



**APPLICATION FOR ENVIRONMENTAL PERMIT
UNDER THE ENVIRONMENTAL PERMITTING
(ENGLAND AND WALES) REGULATIONS 2016
(AS AMENDED)**

**ENVIRONMENTAL PERMIT TECHNICAL
REQUIREMENTS DOCUMENT**

**MICROPHARM LIMITED, CNWCAU,
CILGERRAN, SA43 2SN**



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ACRONYMS / TERMS USED IN THIS REPORT

BAT	Best Available Techniques
Bref	Best Available Techniques Reference Documents
CCTV	Closed Circuit Television
cGMP	Current Good Manufacturing Practice
ECL	Environmental Compliance Limited
EHS	Environmental, Health and Safety
EMS	Environmental Management System
EP Regulations	Environmental Permitting (England and Wales) Regulations 2016 As Amended
EP	Environmental Permit
ERA	Environmental Risk Assessment
EWC	European Waste Catalogue
FRS	Fire Rescue Service
HAZOP	Hazard and Operability Study
HVAC	Heating, Ventilation and Air Conditioning
ICH	International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use
IED	Industrial Emissions Directive
MHRA	Medicine and Healthcare products Regulatory Agency
MicroPharm	MicroPharm (Limited)
MSDS	Material Safety Data Sheet
NGR	National Grid Reference
NRW	Natural Resources Wales
H&SMS	Health and Safety Management System
PCC	Pembrokeshire County Council
PPMR	Planned Preventative Maintenance Regime
QMS	Quality Management System
QPM	Quality Policy Manual
QRM	Quality Risk Management
QS	Quality System
SOP	Standard Operating Procedure
VOC	Volatile Organic Carbon

1. INTRODUCTION

1.1. Project Overview

- 1.1.1. Environmental Compliance Limited (“ECL”) has been appointed by MicroPharm Limited (“MicroPharm”) to prepare an Environmental Permit (“EP”) application to be submitted to Natural Resources Wales (“NRW”).
- 1.1.2. MicroPharm specialise in the development of immunotherapeutic products to target acute toxic conditions. At MicroPharm’s Newcastle Emlyn Site (EP Reference EPR/FP3437VK), the Company specialises in the manufacture of anti-venoms for the treatment of venomous snakebites, specifically the European common adder and the carpet viper in West Africa. In addition, MicroPharm offer a contract manufacturing service. MicroPharm are proposing to undertake similar operations at the Cilgerran Site, hereafter referred to as “the proposed Installation”. The proposed Installation will manufacture treatments for envenomation caused by venomous snake and scorpion species found in Europe, North Africa, sub-Saharan Africa and the Middle East.

1.2. Installation Location

- 1.2.1. The proposed Installation is located at Cnwcau, Cilgerran (SA43 2SN) and occupies an area of approximately 1.09Ha. The proposed Installation is centred on National Grid Reference (“NGR”) 220249, 242714. The Installation boundary (outlined in green) is indicated on the Block and Location Plan (Drawing No. 37) which is provided in Appendix 1 of this document.

1.3. Planning Permission

- 1.3.1. The Planning Application (Reference 18/0988/PA) for the proposed Installation was conditionally approved in February 2019 by Pembrokeshire County Council (“PCC”). A copy of the Planning Permission may be found in Appendix 2 of this document. The conditions of the Planning Permission include environmental controls of potential noise pollution. This is discussed in more detail in Section 6 of this EPTR.

1.4. Pre-Application Meeting

- 1.4.1. A Pre-Application meeting was held at NRW’s Llandarcy Office on Wednesday 8th May 2019 attended by MicroPharm, Environmental Compliance Limited and Guy Baskerville of NRW. Guy Baskerville is currently MicroPharm’s Newcastle Emlyn Site Inspector and the anticipated NRW Site Inspector for the proposed Installation.
- 1.4.2. The purpose of the meeting was to discuss the Schedule 1 Activity within the Environmental Permitting (England and Wales) Regulations 2016 as amended (“EP Regulations”) applicable to the proposed activities and to confirm which NRW guidance and Best Available Techniques (“BAT”) Reference Document (“Bref”) should be considered in this application.

2. THE INSTALLATION AND IT'S ACTIVITIES

2.1. Installation Activities

- 2.1.1. The proposed Listed Activity to be undertaken at the Installation is covered by the description in Section 4.5 A(1)(a) in Part 2 to Schedule 1 of the EP Regulations: *"Producing Pharmaceuticals"*.

2.2. Directly Associated Activities

- 2.2.1. One Directly Associated Activity ("DAA") is proposed; 'storage of waste - from the generation of wastes to the determination of their fate and transfer off-site'. Limits of activity will be 'from point of production of any wastes to their collection, storage and transfer of-site'.

2.3. General Arrangements

- 2.3.1. The arrangements at the Installation have been designed to take account of the relevant requirements of NRW guidance *'How to comply with your environmental permit'* (Version 8, October 2014).
- 2.3.2. Descriptions of the proposed activities are provided in Section 4 of this EPTR and an indicative process flow diagram is also provided in this document.
- 2.3.3. The proposed equipment and techniques will comply with the indicative BAT requirements as detailed in Sector Guidance Note EPR 4.02 *'Speciality Organic Chemicals Sector'* (2009). The compliance with BAT requirements is demonstrated in detail in Section 11 of this report.
- 2.3.4. Normal operating hours will be 8.00am to 6.00pm Monday to Friday. MicroPharm may also undertake occasional shift work and 24 hour working depending of demand.

2.4. Installation Layout

- 2.4.1. The Block and Location Plan as Proposed (Drawing No. 37), which is contained in Appendix 1, details the proposed Installation layout arrangements.
- 2.4.2. The anticipated movement of the product and people within the Installation is provided in Appendix I of this EPTR.

2.5. Installation Infrastructure

- 2.5.1. The main process building is surrounded by a hard surfaced area and located within a secure compound, which is completely enclosed by metal palisade fencing. Access to the site is via one lockable entrance gate.

- 2.5.2. The Installation benefits from an intruder alarm system which is set when the site is unoccupied. If two or more sensors are triggered, an automatic dial out will be sent to an alarm receiving centre; they will contact on-call MicroPharm nominated personnel. The police will also be contacted.
- 2.5.3. All of the internal areas of the Installation are of impermeable concrete construction.
- 2.5.4. MicroPharm will implement a regime of regular visual site condition checks at the proposed Installation to ensure that infrastructure is maintained in good condition. The site condition checks will be included within the site's Health and Safety Management System ("H&SMS") and referenced within the Environmental Management System ("EMS") and will cover:
- fortnightly checks – evidence of tampering, build-up of debris, drainage and guttering, the condition of internal and external hardstanding, tanks and bunding, external buildings walls, fences and gates; and
 - monthly checks – internal and external fittings.
- 2.5.5. The results of these checks will be recorded, together with details of any remedial action, such as clearance of debris or repair of infrastructure and/or fittings that may be required. The completed check sheets will be passed to the Site Manager or nominated deputy for review.

2.6. Drainage Arrangements

- 2.6.1. The drainage arrangements at the Installation are shown on the Block and Location Plan As Proposed (Drawing No. 37) which is provided in Appendix 1 of this document.
- 2.6.2. All drains are colour coded; blue for surface water and red for foul water discharge.
- 2.6.3. There will be direct process-related point source emissions to foul sewer, designated as S1, from the activities that will be undertaken at the proposed Installation. This release will be authorised under a Trade Effluent Consent granted by Welsh Water.
- 2.6.4. There will be no direct process-related releases to surface water from the activities that will be undertaken at the proposed Installation. Clean storm water run-off from the building and impermeable hardstanding areas will pass directly through to the Installation's surface water drainage system via designated emission points W1 and W2.
- 2.6.5. Any accidental spillage will be dealt with in accordance with the installation's Emergency Spillage Response procedure which will form an integral part of the proposed Installation's QMS and EMS.
- 2.6.6. Detailed information regarding emissions to water is provided in Section 5 of this EPTR.

3. MANAGEMENT SYSTEM

3.1. Overview of Existing Management System Arrangements

- 3.1.1. MicroPharm will operate an EMS at the proposed Installation which will address environmental matters. This will be based on their current EMS at the Newcastle Emlyn Site but will be modified to cover any additional and/or site specific risks related to the proposed Installation.
- 3.1.2. Due to the nature of the proposed activities and the strict regulations imposed, MicroPharm have a comprehensive Quality Management System ("QMS") (See Section 4.6 of this EPR) and also an H&SMS and therefore, relevant procedures forming part of the QMS and H&SMS will be incorporated and referenced throughout the EMS, where applicable.
- 3.1.3. The Chief Executive Officer holds overall responsibility for the site. Responsibility for environmental matters at the Installation rests with the Health, Safety and Environmental Manager. The Health, Safety and Environmental Manager is responsible for reporting to the MicroPharm Board of Directors via the Chief Executive Officer ("CEO").

3.2. Outline of Environmental Management System

- 3.2.1. MicroPharm will implement a documented EMS which will be based on the Plan-Do-Check-Act approach, that:
- ensures compliance with all relevant legislation;
 - ensures compliance with the conditions of the proposed Installation's EP;
 - identifies, assesses and minimises the risks of pollution arising from the proposed Installation's activities;
 - comprises a range of written procedures that cover all aspects of the proposed Installation's activities;
 - identifies, sets, monitors and reviews environmental objectives and key performance indicators; and
 - includes a requirement to report annually on environmental performance, objectives, targets and future planned improvements.

3.3. Environmental Policy

- 3.3.1. A copy of the Company's Environmental Policy Statement (EMP 05, October 2019) is provided in Appendix 3 of this document.

3.4. Details of Environmental Management System

3.4.1. Plan

3.4.1.1. The planning element of the EMS will include:

- identification of environmental impacts and aspects associated with the Installation's activities, and assessing their significance; including an assessment of the potential environmental risks posed by the work of contractors;
- identification and evaluation of relevant legal and other relevant requirements;
- identification of environmental objectives and targets that will be focussed on reducing the impact of the identified significant environmental aspects. As production will be increased each year to reach maximum production by 2022, the objectives and targets will be set by consumption per gram of product produced to enable year on year comparison;
- a series of risk assessments to cover a range of issues, including site operations, maintenance, accidents, training and records; and
- details of how MicroPharm will ensure that any relevant standards, guidance and codes of practice are met on an ongoing basis.

3.4.1.2. The outcomes of the above are:

- a comprehensive understanding of the potential and actual impacts of the permitted activities on the surrounding environment;
- the correct appropriate measures selected to manage environmental risks and prevent or minimise their effects so as not to cause pollution;
- a series of documented procedures covering all aspects of the Installation's activities; and
- a series of documented environmental objectives and targets, together with an action plan/development programme to ensure that these are met.

3.4.2. Do

3.4.2.1. This element includes:

- ensuring that EMS roles and responsibilities are clearly defined and documented, and that site staff are made aware of these;
- ensuring that the installation is operated by suitably competent staff who have received the necessary training in all aspects of the plant's operation, including where contractors are used, ensuring that they are suitably competent; in this regard:
 - the skills and competencies necessary for key posts are documented; these key posts include contractors, those responsible for liaising with contractors and those purchasing equipment and materials,
 - training requirements are identified by means of a documented training needs analysis,
 - documented training records are kept and updated as required,
 - training specifically addresses environmental awareness and environmental permit requirements, and
 - the requirement for ongoing/refresher training is identified;

- the induction programme will involve personnel watching an Environmental Awareness DVD. All relevant personnel are also required to be 'Awareness Trained' in regards to EMS procedures;
- ensuring that there are site layout plans - including drainage plans - and that they are revised as required to reflect any changes at the Installation;
- ensuring that there are documented procedures covering internal and external communications;
- ensuring that there are procedures in place for staff and contractors to have access to the Installation's permit and management system requirements; with regard to contractors, ensuring that suitable instructions are provided with regard to protecting the environment whilst working on site;
- the establishment of a documented Planned Preventative Maintenance Regime ("PPMR") to ensure that all plant and site infrastructure are kept in suitable condition and operating effectively; this PPM programme details what maintenance, tests and inspections need to be done and when; this also details the measures required to ensure continuing compliance with the permit conditions during maintenance/shutdown.
- The PPMR also:
 - identifies known or predictable malfunctions associated with the operations and the procedures, spare parts, tools and expertise required to deal with them,
 - includes a defined procedure for identifying, reviewing and prioritising items of plant for which a preventative regime is appropriate,
 - includes equipment or plant whose failure could directly or indirectly lead to an impact on the environment or human health and 'non-productive' items,
 - ensure the necessary spare parts, tools, and competent staff are available prior to commencing maintenance;
- The PPMR is contained in the QMS and will be incorporated into the EMS. It is managed by the Calibration and Maintenance Administrator. MicroPharm are in the process of transferring the database into Formpipe which is an electronic management system;
- ensuring that the Operation and Maintenance Standard Operating Procedures ("SOPs") contain identified spare parts. Essential spare parts will be held on-site at all times;
- ensuring that there are documented procedures covering document control;
- ensuring that there are suitable documented record-keeping arrangements in place;
- ensuring that there are documented operational procedures and work instructions covering all aspects of the Installation's operation;
- ensuring that there are documented procedures covering emissions monitoring undertaken at the Installation; these will specifically include details of the relevant standards/methods used, the equipment used, its maintenance and calibration requirements and the frequency required (i.e. continuous or periodic, and if periodic, the associated schedules);
- ensuring that there are documented procedures that incorporate environmental issues into the control of process/equipment change, design

- and review of new facilities, capital approval and purchasing policy;
- ensuring that there are documented procedures to address non-conformities/non-compliances and the associated corrective and preventative action; these will detail the means by which any such non-conformities/non-compliances are reported to management and the means by which they are reported to NRW;
- ensuring that there is a documented procedure for dealing with complaints; this includes requirements to ensure that:
 - an appropriate person deals with the complaint,
 - the complaint is properly recorded,
 - the complaint is properly investigated,
 - any action necessary to deal with the cause of the complaint is recorded,
 - the impact of the activity causing the problem is minimised,
 - steps are taken to ensure that the problem is not repeated,
 - details of any justified complaints are reported to senior management,
 - that the complainant (or NRW, as appropriate) is responded to in writing,
 - if the complaint came via NRW, a suitable documented response is provided to NRW,
 - if the complaint has come from a neighbour or a member of the public, a suitable documented response is provided to the complainant, and, if the complaint is substantiated, a report is provided to NRW, and
 - the EMS is amended accordingly to reflect any changes;
- ensuring that there are documented procedures covering emergency preparedness and response; these will cover such incidents as major plant failures, significant spillages of potentially polluting substances, loss of mains electrical power etc.; these are incorporated into an Accident Management Plan; MicroPharm will ensure that suitable measures are in place to communicate the Plan to all employees, management and contractors who work at the site; the Plan details:
 - the arrangements for response to an emergency, including defining specific responsibilities,
 - the measures for dealing with the consequences of an incident,
 - communicating with NRW and other relevant regulatory bodies,
 - communicating with the Installation's neighbours and the local community,
 - the measures for investigating incidents (and near-misses), including identifying suitable corrective action and following up implementation of that action,
 - the measures for recording incidents (and near-misses),
 - the measures for reporting incidents (and near misses) to Senior Management, and
 - the measures for reporting incidents to NRW;
- ensuring that there are documented procedures for carrying out internal audits; these describe how to schedule, conduct, report and manage internal audits.

3.4.2.2. The outcome of the above is evidence that day-to-day activities will be taking place in accordance with the requirements of the EMS and the Installation's permit, specifically:

- that control measures and procedures are an integral part of the business operation;
- that the EMS is easy for staff to access, understand and use;
- that staff are suitably trained and competent to carry out procedures and control measures; and
- that the requirements of the EMS are effectively communicated to management, staff and contractors.

3.4.3. Check

3.4.3.1. This element includes:

- ensuring that all regulatory requirements in relation to monitoring and measurement are complied with, specifically:
 - the requirements relating to inspection and testing required under the applicable environmental legislation and the Installation's permit (including a list of the scheduled monitoring programmes) and the associated procedures and work instructions,
 - the requirements relating to inspection and testing required under the applicable health and safety legislation and the associated procedures and work instructions, and
 - the requirements relating to the control of all inspection, measuring and test equipment relating to environmental requirements;
- ongoing evaluation of compliance with environmental legal requirements, policy requirements and objectives and targets; this will include:
 - an annual review of the environmental legal register,
 - regular plant inspections, and
 - internal audit procedures (as detailed below);
- ensuring that non-conformities/non-compliances are properly recorded, investigated and that the appropriate corrective action is taken by the due date;
- ensuring that the necessary reporting and record-keeping required under the various permits, licences and consents are complied with;
- ensuring that internal audits are carried out in accordance with the documented procedures and that any audit actions are followed up ;and
- ensuring that the results of all audits are made available to Senior Management on a regular basis.

3.4.3.2. The outcomes of the above will be:

- that checks are carried out to ensure that the EMS is being implemented as intended, i.e. as documented; and
- the necessary preventative and corrective actions are undertaken to minimise non-compliances.

3.4.4. Review (Act)

3.4.4.1. This element will include:

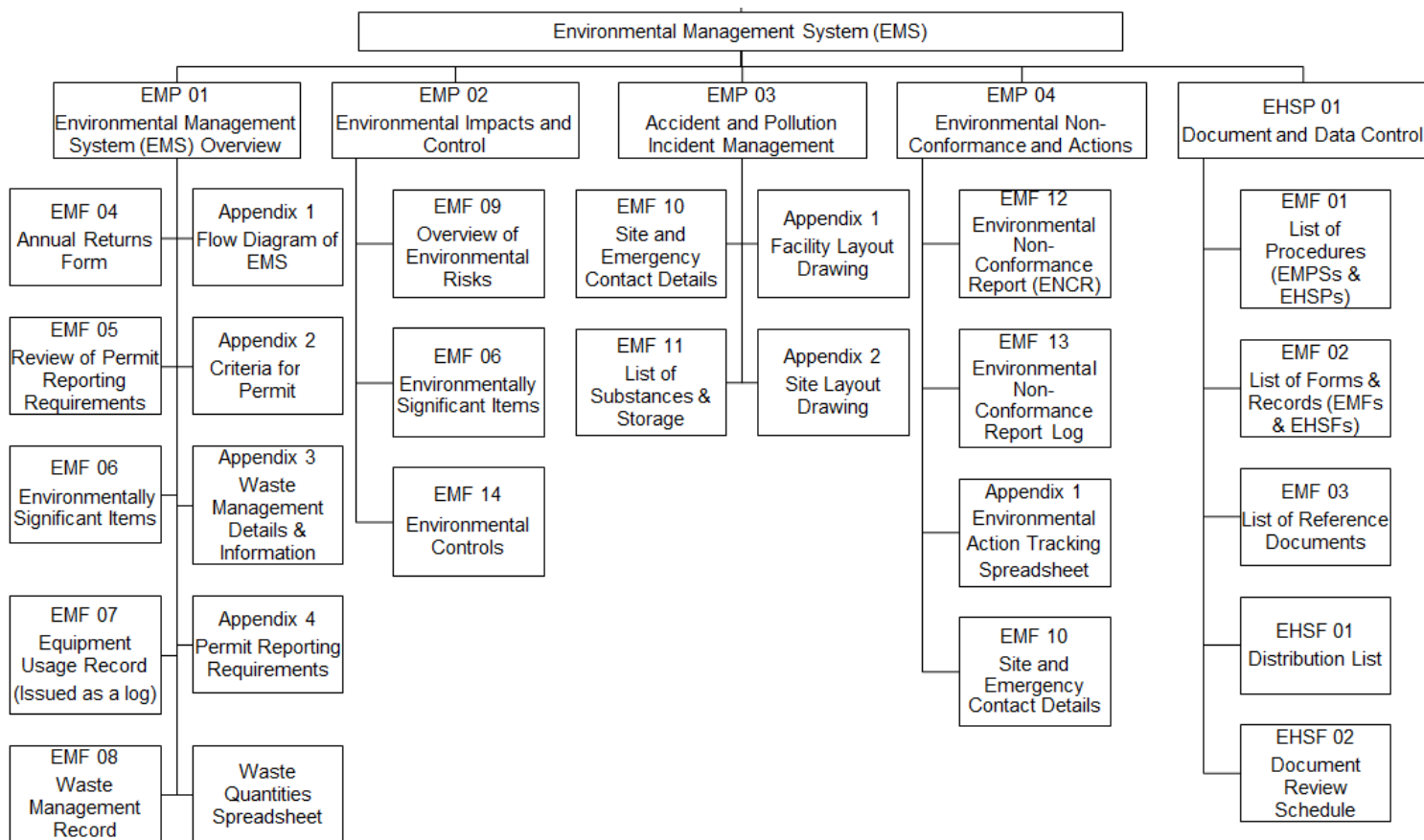
- the methods established for communicating environmental performance. These will include Health and Safety meetings held bi-annually, weekly meetings with managers, fortnightly Cilgerran site progress meetings and monthly reports submitted for board meetings;
- an annual management review of the EMS to ensure that it is appropriate, being implemented and kept up to date, e.g. that any supplementary plans have been included into the EMS;
- a management review of the EMS when:
 - there are changes on site (in activities and/or plant/equipment),
 - if there is an accident, complaint, or breach of permit conditions.
- an annual review of both individual and organisational training needs;
- ensuring that all changes to the EMS are properly recorded, and, if there are any major changes, NRW is informed;
- an assessment of whether the Installation's objectives, and any targets, have been met and reported;
- a review of the Installation's objectives and targets, and, where appropriate, any revisions to these so as to effect continual improvement.

3.4.4.2. The outcomes of the above will be:

- the EMS is kept up to date, and
- the EMS is continually improved.

3.4.4.3. An indicative outline of the EMS documentation which will be implemented at the proposed Installation is provided in Figure 1.

Figure 1: Environmental Management System Documentation



4. OPERATING TECHNIQUES

4.1. Technical Standards

4.1.1. **European Legislation** – The Industrial Emissions Directive (“IED”) is intended to be a single legislative instrument for permitting, compliance and enforcement of environmental legislation across all member states. The requirement of the IED will therefore be considered relevant at this time. The Bref Document ‘*Organic Fine Chemicals*’ (August 2006) will be used to adopt best practices and operating techniques.

4.1.2. **National Legislation** – NRW implement the requirements of IED via the EP Regulations and have provided a number of guidance documents to assist in the preparation of permit applications and the ongoing management of permitted installations. The NRW guidance documents that will be used in the preparation of this permit application will be:

- ‘How to comply with your environmental permit’, Version 8, October 2014 – which is applicable to all permitted activities; and
- ‘How to comply with your environmental permit, Additional Guidance for: *Speciality Organic Chemicals Sector*’ (EPR 4.02), Version 2, September 2014 – which applies to those Installations falling within Section 4.5 of Part 2 of Schedule 1 of the EP Regulations.

4.2. Technical Expertise

4.2.1. MicroPharm was established in 1998 with manufacturing operations commencing in 2004. MicroPharm operate a similar operation in Newcastle Emlyn, Carmarthenshire under Environmental Permit EPR/FP3437VK (issued in 2014). Therefore, the Company has extensive understanding of the manufacture of anti-venom products. Experienced personnel will be involved in the risk assessment, commissioning and training of MicroPharm employees at the proposed Installation.

4.3. Process Summary

4.3.1. The process involves eight functional phases; which are encapsulated as follows:

1. Plasma Pool constitution;
2. Removal of unwanted plasma proteins, pH adjustment and filtration;
3. Further filtration, chromatography and purification of immunoglobulins;
4. Peptidic hydrolysis of the immunoglobulin concentrate and diafiltration;
5. Chromatography, diafiltration and concentration;
6. Pooling of intermediate sub-batches;
7. Pasteurisation and filtration; and
8. Concentration, pH adjustment and final filtration.

4.4. Hazard and Operability Study

- 4.4.1. The proposed activities are based on an established process designed by a French company who currently manufacture human therapeutic products for injection. As part of the agreement to use this process at the proposed Installation in Cilgerran, the well-defined design and engineering phases must be adhered to.
- 4.4.2. As previously discussed, MicroPharm operate a similar Installation, albeit on a smaller scale, at their site in Newcastle Emlyn (EP Reference EPR/FP3437VK). MicroPharm personnel are highly knowledgeable and experienced in this sector and the proposed manufacturing process.
- 4.4.3. MicroPharm's Health, Safety and Environmental Manager is an integral part of the project team for the proposed Installation and is involved in undertaking risk assessments including environmental hazards. The Company's change control procedure including introduction of new products and procedures stipulates that environmental considerations are mandatory prior to approval and implementation of any change.
- 4.4.4. Identified environmental considerations and controls will be addressed once the equipment has been procured, delivered and installed by specialist engineers at the proposed Installation.
- 4.4.5. Due to the adoption of a well-established process, the technical expertise, the standard processing and laboratory equipment to be used, the scale and nature of the proposed activities and the strict regulations related to the manufacture of pharmaceuticals (see Section 4.6 below), the requirement to undertake a formal Hazard and Operability Study ("HAZOP") is not considered to be required.

4.5. Good Manufacturing Practice and Quality Risk Management

- 4.5.1. MicroPharm will be inspected by the UK Regulatory Body, the Medicines and Healthcare products Regulatory Agency ("MHRA") to ensure compliance against current Good Manufacturing Practice ("cGMP") and all related regulations and directives.
- 4.5.2. This inspection will be undertaken after completion of engineering batch(es) and prior to the manufacture of GMP batches. Any observations or non-conformances can lead to delay in issue of licences.
- 4.5.3. In order to comply with the cGMP, MicroPharm has an extensive QMS which will be rolled out at the Installation. The QMS encompasses cGMP and Quality Risk Management ("QRM"). This QRM is used for assessing the risks to quality of product, processes, assays, equipment, premises and personnel. It encompasses all areas of the product lifecycle including:
- pharmaceutical development;
 - technology transfer;
 - commercial manufacturing; and
 - product discontinuation.

- 4.5.4. In addition to the Quality Policy Manual (“QPM”) and associated Standard Operating Procedures (“SOPs”), all MicroPharm personnel will be required to have awareness and knowledge of the following published guidance:
- Rules and Guidance for Pharmaceutical Manufacturers and Distributors (MHRA, 2017);
 - International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (“ICH”) Guidelines.
- 4.5.5. European Directives and UK Regulations which are relevant to the proposed Installation specifically relating to the manufacture of pharmaceuticals includes, but is not limited to:
- Community Coding relating to the Medicinal Products for Human Use – 2001/83/EU;
 - Laying down the Principles and Guidelines of Good Manufacturing Practice in Respect of Medicinal Products for Human Use and Investigational Medicinal Products for Human Use – 2003/94/EC;
 - Amending Directive 2001/83/EC on the Community Code Relating to Medicinal Products for Human Consumption, as regards the Prevention of the Entry into the Legal Supply Chain of Falsified Medicinal Products – 2011/62/EU;
 - Amending Directive 2001/83/EU as regards Pharmacovigilance – 2012/26/EU;
 - The Human Medicines Regulations 2012 – 2012 No.1916.

4.6. Process Controls

- 4.6.1. Due to the nature of the operations and the relatively simple separation and purification technologies being proposed, the level of process control required is considered low.
- 4.6.2. Some process stages, such as purification by chromatography will be automated using programmable chromatography systems (rigs). However, a MicroPharm Operator will be present to supervise all operations until the methods become established.
- 4.6.3. Items of equipment that are used for temperature-critical stages of the process will be temperature-controlled, e.g. jacketed tanks, oven etc.
- 4.6.4. Critical stages are monitored for key indicators, such as pH and temperature; this allows for prompt identification of any failures. There will also be a system installed to identify and alert MicroPharm Operators of any process problems.
- 4.6.5. The manufacturing cleanrooms will be connected to a call-out system for the monitoring of room pressures. Temperature-controlled areas (e.g. walk-in fridges, storage areas etc.) will be connected to a call-out system for monitoring temperature.
- 4.6.6. Additionally, large items of electrical equipment have emergency stop buttons to halt the process immediately in case of serious system failure.

5. EMISSIONS AND MONITORING

5.1. Point Source Emissions to Air

- 5.1.1. A maximum of 500 litres of liquid nitrogen will be stored outside the main building in two storage vessels. A container of cells housing a small reservoir of liquid nitrogen and a transfer vessel will be stored internally. There will be one emission point to air, designated as A1, which is associated with the external storage of liquid nitrogen. The approximate location of A1 is shown on the Block and Location Plan As Proposed (Drawing No.37) contained in Appendix 1 of this EPTR.
- 5.1.2. A1 is a process related emission point which will only occur in an emergency situation. Nitrogen gas will be released in the unlikely event of a catastrophic failure of the vessel or fittings (e.g. valves, hoses etc.). Therefore, no monitoring is proposed as part of this application.
- 5.1.3. The risk management measures proposed to prevent such an emergency scenario from occurring are discussed in the Environmental Risk Assessment ("ERA") (Document Reference ECL.066.01.01/EPTR), which is contained in this application submission.
- 5.1.4. There will also be two non-process related release points to air; boiler gas exhaust flue and ventilation from staff toilets. The boiler is exclusively used to provide ambient temperature heating for site personnel for welfare purposes. Therefore, the use of the boiler and release point of exhaust gases is not directly linked to the proposed operations and therefore, is not considered a process release.
- 5.1.5. Additionally, the release point from the staff restroom is for ventilation purposes only and therefore, is also not considered a process release.

5.2. Discharges to Surface Water

- 5.2.1. There will be no direct process-related releases i.e. process contributions to surface water from the activities that will be undertaken at the proposed Installation.
- 5.2.2. Storm water run-off from the building and impermeable hardstanding areas, such as car parking areas, will pass directly through to the Installation's surface water drainage system into emission points designated W1 and W2, as displayed on the Block and Location Plan contained in Appendix 1.
- 5.2.3. As the discharge will be limited to clean surface water run-off, no monitoring to surface water is proposed as part of the application.

5.3. Discharges to Foul Sewer

- 5.3.1. There will be direct process-related point source emissions to foul sewer, designated as S1, from the activities that will be undertaken at the proposed installation. The proposed location of S1 is illustrated on the Block and Location Plan as Proposed (Drawing No. 37) in Appendix 1 of this EPTR.
- 5.3.2. The aqueous material discharged will comprise the following:
- pharmaceutical grade water;
 - low concentration solutions of salts, such as sodium chloride, sodium phosphate and sodium acetate;
 - de-activated pepsin solution at 100 g/L;
 - sodium hydroxide (up to 2 molar concentration ("M") with the potential for further dilution;
 - hydrochloric acid (up to 2M) with the potential for further dilution;
 - diluted cleaning agent; and
 - waste from processing animal plasma.
- 5.3.3. The proposed S1 discharge will also include foul water arising from site facilities, such as toilets and sinks.
- 5.3.4. All chemicals and solutions used in the manufacture of products at the proposed Installation will be pharmaceutical grade and thus suitable for parenteral use in humans and animals.
- 5.3.5. The point source emissions to foul sewer will be authorised under a Trade Effluent Consent granted by Welsh Water. MicroPharm has applied for the relevant consent. As part of this Trade Effluent Consent application process, a Welsh Water Technician has undertaken a site review. Consent has been granted; upon receipt, a copy of the Trade Effluent Consent will be submitted to NRW.
- 5.3.6. If required, a flow meter will be installed by MicroPharm and monthly readings will be recorded to monitor the volume of wastewater discharged to sewer. Alternatively, trade effluent output volume will be assumed to be equivalent to the volume of solutions entering the Installation.
- 5.3.7. If deemed necessary, a Welsh Water technician will attend site to undertake periodic sampling and analysis to confirm all trade effluent limits are adhered to.
- 5.3.8. As part of the site monitoring, MicroPharm will monitor the pH of the effluent using pH indicator strips prior to the effluent being discharged. No other monitoring is proposed.

5.4. Fugitive Emissions to Surface Water, Sewer and Groundwater

- 5.4.1. All internal and external surfaces on site consist of impermeable concrete hardstanding. Therefore, the risk of fugitive emissions to groundwater is not considered significant.
- 5.4.2. Raw materials storage areas and processing areas are located internally. Therefore, any spillages within the building would not physically be able to enter the surface water drainage network without travelling a considerable distance. MicroPharm personnel will deploy drain covers and/or absorption materials to prevent any potential spillage from entering the internal foul water drainage network.
- 5.4.3. Any potential spillages in the exterior areas of the Installation associated with the unloading, storage and use of 5,000L of fuel oil for heating purposes will be contained in the purposefully designed and installed concrete bunded area. This bund has been lined to ensure impermeability and has the capability of containing 110% of the total tank capacity. Additionally, a suitably sized spill kit is also located on the containment vessel. Any fuel oil spillage will captured within the bund will be subsequently tankered off site to an appropriately licenced Facility or Installation for disposal or re-use.
- 5.4.4. As part of the H&SMS and EMS, all tanks, bunds and site infrastructure will be subject to visual inspections and any required maintenance.
- 5.4.5. Any accidental spillage will be dealt with in accordance with the Installation's emergency spillage response procedure which will form an integral part of the QMS, H&SMS, and EMS.
- 5.4.6. The Installation will benefit from spill kits placed in strategic locations which contain absorbent mats, drain covers and booms which will be deployed by suitably trained MicroPharm personnel in case of loss of containment.
- 5.4.7. Potentially contaminated firewater run-off resulting from a fire event at the Installation is discussed within the Environmental Risk Assessment (Document Reference ECL.066.01.01/ERA) which has been submitted as part of this application.

6. GENERAL REQUIREMENTS

6.1. Noise Management

- 6.1.1. The Environmental Risk Assessment (“ERA”) (Document Reference ECL.066.01.01/ERA), in conjunction with the Environmental Noise Assessment undertaken by the Industrial Noise and Vibration Centre Limited (Report No. 9197, November 2018) submitted with the Planning Application (Reference: 18/0988/PA) has demonstrated that, even with the proposed Installation operating twenty four hours a day in an area with low night time noise levels, the risk of noise nuisance is not considered to be significant. Therefore, a Noise Management Plan is not required as part of this EP application. A copy of the Environmental Noise Assessment is provided in Appendix 4 of this EPTR.
- 6.1.2. Operational noise levels will be required to comply with requirements of The Control of Noise at Work Regulations 2005 and Condition 3 of the Planning Permission (Application Number 18/0988/PA). The latter states that noise generated by the condenser and fresh air units will not exceed the background noise level by more than 5 dB (A) at the nearest residential property to the development site at any time when measured (and shall be assessed in accordance with BS4142: 2014).
- 6.1.3. Based on the requirements outlined, routine noise checks at the EP boundary will be undertaken by MicroPharm personnel during site walkabouts, with the findings reported to management and scheduled maintenance carried out on all equipment in accordance with manufacturer’s specifications.

6.2. Emissions Management

- 6.2.1. The ERA (Document Reference ECL.066.01.01/ERA) has demonstrated that emissions of substances not controlled by emission limits (i.e. fugitive emissions) are not considered to be significant, consequently an Emissions Management Plan is not required as part of this EP application.

6.3. Odour Management

- 6.3.1. The process is not odorous in nature and therefore, an assessment of odour and the requirement for an Odour Management Plan is not considered relevant.

6.4. Fire Management

- 6.4.1. The ERA (Document Reference ECL.066.01.01/ERA) has demonstrated that fire risk is an important consideration for the proposed Installation due to the storage of the various production chemicals, as well as the central heating oil.
- 6.4.2. The proposed Installation will be operated in accordance with MicroPharm’s fire strategy which will form part of the Installation’s H&SMS. Regular fire risk assessments will also be undertaken to identify and mitigate against potential fire hazards.

- 6.4.3. A fire detection alarm systems is installed, maintained and tested in accordance with Fire and Rescue Service (“FRS”) recommendations. PPMR includes the inspection and preventative maintenance on all electrical equipment.
- 6.4.4. Designated smoking areas will be located a significant distance from operational areas and identified fire risks.
- 6.4.5. All MicroPharm personnel will be suitably trained in the fire strategy, preventing fires on site, identify fire risks and emergency response procedures.
- 6.4.6. Containment of firewater runoff has also been considered. The impermeable concrete hardstanding present on site will prevent the percolation and downward migration of firewater runoff into the ground and groundwater.
- 6.4.7. In addition, all proposed operations will be housed internally within the main building. If a fire originates within the building, MicroPharm and the FRS, if safe to do so, will deploy bunds and booms to contain the firewater and prevent any release from the building. The deployment of booms and bunds will enable the captured firewater to be tankered off site to an appropriately licenced installation.
- 6.4.8. All drains will be covered using emergency drain covers to prevent any contaminated firewater from being discharged to the surface/foul water drainage system. However, if there is a risk of firewater leaving the installation, the sewerage undertaker which in this case is Welsh Water will be informed and consideration could be given to utilising storage tanks at their offsite location in an emergency.

7. TYPES AND AMOUNTS OF RAW MATERIALS

7.1. Proposed Arrangements

- 7.1.1. Raw materials will be stored internally on impermeable concrete hardstanding within the main building in dedicated, access controlled stores areas until they are transferred to operational areas for use.
- 7.1.2. The 'Core' area (Room R1) will serve as a holding area for tanks of solutions buffers prior to use. Materials will be stored either at room temperature (15°C to 25°C) or refrigerated (2°C to 8°C).
- 7.1.3. Additionally, the Tank Storage Area as shown on the Ground Floor Plan (Drawing No. 35) which is contained in Appendix I, will be used as a holding area for in and out transfer of full and empty tanks through a dedicated hatch. The Tank Storage Area will serve two purposes; holding area for 'incoming' solutions in tanks before being released into the facility area and holding area for 'released' tanks of solution waiting to be passed into the facility.
- 7.1.4. A 'Titan V5000' single skinned oil tank is housed at the proposed Installation for the purposes of fuelling the central heating system. The tank capacity is 5000 litres and is located within a concrete bund. This bund has been sealed with an impermeable membrane and is capable of containing 110% of the total tank contents. The tank and bund is protected from adverse weather conditions and any vehicle collisions. The integrity of the bund will be regularly checked and maintained in accordance with the H&SMS and EMS site condition checks to ensure that in the unlikely event of a spill, there is no loss of containment.

8. RESOURCE EFFICIENCY AND CLIMATE CHANGE

8.1. Energy Efficiency Measures

- 8.1.1. Throughout the procurement of plant and equipment, where possible, the most energy efficient have been selected. It must also be noted that the selection and availability of plant and equipment are constrained due to the nature of the activities proposed and the licence agreement.
- 8.1.2. General energy efficiency measures will also be employed at the Installation. These measures will include ensuring all LED lighting and equipment not in use are turned off. This is also applicable to the central heating system. The Heating, Ventilation and Air Conditioning ("HVAC") System must run 24/7 once the plant is operational. The HVAC has a 'power-saving' mode; this is activated when all lights are turned off, i.e. no personnel present.
- 8.1.3. In addition, a Conservation of Fuel and Power Assessment has been undertaken by Helyg Energy Services in February 2019 with the findings demonstrating compliance with the Building Fabric Reference method, as detailed in Section 6 of the Approved Document L2B: Conservation of Fuel and Power in Existing Buildings other than Dwellings (2016, Ministry of Housing, Communities and Local Government). A copy of the Conservation of Fuel and Power Assessment is provided in Appendix 5 of this EPTR.
- 8.1.4. The Installation will be served by two electricity meters monitoring usage in the following areas;
- offices, kitchen, warehouse, walk-in refrigerators and laboratories; and
 - the manufacturing facility area.
- 8.1.5. As part of MicroPharm's EMS and their commitment to achieving continual environmental improvement, electricity specific objectives and targets to be set and performance evaluation to be undertaken on an annual basis. The energy consumption will be monitored and reported per gram of product produced in order to undertake comparison year on year until a true electricity consumption baseline has been established following achievement of maximum production at the end of 2022.

8.2. Energy Consumption

- 8.2.1. A new transformer has the capability to supply a maximum of 400kVA. However, at present, the Installation will be limited to a supply of 270kVA. Full utilisation of this power is on a worst case scenario basis of all equipment running simultaneously, plus an overage.
- 8.2.2. At present, prior to commencement of operations, the offices, laboratories, kitchen and main warehouse area are consuming 140kWh/day. This does not include the main manufacturing facility area or tank storage area. The energy supplier has confirmed that this electricity supply is sourced from 100% renewable energy.

- 8.2.3. A Heating, Ventilation and Air Conditioning (“HVAC”) system has been installed to provide temperature-controlled, filtered clean air for the manufacturing cleanrooms; this is a mandatory requirement of cGMP. Estimated HVAC electricity consumption is 100kWh/day. The HVAC has a ‘power-saving’ mode; it is activated when lights are turned off.
- 8.2.4. Additionally, air-conditioning units have been installed in areas where temperature-control is required, e.g. laboratories and storage areas. Currently, there is no electricity consumption data for these units because not all of the units have been installed.
- 8.2.5. The energy consumption at MicroPharm’s Low Impact Installation at Newcastle Emlyn is approximately 360kWh/day. The proposed Installation is a larger purpose built modern plant which has been designed to be more energy efficient. Once the Installation is operational, energy consumption will be monitored using energy meter readings and MicroPharm will provide NRW with actual energy consumption data as part of the Annual Returns.

8.3. Climate Change Agreement

- 8.3.1. MicroPharm have not entered into a Climate Change Levy Agreement. The basic energy requirements, in addition to the sector specific energy requirements set out in the relevant technical guidance, have been adopted as outlined in Section 8.1. above.

8.4. Waste Minimisation

- 8.4.1. Estimates of waste generated by the proposed Installation are provided. These figures have been determined by multiplying the individual waste types currently produced by MicroPharm’s Newcastle Emlyn permitted site by five. If the waste volumes generated once the Installation is operational differs significantly, NRW will be notified.

- 8.4.2. The proposed manufacturing process is highly controlled, therefore, reducing any unnecessary wastage. It must be noted that MicroPharm cannot rework or recycle product as it would jeopardise patient safety. The defined process is an integral part of the product licence and therefore, introducing reworking or recycling of product would require a licence variation which could impact adversely on product availability and potential market shortfalls.
- 8.4.3. As part of the EMS, MicroPharm will monitor and record relevant waste data, including:
- physical and chemical composition of waste;
 - hazard characteristics; and
 - handling precautions and substances with which it cannot be mixed.
- 8.4.4. The waste streams produced at MicroPharm consist of hazardous and non-hazardous waste. The hazardous waste produced at the Installation must be disposed of due to the nature of the waste, for example, waste whose collection and disposal is subject to special requirements in order to prevent infection.
- 8.4.5. In order to reduce the amount of non-hazardous municipal waste produced, recycling will be actively encouraged at the Installation. As part of the EMS, waste reduction and recycling targets will be set.

9. BAT ASSESSMENT

9.1. Overview

- 9.1.1. It is considered that the techniques that will be in use at the proposed Installation will constitute BAT and will be appropriate and proportionate for the scale of the activities and the risks that are posed to the environment by these activities.
- 9.1.2. The BAT Requirements for the proposed Installation have been taken from Guidance Note EPR 4.02 Speciality Organic Chemicals Sector and the Manufacture of Organic Fine Chemicals Bref which specifically references pharmaceutical products. A demonstration of compliance with BAT is provided in Tables 1-3 and follows the order of EPR 4.02.

Table 1: BAT Requirements - Managing your Activities

Section	Indicative BAT	Section of EPTR Document
Environmental Performance Indicators	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Monitor and benchmark your environmental performance, and review this at least once a year. Your plans for minimising environmental impacts should be incorporated into on-going Improvement programs. 	<p>Section 3.4. – Details of Management System</p> <p>Section 8.1 Energy Efficiency Measures</p> <p>Section 8.4. Waste Minimisation</p>
Energy Efficiency	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Assess the environmental impact of each process and choose the one with the lowest environmental impact. 	Section 8.1. – Energy Efficiency Measures
Efficient Use of Raw Materials and Water	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Maximise heat transfer between process streams where water is needed for cooling. Use a recirculating system with indirect heat exchangers and a cooling tower in preference to a once-through cooling system. 2. Where water is used in direct contact with process materials, recirculate the water after stripping out the absorbed substances. 	Not applicable.
Avoidance, Recovery and Disposal of Waste	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Demonstrate that the chosen routes for recovery or disposal represent the best environmental option. Consider avenues for recycling back into the process or reworking for another process wherever possible. 2. Provide a detailed assessment identifying the best environmental options for waste disposal where you cannot avoid disposing of waste 	Section 8.4.- Waste Minimisation

Table 2: BAT Requirements - Operations

Section	Indicative BAT	Section of EPTR Document
Design of a New Process	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Consider all potential environmental impacts from the outset in any new project for manufacturing chemicals. 2. Undertake the appropriate stages of a formal HAZOP study as the project progresses through the process design and plant design phases. The HAZOP studies should consider amongst other things the points noted above. 	Section 4.4. Hazard and Operability Study
Storage and Handling of Raw Materials Products and Wastes	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Store reactive chemicals in such a way that they remain stable, such as under a steady gas stream, for example. If chemical additions are necessary then tests should be carried out to ensure the required chemical composition is maintained. Inhibitors may also be added to prevent reactions. 2. Vent storage tanks to a safe location. 3. Use measures to reduce the risk of contamination from large storage tanks. In addition to sealed bunds, use double-walled tanks and leak detection channels. 4. Use HAZOP studies to identify risks to the environment for all operations involving the storage and handling of chemicals and wastes. Where the risks are identified as significant, plans and timetables for improvements should be in place. 	<p>Section 4.4. Hazard and Operability Study</p> <p>Section 4.5. Good Manufacturing Practice and Quality Risk Management.</p>
Plant Systems and Equipment	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Formally consider potential emissions from plant systems and equipment and have plans and timetables for improvements, where the potential for substance or noise pollution from plant systems and equipment has been identified. 2. Carry out systematic HAZOP studies on all plant systems and equipment to identify and quantify risks to the environment. 3. Choose vacuum systems that are designed for the load and keep them well maintained. Install sufficient instrumentation to detect reduced performance and to warn that remedial action should be taken. 	<p>Section 4.4 Hazard and Operability Study</p> <p>Section 6.2 – Emissions Management</p> <p>Vacuum systems are not relevant to the variation application</p>

Table 2: BAT Requirements – Operations (Cont.)

Section	Indicative BAT	Section of EPTR Document
Overpressure Protection Systems	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Carry out a systematic HAZOP study for all relief systems, to identify and quantify significant risks to the environment from the technique chosen. 2. Identify procedures to protect against overpressure of equipment. This requires the identification of all conceivable over-pressure situations, calculation of relief rates, selection of relief method, design of the vent system, discharge and disposal considerations, and dispersion calculations. In some cases careful design can provide intrinsic protection against all conceivable over-pressure scenarios, so relief systems and their consequential emissions can be avoided. 3. Maintain in a state of readiness all equipment installed in the venting system even though the system is rarely used. 	Overpressure protection systems are not required as part of this application
Heat Exchangers and Cooling Systems	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Consider leak detection, corrosion monitoring and materials of construction, preferably in a formal HAZOP study. Plans and timetables for improved procedures or replacement by higher integrity designs should be in place where the risks are identified as significant. 2. If corrosion is likely, ensure methods for rapid detection of leaks are in place and a regime of corrosion monitoring in operation at critical points. Alternatively, use materials of construction that are inert to the process and heating/cooling fluids under the conditions of operation. 3. For cooling water systems, use techniques that compare favourably with relevant techniques described in the Industrial Cooling Systems BREF. 	Section 4.6 Good Manufacturing Practice and Quality Risk Management
Purging Systems	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Assess the potential for the release to air of Volatile Organic Carbons (“VOCs”) and other pollutants along with discharged purge gas and use abatement where necessary. 	Not applicable.

Table 2: BAT Requirements – Operations (Cont.)

Section	Indicative BAT	Section of EPTR Document
Reaction Stage	<p>You should where appropriate:</p> <ol style="list-style-type: none"> With a clear understanding of the physical chemistry, evaluate options for suitable reactor types using chemical engineering principles. Select the reactor system from a number of potentially suitable reactor designs - conventional STR, process-intensive or novel-technology - by formal comparison of costs and business risks against the assessment of raw material efficiencies and environmental impacts for each of the options. Undertake studies to review reactor design options based on process-optimisation where the activity is an existing activity and achieved raw material efficiencies and waste generation suggest there is significant potential for improvement,. The studies should formally compare the costs and business risks, and raw material efficiencies and environmental impacts of the alternative systems with those of the existing system. The scope and depth of the studies should be in proportion to the potential for environmental improvement over the existing reaction system. Maximise process yields from the selected reactor design, and minimise losses and emissions, by the formalised use of optimised process control and management procedures (both manual and computerised where appropriate). Minimise the potential for the release of vapours to air from pressure relief systems and the potential for emissions of organic solvents into air or water, by formal consideration at the design stage - or formal review of the existing arrangements if that stage has passed. 	<p>Not applicable to this application.</p> <p>No pressure relief system is proposed and no organic solvents will be generated.</p>
Minimisation of Liquid Losses from Reaction Systems	<p>You should where appropriate:</p> <ol style="list-style-type: none"> Use the features listed that contribute to a reduction in waste arisings from clean-outs. 	<p>Minimisation of liquid losses from reaction systems are not relevant to this application</p>
Minimisation of Vapour Losses	<p>You should where appropriate:</p> <ol style="list-style-type: none"> Review your operating practices and review vent flows to see if improvements need to be made. Consider opportunities to enhance the performance of abatement systems 	<p>Minimisation of vapour losses are not relevant to this application</p>

Table 2: BAT Requirements – Operations (Cont.)

Section	Indicative BAT	Section of EPTR Document
Liquid-Vapour Separations	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Choose your separation technique following a detailed process design and HAZOP study. Follow formal operating instructions to ensure effective separation and minimisation of losses. Adhere to design conditions such as heat input, reflux flows and ratios, etc. 2. Install instrumentation to warn of faults in the system, such as a temperature, pressure or low coolant-flow alarms. 	Liquid-vapour separations are not relevant to this application
Solid-Liquid Separations	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Use techniques to minimise, re-use and/or recycle rinse water, and to prevent breakthrough of solids. 2. Install instrumentation or other means of detecting malfunction as all of the techniques are vulnerable to solids breakthrough. 3. Consider installing "guard" filters of smaller capacity downstream which, in the event of breakthrough, rapidly 'clog' and prevent further losses. 4. Have good management procedures to minimise loss of solids, escape of volatiles to air and excessive production of waste water 	Section 8.4. Waste Minimisation
Chemical Process Control	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Monitor the relevant process controls and set with alarms to ensure they do not go out of the required range 	Section 4.6. – Process Controls
Analysis	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Analyse the components and concentrations of by products and waste streams to ensure correct decisions are made regarding onward treatment or disposal. Keep detailed records of decisions based on this analysis in accordance with management systems. 	Section 8.4. – Waste Minimisation

Table 3: BAT Requirements - Emissions and Monitoring

Section	Indicative BAT	Section of EPTR Document
Point Source Emissions to Air	<p>You should where appropriate:</p> <ol style="list-style-type: none"> Formally consider the information and recommendations in the BREF on Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector (see Reference 1) as part of the assessment of BAT for point-source releases to air, in addition to the information in this note. Identify the main chemical constituents of the emissions, including VOC speciation where practicable. Assess vent and chimney heights for dispersion capability and assess the fate of the substances emitted to the environment. Use the following measures to minimise emissions to air: <ul style="list-style-type: none"> recover emissions rich in organics by fractionation and then recycle recover and reuse solvents continuously monitor off-gas concentration from reaction vessels, dryers, condensers, evaporators and scrubbers where off-gases are shown to be environmentally significant 	Section 5.1. – Point Source Emissions to Air. Note: there are no process related emissions to air.
Point Source Emissions to Water	<p>You should where appropriate:</p> <ol style="list-style-type: none"> Control all emissions to avoid a breach of water quality standards as a minimum. Where another technique can deliver better results at reasonable cost it will be considered BAT and should be used. Use the measures listed to minimise water use and emissions to water. 	Section 5.2. Discharge to Surface Water Section 5.3. Discharge to Foul Water
Point Source Emissions to Land	<p>You should where appropriate:</p> <ol style="list-style-type: none"> Use the measures listed to minimise emissions to land. 	There are no emissions to land from the Installation
Fugitive Emissions to Air	<p>You should where appropriate:</p> <ol style="list-style-type: none"> Identify all potential sources and develop and maintain procedures for monitoring and eliminating or minimising leaks and releases of VOCs from all non-process stream sources. Choose vent systems to minimise breathing emissions (for example pressure/ vacuum valves) and, where relevant, should be fitted with knock-out pots and appropriate abatement equipment. Use the listed techniques (together or in any combination) to reduce losses from storage tanks at atmospheric pressure. 	Section 5.1 – Point Source Emissions to Air. Note: there are no process related emissions to air.

Table 3: BAT Requirements - Emissions and Monitoring (Cont.)

Section	Indicative BAT	Section of EPTR Document
Fugitive Emissions to Surface Water, Sewer and Groundwater	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Provide hard surfacing in areas where accidental spillage or leakage may occur, e.g. beneath prime movers, pumps, in storage areas, and in handling, loading and unloading areas. The surfacing should be impermeable to process liquors. 2. Drain hard surfacing of areas subject to potential contamination so that potentially contaminated surface run-off does not discharge to ground. 3. Hold stocks of suitable absorbents at appropriate locations for use in mopping up minor leaks and spills, and dispose of to leak-proof containers. 4. Take particular care in areas of inherent sensitivity to groundwater pollution. Poorly maintained drainage systems are known to be the main cause of groundwater contamination and surface/above-ground drains are preferred to facilitate leak detection (and to reduce explosion risks). 5. Additional measures could be justified in locations of particular environmental sensitivity. Decisions on the measures to be taken should take account of the risk to groundwater, taking into consideration the factors outlined in the Agency document, Policy and Practice for the Protection of Groundwater, including groundwater vulnerability and the presence of groundwater protection zones. 6. Surveys of plant that may continue to contribute to leakage should also be considered, as part of an overall environmental management system. In particular, you should consider undertaking leakage tests and/or integrity surveys to confirm the containment of underground drains and tanks 	Section 5.4. – Fugitive Emissions to Surface Water, Sewer and Groundwater

Table 3: BAT Requirements - Emissions and Monitoring (Cont.)

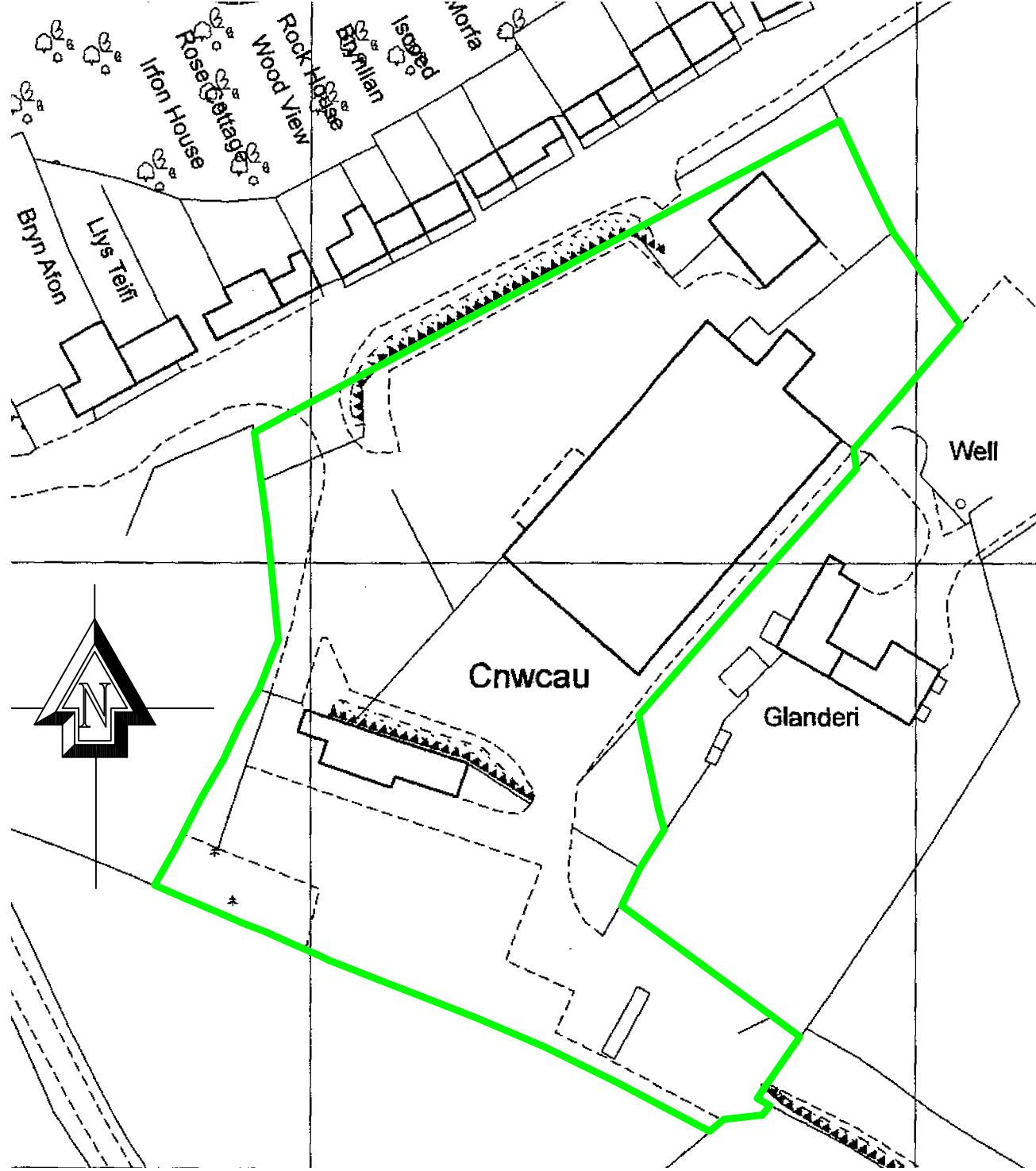
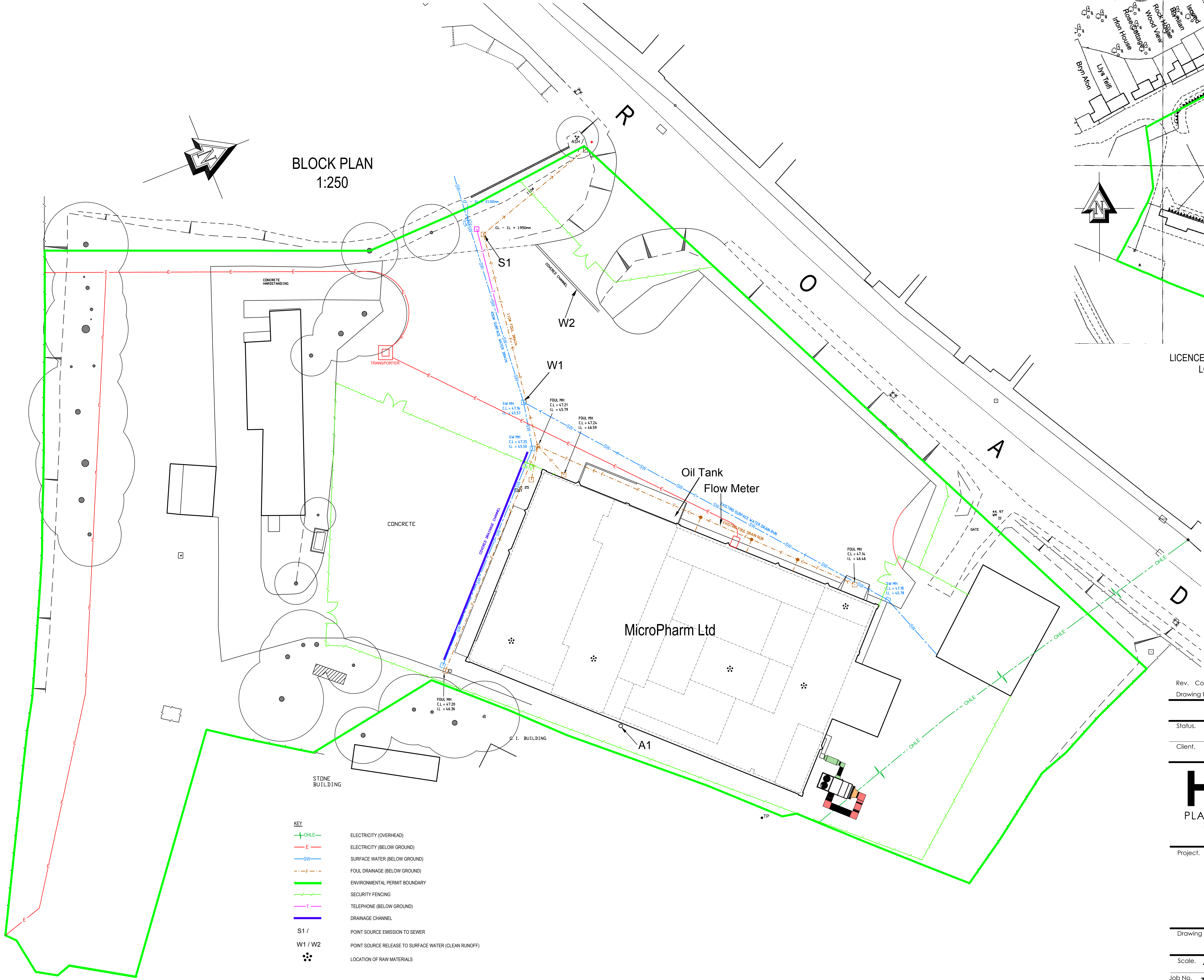
Section	Indicative BAT	Section of EPTR Document
Odour	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Manage the operations to prevent release of odour at all times. 2. Where odour releases are expected to be acknowledged in the permit, (i.e. contained and treated prior to discharge or discharged for atmospheric dispersion): <ul style="list-style-type: none"> • for existing installations, the releases should be modelled to demonstrate the odour impact at sensitive receptors. The target should be to minimise the frequency of exposure to ground level concentrations that are likely to cause annoyance. 3. Where odour generating activities take place in the open, or potentially odorous materials are stored outside, a high level of management control and use of best practice will be expected. 4. Where an installation releases odours but has a low environmental impact by virtue of its remoteness from sensitive receptors, it is expected that you will work towards achieving the standards described in this guidance note, but the timescales allowed to achieve this might be adjusted according to the perceived risk. 5. Where further guidance is needed to meet local needs, refer to Horizontal Guidance Note H4 Odour (see GTBR). 	Section 6.3. – Odour Management
Noise and Vibration	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Install particularly noisy machines such as compactors and pelletisers in a noise control booth or encapsulate the noise source. 2. Where possible without compromising safety, fit suitable silencers on safety valves. 3. Minimise the blow-off from boilers and air compressors, for example during start up, and provide silencers 	Section 6.1. – Noise Management

Table 3: BAT Requirements - Emissions and Monitoring (Cont.)

Section	Indicative BAT	Section of EPTR Document
Monitoring and Reporting of Emissions to Air and Water	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Carry out an analysis covering a broad spectrum of substances to establish that all relevant substances have been taken into account when setting the release limits. The need to repeat such a test will depend upon the potential variability in the process and, for example, the potential for contamination of raw materials. Where there is such potential, tests may be appropriate. 2. Monitor more regularly any substances found to be of concern, or any other individual substances to which the local environment may be susceptible and upon which the operations may impact. This would particularly apply to the common pesticides and heavy metals. Using composite samples is the technique most likely to be appropriate where the concentration does not vary excessively. 3. If there are releases of substances that are more difficult to measure and whose capacity for harm is uncertain, particularly when combined with other substances, then "whole effluent toxicity" monitoring techniques can be appropriate to provide direct measurements of harm, for example, direct toxicity assessment. 	Section 5 – Emissions and Monitoring
Monitoring and Reporting of Waste Emissions	<p>You should where appropriate:</p> <ol style="list-style-type: none"> 1. Monitor and record: <ul style="list-style-type: none"> • the physical and chemical composition of the waste; • its hazard characteristics; and • handling precautions and substances with which it cannot be mixed. 	Section 8.4. – Waste Minimisation

APPENDIX 1 DRAWING

BLOCK AND LOCATION PLAN AS PROPOSED (DRAWING NO.37)



LICENCE NUMBER = 100012867
LOCATION PLAN
1:1000

- KEY**
- OHLE — ELECTRICITY (OVERHEAD)
 - E — ELECTRICITY (BELOW GROUND)
 - SW — SURFACE WATER (BELOW GROUND)
 - F — FOUL DRAINAGE (BELOW GROUND)
 - — ENVIRONMENTAL PERMIT BOUNDARY
 - — SECURITY FENCING
 - T — TELEPHONE (BELOW GROUND)
 - — DRAINAGE CHANNEL
 - S1 / POINT SOURCE EMISSION TO SEWER
 - W1 / W2 POINT SOURCE RELEASE TO SURFACE WATER (CLEAN RUNOFF)
 - LOCATION OF RAW MATERIALS

Rev. Comments. Date.
Drawing Recorded

ORIGINAL DRAWING A1

Status. GENERAL ARRANGEMENT SITE PLAN

Client. MicroPharm Ltd

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PLANNING DESIGN MANAGEMENT
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Project. Proposed Works at,
Micropharm Ltd,
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Drawing Title. BLOCK & LOCATION PLAN AS PROPOSED

Scale. — Drawn By. AP Checked. WTH Date. 12.06.2019

Job No. 1570 Drawing No. 37 Rev. —

APPENDIX 2
PLANNING PERMISSION
18/0988/PA



Planning Permission

Town and Country Planning Act 1990

Name and address of Applicant

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SA43 2SN

Name and address of Agent (if any)

Mr Wyn Harries MRICS,
HARRIES Planning Design Management
HARRIES DESIGN & MANAGEMENT,
Henllan
EGLWYSWRW
Crymych
Pembrokeshire
SA41 3UP

Part I - Particulars of application

Date of application: **03-Jan-2019**

Application Number: **18/0988/PA**

Particulars and location of development:

**Proposed air conditioning and ventilation system, fire exit and roof canopy. -
Cnwcau, CILGERRAN, Cardigan, Pembrokeshire, SA43 2SN**

Part II - Particulars of decision

The Pembrokeshire County Council hereby give notice in pursuance of the provisions of the **Town and Country Planning Act 1990** that **permission has been granted** for the carrying out of the development referred to in Part I hereof in accordance with the application and plans submitted subject to the following conditions:

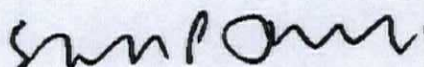
1. The development shall begin no later than five years from the date of this decision.
Reason: To comply with the requirements of Section 91 of the Town & Country Planning Act 1990 (as amended).
2. The development shall be carried out in accordance with the following approved plans and documents:
Block plan & elevations as existing dwg no 08 rev B
Block and location plan dwg no 33 rev A
Floor plan as existing dwg no 09 rev A
Floor plan as proposed dwg no 34
Reason: In the interests of amenity and to comply with the requirements of policy GN.1 of the Local Development for Pembrokeshire (Adopted 28th February 2013).

3. The noise generated by the condenser and fresh air units shall not exceed the background noise level by more than 5 dB (A) at the nearest residential property to the development site at any time when measured and assessed in accordance with BS4142:2014. Methods for rating and assessing industrial and commercial sound.

Reason: In the interest of amenity and to satisfy the relevant requirements of policy GN.1 from the Pembrokeshire Local Development Plan, adopted February 2013.

Decision Date: 26-Feb-2019

**County Hall
Haverfordwest
Pembrokeshire**



DIRECTOR OF DEVELOPMENT

Notes to Applicant

1. Having regard to the details of the application proposals, and the relevant provisions of the Local Development Plan for Pembrokeshire (adopted 28 February 2013) as summarised below

Policies SP 1, GN.1 and GN.2.

It is considered that subject to compliance with the conditions attached in this permission, the proposed development would be in accordance with the Development Plan.

This informative is intended only to be a summary of the reasons for the granting of planning permission. For further details on the decision, please see the application report under the above reference.

Notes

If you are in receipt of a householder or minor commercial decision and are aggrieved by the decision of the local planning authority to refuse permission, or to grant permission or approval subject to condition, then you can appeal to the Welsh Ministers under Section 78 of the Town and Country Planning Act 1990 within 12 weeks of the date of the notice of the decision or determination giving rise to the appeal.

If you are in receipt of any other decision notice and are aggrieved by the decision of the local planning authority to refuse permission or, or to grant permission or approval subject to condition, then you can appeal to the Welsh Ministers under Section 78 of the Town and Country Planning Act 1990 within 6 months of the date of the notice of the decision or determination giving rise to the appeal. The Welsh Government has power to allow a longer period for the giving of a notice of appeal but it will not normally be prepared to exercise this power unless there are special circumstances which exclude the delay in giving notice of appeal. The Welsh Government is not required to entertain an appeal if it seems to it that permission for the proposed development could not have been granted by the local planning authority, or could not have been so granted otherwise than subject to the conditions imposed by them, having regard to the statutory requirements to the provisions of any development order, and to any directions given under the order. In practice, the Welsh Government does not refuse to consider appeals solely because the local planning authority based its decision on a direction given by the Welsh Government.

How can you submit your appeal?

You can download the appeal forms online through the planning portal website at: www.planningportal.gov.uk/wales/public. Once you have downloaded the appeal forms you can complete them electronically and email them to us at wales@pins.gsi.gov.uk.

You can also either print off the downloaded appeal forms or get a copy of the forms by contacting us on 0303 444 5940 and complete them by hand. They need to be sent into the address: The Planning Inspectorate, Crown Buildings, Cathays Park, Cardiff. CF10 3NQ.

If permission to develop land is refused or granted subject to conditions, whether by the local planning authority or by the Welsh Government, and the owner of the land claims that the land has become incapable of reasonably beneficial use in its existing state and cannot be rendered capable of reasonably beneficial use by the carrying out of any development which has been or would be permitted, he may serve on the Council of the county district in which the land is situated a purchase notice requiring that council to purchase his interest in the land in accordance with the provisions of part VI of the Town and Country Planning Act 1990.

In certain circumstances, a claim may be made against the local planning authority for compensation, where permission is refused or granted subject to conditions by the Welsh Government on appeal or on a reference of the application to them. The circumstances in which such compensation is payable are set out in section 114 of the Town and Country Planning Act 1990.

Your attention is drawn to the fact that the proposed development may be located in an area affected by radon gas. Further information may be obtained from the Council's Building Control Section.

Note: This decision refers only to that required under the Town and Country Planning Acts and does not include any consent or approval under Building Regulations or any other enactment, byelaw, order or regulation. You are advised to contact that Section separately to ascertain whether you require their prior approval before commencing any work on site.

This planning permission shall not be construed as granting rights to carry out works on, or over, land not within the ownership, or control of the applicant, including Council owned land

APPENDIX 3 ENVIRONMENTAL POLICY

Title	ENVIRONMENTAL POLICY		
Author (name, signature, & date)	Michele Gamage	<i>Michele Gamage</i>	09/10/19
Authorized by (name, signature & date)	Ian Cameron	<i>I. Cameron</i>	09/10/19
Effective date (month/year):	OCTOBER 2019	Review date (month/year):	OCTOBER 2020

Mission Statement

MicroPharm recognises that it has a responsibility to the environment beyond legal and regulatory requirements. We are committed to reducing our environmental impact and continually improving our environmental performance as an integral part of our business strategy and operating methods, with regular review points.

Responsibilities

Ian Cameron (Chief Executive Officer) is responsible for ensuring that the environmental policy is implemented. Michele Gamage (Environmental Manager) is responsible for day-to-day environmental issues. However, all employees have a responsibility in their area to ensure that the aims and objectives of this policy are met.

Policy Aims

MicroPharm endeavours to (so far as reasonably practicable):

- Comply with all relevant regulatory requirements.
- Monitor environmental performance with the aim to continually improve.
- Consider our environmental impact during the change control and quality risk assessment processes.
- Incorporate environmental factors into business decisions.
- Increase employee awareness and training.

Paper

- We will minimise the use of paper in the office.
- We will reduce packaging as much as reasonably possible.
- We will seek to buy recycled and recyclable paper products.
- We will reuse and recycle all paper where reasonably possible.

Energy and Water

- We will seek to reduce the amount of energy used as much as is reasonably possible.
- Lights and electrical equipment will be switched off when not in use.
- Heating will be adjusted with energy consumption in mind.
- The energy consumption and efficiency of new products will be taken into account when purchasing.

Office Supplies

- We will favour more environmentally friendly and efficient products wherever reasonably possible.
- We will reuse and recycle everything we are reasonably able to.

Transportation

- We only travel when it is necessary to do so.
- We will promote the use of travel alternatives such as e-mail or video/phone conferencing.

Maintenance and Cleaning

- Cleaning materials used will be as environmentally friendly as is reasonably possible.
- We will only use licensed and appropriate organisations to dispose of waste.

Monitoring and Improvement

MicroPharm will assess its environmental performance and impact against the following objectives:

- Compliance with all relevant regulatory requirements.
- Monitor environmental performance with the aim to continually improve (so far as reasonably practicable). Key performance indicators (KPIs) will be determined when sufficient data becomes available (minimum of 12 months in operation).
- Effectiveness of change control and quality risk assessment processes for considering environmental impacts.
- Incorporation of environmental factors into business decisions.
- Increase in employee awareness through training.
- Review of this policy and any related business issues at our management meetings.

Culture

- We will involve staff in the implementation of this policy, for greater commitment and improved performance.
- We will review (and update, if required) this policy at least once annually in consultation with staff and/or in accordance with regulatory requirements.
- We will provide staff with relevant environmental training where necessary.
- We will use local labour and materials where it is practical and cost effective to do so to reduce CO₂ emissions and help the community.

APPENDIX 4

ENVIRONMENTAL NOISE ASSESSMENT

Email to : Nick Smith
MicroPharm Ltd

Email address : nick.smith@micropharm.co.uk

From : Steve Ellis

Date : 24 January 2019

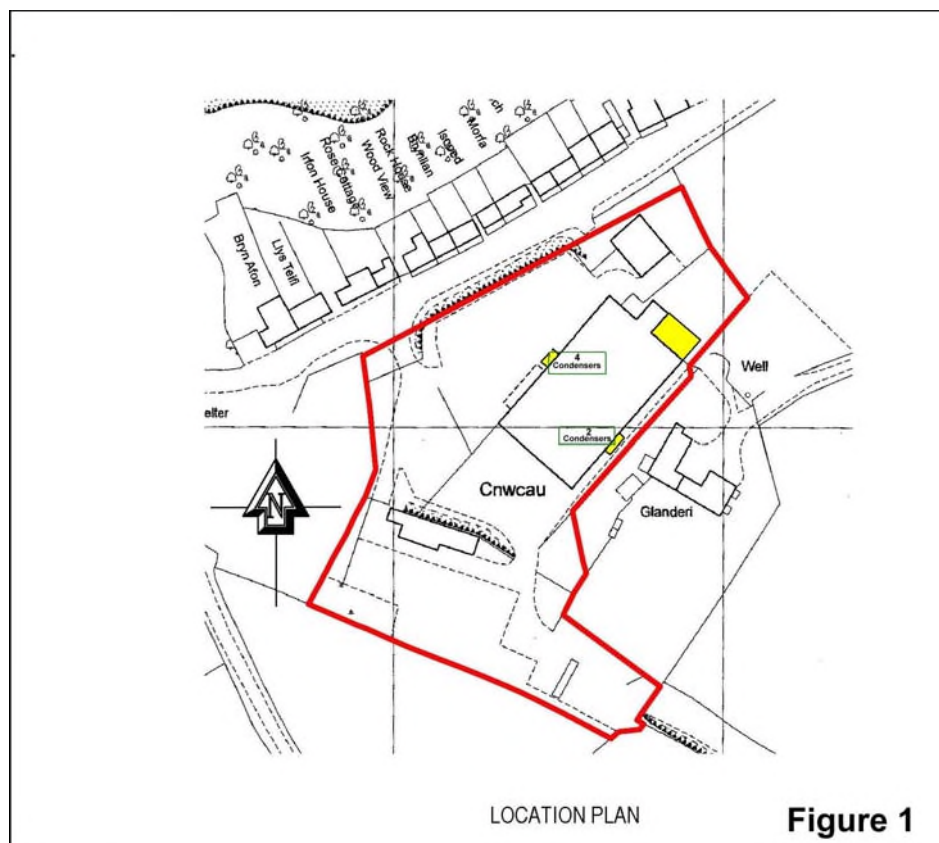
Subject : Environmental noise assessment of proposed MicroPharm facility, Cilgerran, Pembrokeshire

Report no : 9197

Introduction

Nick Smith, on behalf of MicroPharm, requested that the **Industrial Noise & Vibration Centre Limited (INVC)** undertake an environmental noise impact assessment of the proposed facility at Cilgerran, Pembrokeshire. This report details the results of the assessment and makes recommendations on noise attenuation.

Figure 1 shows the site in relation to the local area and particularly, the residential properties.



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All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means electronic, mechanical, photocopying, recording or otherwise outside the client's business without the written permission of the Industrial Noise & Vibration Centre Limited, 889 Plymouth Road, Slough, Berkshire, SL1 4LP. **Registered in England No 1981938**

Noise survey

A background (L_{A90}) an ambient (L_{Aeq}) noise survey was undertaken on 17 October 2018 in free field conditions using calibrated instrumentation conforming to the Type 1 specification of BS 61672-1-2003 at the location shown on Figure 2. Table 1 gives the 10 minute values recorded from 3:55 pm on 17 October 2018 through to 8:00 am on 18 October 2018.



report

TABLE 1

Date	Time 10 minute values	L_{Aeq}	L_{A10}	L_{A90}
17 October 2018	15:55	45	48	36
		46	48	36
		45	49	35
		43	47	35
		41	45	33
		47	49	34
	17:05	42	47	35
	17:20	43	46	35
		41	45	33
		43	46	33
		40	44	32
		38	42	31
		40	44	31
		44	46	32
		45	48	32
		41	45	32
		40	44	32
	19:50	41	45	30
change of batteries				



Table 1 continued

Date	Time 10 minute values	L _{Aeq}	L _{A10}	L _{A90}
17 October 2018	20:00	38	41	31
		39	44	30
		38	42	30
		38	40	29
		36	40	29
		35	38	29
		37	40	28
		30	32	27
		33	35	28
		32	33	28
		35	36	27
		33	34	27
		29	31	27
		33	35	27
		36	40	28
		34	36	26
		37	38	26
		41	41	
		40	41	28
		30	32	26
		33	37	26
		28	29	26
		27	28	26
		31	30	25
		27	28	25
		35	37	25
		26	28	25
		26	28	25
		25	26	25
		30	30	25
18 October 2018	00:00	27	29	25
	00:10	35	28	25
		33	34	25
		27	29	25
		26	28	25
		26	28	25
		25	25	25
		25	25	25
		26	27	25
		31	29	25
		25	26	25
		25	26	25
		25	26	25
		25	26	25
		25	26	25
		25	26	25
		34	37	24
		26	28	24
		26	28	24
		25	25	24
		24	25	24
		25	25	24
		26	26	24
	03:40	26	26	24

report

Table 1 continued

Date	Time 10 minute values	L _{Aeq}	L _{A10}	L _{A90}
18 October 2018	03:50	25	25	25
		31	27	25
		28	30	25
		25	25	25
		37	39	25
		32	34	24
		25	27	24
		30	34	24
		29	32	25
		31	34	27
		33	37	27
		28	31	26
		29	31	26
		31	32	29
		32	34	30
		32	35	28
		36	38	31
		39	42	30
		45	49	33
		41	44	32
		43	43	34
		42	46	35
		40	43	33
		42	46	34
		50	52	37
	08:00	44	46	37

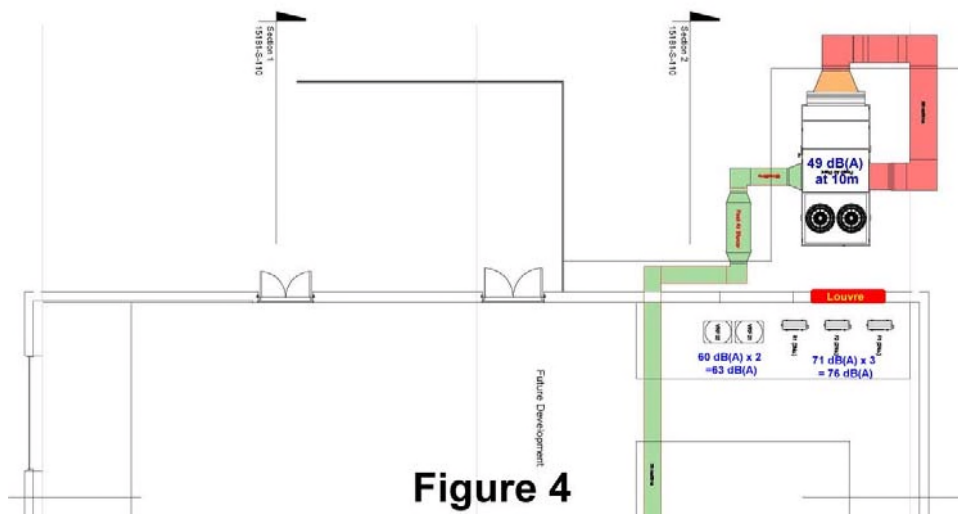
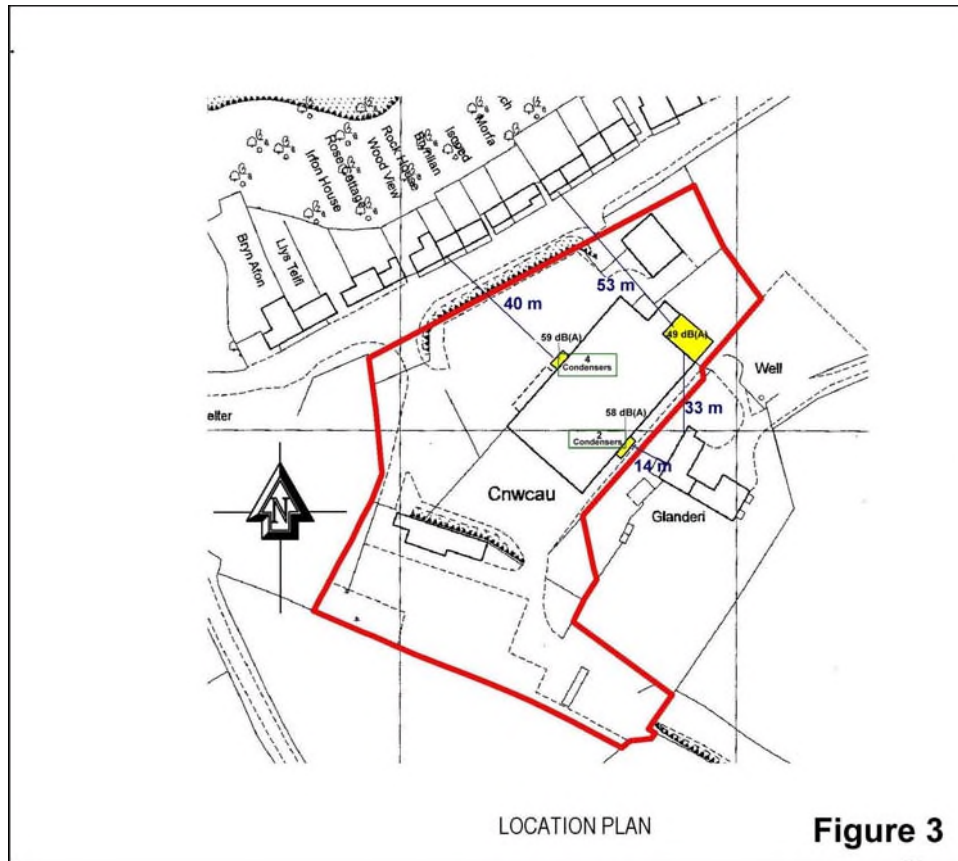
report

From the noise measurements it can be seen that the background level (L_{A90}) drops to 24 dB(A) with an attendant level of 25 dB L_{Aeq}. For the purposes of this assessment these have been taken as the levels from which to assess the noise impact, given that these are worst case.

The weather conditions were good, dry, no wind and hence can be taken as representative of the very low levels experienced in this rural location.

Predicted noise levels

Figures 3 and 4 show the location of the noise sources relative to local residential properties along with the combined noise levels depending on the number of noise sources at each location.



Given the information shown on Figures 3 and 4, the worst case predicted noise levels are as follows assuming that the noise attenuates at a basic rate of 6 dB per doubling of distance (inverse square law). Information on the plant noise levels are given at the end of this report (Appendix A).

Figure 5 gives the noise levels with the main building, the location of the louvres and the angle of view the external plant has of Glenderi.

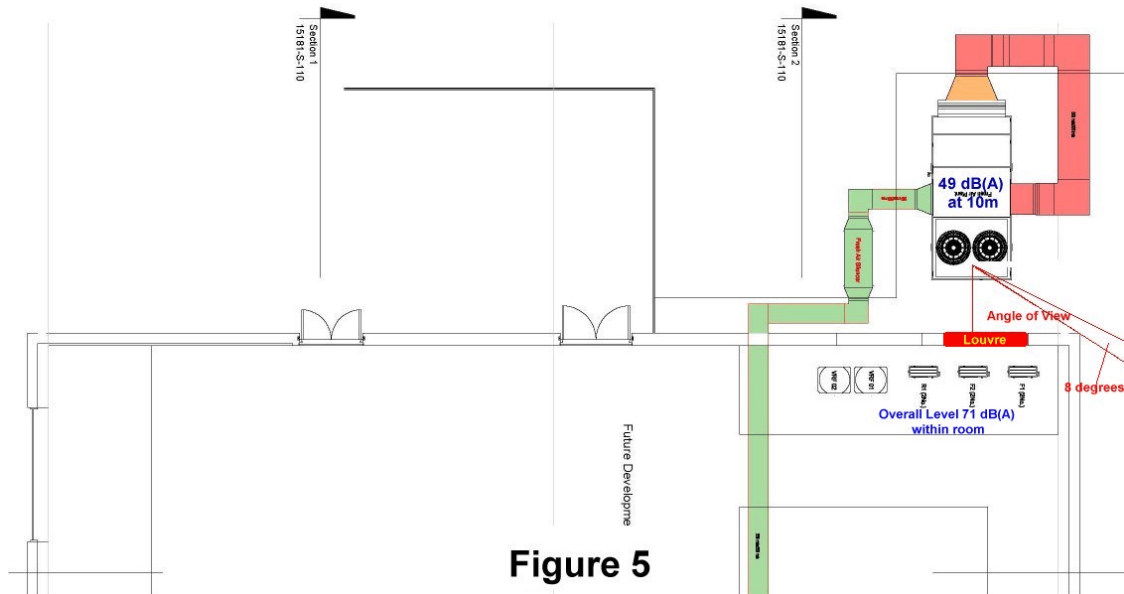


Figure 5

Housing on main road

Assuming the following:

4 condensers	=	59 dB(A) at 1m	distance	=	40m
Plant noise	=	49 dB(A) at 10m	distance	=	53m – 7 dB(A) for partial barrier effect
∴ at housing		$59 - 20 \log 40$	=	27 dB(A)	condensers
		$49 - 20 \log \frac{53}{10}$	=	27 dB(A)	plant noise

Internal plant noise included as level is too low

$$\therefore \text{combined noise level} = 30 \text{ dB } L_{Aeq}$$

Glenderi

Assuming the following:

2 condensers	=	58 dB(A) at 1m	distance	=	14m
Plant noise	=	49 dB(A) at 10m	distance	=	33m
∴ at Glenderi		$58 - 20 \log 14$	=	35 dB(A)	condensers
		$48 - 20 \log \frac{10}{33} - 10 \log \frac{8}{180}$	=	24 dB(A)	plant noise

The noise through the louvre from the internal plant needs to be considered. Assuming a sound reduction index of 35 for the main building and 10 dB for the louvre, an average SRI of 23.7 dB(A) has been calculated.

Using the following formula it is possible to calculate the noise level from the internal plant at Glenderi.

$$L_2 = L_1 - \text{SRI} + 10 \log s - 20 \log r - 14 \text{ dB}$$

where L_1 = internal level
 SRI = sound reduction index of composite panel
 s = area of panel (ie wall)
 r = distance to receiver

$$\begin{aligned} \therefore L_2 &= 76 - 23.7 + 13.9 - 30.4 - 14 \\ &= 21.8, \text{ say } 22 \text{ dB(A)} - 10 \log \frac{8}{180} \text{ for angle of view} \\ &= 22 - 13 \text{ dB(A)} = 9 \text{ dB(A)} \end{aligned}$$

Therefore the total noise level at Glenderi is:

$$\begin{array}{ccccccc} 35 \text{ dB(A)} & + & 9 \text{ dB(A)} & + & 24 \text{ dB(A)} & = & 35 \text{ dB(A)} \\ \text{(condensers)} & & \text{(internal plant)} & & \text{(external plant)} & & \end{array}$$

In addition, it is considered reasonable to adjust the nighttime noise levels from the condensers because they will not need to work as hard. In view of this, the four condensers at the front of the building will be up to 15 dB(A) quieter because the fans will be running at half speed. Given that fan noise is to the $1/5$ power, then a reduction of 50% in speed means an attenuation of 16 dB(A).

At the nearest housing on main road:

$$\text{Condensers} = 30 - 16 = 18 \text{ dB(A)}$$

The condensers, facing Glenderi, again assuming that they run at 50% during the night
 $= 34 - 15 = 19 \text{ dB(A)}$.

Giving consideration to Glenderi, the overall noise level at night has been calculated as follows:

19 dB(A) condenser + 9 + 24 dB(A) from internal plant which includes the correction for a nominal angle of view. Therefore the total level at Glenderi is 25 dB(A). A reduction of up to 5 dB(A) is possible with the plant running at 21% full power, which is more likely at night. This gives a total level at night of:

$$\begin{array}{ccccccc} 19 \text{ dB(A)} & + & 9 \text{ dB(A)} & + & 20 \text{ dB(A)} & = & 23 \text{ dB } L_{\text{Aeq}} \\ \text{(condensers)} & & \text{(internal plant)} & & \text{(external plant} & & \\ & & & & \text{at 21\%)} & & \end{array}$$

Discussion of results

Based on the calculations, it can be seen that at the nearest housing on the main road the noise from the plant and condensers is 12 dB L_{Aeq} at night given the assumptions made which are that the condensers run at 50% full power.

A level of 18 dB L_{Aeq} is 6 dB(A) below the low background level.


Similarly, the external noise level for Glenderi would be 23 dB(A), some 2 dB(A) below the background level, assuming the condensers run at 50% at night and the internal plant runs at 21% at night.



Conclusions

Given the assumptions used in this report and the fact that the major items of plant, where possible, have been placed inside the building, residents should not be disturbed by the proposed facility running 24 hours/day even considering the low nighttime noise levels, hence noise should not be a reason for preventing the proposed planning application going ahead.

Please contact the author directly if any further clarification is required on this matter.

Author _____

S ELLIS

attch Appendix A

report

EN196713	 1 x E016AH105FM1M	  
Micropharm		

DIMENSIONS FOR THE UNIT EXCLUDING ACCESSORIES



Length	Width	Height	Operating weight
4601	2270	2024	1850 *

Non-certified pictures

(*) The weight values are provided as an indication. For helicopter or special crane transportation, plan to check the weight before the job.

ACOUSTIC DATA

		Outdoor Part load			
Lwa 21%	75.5	dB(A)	Lp	44.5	dB(A)
Lwa 47%	76.8	dB(A)	Lp	45.8	dB(A)

Outdoor Spectrum per octave band dB(A) (Full load)									
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 HZ	Lwa	Lp
57.6	60.9	65	75	74.5	72.6	68.5	64	79.7	48.7

Supply Spectrum per octave band dB(A) (Full load)								
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 HZ	Lwa: Sound power dB(A)
19.8	50.7	67.4	75.7	80.4	78.1	74.9	66.9	84

Return Spectrum per octave band dB(A) (Full load)								
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 HZ	Lwa: Sound power dB(A)
16.8	44.7	58.8	66.9	68.5	69.3	67	59.8	74.4

Lwa: Sound power dB(A)

Lp: Sound pressure at 10 m dB(A)

Global sound power level measured in compliance with ISO STANDARD 3744

Values are displayed according to norm EN12102

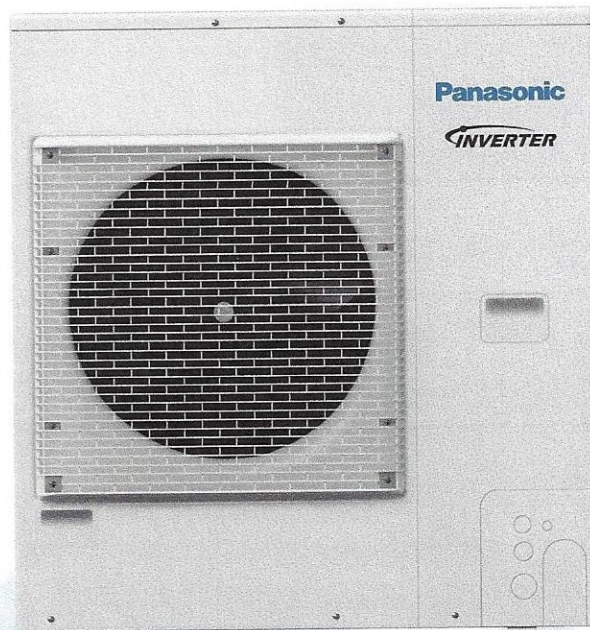
Tolerance to +/- 3 dB(A)

PACi Standard Inverter Three Phase

Product Code: U-100PZ2E8

Notes

- » R32
- » Good balance, system cost vs energy efficiency
- » Top class SEER/SCOP as a Standard Inverter category
- » Interchangeable controller with ECOi
- » Suitable For Replacement Technology
- » Three Phase



MODEL NUMBER		U-100PZ2E8
Nominal Cooling	kW	9.0 (3.0 - 9.7)
Nominal Heating	kW	9.0 (3.0 - 10.5)
Operating Range - Cooling (Outdoor Air)		-10°C to 43°C
Operating Range - Heating (Outdoor Air)		-15°C to 24°C
Height	mm	996
Width	mm	980
Depth	mm	370
Weight	mm	90
Airflow Rate	l/s	1267 - 1167
Sound Pressure Level	dB(A)	52 - 52
Pipe Connection Size - Gas	in	5/8"
Pipe Connection Size - Liquid	in	3/8"
Maximum Pipe Run	m	5 - 50
Maximum Height Difference	m	30
Refrigerant		R32
Precharged For	m	30
Factory Charge	kg	2.6
GWP (Tonnes CO2 Equivalent)		1.76
Additional Charge	g/m	45
Suitable For Replacement Technology		Yes
Power Supply	V- Ph - Hz	230 - 1 - 50
Interconnecting Cables		2 core
Suggested Fuse Size	A	TBC
* exact cooling and heating capacities will depend on connected indoor unit(s)		

x3 front
x2 back

1-6. Noise Criterion Curves

(B) Outdoor Units

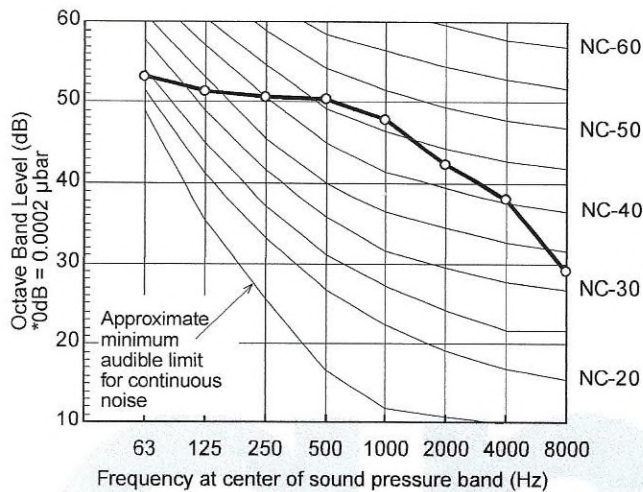
MODEL : U-100PZ2R5, U-100PZ2R8

SOUND LEVEL : Cooling 52 dB(A)

CONDITION : 1 m in front at height of 1.5 m

SOURCE : 230-240V, 1 phase, 50Hz
400-415V, 3 phase, 50Hz

—●— Cooling



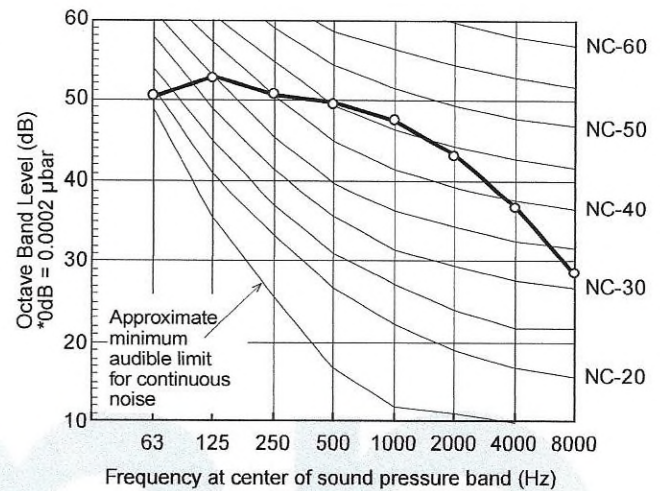
MODEL : U-100PZ2R5, U-100PZ2R8

SOUND LEVEL : Heating 52 dB(A)

CONDITION : 1 m in front at height of 1.5 m

SOURCE : 230-240V, 1 phase, 50Hz
400-415V, 3 phase, 50Hz

—●— Heating



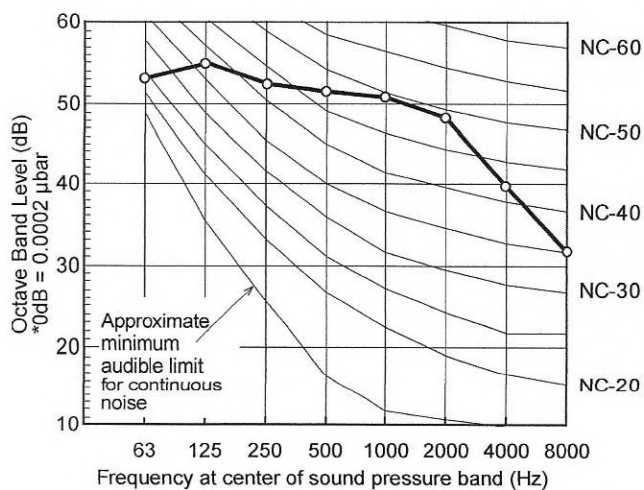
MODEL : U-125PZ2R5, U-125PZ2R8

SOUND LEVEL : Cooling 55 dB(A)

CONDITION : 1 m in front at height of 1.5 m

SOURCE : 230-240V, 1 phase, 50Hz
400-415V, 3 phase, 50Hz

—●— Cooling



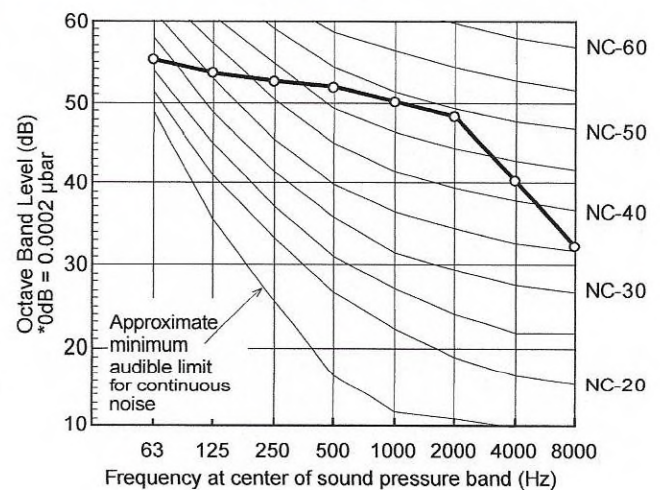
MODEL : U-125PZ2R5, U-125PZ2R8

SOUND LEVEL : Heating 55 dB(A)

CONDITION : 1 m in front at height of 1.5 m

SOURCE : 230-240V, 1 phase, 50Hz
400-415V, 3 phase, 50Hz

—●— Heating



PACi Elite Inverter Three Phase

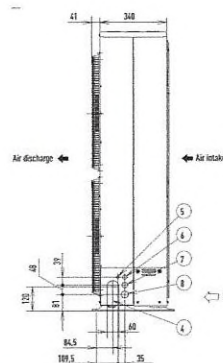
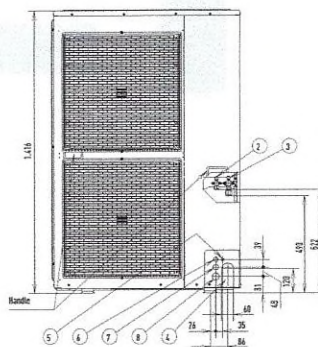
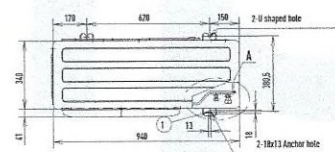
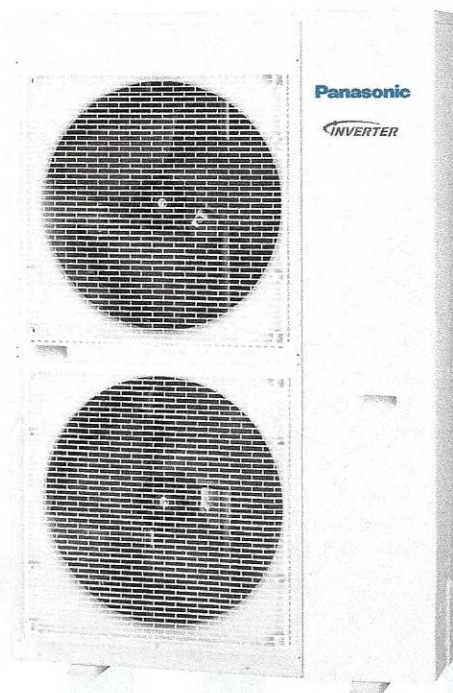
Product Code: U-140PE1E8A

Notes

- » Meeting all necessary safety approvals to ensure quality and safety
- » Top-class SEER: & SCOP
- » Cooling operation is possible when outdoor temperature as high as 46°C
- » DC inverter technology combined with R410A for excellent efficiency
- » Cooling operation is possible when outdoor temperature as low as -15°C
- » Heating operation is possible when outdoor temperature as low as -20°C
- » Compact outdoor units
- » Auto restart from outdoor unit

MODEL NUMBER		U-140PE1E8A
Nominal Cooling	kW	14.0
Nominal Heating	kW	16.0
Operating Range - Cooling (Outdoor Air)		-15°C to 46°C
Operating Range - Heating (Outdoor Air)		-20°C to 24°C
Height	mm	1416
Width	mm	940
Depth	mm	340
Weight	kg	98
Airflow Rate	l/s	2250 - 2000 (Cool - Heat)
Sound Pressure Level	dB(A)	54 - 55 (Cool - Heat)
Pipe Connection Size - Gas	in	5/8"
Pipe Connection Size - Liquid	in	3/8"
Maximum Pipe Run	m	5 min - 75 max
Maximum Height Difference	m	30
Refrigerant		R410A
Precharged For	m	30
Factory Charge	kg	3.40
GWP (Tonnes CO2 Equivalent)		7.099
Additional Charge	g/m	50
Suitable For Replacement Technology		Yes
Power Supply	V- Ph - Hz	400 - 3 - 50
Interconnecting Cables		2 core
Suggested Fuse Size	A	16

* exact cooling and heating capacities will depend on connected indoor unit(s)



APPENDIX 5

CONSERVATION OF FUEL AND POWER ASSESSMENT

Helyg Energy Services
Parc Helyg
Lon Helyg
Llechryd
Cardigan SA43 2NE

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M 07800 534008
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Energy
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DEMONSTRATION OF COMPLIANCE
WITH
APPROVED DOCUMENT L2B 2014 (WALES)
CONSERVATION OF FUEL AND POWER
IN EXISTING BUILDINGS OTHER THAN
DWELLINGS
(THE BUILDING REGULATIONS 2010)
FOR
PROPOSED CONVERSION OF EXISTING OFFICES
AND CLOTHING MANUFACTURE WORKSHOP TO
FORM NEW OFFICES, LABORATORIES AND
STORES AREAS,
CNWCAU, CILGERRAN,
CARDIGAN,
PEMBROKESHIRE,
SA43 2SN.
(FINAL DESIGN STAGE)

COMMERCIAL AND DOMESTIC BUILDING ENERGY PERFORMANCE



PROVISION OF QUALITY ASSURED CALCULATIONS FOR BUILDING REGULATION PART L1 & 2
COMPLIANCE AND ENERGY CONSULTANCY



CONTENTS

- 1. L2B SUMMARY OF COMPLIANCE METHOD**
- 2. BUILDING SPECIFICATION/SERVICES ASSUMPTIONS
AND DETAILS**
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- 4. HVAC SCHEDULES**

1. L2B SUMMARY OF COMPLIANCE METHOD

The Method of compliance demonstrated in this report is the Building Fabric Reference method, as detailed in Section. 6., Approved Document L2B (2014 WALES).

The proposed works on the existing two storey commercial building will form offices, laboratories, manufacturing and stores areas.

The proposed new and existing structures meet or exceed the guidance detailed in ADL2B.

The existing structures such as the cavity block walls with existing partial fill insulation will be retained, meet the maximum U values set out in Table 8, as per the guidance detailed in ADL2B but in some cases are to be further thermally upgraded.

The existing solid ground floors are deemed to be not technically or functionally feasible to thermally upgrade..

COMPLIANCE WITH ADL2B **PASS**

Details of the criteria used in this ADL2B compliance assessment are contained in the following sections of the report.

2. BUILDING SPECIFICATION/SERVICES ASSUMPTIONS AND DETAILS

SUMMARY OF ASSUMED BUILDING SPECIFICATION/SERVICES DETAILS**(ALL TO BE CONFIRMED BY BUILDING SERVICE ENGINEER/ARCHITECT AND INSTALLED AS PER MANUFACTURERS INSTRUCTIONS.)****Planning/Building Control Classification**

Building Regulation PART L2B 2014 (Wales) – Design Stage

Primary Heating/Cooling

Micropharm Ltd. responsibility laboratory, Stores areas- Panasonic Electric Air to Air source heat pump/Air conditioning throughout all Units with heating and cooling performance criteria meeting or exceeding the criteria listed below. (See Jenkins Refrigeration & Air Conditioning schedule).

Seasonal heat generating efficiency SCOP of: **3.8-4.8**

Seasonal Cooling Energy Efficiency Ratio SEER of: **5.8-7.0**

CRC Ltd. responsibility laboratory pod areas- Mitsubishi VRF Electric Air to Air source heat pump/Air conditioning throughout all Units with heating and cooling performance criteria meeting or exceeding the criteria listed below. (See CRC Ltd schedule).

Seasonal heat generating efficiency SCOP of: **4.02**

Seasonal Cooling Energy Efficiency Ratio SEER of: **3.63**

CRC Ltd. responsibility laboratory pod areas- Lennox Air Handling Unit Electric Air to Air source heat pump/Air Handling unit throughout all Units with heating and cooling performance criteria meeting or exceeding the criteria listed below. (See CRC Ltd schedule).

Seasonal heat generating efficiency SCOP of: **3.76**

Seasonal Cooling Energy Efficiency Ratio SEER of: **5.09**

Secondary Heating

None

Main Heating Controls

The electric Heat Pumps to be temperature and time controlled, all in accordance with Section 3 & 9, Tables 12 (Minimum Controls Package B) & 35, Non Domestic Heating, Cooling and Ventilation Compliance Guide.

Domestic Hot Water Services (DWS)

Electric Multipoint water heaters supplying the hot water services throughout located in the heated space with a standing heat loss of no more than 0.58kWh/24hrs. The primary pipework is to be fully insulated.

Secondary DHW Circulation

None

Solar (Power) PV Panels

N/A

Ventilation

Natural ventilation for all areas except the CRC Ltd pods. Extract fans to the toilets with a SFP of no more than 0.3 W/l/s such as the Ventaxia Ltd LO-Carbon range for the toilets

CRC Ltd laboratory pods – The Lennox Air handling unit provides air heat recovery in excess of 100% via heat pump dehumidification process. All fresh air intake is preheated by the Lannox unit from recovered heat.

Air Permeability

No Air Pressure Test required. Default of 15 m³/h.m² (at 50Pa) used as Per ADL2A 2013 Para 6.4.4 a. Alternative to Air Pressure Testing.

Fixed internal Lighting

LED light fittings throughout with a minimum average efficacy of not less than 80 Luminaire efficacy lumens per circuit watt throughout.

All light fittings will achieve at least 80 lumens per circuit watt together with a light output ratio of 1.0.

Generally locally switch with presence and daylight control where appropriate to maximise the use of daylight.

(Design & selection to be confirmed by manufacturer/ lighting engineer).

Metering

Lighting and Heat Pump are to be separately sub-metered.

Electric Power Factor Correction

None. Default <0.9

Thermal Bridging

Default Construction Details Construction Details assumed.

Fabric U-Values/construction details

(All installed as per the manufacturer's instructions. The constructions detailed below are for thermal calculation only. No account has been taken for Condensation risk, acoustic or structural considerations. Appropriately Qualified Persons should be consulted regarding these specific areas)

Element Description	Construction Details	U-Value W/m ² /K	Comment
Roof type 1 Existing Pitched Roof over existing Offices. (first floor flat ceiling, insulation at ceiling joist level)	Existing insulated metal profile sheeting and 50mm PIR insulation board lining, Unventilated Roof void, New 200mm Mineral wool insulation over suspended ceiling. Total thickness of 200mm Mineral wool insulation.	0.14	Min Requirement ADL2B for integral insulation roofs 0.18 W/m2K
Roof type 2 Existing Pitched Roof over QC, R&D Labs, etc. . (first floor flat ceiling, insulation at ceiling joist level)	Existing insulated metal profile sheeting and 50mm PIR insulation board lining, Unventilated Roof void, New 200mm Mineral wool insulation over suspended ceiling. Total thickness of 200mm Mineral wool insulation.	0.14	Min Requirement ADL2B for integral insulation roofs 0.18 W/m2K
Roof type 3 Existing Pitched Roof over CRC Ltd converted areas. (Ground floor flat ceiling, insulation at ceiling joist level)	Existing insulated metal profile sheeting and 50mm PIR insulation board lining, Unventilated Roof void, New 100mm CRC Ltd Pod insulated ceiling panel	0.13	Min Requirement ADL2B for integral insulation roofs 0.18 W/m2K

Roof type 4 Existing Pitched Roof over Micropharm Ltd converted areas. (Ground floor flat ceiling, insulation at ceiling joist level)	Existing insulated metal profile sheeting and 50mm PIR insulation board lining, Unventilated Roof void, New 200mm Mineral wool insulation over suspended ceiling. Total thickness of 200mm Mineral wool insulation.	0.14	Min Requirement ADL2B for integral insulation roofs 0.18 W/m2K
Roof type 5 Ground floor Flat ceiling of 'Goods In' office and Storage area under unheated first floor storage area.	Unheated first floor area adjacent to 'Goods In' entrance, 22mm Chipboard, 200mm Loft Roll 44 Mineral wool insulation between timber joists	0.15	Min Requirement ADL2B for integral insulation roofs 0.18 W/m2K
Wall Type 1 - Existing Offices cavity block external wall with existing cavity partial fill insulation	Existing 100mm dense concrete block, 50mm cavity, 50mm existing Mineral wool cavity insulation batt, 100mm Dense concrete block.	0.55	Min Requirement ADL2B for cavity walls 0.55 W/m2K
Wall Type 2 - Existing cavity block external wall with existing cavity partial fill insulation – Converted areas by Micropharm Ltd.	Existing 100mm dense concrete block, 50mm cavity, 50mm existing Mineral wool cavity insulation batt, 100mm Dense concrete block. Insulated wall panels.	0.55	Min Requirement ADL2B for cavity walls 0.55 W/m2K
Wall Type 3 - Existing cavity block external wall with existing cavity partial fill insulation – Converted areas by CRC Ltd.	Existing 100mm dense concrete block, 50mm cavity, 50mm existing Mineral wool cavity insulation batt, 100mm Dense concrete block. New CRC Ltd Insulated wall panels.	0.55	Min Requirement ADL2B for cavity walls 0.55 W/m2K

Wall Type 4 - Existing cavity block external wall with existing cavity partial fill insulation and fire protection panels – Converted areas by Micropharm Ltd.	Existing 100mm dense concrete block, 50mm cavity, 50mm existing Mineral wool cavity insulation batt, 100mm Dense concrete block. Fire protection wall panels.	0.55	Min Requirement ADL2B for cavity walls 0.55 W/m ² K
Wall Type 5 - New timber frame external wall adjacent 'Goods In' area.	12.5mm Plasterboard, 50mm Celotex insulation board, 100mm Mineral wool insulation batt between timber stud, 12.5mm plasterboard.	0.22	Min Requirement ADL2B for new external walls 0.26 W/m ² K
Wall Type 7 - New First floor (QC, R&D Labs, etc.) timber frame external wall adjacent Attic areas	12.5mm Plasterboard, 50mm Celotex insulation board, 100mm Mineral wool insulation batt between timber stud, 12.5mm plasterboard.	0.22	Min Requirement ADL2B for new external walls 0.26 W/m ² K
Wall Type 8 - New First floor timber frame external wall adjacent unheated storage area.	12.5mm Plasterboard, 50mm Celotex insulation board, 100mm Mineral wool insulation batt between timber stud, 12.5mm plasterboard.	0.22	Min Requirement ADL2B for new external walls 0.26 W/m ² K
Existing ground floor	Existing solid ground floor concrete slab	1.2	Min ADL2B Requirement waived due to technical and functional feasibility issues.
EXISTING WINDOWS/DOORS	Existing Double glazed, uPVC frames	2.8	ADL2B Threshold of 3.3 W/m ² K
NEW SIDE ENTRANCE DOORS	INSULATED WOOD DOORS	1.6	Min Requirement 1.8 W/m ² K
SOLID ENTRANCE DOORS –	Metal clad uPVC - Insulated	U Value 1.5 W/m ² K	Min Requirement 1.8 W/m ² K
VEHICLE ACCESS DOORS	Metal - Insulated	U Value 1.5 W/m ² K	Min Requirement 1.5 W/m ² K

3. U-VALUE CALCULATION SHEETS

U-value calculation

by BRE U-value Calculator version 2.04a

Printed on 19 Feb 2019 at 10:11

Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
\ROOF TYPE 1 NEW 200MM MIN WOOL OVR SUP CLNG + OLD.uva (File saved: 18 Feb 2019 11:36)

Element type: Roof - Pitched roof - insulated slope, flat ceiling

Calculation Method: BS EN ISO 6946

ROOF TYPE 1 NEW 200MM MIN WOOL OVR SUP CLNG + OLD 50MM PIR AT SLOPE

Layer	d (mm)	λ layer	λ bridge	Fraction	Density	Sp. heat	R layer	R bridge	Description
1	12.5	0.210			700	1000	0.100		Rsi
2	200	0.040			20	1030	0.060		Plasterboard
OVER SUSP CLNG									
3		R-value ¹			1	1000	5.000		insulation
4	50	0.022			20	1030	0.160		Roof space
EXISTING									
INSULATION									
							1.968*		
							<u>0.035*</u>		Rse
							<u>263 mm</u>	<u>7.322</u>	

¹Loft space below insulated rafters

*These resistance values have been multiplied 0.866 (Roof pitch 30°)

Total resistance: Upper limit: 7.322 Lower limit: 7.322 Ratio: 1.000 Average: 7.322 m²K/W

U-value (uncorrected) 0.137

U-value corrections

Air gaps in layer 2 $\Delta U = 0.000$ (Level 0)

Fixings in layer 3 $\Delta U = 0.000$ (8.50 per m², 7.5 mm² cross-section, $\lambda = 17.0$)

Total ΔU 0.000

U-value (corrected) 0.137

U-value (rounded) 0.14 W/m²K

Heat capacity per m² (κ) 8.8 kJ/m²K

Calculated by:

DAVID HENEKER

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U-value calculation

by BRE U-value Calculator version 2.04a

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Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
\ROOF TYPE 2 NEW 200MM MIN WOOL OVR SUP CLNG + OLD.uva (File saved: 19 Feb 2019 10:11)

Element type: Roof - Pitched roof - insulated slope, flat ceiling

Calculation Method: BS EN ISO 6946

ROOF TYPE 2 NEW 200MM MIN WOOL OVR SUP CLNG + OLD 50MM PIR AT SLOPE

Layer	d (mm)	λ layer	λ bridge	Fraction	Density	Sp. heat	R layer	R bridge	Description
1	12.5	0.210			700	1000	0.100		Rsi
2	200	0.040			20	1030	0.060		Plasterboard
OVER SUSP CLNG									
3		R-value ¹			1	1000	0.160		Roof space
4	50	0.022			20	1030	1.968*		EXISTING
INSULATION									
							<u>0.035*</u>		Rse
	<u>263 mm</u>						7.322		

¹Loft space below insulated rafters

*These resistance values have been multiplied 0.866 (Roof pitch 30°)

Total resistance: Upper limit: 7.322 Lower limit: 7.322 Ratio: 1.000 Average: 7.322 m²K/W

U-value (uncorrected) 0.137

U-value corrections

Air gaps in layer 2 $\Delta U = 0.000$ (Level 0)

Fixings in layer 3 $\Delta U = 0.000$ (8.50 per m², 7.5 mm² cross-section, $\lambda = 17.0$)

Total ΔU 0.000

U-value (corrected) 0.137

U-value (rounded) 0.14 W/m²K

Heat capacity per m² (κ) 8.8 kJ/m²K

Calculated by:

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U-value calculation

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Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
\ROOF TYPE 3 NEW 100MM CRC CLNG PANEL + OLD 50MM PIR AT SLOPE.uva (File saved: 18
Feb 2019 11:41)

Element type: Roof - Pitched roof - insulated slope, flat ceiling

Calculation Method: BS EN ISO 6946

ROOF TYPE 3 NEW 100MM CRC CLNG PANEL + OLD 50MM PIR AT SLOPE

<u>Layer</u>	<u>d (mm)</u>	<u>λ layer</u>	<u>λ bridge</u>	<u>Fraction</u>	<u>Density</u>	<u>Sp. heat</u>	<u>R layer</u>	<u>R bridge</u>	<u>Description</u>
1	100	0.018			20	1030	0.100		Rsi
INSULATED CLNG PANEL									
2		R-value ¹			1	1000	0.160		Roof space
3	50	0.022			20	1030	1.968*		EXISTING
INSULATION									
							0.035*		Rse
	<u>150 mm</u>						7.818		

¹Loft space below insulated rafters

*These resistance values have been multiplied 0.866 (Roof pitch 30°)

Total resistance: Upper limit: 7.818 Lower limit: 7.818 Ratio: 1.000 Average: 7.818 m²K/W

U-value (uncorrected) 0.128

U-value corrections

Air gaps in layer 1 $\Delta U = 0.000$ (Level 0)

Fixings in layer 2 $\Delta U = 0.000$ (8.50 per m², 7.5 mm² cross-section, $\lambda = 17.0$)

Total ΔU 0.000

U-value (corrected) 0.128

U-value (rounded) 0.13 W/m²K

Heat capacity per m² (κ) 0.0 kJ/m²K

Calculated by:

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U-value calculation

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Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
\ROOF TYPE 4 NEW 200MM MIN WOOL OVR SUP CLNG + OLD 50MM PIR AT SLOPE.uva (File
saved: 19 Feb 2019 10:13)

Element type: Roof - Pitched roof - insulated slope, flat ceiling

Calculation Method: BS EN ISO 6946

ROOF TYPE 4 NEW 200MM MIN WOOL OVR SUP CLNG + OLD 50MM PIR AT SLOPE

Layer	d (mm)	λ layer	λ bridge	Fraction	Density	Sp. heat	R layer	R bridge	Description
							0.100		Rsi
1	12.5	0.210			700	1000	0.060		Plasterboard
2	200	0.040			20	1030	5.000		insulation
OVER SUSP CLNG									
3		R-value ¹			1	1000	0.160		Roof space
4	50	0.022			20	1030	1.968*		EXISTING
INSULATION									
							0.035*		Rse
	<u>263 mm</u>						7.322		

¹Loft space below insulated rafters

*These resistance values have been multiplied 0.866 (Roof pitch 30°)

Total resistance: Upper limit: 7.322 Lower limit: 7.322 Ratio: 1.000 Average: 7.322 m²K/W

U-value (uncorrected) 0.137

U-value corrections

Air gaps in layer 2 $\Delta U = 0.000$ (Level 0)

Fixings in layer 3 $\Delta U = 0.000$ (8.50 per m², 7.5 mm² cross-section, $\lambda = 17.0$)

Total ΔU 0.000

U-value (corrected) 0.137

U-value (rounded) 0.14 W/m²K

Heat capacity per m² (κ) 8.8 kJ/m²K

Calculated by:

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U-value calculation

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Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
\ROOF TYPE 5, 200MM MN WOOL BTWN JOISTS 50MM CELOTE.uva (File saved: 11 Feb 2019 14:06)

Element type: Roof - Flat roof - insulation between timber joists

Calculation Method: BS EN ISO 6946

ROOF TYPE 5, 200MM MN WOOL BTWN JOISTS 50MM CELOTEX UNDR

Layer	d (mm)	λ layer	λ bridge	Fraction	Density	Sp. heat	R layer	R bridge	Description
1	12.5	0.210			700	1000	0.100		Rsi
2	50	0.022			30	1400	0.060		Plasterboard
CELOTEX									
3	200	0.040	0.130	0.0900	12	1030	5.000	1.538	Insulation /
4	12	0.130			500	1600	0.092		Timber
decking									
							0.040		Rse
<u>275 mm</u> (total roof thickness)							7.565		

Total resistance: Upper limit: 7.031 Lower limit: 6.723 Ratio: 1.046 Average: 6.877 m²K/W

U-value (uncorrected) 0.1454

U-value corrections

Air gaps in layer 3 $\Delta U = 0.0044$ (Level 1)

Fixings in layer 2 $\Delta U = 0.0011$ (6.00 per m², 7.5 mm² cross-section, $\lambda = 17.0$)

Total ΔU 0.0055

U-value (corrected) 0.151

U-value (rounded) 0.15 W/m²K

Heat capacity per m² (κ) 8.8 kJ/m²K

Calculated by:

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U-value calculation

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Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
\WALL TYPE 1 EXISTING 50MM MINERAL WOOL CAVITY INS.uva (File saved: 11 Feb 2019 14:15)

Element type: Wall - Masonry - partial cavity fill

Calculation Method: BS EN ISO 6946

WALL TYPE 1 EXISTING 50MM MINERAL WOOL CAVITY INS

Layer	d (mm)	λ layer	λ bridge	Fraction	Density	Sp. heat	R layer	R bridge	Description
1	13	0.180			600	1000	0.130		Rsi
(lightweight)							0.072		Plaster
2	100	1.130			2000	1000	0.088		Concrete
block (dense)									
3	50	R-value			1	1000	0.180		Cavity
unventilated									
4	50	0.040			20	1030	1.250		mineral wool
5	100	1.210			2000	1000	0.083		Concrete
block (DENSE)									
							<u>0.040</u>		Rse
							1.843		
	<u>313 mm</u> (total wall thickness)								

Total resistance: Upper limit: 1.843 Lower limit: 1.843 Ratio: 1.000 Average: 1.843 m²K/W

U-value (uncorrected) 0.5425

U-value corrections

Air gaps in layer 4 $\Delta U = 0.0000$ (Level 0)

Wall ties in layer 4 $\Delta U = 0.0074$ (2.00 per m², 10.0 mm² cross-section, $\lambda = 50.0$)

Total ΔU 0.0074

U-value (corrected) 0.550

U-value (rounded) 0.55 W/m²K

Heat capacity per m² (κ) 181.8 kJ/m²K

Calculated by:

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U-value calculation

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Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
\WALL TYPE 2 EXISTING 50MM MINERAL WOOL CAVITY INS.uva (File saved: 19 Feb 2019 10:15)

Element type: Wall - Masonry - partial cavity fill

Calculation Method: BS EN ISO 6946

WALL TYPE 2 EXISTING 50MM MINERAL WOOL CAVITY INS

Layer	d (mm)	λ layer	λ bridge	Fraction	Density	Sp. heat	R layer	R bridge	Description
1	13	0.180			600	1000	0.130		Rsi
(lightweight)							0.072		Plaster
2	100	1.130			2000	1000	0.088		Concrete
block (dense)									
3	50	R-value			1	1000	0.180		Cavity
unventilated									
4	50	0.040			20	1030	1.250		mineral wool
5	100	1.210			2000	1000	0.083		Concrete
block (DENSE)									
							<u>0.040</u>		Rse
							1.843		
	<u>313 mm</u> (total wall thickness)								

Total resistance: Upper limit: 1.843 Lower limit: 1.843 Ratio: 1.000 Average: 1.843 m²K/W

U-value (uncorrected) 0.5425

U-value corrections

Air gaps in layer 4 $\Delta U = 0.0000$ (Level 0)

Wall ties in layer 4 $\Delta U = 0.0074$ (2.00 per m², 10.0 mm² cross-section, $\lambda = 50.0$)

Total ΔU 0.0074

U-value (corrected) 0.550

U-value (rounded) 0.55 W/m²K

Heat capacity per m² (κ) 181.8 kJ/m²K

Calculated by:

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U-value calculation

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Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
\WALL TYPE 3 EXISTING 50MM MINERAL WOOL CAVITY INS.uva (File saved: 19 Feb 2019 10:16)

Element type: Wall - Masonry - partial cavity fill

Calculation Method: BS EN ISO 6946

WALL TYPE 3 EXISTING 50MM MINERAL WOOL CAVITY INS

Layer	d (mm)	λ layer	λ bridge	Fraction	Density	Sp. heat	R layer	R bridge	Description
1	13	0.180			600	1000	0.130		Rsi
(lightweight)							0.072		Plaster
2	100	1.130			2000	1000	0.088		Concrete
block (dense)									
3	50	R-value			1	1000	0.180		Cavity
unventilated									
4	50	0.040			20	1030	1.250		mineral wool
5	100	1.210			2000	1000	0.083		Concrete
block (DENSE)									
							<u>0.040</u>		Rse
							1.843		
	<u>313 mm</u> (total wall thickness)								

Total resistance: Upper limit: 1.843 Lower limit: 1.843 Ratio: 1.000 Average: 1.843 m²K/W

U-value (uncorrected) 0.5425

U-value corrections

Air gaps in layer 4 $\Delta U = 0.0000$ (Level 0)

Wall ties in layer 4 $\Delta U = 0.0074$ (2.00 per m², 10.0 mm² cross-section, $\lambda = 50.0$)

Total ΔU 0.0074

U-value (corrected) 0.550

U-value (rounded) 0.55 W/m²K

Heat capacity per m² (κ) 181.8 kJ/m²K

Calculated by:

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U-value calculation

by BRE U-value Calculator version 2.04a

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Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
 \WALL TYPE 5 100MM MINERAL WOOL BTWN + 50MM CELOTEX OVER.uva (File saved: 19 Feb
 2019 10:18)

Element type: Wall - Other external wall type

Calculation Method: BS EN ISO 6946

WALL TYPE 5 100MM MINERAL WOOL BTWN + 50MM CELOTEX OVER

<u>Layer</u>	<u>d (mm)</u>	<u>λ layer</u>	<u>λ bridge</u>	<u>Fraction</u>	<u>Density</u>	<u>Sp. heat</u>	<u>R layer</u>	<u>R bridge</u>	<u>Description</u>
							0.130		Rsi
1	12.5	0.210			700	1000	0.060		Plasterboard
2	50	0.022			30	1400	2.273		CELOTEX
INS BOARD									
3	100	0.040	0.150	0.120	12	1030	2.500	0.667	insulation /
timber frame									
4	12.5	0.210			700	1000	0.060		Plasterboard
(standard wallboard)									
							0.040		Rse
	<u>175 mm</u> (total wall thickness)						5.062		

Total resistance: Upper limit: 4.739 Lower limit: 4.441 Ratio: 1.067 Average: 4.590 m²K/W

U-value (uncorrected) 0.218

U-value correctionsAir gaps in layer 3 $\Delta U = 0.000$ (Level 0)Fixings in layer 2 $\Delta U = 0.002$ (6.00 per m², 7.0 mm² cross-section, $\lambda = 17.0$)Total ΔU 0.002

U-value (corrected) 0.220

U-value (rounded) 0.22 W/m²KHeat capacity per m² (κ) 8.8 kJ/m²K

Calculated by:

DAVID HENEKER

HELYG ENERGY SERVICES

PARC HELYG

LLECHRYD

CARDIGAN

CEREDIGION

SA43 2NE

Tel: 01239 682013

E-mail: dheneker@helygenenergyservices.co.uk

U-value calculation

by BRE U-value Calculator version 2.04a

Printed on 19 Feb 2019 at 10:17

Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
\WALL TYPE 4 EXISTING 50MM MINERAL WOOL CAVITY INS.uva (File saved: 19 Feb 2019 10:16)

Element type: Wall - Masonry - partial cavity fill

Calculation Method: BS EN ISO 6946

WALL TYPE 4 EXISTING 50MM MINERAL WOOL CAVITY INS

Layer	d (mm)	λ layer	λ bridge	Fraction	Density	Sp. heat	R layer	R bridge	Description
1	13	0.180			600	1000	0.130		Rsi
(lightweight)							0.072		Plaster
2	100	1.130			2000	1000	0.088		Concrete
block (dense)									
3	50	R-value			1	1000	0.180		Cavity
unventilated									
4	50	0.040			20	1030	1.250		mineral wool
5	100	1.210			2000	1000	0.083		Concrete
block (DENSE)									
							<u>0.040</u>		Rse
							1.843		
	<u>313 mm</u> (total wall thickness)								

Total resistance: Upper limit: 1.843 Lower limit: 1.843 Ratio: 1.000 Average: 1.843 m²K/W

U-value (uncorrected) 0.5425

U-value corrections

Air gaps in layer 4 $\Delta U = 0.0000$ (Level 0)

Wall ties in layer 4 $\Delta U = 0.0074$ (2.00 per m², 10.0 mm² cross-section, $\lambda = 50.0$)

Total ΔU 0.0074

U-value (corrected) 0.550

U-value (rounded) 0.55 W/m²K

Heat capacity per m² (κ) 181.8 kJ/m²K

Calculated by:

DAVID HENEKER

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U-value calculation

by BRE U-value Calculator version 2.04a

Printed on 19 Feb 2019 at 10:18

Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
 \WALL TYPE 7 100MM MINERAL WOOL BTWN + 50MM CELOTEX OVER.uva (File saved: 19 Feb
 2019 10:18)

Element type: Wall - Other external wall type

Calculation Method: BS EN ISO 6946

WALL TYPE 7 100MM MINERAL WOOL BTWN + 50MM CELOTEX OVER

<u>Layer</u>	<u>d (mm)</u>	<u>λ layer</u>	<u>λ bridge</u>	<u>Fraction</u>	<u>Density</u>	<u>Sp. heat</u>	<u>R layer</u>	<u>R bridge</u>	<u>Description</u>
							0.130		Rsi
1	12.5	0.210			700	1000	0.060		Plasterboard
2	50	0.022			30	1400	2.273		CELOTEX
INS BOARD									
3	100	0.040	0.150	0.120	12	1030	2.500	0.667	insulation /
timber frame									
4	12.5	0.210			700	1000	0.060		Plasterboard
(standard wallboard)									
							0.040		Rse
	<u>175 mm</u> (total wall thickness)						5.062		

Total resistance: Upper limit: 4.739 Lower limit: 4.441 Ratio: 1.067 Average: 4.590 m²K/W

U-value (uncorrected) 0.218

U-value correctionsAir gaps in layer 3 $\Delta U = 0.000$ (Level 0)Fixings in layer 2 $\Delta U = 0.002$ (6.00 per m², 7.0 mm² cross-section, $\lambda = 17.0$)Total ΔU 0.002

U-value (corrected) 0.220

U-value (rounded) 0.22 W/m²KHeat capacity per m² (κ) 8.8 kJ/m²K

Calculated by:

DAVID HENEKER

HELYG ENERGY SERVICES

PARC HELYG

LLECHRYD

CARDIGAN

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SA43 2NE

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U-value calculation

by BRE U-value Calculator version 2.04a

Printed on 19 Feb 2019 at 10:19

Filename: C:\Users\Dave\Documents\BRE U VALUE CALC PROJECT FILES\01191089 MICROPHARM
 \WALL TYPE 8 100MM MINERAL WOOL BTWN + 50MM CELOTEX OVER.uva (File saved: 19 Feb
 2019 10:19)

Element type: Wall - Other external wall type

Calculation Method: BS EN ISO 6946

WALL TYPE 8 100MM MINERAL WOOL BTWN + 50MM CELOTEX OVER

<u>Layer</u>	<u>d (mm)</u>	<u>λ layer</u>	<u>λ bridge</u>	<u>Fraction</u>	<u>Density</u>	<u>Sp. heat</u>	<u>R layer</u>	<u>R bridge</u>	<u>Description</u>
							0.130		Rsi
1	12.5	0.210			700	1000	0.060		Plasterboard
2	50	0.022			30	1400	2.273		CELOTEX
INS BOARD									
3	100	0.040	0.150	0.120	12	1030	2.500	0.667	insulation /
timber frame									
4	12.5	0.210			700	1000	0.060		Plasterboard
(standard wallboard)									
							0.040		Rse
	<u>175 mm</u> (total wall thickness)						5.062		

Total resistance: Upper limit: 4.739 Lower limit: 4.441 Ratio: 1.067 Average: 4.590 m²K/W

U-value (uncorrected) 0.218

U-value correctionsAir gaps in layer 3 $\Delta U = 0.000$ (Level 0)Fixings in layer 2 $\Delta U = 0.002$ (6.00 per m², 7.0 mm² cross-section, $\lambda = 17.0$)Total ΔU 0.002

U-value (corrected) 0.220

U-value (rounded) 0.22 W/m²KHeat capacity per m² (κ) 8.8 kJ/m²K

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4. HVAC SCHEDULES

MICROPHARM PROJECT, CILGERRAN



SCHEDULE OF HVAC AND BUILDING SERVICES.

HEATING/COOLING

[illegible]

<u>VENTILATION</u>				
CONVERTED GF AREAS BY CRC	LENNOX EO16AH105FM 1M	LENNOX NEW AIR HANDLING UNIT & DUCTWORK WITH 100% HEAT RECOVERY BY HEAT PUMP	100% +	
ALL EXISTING/CONVERTE D WET ROOMS	INTERMITTENT EXTRACT FANS	VARIOUS INTERMITTENT EXTRACT FANS	SFP 0.3	
<u>WATER HEATING</u>				
ALL AREAS	ELECTRIC MULTIPOINT	NEW AND EXISTING ELECTRIC MULTIPOINT	100%	
<u>LIGHTING</u>				
ALL AREAS	LED LIGHTING TH	LIGHTING SCHEDULE TO BE CONFIRMED	AT LEAST 80 LUMENS PER CIRCUIT WATT	

EN196713	   
Micropharm	

			
THERMODYNAMIC DATA (HEATING/COOLING)			
Gross capacity (excluding supply air fan motor)	99.9	97.5	kW
Heat gain from the supply air fan motor (*)	2	-2	kW
Energy recovery / Auxiliary Preheater capacity	0	0	kW
Net capacity (Including supply fan) (*)	101.9	95.5	kW
Sensible Heat Ratio (S/T)		0.72	
Total Absorbed power (*)	29.5	30.5	kW
Total unit net COP / EER (*)	3.46	3.13	
Gross compressor COP/EER	4.31	4.04	
Eurovent energy class	B	A	
global SFP		1029	W/(m3/s)
Indoor data	20 / 50	21 / 47	°C/%
External Ambient temperature	5 / 85	30 / 50	°C/%
Fresh air quantity	39	39	%
Mixed air data	14 / 62.4	24.4 / 50.1	°C/%
Auxiliary Electric Preheater Output T°	14		°C
Supply air temperature (including fan gain)	33.3	11.2	°C

(*):according to EN14511-2018

SEASONAL PERFORMANCES

SCOP/SEER (1)	3.76	5.09	
Seasonal energy efficiency (heating $\eta_{s,h}$ /cooling $\eta_{s,c}$) (2)	147.5	200.6	%

(1):In accordance with standard EN14825, heating mode performance is given for average climate.

(2):Space cooling & Space heating energy efficiency following Ecodesign regulation EU 2016/2281.

AUXILLIARY ELECTRIC PREHEATER DATA

Heating Gross Capacities	36	kW
Auxiliary Electric Preheater Load	0	%
Temperature rise	0	°C
Air outlet temp.	14	°C

GENERAL DATA

Number of circuits	2
Compressor type/Number	Scroll (1xtandem + 1xVariable speed)/3
Refrigerant	R410A

SUPPLY FAN DATA

Air Volume Flow rate	15500	m3/h
External Static Pressure available in supply network	350	Pa
Drive kit reference	LP	
Total electrical power of the drive kit	4.43	kW
Rotation speed	1590	rpm
SFP class (Specific power factor)	3	
SFP value	1029	W/(m3/s)

EN196713	   
Micropharm	

ELECTRICAL DATA (INCLUDING OPTIONS)

Electrical supply	400V/III/50Hz	V/P
Maximum power	81.8	kW
Starting current	235	A
Maximum running current	128	A
SCC (short circuit current)	10	KA
EMC (electro-magnetic compatibility)	Class B	

EN196713	   
Micropharm	

1 x E016AH105FM1M

DIMENSIONS FOR THE UNIT EXCLUDING ACCESSORIES



Length	Width	Height	Operating weight
4601	2270	2024	1850 *

Non-certified pictures

(*) The weight values are provided as an indication. For helicopter or special crane transportation, plan to check the weight before the job.

ACOUSTIC DATA

		Outdoor Part load			
Lwa 21%	75.5	dB(A)	Lp	44.5	dB(A)
Lwa 47%	76.8	dB(A)	Lp	45.8	dB(A)

Outdoor Spectrum per octave band dB(A) (Full load)									
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 HZ	Lwa	Lp
57.6	60.9	65	75	74.5	72.6	68.5	64	79.7	48.7

Supply Spectrum per octave band dB(A) (Full load)								Lwa: Sound power dB(A)	
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 HZ		
19.8	50.7	67.4	75.7	80.4	78.1	74.9	66.9	84	

Return Spectrum per octave band dB(A) (Full load)								Lwa: Sound power dB(A)	
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 HZ		
16.8	44.7	58.8	66.9	68.5	69.3	67	59.8	74.4	

Lwa: Sound power dB(A)

Lp: Sound pressure at 10 m dB(A)

Global sound power level measured in compliance with ISO STANDARD 3744

Values are displayed according to norm EN12102

Tolerance to +/- 3 dB(A)



PUHY-P350YHM-A

Standard Y Series 14hp Outdoor Unit

R410A Heat Pump



The City Multi Standard Y Series makes use of a two pipe refrigerant circuit throughout, with the choice of either Branch Pipe or Header Pipe feeds to indoor units, with manual changeover from cooling to heating to ensure that a constant indoor climate is maintained.

- **High Sensible Cooling Function – By raising off coil temperature, a 10% increase in sensible cooling capacity over standard operation is achievable, the result being greater comfort for occupants**
- **Refrigerant Volume Checking Function can indicate if a leakage has occurred by measuring various temperature and pressures around the system, allowing customers to easily comply with the F-Gas regulation**
- **Replace Technology Function allows the re-use of refrigerant piping, controllers, power and control wiring for all previously installed R22 and R407c Heat Recovery and Cooling Only systems**
- **Energy-saving 100% inverter driven outdoor compressor units with very low start currents**



Pictures not to scale

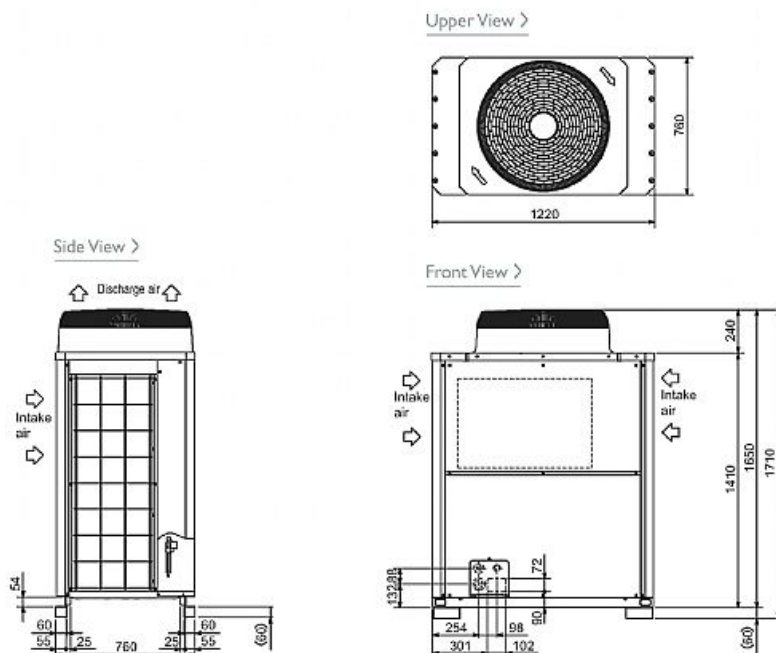
Product Details

PUHY-P350YHM-A	
Capacity (kW):	
Heating (Nominal)	45.0
Cooling (Nominal)	40.0
Heating (UK)	39.6
Cooling (UK)	37.6
Power Input (kW) Heating (Nominal)	12.09
Power Input (kW) Cooling (Nominal)	11.2
Power Input (kW) Heating (UK)	11.73
Power Input (kW) Cooling (UK)	8.29
Max No. of Connectable Indoor Units	30
Airflow(m3/min)	225
Noise (dBA)	60
Width - mm	1220
Depth - mm	760
Height - mm	1710
Weight - kg	245
Electrical Supply	380-415v, 50Hz
Phase	3
Mains Cable No. Cores	4 + earth
Starting Current (A)	8
Running Current (A) - Heating	18.6
Running Current (A) - Cooling	17.3
Fuse Rating (BS88) - HRC (A)	32

Piping Restrictions	
Total Piping Length (m)	1000
Furthest Piping Length (m)	165
Furthest Piping Length after 1st Branch (m)	40
Between Indoor and Outdoor Units - Height (m)	50
Between Indoor and Indoor Units - Height (m)	15

Dimensions

PUHY-P350YHM-A



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PEFY-P-VMA-E

Ceiling Concealed Ducted Indoor Unit

The PEFY-P-VMA-E ducted indoor unit is concealed within the ceiling space to allow unobtrusive air conditioning. Flexibility of duct layout allows air flow patterns to be arranged to suit any application.

Key Features

- Low height - only 250mm
- Wide range of external static pressure settings across entire range (35-150Pa)
- Low noise levels thanks to the use of a centrifugal fan - as low as 23dBA (size 20-40)
- Drain pump included as standard
- CN105 connector available - connect to MELCOBEMS MINI for simple BEMS interfacing



INDOOR UNITS		PEFY-P20VMA-E	PEFY-P25VMA-E	PEFY-P32VMA-E	PEFY-P40VMA-E	PEFY-P50VMA-E	PEFY-P63VMA-E	PEFY-P80VMA-E	PEFY-P100VMA-E	PEFY-P125VMA-E
CAPACITY (kW)	Heating (nominal)	2.5	3.2	4.0	5.0	6.3	8.0	10.0	12.5	16.0
	Cooling (nominal)	2.2	2.8	3.6	4.5	5.6	7.1	9.0	11.2	14.0
	UK Heating	2.5	3.2	4.0	5.0	6.3	8.0	10.0	12.5	16.0
	UK Total Cooling - Hi (Sensible)	2.00 (1.80)	2.50 (2.00)	3.20 (2.50)	4.10 (3.30)	5.00 (4.10)	6.40 (5.10)	8.10 (5.90)	10.10 (8.10)	12.60 (9.90)
	UK Total Cooling - Mi2	-	-	-	-	-	-	-	-	-
	UK Total Cooling - Mi1	1.94	2.42	3.07	3.94	4.80	6.11	7.78	9.67	12.07
	UK Total Cooling - Lo	1.78	2.22	2.86	3.67	4.45	5.71	7.14	8.93	11.17
POWER INPUT (kW)	UK Total Cooling - Hi (Sensible) (Raised Evaporation Temperature*)	1.7 (1.7)	2.1 (1.8)	2.7 (2.2)	3.4 (3.0)	4.2 (3.7)	5.4 (4.6)	6.8 (5.3)	8.5 (7.4)	10.6 (9.0)
	Heating (nominal)	0.04	0.04	0.05	0.07	0.09	0.10	0.12	0.22	0.32
AIRFLOW (l/s)	Cooling (nominal)	0.06	0.06	0.07	0.09	0.11	0.12	0.14	0.24	0.34
	Lo-Mi-Hi	100-125-142	100-125-142	125-150-175	167-200-233	200-242-283	225-267-317	242-300-350	383-467-550	467-567-667
EXTERNAL STATIC PRESSURE (Pa)		35-50-70-100-150	35-50-70-100-150	35-50-70-100-150	35-50-70-100-150	35-50-70-100-150	35-50-70-100-150	35-50-70-100-150	35-50-70-100-150	35-50-70-100-150
SOUND PRESSURE LEVEL (dBA)** (50Pa) Lo-Mi-Hi		23-25-26	23-25-26	23-26-29	23-27-30	25-29-32	25-29-33	26-29-34	28-33-37	32-36-40
WEIGHT (kg)		23	23	23	26	26	32	32	42	42
DIMENSIONS (mm)	Width	700	700	700	900	900	1100	1100	1400	1400
	Depth	732	732	732	732	732	732	732	732	732
	Height	250	250	250	250	250	250	250	250	250
ELECTRICAL SUPPLY		220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz
PHASE		Single	Single	Single	Single	Single	Single	Single	Single	Single
RUNNING CURRENT (A) Heating / Cooling		0.42 / 0.53	0.42 / 0.53	0.44 / 0.55	0.53 / 0.64	0.63 / 0.74	0.90 / 1.01	1.04 / 1.15	1.36 / 1.47	1.94 / 2.05
FUSE RATING (BS88) - HRC (A)		6	6	6	6	6	6	6	6	6
MAINS CABLE No. Cores		3	3	3	3	3	3	3	3	3

PRICE	£594	£609	£617	£657	£684	£706	£806	£892	£1,021
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Note: * Figures shown using 9°C Raised Evaporation Temperature. PUHY-(E)P YKB/YLM and PURY-(E)P YLM models have an option for 6°C and 14°C Evaporation Temperature. Please consult with your sales office for application of this feature.

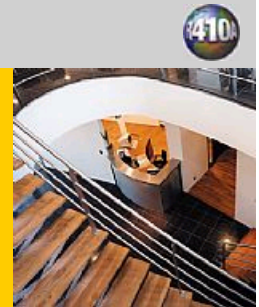
** Additional sound data is available for this model. Separated inlet and breakout sound power level and discharge sound power level data is available on request.



CMB-P106V-G1

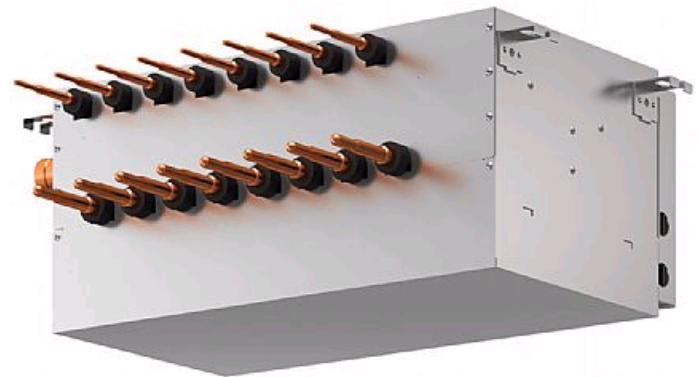
BC Controller

R410A



At the heart of both the R2 and WR2 Series, the BC Controller makes simultaneous heating and cooling possible. It has the inherent 'intelligence' to be the system's decision-maker. The CMB-P106V-G1 unit is for use with PURY-(E)P200-350YJM-A outdoor units & PQRY-P200-300YHM-A condensing units only.

- **New brazed connections**
- **Transfers energy around the system, drawing on energy from the heat source units/outdoor units**
- **Directing energy as requested by the individual indoor units**
- **Instructs the heat source unit/outdoor unit on the amount of refrigerant (liquid or gas) that is required to achieve the requested cooling or heating requirements**
- **Allows unique 2-pipe heat recovery**
- **HIC Circuit for improved efficiency**



Pictures not to scale

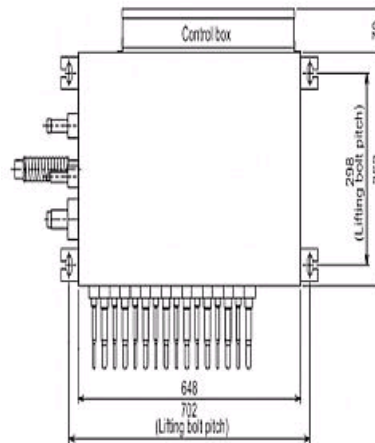
Product Details

CMB-P106V-G1	
Number of Connections	6
Power Input (kW) Heating (Nominal)	0.123
Power Input (kW) Cooling (Nominal)	0.123
Width - mm	648
Depth - mm	432
Height - mm	284
Weight - kg	28
Electrical Supply	220-240v, 50Hz
Phase	Single
Mains Cable No. Cores	3
Running Current (A) - Heating	0.52
Running Current (A) - Cooling	0.52
Fuse Rating (BS88) - HRC (A)	6

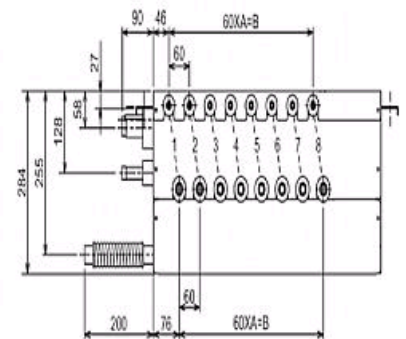
Dimensions

CMB-P106V-G1

Upper View >



Side View >



	A	B
CMB-P104V-G1	3	180
CMB-P105V-G1	4	240
CMB-P106V-G1	5	300



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The **AE-200E** is a large 10.4" touch screen centralised controller with simple intuitive operation and control over M-NET network.

Key Features

- 10.4" full function touch screen
- Centralised controller
- Monitor and control up to 50 indoor units (or up to 200 indoor units with EW-50Es)
- Monitor and control general equipment
- Energy monitoring, load shedding
- Web based controller
- Onboard HTML5 web browser
- Optional direct BACnet connection



Controls

Product Information

AE-200E

Centralised Controller

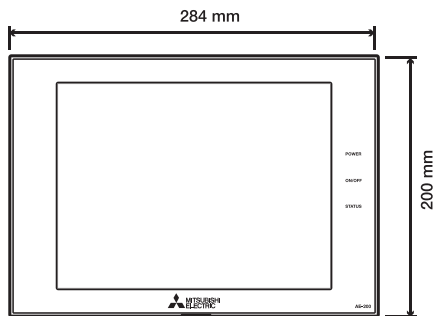
Making a World of Difference

CENTRALISED CONTROLLER		AE-200E
Description		10.4" Touch Screen Controller
Connect to		M-NET Network
Max Number of Units		50 and 4 Pulse Meters
Compatibility		M Series, Mr Slim, City Multi Lossnay and Ecodan CAHV
Power Supply		220-240v, 50Hz
Dimensions (mm) (WxDxH)		283 x 64 x 199
Control	On/Off	✓
	Mode	✓
	Setpoint	✓
	Fan Speed	✓
	Air Direction	✓
	Permit/Prohibit	✓
	Filter Sign	✓
Monitor	On/Off	✓
	Mode	✓
	Setpoint	✓
	Fan Speed	✓
	Air Direction	✓
	Permit/Prohibit	✓
	Filter Sign	✓
	Fault Codes	✓
	Room Temperature	✓
Weekly Schedule		✓
Annual Schedule		✓
Night Set Back		✓
Web Pages		✓
Optimised Start		✓
Automatic Setpoint Adjustment		✓
Load Shedding		✓
Occupied / Unoccupied Settings Reset		x
Remote Monitoring with M2M		✓
Simple Energy Monitoring		✓
Advanced Energy Monitoring		✓

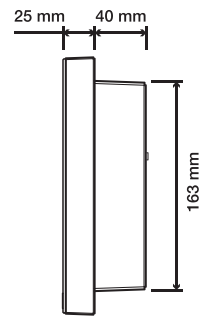
✓ = Yes, x = No, - = Not applicable.

DIMENSIONS

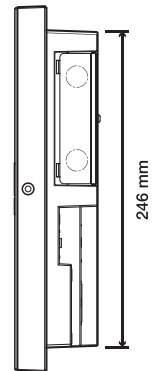
Front View



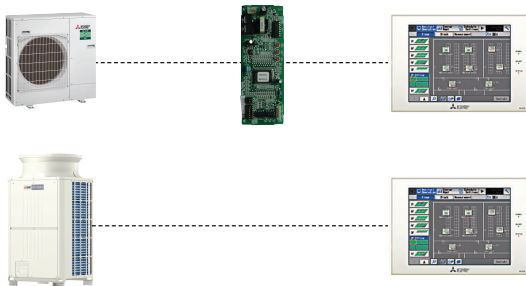
Side View



Upper View

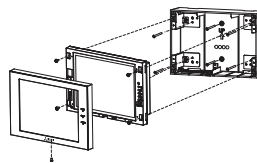


SYSTEM DIAGRAM

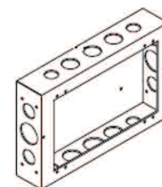


OPTIONS

PAC-YG82TB



PAC-YG84UTB



Description	AE-200E Plastic Wall Mounted Box	AE-200E Metal Wall Mounted Box
Compatibility	AE-200E	AE-200E
Dimensions (mm) (WxDxH)	282 x 77 x 198	380 x 90 x 280



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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrical/electronic engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774) or R134a (GWP:1430). These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, the values are as follows: R410A (GWP:1975), R32 (GWP: 650), R407C (GWP:1650) or R134a (GWP:1300).



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Mitsubishi Electric UK's commitment
to the environment



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Mitsubishi Electric
Living Environmental Systems UK



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Effective as of September 2017

4 WAY 90x90 CASSETTE PACi INVERTER+

Large capacity PACi. Trusted power and high efficiency.

Thanks to advances in design and technology such as the new high performance turbo fan, more efficient and silent, the nanoe™ air cleaner, for total healthy and the floor temperature & humidity sensor to more control, the new U2 Panasonic 90x90 4 way cassette is the best Industry in energy savings, healthy and comfort.

Technical focus

- New high performance turbo fan, new path system for heat exchanger
- Lower noise in slow fan operation
- Industry top light weight, easy piping
- Easy installation structure of the panel
- Econavi: Floor temperature and humidity sensor added. Activity amount detection and new circulator
- Nanoe™: The first 10x for CAC (10 times more purification power). Inside cleaning by 10x nanoe™ + dry control

			PACi Standard							
			Single Phase				Three Phase			
			6.0kW	7.1kW	10.0kW	12.5kW	10.0kW	12.5kW	14.0kW	
KIT			KIT-60PUY2E5B4	KIT-71PUY2E5B4	KIT-100PUY2E5A4	KIT-125PUY2E5A4	KIT-100PUY2E8A4	KIT-125PUY2E8A4	KIT-140PUY2E8A4	
Panel			CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	
Timer remote controller			CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	
Cooling capacity	Nominal (Min - Max)	kW	6.0 (2.0 - 7.1)	7.1 (2.0 - 7.7)	10.0 (3.3 - 12.5)	12.5 (3.8 - 15.5)	10.0 (2.7 - 11.5)	12.5 (3.8 - 13.5)	14.0 (3.3 - 15.5)	
EER ¹⁾	Nominal (Min - Max)	W/W	3.70 (8.00 - 3.23) A	3.24 (8.00 - 2.91) A	4.27 (4.29 - 3.38) A	3.16 (4.22 - 2.77) B	3.16 (5.09 - 2.74) B	3.16 (4.22 - 2.77) B	3.25 (3.93 - 2.67) A	
SEER ²⁾		W/W	7.00 A++	6.50 A++	7.60 A++	—	6.60 A++	—	—	
Pdesign		kW	6.0	7.1	10.0	—	10.0	—	—	
Input power cooling	Nominal (Min - Max)	kW	1.62 (0.25 - 2.20)	2.19 (0.25 - 2.65)	2.34 (0.77 - 3.70)	3.96 (0.90 - 4.88)	3.16 (0.53 - 4.20)	3.96 (0.90 - 4.88)	4.31 (0.84 - 5.81)	
Annual energy consumption (ErP) ³⁾		kWh/a	300	382	461	—	530	—	—	
Heating capacity	Nominal (Min - Max)	kW	6.0 (1.8 - 7.0)	7.1 (1.8 - 8.1)	11.2 (4.1 - 14.0)	12.5 (3.4 - 15.0)	10.0 (2.1 - 13.8)	12.5 (3.4 - 15.0)	14.0 (4.1 - 16.0)	
Heating capacity at -7/-15°C ⁴⁾		kW	— / —	— / —	— / —	— / —	— / —	— / —	— / —	
COP ¹⁾	Nominal (Min - Max)	W/W	4.20 (9.00 - 4.24) A	4.13 (9.00 - 3.68) A	5.00 (5.19 - 3.18) A	4.10 (4.66 - 3.41) A	4.15 (5.12 - 3.45) A	4.10 (4.66 - 3.41) A	4.15 (4.56 - 3.08) A	
SCOP ⁵⁾		W/W	4.10 A+	4.20 A+	4.80 A++	—	4.30 A+	—	—	
Pdesign at -10°C		kW	6.0	6.0	10.0	—	10.0	—	—	
Input power heating	Nominal (Min - Max)	kW	1.43 (0.20 - 1.65)	1.72 (0.20 - 2.20)	2.24 (0.79 - 4.40)	3.05 (0.73 - 4.40)	2.41 (0.41 - 4.00)	3.05 (0.73 - 4.40)	3.37 (0.90 - 5.20)	
Annual energy consumption (ErP) ³⁾		kWh/a	2047	2002	2917	—	3256	—	—	
Indoor Unit			S-60PUZE5A	S-71PUZE5A	S-100PUZE5A	S-125PUZE5A	S-100PUZE5A	S-125PUZE5A	S-140PUZE5A	
Air volume	Hi / Med / Lo	m³/min	21.0 / 16.0 / 13.0	22.0 / 16.0 / 13.0	36.0 / 26.0 / 18.0	37.0 / 27.0 / 19.0	36.0 / 26.0 / 18.0	37.0 / 27.0 / 19.0	38.0 / 29.0 / 20.0	
Moisture removal volume		L/h	1.7	2.5	2.7	4.8	2.7	4.8	6.0	
Sound pressure ⁶⁾	Hi / Med / Lo	dB(A)	36 / 31 / 28	37 / 31 / 28	45 / 38 / 32	46 / 39 / 33	45 / 38 / 32	46 / 39 / 33	47 / 40 / 34	
Sound power	Hi / Med / Lo	dB	51 / 46 / 43	52 / 46 / 43	60 / 53 / 47	61 / 54 / 48	60 / 53 / 47	61 / 54 / 48	62 / 55 / 49	
Dimensions (H x W x D)		mm / kg	256 x 840 x 840 / 20	256 x 840 x 840 / 20	319 x 840 x 840 / 25	319 x 840 x 840 / 25	319 x 840 x 840 / 25	319 x 840 x 840 / 25	319 x 840 x 840 / 25	
Net weight	Panel	mm / kg	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	
Outdoor Unit			U-60PEY2E5	U-71PEY2E5	U-100PEY1E5	U-125PEY1E5	U-100PEY1E8	U-125PEY1E8	U-140PEY1E8	
Power source		V	220 / 230 / 240	220 / 230 / 240	220 / 230 / 240	220 / 230 / 240	380 / 400 / 415	380 / 400 / 415	380 / 400 / 415	
Recommended fuse		A	—	—	—	30	16	16	16	
Connection		mm²	—	—	—	6.0	2.5	2.5	2.5	
Current	Cooling	A	8.00 / 7.60 / 7.30	10.70 / 10.30 / 9.85	0.82 / 0.79 / 0.76	19.2 / 18.4 / 17.6	5.10 / 4.85 / 4.70	6.35 / 6.05 / 5.80	6.85 / 6.50 / 6.25	
	Heating	A	7.05 / 6.75 / 6.45	8.50 / 8.10 / 7.80	0.81 / 0.78 / 0.75	15.4 / 14.8 / 14.2	4.15 / 3.95 / 3.80	5.15 / 4.90 / 4.70	5.65 / 5.35 / 5.20	
Air volume	Cooling / Heating	m³/min	38 / 41	44 / 41	110 / 95	80 / 73	76 / 67	80 / 73	135 / 120	
Sound pressure	Cooling / Heating (Hi)	dB(A)	46 / 48	49 / 49	52 / 52	56 / 56	54 / 54	56 / 56	54 / 53	
Sound power	Cooling / Heating (Hi)	dB	65 / 68	69 / 69	69 / 69	73 / 73	70 / 70	73 / 73	71 / 70	
Dimensions	H x W x D	mm	619 x 799 x 299	619 x 799 x 299	996 x 940 x 340	996 x 940 x 340	996 x 940 x 340	996 x 940 x 340	1416 x 940 x 340	
Net weight		kg	40	40	73	85	73	85	98	
Piping connections	Liquid pipe	Inch (mm)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	
	Gas pipe	Inch (mm)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	
Piping length range / Elevation difference (in/out) ⁷⁾		m	3 ~ 40 / 30	3 ~ 40 / 30	5 ~ 50 / 30	5 ~ 50 / 30	5 ~ 50 / 30	5 ~ 50 / 30	5 ~ 50 / 30	
Pipe length for additional gas / Additional gas amount		m / g/m	30 / 40	30 / 40	30 / 50	30 / 50	30 / 50	30 / 50	30 / 50	
Refrigerant (R410A)		kg / TCO ₂ Eq.	1.95 / 4.0716	1.95 / 4.0716	2.60 / 5.4288	3.20 / 6.6816	2.60 / 5.4288	3.20 / 6.6816	3.40 / 7.0992	
Operating range	Cooling Min ~ Max	°C	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43	
	Heating Min ~ Max	°C	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24	

1) EER and COP, Energy Saving Classification, is at 220 / 240V (380 / 415V) only in accordance with EU directive 2002/31/EC. 2) SEER is calculated in base Eurovent IPLV for SBEM for U1 indoor unit SEER=a(EER25)+b(EER50)+c(EER75)+d(EER100) where EER25, EER50, EER75 and EER100 are the EER measured value at 25%, 50%, 75% and 100% part load for temperatures 20, 25, 30 and 35°C DB, respectively. a, b, c and d are values assigned for an office type. These values are given as a=0.2, b=0.36, c=0.32 and d=0.03. The internal temperatures are taken at 27°C DB and 19°C WB. 3) The annual consumption(ErP) is calculated by formula determined by ErP regulation. 4) Heating capacity is calculated including defrost factor correction. 5) SCOP is calculated in base Eurovent IPLV for SBEM with U1 indoor unit including defrost correction factor. 6) The Sound pressure of the units shows the value measured of a position 1 meter in front of the main body and 1.5m from the ground. The sound pressure is measured in accordance with Eurovent 6/C/006-97 specification. 7) When installing the outdoor unit at a higher position than the indoor unit. // Recommended fuse for the indoor 3A.

STANDARD

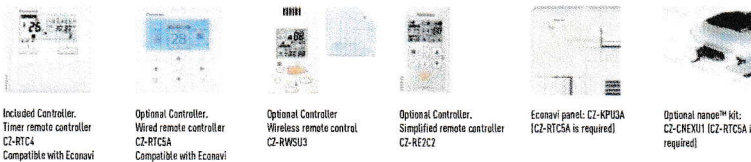
ELITE



SEER and SCOP: For KIT-100PUY2E5A4.

SEER and SCOP: For KIT-100PUY2E5A4.

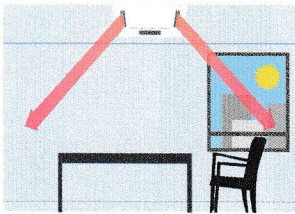
ECONAVI and INTERNET CONTROL: Optional. 5 YEARS COMPRESSOR WARRANTY: Only for PRO Partners.



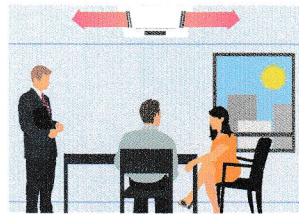
Compatible with all Panasonic connectivity solutions. For detailed information go to the Control Systems section.

Group control, new circulation function

Do circulating operation when nobody there, and mix air in the whole room. Minimize temperature gap in both heating and cooling operation.



Circulation by Detecting no movement (10min.)



Indirect air flow by detecting movement

2 types of body with height difference (same as current ones)

25.6cm and 31.9cm.

Always fresh and clean air with nanoe™

New nanoe™ is newly developed for PACi cassette by the advanced technology of Room Air conditioning.

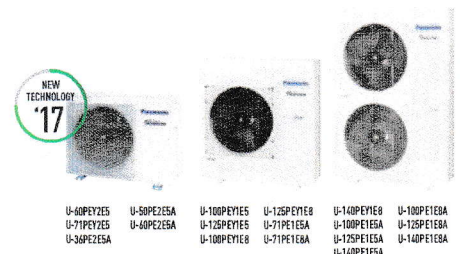
CZ-RTCSA and optional accessory CZ-CNEXU1 are required to use nanoe™ function.

PACi Elite

Single Phase							Three Phase				
3.6kW	5.0kW	6.0kW	7.1kW	10.0kW	12.5kW	14.0kW	7.1kW	10.0kW	12.5kW	14.0kW	
KIT-36PU2E5B4	KIT-50PU2E5B4	KIT-60PU2E5B4	KIT-71PU2E5A4	KIT-100PU2E5A4	KIT-125PU2E5A4	KIT-140PU2E5A4	KIT-71PU1E8A4	KIT-100PU2E8A4	KIT-125PU2E8A4	KIT-140PU2E8A4	
CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	CZ-KPU3	
CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	CZ-RTC4	
3.6 (1.5 - 4.0)	5.0 (1.5 - 5.6)	6.0 (2.0 - 7.1)	7.1 (2.5 - 8.0)	10.0 (3.03 - 12.5)	12.5 (3.3 - 14.0)	14.0 (3.3 - 15.5)	7.1 (3.2 - 8.0)	10.0 (3.3 - 12.5)	12.5 (3.3 - 14.0)	14.0 (3.3 - 15.0)	
4.68 (6.25 - 4.40) A	3.79 (6.25 - 3.46) A	3.75 (8.00 - 3.23) A	3.94 (5.56 - 3.02) A	4.27 (4.29 - 3.38) A	3.70 (4.29 - 3.04) A	3.30 (4.29 - 2.70) A	3.94 (5.71 - 3.02) A	4.27 (4.29 - 3.38) A	3.70 (4.29 - 3.04) A	3.30 (4.29 - 2.70) A	
7.40 A++	7.10 A++	7.40 A++	7.60 A++	7.60 A++	—	—	7.30 A++	7.40 A++	—	—	
3.6	5.0	6.0	7.1	10.0	—	—	7.1	10.0	—	—	
0.77 (0.24 - 0.91)	1.32 (0.24 - 1.62)	1.60 (0.25 - 2.20)	1.80 (0.45 - 2.65)	2.34 (0.77 - 3.70)	3.37 (0.77 - 4.60)	4.24 (0.77 - 5.74)	1.80 (0.56 - 2.65)	2.34 (0.77 - 3.70)	3.37 (0.77 - 4.60)	4.24 (0.77 - 5.74)	
170	246	284	327	461	—	—	340	473	—	—	
4.0 (1.5 - 5.0)	5.6 (1.5 - 6.5)	7.0 (1.8 - 8.0)	8.0 (2.0 - 9.0)	11.2 (4.1 - 14.0)	14.0 (4.1 - 16.0)	16.0 (4.1 - 18.0)	8.0 (2.8 - 9.0)	11.2 (4.1 - 14.0)	14.0 (4.1 - 16.0)	16.0 (4.1 - 18.0)	
— / —	— / —	— / —	— / —	— / —	— / —	— / —	— / —	— / —	— / —	— / —	
5.13 (7.89 - 4.63) A	4.44 (7.89 - 4.01) A	4.07 (9.00 - 3.90) A	4.30 (5.00 - 3.16) A	5.00 (5.19 - 3.18) A	4.60 (5.19 - 3.17) A	4.30 (5.19 - 3.15) A	4.30 (5.60 - 3.16) A	5.00 (5.19 - 3.18) A	4.60 (5.19 - 3.17) A	4.30 (5.19 - 3.15) A	
4.60 A++	4.40 A++	4.20 A++	4.30 A++	4.80 A++	—	—	4.30 A++	4.80 A++	—	—	
3.6	5.0	6.0	7.1	10.0	—	—	7.1	10.0	—	—	
0.78 (0.19 - 1.08)	1.26 (0.19 - 1.62)	1.72 (0.20 - 2.05)	1.86 (0.40 - 2.85)	2.24 (0.79 - 4.40)	3.04 (0.79 - 5.04)	3.72 (0.79 - 5.72)	1.86 (0.50 - 2.85)	2.24 (0.79 - 4.40)	3.04 (0.79 - 5.04)	3.72 (0.79 - 5.72)	
1095	1591	1999	2312	2917	—	—	2312	2917	—	—	
S-36PU2E5A	S-50PU2E5A	S-60PU2E5A	S-71PU2E5A	S-100PU2E5A	S-125PU2E5A	S-140PU2E5A	S-71PU2E5A	S-100PU2E5A	S-125PU2E5A	S-140PU2E5A	
14.5 / 13.0 / 11.5	16.5 / 13.5 / 11.5	21.0 / 16.0 / 13.0	22.0 / 16.0 / 13.0	36.0 / 26.0 / 18.0	37.0 / 27.0 / 19.0	38.0 / 29.0 / 20.0	22.0 / 16.0 / 13.0	36.0 / 26.0 / 18.0	37.0 / 27.0 / 19.0	38.0 / 29.0 / 20.0	
0.7	1.6	1.7	2.5	2.7	4.8	6.0	2.5	2.7	4.8	6.0	
30 / 28 / 27	32 / 29 / 27	36 / 31 / 28	37 / 31 / 28	45 / 38 / 32	46 / 39 / 33	47 / 40 / 34	37 / 31 / 28	45 / 38 / 32	46 / 39 / 33	47 / 40 / 34	
45 / 43 / 42	47 / 44 / 42	51 / 46 / 43	52 / 46 / 43	60 / 53 / 47	61 / 54 / 48	62 / 55 / 49	52 / 46 / 43	60 / 53 / 47	61 / 54 / 48	62 / 55 / 49	
256 x 840 x 840 / 19	256 x 840 x 840 / 19	256 x 840 x 840 / 20	256 x 840 x 840 / 20	319 x 840 x 840 / 25	319 x 840 x 840 / 25	319 x 840 x 840 / 25	256 x 840 x 840 / 20	319 x 840 x 840 / 25	319 x 840 x 840 / 25	319 x 840 x 840 / 25	
33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	33.5 x 950 x 950 / 5	
U-36PE2E5A	U-50PE2E5A	U-60PE2E5A	U-71PE1E5A	U-100PE1E5A	U-125PE1E5A	U-140PE1E5A	U-71PE1E8A	U-100PE1E8A	U-125PE1E8A	U-140PE1E8A	
220 / 230 / 240	220 / 230 / 240	220 / 230 / 240	220 / 230 / 240	220 / 230 / 240	220 / 230 / 240	220 / 230 / 240	380 / 400 / 415	380 / 400 / 415	380 / 400 / 415	380 / 400 / 415	
—	—	—	20	25	30	16	16	16	16	16	
—	—	—	2.5	4.0	6.0	2.5	2.5	2.5	2.5	2.5	
3.75 / 3.55 / 3.40	6.25 / 5.95 / 5.70	7.90 / 7.50 / 7.25	8.40 / 8.10 / 7.90	10.7 / 10.3 / 9.90	15.8 / 15.3 / 14.8	19.6 / 19.0 / 18.4	2.80 / 2.70 / 2.60	3.70 / 3.50 / 3.40	5.45 / 5.15 / 5.00	6.75 / 6.45 / 6.20	
3.80 / 3.60 / 3.45	6.05 / 5.75 / 5.50	8.50 / 8.15 / 7.80	9.30 / 9.00 / 8.70	11.8 / 11.4 / 11.0	15.9 / 15.4 / 14.9	19.8 / 19.2 / 18.6	3.10 / 3.00 / 2.90	4.05 / 3.85 / 3.75	5.50 / 5.20 / 5.05	6.85 / 6.50 / 6.25	
38 / 38	38 / 41	38 / 41	60 / 60	110 / 95	130 / 110	135 / 120	60 / 60	110 / 95	130 / 110	135 / 120	
45 / 46	46 / 48	46 / 49	48 / 50	52 / 52	53 / 53	54 / 55	48 / 50	52 / 52	53 / 53	54 / 55	
64 / 66	65 / 68	65 / 69	65 / 67	69 / 69	70 / 70	71 / 71	65 / 67	69 / 69	70 / 70	71 / 71	
619 x 799 x 299	619 x 799 x 299	619 x 799 x 299	996 x 940 x 340	1416 x 940 x 340	1416 x 940 x 340	1416 x 940 x 340	996 x 940 x 340	1416 x 940 x 340	1416 x 940 x 340	1416 x 940 x 340	
39	39	39	69	98	98	98	71	98	98	98	
1/4 (6.35)	1/4 (6.35)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	
1/2 (12.7)	1/2 (12.7)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	5/8 (15.88)	
3 - 40 / 30	3 - 40 / 30	3 - 40 / 30	5 - 50 / 30	5 - 75 / 30	5 - 75 / 30	5 - 75 / 30	5 - 50 / 30	5 - 75 / 30	5 - 75 / 30	5 - 75 / 30	
30 / 20	30 / 20	30 / 40	30 / 50	30 / 50	30 / 50	30 / 50	30 / 50	30 / 50	30 / 50	30 / 50	
1.40 / 2.9232	1.40 / 2.9232	1.95 / 4.0716	2.35 / 4.9068	3.40 / 7.0992	3.40 / 7.0992	3.40 / 7.0992	2.35 / 4.9068	3.40 / 7.0992	3.40 / 7.0992	3.40 / 7.0992	
-15 ~ +46	-15 ~ +46	-15 ~ +46	-15 ~ +46	-15 ~ +46	-15 ~ +46	-15 ~ +46	-15 ~ +46	-15 ~ +46	-15 ~ +46	-15 ~ +46	
-20 ~ +24	-20 ~ +24	-20 ~ +24	-20 ~ +24	-20 ~ +24	-20 ~ +24	-20 ~ +24	-20 ~ +24	-20 ~ +24	-20 ~ +24	-20 ~ +24	

Accessories

CZ-RTCSA	Wired remote control with Econavi button
CZ-RWSU3	Wireless remote controller
CZ-RE2C2	Simplified remote controller
CZ-CNEXU1	Nanoe™ air purifying system for Cassette 90x90 PU2
CZ-KPU3A	Econavi exclusive panel
CZ-BCU2	Air intake box form main unit
CZ-ATU2	Air intake box when using air intake plenum CZ-FDU2
CZ-FDU2	Air intake plenum
CZ-CFU2	Airflow blanking panel
PAW-WTRAY	Tray for condenser water compatible with base ground support



WALL MOUNTED TZ COMPACT STYLE INVERTER • R32 GAS

TZ compact indoor size.

The new TZ indoor units have a new size. With 799mm of width, you can put the air conditioner on the top of the door.

New TZ Inverter models are powerful and efficient, with an outstanding energy ranking of A++/A+, unique in the market!

Furthermore, the annual energy consumption has never been so low.

CS-TZ20TKEW
CS-TZ25TKEW
CS-TZ35TKEW

Technical focus

- **NEW!** New compact design with 799mm
- R32 gas environmental friendly
- Aerowings to control air draft direction
- PM2.5 Filter to create clean and comfort indoor quality
- Super Quiet! Only 20dB(A)
- High energy savings
- Wired control (Optional)
- Smartphone control (Optional)

Kit			KIT-TZ20-TKE	KIT-TZ25-TKE	KIT-TZ35-TKE	KIT-TZ42-TKE	KIT-TZ50-TKE	KIT-TZ60-TKE
Cooling capacity	Nominal (Min - Max)	kW	2.00 (0.75 - 2.40)	2.50 (0.85 - 3.00)	3.50 (0.85 - 3.90)	4.20 (0.85 - 4.60)	5.00 (0.98 - 5.60)	6.30 (0.98 - 7.10)
EER ¹⁾	Nominal (Min - Max)	W/W	3.92 (3.00 - 3.87) A	3.79 (3.40 - 3.37) A	3.50 (3.33 - 3.28) A	3.33 (3.21 - 2.79) A	3.40 (3.44 - 3.24) A	3.26 (3.50 - 2.98) A
SEER		W/W	6.40 A++	6.40 A++	6.20 A++	5.80 A+	6.80 A++	6.50 A++
Pdesign (cooling)		kW	2.0	2.5	3.5	4.2	5.0	6.3
Input power cooling	Nominal (Min - Max)	kW	0.51 (0.25 - 0.62)	0.66 (0.25 - 0.89)	1.00 (0.26 - 1.19)	1.26 (0.265 - 1.65)	1.47 (0.29 - 1.73)	1.93 (0.28 - 2.38)
Annual electricity consumption (cooling) ²⁾		kWh/a	255	330	500	630	735	339
Heating capacity	Nominal (Min - Max)	kW	2.70 (0.70 - 3.60)	3.30 (0.80 - 4.10)	4.00 (0.80 - 5.10)	5.00 (0.80 - 6.80)	5.80 (0.98 - 7.80)	7.20 (0.98 - 8.50)
Heating capacity at -7°C		kW	2.14	2.70	3.30	3.90	4.79	5.24
COP ¹⁾	Nominal (Min - Max)	W/W	4.03 (3.78 - 3.46) A	4.13 (4.10 - 3.63) A	3.81 (4.00 - 3.59) A	3.70 (4.00 - 3.32) A	3.77 (2.88 - 3.39) A	3.44 (2.88 - 3.15) B
SCOP		W/W	4.10 A+	4.20 A+	4.20 A+	3.80 A	4.30 A+	4.20 A+
Pdesign at -10°C		kW	1.9	2.4	2.8	3.6	4.0	4.6
Input power heating	Nominal (Min - Max)	kW	0.67 (0.19 - 1.04)	0.80 (0.20 - 1.13)	1.05 (0.20 - 1.42)	1.35 (0.20 - 2.05)	1.54 (0.34 - 2.30)	2.09 (0.34 - 2.70)
Annual electricity consumption (heating) ²⁾		kWh/a	648	800	933	1326	1302	1533
Indoor Unit			CS-TZ20TKEW	CS-TZ25TKEW	CS-TZ35TKEW	CS-TZ42TKEW	CS-TZ50TKEW	CS-TZ60TKEW
Air volume	Cooling / Heating	m³/min	10.0 / 10.9	10.9 / 11.6	11.8 / 12.5	12.3 / 12.9	19.9 / 20.8	20.3 / 21.4
Moisture removal volume		L/h	1.3	1.5	2.0	2.4	2.8	3.5
Sound pressure ³⁾	Cooling (Hi / Lo / Q-Lo)	dB(A)	37 / 26 / 20	40 / 26 / 20	42 / 30 / 20	44 / 31 / 29	44 / 37 / 34	45 / 37 / 34
	Heating (Hi / Lo / Q-Lo)	dB(A)	38 / 26 / 22	40 / 27 / 22	42 / 33 / 22	44 / 35 / 28	44 / 37 / 34	45 / 37 / 34
Dimensions	H x W x D	mm	290 x 799 x 197	290 x 799 x 197	290 x 799 x 197	290 x 799 x 197	302 x 1102 x 244	302 x 1102 x 244
Net weight		kg	8	8	8	8	12	12
Outdoor Unit			CU-TZ20TKE	CU-TZ25TKE	CU-TZ35TKE	CU-TZ42TKE	CU-TZ50TKE	CU-TZ60TKE
Power source		V	230	230	230	230	230	230
Recommended fuse		A	16	16	16	16	16	20
Connection (indoor/outdoor)		mm²	4 x 1.5	4 x 1.5	4 x 1.5	4 x 1.5	4 x 2.5	4 x 2.5
Air volume	Cooling / Heating	m³/min	31.2 / 29.7	30.0 / 28.9	28.7 / 30.4	33.6 / 34.0	33.0 / 32.2	42.6 / 41.5
Sound pressure ³⁾	Cooling / Heating (Hi)	dB(A)	46 / 47	47 / 48	48 / 50	49 / 51	48 / 49	49 / 49
Dimensions ⁴⁾	H x W x D	mm	542 x 780 x 289	542 x 780 x 289	542 x 780 x 289	619 x 824 x 299	619 x 824 x 299	695 x 875 x 320
Net weight		kg	26	27	32	32	40	42
Piping connections	Liquid pipe	Inch (mm)	1/4 (6.35)	1/4 (6.35)	1/4 (6.35)	1/4 (6.35)	1/4 (6.35)	1/4 (6.35)
	Gas pipe	Inch (mm)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	1/2 (12.70)	1/2 (12.70)	1/2 (12.70)
Piping length range / Elevation difference (in/out)		m	3 - 15 / 15	3 - 15 / 15	3 - 15 / 15	3 - 15 / 15	3 - 20 / 15	3 - 30 / 15
Pipe length for additional gas / Additional gas amount		m / g/m	7.5 / 10	7.5 / 10	7.5 / 10	7.5 / 10	7.5 / 15	7.5 / 15
Refrigerant (R32)		kg / TCO ₂ Eq.	0.58 / 0.392	0.67 / 0.452	0.77 / 0.520	0.86 / 0.581	1.14 / —	1.11 / 0.749
Operating range	Cooling Min - Max	°C	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43
	Heating Min - Max	°C	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24

Accessories

PA-AC-WIFI-1	Full bidirectional Wifi interface for Internet control
PAW-IR-WIFI-1	IR Wifi interface for Internet control

Accessories

CZ-RD514C	Wired remote controller for wall type
CZ-CAPRA1	H Generation interface to ECOi control integration

1) EER and COP classification is at 230V in accordance with EU directive 2002/31/EC. 2) The annual energy consumption is calculated in accordance with the ErP directive. 3) The Sound pressure of the units shows the value measured at a position 1m in front of the main air outlet. The sound pressure is measured in accordance with Eurovent 4/C/006-97 specification. Q-Lo: The lowest fan speed. Lo: The second lowest fan speed (the lowest fan speed for TZ50/60). 4) Add 70mm for piping port. * Tentative values.



CU-TZ20TKE
CU-TZ25TKE
CU-TZ35TKE



CU-TZ42TKE
CU-TZ50TKE



CU-TZ60TKE
CU-TZ71TKE



Included for
TZ20, TZ25, TZ35
and TZ42



Included for
TZ50, TZ60 and
TZ71



Optional
remote
control
CZ-RD



SEER and SCOP: For KIT-TZ50-TKE. SUPER QUIET: For KIT-TZ20-TKE, KIT-TZ25-TKE and KIT-TZ35-TKE. INTERNET CONTROL: Optional.

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Building Energy Performance Ass...

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Boilers



Type	Index number	Status
Gas and oil fuel boiler	001743	Normal
Brand	Model name	Model qualifier
Worcester	Danesmoor	50/70 000

Boiler ID*	C14769/7-1
Fuel	heating oil
SAP 2009/2012 annual efficiency (%)	84.6
SAP winter seasonal efficiency (%)	85.7
SAP summer seasonal efficiency (%)	74.0
Comparative hot water efficiency (%)	54.1
SAP 2005 seasonal efficiency (%)	84.8
Efficiency category	SEDBUK based on certified data
SAP equation used	201
Output power (kW)	70.0
Electrical power when firing (W)	0
Electrical power not firing (W)	0

Main type	regular
Condensing	no
Integral PFCHRD	no
Flue type	open
Fan assisted	yes
Ignition	no

10:34

19/02/2019

