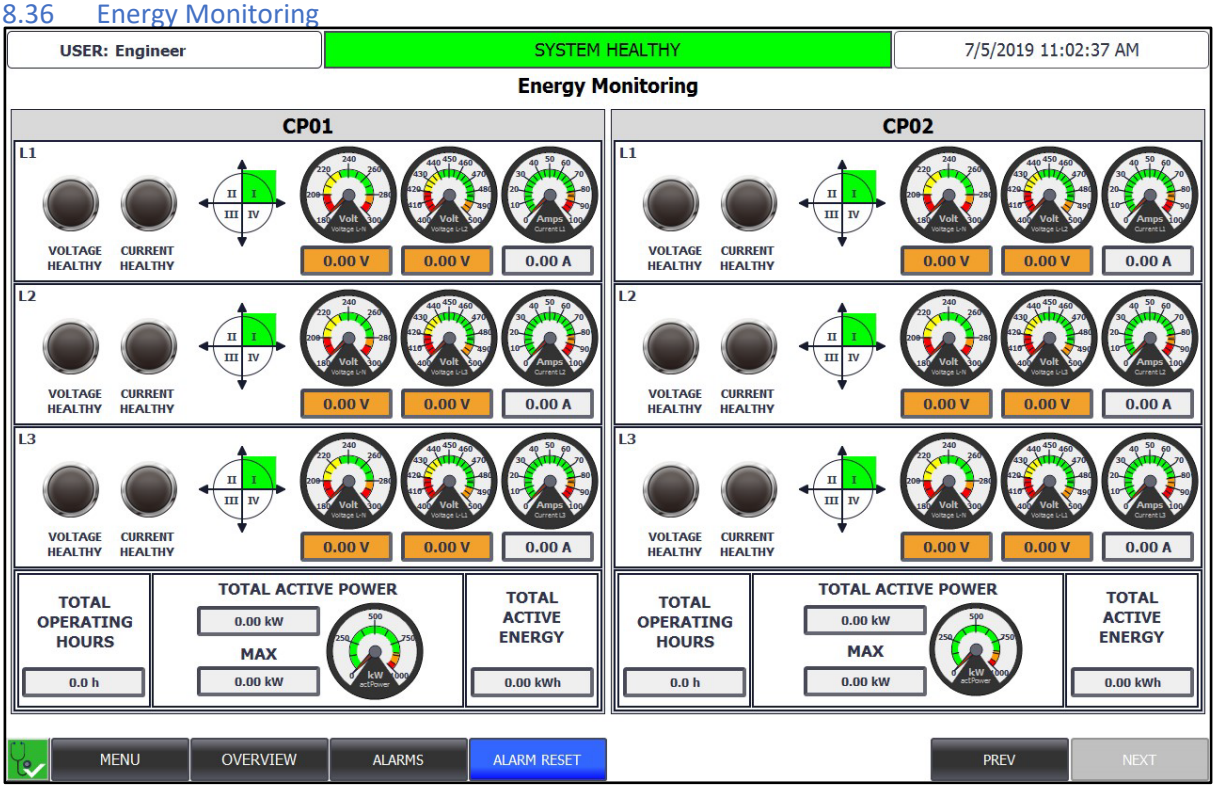
Pressing the CONFIRM button at Admin Level stores the XOs current values as its saved default values.

Pressing the CANCEL button or the button closes the pop-up.

8.35 IO Status Button

This button navigates to the IO Menu screen.

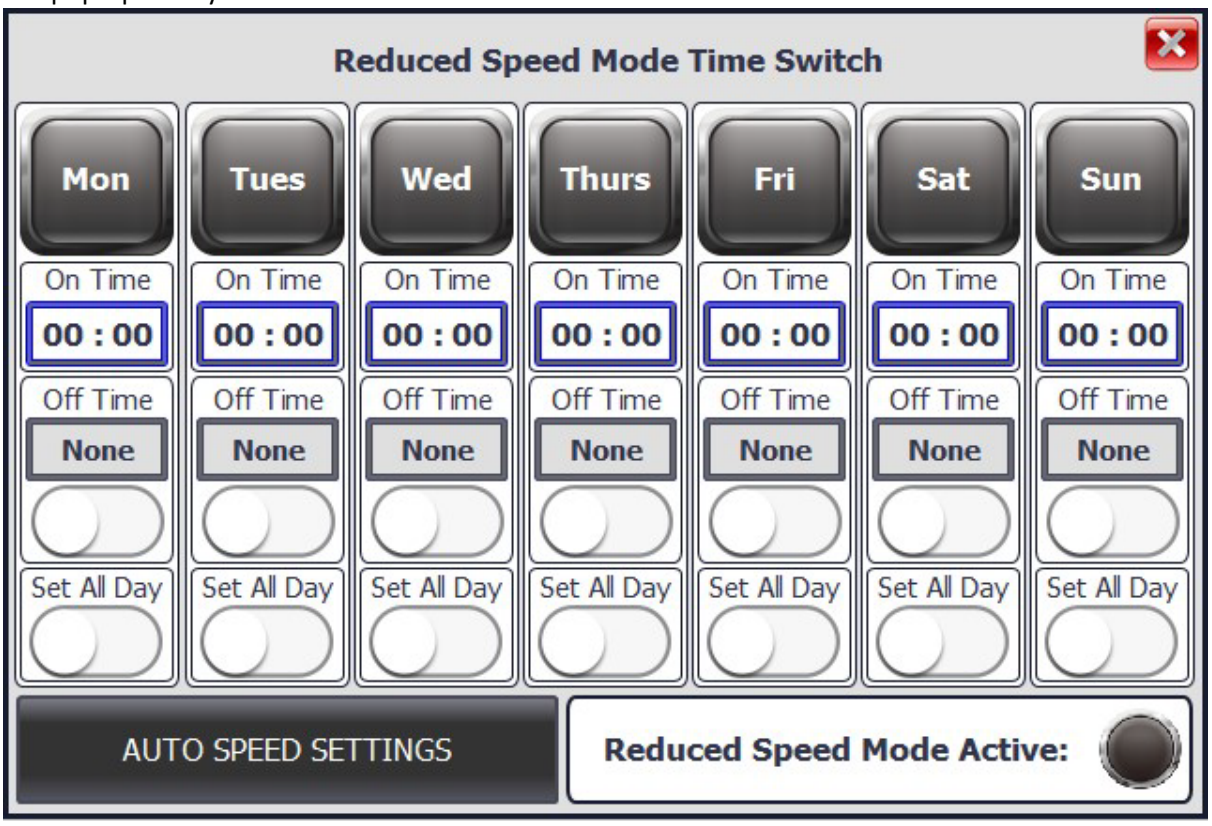
8.36 Energy Monitoring



The Energy Monitoring screen shows Power, Voltage and Current status indications.

8.37 Reduced Speed Mode

This pop-up is only accessible at Technician Level. All related functions need Technician Level or above.



The user can schedule Reduced Speed Mode to activate on different days of the week. The user may select the buttons of the days on which Reduced Speed Mode enables. Note that selected buttons appear as follows:

8.35.1 Set On Time

Set an On Time by pressing the respective blue outlined field and using the Numeric OSK.

8.35.2 Set Off Time

Enable/Disable an Off Time by toggling the Off Time toggle-switch (). Whilst an Off Time is disabled reduced speed mode stays active until the end of that day. Set an Off Time (when enabled) by pressing the respective blue outlined field and using the Numeric OSK. When disabled the off time displays as 

.

8.35.3 Disable Off Time

To set reduced speed mode to be active for an entire day toggle on the respective 

toggle-switch. This switch features for convenience and disables the On Time and Off Time for the given weekday. In this case, reduced Speed Mode be active for the entirety of the selected day.

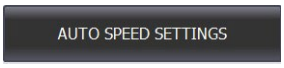
8.35.4 Reduced Speed Mode Indication

The 

indication shows  when Reduced Speed Mode is active and  when inactive.

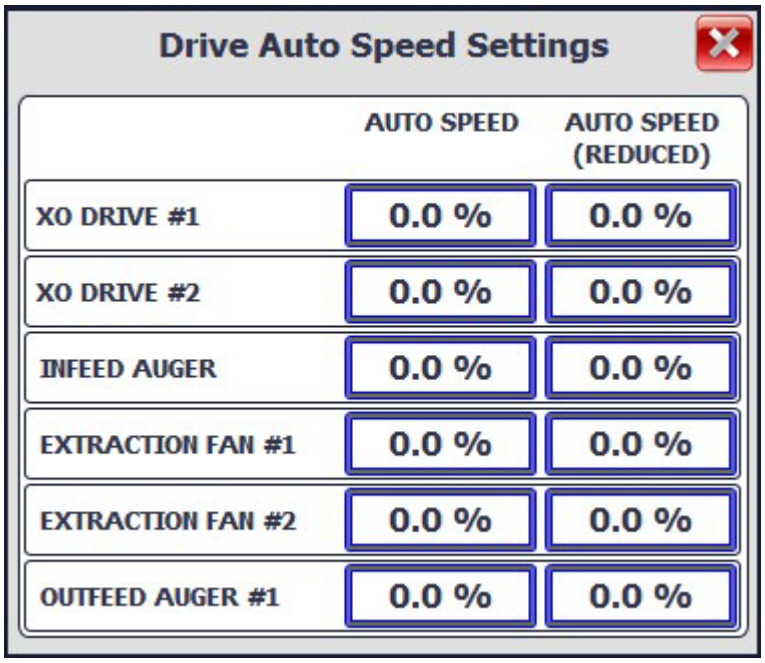
8.35.5 Further Buttons

Pressing the  button closes the Reduced Speed Mode Settings.

Pressing the 

button produces the Auto Speed Settings.

8.35.6 Auto Speed Settings

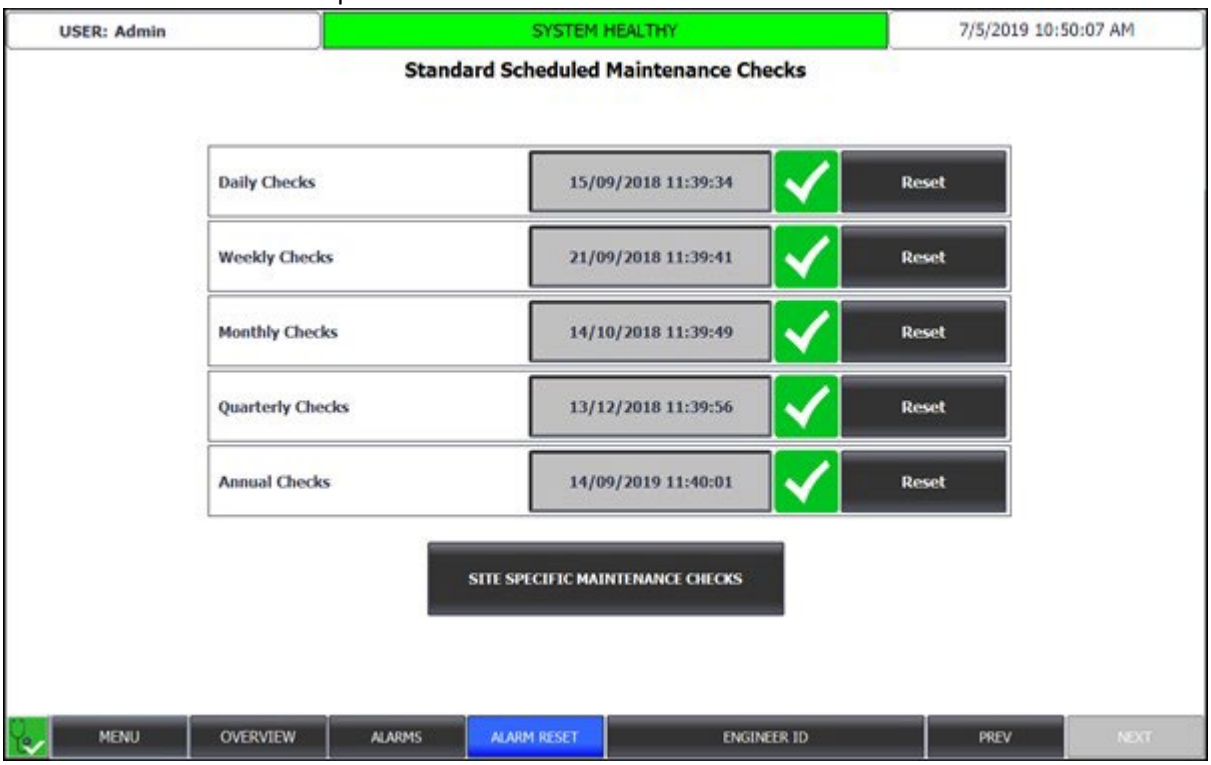


The user may edit any values in a blue outlined field at Engineer Level using the Numeric OSK. Auto Speed Settings close when the user presses the button.

8.38 Maintenance Alarms

8.38.1 Standard Scheduled Checks

This screen is accessible at Operator Level.

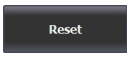


Several standardised maintenance timers are associated with the XO. These are resettable from this screen. The time and date when a given maintenance timer needs reset (when maintenance is due) exists next to the description of the timer.

8.38.2 Maintenance Due

When the HMI time and date reaches the Maintenance Due Date an alarm specific to the timer triggers and the respective  status indication changes to  until the maintenance timer resets. Note that maintenance alarms stay active until the respective maintenance timer resets.

8.38.3 Reset a Maintenance Timer

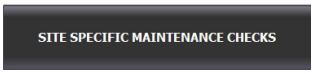
To reset a maintenance timer, begin by pressing the respective 

button. This produces the Enter Engineer PIN pop-up from which the user may confirm timer reset.

8.38.4 Further Buttons

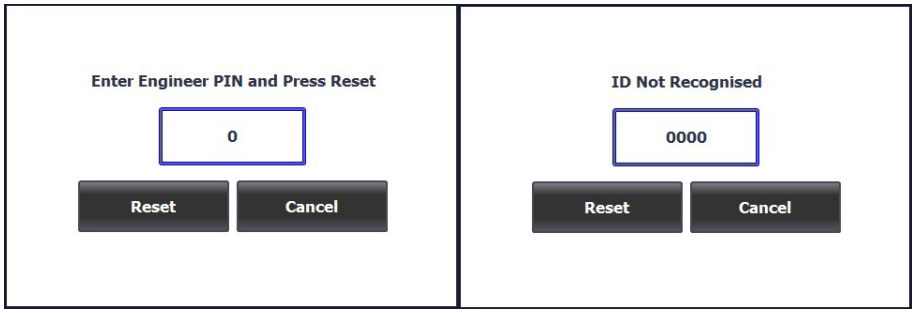
Pressing the 

button produces the Engineer ID Pin Enable pop-up.

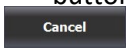
Pressing the 

button produces the Site-Specific maintenance alarm settings.

8.38.5 Engineer ID Pop-up

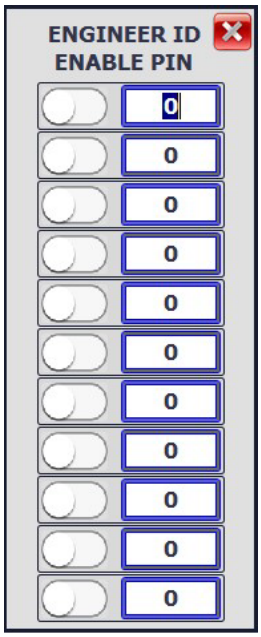


The HMI produces this pop-up upon the user starting a reset of a given maintenance timer. The user may reset the maintenance timer by entering a valid enabled Engineer ID, in the blue-outlined field, using the Numeric OSK and pressing the 

button. If the user enters an invalid Engineer ID, then 'ID Not Recognised' will display. Pressing the 

button closes the pop-up.

8.38.6 Engineer ID/Enable PIN Pop-up

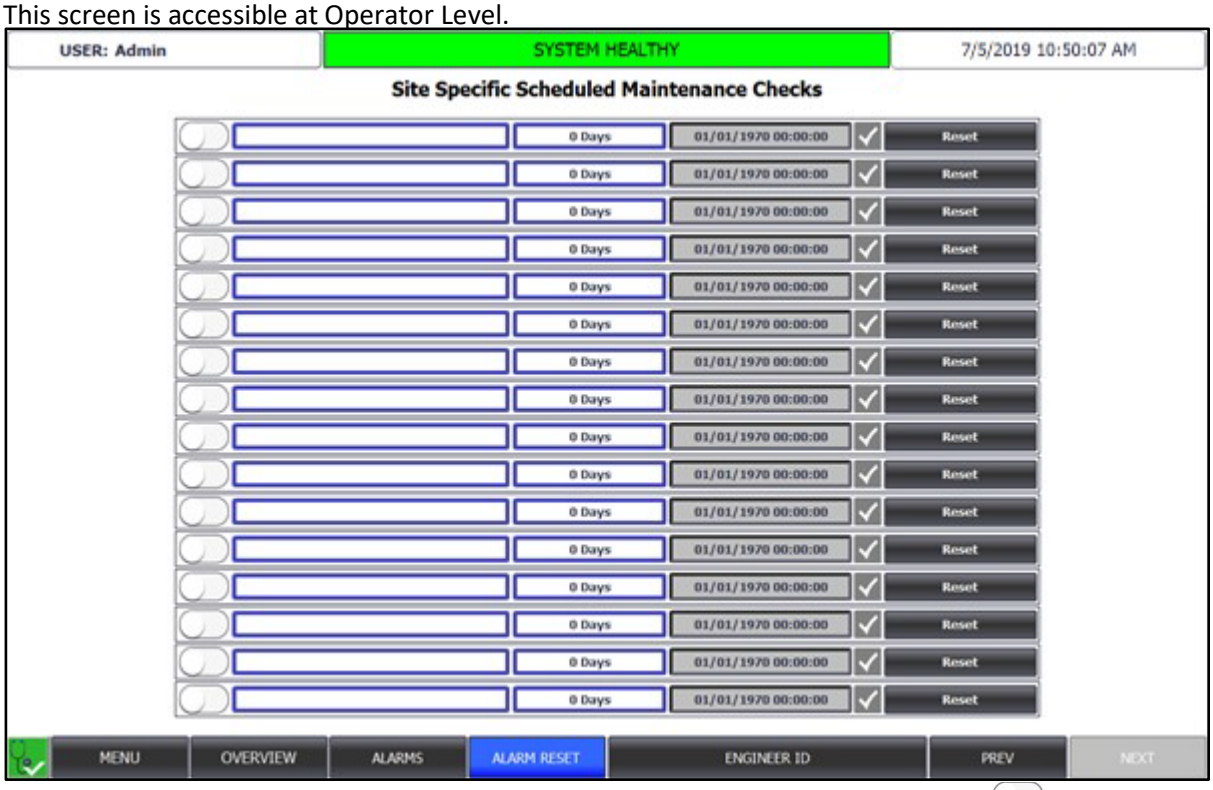


The user needs an enabled Engineer ID to reset the XO22 maintenance timers. To enable/disable an Engineer ID press the respective toggle-switch ( ) at Engineer Level. To change the ID number, press the associated blue-outlined field and use the Numeric OSK to enter data.

To close the pop-up, press the button.

8.39 Site Specific Checks

This screen is accessible at Operator Level.



This screen has further maintenance timers that can be enabled by toggling on the toggle-switch. The user can name timers, and custom durations can be set by pressing the blue-outlined fields and using the Standard OSK and Numeric OSK respectively. Other functionalities of this screen mirror that of the Standard Scheduled Checks.

8.40 Recipe Control

This screen is accessible at Technician Level.

From this screen, the user can load several settings from a recipe, edit recipes and add and delete recipes. Note that once the XO22 PLC has loaded the recipe, it is possible for the user to change settings from various other screens.

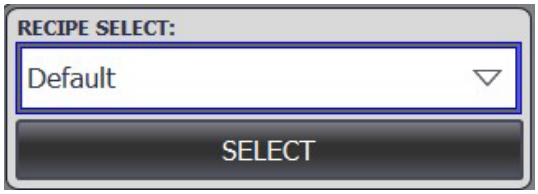
8.40.1 Synchronisation Status Indicator

Next to each setting is a Synchronisation Status Indicator. This shows if current value of the setting matches the recipe – a user may have changed the value elsewhere on the HMI or may have selected a different recipe. Statuses:

- - Recipe value matches the current value.

- - Recipe value does not match the current value.

8.40.2 Recipe Selection

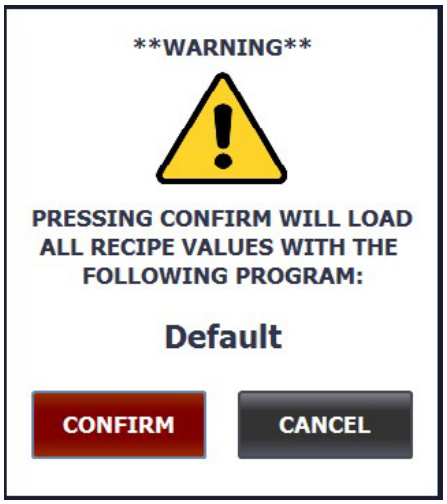


Pressing the blue-outlined field at Technician Level produces the dropdown menu. Selecting a recipe causes the values stored within that recipe to be display on the Recipe Selection screen. Note that selecting a blank recipe causes the dropdown to revert to its previous value.

Pressing the 

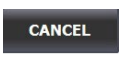
button at Technician Level produces the Confirm Recipe Pop-up.

8.40.3 Confirm Recipe Pop-up



Pressing the 

button at Technician Level loads the settings from the selected recipe.

Pressing the 

button closes the pop-up.

8.40.4 Add New Recipe

8.40.5 Add New Button

Clicking the ADD NEW button at Engineer Level disables Recipe Selection and modification of existing recipes and begins adding a new recipe. Note that the user may add up to 10 new recipes at which point the ADD NEW will disable.

Once the user has pressed the ADD NEW button at Engineer Level, the user may change values by entering data with the Numeric OSK (Engineer Level). Values flash dark blue whilst invalid. Maximum temperatures must exceed their respective minimum temperatures and for setpoints than are not temperatures a 0 value is invalid.

8.40.6 Enter File Name

The user can change the name of the recipe file by pressing the blue-outlined field and entering data with the Standard OSK (Engineer Level). The file name appears as invalid if the file name entered is already in use or if the file name is blank. In either case an File Name is Already in use indication appears.

8.40.7 Cancel Add New Recipe

Pressing the Cancel button at Engineer Level discards any newly entered recipe data and returns to the default Recipe Control screen.

8.40.8 Save New Recipe

Once the recipe and file name only hold valid data then the Save button enables. Upon pressing the enabled Save button at Engineer Level, the recipe saves under the given

file name and the screen returns to the default Recipe Control screen. The user may then select the new recipe (Technician Level).

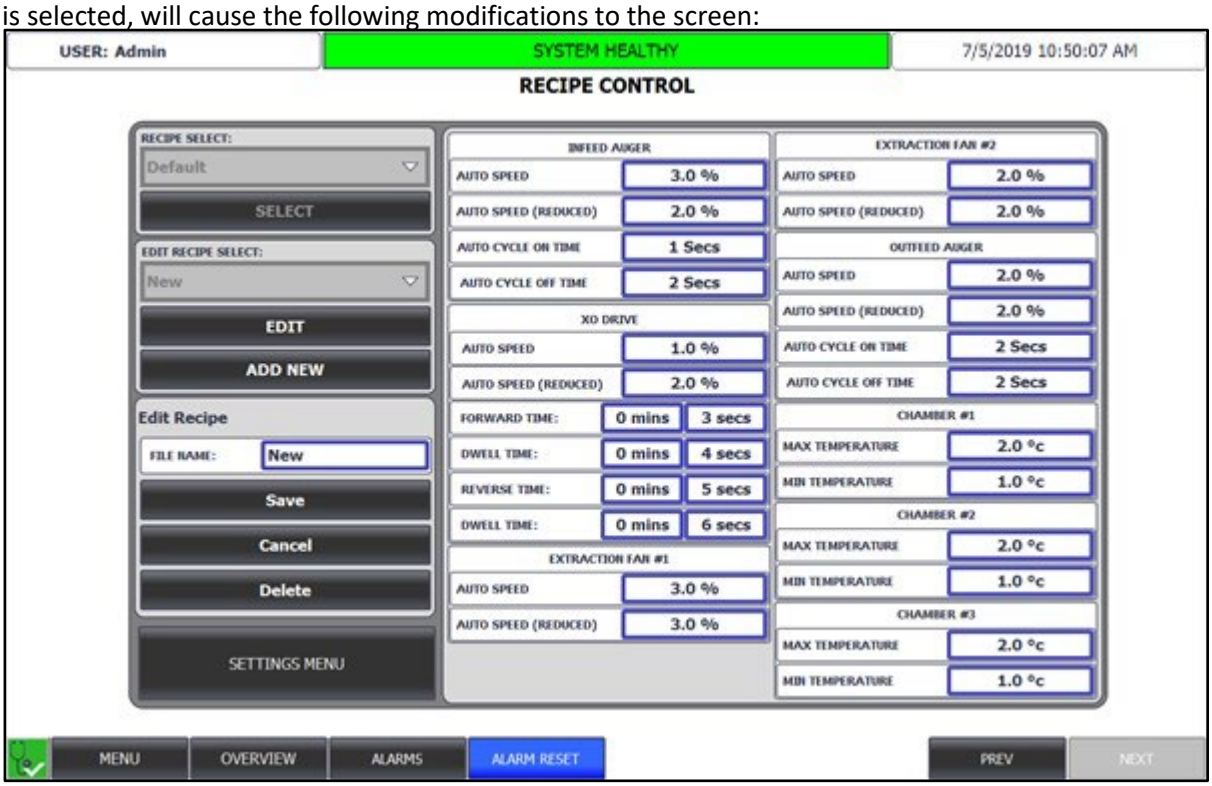
8.40.9 Edit Recipe

The recipe that becomes editable is selectable from the dropdown menu. To produce the dropdown menu, press the blue-outlined field at Engineer Level. Note that selecting a blank recipe causes the dropdown to revert to its previous value. The user cannot edit a recipe whilst the user has selected the 'Default' recipe.

8.40.10 Edit Button

Pressing the 

button at Engineer Level, when any recipe other than the 'Default' recipe is selected, will cause the following modifications to the screen:



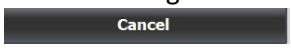
The user may now edit recipe values by pressing the blue-outlined field and entering data with the Numeric OSK (Engineer Level).

8.40.11 Edit File Name

The user may also change the name of the recipe file by using the Standard OSK (Engineer Level). The file name is invalid if the file name entered is already in use or if the file name is blank. In either case an 

indication will appear.

8.40.12 Cancel Edit Recipe

To cancel all changes to the current recipe and revert all values to the way they were before the edit, click the 

button at Engineer Level. In this case, the screen reverts to the default Recipe Control screen.

8.40.13 Save New Recipe

Note that the user must save the values before an update to any of the settings occurs by pressing the Save button at Engineer Level. If any values are invalid, then the respective field(s) flash dark blue. The user cannot save changes to a recipe whilst any of the values are invalid.

8.40.14 Delete Button

Pressing the Delete button produces the Confirm Delete Recipe Pop-up.

8.40.15 Confirm Delete Recipe Pop-up

(Note that the XO22 PLC will replace 'New' with the name of the recipe to remove.)

Pressing the Delete button at Engineer Level deletes the given recipe, close the Confirm Delete Recipe pop-up and return the default Recipe Control Screen.

Pressing the Cancel button closes the pop-up and return the default Recipe Control Screen.

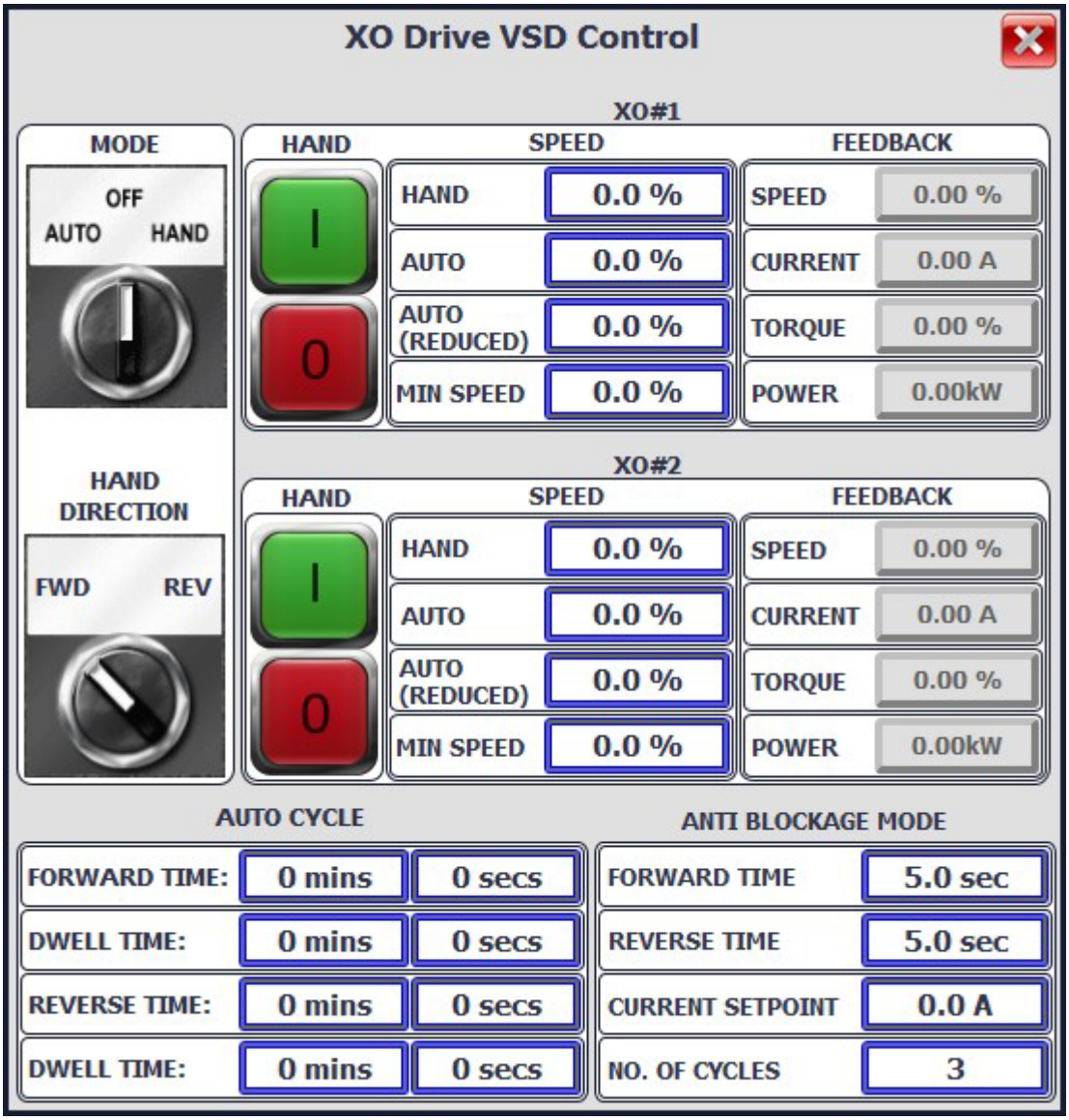
8.41 XO Drives

Pressing this button navigates to the XO Drive VSD Control pop-up (Operator Level).

Pressing this button navigates to the XO Drive #1 Vibration Control pop-up (Operator Level).

Pressing this button navigates to the XO Drive #2 Vibration Control pop-up (Operator Level).

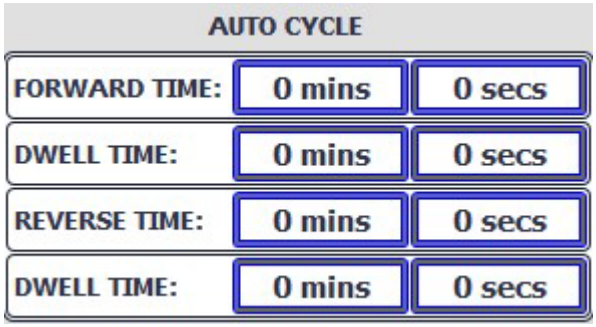
8.41.1 VSD Control



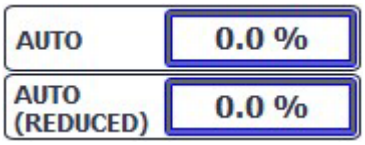
8.41.2 Mode Settings

The Mode selector-switch is common to both drives and allows selection between Hand (manual), off, and Auto mode (Operator Level). Whilst off the motor will not run. See the relevant sections for Auto and Manual mode.

8.41.3 Auto Control



When in Auto Mode the Auto Cycle Settings control both XO Drives. The drives will run in the forward direction for the specified amount of time, wait for the first dwell time, run in the reverse direction for the specified amount of time and then wait for the second dwell time. This process will repeat continuously whilst in Auto. To change durations, select one of the associated blue-outlined fields at Engineer Level and use the Numeric OSK to enter date. Note that minutes and seconds change separately.



Auto Drive speed may be set independently for each drive in an identical manner. The usual speed of the drive can be set by pressing the respective blue-outlined field and entering data with the Numeric OSK at Engineer Level. A reduced speed setting also exists in Auto that can be set by pressing the respective blue-outlined field and entering data with the Numeric OSK at Engineer Level. For further information on when the drive runs at a reduce speed see Reduced Speed Mode.

8.41.4 Manual Control

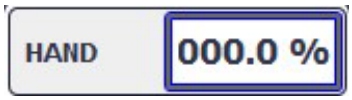
When in Manual Mode, control of the XO Drives takes place at Operator Level as follows.

Pressing the respective button starts the drive running.

Pressing the respective button stops the respective drive.

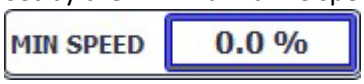
Toggling between FWD / REV changes the direction of both drives. Drives may only manually operate in the same direction.

The speed of the drive in Manual can be set by pressing the respective blue-outlined field at Engineer Level and entering data with the Numeric OSK.



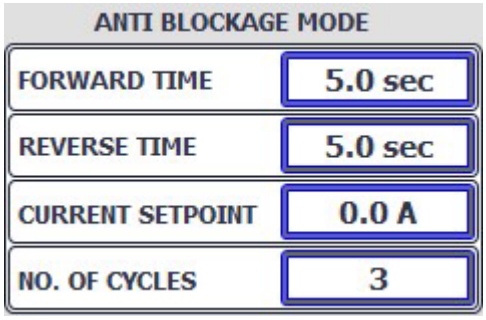
8.41.5 Minimum Drive Speeds

Each Drive has a minimum drive speed that takes priority over all other drive speeds – if the calculated/allocated drive speed of the drive is less than this setpoint then the drive will run at the speed set by the minimum drive speed setpoint as opposed to the calculated/previously allocated speed.



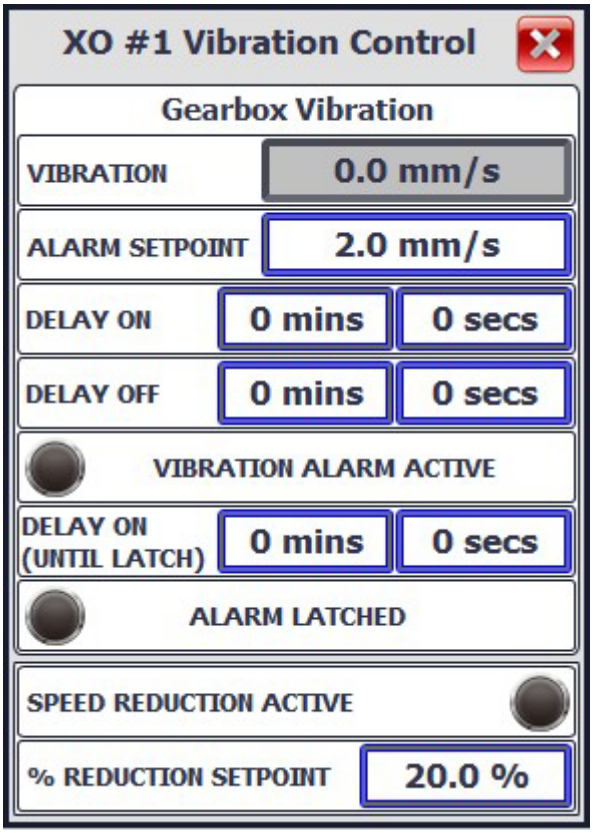
The value of these setpoints may be changed at Engineer level by pressing the blue-outlined field and entering data with the Numeric OSK.

8.41.6 Anti-Blockage Settings



Anti-Blockage settings are common to both XO Drives. Both XO Drives are interlinked when Anti-Blockage Mode is active, and change operate in an identical manual. Either drive will detect a blockage if the motor current exceeds the Current Setpoint. This will activate Anti-Blockage Mode. In Anti-Blockage Mode the drives will continually change direction, running forwards and backwards for the specified durations. After a given number of cycles, if either of the drive currents once again exceed the Current Setpoint, an alarm will occur. Note that if the user has set NO. OF CYCLES to 0 then Anti-blockage mode disables and that the drive must be in Auto Mode for Anti-Blockage Mode to occur. To change parameters, select the blue-outlined field at Engineer Level and enter data using the Numeric OSK.

8.41.7 XO Drive #1 Vibration Control



These settings allow for setup of vibration alarms and vibration related speed reduction associated with the XO Drive #1. Note that Gearbox Vibration settings and Bearing Vibration settings have the exact same interface. The user may change the value of any blue-outlined fields may by pressing on them at Engineer Level and entering data using the Numeric OSK. Note, however, that the user cannot edit alarms setpoints whilst a corresponding alarm indication is active.

8.41.8 Alarm Setpoint

If the VIBRATION is greater than or equal to the ALARM SETPOINT then an alarm will trigger after the DELAY ON time. This will set the VIBRATION ALARM ACTIVE. Whilst the Vibration Alarm is active the respective status indication will turn red.

If the VIBRATION is less than the ALARM SETPOINT then the alarm will clear after the DELAY OFF time.

8.41.9 Alarm Latch

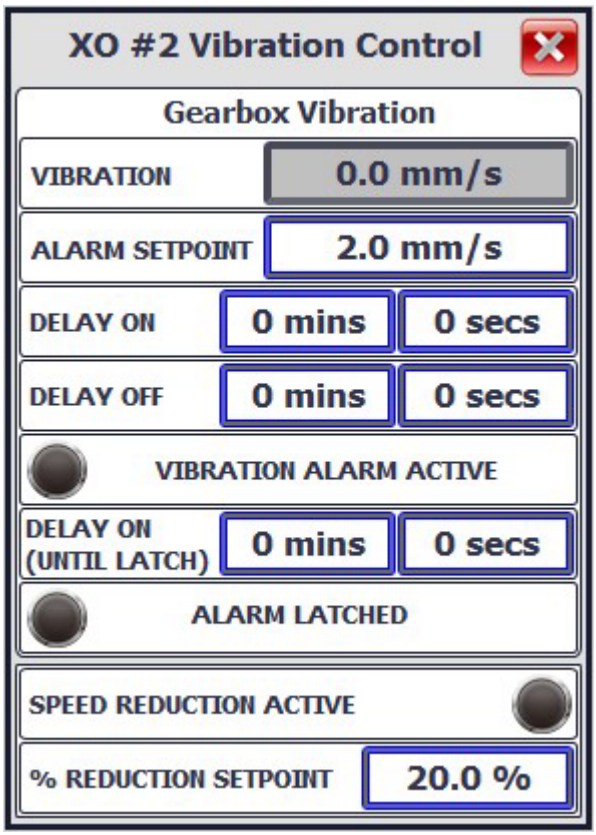
If the alarm is active for longer than DELAY ON (UNTIL LATCH) the time, then the alarm will need manual reset and will not automatically reset when the VIBRATION is no longer more than the ALARM SETPOINT.

8.41.10 Reduction Setpoint

If a vibration alarm is active the speed of the XO Drive #1 reduces to a given percentage of its selected value. This percentage is set via the % REDUCTION SETPOINT. Note that whilst this is occurring the respective status indication will be light blue.

$$Actual\ Speed = Speed \times \frac{Reduction\ Setpoint}{100}$$

8.42 XO Drive #2 Vibration Control



These settings allow for setup of vibration alarms and vibration related speed reduction associated with the XO Drive #1. Note that Gearbox Vibration settings and Bearing Vibration settings have the exact same interface. The user may change the value of any blue-outlined fields may by pressing on them at Engineer Level and entering data using the Numeric OSK. Note, however, that the user cannot edit alarms setpoints whilst a corresponding alarm indication is active.

8.42.1 Alarm Setpoint

If the VIBRATION is greater than or equal to the ALARM SETPOINT then an alarm will trigger after the DELAY ON time. This will set the VIBRATION ALARM ACTIVE. Whilst the Vibration Alarm is active the respective status indication will turn red.

If the VIBRATION is less than the ALARM SETPOINT then the alarm will clear after the DELAY OFF time.

8.42.2 Alarm Latch

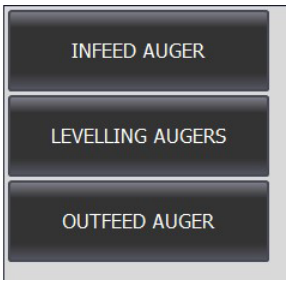
If the alarm is active for longer than **DELAY ON (UNTIL LATCH)** the time, then the alarm will need manual reset and will not automatically reset when the **VIBRATION** is no longer more than the **ALARM SETPOINT**.

8.42.3 Reduction Setpoint

If a vibration alarm is active the speed of the XO Drive #1 reduces to a given percentage of its selected value. This percentage is set via the **% REDUCTION SETPOINT**. Note that whilst this is occurring the respective status indication will be light blue.

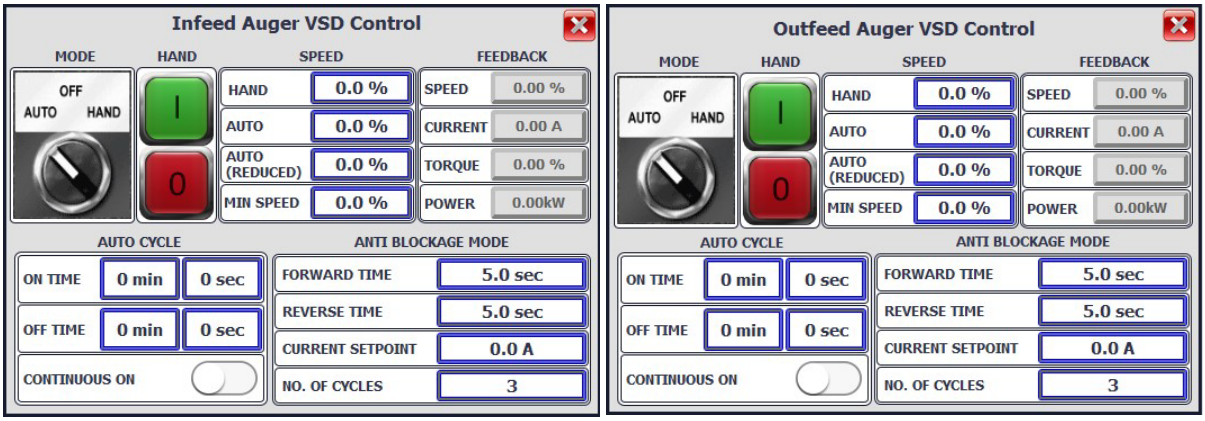
$$Actual\ Speed = Speed \times \frac{Reduction\ Setpoint}{100}$$

8.42.4 Augers



Pressing any one of these buttons at Operator Level will navigate to the respective settings pop-up.

8.42.5 Infeed/Outfeed Auger VSD Control

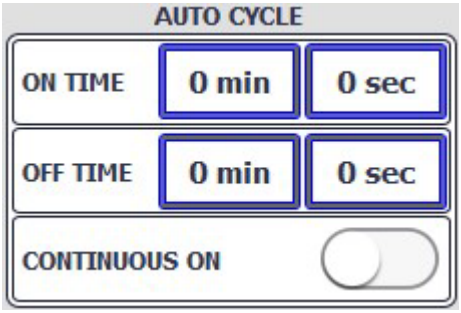


Note that the control interface for both augers is identical. Invalid values flash dark-blue.

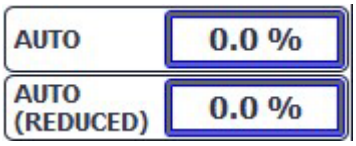
8.42.6 Mode Settings

The Mode selector-switch allows selection between Hand (manual), off, and Auto mode at Operator Level. Whilst off the motor will not run. See the relevant sections for Auto and Manual mode.

8.42.7 Auto Control



When in Auto Mode the Auto Cycle Settings control the Auger VSD. With the CONTINUOUS ON toggle-switch toggled off, the drive will run for the ON TIME and then remain off for the OFF TIME and this process will repeat continuously whilst in Auto. With the CONTINUOUS ON toggle-switch toggled on the drive will run continuously whilst in Auto. To change durations, select one of the associated blue-outlined fields at Engineer Level and input data using the Numeric OSK. Note that minutes and seconds change separately.



The usual speed of the drive in Auto can be set by pressing the respective blue-outlined field at Engineer Level and entering data with the Numeric OSK. There is also a reduced speed setting when running in Auto that can be set in a comparable way (Engineer Level). For further information on when the drive runs at this speed see Reduced Speed Mode.

8.42.8 Manual Control

When in Manual Mode, control of the auger takes place at Operator Level as follows.

Pressing the button starts the drive running.

Pressing the button stops the drive.

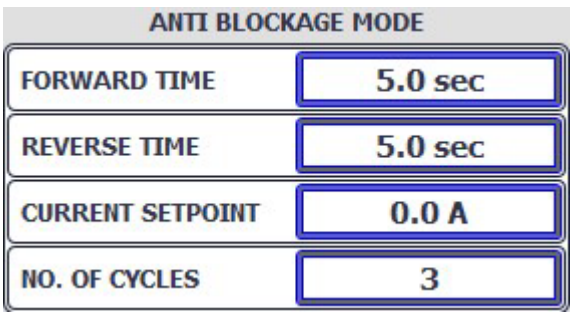
The speed of the drive in Manual can be set by pressing the respective blue-outlined field at Engineer Level and entering data with the Numeric OSK.

8.42.9 Minimum Auger Speeds

Each auger has a minimum drive speed that takes priority over all other auger speeds – if the calculated/allocated auger speed of the auger is less than this setpoint then the auger will run at the speed set by the minimum auger speed setpoint as opposed to the calculated/previously allocated speed.

The value of these setpoints may be changed at Engineer level by pressing the blue-outlined field and entering data with the Numeric OSK.

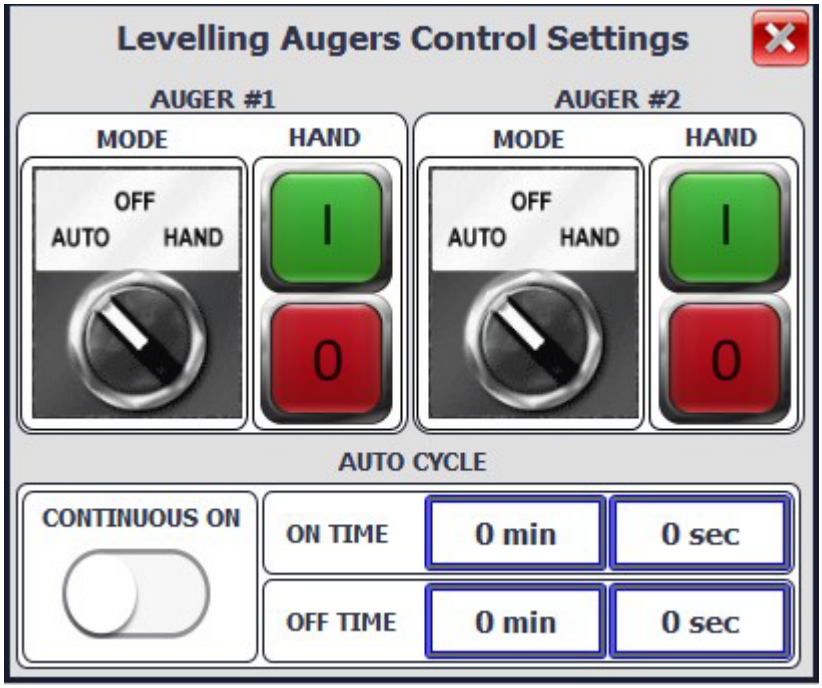
8.42.10 Anti-Blockage Settings



The drive will detect a blockage when the current exceeds the Current Setpoint. This will activate AntiBlockage Mode. In Anti-Blockage Mode the drive will continually change direction, running forwards and backwards for the specified durations. After a given number of cycles, if the current once again exceeds the Current Setpoint, an alarm will occur. Note that if the user has set NO. OF CYCLES to 0 then Anti-blockage mode disables and that the drive must be in Auto Mode

for Anti-Blockage Mode to occur. To change parameters, select the blue-outlined field at Engineer Level and enter data using the Numeric OSK.

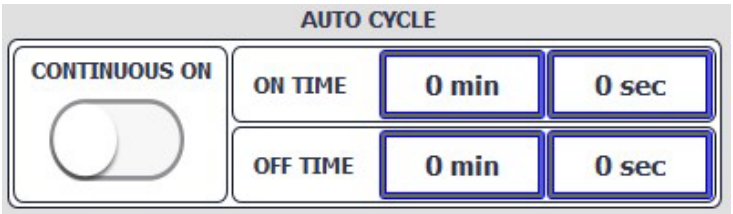
8.43 Levelling Augers Control



8.43.1 Mode Settings

The Mode selector-switch allows selection between Hand (manual), off, and Auto mode at Operator Level. Whilst off the motor will not run. See the relevant sections for Auto and Manual mode.

8.43.2 Auto Control



When in Auto Mode the Auto Cycle Settings control the Auger VSDs. With the CONTINUOUS ON toggle-switch toggled off, the drive will run for the ON TIME and then remain off for the OFF TIME and this process will repeat continuously whilst in Auto. With the CONTINUOUS ON toggle-switch toggled on the drive will run continuously whilst in Auto. To change durations, select one of the associated blue-outlined fields at Engineer Level and enter data using the Numeric OSK. Note that minutes and seconds change separately.

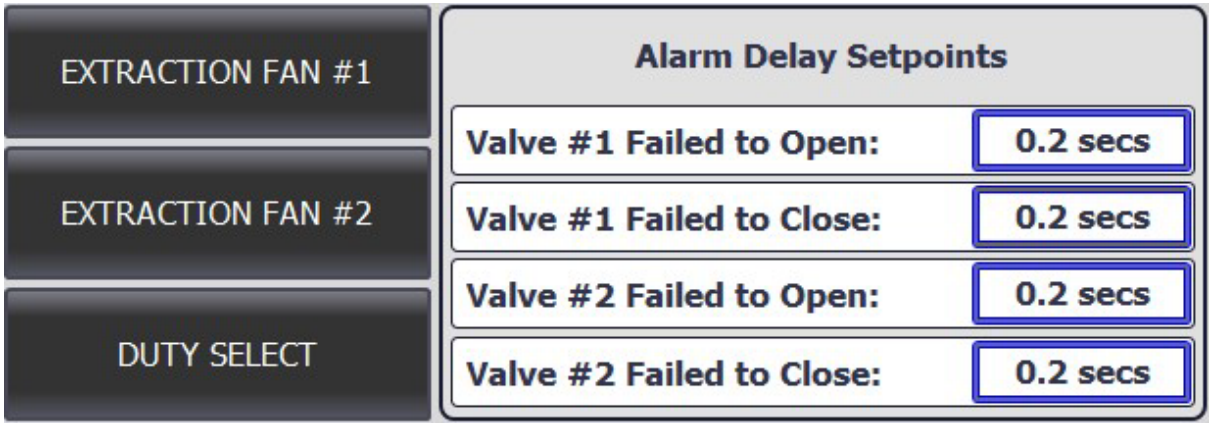
8.43.3 Manual Control

When in Manual Mode, control of each Levelling Auger is identical and takes place at Operator Level as follows.

Pressing  the button starts the auger running.

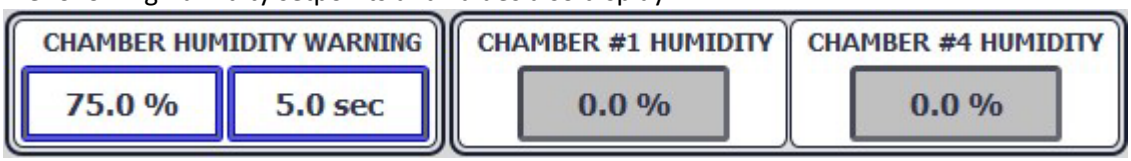
Pressing the button stops the augers.

8.44 Extraction Fans



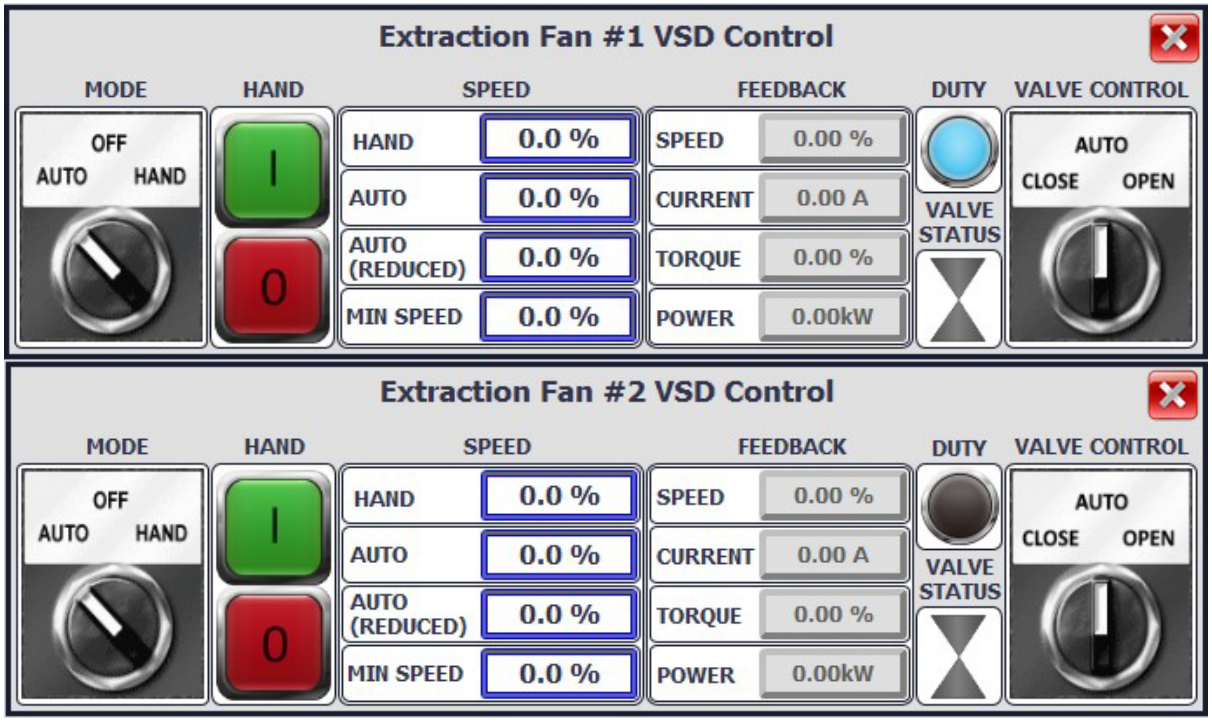
See the relevant subsection for settings that appear from pressing each button at Operator Level. Note that by default, the Extraction Valve Alarm Delay setpoints display. The user may change these values by pressing the respective blue-outlined field at Engineer Level and entering data with the Numeric OSK.

The following humidity setpoints and values also display.



The user may change these values by pressing the respective blue-outlined field at Engineer Level and entering data with the Numeric OSK. Note that the Humidity Warning Setpoints relate to both the Chamber #1 and Chamber #4 Humidity and trigger a common ‘Chamber Humidity Exceeds’ alarm.

8.44.1 Extraction Fan VSD Control



Note that the control interface for both Extraction Fans is identical.

8.44.2 Fan Mode Settings

The Mode selector-switch allows selection between Hand (manual), off, and Auto mode at Operator Level. Whilst off the motor will not run. See the relevant sections for Auto and Manual mode.

8.44.3 Auto Control

The usual speed of the drive in Auto can be set by pressing the respective blue-outlined field at Engineer Level and entering data with the Numeric OSK. There is also a reduced speed setting when running in Auto that can be set in a comparable way (Engineer Level). For further information on when the drive runs at this speed see Reduced Speed Mode.

Note that when in Auto the drive will only run when the duty selection indicator is light blue.

8.44.4 Manual Control

When in Manual Mode, control of the Extraction Fan takes place as follows.

Pressing  the button starts the drive running (Operator Level).

Pressing the button stops the drive (Operator Level).

The speed of the drive in Manual can be set by pressing the respective blue-outlined field and entering data with the Numeric OSK (Engineer Level).

8.44.5 Minimum Fan Speeds

Each fan has a minimum fan speed that takes priority over all other fan speeds – if the calculated/allocated fan speed of the fan is less than this setpoint then the fan will run at the speed set by the minimum fan speed setpoint as opposed to the calculated/previously allocated speed.

The value of these setpoints may be changed at Engineer level by pressing the blue-outlined field and entering data with the Numeric OSK.

8.44.6 Valve Mode Settings

The Mode selector-switch allows selection between Close (manual), Open (manual), and Auto mode at Operator Level. In Auto the valve will open when the respective Extraction Fan is called to run.

8.44.7 Valve Status

Status Description	HMI Indication
Closed	
Open	
Fault	

8.45 Extraction Fan Duty Selection

8.45.1 Duty Status Indicators

The respective status indicator shows in light when the extraction fan is in duty and grey otherwise.

8.45.2 Mode Settings

The Duty Mode selector-switch allows the user to change the mode of Duty Selection between Manual and Auto mode at Technician Level. See the relevant sections for Auto and Manual mode.

8.45.3 Auto Control

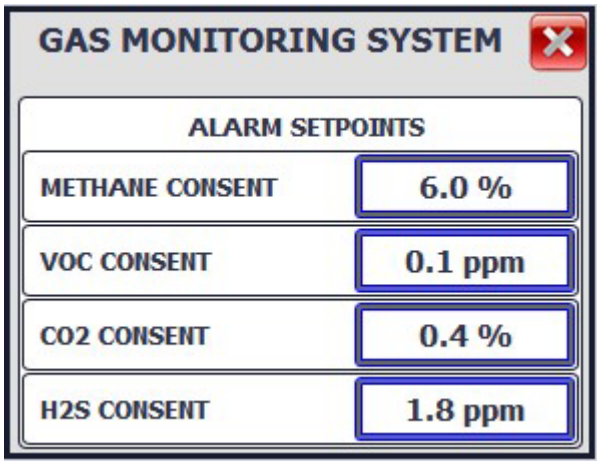
When in Auto Mode the Extraction Fans will automatically switch Duty when the AUTO CHANGEOVER TIME elapses. To set the AUTO CHANGEOVER TIME press the blue-outlined field at Technician Level and enter data using the Numeric OSK.

8.45.4 Manual Control

MANUAL SWAP

When in Manual Mode the Extraction Fans will switch Duty when the user presses the button at Technician Level.

8.46 Gas Monitoring



If a sensor reading exceeds these setpoints an individual alarm will trigger relating to the sensor value. The user may change these setpoints by pressing the blue-outlined field and entering data with the Numeric OSK at Engineer Level.

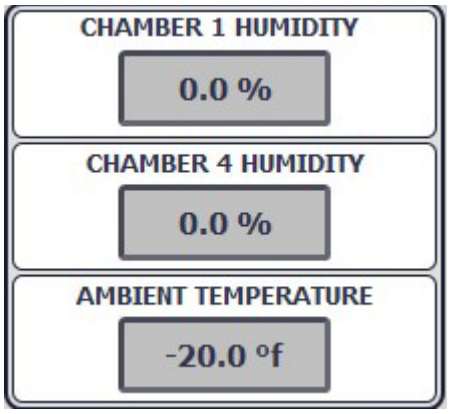
8.47 Heating

8.47.1 Buttons

Pressing a CHAMBER button at Operator level will produce the respective Heating Control settings.

8.47.2 Displayed Values

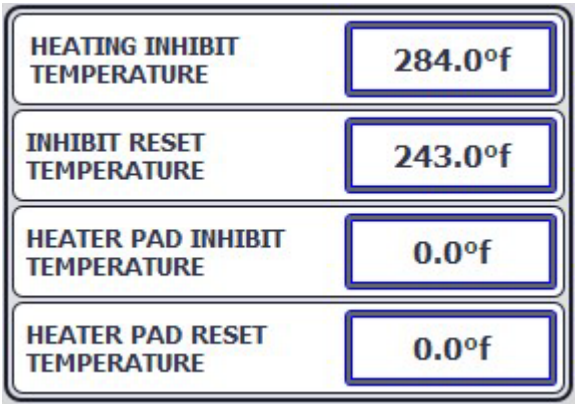
The following values display when the heating button is pressed at Operator level.



8.47.3 Setpoints

The following setpoints display when the heating button is pressed at Operator level.

8.47.4 Heater Inhibit Setpoints

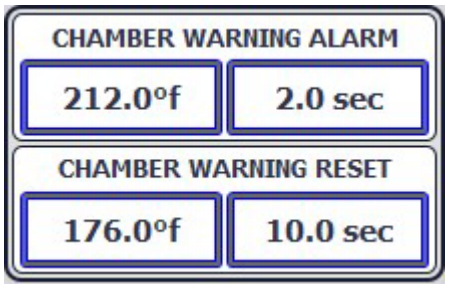


If the core temperature in any chamber exceeds the heating inhibit temperature, then heating will inhibit in the respective chamber. Heating will continue to be inhibited until the core temperature falls below the inhibit reset temperature and a minimum of 20 seconds has elapsed since the chamber was inhibited.

If both core temperature sensors are in fault in a chamber, then the same basis for control will be used except the Heater pad sensor readings will be used instead of readings from the core temperature sensors. If any heater pad exceeds the heater pad inhibit temperature, then heating will inhibit in the respective chamber. Heating will continue to be inhibited until all of the heater pad temperatures fall below the heater pad reset temperature and a minimum of 20 seconds has elapsed since the chamber was inhibited.

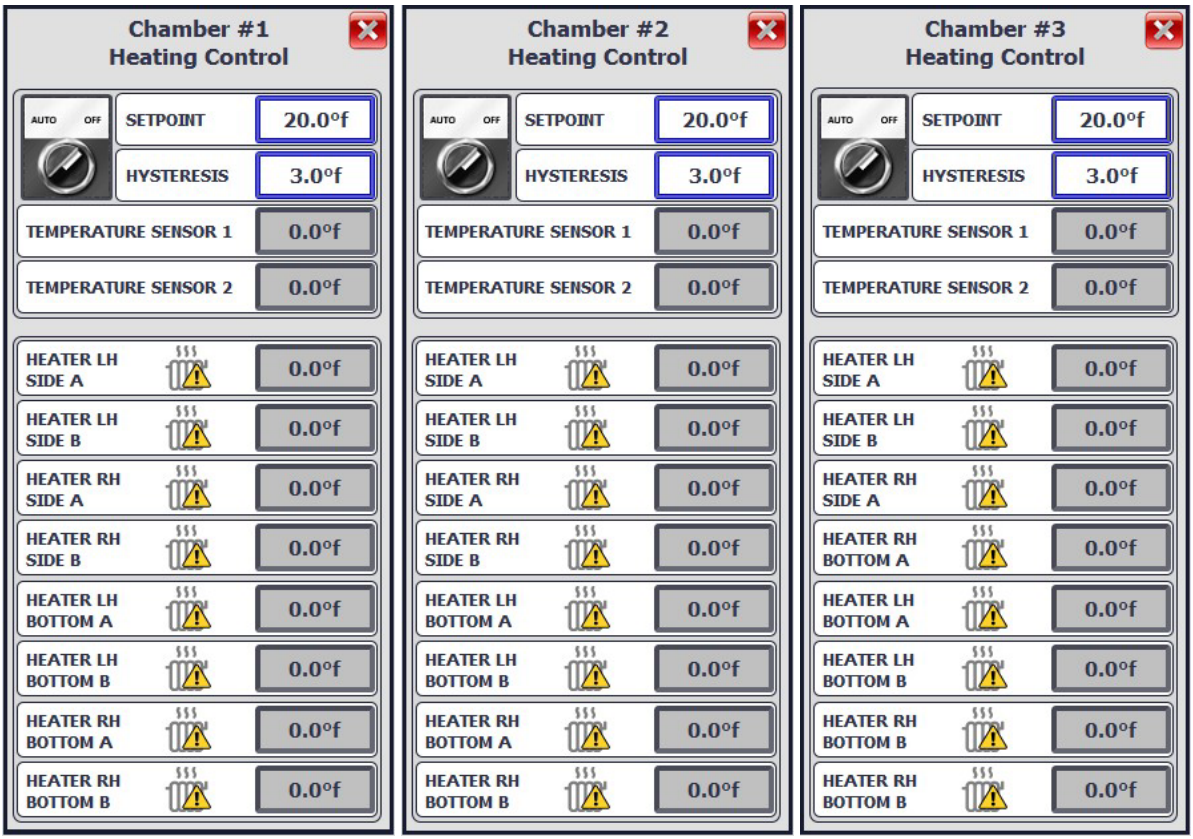
To change the value of a setpoint, press the respective blue-outlined at Engineer level and enter data using the Numeric OSK.

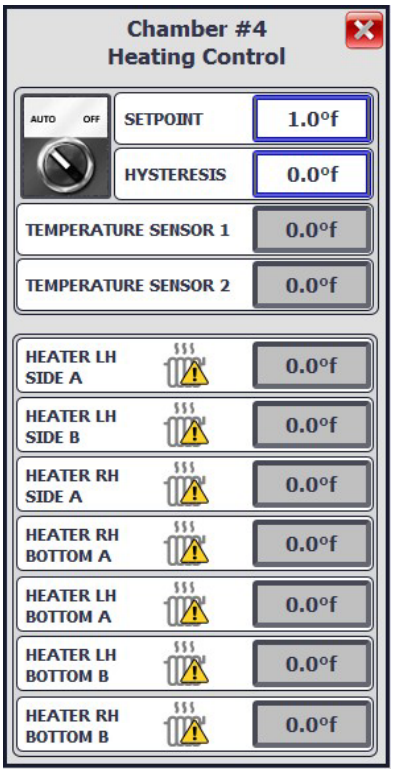
8.47.5 Chamber Warning Alarm Setpoints



The respective chamber warning alarm will activate when the given chamber sensor temperature sensor reads over the chamber warning alarm temperature setpoint for the duration of the chamber warning alarm hysteresis. The chamber warning alarm will de-activate when the same given sensor reads less than the chamber warning reset setpoint for the duration of the chamber warning reset alarm hysteresis. To change the value of a setpoint, press the respective blue-outlined at Engineer level and enter data using the Numeric OSK.

8.48 Heating Control





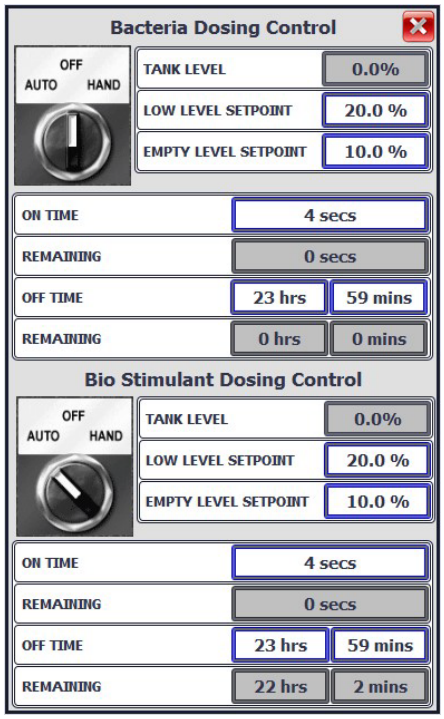
The Heaters have two modes; ‘Auto’ and ‘Off’. When the user has selected ‘Off’ then the heaters in the respective chamber will be permanently off. In ‘Auto’, a setpoint and a hysteresis value control the Heaters in each chamber.

The user may change the mode of operation for each chamber by pressing the ‘Auto’/’Off’ selector switch at Operator Level.

The user may change setpoint and hysteresis settings at Engineer Level by pressing on the respective blue-outlined field and entering data using the Numeric OSK.

If the user presses the respective button, then the respective Heating Control pop-up will close.

8.49 Dosing Control



Note that the control interfaces for the Bacteria Dosing Control and Bio Stimulant Dosing Control are identical.

8.49.1 Mode Settings

The Mode selector-switch allows selection between Hand (manual), off, and Auto mode at Operator Level. Whilst off dosing will disable. See the relevant sections for Auto and Manual mode.

8.49.2 Auto Control

When in Auto Mode dosing will be enabled for the ON TIME and then remain off for the OFF TIME and this process will repeat continuously. To change durations, select one of the associated blue-outlined fields and use the Numeric OSK. Note that hours, minutes and seconds change separately.

8.49.3 Manual Control

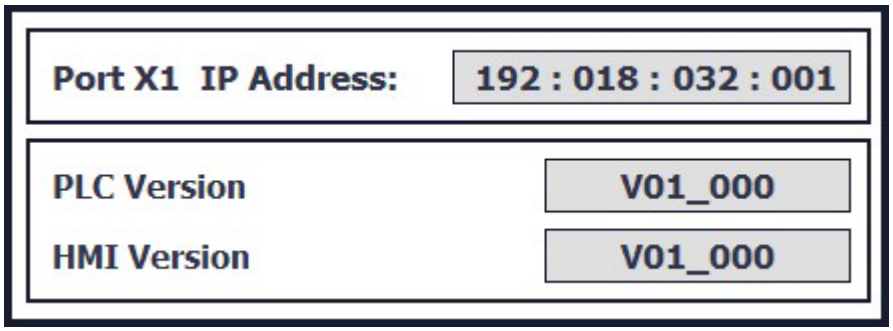
In Manual Mode dosing is always enabled.

8.49.4 Alarm Setpoints

If the TANK LEVEL falls below the LOW LEVEL SETPOINT a low-level alarm will sound, a ⚠ will flash next to the heading of the Dosing Control that generated the alarm and an LOW LEVEL - DOSING IS REDUCED 50% indication will appear underneath the respective setpoints
and flash red. Also, the dosing on duration will halve.

If the TANK LEVEL falls below the EMPTY LEVEL SETPOINT a tank empty alarm will sound, a ⚠ will flash next to the heading of the Dosing Control that generated the alarm and an EMPTY LEVEL - DOSING IS INHIBITED indication will appear underneath the respective alarm setpoints
and flash red to show that dosing is inhibited.
The user may change the values of setpoints by pressing on the respective blue-outlined field at Engineer Level and entering data using the Numeric OSK.

8.50 IP Address and Software Versions



The IP Address of Port X1 corresponds to the IP Address of the XO22 PLC.

Both the PLC and HMI and versioned separately and as per TAC Software versioning standards:
Digits to the right of the underscore increase upon a minor revision or internal revision. Digits to the left of the underscore increment upon a major revision.

9 Safety

9.1 Emergency Stops

An emergency stop button features on the control panel door of the XO22 machine. Further emergency stops feature at the outfeed end of the machine and at the infeed control system.

Once activated, any emergency stop inhibits the following components of the XO22 system:

- Shredder
- Levelling Auger #1
- Levelling Auger #2
- Infeed Auger
- XO Drive #1
- XO Drive #2
- Outfeed Auger
- Extraction Fan #1
- Extraction Valve #1 Extraction Fan #2
- Extraction Valve #2

- Chamber #1 Heaters
- Chamber #2 Heaters
- Chamber #3 Heaters
- Bacteria Dosing System
- Bio Stimulant Dosing System

Activating any of the emergency stop buttons generates an HMI alarm and the activation of an emergency stop shows on the status bar, assuming a higher priority indication is not present.

Each emergency stop button needs manually releasing once pressed. Pressing the safety reset push button on the door of the control panel then returns the system to a healthy state.

9.1.1 Auto Safety Reset

When power restores to the XO22 system after a power failure, 3 seconds after PLC Start-up, a relay will be pulsed for a 2 seconds period. This resets the safety circuit and returns the machine to a healthy state.

9.2 415V/480V MCCB Isolators

A 415V/480V MCCB isolator features on the front of both XO22 control panels. The isolator voltage rating will depend upon whether the panels need to be CE or UL compliant respectively and this will depend upon the destination of the XO22 machine. The switch needs to be in the ‘On’ position for each panel to receive power. If an isolator trips, then the handle will turn to face ‘Trip’. Upon a trip occurring, the user must turn the handle to reset before power will restore when the switch switches to ‘On’ again.

9.3 Programming Port

An external connector that accepts an ethernet cable is accessible on the outside of the control panel of the XO22 machine. This allows for programming the XO22 HMI and PLC without having to open the panel door.

10 – Alarm List

10.1 Analogue Input Overflow

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Bacteria Tank Level Analogue Input Overflow	Alarm	Bacteria Tank Level Analogue Input Overflow	None	None
Bio Stimulant Tank Level Analogue Input Overflow	Alarm	Bio Stimulant Tank Level Analogue Input Overflow	None	None
Extract Humidity Analogue Input Overflow	Alarm	Extract Humidity Analogue Input Overflow	None	None
Chamber Humidity Analogue Input Overflow	Alarm	Chamber Humidity Analogue Input Overflow	None	None
Ambient Air Temperature Analogue Input Overflow	Alarm	Ambient Air Temperature Analogue Input Overflow	None	None
Ambient Humidity Analogue Input Overflow	Alarm	Ambient Humidity Analogue Input Overflow	None	None
Methane Sensor Analogue Input Overflow	Alarm	Methane Sensor Analogue Input Overflow	None	None
VOC Sensor Analogue Input Overflow	Alarm	VOC Sensor Analogue Input Overflow	None	None
Carbon Dioxide Sensor Analogue Input Overflow	Alarm	Carbon Dioxide Sensor Analogue Input Overflow	None	None
Hydrogen Sulphide Sensor Analogue Input Overflow	Alarm	Hydrogen Sulphide Sensor Analogue Input Overflow	None	None
XO#1 Gearbox Vibration Sensor Analogue Input Overflow	Alarm	XO Gearbox Vibration Sensor Analogue Input Overflow	None	None
XO#2 Gearbox Vibration Sensor Analogue Input Overflow	Alarm	XO Bearing Vibration Sensor Analogue Input Overflow	None	None
Heater 1 Analogue Input Overflow	Alarm	Heater #1 Analogue Input Overflow	None	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Heater 2 Analogue Input Overflow	Alarm	Heater #2 Analogue Input Overflow	None	None
Heater 3 Analogue Input Overflow	Alarm	Heater #3 Analogue Input Overflow	None	None
Heater 4 Analogue Input Overflow	Alarm	Heater #4 Analogue Input Overflow	None	None
Heater 5 Analogue Input Overflow	Alarm	Heater #5 Analogue Input Overflow	None	None
Heater 6 Analogue Input Overflow	Alarm	Heater #6 Analogue Input Overflow	None	None
Heater 7 Analogue Input Overflow	Alarm	Heater #7 Analogue Input Overflow	None	None
Heater 8 Analogue Input Overflow	Alarm	Heater #8 Analogue Input Overflow	None	None
Heater 9 Analogue Input Overflow	Alarm	Heater #9 Analogue Input Overflow	None	None
Heater 10 Analogue Input Overflow	Alarm	Heater #10 Analogue Input Overflow	None	None
Heater 11 Analogue Input Overflow	Alarm	Heater #11 Analogue Input Overflow	None	None
Heater 12 Analogue Input Overflow	Alarm	Heater #12 Analogue Input Overflow	None	None
Heater 13 Analogue Input Overflow	Alarm	Heater #13 Analogue Input Overflow	None	None
Heater 14 Analogue Input Overflow	Alarm	Heater #14 Analogue Input Overflow	None	None
Heater 15 Analogue Input Overflow	Alarm	Heater #15 Analogue Input Overflow	None	None
Heater 16 Analogue Input Overflow	Alarm	Heater #16 Analogue Input Overflow	None	None
Heater 17 Analogue Input Overflow	Alarm	Heater #17 Analogue Input Overflow	None	None
Heater 18 Analogue Input Overflow	Alarm	Heater #18 Analogue Input Overflow	None	None

Heater 19 Analogue Input Overflow	Alarm	Heater #19 Analogue Input Overflow	None	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Heater 20 Analogue Input Overflow	Alarm	Heater #20 Analogue Input Overflow	None	None
Heater 21 Analogue Input Overflow	Alarm	Heater #21 Analogue Input Overflow	None	None
Heater 22 Analogue Input Overflow	Alarm	Heater #22 Analogue Input Overflow	None	None
Heater 23 Analogue Input Overflow	Alarm	Heater #23 Analogue Input Overflow	None	None
Heater 24 Analogue Input Overflow	Alarm	Heater 24 Analogue Input Overflow	None	None
Heater 25 Analogue Input Overflow	Alarm	Heater 25 Analogue Input Overflow	None	None
Heater 26 Analogue Input Overflow	Alarm	Heater 26 Analogue Input Overflow	None	None
Heater 27 Analogue Input Overflow	Alarm	Heater 27 Analogue Input Overflow	None	None
Heater 28 Analogue Input Overflow	Alarm	Heater 28 Analogue Input Overflow	None	None
Heater 29 Analogue Input Overflow	Alarm	Heater 29 Analogue Input Overflow	None	None
Heater 30 Analogue Input Overflow	Alarm	Heater 30 Analogue Input Overflow	None	None
Heater 31 Analogue Input Overflow	Alarm	Heater 31 Analogue Input Overflow	None	None
Chamber 1 Temperature Sensor 1 Analogue Input Overflow	Alarm	Chamber #1 Temperature Sensor #1 Analogue Input Overflow	See Control Philosophy.	None
Chamber 1 Temperature Sensor 2 Analogue Input Overflow	Alarm	Chamber #1 Temperature Sensor #2 Analogue Input Overflow	See Control Philosophy.	None
Chamber 2 Temperature Sensor 1 Analogue Input Overflow	Alarm	Chamber #2 Temperature Sensor #1 Analogue Input Overflow	See Control Philosophy.	None

Chamber 2 Temperature Sensor 2 Analogue Input Overflow	Alarm	Chamber #2 Temperature Sensor #2 Analogue Input Overflow	See Control Philosophy.	None
Chamber 3 Temperature Sensor 1 Analogue Input Overflow	Alarm	Chamber #3 Temperature Sensor #1 Analogue Input Overflow	See Control Philosophy.	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Chamber 3 Temperature Sensor 2 Analogue Input Overflow	Alarm	Chamber #3 Temperature Sensor #2 Analogue Input Overflow	See Control Philosophy.	None
Chamber 4 Temperature Sensor 1 Analogue Input Overflow	Alarm	Chamber #4 Temperature Sensor #1 Analogue Input Overflow	See Control Philosophy.	None
Chamber 4 Temperature Sensor 2 Analogue Input Overflow	Alarm	Chamber #4 Temperature Sensor #2 Analogue Input Overflow	See Control Philosophy.	None

10.2 Analogue Input Underflow

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Bacteria Tank Level Analogue Input Underflow	Alarm	Bacteria Tank Level Analogue Input Underflow	None	None
Bio Stimulant Tank Level Analogue Input Underflow	Alarm	Bio Stimulant Tank Level Analogue Input Underflow	None	None
Extract Humidity Analogue Input Underflow	Alarm	Extract Humidity Analogue Input Underflow	None	None
Chamber Humidity Analogue Input Underflow	Alarm	Chamber Humidity Analogue Input Underflow	None	None
Ambient Air Temperature Analogue Input Underflow	Alarm	Ambient Air Temperature Analogue Input Underflow	None	None
Ambient Humidity Analogue Input Underflow	Alarm	Ambient Humidity Analogue Input Underflow	None	None
Methane Sensor Analogue Input Underflow	Alarm	Methane Sensor Analogue Input Underflow	None	None

VOC Sensor Analogue Input Underflow	Alarm	VOC Sensor Analogue Input Underflow	None	None
Carbon Dioxide Sensor Analogue Input Underflow	Alarm	Carbon Dioxide Sensor Analogue Input Underflow	None	None
Hydrogen Sulphide Sensor Analogue Input Underflow	Alarm	Hydrogen Sulphide Sensor Analogue Input Underflow	None	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
XO#1 Gearbox Vibration Sensor Analogue Input Underflow	Alarm	XO Gearbox Vibration Sensor Analogue Input Underflow	None	None
XO#2 Gearbox Vibration Sensor Analogue Input Underflow	Alarm	XO Bearing Vibration Sensor Analogue Input Underflow	None	None
Heater 1 Analogue Input Underflow	Alarm	Heater #1 Analogue Input Underflow	None	None
Heater 2 Analogue Input Underflow	Alarm	Heater #2 Analogue Input Underflow	None	None
Heater 3 Analogue Input Underflow	Alarm	Heater #3 Analogue Input Underflow	None	None
Heater 4 Analogue Input Underflow	Alarm	Heater #4 Analogue Input Underflow	None	None
Heater 5 Analogue Input Underflow	Alarm	Heater #5 Analogue Input Underflow	None	None
Heater 6 Analogue Input Underflow	Alarm	Heater #6 Analogue Input Underflow	None	None
Heater 7 Analogue Input Underflow	Alarm	Heater #7 Analogue Input Underflow	None	None
Heater 8 Analogue Input Underflow	Alarm	Heater #8 Analogue Input Underflow	None	None
Heater 9 Analogue Input Underflow	Alarm	Heater #9 Analogue Input Underflow	None	None
Heater 10 Analogue Input Underflow	Alarm	Heater #10 Analogue Input Underflow	None	None
Heater 11 Analogue Input Underflow	Alarm	Heater #11 Analogue Input Underflow	None	None
Heater 12 Analogue Input Underflow	Alarm	Heater #12 Analogue Input Underflow	None	None

Heater 13 Analogue Input Underflow	Alarm	Heater #13 Analogue Input Underflow	None	None
Heater 14 Analogue Input Underflow	Alarm	Heater #14 Analogue Input Underflow	None	None
Heater 15 Analogue Input Underflow	Alarm	Heater #15 Analogue Input Underflow	None	None
Heater 16 Analogue Input Underflow	Alarm	Heater #16 Analogue Input Underflow	None	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Heater 17 Analogue Input Underflow	Alarm	Heater #17 Analogue Input Underflow	None	None
Heater 18 Analogue Input Underflow	Alarm	Heater #18 Analogue Input Underflow	None	None
Heater 19 Analogue Input Underflow	Alarm	Heater #19 Analogue Input Underflow	None	None
Heater 20 Analogue Input Underflow	Alarm	Heater #20 Analogue Input Underflow	None	None
Heater 21 Analogue Input Underflow	Alarm	Heater #21 Analogue Input Underflow	None	None
Heater 22 Analogue Input Underflow	Alarm	Heater #22 Analogue Input Underflow	None	None
Heater 23 Analogue Input Underflow	Alarm	Heater #23 Analogue Input Underflow	None	None
Heater 24 Analogue Input Underflow	Alarm	Heater 24 Analogue Input Underflow	None	None
Heater 25 Analogue Input Underflow	Alarm	Heater 25 Analogue Input Underflow	None	None
Heater 26 Analogue Input Underflow	Alarm	Heater 26 Analogue Input Underflow	None	None
Heater 27 Analogue Input Underflow	Alarm	Heater 27 Analogue Input Underflow	None	None
Heater 28 Analogue Input Underflow	Alarm	Heater 28 Analogue Input Underflow	None	None

Heater 29 Analogue Input Underflow	Alarm	Heater 29 Analogue Input Underflow	None	None
Heater 30 Analogue Input Underflow	Alarm	Heater 30 Analogue Input Underflow	None	None
Heater 31 Analogue Input Underflow	Alarm	Heater 31 Analogue Input Underflow	None	None
Chamber 1 Temperature Sensor 1 Analogue Input Underflow	Alarm	Chamber #1 Temperature Sensor #1 Analogue Input Underflow	See Control Philosophy.	None
Chamber 1 Temperature Sensor 2 Analogue Input Underflow	Alarm	Chamber #1 Temperature Sensor #2 Analogue Input Underflow	See Control Philosophy.	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Chamber 2 Temperature Sensor 1 Analogue Input Underflow	Alarm	Chamber #2 Temperature Sensor #1 Analogue Input Underflow	See Control Philosophy.	None
Chamber 2 Temperature Sensor 2 Analogue Input Underflow	Alarm	Chamber #2 Temperature Sensor #2 Analogue Input Underflow	See Control Philosophy.	None
Chamber 3 Temperature Sensor 1 Analogue Input Underflow	Alarm	Chamber #3 Temperature Sensor #1 Analogue Input Underflow	See Control Philosophy.	None
Chamber 3 Temperature Sensor 2 Analogue Input Underflow	Alarm	Chamber #3 Temperature Sensor #2 Analogue Input Underflow	See Control Philosophy.	None
Chamber 4 Temperature Sensor 1 Analogue Input Underflow	Alarm	Chamber #4 Temperature Sensor #1 Analogue Input Underflow	See Control Philosophy.	None
Chamber 4 Temperature Sensor 2 Analogue Input Underflow	Alarm	Chamber #4 Temperature Sensor #2 Analogue Input Underflow	See Control Philosophy.	None

10.3 Core Temperatures

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req

Chamber #1 Sensor #1 > Chamber Warning Temperature	Warning	Chamber #1 Sensor #1 > Chamber Warning Temperature	None	None
Chamber #1 Sensor #2 > Chamber Warning Temperature	Warning	Chamber #1 Sensor #2 > Chamber Warning Temperature	None	None
Chamber #2 Sensor #1 > Chamber Warning Temperature	Warning	Chamber #2 Sensor #1 > Chamber Warning Temperature	None	None
Chamber #2 Sensor #2 > Chamber Warning Temperature	Warning	Chamber #2 Sensor #2 > Chamber Warning Temperature	None	None
Chamber #3 Sensor #1 > Chamber Warning Temperature	Warning	Chamber #3 Sensor #1 > Chamber Warning Temperature	None	None
Chamber #3 Sensor #2 > Chamber Warning Temperature	Warning	Chamber #3 Sensor #2 > Chamber Warning Temperature	None	None
Chamber #1 Sensor #1 > Chamber Warning Temperature	Warning	Chamber #1 Sensor #1 > Chamber Warning Temperature	None	None
Chamber #1 Sensor #2 > Chamber Warning Temperature	Warning	Chamber #1 Sensor #2 > Chamber Warning Temperature	None	None

10.4 Extraction Valves

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Extraction Valve #1 Failed to Open	Alarm	Extraction Valve #1 Failed to Open	Inhibit Extraction Fan #1 Run	HMI
Extraction Valve #1 Failed to Close	Alarm	Extraction Valve #1 Failed to Close	Inhibit Extraction Fan #1 Run	HMI
Extraction Valve #1 Switch Fault	Alarm	Extraction Valve #1 Switch Fault	Inhibit Extraction Fan #1 Run	HMI
Extraction Valve #2 Failed to Open	Alarm	Extraction Valve #2 Failed to Open	Inhibit Extraction Fan #2 Run	HMI
Extraction Valve #2 Failed to Close	Alarm	Extraction Valve #2 Failed to Close	Inhibit Extraction Fan #2 Run	HMI

Extraction Valve #2 Switch Fault	Alarm	Extraction Valve #2 Switch Fault	Inhibit Extraction Fan #2 Run	HMI

10.5 Gas Monitoring

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Methane Consent Exceeded	Alarm	Methane Consent Exceeded	None	HMI
VOC Consent Exceeded	Alarm	VOC Consent Exceeded	None	HMI
CO2 Consent Exceeded	Alarm	CO2 Consent Exceeded	None	HMI
H2S Consent Exceeded	Alarm	H2S Consent Exceeded	None	HMI

10.6 General

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Emergency Stop Active	Alarm	Emergency Stop Active	Inhibits the following: □ Shredder□ □ Levelling Auger #1□ □ Levelling Auger #2□ □ Infeed Auger□ □ XO Drive #1□ □ XO Drive #2□ □ Outfeed Auger□ □ Extraction Fan #1□ □ Extraction Valve #1□ □ Extraction Fan #2□ □ Extraction Valve #2□ □ Chamber #1 Heaters□ □ Chamber #2 Heaters□ □ Chamber #3 Heaters□	None

			Bacteria Dosing System Bio Stimulant Dosing System	
CP01 Voltage Fault L1	Alarm	CP01 Voltage Fault L1	None	HMI
CP01 Voltage Fault L2	Alarm	CP01 Voltage Fault L2	None	HMI

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
CP01 Voltage Fault L3	Alarm	CP01 Voltage Fault L3	None	HMI
CP01 Current Fault L1	Alarm	CP01 Current Fault L1	None	HMI
CP01 Current Fault L2	Alarm	CP01 Current Fault L2	None	HMI
CP01 Current Fault L3	Alarm	CP01 Current Fault L3	None	HMI
CP02 Voltage Fault L1	Alarm	CP02 Voltage Fault L1	None	HMI
CP02 Voltage Fault L2	Alarm	CP02 Voltage Fault L2	None	HMI
CP02 Voltage Fault L3	Alarm	CP02 Voltage Fault L3	None	HMI
CP02 Current Fault L1	Alarm	CP02 Current Fault L1	None	HMI
CP02 Current Fault L2	Alarm	CP02 Current Fault L2	None	HMI
CP02 Current Fault L3	Alarm	CP02 Current Fault L3	None	HMI
Shredder Not Available	Warning	Shredder Not Available	Inhibit Shredder	None
Shredder Jammed	Warning	Shredder Jammed	Inhibit Shredder	None
Shredder Run Command Failed	Warning	Shredder Run command sent and Shredder Running signal not received after 5 seconds.	None	None
Air Conditioner #1 Fault	Alarm	Air Conditioner #1 Fault	None	HMI
Air Conditioner #2 Fault	Alarm	Air Conditioner #2 Fault	None	HMI

Chamber Humidity Exceeds X	Alarm	Chamber #1 and/or Chamber #4 Humidity readings have exceeded their setpoint. (See Extraction Fan Settings).	None	None
Netbiter Modbus Error	Alarm	Air Conditioner #1 Fault	None	None

10.7 Hardware

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
CPU Error	Alarm	CPU Error	None	None
CPU Maintenance Required	Alarm	CPU Maintenance Required	None	None
CP01 ET200 Module Error Slot 0 Header	Alarm	CP01 ET200 Module Error Slot 0 Header	None	None
CP01 ET200 Module Error Slot 1 DI	Alarm	CP01 ET200 Module Error Slot 1 DI	None	None
CP01 ET200 Module Error Slot 2 DI	Alarm	CP01 ET200 Module Error Slot 2 DI	None	None
CP01 ET200 Module Error Slot 3 AI	Alarm	CP01 ET200 Module Error Slot 3 AI	None	None
CP01 ET200 Module Error Slot 4 AI	Alarm	CP01 ET200 Module Error Slot 4 AI	None	None
CP01 ET200 Module Error Slot 5 AI	Alarm	CP01 ET200 Module Error Slot 5 AI	None	None
CP01 ET200 Module Error Slot 6 TC	Alarm	CP01 ET200 Module Error Slot 6 TC	None	None
CP01 ET200 Module Error Slot 7 TC	Alarm	CP01 ET200 Module Error Slot 7 TC	None	None
CP01 ET200 Module Error Slot 8 DQ	Alarm	CP01 ET200 Module Error Slot 8 DQ	None	None
CP01 ET200 Module Error Slot 9 DQ	Alarm	CP01 ET200 Module Error Slot 9 DQ	None	None
CP01 ET200 Module Error Slot 10 FDI	Alarm	CP01 ET200 Module Error Slot 10 FDI	None	None
CP01 ET200 Module Error Slot 11 FDQ	Alarm	CP01 ET200 Module Error Slot 11 FDQ	None	None
CP01 ET200 Module Error Slot 12 FRQ	Alarm	CP01 ET200 Module Error Slot 12 FRQ	None	None
CP01 ET200 Module Error Slot 13 EM	Alarm	CP01 ET200 Module Error Slot 13 EM	None	None

CP01 ET200 Module Error Slot 14 SX	Alarm	CP01 ET200 Module Error Slot 14 SX	None	None
CP02 ET200 Module Error Slot 11 EM	Alarm	CP02 ET200 Module Error Slot 11 EM	None	None
CP02 ET200 Module Error Slot 10 FRQ	Alarm	CP02 ET200 Module Error Slot 10 FRQ	None	None
CP02 ET200 Module Error Slot 9 FDQ	Alarm	CP02 ET200 Module Error Slot 9 FDQ	None	None
CP02 ET200 Module Error Slot 8 FDI	Alarm	CP02 ET200 Module Error Slot 8 FDI	None	None
CP02 ET200 Module Error Slot 7 DQ	Alarm	CP02 ET200 Module Error Slot 7 DQ	None	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
CP02 ET200 Module Error Slot 6 TC	Alarm	CP02 ET200 Module Error Slot 6 TC	None	None
CP02 ET200 Module Error Slot 5 TC	Alarm	CP02 ET200 Module Error Slot 5 TC	None	None
CP02 ET200 Module Error Slot 4 TC	Alarm	CP02 ET200 Module Error Slot 4 TC	None	None
CP02 ET200 Module Error Slot 3 TC	Alarm	CP02 ET200 Module Error Slot 3 TC	None	None
CP02 ET200 Module Error Slot 2 AI	Alarm	CP02 ET200 Module Error Slot 2 AI	None	None
CP02 ET200 Module Error Slot 1 DI	Alarm	CP02 ET200 Module Error Slot 1 DI	None	None
CP02 ET200 Module Error Slot 0 Header	Alarm	CP02 ET200 Module Error Slot 0 Header	None	None

10.8 Dosing/Level

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Bacteria Empty	Alarm	Bacteria Empty	Inhibit Bacteria Dosing	None
Bio Stimulant Empty	Alarm	Bio Stimulant Empty	Inhibit Bio Stimulant Dosing	None
Bacteria Low Level	Warning	Bacteria Low Level	Halve Bacteria Dosing Duration	None
Bio Stimulant Low Level	Warning	Bio Stimulant Low Level	Halve Bio Stimulant Dosing Duration	None

10.9 Maintenance

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req

Daily Maintenance Check Required	Warning	Daily Maintenance Check Required	None	HMI Individual Reset
Weekly Maintenance Check Required	Warning	Weekly Maintenance Check Required	None	HMI Individual Reset
Monthly Maintenance Check Required	Warning	Monthly Maintenance Check Required	None	HMI Individual Reset
Quarterly Maintenance Check Required	Warning	Quarterly Maintenance Check Required	None	HMI Individual Reset
Annual Maintenance Check Required	Warning	Annual Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 1 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Site Specific Maintenance Check 2 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 3 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 4 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 5 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 6 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 7 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 8 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 9 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 10 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset

Site Specific Maintenance Check 11 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 12 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 13 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 14 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 15 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset
Site Specific Maintenance Check 16 Required	Warning	Site Specific Maintenance Check Required	None	HMI Individual Reset

10.10 Not in Auto

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
XO Drive Not in Auto	Warning	XO Drive #1 and XO Drive #2 Not in Auto	None	None
Levelling Auger #1 Not in Auto	Warning	Levelling Auger #1 Not in Auto	None	None
Infeed Auger Not in Auto	Warning	Infeed Auger Not in Auto	None	None
Extraction Fan #1 Not in Auto	Warning	Extraction Fan #1 Not in Auto	None	None
Extraction Fan #2 Not in Auto	Warning	Extraction Fan #2 Not in Auto	None	None
Extraction Valve #1 Not in Auto	Warning	Extraction Valve #1 Not in Auto	None	None
Extraction Valve #2 Not in Auto	Warning	Extraction Valve #2 Not in Auto	None	None
Outfeed #1 Auger Not in Auto	Warning	Outfeed #1 Auger Not in Auto	None	None
Bacteria Dosing Not in Auto	Warning	Bacteria Dosing Not in Auto	None	None
Bio Stimulant Dosing Not in Auto	Warning	Bio Stimulant Dosing Not in Auto	None	None
Levelling Auger #2 Not in Auto	Warning	Levelling Auger #2 Not in Auto	None	None

Chamber #1 Heating Not in Auto	Warning	Chamber #1 Heating Not in Auto	None	None
Chamber #2 Heating Not in Auto	Warning	Chamber #2 Heating Not in Auto	None	None
Chamber #3 Heating Not in Auto	Warning	Chamber #3 Heating Not in Auto	None	None
Chamber #4 Heating Not in Auto	Warning	Chamber #4 Heating Not in Auto	None	None

10.11 Tripped

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
XO #1 Motor QM Tripped	Alarm	XO #1 Motor QM Tripped	Inhibit XO Drive #1	HMI
XO #2 Motor QM Tripped	Alarm	XO #2 Motor QM Tripped	Inhibit XO Drive #2	HMI
Infeed Auger QM Tripped	Alarm	Infeed Auger QM Tripped	Inhibit Infeed Auger	HMI
Extraction Fan No.1 QM Tripped	Alarm	Extraction Fan No.1 QM Tripped	Inhibit Extraction Fan #1	HMI
Extraction Fan No.2 QM Tripped	Alarm	Extraction Fan No.2 QM Tripped	Inhibit Extraction Fan #2	HMI
Outfeed #1 Auger QM Tripped	Alarm	Outfeed #1 Auger QM Tripped	Inhibit Outfeed Auger	HMI

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Levelling Auger #1 Tripped	Alarm	Levelling Auger #1 Tripped	Inhibit Levelling Auger #1	HMI
Levelling Auger #2 Tripped	Alarm	Levelling Auger #2 Tripped	Inhibit Levelling Auger #2	HMI
Bio Stimulant Dosing Pump Tripped	Alarm	Bio Stimulant Dosing Pump Tripped	Inhibit Bio Stimulant Dosing	HMI
Bacteria Dosing Valve Tripped	Alarm	Bacteria Dosing Valve Tripped	Inhibit Bacteria Dosing	HMI
PSU2 Fault	Alarm	PSU2 Fault	None	HMI
Heaters Chamber 1 Zone 1 Tripped	Alarm	Heaters Chamber 1 Zone 1 Tripped	Inhibit Chamber #1 Zone #1 Heaters	HMI
Heaters Chamber 1 Zone 2 Tripped	Alarm	Heaters Chamber 1 Zone 2 Tripped	Inhibit Chamber #1 Zone #2 Heaters	HMI
Heaters Chamber 2 Zone 1 Tripped	Alarm	Heaters Chamber 2 Zone 1 Tripped	Inhibit Chamber #2 Zone #1 Heaters	HMI
Heaters Chamber 2 Zone 2 Tripped	Alarm	Heaters Chamber 2 Zone 2 Tripped	Inhibit Chamber #2 Zone #2 Heaters	HMI

Heaters Chamber 3 Zone 1 Tripped	Alarm	Heaters Chamber 3 Zone 1 Tripped	Inhibit Chamber #3 Zone #1 Heaters	HMI
Heaters Chamber 3 Zone 2 Tripped	Alarm	Heaters Chamber 3 Zone 2 Tripped	Inhibit Chamber #3 Zone #2 Heaters	HMI
Heaters Chamber 4 Zone 1 Tripped	Alarm	Heaters Chamber 4 Zone 1 Tripped	Inhibit Chamber #4 Zone #1 Heaters	HMI
Heaters Chamber 4 Zone 2 Tripped	Alarm	Heaters Chamber 4 Zone 2 Tripped	Inhibit Chamber #4 Zone #2 Heaters	HMI

10.12 Siwarex

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Siwarex 5000 Data or command error exists.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 5000 Data or command error exists.	None	None
Siwarex 5001 Data record or command unknown.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 5001 Data record or command unknown.	None	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Siwarex 2001 Taring/zeroing timeout.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 2001 Taring/zeroing timeout.	None	None
Siwarex 2000 Technology error exists.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 2000 Technology error exists.	None	None
Siwarex 5003 Cannot exit service mode.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 5003 Cannot exit service mode.	None	None

Siwarex 7008 Zeroing or tare parameter not plausible.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 7008 Zeroing or tare parameter not plausible.	None	None
Siwarex 7011 Filter parameters.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 7011 Filter parameters.	None	None
Siwarex 5004 Command or data transfer only permitted in service mode.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 5004 Command or data transfer only permitted in service mode.	None	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Siwarex 7010 Scale interval / rounding.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 7010 Scale interval / rounding.	None	None
Siwarex 7009 Standstill range / standstill wait time.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 7009 Standstill range / standstill wait time.	None	None
Siwarex 7007 Calibration weights / Calibration digits not plausible.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 7007 Calibration weights / Calibration digits not plausible.	None	None
Siwarex 7000 Permitted number range violated.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 7000 Permitted number range violated.	None	None

Siwarex 5105 Load cell parameters not plausible.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 5105 Load cell parameters not plausible.	None	None
Siwarex 5104 Command cannot be executed because the permitted range has been exceeded.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 5104 Command cannot be executed because the permitted range has been exceeded.	None	None

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Siwarex 5102 Command not possible while not standstill.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 5102 Command not possible while not standstill.	None	None
Siwarex 5101 Command is not permissible in this operating state.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 5101 Command is not permissible in this operating state.	None	None
Siwarex 5107 Calibration characteristic shift not possible.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 5107 Calibration characteristic shift not possible.	None	None
Siwarex 1001 Watchdog.	Warning	Siwarex 1001 Watchdog.	None	None
Siwarex 1000 operating error exists.	N/A (Should be implemented but not feature on the HMI Alarms and Historic Alarms screens)	Siwarex 1000 operating error exists.	None	None
Siwarex 1102 ADC error.	Warning	Siwarex 1102 ADC error.	None	None
Siwarex 1104 Undervoltage.	Warning	Siwarex 1104 Undervoltage.	None	None

Siwarex 1003 Checksum incorrect parameter.	Warning	Siwarex 1003 Checksum incorrect parameter.	None	None
Siwarex 1004 Checksum incorrect program.	Warning	Siwarex 1004 Checksum incorrect program.	None	None
Siwarex 1106 Underload.	Warning	Siwarex 1106 Underload.	None	None
Siwarex 1105 Overload.	Warning	Siwarex 1105 Overload.	None	None
Siwarex 5007 Command or data transfer not possible - Module fault or CPU in STOP.	Warning	Siwarex 5007 Command or data transfer not possible - Module fault or CPU in STOP.	None	None

10.13 Heaters

Note that the following > 320°F alarms may alternatively read > 160°C dependent upon machine location and at the discretion of Advetec.

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Heater #1 Temperature > 320°F	Alarm	Heater #1 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #2 Temperature > 320°F	Alarm	Heater #2 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #3 Temperature > 320°F	Alarm	Heater #3 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #4 Temperature > 320°F	Alarm	Heater #4 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #5 Temperature > 320°F	Alarm	Heater #5 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #6 Temperature > 320°F	Alarm	Heater #6 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #7 Temperature > 320°F	Alarm	Heater #7 Temperature > 320°F	Inhibit respective bank of heaters.	HMI

Heater #8 Temperature > 320°F	Alarm	Heater #8 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #9 Temperature > 320°F	Alarm	Heater #9 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #10 Temperature > 320°F	Alarm	Heater #10 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #11 Temperature > 320°F	Alarm	Heater #11 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #12 Temperature > 320°F	Alarm	Heater #12 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #13 Temperature > 320°F	Alarm	Heater #13 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #14 Temperature > 320°F	Alarm	Heater #14 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #15 Temperature > 320°F	Alarm	Heater #15 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Heater #16 Temperature > 320°F	Alarm	Heater #16 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #17 Temperature > 320°F	Alarm	Heater #17 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #18 Temperature > 320°F	Alarm	Heater #18 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #19 Temperature > 320°F	Alarm	Heater #19 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #20 Temperature > 320°F	Alarm	Heater #20 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #21 Temperature > 320°F	Alarm	Heater #21 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #22 Temperature > 320°F	Alarm	Heater #22 Temperature > 320°F	Inhibit respective bank of heaters.	HMI

Heater #23 Temperature > 320°F	Alarm	Heater #23 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #24 Temperature > 320°F	Alarm	Heater #24 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #25 Temperature > 320°F	Alarm	Heater #25 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #26 Temperature > 320°F	Alarm	Heater #26 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #27 Temperature > 320°F	Alarm	Heater #27 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #28 Temperature > 320°F	Alarm	Heater #28 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #29 Temperature > 320°F	Alarm	Heater #29 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #30 Temperature > 320°F	Alarm	Heater #30 Temperature > 320°F	Inhibit respective bank of heaters.	HMI
Heater #31 Temperature > 320°F	Alarm	Heater #31 Temperature > 320°F	Inhibit respective bank of heaters.	HMI

10.14 Vibration

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
XO1 Gearbox Vibration Setpoint Exceeded	Warning	XO1 Gearbox Vibration Setpoint Exceeded	Reduce XO Drive Speed	None
XO1 Gearbox Vibration Alarm Exceeded Timeout	Warning	XO1 Gearbox Vibration Alarm Exceeded Timeout	Reduce XO Drive Speed	None
XO2 Gearbox Vibration Setpoint Exceeded	Warning	XO2 Gearbox Vibration Setpoint Exceeded	Reduce XO Drive Speed	None
XO2 Gearbox Vibration Alarm Exceeded Timeout	Warning	XO2 Gearbox Vibration Alarm Exceeded Timeout	Reduce XO Drive Speed	None

10.15 VSD

Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req

XO Drive Blocked	Alarm	Either XO Drive #1 or XO Drive #2 Blocked	Inhibit XO Drive #1, Inhibit XO Drive #2	None
Infeed Auger Blocked	Alarm	Infeed Auger Blocked	Inhibit Infeed Auger	None
Outfeed Auger Blocked	Alarm	Outfeed Auger Blocked	Inhibit Outfeed Auger	None
XO#1 Drive Failed To Start	Alarm	XO#1 Drive Failed To Start	Inhibit XO Drive #1	HMI
XO#1 Drive Failed To Stop	Alarm	XO#1 Drive Failed To Stop	Inhibit XO Drive #1	HMI
XO#1 Drive VSD Fault	Alarm	XO#1 Drive VSD Fault	Inhibit XO Drive #1	HMI
XO#1 Drive VSD Alarm	Alarm	XO#1 Drive VSD Alarm	Inhibit XO Drive #1	HMI
XO#1 Drive VSD Overtemperature	Alarm	XO#1 Drive VSD Overtemperature	Inhibit XO Drive #1	HMI
XO#2 Drive Failed To Start	Alarm	XO#2 Drive Failed To Start	Inhibit XO Drive #2	HMI
XO#2 Drive Failed To Stop	Alarm	XO#2 Drive Failed To Stop	Inhibit XO Drive #2	HMI
XO#2 Drive VSD Fault	Alarm	XO#2 Drive VSD Fault	Inhibit XO Drive #2	HMI
XO#2 Drive VSD Alarm	Alarm	XO#2 Drive VSD Alarm	Inhibit XO Drive #2	HMI
XO#2 Drive VSD Overtemperature	Alarm	XO#2 Drive VSD Overtemperature	Inhibit XO Drive #2	HMI
Infeed Auger Failed To Start	Alarm	Infeed Auger Failed To Start	Inhibit Infeed Auger	HMI
Infeed Auger Failed To Stop	Alarm	Infeed Auger Failed To Stop	Inhibit Infeed Auger	HMI

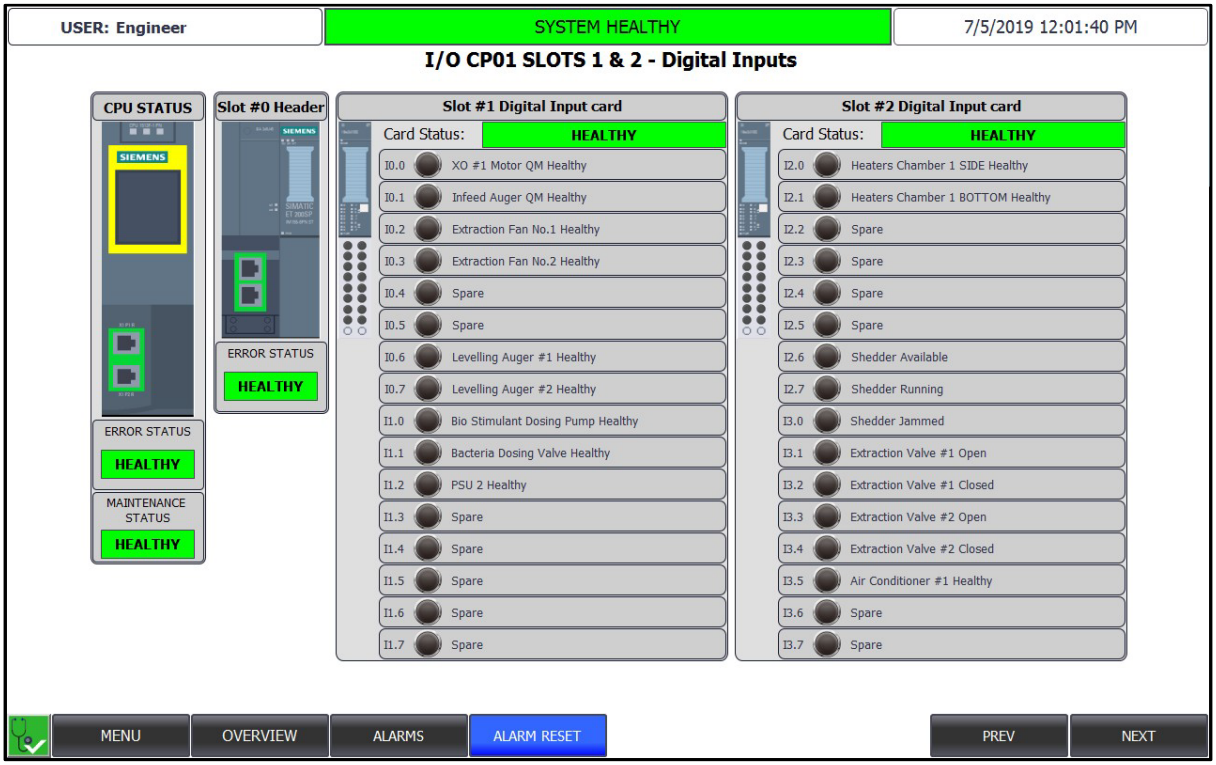
Alarm Text	Warning / Alarm	Trigger Condition	Action	Reset Req
Infeed Auger VSD Fault	Alarm	Infeed Auger VSD Fault	Inhibit Infeed Auger	HMI
Infeed Auger VSD Alarm	Alarm	Infeed Auger VSD Alarm	Inhibit Infeed Auger	HMI
Infeed Auger VSD Overtemperature	Alarm	Infeed Auger VSD Overtemperature	Inhibit Infeed Auger	HMI
Extraction Fan #1 Failed To Start	Alarm	Extraction Fan #1 Failed To Start	Inhibit Extraction Fan #1	HMI
Extraction Fan #1 Failed To Stop	Alarm	Extraction Fan #1 Failed To Stop	Inhibit Extraction Fan #1	HMI
Extraction Fan #1 VSD Fault	Alarm	Extraction Fan #1 VSD Fault	Inhibit Extraction Fan #1	HMI

Extraction Fan #1 VSD Alarm	Alarm	Extraction Fan #1 VSD Alarm	Inhibit Extraction Fan #1	HMI
Extraction Fan #1 VSD Overtemperature	Alarm	Extraction Fan #1 VSD Overtemperature	Inhibit Extraction Fan #1	HMI
Extraction Fan #2 Failed To Start	Alarm	Extraction Fan #2 Failed To Start	Inhibit Extraction Fan #2	HMI
Extraction Fan #2 Failed To Stop	Alarm	Extraction Fan #2 Failed To Stop	Inhibit Extraction Fan #2	HMI
Extraction Fan #2 VSD Fault	Alarm	Extraction Fan #2 VSD Fault	Inhibit Extraction Fan #2	HMI
Extraction Fan #2 VSD Alarm	Alarm	Extraction Fan #2 VSD Alarm	Inhibit Extraction Fan #2	HMI
Extraction Fan #2 VSD Overtemperature	Alarm	Extraction Fan #2 VSD Overtemperature	Inhibit Extraction Fan #2	HMI
Outfeed Auger Failed To Start	Alarm	Outfeed Auger Failed To Start	Inhibit Outfeed Auger	HMI
Outfeed Auger Failed To Stop	Alarm	Outfeed Auger Failed To Stop	Inhibit Outfeed Auger	HMI
Outfeed Auger VSD Fault	Alarm	Outfeed Auger VSD Fault	Inhibit Outfeed Auger	HMI
Outfeed Auger VSD Alarm	Alarm	Outfeed Auger VSD Alarm	Inhibit Outfeed Auger	HMI
Outfeed Auger VSD Overtemperature	Alarm	Outfeed Auger VSD Overtemperature	Inhibit Outfeed Auger	HMI

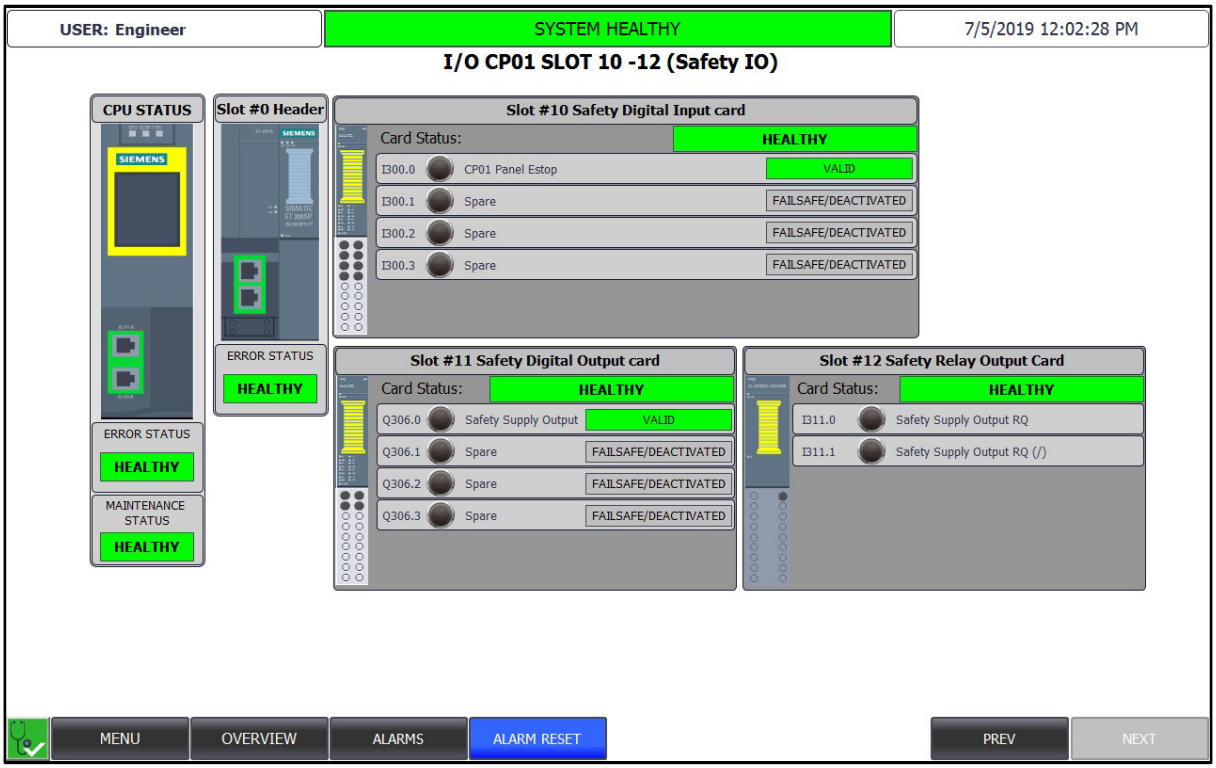
11 – IO Screen List

11.1 – Digital Inputs

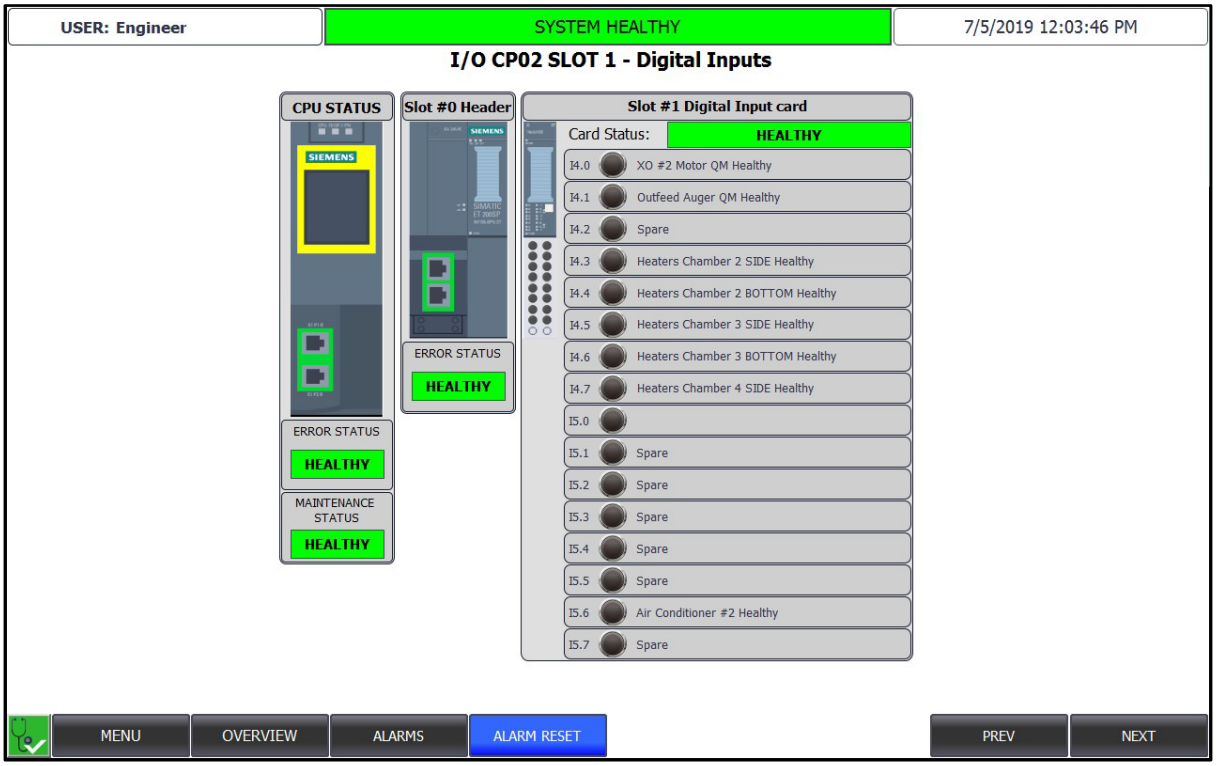
11.1.1 – CP01 Slots 1 & 2



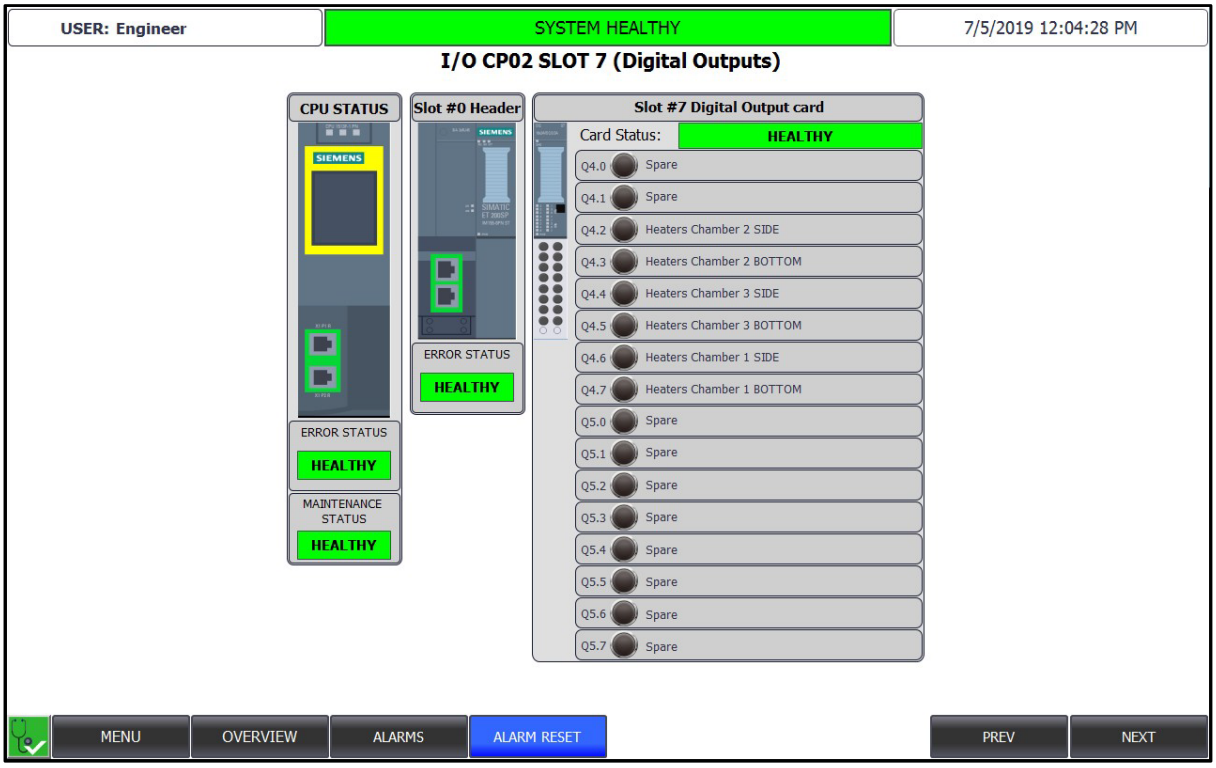
11.1.2 – CP01 Slots 11 & 12



11.1.3 CP02 Slot 1



11.1.4 - CP02 Slot 7



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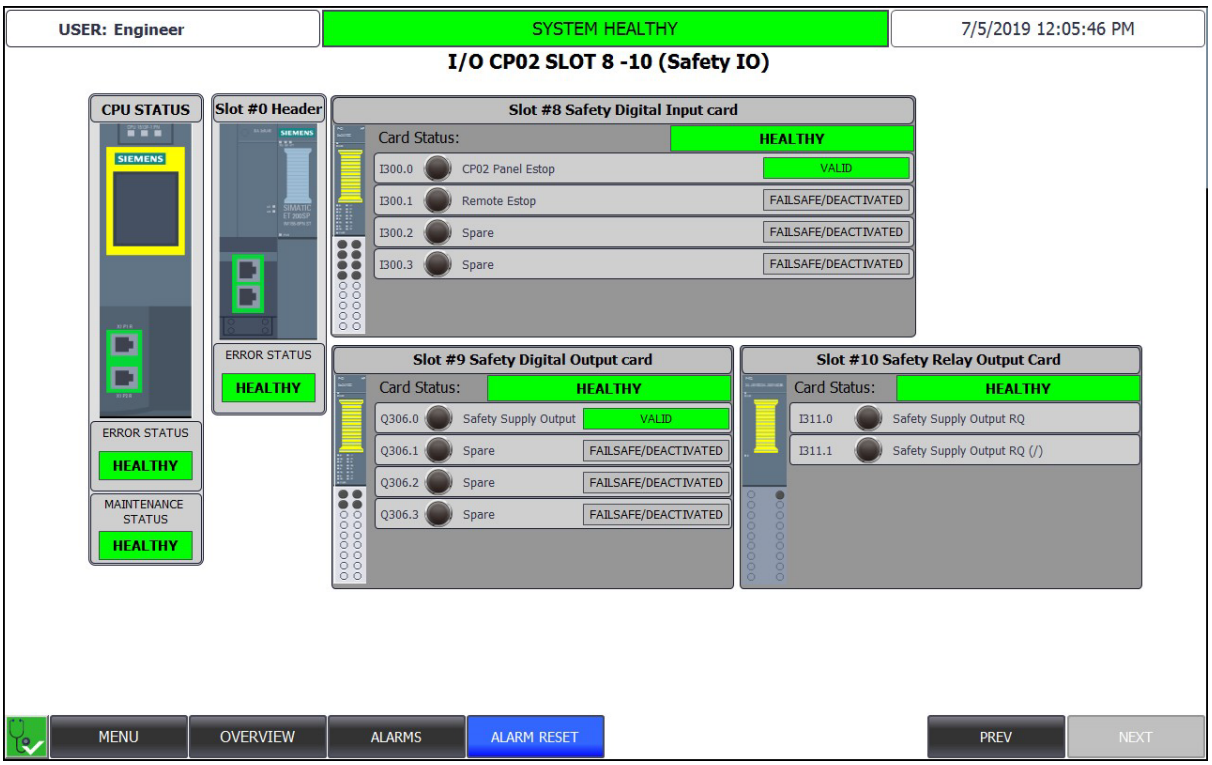
11.1.5 CP02 Slot 8-10



11.2 - Analogue Input Screen List

11.2.1 – CP01 Slots 3-5

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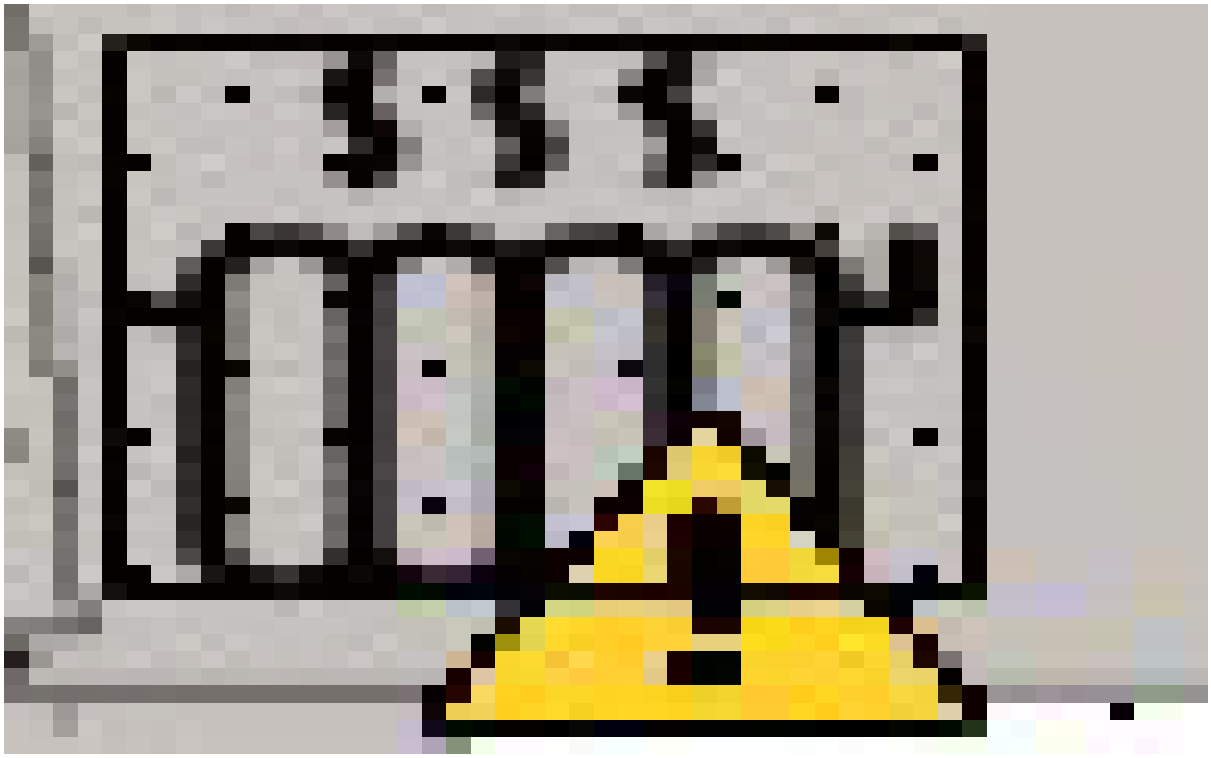
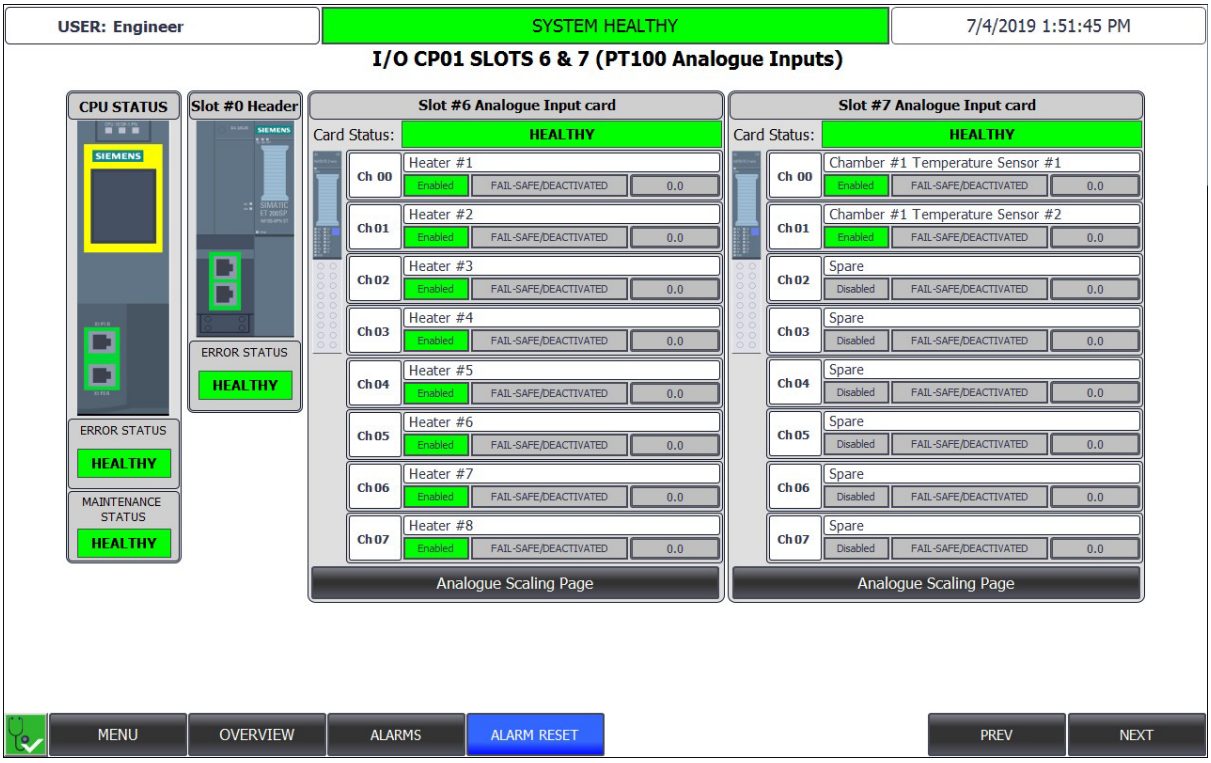
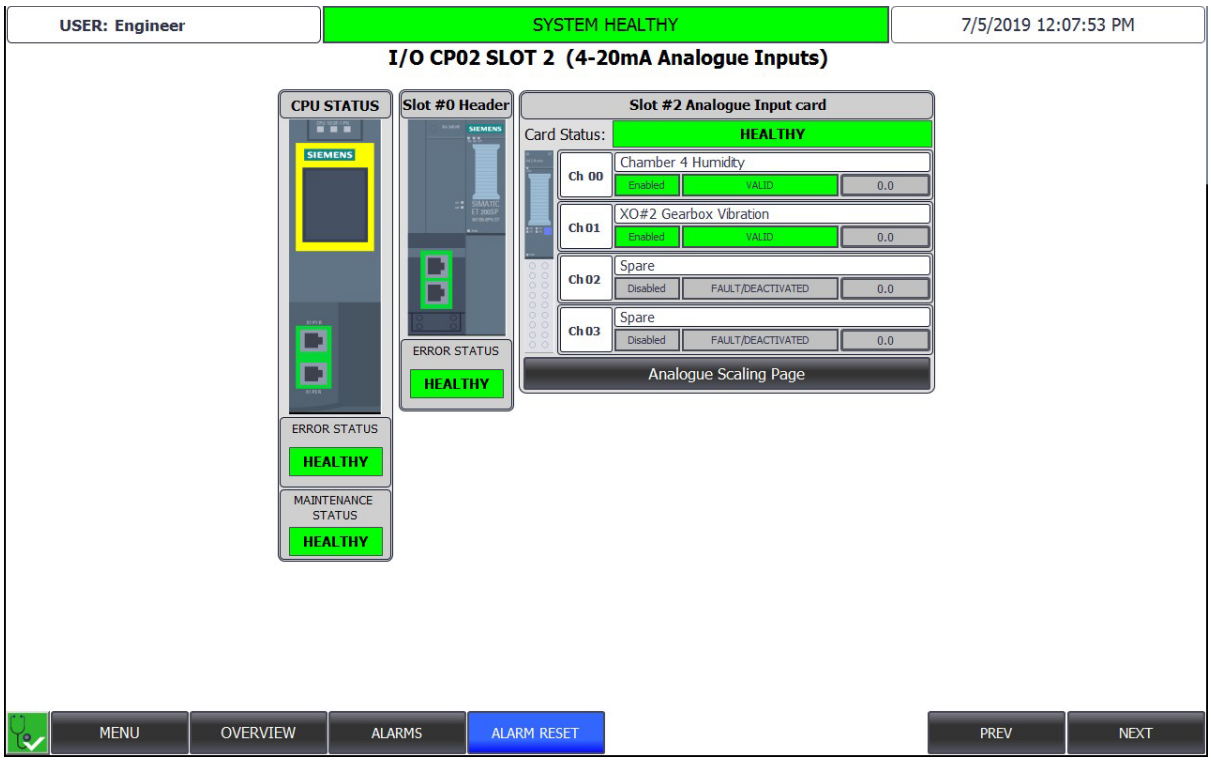


11.2.2 CP01 Slots 6 & 7



11.2.3 – CP02 Slot 2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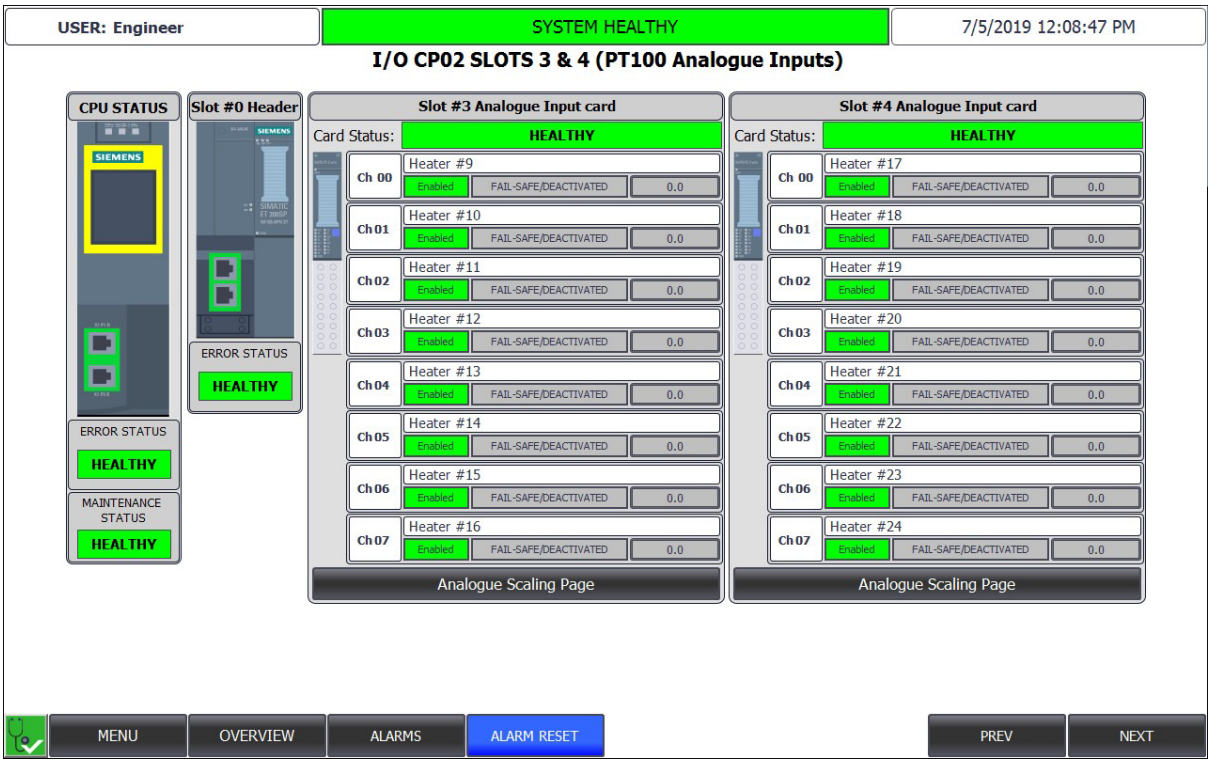
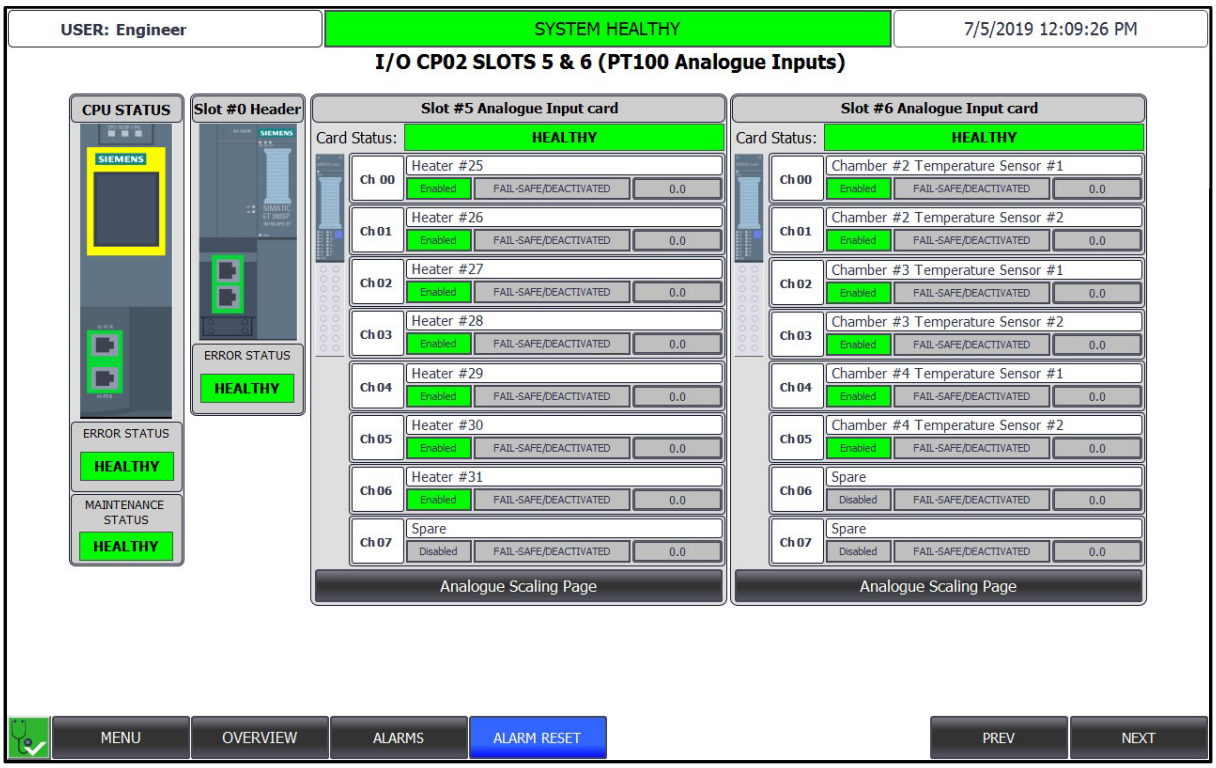
SYSTEM HEALTHY
7/5/2019 12:07:53 PM
I/O CP02 SLOT 2 (4-20mA Analogue Inputs)
CPU STATUS
ERROR STATUS
HEALTHY
MAINTENANCE STATUS
HEALTHY
Slot #0 Header
ERROR STATUS
HEALTHY
Slot #2 Analogue Input card
Card Status:
HEALTHY
Ch 00
Chamber 4 Humidity
Enabled
VALID
0.0
Ch 01
XO#2 Gearbox Vibration
Enabled
VALID
0.0
Ch 02
Spare
Disabled
FAULT/DEACTIVATED
0.0
Ch 03
Spare
Disabled
FAULT/DEACTIVATED
0.0
Analogue Scaling Page
MENU
OVERVIEW
ALARMS
ALARM RESET
PREV
NEXT

11.2.4 - CP02 Slots 3 & 4

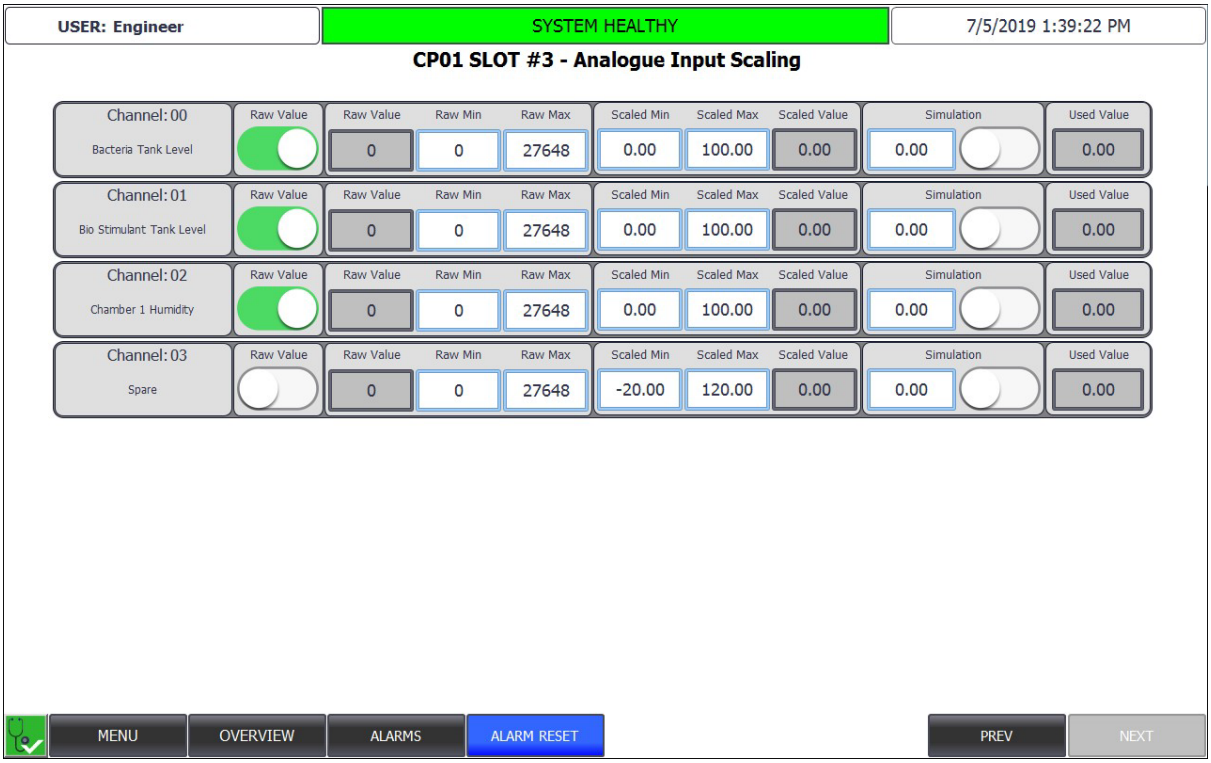


11.2.5 - CP02 Slots 5 & 6

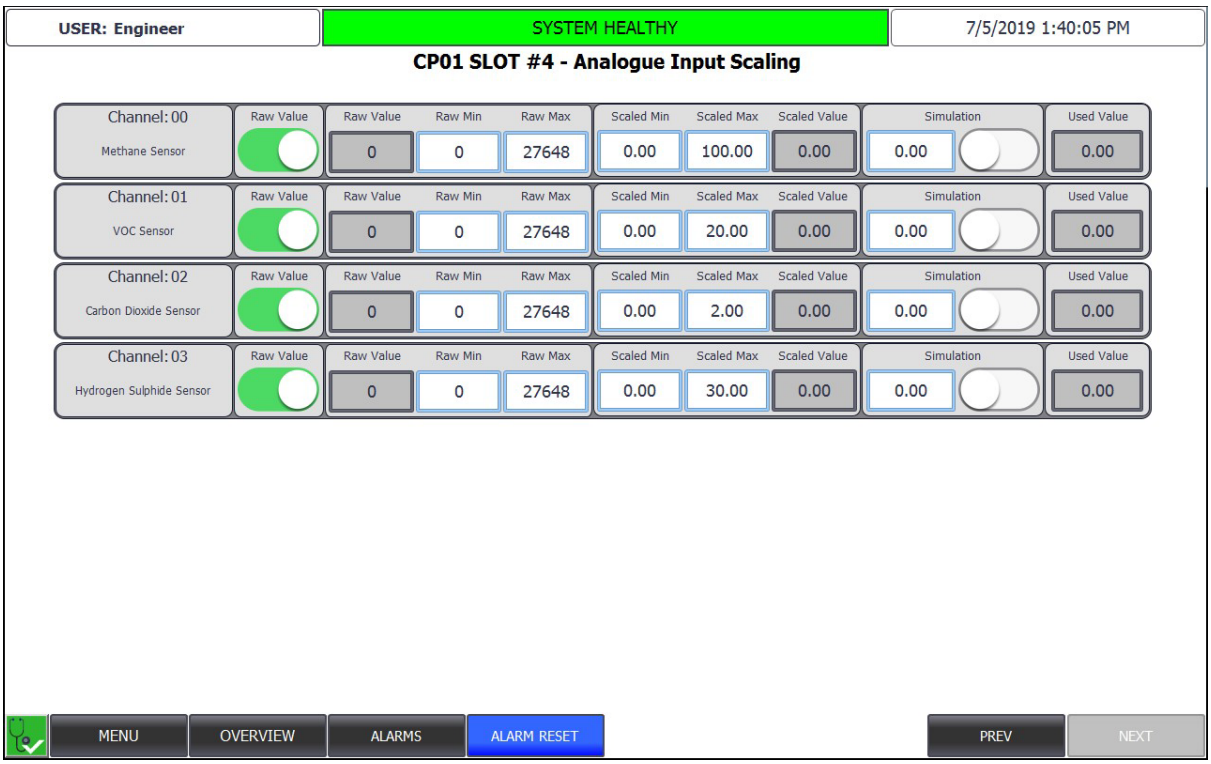


11.3 Analogue Input Scaling Screen List

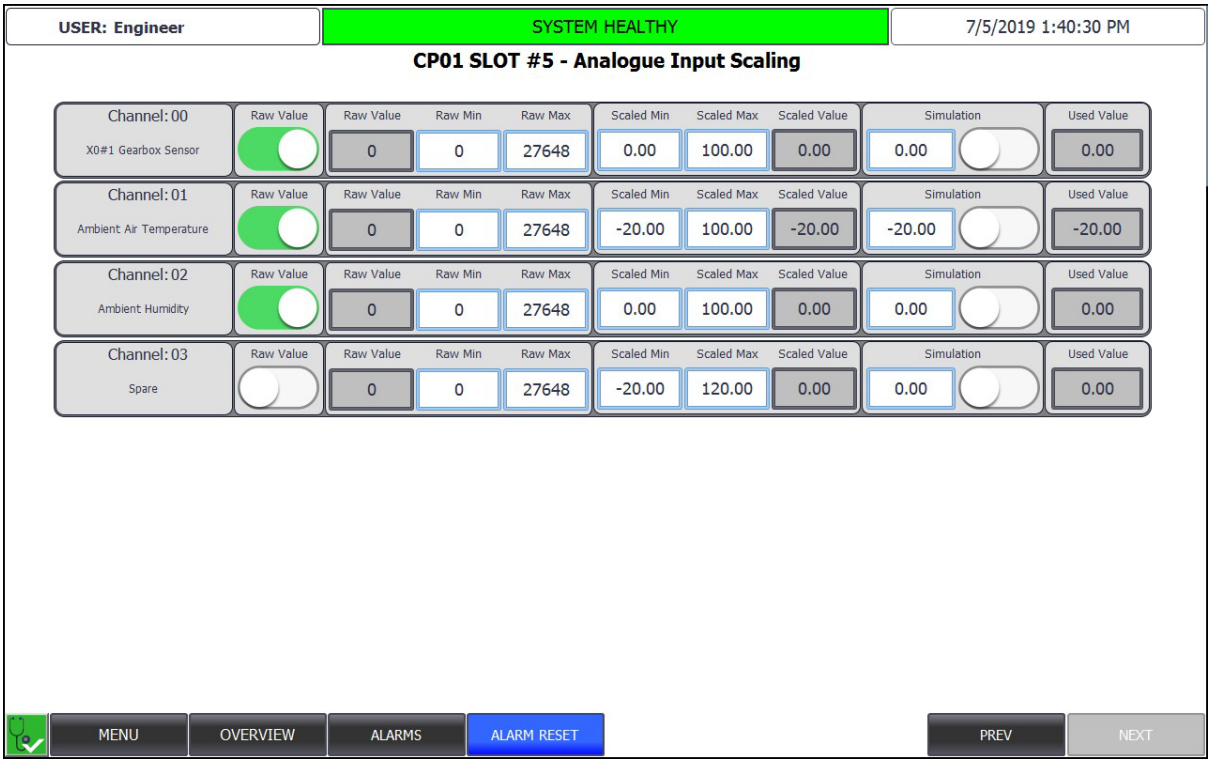
11.3.1 – CP01 Slot #3



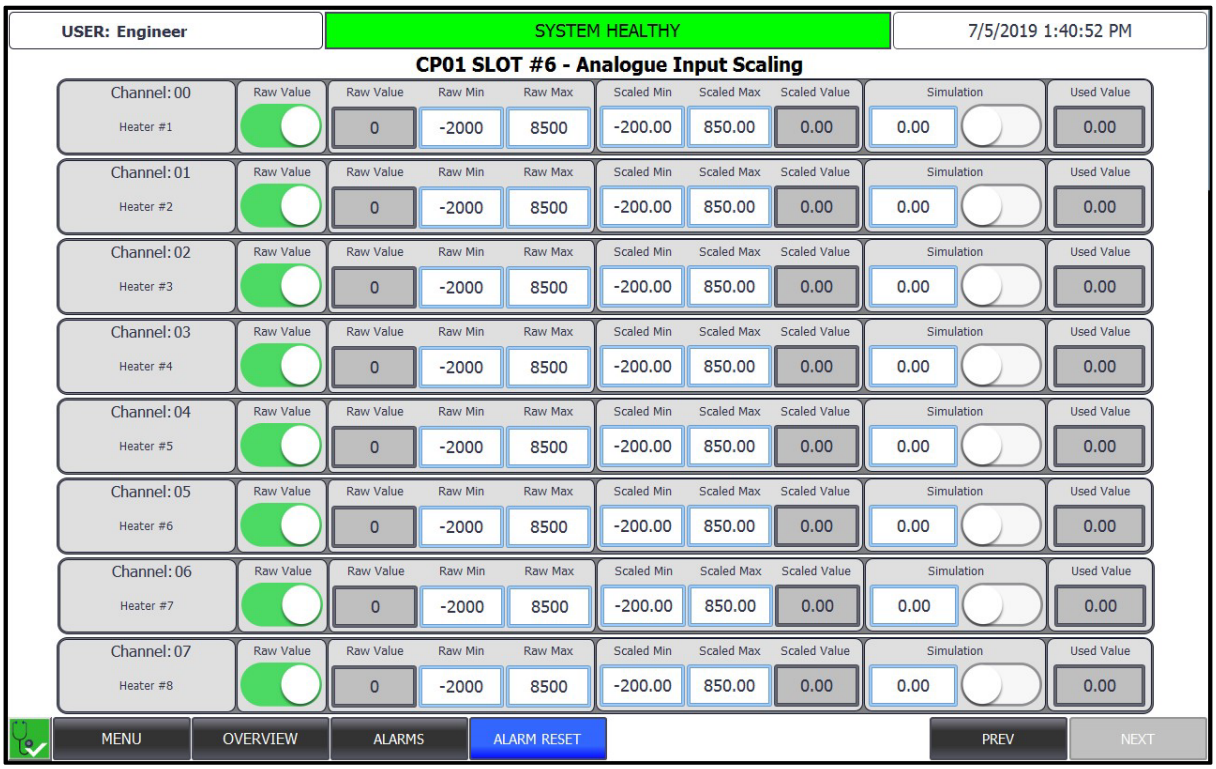
11.3.2 – CP01 Slot #4



11.3.3 CP01 Slot #5



11.3.4 – CP01 Slot #6



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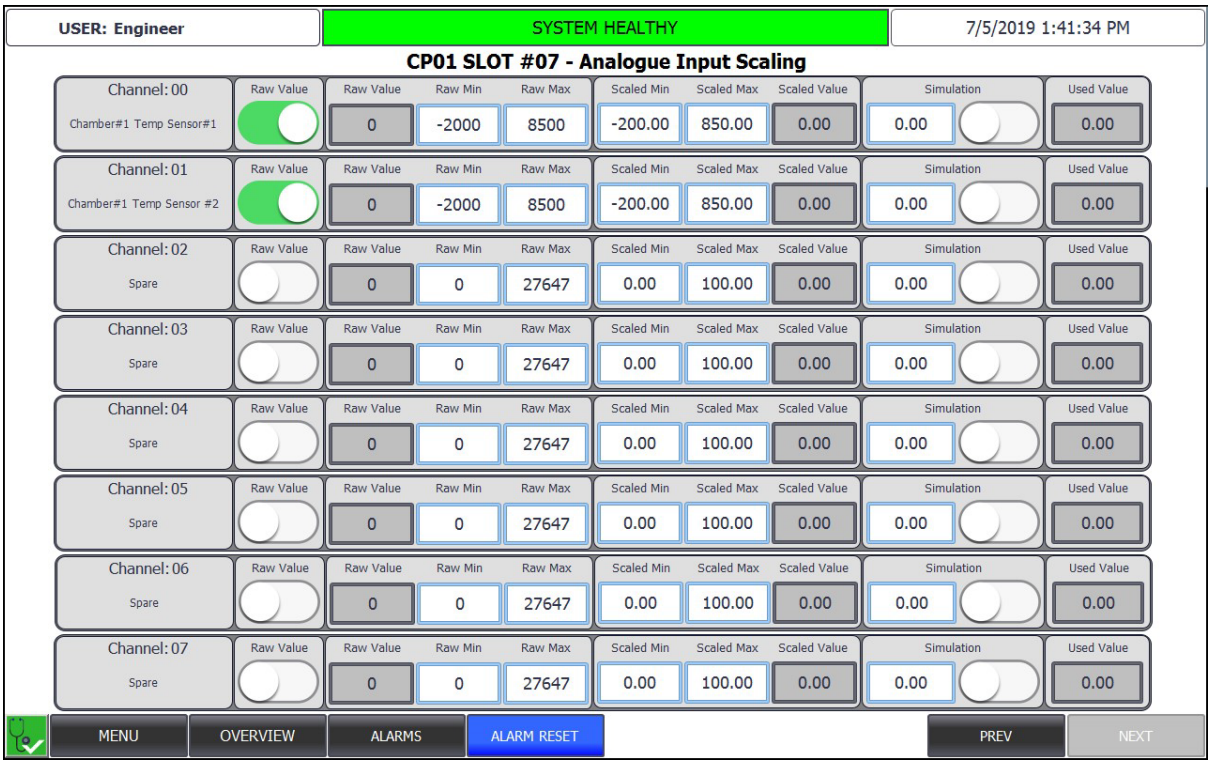
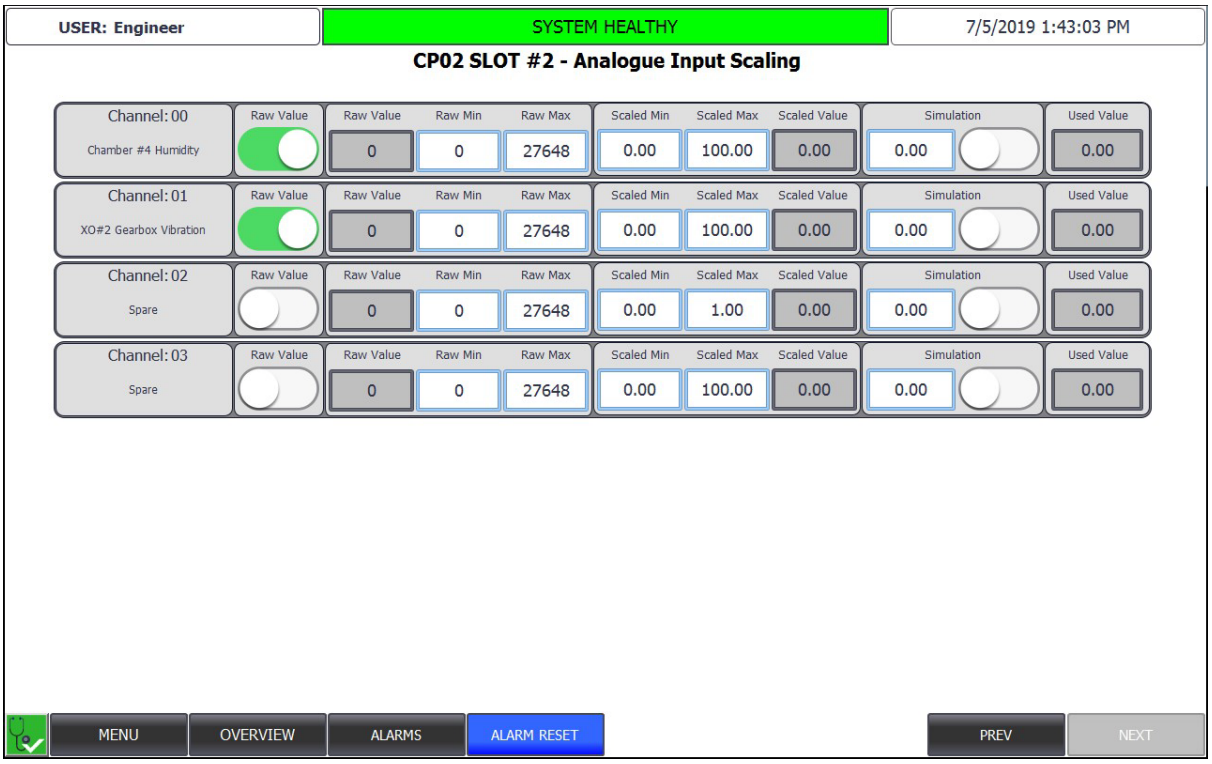
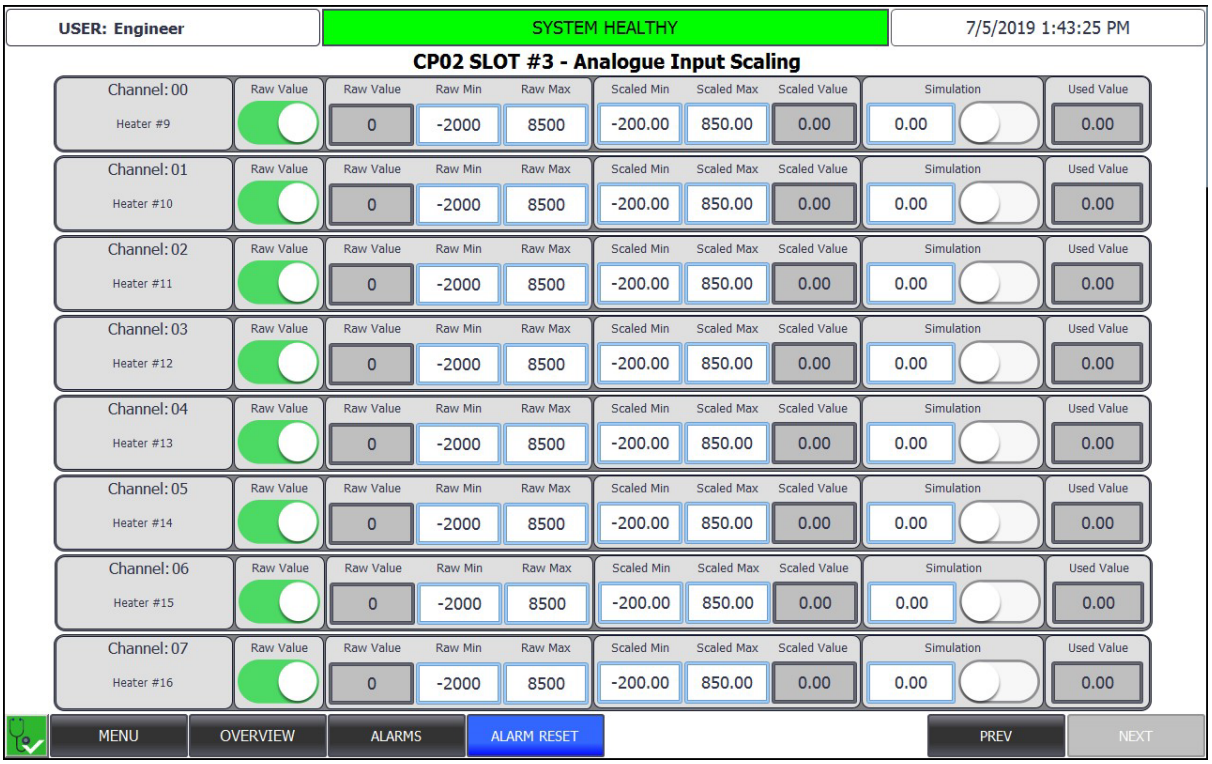
11.3.5 CP01 Slot #7



11.3.6 – CP02 Slot 2



11.3.7 CP02 Slot 3



11.3.8 CP02 Slot4

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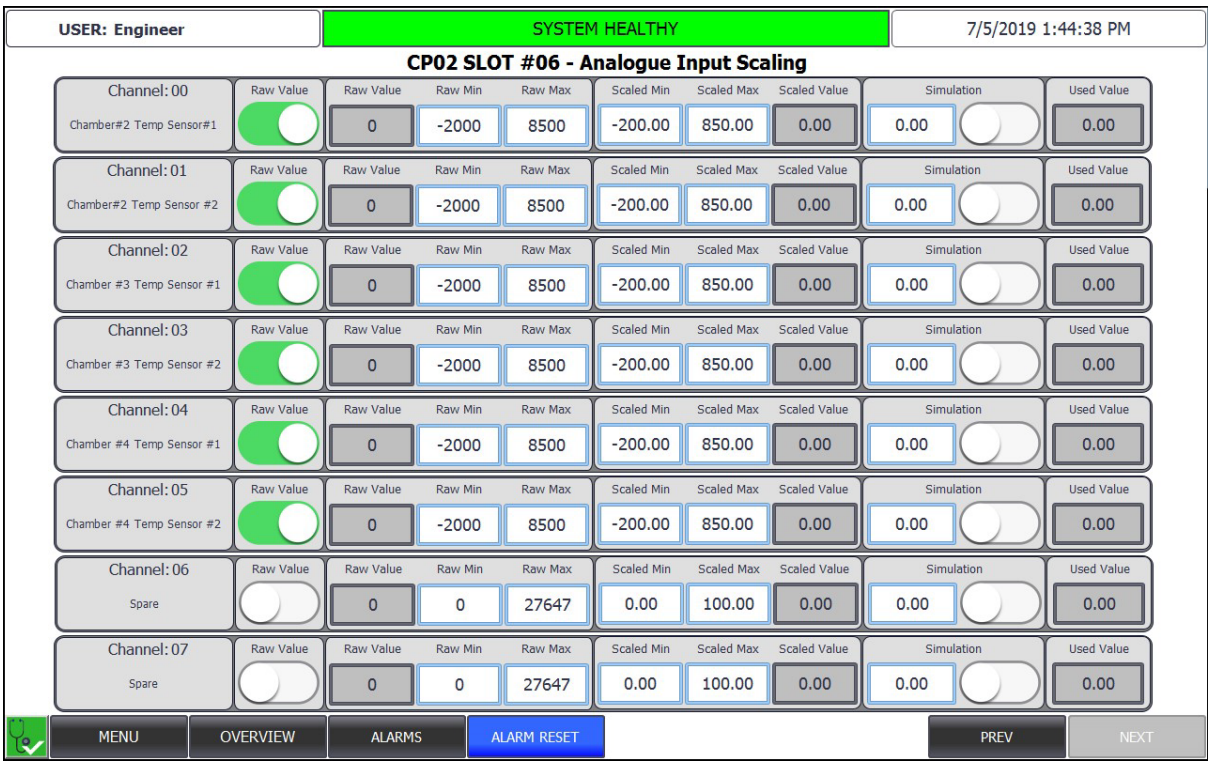
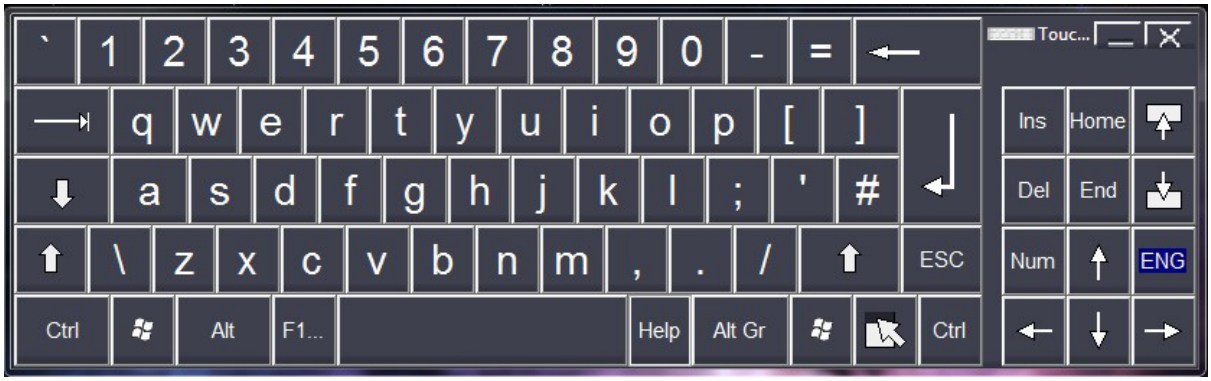
11.3.9 CP02 Slot 5

11.3.10 – CP02 Slot 6

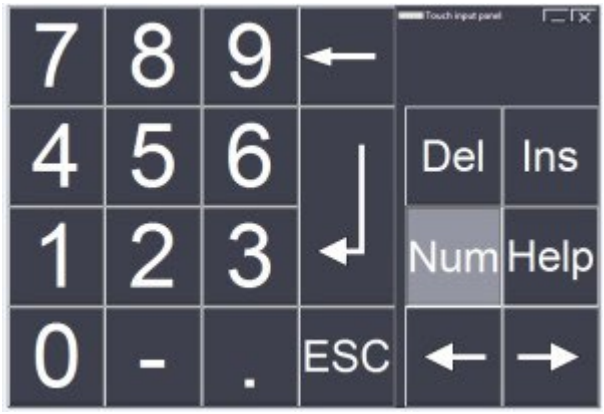


Appendix A - OSKs

A.1 - Standard OSK



A.2 - Numeric OSK



12 MAINTENANCE

12.1 Safety Recommendations

Before commencement of work on any system or installed item, it is important that a PERMIT TO WORK is issued by a competent person in authority, AND the item of plant is isolated and “Locked Off”. Before commencement of work on any system or installed item, make sure you have read and understood the safety rules and regulations for the works.
Before commencement of work on any system or installed item, make sure you have obtained a copy of the latest issue of the engineering drawing that gives you the schematic layout of the systems components.
Unreported faults and problems can cause serious breakdown to plant. Always report findings to the maintenance supervisor.
After maintenance, all plant that has been subjected to shutdown must be operated and tested prior to a qualified/authorised person signing off the permits.

12.2 Customer Maintenance Schedule

The following maintenance should be carried out as detailed in Table 3. If any problems are identified, refer to troubleshooting Section 8.

Table 3: Customer Maintenance Schedule

Action:	Daily	Weekly
Visual checks for oil leakage around gearbox and bearings	X	
Visual checks on input and output material	X	
Visual check on operation of motor(s) and drive(s)		X
Visual check on extraction fan	X	
Auditory bearing check		X
Visual check of material near heat pads – clear off any burnt substance		X
Drain Gas Monitoring Inline Water Trap Filter	X	

12.3 Advetec Service Schedule (If supplied through MSA)

The following maintenance will be undertaken by the Advetec Service Engineer as detailed below. 4: Advetec Service Schedule

Action:	3 Months	1 Year
Motor and drive inspection	X	
Moisture recovery inspection	X	
Odour control inspection and media change	X	
Infeed and outfeed inspection	X	
Internal paddle and chamber inspection	X	
Replenish inoculant and stimulant supply	X	
Annual full calibration service		X
Grease Bearings	X	

12.4 Lubrication schedule See Manual for Nord Powertrain.

12.5 Tools Required

The following tools are required for maintenance of the Advetec XO:
Selection of spanners (6mm to 19mm or ¼” to ¾”)
Selection of screwdrivers (large and small, Phillips and flat head)
Electrical cabinet key

13 TROUBLESHOOTING

13.1 General

FAULT	POSSIBLE CAUSE	REMEDY
Advetec XO not operating	No electrical power	Check electric power supply
		Ensure red emergency stop button is pulled out and blue E-stop reset button is pressed
	Software error	Ensure start button on main panel is pressed
		Ensure all settings are in auto mode
No rotation of drive shafts	Check Gearboxes and electric motors for damage or broken couplings. Fracture in gear unit or shrink disc slippage	Consult Advetec Service
	Software error	Ensure start button on main panel is pressed
		Ensure all settings are in auto mode
Advetec XO jammed	Debris caught within the Advetec XO	Remove debris and check for damage. Consult Advetec Service
Gearbox unusual running noises or vibrations	Oil too low in gearbox Bearing Damage or toothed wheel damage	Consult Advetec Service
Gearbox oil escaping from gear unit or motor	Defective seal	Consult Advetec Service
Gearbox oil escaping from pressure vent	Incorrect oil level or contaminated oil	Oil change, use oil expansion tank
Gear unit becomes too hot	Incorrect oil level or contaminated oil	Oil change
	Gear unit damage	Consult Advetec Service
	Gearbox placed in direct sunlight	Consider repositioning Advetec XO or cover unit

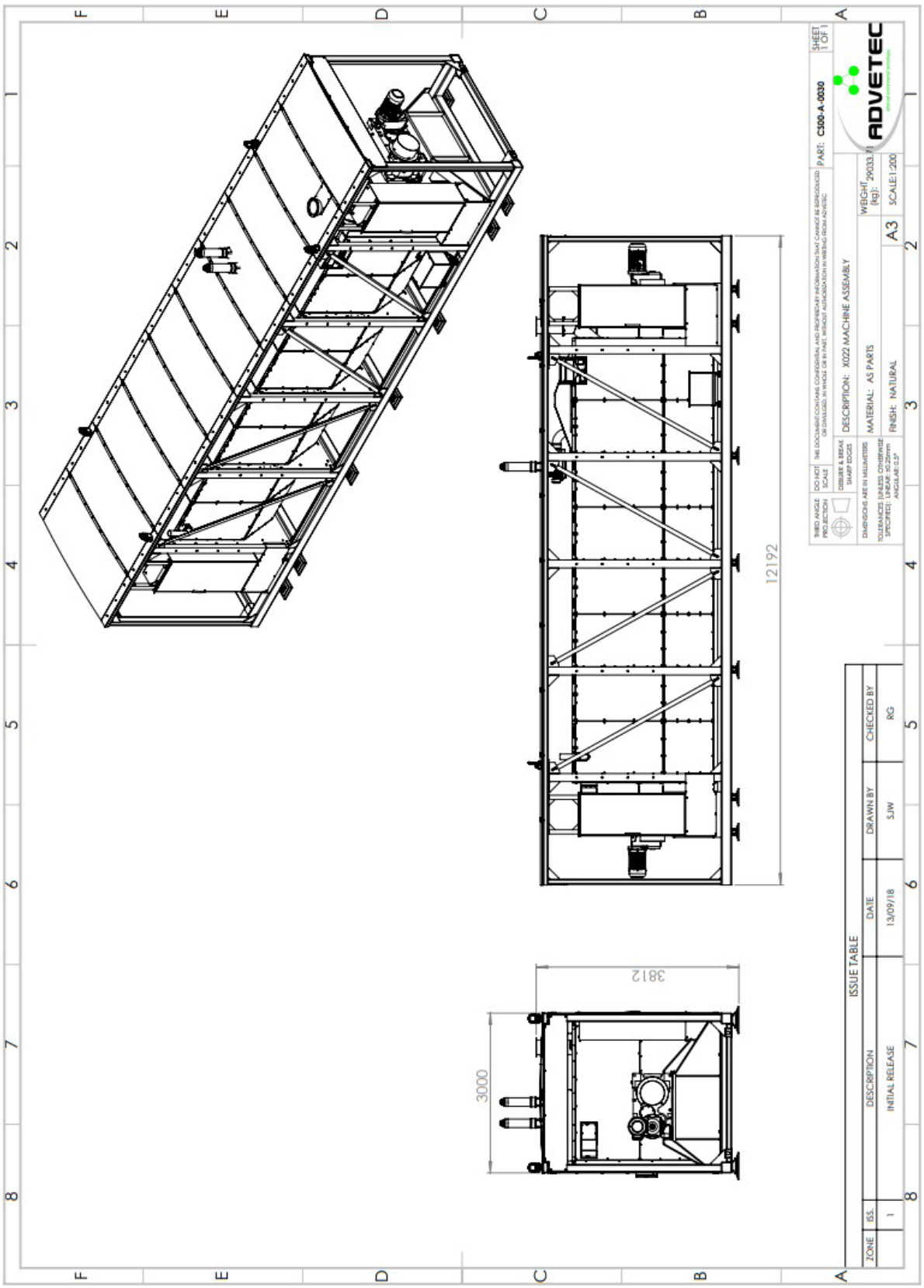
Shock vibrations when Advetec XO starts	Defective motor coupling Loose gear unit mounting Defective bearing	Consult Advetec Service

FAULT	POSSIBLE CAUSE	REMEDY
Temperature levels low	Heat pads not turned on	Ensure heat pads are set to auto, and set to correct temperature in recipe menu Ensure product maximum temperature is set in the setup menu Check circuit breakers in cabinet panel. Consult Advetec Service
	Extraction fan not operating	See below
	Incorrect loading conditions	Use regular intervals between loading, as advised by Advetec
	Change in waste stream	Revert back to original waste steam as agreed with Advetec. Or Consult Advetec Service
	Inoculant/Stimulant dosing pump issues	Check levels of inoculant/stimulant in cabinet Check power to pumps Check for blockages in pipe Prime pumps
Extraction fan not operating	Fan not turned on	Ensure extraction fan is set to auto in software Check circuit breakers in cabinet panel. Consult Advetec Service
	Motor failure	Consult Advetec Service
Drop in temperature & increase in moisture or a change in odour	Mass is binding together	Remove long strips of material (for mixed solid waste machines) Add material to waste stream to break it up (i.e. wood chips)
Increase in Hydrogen Sulphide	Process has become anaerobic	Increase rotations to aerate the process
Increase in Volatile Organic Carbons (VOCs)	Process has become anaerobic	Increase rotations to aerate the process

Increase in Methane	Process has become anaerobic	Increase rotations to aerate the process

	**Attention!**
	Warning: shut down the gear unit immediately should any of the above faults occur!

14 DRAWINGS



Appendix 1

Project Specific Method Statement/Risk Assessment if applicable.

Appendix 2

Dosages of Bacteria & Bio-Stimulant.

Advetec XO Model Number	Inoculant Usage (kgs/month)	Stimulant Usage (L/month)
XO22	12	31

Appendix 3

Electrical Diagrams are provided at the time of installation.

Appendix 4

Lift Certificate: Provided upon request

Appendix 5

Gas Monitoring and Odour Control

Advetec Gas Sampling System is a fixed sampler for TVOC, H2S, CO2, and Methane.

System includes:

All necessary sensors and components for complete measurement of these gasses
IP66 Stainless Steel cabinet with standard locking mechanism
Water Trap Filter
24V power supply unit
4-20mA Cable communications block for onward data transmission to Advetec XO Control Panel
Replaceable inline carbon filter for filtered gas out

Appendix 6 Log Sheets (*Example*)

Daily Check Sheet

Customer	
Machine	
Date installed	
Month	

Action / Date	Visual checks for oil leakage around gearbox and bearings	Visual checks on input and output material	Visual check on extraction fan	Comments
1st				
2nd				
3rd				
4th				
5th				
6th				
7th				
8th				
9th				
10th				
11th				
12th				
13th				
14th				
15th				
16th				
17th				
18th				
19th				
20th				
21st				
22nd				
23rd				
24th				
25th				
26th				
27th				
28th				
29th				
30th				
31st				

Example

Data Collection Record

Customer	
Machine	
Date installed	

Date	Time waste loaded	Ambient Temperature	Weight of waste fed in (kg)	Waste type	Digestate weight out (kg)	Core Temperature (celsius)			Data collected by	Comments / Observations
						1	2	3		

Example

Weekly Check Sheet

Customer	
Machine	
Date installed	
Year	

Action / Date	Visual check on operation of motor(s) and drive(s)	Auditory bearing check	Visual check of material near heat pads – clear off any burnt substance	Comments
Week 1				
Week 2				
Week 3				
Week 4				
Week 5				
Week 6				
Week 7				
Week 8				
Week 9				
Week 10				
Week 11				
Week 12				
Week 13				
Week 14				
Week 15				
Week 16				
Week 17				
Week 18				
Week 19				
Week 20				
Week 21				
Week 22				
Week 23				
Week 24				
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Week 32				
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Week 35				
Week 36				
Week 37				
Week 38				
Week 39				
Week 40				
Week 41				
Week 42				
Week 43				
Week 44				
Week 45				
Week 46				
Week 47				
Week 48				
Week 49				
Week 50				
Week 51				
Week 52				