

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

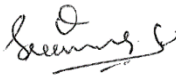
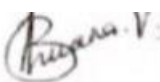
Word count: 4490

Product Design Brief

"Breathalyser"

Document No. : UWTSD-NPD-001

Revision: A

	Name	Signature	Date
Compiler*	Sreenivasa Chalavadi (Student ID: 2117168) Design Engineer		20-Sept-2022
Reviewer*	Bhuvana VD (Senior Design Engineer)		20-Sept-2022
Approver*#	Alan Mumby (Head of Design)		20-Sept-2022

Note:

* Compiler, Reviewer and Approver shall be different personnel at all times.

Approver shall be listed in the Company Signatory document.

Limitations of signatures, if any:

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 1 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 2 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

1. Revision Log:

Revision	Description of Modification (clearly mention, what was modified, Change Request Number, where it was modified e.g. page numbers, etc)	Date DD-MM-YYYY	Revision Approved by
A	New Document	20-Sept-2022	Alan Mumby, (Head of Design)

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 3 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

2. Table of Contents

1. Revision Log:	3
2. Table of Contents	4
3. Abbreviations	6
4. Introduction	7
5. Market Analysis.....	7
6. Breathalyser concept design.....	8
7. Functional Requirements.....	8
8. Design Considerations.....	9
4.1. Configuration	9
4.1.1. Type and Model	9
4.1.2. Size and Shape	9
4.1.3. Tolerance.....	9
4.1.4. Accuracy and Repeatability.....	10
4.1.5. Feel and Touch	10
4.1.6. Colour Grading	10
4.1.7. Installation	10
4.1.8. Part Marking and Barcodes.....	10
4.2. Mechanical.....	11
4.2.1. Materials	11
4.2.2. Processes.....	11
4.2.3. External coatings	12
4.2.4. Weight and centre of gravity	12
4.2.5. Accessories and Interface	12
4.2.6. Loads and Safety Factors	12
4.2.7. Handling	12
4.2.8. Design Features.....	13
4.2.9. Accessibility.....	13
4.3. Aesthetics and Styling	13
4.4. Electrical.....	14
4.4.1. Power Supply	14

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 4 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

4.4.2.	Signal interference	14
4.4.3.	Electrostatic Discharge susceptibility.....	14
4.4.4.	Software upgrade, Battery and Charging.....	14
4.5.	Environmental.....	15
4.5.1.	General.....	15
4.5.2.	Temperature	15
4.5.3.	Pressure.....	15
4.5.4.	Humidity.....	15
4.5.1.	Shock & Vibration	15
4.5.2.	Food Residue and water resistant	16
4.5.3.	Sand and Dust	16
4.5.4.	Fungus Resistance	16
4.5.5.	Corrosion Resistant	16
4.6.	Ergonomics.....	17
4.7.	In service Life	17
4.8.	Shelf life and Storage	17
4.9.	Safety	17
4.10.	Quality	17
4.11.	Product cost	18
4.12.	Calibration and Reliability	18
4.13.	Packaging and Warranty	18
4.14.	Documentation	19
4.15.	Supplier control.....	19
4.16.	Special instructions	19
1	References	20

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 5 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

3. Abbreviations

ECHA

EUROPEAN CHEMICALS AGENCY

REACH

Registration, Evaluation Authorisation and Restriction of Chemicals

UWTSD

University of Wales and Trinity Saint David

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 6 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

4. Introduction

Our company has seen an opportunity to extend the Chemical Detector system currently being used by Police and Security forces.

The opportunity to detect various viral infections has been a talk of the town in the recent times (Hodsden, 2017). Hence, the company has seen a business opportunity to design a new Breathalyser using the Government grants and by collaborating with the local university, UWTSD. The existing Chemical Detector system cannot be used or upgraded. Therefore, a completely new Breathalyser is to be developed based on the market data available from Section 5.

The scope of this document is to provide a design brief of this new Breathalyser.

The electrical and mechanical systems are to be designed as per the requirements of this document.

5. Market Analysis

Our company along with the University has performed a Market research involving Online Surveys, social media interactions and government official websites like Gov.uk and have identified this business opportunity to be considered. (COVID-19 Research Coordination & Learning, n.d.).



Types of participant observation

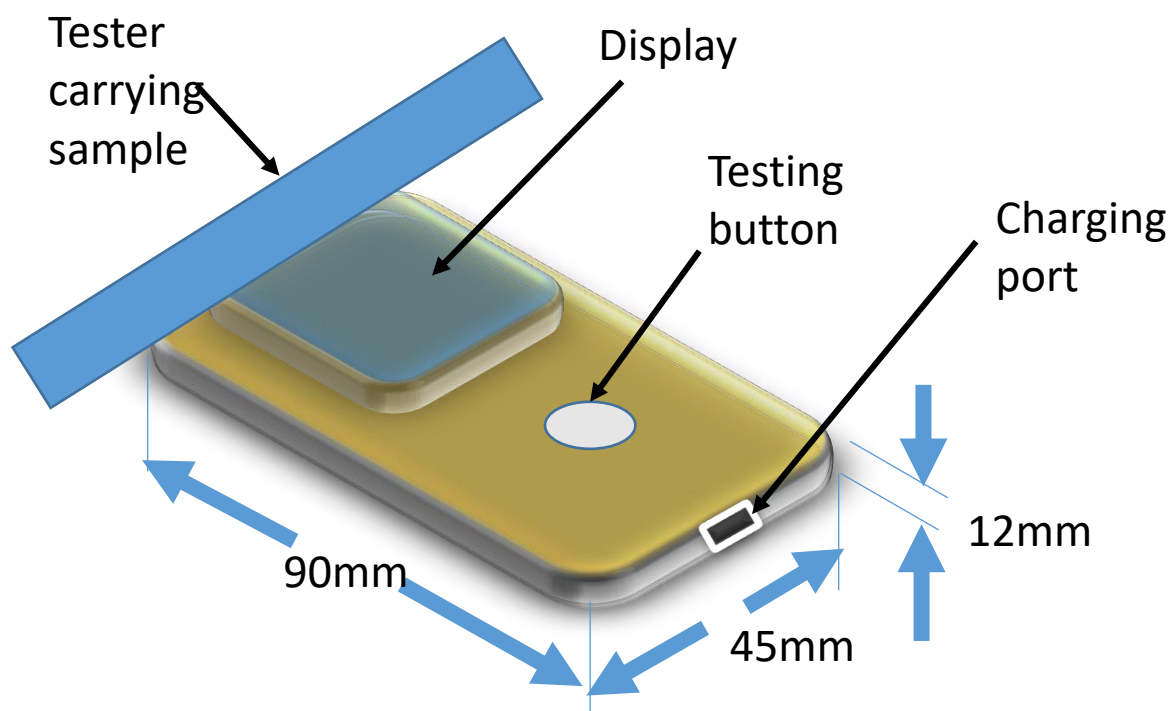
1. Passive participant observation
2. Active participant observation
3. Covert and overt participant observation
4. Covert and active participant observation
5. Covert and passive participant observation
6. Open and active participant observation
7. Open and passive participant observation

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

6. Breathalyser concept design

- The following concept design has been proposed and the detailed design needs to be developed based on the initial envelope dimensions and the requirements set in this document, henceforth.



7. Functional Requirements

- Must be very simple to use (breathalyserdirect, n.d.).



- The tester can be oral or nasal.
- The user blows the tester orally for continuous 5 seconds or inserts it into clear nose for 5 Seconds.

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 8 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

- Before the tester is inserted into the Breathalyser and held for 5 Secs, the user enters the name of the person by using touch screen of the Breathalyser to record the results for himself.
- Breathalyser should not be noisy, whilst not in usage, operation, charging etc.
- The Breathalyser, then indicates whether infected or not by indicating the details on the display screen.
- No compromise in the performance of the Breathalyser.
- The data displayed should include :
 - Name of the person tested.
 - Date and time of testing.
 - Positive or Negative (LED lighted display having colour identification shoing red for positive or green for negative).
 - Details of the infection.

8. Design Considerations

4.1. Configuration

4.1.1. Type and Model

- Different variants shall be clearly identified by the customers for their needs.
- The Breathalyser should have a digital display and memory that can retain results for atleast 30 days and upto 5000 test results as a minimum.
- Pricing must be competitive for different variants compared with the competitor's pricing.
- Provisions should be provided to convert a particular model to another by Company's customer service centres, if customer likes to upgrade, with a cost for the upgrading.

4.1.2. Size and Shape

- The breathalyser size should not be more than 90mm high, 45mm wide and 12mm thick. It should be handy to carry in pockets or handbags.
- The profile of the Breathalyser should be designed so that it can be handled both by left hand and right handed persons.
- The materials used to build the components have a direct impact on the size of the breathalyser. Hence, size of the components should be considered during the selection of Materials in para 4.2.1. E.g. Thicker Aluminium sheet metal may be needed to replace a Steel sheet metal part, to gain the same strength.
- In most cases, shape and size of the equipment is the first preference of a customer.
- Battery size should be optimal to make sure the Breathalyser is not bulkier and heavier.

4.1.3. Tolerance

- Appropriate manufacturing tolerances should be used for the parts and the assembly and should be justified in tolerance analysis.
- The selection of tolerances should be standardized as per the company procedures.

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 9 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

- The design should be validated by the tolerance analysis to gain confidence of first time pass during assembly.
- The Vendor supplied parts that interface, e.g. chargers, batteries, etc, should be considered during the early stages of the design.
- Tolerances selected should be achievable during manufacturing and assembly.

4.1.4. Accuracy and Repeatability

- The breathalyser should be designed, tested and certified to show consistent results without any discrepancies.
- Temperature, pressure, humidity or any other environmental changes within their operating ranges, shall not impact the results.
- The equipment shall be appropriately tested to show accurate results and repeatability as per the test plans.

4.1.5. Feel and Touch

- It should not be too cold during winter and too hot during the summer. The temperature should not have significant impact on the surface of the Breathalyser.
- The customers should feel comfortable using the Breathalyser at all weather conditions.

4.1.6. Colour Grading

- The colour of the equipment shall be pleasing and may be more closely related to the company defined colour palettes.
- Colours should not be too bright to the eyes.
- Display glass should be as clear as possible.
- The results displayed should be visible at all times, during the day and at the night.
- Display should be smart and must change its colours based on the day and night schemes to avoid sharp light to the eyes.
- Colour of the equipment should be as homogenous as possible.
- Colour grading should be appropriately certified for its life and usage.
- Constant handling should not wear out the colour and surface finish.
- Different variants may have different colours to identify the model variant.
- Display indicator lights should be contrast to the body colour to clearly be visible.
- Should be different to the colour palette used by the competitors.

4.1.7. Installation

- The different components used should be easily installed and assembled.
- Installation interfaces e.g. charging ports, display units, battery, memory chips etc should be discussed appropriately with the suppliers.

4.1.8. Part Marking and Barcodes

- The equipment shall have the part numbering system as per company procedures.

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 10 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

- The branding symbol or logo should be attractive and should be as per company procedures.
- Model numbers should be clearly identified to help customers in choosing what they want.
- The Markings should not deteriorate due to continuous usage of the equipment.
- Breathalyser should have Barcode etched on to the body and should also contain part number and various other symbols of compliance.
- Barcode should have all the details to identify within the company.

4.2. Mechanical

4.2.1. Materials

- The materials used in designing and developing the Breathalysers should be tested and approved by the materials department.
- Any new materials should be tested and approved as per the company procedures for strength requirements, flammability, electrical requirements, environmental requirements etc.
- The materials must be widely available for use.
- Should not be expensive and must be fit for use.
- The materials when assembled should not produce galvanic corrosion due to dissimilar metals (Staff, 2020).
- The materials used shall be compliant to the regulatory requirements of REACH (European_Chemicals_Agency, n.d.).
- Materials shall not be affected by the external varying environmental conditions.
- Customers shall not have reactions due to the materials used.
- Materials used shall not overheat and operate within the operating conditions defined.
- Forming and machining of the materials is an important consideration in the design of the Breathalysers. The selected materials should offer ease of manufacturing whichever method of manufacturing is adopted.
- The materials, mainly plastic including the electric wires, used in the design of the Breathalyser must be Fire retardant and meet Flammability requirements (Mallik, 1998).

4.2.2. Processes

- The manufacturing process plan should be prepared prior to the start of production.
- An optimal manufacturing process shall be selected to make sure the costs are within the budget.
- Right manufacturing process should be selected for the parts eg. machining, vacuum forming, casting, forging, sheet metal forming, bending etc.
- Key characteristics should be carefully manufactured and monitored to make sure they are controlled.

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 11 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

- If the manufacturing is outsourced, Engineering should make sure that the manufacturing is controlled and are supplied with the drawings or documents that they need to manufacture.
- Tooling must not be expensive for the manufacturing.
- Based on the volume of parts to be produced, manufacturing process should be selected.
- If needed, request Engineering to change the design to manufacture during the early stages.

4.2.3. External coatings

- External coatings should be done in a closed clean room to make sure there is no dust on the product.
- Coatings should be consistent in appearance on all surfaces of the Breathalyser.
- Supplier supplying the Coatings or paint, should control the coatings manufacturing process seamlessly. The Company Purchasing department, supported internally by manufacturing department shall monitor the coating processes and audit periodically.
- Any deviations should be approved or rejected by Quality and Engineering.
- Certified and approved long lasting Antimicrobial coatings shall be used on the external surfaces of the Breathalyser (Nanoelab, n.d.).

4.2.4. Weight and centre of gravity

- The weight of the equipment and the size, should be such that it can be easily carried by the customers e.g., can be carried in pockets, handbags, etc.
- A fully functional Breathalyser shall weigh not more than 120 grams.
- The weight of the equipment shall be designed to suit all age groups and genders, over the age of 12 years.
- The centre of gravity of the equipment should be equally distributed, as much as possible to avoid unnecessary falls due to imbalance.

4.2.5. Accessories and Interface

- The interfacing of the accessories like charger, memory chip, should be easily connected without any hassle.
- The ports and buttons should be flushed with the body of the Breathalyser.

4.2.6. Loads and Safety Factors

- The equipment should be designed to different handling load cases to avoid damages.
- Safety factors should be considered in the design to avoid damages.

4.2.7. Handling

- The manufacturing and assembly areas should be dry and clean to avoid any dust particles entering or avoid scratches on the parts (Kamble). Clean rooms can be used.

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 12 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

- The product should be carefully handled through out its manufacturing upto dispatch to avoid any unwanted damages and accidents.
- Precision components can be handled in plastic trays to avoid damages.
- Hands should be clean and dry whilst manually handling the components or the Breathalyser.
- Efficient way of material handling should be in place to reduce costs.
- Breathalyser should be designed by considering safety factors to overcome general wear and tear due to rough handling.

4.2.8. Design Features

- The design features of the components all the Breathalyser components should be mistake proofed, where applicable and needed.
- Every design feature or a component introduced should have a justification for itself for being in the design. Unnecessary addition of design features shall be avoided. Keep the design as simple as possible.
- Design features should not be costly to produce.
- The design feature should be achievable and manufacturable and when needed, manufacturing must be consulted at the early stages of the design.
- Provide labyrinth design, where needed to avoid damages to the internal electronic circuits and components because of any spillage of liquids. Avoid direct access to any liquids to the internal components.
- No sharp edges in the design that could damage during handling.
- The external body of the breathalyser should be smooth and should not slip away.
- The components or features should be designed for maintainability. Easy to replace components or parts, when it needs repairing or replacing.
- The equipment should be designed to different handling load cases to avoid damages and a prior stress analysis must be carried out on the design.

4.2.9. Accessibility

- The buttons of the breathalyser should be easily accessible and should be flushed neatly with the body of the Breathalyser for the aesthetic looks.
- On/Off power button accessibility to be designed in such a way that it should not be accidentally pressed.

4.3. Aesthetics and Styling

- The aesthetic look of the breathalyser should be trendsetter in the market for which market research and analysis results should be considered on the latest trending designs available in the market.
- It should be appealing to all the customers irrespective of age and gender.
- Aesthetic shall address all elements of the size, weight, external body design, colour, pattern, symmetry, finishing, handling etc.

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 13 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

- A product rendering should be produced for the aesthetic review internally before manufacturing and it should be agreed by the marketing and management. The product attraction is the biggest influencer of customers and justification for the product's high cost (Aiqin Shi, 2021).
- The design should be sleek and simplistic with a great performance, to attract customers. (Ayers, n.d.).
- Modern design aesthetics should be considered for the design of the Breathalyser, where the beauty of the product defines its performance and reliability.
- The surface finishing should be in such a way that it should always present itself as if it is newly purchased.

4.4. Electrical

4.4.1. Power Supply

- Breathalyser shall be compliant to the local power requirements and regulations.
- The plugs for charging should be compatible with the sockets of that region.
- Charger Plugs shall be insulated to make sure there is no chance of electrocution.
- Electrical components should be grounded.
- The design of the electrical connections, electrical supply wires and breather tube should all be safe for use. Different failure modes should be considered during the design phase.
- Internal Battery should be compatible to the power supply.
- Should be designed to overcome voltage spikes and variations.
- Digital systems should be protected per BSI standards (Digital Healthcare, n.d.)

4.4.2. Signal interference

- The Breathalyser should not be influenced by external signals like radio waves and other electromagnetic waves.
- Data should be protected from Cyber attacks. Therefore, it should be cyber secured.
- Breathalyser should not be susceptible to induced signals.

4.4.3. Electrostatic Discharge susceptibility

- The Breathalyser should not be susceptible to electrostatic discharging.
- Appropriate Electrostatic Discharge protection should be provided (Complete guide to Electrostatic Discharge Protection, n.d.).

4.4.4. Software upgrade, Battery and Charging

- Should be capable of using wifi technology and Bluetooth.
- Should be designed for future software upgrades.
- Software update should become easily available within the breathalyser itself. Update can be done by connecting it to the wifi and update it.
- Data should not be lost due to software updates.
- Software updates should not bring down the performance of the Breathalyser.

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 14 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

- Battery should be long lasting.
- Battery should be leak proof and should not release the acids.
- Battery should be easily replaceable.
- Charging to full capacity of the battery should not take more than 1hr.
- Rapid charging to 25% of the battery should be done in less than 10mins.

4.5. Environmental

4.5.1. General

The Breathalyser shall be designed and built to function efficiently in any environmental conditions and shall comply to the requirements stated below.

4.5.2. Temperature

- The Breathalyser shall be designed to operate in the temperatures ranging from 0° to 40°C (Gov.UK, 2013).
- Operation of the Breathalyser outside of the above operating temperatures, shall be considered invalid. Should be clearly mentioned in the instructions manual.
- The electronic, electrical and mechanical components within the Breathalyser shall withstand without damage, a maximum temperature of 60°C and to a minimum temperature of -10°C.

4.5.3. Pressure

- The Breathalyser shall operate within atmospheric pressure range of 86 kPa to 104 kPa (Gov.UK, 2013).
- Pressure spikes shall not damage the electrical and mechanical components working with the above pressure range.

4.5.4. Humidity

- Breathalyser shall operate within Ambient relative humidity 10 to 95%, non-condensing.
- Temperature range must be considered as a function of the humidity for the range as per para 4.5.2.
- Humidity, pressure and temperature together, should not have any interference in the results of the Breathalyser.

4.5.1. Shock & Vibration

- The Breathalyser should be shock proof and shatter poof (DO EEET, n.d.). This is to avoid the rough handling, transportation, dropping etc.
- To increase the reliability of the equipment it is absolute necessity to carry out the shock and vibration tests on the Breathalyser. Prior to these tests, a stress analysis must be conducted to gain confidence on the design for manufacturing and testing.
- The device shall be subjected to mechanical shock consisting of 1000 shocks in each of 3 perpendicular directions at a frequency of 2Hz. The device shall be rigidly mounted on a

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 15 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

suitable surface. Each shock shall comprise a 10G severity, 6 milliseconds duration, half sine pulse. (Gov.UK, 2013).

4.5.2. Food Residue and water resistant

- Food spillage and any liquids should not have any impact on the normal operation of the Breathalyser. It should be leak proof.
- This should be demonstrated by appropriate tests considering the worst liquids like coke, hot coffee.
- Should be resistant to corrosive fluids and oils.
- Resistant to rain and spray per BS EN 60068-2-18:2001 and IEC 60068-2-18:2000 - Environmental testing.

4.5.3. Sand and Dust

- Breathalyser should be resistant to the effect of dust in the atmosphere on the operation of the instrument and should be tested to the requirements of BS EN 60068-2-68:1996, IEC60068-2-68:1994 - Environmental testing (Gov.UK, 2013).
- The sand and dust should not erode the surface and should not affect the surface finish.
- Particles of the sand and dust should not enter into the Breathalyser and should not affect the function. External case should be dust proof.

4.5.4. Fungus Resistance

- Materials used in the design of the Breathalyser should not be susceptible to Fungus accumulation.
- There should not be moisture inside the casing of the Breathalyser that could accumulate and become fungus resulting abnormal performance or failure of the electronic components internally.
- External fungus growth may impact the aesthetic look of the Breathalyser.
- Growth of fungus on external surfaces could cause fungal infections to the users, which is the safety issue. Hence the design shall be resistant to fungus and tested to the conditions defined in the relevant standards as defined in the company procedures.
- This is a direct function of temperature and humidity. Hence, a proper testing must be conducted to make sure Breathalyser is safe from fungus growth (Keystone, n.d.)

4.5.5. Corrosion Resistant

- Corrosion eats away the material and could result in a permanent damage to the Breathalyser, which may even cause malfunctioning of the equipment itself.
- The potential differences should be evaluated prior to components selection material to avoid galvanic corrosion (Staff, 2020).
- Other corrosions including Stress Corrosion cracking, Cervice, pitting, fretting etc should all be addressed appropriately. (Navy, n.d.)

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 16 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

4.6. Ergonomics

- The outer body of the Breathalyser must be ergonomically suitable to all genders over the age of 12.
- Its body shape should be designed to have a proper grip so that it will not slip out of the hand.
- The use of accessories should also be designed so that they can be plugged or removed with a great comfort.
- The chargers should be designed to make sure they have a proper grip and are comfortable while inserting into the power socket and whilst removing it.

4.7. In service Life

- The service life is to be determined by analysis, as this is a new product in market. The baseline for the analysis will be the existing Chemical Detector system data and the other competitor breathalysers from the market analysis.
- Based on the analysis the life span of the Breathalyser is set and warranty period shall be set.
- Warranty claims against any failures should be closely monitored for abuse usage to make sure right service is provided to the customers.

4.8. Shelf life and Storage

- The Specification for the Breathalyser should contain the shelf life period and its storage conditions including temperature, humidity, pressure etc.
- Factors affecting shelf life like, temperature, pressure, humidity etc should all be evaluated and the product should be tested to these conditons.
- If a Breathalyser passes the shelf life period, it should be tested and calibrated so that it is fit for use again.
- Storage area should be room temperature.

4.9. Safety

- The Breathalyser shall be safe to use, free from any fungus growth, electrically stable and shall not emit dangerous electromagnetic waves which could cause health issues.

4.10. Quality

- No compromise on the quality of the product
- Quality should be involved in all stages of the product development to make sure the product is built to the design and assembled.
- Key dimensions should be checked appropriately during manufacturing.
- Regular quality audits should be conducted to make sure the process is followed as per the company procedures and policies.
- Supplier quality assurance must be monitored.
- Approved suppliers should be used. Any new suppliers should be qualified prior to use.

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 17 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

4.11. Product cost

- Cost of the product should not exceed £700 including VAT per Breathalyser (Breathalyser Direct, n.d.), in order to be more competitive in the market as compared to the competitors.
- Manufacturing, Finance, Design, procurement, Testing and Certification should all work on the reduction of costs to make sure we meet the target cost.
- Size of the Breathalyser contributes to the product cost and packaging. The bigger the size, recurring costs are more due to the costs involved in raw material procurement, manufacturing, packaging, shipping etc.

4.12. Calibration and Reliability

- Self calibration capability should be provided within the design of the Breathalyser.
- Calibration process should be user friendly and be easy to perform by the users themselves.
- Instructions manual should include the process of calibration.
- Calibration intervals should not be dependent on the battery charge level.
- Regular calibration should not impact the performance of the equipment.
- Failure modes should be studied and the reliability of the design should be evaluated.
- The Breathalyser should be highly reliable in terms of functionality, precise readings, robust body design.
- Any maintenance instructions should be clearly mentioned in the instructions sheet.

4.13. Packaging and Warranty

- Packaging dimensions should not be more than 110mm high, 65mm wide and 20mm thick.
- Brand symbol should be exclusively dominant to the customers and highly appealing.
- Part numbering text on the packaging should be small and should not be dominant compared to the Brand name.
- Packaging design should be designed to pack the Breathalyser and its accessories in a compact way.
- No loose fit of the Breathalyser and its accessories in the packaging.
- Foams used in packaging should be tested per the company packaging requirements to ensure there is no damage to the Breathalyzers and its accessories.
- Packaging should include Breathalyser, its accessories, warranty card, instructions manual.
- If external suppliers supply packaging parts, they should be monitored through supplier audits.
- Aftermarket services should be highly responsive as the new product is being introduced into the market.
- Warranty should not be less than 2 years.

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 18 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

4.14. Documentation

- The design, quality, dispatch, etc should all be documented at all stages of the product development controlled by giving a document number, revision as per company procedures.
- All tests results should be documented.
- They should be stored in project folders or in internal company databases and presented when audited.
- Supplier documentation should be documented and controlled.

4.15. Supplier control

- Every stages of the design evolution, the suppliers must be involved, as required.
- Communication between all the interested parties involved in the services should be top priority and any changes to any design, manufacturing, procurement etc, should be communicated immediately without any delays to avoid unnecessary work.
- A clear scope of work and requirements should be defined in the SOW.
- A clear line of responsibilities where it starts and when it ends should be clear in the SOW and the agreement must be obtained with the supplier.
- Supplier drawings must be approved internally by the Engineering Team.

4.16. Special instructions

- Special instructions for the visually impaired (Arielle Michal Silverman, 2018) should be considered.
- Disposal notes and health notes must be presented in the packaging to make sure the users have a clear idea of what to do and how to use the equipment and its accessories.
- Warnings should be added in the instructions manual.

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

1 References

Aiqin Shi, F. H. (2021, July 29). *Effects of Design Aesthetics on the Perceived Value of a Product*.

Retrieved from Frontiersin:

<https://www.frontiersin.org/articles/10.3389/fpsyg.2021.670800/full>

Alco Digital. (n.d.). Retrieved from Breathalyzer: <https://www.breathalyzer.co.uk/breathalyzers/>

Arielle Michal Silverman, E. C. (2018). *Journal of Blindness Innovation and Research*. Retrieved from nfb: <https://nfb.org/images/nfb/publications/jbir/jbir18/jbir080103.html>

Ayers, R. (n.d.). *Lessons from Apple on Why Aesthetic Innovation is Important*. Retrieved from Innovation Management: <https://innovationmanagement.se/2017/06/22/lessons-from-apple-on-why-aesthetic-innovation-is-important/>

Breathalyser Direct. (n.d.). Retrieved from breathalyserdirect:

https://www.breathalyserdirect.co.uk/Lion_Breathalyser_500.htm

breathalyserdirect. (n.d.). Retrieved from breathalyserdirect:

<https://www.breathalyserdirect.co.uk/Lion500.pdf>

Complete guide to Electrostatic Discharge Protection. (n.d.). Retrieved from RS: <https://uk.rs-online.com/web/generalDisplay.html?id=ideas-and-advice/esd-protection-guide>

COVID-19 Research Coordination & Learning. (n.d.). Retrieved from UKCDR:

<https://www.ukcdr.org.uk/covid-circle/>

Digital Healthcare. (n.d.). Retrieved from BSI: <https://www.bsigroup.com/en-GB/healthcare/digital-healthcare/>

DO EEET. (n.d.). Retrieved from DOEET: <https://www.doeet.com/content/testing-eee-parts/mechanical-shock-test-for-electronic-devices/>

European_Chemicals_Agency. (n.d.). Retrieved from ECHA (European Chemicals Agency):

<https://echa.europa.eu/regulations/reach/understanding-reach>

FAGER, P. (2019). *Materials Handling in Production Systems: Design and Performance of Kit Preparation*. Retrieved from Reserarch Chambers:

https://research.chalmers.se/publication/512020/file/512020_Fulltext.pdf

Gov.UK. (2013, June). *Type Approval Procedures for Evidential Breath Alcohol Analysis Instruments*.

Retrieved from gov.uk:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/362271/MEBTlguideV2.pdf

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 20 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		

Company Name: Alan Industries	Design Brief - Breathalyser	Document No.: UWTSD-NPD-001	Revision: A
---	--	---------------------------------------	-----------------------

Word count: 4490

Hodsden, S. (2017, January 3). *Breathalyzer Diagnoses 17 Different Diseases Using A Single Breath*. Retrieved from Med device Online: <https://www.meddeviceonline.com/doc/breathalyzer-diagnoses-different-diseases-using-a-single-breath-0001>

Kamble, A. (n.d.). *Selection of Material Handling Equipment: Classifications & Attributes*. Retrieved from <http://www.ijirst.org/articles/IJIRSTV5I8005.pdf>

Keystone. (n.d.). *Keystone Compliance*. Retrieved from Keystone Compliance: <https://keystonecompliance.com/mil-std-810/fungus/>

Mallik, H. A. (1998, 05). *Assessment of Flammability of Plastic Materials used as Electrical appliance Enclosures*. Retrieved from CPSC: <https://www.cpsc.gov/s3fs-public/electric.pdf>

Nanoelab. (n.d.). Retrieved from Nanoelab: <https://nanoelab.com/>

Navy, U. (n.d.). *EN380 Naval Materials Science and Engineering Course Notes Chapter 5*. Retrieved from USNA: https://www.usna.edu/NAOE/_files/documents/Courses/EN380/Course_Notes/Ch05_Corrosion_Types.pdf

Staff, C. (2020, November 12). *An Introduction to the Galvanic Series: Galvanic Compatibility and Corrosion*. Retrieved from Corrosionpedia: <https://www.corrosionpedia.com/an-introduction-to-the-galvanic-series-galvanic-compatibility-and-corrosion/2/1403>

Date: 20-Sept-2022	By: Sreenivasa Chalavadi . Student ID : 2117168	Page 21 of 21
This document and the information contained are the property of Alan Industries. Alan Industries must be notified in writing of any circulation of the document as a whole or its content. DOCUMENT IS VALID ONLY IF IT HAS FRONT SHEET SIGNED.		