# 8. ANNEX I | SENSOR'S MARKET RESEARCHS

| | |
|---|---|
| Statex [1] | Very elastic, shiny and extremely electrically conductive silver knitted fabrics. |
| TT Sensor Plus 4 [2] | TT Sensor Plus 4 sensor as a disposable card that records the temperature to which an item is exposed.<br>*• Minimum application temperature: +5°C*<br>*• Service temperature range: -15°C to +90°C* |
| Luminary Micro / Texas Instruments - RF430-TMPSNS-EVM [3] | Near Field Communication type. |
| LIlypad sensor de temperatura MCP9700 [4] | They can be sewn into clothes, even washable. This board is a temperature sensor based on the MCP9700 The MCP9700 is a small thermistor type temperature sensor. This sensor has in the output 0. 5V at 0 ° C, 0. 75 V at 25 ° C and a thermal drift of 10 mV per degree centigrade. Converting from analog to digital on the signal line will allow you to set the local ambient temperature |
| Clothing PLUS [5] | Entity in charge of developing intelligent textiles. Create e-textile solutions with durability, easy maintenance, refined process and full technical testing.<br>- Sensors<br>- Material technologies<br>- Product design and development<br>- Software application - Testing<br>- Certification and approval<br>- Intelligent textile production<br>- Supply chain management |
| Sparkfun single lead heart rate [6] | Heart rate sensor. Interface type. |
| Sensor de respiración X4M200 [7] | The XeThru X4M200 is Novelda's breathing sensor powered by the XeThru X4 system on the chip. Standard sleep and breathing monitoring capabilities are integrated into the sensor and provide advanced breathing and movement tracking during both day and night. The programmable detection range of up to 5 meters is a key feature for the sensor. |
| Desarrollo de sensores personalizados [8] | Includes all the built-in functionality for your radar sensor project; access to the XeThru X4 UWB Radar's SoC parametric control, the back-end data processing it requires, and communication stacks that connect to host software running on Windows, Mac, Linus, and embedded targets |
| FLORA - Wearable electronic platform: Arduino-compatible - v2 [9] | Portable electronic platform |

| | |
|---|---|
| Sensor de frecuencia cardiaca – Polar OH1 – Talla M – XXL, Naranja [10] | Polar OH1 records the heart rate with the unique 6-LED POLAR optical heart rate system. |
| eVu TPS – Sensor fisiológico triple [11] | Compact and lightweight fingertip sensor. Heart rate variability, skin conductance, temperature. eVu Senz Smart<br>App for Android phones and tablets.<br>Easily track customer compliance and progress |
| Tecnología E-WEBBINGS e-Textile [12] | By combining non-conductive base fibres with a combination of specialised conductive elements, our E-WEBBINGS® electronic textiles offer a customisable base for various smart textile projects.<br>- Metal Stranding<br>- Metal Injection |
| VitalPach [13] | The most discreet and advanced patient monitoring device possible. State-of-the-art biosensor monitors eight physiological measurements continuously, in real time.<br>- Single-wire ECG, heart rate, heart rate variability, breathing rate, skin temperature, body posture, fall detection and activity |
| Módulos de detección de signos vitales [14] | The biometric sensor product family has first-class integrated optical sensor modules that include algorithms for heart rate measurement, photoplestimography (PPG) and electrocardiography (ECG). |
| Semtech Wireless Power [15] | Sensor for evaluation modules. Complete system design solutions for low-power portable applications Leading power scalability. Design flexibility. Applications: HEALTH MONITORS |
| Plataformas ARDUINO [16] | Platforms that can be used to control devices and read data from all types of sensors.<br>Arduino boards can work at an operating frequency of up to 16 MHz and up to 16 MIPS, so the computational capacity is sufficient for the acquisition, processing and transmission of data from digital and analog sensors for monitoring vital signs. |
| GENTAG, Inc. [17] | GENTAG, Inc. is a technology development company that focuses on creating innovative, low-cost wireless sensor technologies based on cell phones. |

| | |
|---|---|
| Etiqueta NFC Textil Flexible Ntag212 [18] | The only stretchable NFC label, which can be sewn, ironed, folded and creased. Completely waterproof, resistant up to 150 ° C. Universal compatibility. |
| 20 Tags NFC etiquetas NTAG203 Circus [19] | Purchase of NFC patches. |
| 6-Axis Sensor [20] | 6-axis magnetometer and accelerometer products offer extremely high resolution, low power performance that is compatible with our eCompass software. These solutions address high-precision electronic compass functionality for augmented reality, e-readers, medical applications, home appliances, portable navigation devices, smart phones and tablets. |
| LIBRO SMART TEXTILES FOR MEDICINE AND HEALTHCARE | |
| BEKINTEX [22] | Sale of conductive materials used in a project for monitoring vital signs in children. |
| MICROCONTROLADOR PIC [23] | Used in the same project for the collection of information. |
| Textile Sensor EVALUATION KIT [24] | This kit contains evaluation samples of the following sensors:<br>- Analogue pressure sensor PW073<br>- High load textile pressure button PW073<br>- Analogue pressure sensor in the form of PW074<br>- Sensor de tela PR PW109 GSR<br>- TACRACPS1X0404GY Single textile snap button<br>- Temperature sensor |
| SMARTEX [25] | Entity in charge of the production of interactive, multifunctional, flexible and conformable fabrics for the human body that represents a cutting-edge tool promoting innovation, sustainable development and competitiveness in many disciplines. |

**Note: The web reference page for each sensor can be found by clicking on the number in brackets. A hyperlink has been created with the corresponding link for each one.*

# 9. ANNEX II | SUMMARY TABLE OF THE RESULTS OBTAINED FOR EACH PROTOTYPE

| SURFACE TESTER | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **MIU** | | | | **MMD** | | | | **SMD (um)** | | | |
| | WARP | | WEFT | | WARP | | WEFT | | WARP | | WEFT | |
| | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" |
| COTTON - ELASTANE FABRIC (**KNITTING**) | 0.183 | 0.257 | 0.230 | 0.201 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 1.070 | 1.905 | 1.990 | 1.450 |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | 0.508 | 0.579 | 0.364 | 0.608 | 0.0310 | 0.0412 | 0.0242 | 0.0400 | 7.500 | 4.015 | 7.760 | 3.840 |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | 0.414 | 0.400 | 0.516 | 0.243 | 0.0178 | 0.0186 | 0.0304 | 0.0098 | 9.195 | 6.165 | 8.935 | 5.300 |
| COTTON – ELASTANE FABRIC – (monofilament with conductive covered) | 0.312 | 0.593 | 0.336 | 0.269 | 0.0160 | 0.0292 | 0.0191 | 0.0192 | 3.875 | 4.340 | 4.635 | 4.710 |

| COMPRESSION TESTER | | |
|---|---|---|
| | **WC (gf / cm$^2$)** | **RC (%)** |
| COTTON - ELASTANE FABRIC (**KNITTING**) | 0.221 | 48.87 |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | 0.878 | 26.20 |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | 1.002 | 29.14 |
| COTTON – ELASTANE FABRIC – (monofilament with conductive covered) | 0.287 | 30.66 |

| BENDING TESTER | | | | |
|---|---|---|---|---|
| | **B (gf.cm$^2$ / cm)** | | **2HB (gf.cm$^2$ / cm)** | |
| | WARP | WEFT | WARP | WEFT |
| COTTON - ELASTANE FABRIC (**KNITTING**) | 0.0486 | 0.0178 | 0.0325 | 0.0143 |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | 0.2760 | 0.2799 | 0.3497 | 0.3525 |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | 0.1035 | 0.3219 | 0.2013 | 0.2700 |
| COTTON – ELASTANE FABRIC – (monofilament with conductive covered) | 0.0415 | 0.1350 | 0.0738 | 0.3111 |

| SHEAR TESTER | | | | |
|---|---|---|---|---|
| | **G (gf/cm.degree)** | | **2HG (gf/cm.degree)** | |
| | WARP | WEFT | WARP | WEFT |
| COTTON - ELASTANE FABRIC (**KNITTING**) | 0.32 | 0.38 | 0.93 | 0.98 |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | 0.15 | 0.17 | 0.45 | 0.43 |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | 0.17 | 0.10 | 0.48 | 0.35 |
| COTTON – ELASTANE FABRIC – (monofilament with conductive covered) | 0.14 | 0.16 | 0.50 | 0.38 |

| TENSILE TESTER | | | | | | |
|---|---|---|---|---|---|---|
| | **WT (%)** | | **RT (%)** | | **LT** | |
| | **WARP** | **WEFT** | **WARP** | **WEFT** | **WARP** | **WEFT** |
| COTTON - ELASTANE FABRIC (**KNITTING**) | | | | | | |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | | | | | | |
| COTTON – ELASTANE FABRIC – (multifilament stainless steel) | | | | | | |
| COTTON – ELASTANE FABRIC – (monofilament with conductive covered) | | | | | | |

| SURFACE TESTER | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **MIU** | | | | **MMD** | | | | **SMD (um)** | | | |
| | WARP | | WEFT | | WARP | | WEFT | | WARP | | WEFT | |
| | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" |
| COTTON FABRIC (**KNITTING**) | 0.184 | 0.204 | 0.227 | 0.192 | 0.0003 | 0.0004 | 0.0001 | 0.0001 | 1.105 | 1.185 | 1.630 | 1.145 |
| COTTON FABRIC – (multifilament stainless steel) | 0.256 | 0.284 | 0.416 | 0.245 | 0.0308 | 0.0303 | 0.0375 | 0.0316 | 6.015 | 7.335 | 7.850 | 6.970 |
| COTTON FABRIC – (multifilament stainless steel) | 0.252 | 0.269 | 0.456 | 0.322 | 0.0328 | 0.0207 | 0.0236 | 0.0284 | 9.940 | 8.545 | 8.630 | 4.960 |
| COTTON FABRIC – (monofilament with conductive covered) | 0.290 | 0.247 | 0.376 | 0.434 | 0.0345 | 0.0325 | 0.0337 | 0.0210 | 5.675 | 3.875 | 5.415 | 3.905 |

| COMPRESSION TESTER | | |
|---|---|---|
| | **WC (gf / cm$^2$)** | **RC (%)** |
| COTTON FABRIC (**KNITTING**) | 0.254 | 40.55 |
| COTTON FABRIC – (multifilament stainless steel) | 0.794 | 30.23 |
| COTTON FABRIC – (multifilament stainless steel) | 0.781 | 42.97 |
| COTTON FABRIC – (monofilament with conductive covered) | 0.251 | 29.88 |

| BENDING TESTER | | | | |
|---|---|---|---|---|
| | **B (gf.cm$^2$ / cm)** | | **2HB (gf.cm$^2$ / cm)** | |
| | WARP | WEFT | WARP | WEFT |
| COTTON FABRIC (**KNITTING**) | 0.0142 | 0.0286 | 0.0030 | 0.0112 |
| COTTON FABRIC – (multifilament stainless steel) | 0.1879 | 0.0327 | 0.4024 | 0.0889 |
| COTTON FABRIC – (multifilament stainless steel) | 0.2284 | 0.0590 | 0.3424 | 0.1126 |
| COTTON FABRIC – (monofilament with conductive covered) | 0.1368 | 0.0549 | 0.1983 | 0.0538 |

| SHEAR TESTER | | | | |
|---|---|---|---|---|
| | **G (gf/cm.degree)** | | **2HG (gf/cm.degree)** | |
| | WARP | WEFT | WARP | WEFT |
| COTTON FABRIC (**KNITTING**) | 0.40 | 0.43 | 0.90 | 0.78 |
| COTTON FABRIC – (multifilament stainless steel) | 0.45 | 0.27 | 1.30 | 0.58 |
| COTTON FABRIC – (multifilament stainless steel) | 0.85 | 0.73 | 2.70 | 4.00 |
| COTTON FABRIC – (monofilament with conductive covered) | 0.95 | 0.43 | 1.78 | 0.35 |

| TENSILE TESTER | | | | | | |
|---|---|---|---|---|---|---|
| | **WT (%)** | | **RT (%)** | | **LT** | |
| | **WARP** | **WEFT** | **WARP** | **WEFT** | **WARP** | **WEFT** |
| COTTON FABRIC (**KNITTING**) | 59.80 | | 20.40 | | 0.744 | |
| COTTON FABRIC – (multifilament stainless steel) | 26.60 | 33.50 | 12.97 | 13.43 | 0.379 | 0.432 |
| COTTON FABRIC – (multifilament stainless steel) | 33.60 | 37.80 | 10.57 | 13.10 | 0.402 | 0.400 |
| COTTON FABRIC – (monofilament with conductive covered) | 37.10 | 49.50 | 10.65 | 11.01 | 0.451 | 0.471 |

| SURFACE TESTER | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **MIU** | | | | **MMD** | | | | **SMD (um)** | | | |
| | WARP | | WEFT | | WARP | | WEFT | | WARP | | WEFT | |
| | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" |
| COTTON FABRIC (**WOVEN**) | 0.174 | 0.141 | 0.188 | 0.204 | 0.0179 | 0.0139 | 0.0148 | 0.0206 | 4.730 | 3.130 | 4.875 | 4.460 |
| COTTON FABRIC – (multifilament stainless steel) | 0.272 | 0.280 | 0.255 | 0.466 | 0.0295 | 0.0348 | 0.0279 | 0.0381 | 7.010 | 15.135 | 9.645 | 11.025 |
| COTTON FABRIC – (multifilament stainless steel) | 0.331 | 0.386 | 0.280 | 0.269 | 0.0242 | 0.0460 | 0.0301 | 0.0519 | 9.110 | 11.215 | 5.735 | 10.555 |
| COTTON FABRIC – (monofilament with conductive covered) | 0.375 | 0.384 | 0.215 | 0.170 | 0.0461 | 0.0566 | 0.0201 | 0.0404 | 8.450 | 7.075 | 4.080 | 8.725 |

| COMPRESSION TESTER | | |
|---|---|---|
| | **WC (gf / cm$^2$)** | **RC (%)** |
| COTTON FABRIC (**WOVEN**)) | 0.154 | 59.09 |
| COTTON FABRIC – (multifilament stainless steel) | 1.840 | 42.45 |
| COTTON FABRIC – (multifilament stainless steel) | 1.954 | 43.19 |
| COTTON FABRIC – (monofilament with conductive covered) | 0.504 | 37.50 |

| BENDING TESTER | | | | |
|---|---|---|---|---|
| | **B (gf.cm$^2$ / cm)** | | **2HB (gf.cm$^2$ / cm)** | |
| | WARP | WEFT | WARP | WEFT |
| COTTON FABRIC (**WOVEN**) | 0.4590 | 0.4116 | 0.3703 | 0.3326 |
| COTTON FABRIC – (multifilament stainless steel) | 0.4590 | 0.3075 | 0.3703 | 0.3497 |
| COTTON FABRIC – (multifilament stainless steel) | 0.3158 | 0.0139 | 0.4649 | 0.3398 |
| COTTON FABRIC – (monofilament with conductive covered) | 0.4841 | 0.0610 | 0.3611 | 0.3073 |

| SHEAR TESTER | | | | |
|---|---|---|---|---|
| | **G (gf/cm.degree)** | | **2HG (gf/cm.degree)** | |
| | WARP | WEFT | WARP | WEFT |
| COTTON FABRIC (**WOVEN**) | 0.87 | 1.28 | 1.35 | 1.80 |
| COTTON FABRIC – (multifilament stainless steel) | 2.37 | 2.27 | 8.95 | 5.83 |
| COTTON FABRIC – (multifilament stainless steel) | 3.1 | 2.97 | 6.15 | 9.55 |
| COTTON FABRIC – (monofilament with conductive covered) | 4.44 | 2.21 | 15.58 | 9.18 |

| TENSILE TESTER | | | | | | |
|---|---|---|---|---|---|---|
| | **WT (%)** | | **RT (%)** | | **LT** | |
| | **WARP** | **WEFT** | **WARP** | **WEFT** | **WARP** | **WEFT** |
| COTTON FABRIC (**WOVEN**) | 1.10 | 2.05 | 86.36 | 65.85 | 0.419 | 0.488 |
| COTTON FABRIC – (multifilament stainless steel) | **5.50** | **3.00** | **28.19** | **33.33** | **0.141** | **0.469** |
| COTTON FABRIC – (multifilament stainless steel) | **4.50** | **1.10** | **31.11** | **40.91** | **0.353** | **0.192** |
| COTTON FABRIC – (monofilament with conductive covered) | **3.05** | **4.90** | **39.34** | **30.61** | **0.434** | **0.482** |

| SURFACE TESTER | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **MIU** | | | | **MMD** | | | | **SMD (um)** | | | |
| | WARP | | WEFT | | WARP | | WEFT | | WARP | | WEFT | |
| | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" | "A" | "B" |
| COTTON - POLYESTER FABRIC (**WOVEN**) | 0.183 | 0.240 | 0.171 | 0.200 | 0.0190 | 0.0190 | 0.0243 | 0.0196 | 3.490 | 3.760 | 3.385 | 4.585 |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | 0.264 | 0.217 | 0.468 | 0.381 | 0.0336 | 0.0217 | 0.0419 | 0.0447 | 4.305 | 6.555 | 4.710 | 7.245 |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | 0.402 | 0.252 | 0.323 | 0.492 | 0.0561 | 0.0339 | 0.0321 | 0.0605 | 10.395 | 7.165 | 9.710 | 13.315 |
| COTTON - POLYESTER FABRIC – (monofilament with conductive covered) | 0.216 | 0.200 | 0.354 | 0.371 | 0.0380 | 0.0226 | 0.0437 | 0.0447 | 8.125 | 7.550 | 10.170 | 5.705 |

| COMPRESSION TESTER | | |
|---|---|---|
| | **WC (gf / cm$^2$)** | **RC (%)** |
| COTTON - POLYESTER FABRIC (**WOVEN**)) | 0.166 | 59.04 |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | 0.788 | 60.15 |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | 0.357 | 51.54 |
| COTTON - POLYESTER FABRIC – (monofilament with conductive covered) | 0.397 | 53.90 |

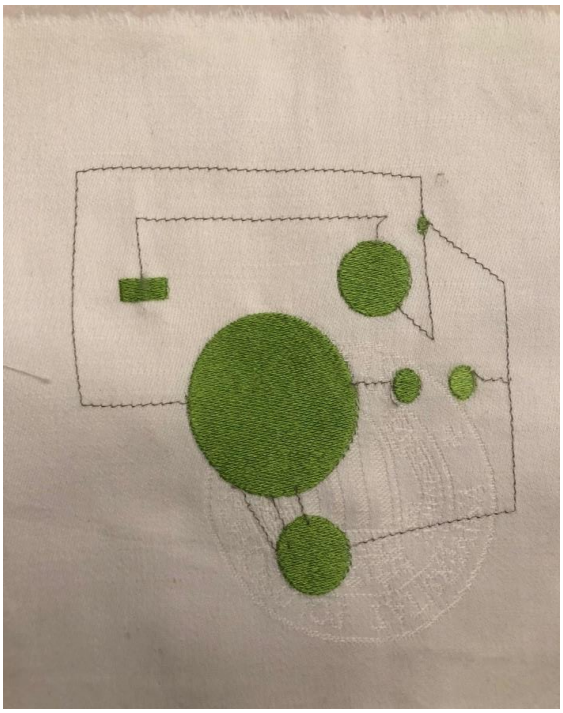
| BENDING TESTER | | | | |
|---|---|---|---|---|
| | **B (gf.cm$^2$ / cm)** | | **2HB (gf.cm$^2$ / cm)** | |
| | WARP | WEFT | WARP | WEFT |
| COTTON – POLYESTER FABRIC (**WOVEN**) | 0.0705 | 0.3011 | 0.2851 | 0.2270 |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | 0.0684 | 0.0075 | 0.0485 | 0.1102 |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | 0.0623 | 0.0048 | 0.2006 | 0.1602 |
| COTTON - POLYESTER FABRIC – (monofilament with conductive covered) | 0.0351 | 0.0703 | 0.0929 | 0.1901 |

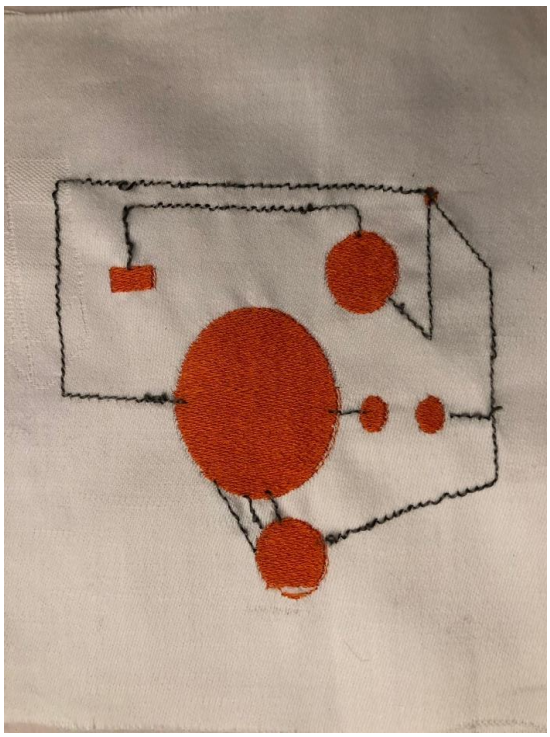
| SHEAR TESTER | | | | |
|---|---|---|---|---|
| | **G (gf/cm.degree)** | | **2HG (gf/cm.degree)** | |
| | WARP | WEFT | WARP | WEFT |
| COTTON - POLYESTER FABRIC (**WOVEN**) | 0.49 | 0.92 | 0.53 | 1.08 |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | 2.05 | 1.45 | 4.25 | 2.58 |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | 1.84 | 1.74 | 4.33 | 3.18 |
| COTTON - POLYESTER FABRIC – (monofilament with conductive covered) | 1.43 | 2.81 | 3.03 | 6.98 |

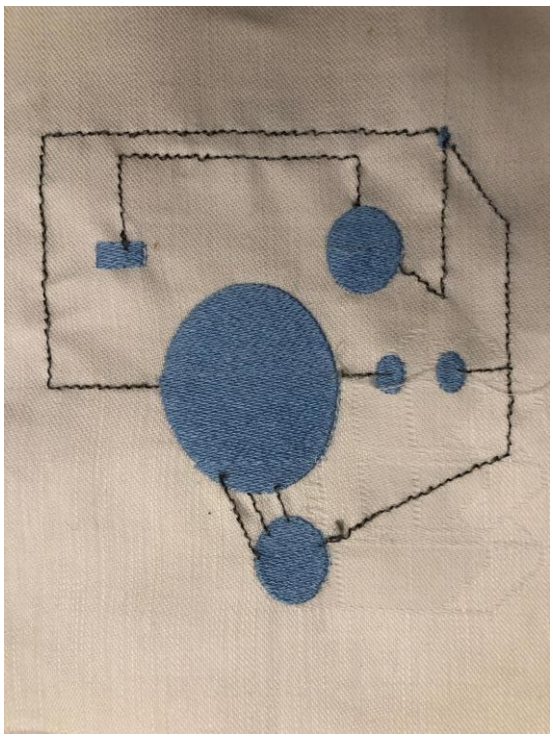
| TENSILE TESTER | | | | | | |
|---|---|---|---|---|---|---|
| | **WT (%)** | | **RT (%)** | | **LT** | |
| | **WARP** | **WEFT** | **WARP** | **WEFT** | **WARP** | **WEFT** |
| COTTON - POLYESTER FABRIC (**WOVEN**) | 10.50 | 10.27 | 50.00 | 53.66 | 0.435 | 0.431 |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | 4.35 | 15.30 | **36.78** | **15.30** | **0.437** | **0.461** |
| COTTON - POLYESTER FABRIC – (multifilament stainless steel) | **7.30** | **5.20** | **38.36** | **45.19** | **0.378** | **0.499** |
| COTTON - POLYESTER FABRIC – (monofilament with conductive covered) | **5.45** | **15.10** | **32.11** | **36.78** | **0.436** | **0.580** |

# 10. ANNEX III | PHOTOS OF THE PROTOTYPES

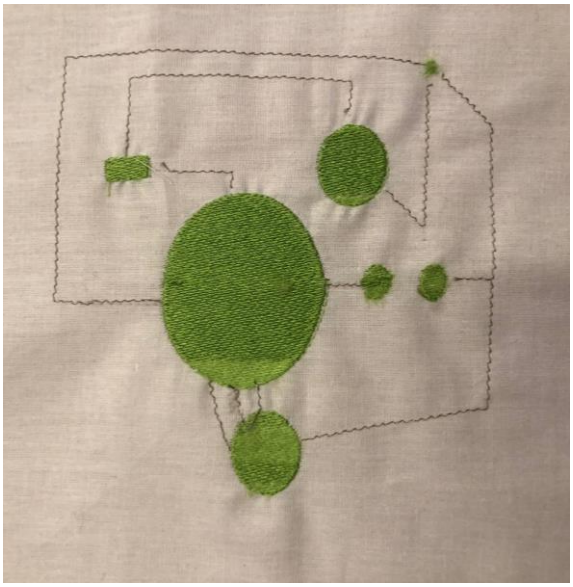
# COTTON WOVEN FABRIC | PROTOTYPES

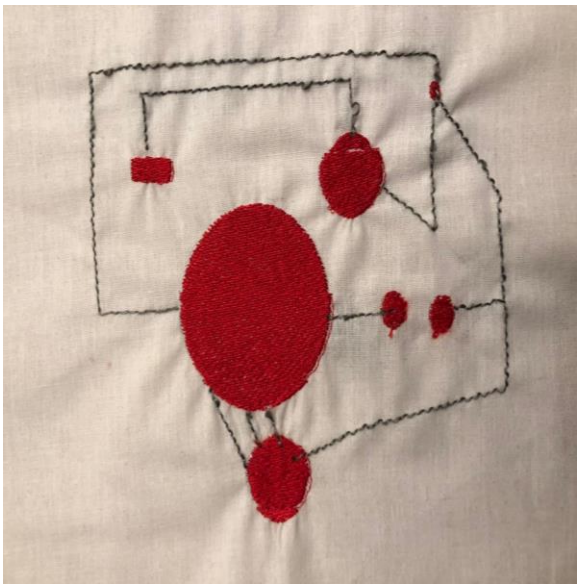


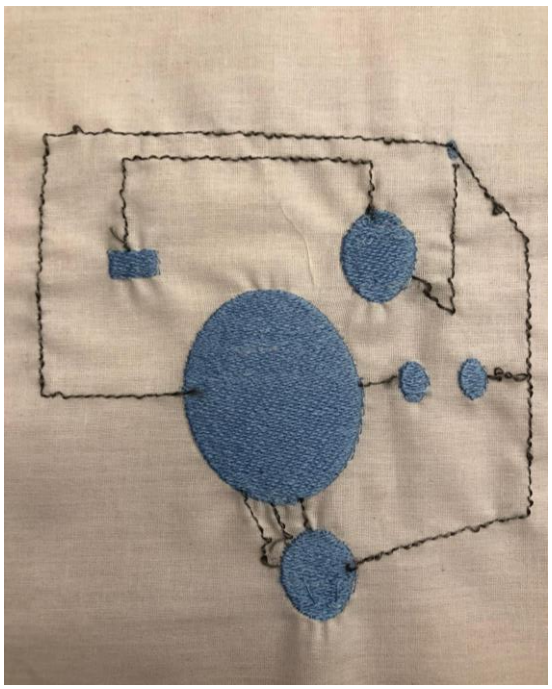




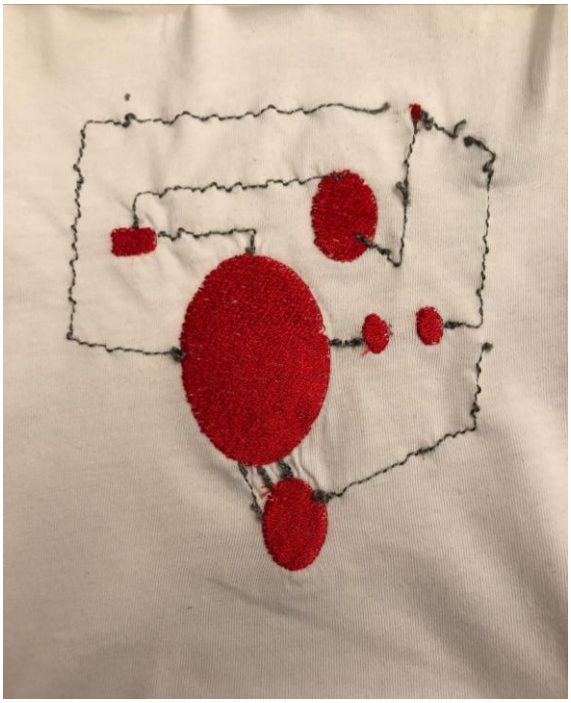
## COTTON - POLYESTER WOVEN FABRIC | PROTOTYPES

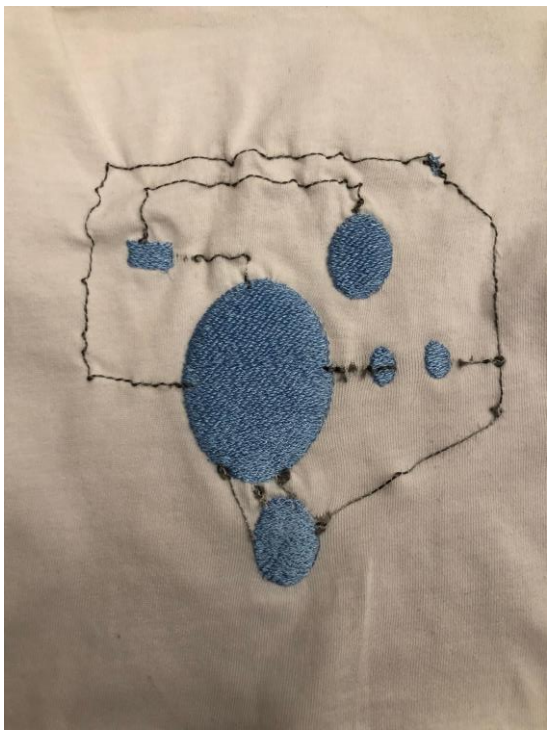






## COTTON KNITTED FABRIC | PROTOTYPES





## COTTON - ELASTANE KNITTED FABRIC | PROTOTYPES