# PROCESS REPORT

# DESIGN BRIEF

## THE PROBLEM TACKLED:

THERE ARE NO BLOOD PRESSURE MONITORS AVAILABLE TODAY THAT ARE DESIGNED FOR INDIVIDUALS WHO ARE VISUALLY IMPAIRED AND LEGALLY BLIND. INDIVIDUALS WHO ARE VISUALLY IMPAIRED FIND IT DIFFICULT TO HAVE AN ACCURATE BLOOD PRESSURE MONITOR THAT THEY CAN USE ON THEIR OWN WITHOUT THE NEED OF PHYSICAL ASSISTANCE , SOME OF THEM EVEN GO OUT OF THEIR WAY TO VISIT A CLINIC TO MEASURE THEIR BLOOD PRESSURE.

## THE TARGET AUDIENCE:

INDIVIDUAL WHO ARE LEGALLY BLIND , AND/ OR VISUALLY IMPAIRED. THE AGE RANGE FROM 18-70 YEARS OLD .

## MARKET:

TO DESIGN AND ENGINEER A BPM THAT IS SPECIFICALLY DESIGNED FOR THE VISUALLY IMPAIRED/LEGALLY BLIND INDIVIDUAL .

## COMPETITORS :

COMPETITORS INCLUDE OMRON , WIRELESS BPM, BIOS DIAGNOSTICS AND OTHER OSCILLOMETRIC BLOOD PRESSURE MONITORS.

## MARKET NEEDS :

SIMPLE, ACCURATE, EFFICIENT AND COMFORTABLE BPM THAT IS TARGETED FOR PEOPLE WHO ARE VISUALLY IMPAIRED WHICH INCLUDES A SPECIFIC DESIGN JUST FOR THEM.

# DESIGN SPECIFICATIONS AND DETAIL:

## MATERIALS:

THE BLOOD PRESSURE MONITOR HAS TO BE STRETCHABLE YET BE ABLE TO TAKE THE SHAPE OF THE ARM AND STAY IN ITS PLACE.FOR THIS REASON USING COMPRESSION FABRICS WHICH INCLUDE SPANDEX, LYCRA, ELASTIC IS THE BEST MATERIAL FOR THAT. AS FOR THE REMOTE AND MOTHERBOARD THEY ARE MADE UP OF FIBER GLASS AND PLASTIC WITH FIBERGLASS WIRES FOR PORTABILITY, FLEXIBILITY, AND FUNCTIONALITY.

## FUNCTIONALITY:

SOMEONE WHO IS VISUALLY IMPAIRED/OR FOR SOMEONE WHO HAS DIABETES AND IS LEGALLY BLIND AND WANTS TO HAVE THE ABILITY TO USE A BLOOD PRESSURE MONITOR WITHOUT ADJUSTING THE CUFF SIZE AND GETTING CONFUSED USING THE BUTTONS AND INTERFACE, OR ASKING SOMEONE TO HELP. THE GLOVE OFFERS SIMPLICITY AND EASY TO USE IN TERMS OF WEARING IT, THEY JUST SLIP IT ON THE WAY THEY WEAR A GLOVE/ SLEEVE, AND JUST USE THE BUTTONS PLACED ON EACH FINER; WHICH ARE MEAN TO IMITATE BRAILLE AND IS A TACTILE SENSATION THAT BLIND PEOPLE ARE MORE FAMILIAR WITH WHERE THEY CAN START THE DEVICE WITH A PUSH OF A BUTTON.

## ENVIRONMENT:

CAN BE PACKED IN A SMALL POUCH AND BE USED AT WORK , OR IN THE COMFORT OF THEIR OWN HOME.

## DESIGN:

THE DESIGN WOULD HAVE SOUND AND TACTILE CONSIDERATIONS FOR THE ACCESSIBILITY OF THE VISUALLY IMPAIRED END USER, WITHOUT THE NEED FOR SOMEONE TO ASSIST THEM WITH HOW TO PLACE AND USE IT. ITS MAIN FOCUS IS TO USE TACTILE SENSATION DESIGN AND A AI SPEECH ACTIVATION SYSTEM IN ORDER TO REPLACE THE SCREEN AND BUTTON USER INTERFACE THAT THE BPM USUALLY CONSIST OF. THE SPEECH SYSTEM IS MEANT TO HELP THE END USER NAVIGATE AND START THE DEVICE. SPEECH ACTIVATION SYSTEM IS A VIRTUAL HELP INSTEAD OF THE PHYSICAL.

# DEMOGRAPHIC

## MARKET:

COMPRESSION SLEEVES, SMART GLOVES WITH BUILD IN PRESSURIZING SYSTEM, OSCILLOMETRIC BPM WITH SMART PRESSURIZING SYSTEM THAT IS COMFORTABLE, AND GIVES ACCURATE RESULTS.

## ENGINEERING :




THE IMAGES ON THE RIGHT, CONSIST OF AN AI SOUND SYSTEM TO BE INTEGRATED IN THE DESIGN AS WELL AS A SMART PRESSURIZING SYSTEM, BUTTONS THAT ARE CONNECTED TO THE AI SOUND ACTIVATION MOTION DETECTOR CHIP, AND BLUETOOTH THAT WOULD CONNECT THE BPM TO AN APP. THE APP CAN BE USED BY MIDDLE AGE INDIVIDUALS WHO WANT FURTHER ASISTANCE ON HOW TO USE THE BPM.

## MAIN GOAL:

SIMPLE, EASY TO USE , ACCURATE BLOOD PRESSURE MONITOR, THAT IS ENGINEERED TO BE USED BY VISUALLY IMPAIRED INDIVIDUALISM 3 IN ONE PRODUCT; COMBINING MONITOR WITH THE CUFF AND THE REMOTE THAT CONTROLS THE NAVIGATION AND HOW TO GO ABOUT USING IT, STARTING IT AS WELL .

## PROBLEMS TO SOLVE:

FOR THE VISUALLY IMPAIRED TO BE ABLE TO USE THE BLOOD PRESSURE MONITOR ON THEIR OWN ANYTIME DURING THE DAY AT HOME WITHOUT THE NEED OF ASSISTANCE, ESPECIALLY IF THEY ARE BLIND DUE TO DIABETES AND NEED TO GET THEIR BLOOD PRESSURE REGULARLY MEASURED.

# PRODUCT RESEARCH

## USE CYCLE

**A Classic Blood pressure monitor consists of the pressurizing pumping system in the cuff and the monitor machine and or a bulb if it is a manual BPM. Cuff is placed on the upper arm of the left arm and should be placed where the bronchial artery is located for more accurate measures.**

## MANUFACTURING PROCESS OF MANUAL BLOOD PRESSURE MONITOR :

### Bulb

The bulb is made from melted rubber or neoprene material blown into the cavity of a two-piece metal die chamber. Material flows into the die chamber at a constant thickness thanks to tiny pores that allow air to be sucked out right before injection. Small protuberances are formed by the remnants of the rubber substance that is pushed into the holes. The bulb is prepared to be connected to the other after a brief amount of manual labour.

### Guage

The pressure element is the gauge's most crucial part. A hollow wafer is created by soldering two discs together at the produced lip of the wafer. The movement assembly notices this swelling, which prompts it to spin the pointer around the dial. The gauge needs to be calibrated after being assembled. By coupling it to a pressure source that has a defined level of accuracy, this is done.

### Valve

Machining techniques such as 2 Die casting, plastic injection moulding and bar material machining are used to make the valves. The bladder is a flexible band that is heat-sealed together to create the cuff, also known as the bladder. It is then covered in cloth and covered with cloth using traditional sewing techniques.

### Hoses

The hoses are produced via a continious extrusion method, which involves heating rubber pallet to their melting point before they take on the consistency of a clay and become viscous. This molten material is then forced through a die block, which is a hole in an aluminum block the same size as the outside of the tube. It is then wounded onto spools for transportation and assembly facility

### Assemble

Hoses are utilised to connect the mentioned components during the final assembly.If even one part is missing, the entire assembly is unusable. to ensure that the finished product is delivered to the customer, the factory needs to recieve supplies and parts on time. the components must be of good enough quality to allow for proper assembly without jeopardising the design

## TYPES OF MONITORS

MANUAL


OSCILLOMETRY


SMART WATCH WIRELESSS

# MARKET RESEARCH

## PRODUCT EXPERIENCE

STARTED EXPLORING THE RECEN BPM MONITORS AVAILABLE IN THE MARKET AND CAME UPON 2FINAL DESIGNS FOR THE BPM A OSCCILIMIRTIIC ONE BEING THE MOST ACCURATE AND WIRELESS .THIS TYPE OF MONITOR ALLOWS FOR A SMART PRESSURIZING SYSTEM WHERE THERE IS NO NEED TO ENGAGE A PHYSICAL EXTERIOR HOSE AND INSTEAD CAN BE PLACED INSIDE THE MONITOR ITSELF AND ATTACHED TO THE CUFF


## RANGE PRICES AND SIMILAR PRODUCTS

| BP Monitor | Type | Price | Accuracy | Convience | Comfort | Portability | Key Features | Key Failures |
|---|---|---|---|---|---|---|---|---|
| A & D Medical UB-1100  | Wrist Monitor | 96.66 - 99.99 | ●●○○○ | ●●●●○ | ●●●●● | Very Portable | • Irregular Heartbeat Detector<br>• BP risk category indicator<br>• Indicates when the user's wrist is at certain heart level<br>• Allows multiple users to store readings seperately<br>• Can download memory | • Inaccurate BP readings<br>• Inconsistent charging leads to it getting no power. |
| Omron Healthcare Heart Guide BP8000M  | Wireless Arm Monitor/ Smart watch | 499.00 | ●●○○○ | ●●●○○ | ●●●●○ | Extremely Portable | • Indicates when a user's wrist is at a certain heart level<br>• Very good comfort<br>• Syncs with the HartAdvisor App | • Takes longer than most to pull a reading.<br>• Models has very innacurate readings<br>• Band not easy to buckle and not easy to properly align<br>• Cuff will inflate even when it's in the wrong |
| Omron Platinum BP5440  | Cuff Monitor | 79.00 | ●●●●● | ●●●●● | ●●●●○ | Semi-Portable | • Irregular heartbeat detector<br>• Large digit display<br>• Can hold multiple users date<br>• Easy to read display<br>• Advanced Averaging | • Default cuff is too large<br>• Cuff is hard to adjust<br>• No Battery Display<br>• Many user reviews stated inconsistent results |
| Omron Evolv BP7000  | Wireless Arm Monitor | 75.99 - 122.99 | ●●●●● | ●●●●○ | ●●●●○ | Very Portable | • Syncs data with mobile Omron App<br>• One size fits most cuff<br>• Graphs readings over time<br>• Syncs with Kaedia app and transfers easily | • Directions for applying the cuff aren't on the cuff itself<br>• Fast Battery Drain<br>• Can't detect hearbeat if patients suffer tremors |
| Equate 4000 Series  | Cuff Monitor | 28.84 - 29.99 | ●●●●○ | ●●●●○ | ●●●●○ | Semi-Portable | • Data Averaging Functions<br>• Has BP risk Category Indicator<br>• Irregular heartbeat detector<br>• Directions for how to use on the cuff | • Only Stores memory for one user<br>• No AC adapter<br>• Drains batteries quickly<br>• Velcro won't hold<br>• Inconsistent Readings |

# DESIGN CONSIDERATIONS

## PROS AND CONS

AFTER RESEARCHING THE MARKET, SOME OF THE PROS OF THE SIMILAR OSCILLOMETRIC PRODUCTS INCUDE 99% ACCURATE READINGS; HOWEVER, THE CONS ARE THAT IT IS CHALLENGING TO USE THE BUTTONS WHEN BLIND, ALWAYS NEED PHYSICAL ASSISTANCE, CANNOT READ THE BLOOD PRESSURE RESULTS, AND SOMEONE ALWAYS HAS TO READ IT FOR THEM

# MARKET SIZE

THERE ARE GOOD RANGES OF BLOOD PRESSURE MONITORS THAT ARE PORTABLE, HAVE A SMART PRESSURIZING SYSTEM, AND EVEN INCLUDE AN APP THAT FEATURES SAVING THEIR READINGS AND EVEN CONTROLLING AND NAVIGATING THE SYSTEM.HOWEVER, THERE ARE NO MARKETS AVAILABLE FOR BLOOD PRESSURE MONITORS THAT CAN BE EASILY ACCESSIBLE FOR THE VISUALLY IMPAIRED, MAKING IT CHALLENGING FOR THEM TO USE A BLOOD PRESSURE MONITOR THAT IS NOT DESIGNED FOR THEM.

# DESIGN PROCESS

## FIRST CONCEPT SKETCH

# FIRST PROTOTYPE

AT FIRST I WANTED TO MAKE A PROTOTYPE OF A SLEEVE. HOWEVER IT WAS FIRST PLACED ON THE WRIST, WITH REMOTE CONTROL BUTTONS THAT NAVIGATE THROUGH THE DEVICE

1 FIRST YOU PLACE THE HOLE ON THE THUMB

2 THEN YOU WRAP IT AROUND YOUR ARM LIKE WRAPPING A BANDAGE

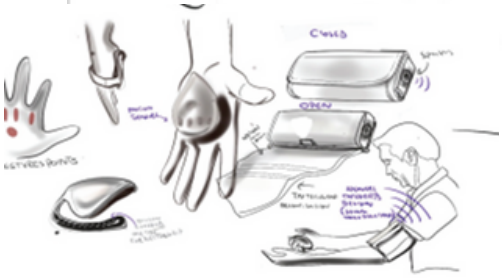
3 THEN YOU SECURE WITH A VELCRO

4 THEN YOU START THE DEVICE, WITH THE REMOTE THAT IS PLACED ON THE HAND

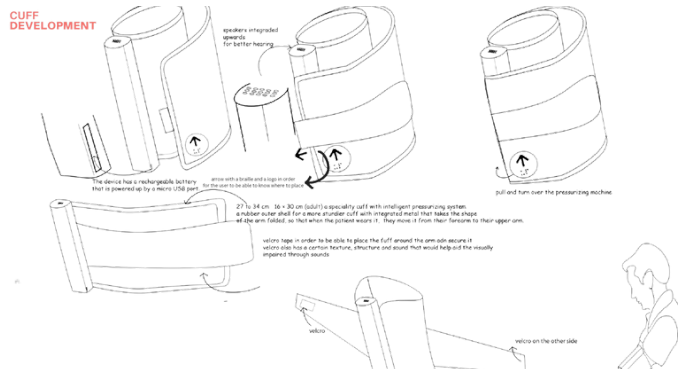
5. AFTER TESTING THE PROTOTYPE, I WAS ABLE TO MAKE CHANGES. 1 MAKE IT A FULL SLEEVE WHERE THE MONITOR IS PLACED ON THE UPPER ARM FOR ACCURACY, PLACE THE BUTTONS ON FINGERS FOR NAVIGATION
CONTROL, AND EMBEDS A SPEECH MOTIOI ACTIVATED
SYSTEM TO TALK TO THE USER UPON EACH STEP OF USING IT. MOREOVER,
HAVE A SIMPLE APP THAT HELPS TEACH THE BLIND USER HOW TO USE THE DEVICE

FALL 2(

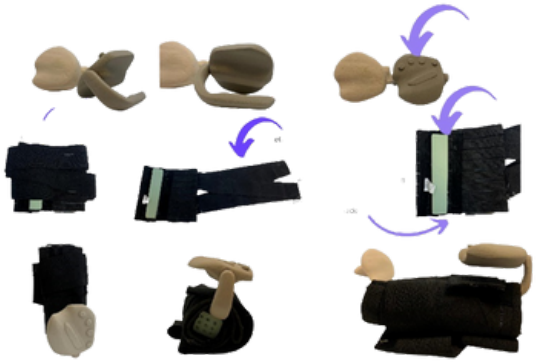
# SECOND CONCEPT SKETCH



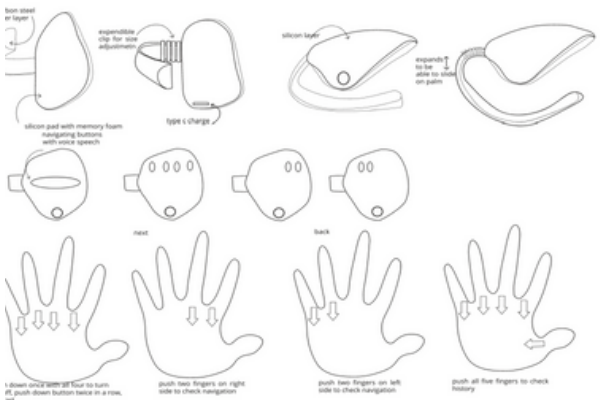
# SECOND CONCEPT ILLUSTRATOR




# SECOND PROTOTYPE

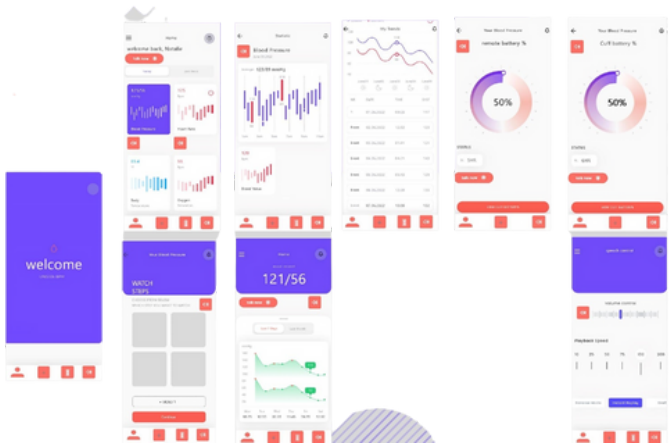


I WANT TO EMPHASIZE ON USING A REMOTE CONTROL THAT IS ABLE TO NAVIGATE THROUGH THE MONITOR SYSTEM. SINCE MONITOR IS AI SPEECH MOVEMENT ACTIVATED, EVERY BUTTON DELEGATES A CERTAIN TASK.
HOWEVER, BEFORE GOING TO THE FINAL PHASE OF SKETCHING AND MODEL, I WAS STUCK IN A PHASE OF MAKING A MONITOR 2 PRODUCTS. A CUFF, AND AN ERGONOMIC REMOTE. PROBLEMS OCCURRED IN THIS DESIGN WHICH INCLUDES THE POSSIBILITY O LOSING THE REMOTE AS WELL AS THE POSSIBILITY OF NOT BEIN ABLE TO UNDERSTAND HOW IT WORKS AND IT WILL BE COMPLICATED TO EXPLAIN TO THEM HOW TO USE IT THROUGH THE APP.



# FINAL PROCESS

## FIRST CONCEPT APP PROTOTYPE

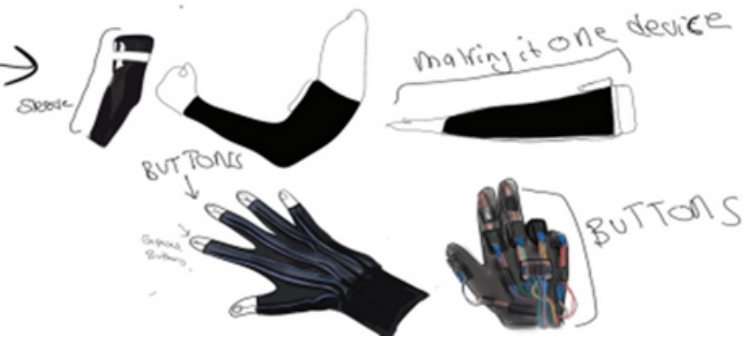



## FINAL APP PROTYPE

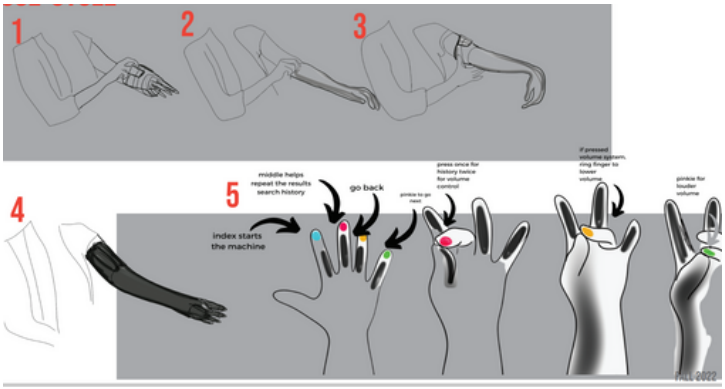
## APP PROTOTYPE USE CYCLE

FIRST YOU ENTER THEN YOU CONTROL THE VOLUME YOU WANT THE SPEAK ACTIVATION TO BE. AFTER THAT, YOU WATCH A TUTORIAL AND STEPS ON HOW TO USE IT THEN YOU HAVE THE OPTION TO SAVE YOUR HISTORY TO BE ABLE TO COMPARE AND MONITOR .

## USE CYCLE

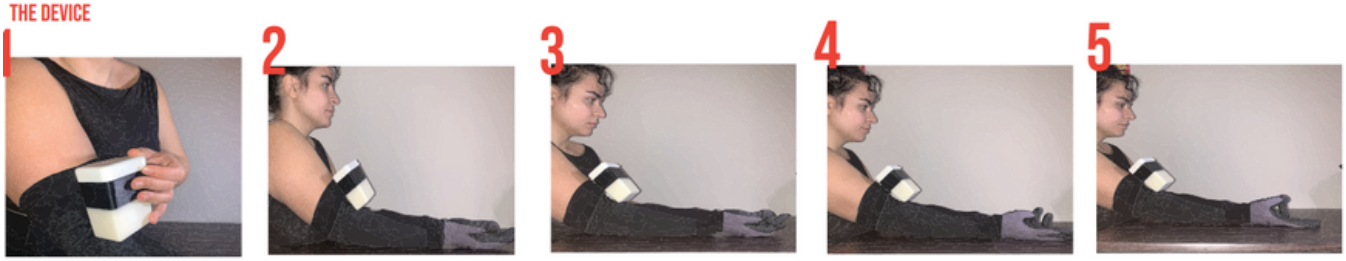



## FINAL IDEATION SKETCH




## USE-CYCLE FINAL MODEL


AFTER WEARING THE DEVICE THE PATIENT WILL TURN ON THE MONITOR WITH A SWITCH THAT IS PLACE ON THE UPPER LEFT CORNER OF THE DEVICE, THEN PRESS START ON THEIR INDEX FINGER OR PRESS THEIR MIDDLE FINGER IF THEY WANT TO ADJUST THE VOLUME BEFORE STARTING THE DEVICE




## USE-CYCLE FINAL MODEL


PRESS INDEX TO START MACHONE

PRESS MIDDLE FINGER TO GO TO READ HISTORY/ PRESS TWICE FOR VOLUME CONTROL OPTION

PRESS RING FINGER TO HEAR RECENT BPM MESURE/ INCREASE VOLUME

PRESS PINKIE TO GO BACK/ TO DECREASE VOLUME

## USER TESTING RESULTS

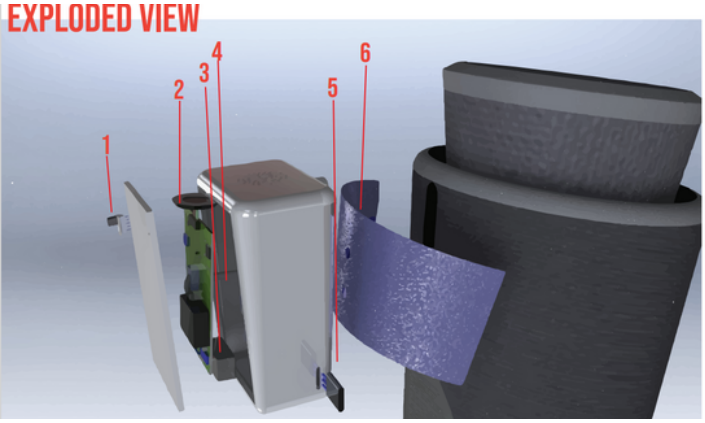
ANTHROPOMETRIC FEATURES:

- BODY: I DECIDED TO GO WITH A FULL SLEEVE FOR THE INDIVIDUAL TO EASILY WEAR THE PRODUCT WITHOUT DIFFICULTY SIZING THE CUFFS. THE REMOTE BUTTONS ON EACH FINGER ALLOW FOR SOFT PRESS FOR THE INDIVIDUAL'S COMFORT AND EASY USE IN ONE ARM. THE SLEEVE WILL COME IN DIFFERENT SIZES:S M L. AND ITS ELASTICITY GIVE MORE SPACE AND COMPRESSION AT THE SAME . AS FOR THE GLOVE'S PALM, IT IS DIPPED IN SILICON FOR INDIVIDUALS TO DETECT WHICH SIDE TO WEAR THE GLOVE AS WELL AS FOR RIGIDITY.

- MONITOR SYSTEM: MONITOR WEIGHS AROUND 2-3 POUNDS AND IS PLACED ON THE UPPER SIDE OF THE ARM. ITS POSITION ALLOWS THE SPEAKER TO BE PLACED FACING UP FOR A BETTER HEARING WHEN NAVIGATING. THE SWITCH IS A CLASSIC SLIDE SWITCH SO THAT THE VISUALLY IMPAIRED INDIVIDUAL CAN EASILY FEEL THE SWITCH AND UNDERSTAND WHAT IT IS AND HOW TO TURN IT ON

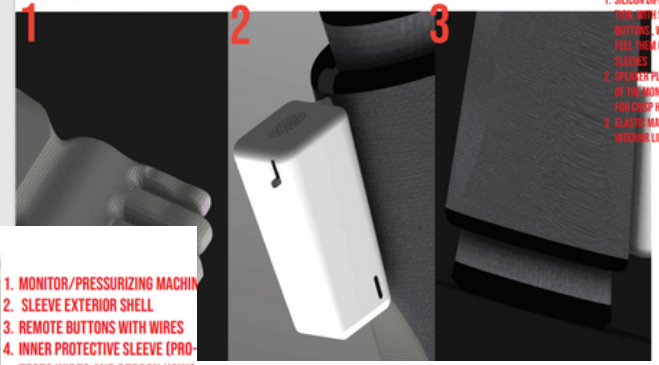
# PRODUCT

## EXPLODED VIEW



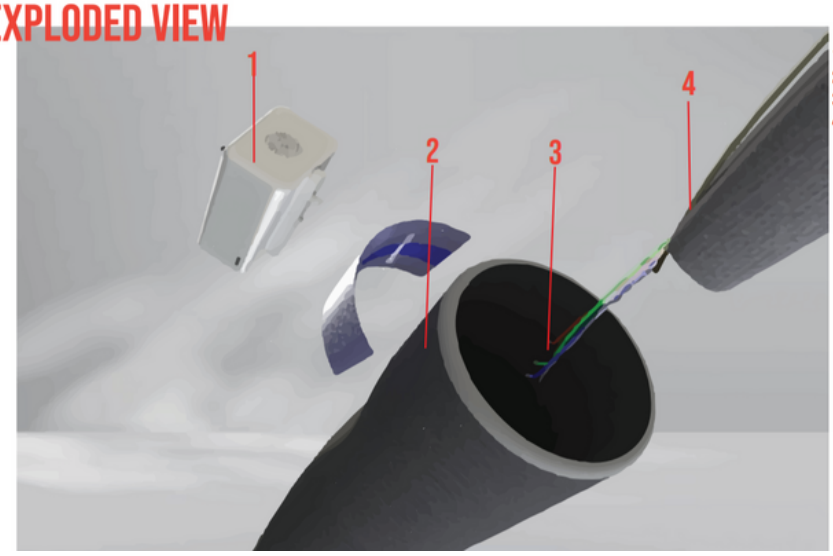

1. SWITCH
2. SPEAKER SYSTEM WIT MOTHER BOARD
3. BATTERY
4. AIR TUBE
5. TYPE C CHARGE OUTLI
6. INFLATED CUFF

## FEATURES

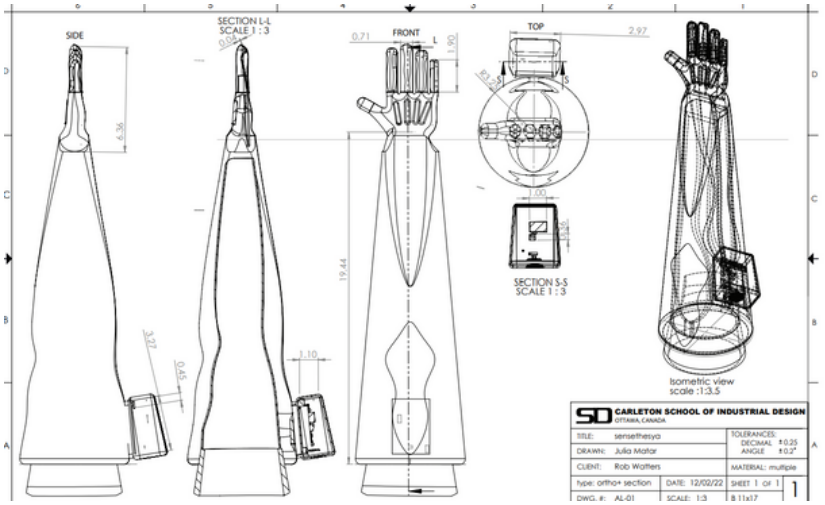


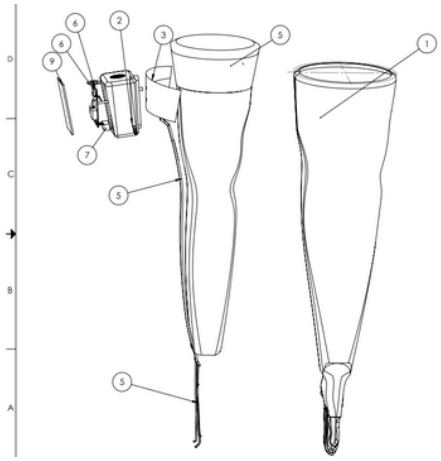

1. SILICON DIPPED PALM FOR RECOGN ROW WITH SMALLBUMPS, SEAMLE BUTTONS, WHERE YOU CAN ONLY FEEL THEM ONCE YOU WEAR THE SLEEVES
2. SPEAKER PLACED ON THE UPPER SI OF THE MONITOR CLOSER TO THE EA FOR CRISP HEARING QUALITY
3. ELASTIC MADE OF SILICON FROM TH INTERIOR LINING FOR BETTER GRIP

## EXPLODED VIEW




1. MONITOR/PRESSURIZING MACHIN
2. SLEEVE EXTERIOR SHELL
3. REMOTE BUTTONS WITH WIRES
4. INNER PROTECTIVE SLEEVE (PRO- TECTS WIRES AND PERSON USING




| ITEM NO. | PART NUMBER | Material | QTY. |
|---|---|---|---|
| 1 | Glove 2 | Glove made of Spandex and Elastic | 1 |
| 2 | Monitor part | ABC plastic | 1 |
| 3 | Pumping cuff | Nylon and silicon | 1 |
| 5 | Remote | Fiberglass | 1 |
| 5 | Inner protective Layer | Spandex | 1 |
| 6 | Motherboard With pumping System | Fiberglass | 5 |
| 7 | Battery | Lithium | 1 |
| 8 | Type c | Metal | 1 |
| 9 | Monitor cover | ABC plastic | 1 |

CARLETON SCHOOL OF INDUSTRIAL DESIGN
OTTAWA, CANADA

| | | | |
|---|---|---|---|
| TITLE: | sensethesya's bill of material | TOLERANCES: DECIMAL ±0.25 ANGLE ±0.2° | |
| DRAWN: | Julia Matar | | |
| CLIENT: | Rob Watters | MATERIAL: Multiple | |
| Type: Exploded view | DATE: 12/02/22 | SHEET 1 OF 1 | 1 |