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<p>Government Approved Test laboratory 7 Spanner rd. PO Box 467 Olifantsfontein 1665</p>		<p>Tel: +27 (11) 316 4601 Fax: +27 (11) 316 5670 E- mail: admin-mgr@explolabs.co.za</p>

ASSESSMENT AND TEST REPORT XPL/20082/18.1262

File Number	J20082	
Compiled by + signature	S La Cock	
Designation	Testing Officer	_____
Reviewed by + signature.)	D Maree	
Designation	Senior Testing Officer	_____
Date of issue	5 March 2019	
Standards.....	<p>SANS 60079-0: 2012 Ed 5/IEC 60079-0: 2011 Ed 6 Explosive atmospheres Part 0: Equipment — General requirements</p> <p>SANS 60079-11: 2012 Ed 4 /IEC 60079-11: 2011 Ed 6 Explosive atmospheres Part 11: Equipment protection by intrinsic safety "i"</p>	
Code	Ex ia I Ma & Ex ia IIC T4 Ga	
Applicant's name.....	Magtouch Electronics	
Address.....	PO Box 13561 Northmead 1511	
Manufacturer.....	Magtouch Electronics	
Test Item Description.....	Tag reader batons	
Model/Type reference.....	EX and MR	
Electrical Ratings.....	EX ratings: V = 3.3V; I = 60mA MR ratings: V = 3.7V; I = 472mA	
Rated Ambient temp range.....	-20°C to +40°C	
Sample/Serial Number	--	

Possible test case verdicts:

- test case does not apply to the test item.....:N / A
- test item does meet the requirement:Pass

General remarks:

The test results presented in this Ex Test Report relate only to the item or product tested.

- "(see Attachment #)" refers to additional information appended to this document.
- "(see appended table)" refers to a table appended to this document.
- Throughout this document, a point "." is used as the decimal separator.

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T0104

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1. GENERAL PRODUCT INFORMATION (DESCRIPTION):

The tag reader batons has been designed and constructed by Magtouch. There are two models, namely, model EX is a 190mm long cylindrical baton and model MR is a 100mm long cylindrical baton. Both models have the same functionality, the only difference other than size, is the power supplies. The larger baton, model EX, is supplied by 2xAA Alkaline cells connected in series to form a 3.3V battery. The smaller baton, model MR, is supplied by a CR 2032 coin cell. Pictures of each baton are attached in Annex A of the report.

Both tag reader batons contain 1 identical PC board. The board is multi-layered and has red solder mask applied. See Annex A for the circuit diagram of the PCB.

Both models of the tag reader were made from 305 stainless steel and the treaded entries are sealed with 272 Loctite. The front of each baton has a brass plate which is used to read the tag. At the ends of each baton there is a clear epoxy filled hole that allows the user to visually see if the tag reader has registered the required tag. Annex A has picture of each baton.

2. MANUFACTURER'S DOCUMENTS SUBMITTED

Drg/Document No	Title/Description	No of Pages	Revision No	Date
2018081903	Circuit diagram	2	2.2	2018/08/19
02mtcorebom	Component list	1	-	-
2018081902	PC board bottom	1	2.2	2018/08/19
2018081901	PC board top	1	2.2	2018/08/19

SANS 60079-0: 2012 Ed 5/IEC 60079-0: 2011 Ed 6			
Clause	Requirement – Test	Result – Remark	Verdict
1	Scope		
2	Normative references		
3	Terms and definitions		
4	Equipment grouping		
4.1	Group I	The tag reader batons are intended for use in Group I and Group IIC environment.	Pass
4.2	Group II	The tag reader batons are intended for use in Group I and Group IIC environment.	Pass
4.3	Group III	The tag reader batons are intended for use in Group I and Group IIC environment.	N/A
4.4	Equipment for a particular explosive atmosphere	The tag reader batons are intended for use in Group I and Group IIC environment.	N/A
5	Temperatures		
5.1	Environmental influences		
5.1.1	Ambient temperature	The tag reader batons are intended to be used in normal ambient temperature, -20°C to +40°C.	Pass
5.1.2	External source of heating or cooling	The manufacturer has not specified any external heating or cooling elements.	N/A
5.2	Service temperature	Model EX's power consumption is limited to 1.3W; a temperature class of T4 is issued in accordance with Table 3a of SANS 60079-0. Model MR has a maximum power dissipation of greater than 1.3W, however all the components are smaller than 1000mm ² , therefore in accordance with table 3a of SANS 60079-0 the surface temperature is limited to 200°C.	Pass
5.3	Maximum surface temperature		
5.3.1	Determination of maximum surface temperature	Model EX's maximum output power from the source is limited by infallible safety component in accordance with clause 7.1 and 8.5 of SANS 60079-11. The maximum output power is 0.297W. All components are smaller than 1000mm ² . Calculation: V = 3.3 (2x1.65 for alkaline batteries as per table 11 of SANS 60079-0.) I = 60mA as per short circuit test in accordance with SANS 60079-11 clause 10.5.3. $P_{max} = 1.5 \times (60 \times 10^{-3}) \times 3.3 = 0.297W$ For model MR the surface temperature was limited to 200°C. The maximum surface temperatures of the components were either supplied by the component data sheets or by determination using clause 26.5.1 of SANS 60079-0. The maximum surface temperature of any component was 141°C which was the microcontroller determined as per clause 26.5.1.2 of SANS 60079-0.	Pass
5.3.2	Limitation of maximum surface temperature		
5.3.2.1	Group I electrical equipment	Maximum surface temperature of 150°C. Group II maximum surface temperature is therefore the limiting parameter.	Pass

SANS 60079-0: 2012 Ed 5/IEC 60079-0: 2011 Ed 6			
Clause	Requirement – Test	Result – Remark	Verdict
5.3.2.2	Group II electrical equipment	The maximum surface temperature shall not exceed the rating of T4 (135°C) and for small components the maximum power rating shall not exceed 1.3W or 200°C in accordance with Table 3a in SANS 60079-0.	Pass
5.3.2.3	Group III electrical equipment	The tag reader batons are intended for use in Group I and Group II environment.	N/A
5.3.3	Small component temperature for Group I and Group II electrical equipment.	For the temperature rating of T4, the components of the tag reader batons (all are smaller than 1000mm ²) are limited to a maximum power dissipation of 1.3 W or a maximum surface temperature of 200°C.	Pass
6	Requirements for all electrical equipment		
6.1	General	The tag reader batons comply with the relative requirements of SANS 60079-0: 2011, and SANS 60079-11:2011.	Pass
6.2	Mechanical strength of equipment	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	Pass
6.3	Opening times	Excluded.	N/A
6.4	Circulating currents in enclosures (e.g. of large electrical machines)	Excluded.	N/A
6.5	Gasket retention	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
6.6	Electromagnetic and ultrasonic energy radiating equipment	No electromagnetic and ultrasonic energy radiating equipment was used by the tag reader batons.	N/A
7	Non-metallic enclosures and non-metallic parts of enclosures		
7.1	Non-metallic enclosures and non-metallic parts of enclosures	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
7.2	Thermal endurance	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
7.3	Resistance to light	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
7.4	Electrostatic charges on external non-metallic materials		
7.4.1	Applicability	The electrostatic charges on non-metallic part on the enclosure of the tag reader batons were assessed in this clause.	N/A
7.4.2	Avoidance of a build-up of electrostatic charge on Group I or Group II electrical equipment	The area of the non-metallic part of the enclosure is 78.54mm ² . Table 6 of this clause exempts the requirement due to the area being smaller than 400mm ² .	N/A
7.4.3	Avoidance of a build-up of electrostatic charge on equipment for Group III	The tag reader batons are intended for use in Group I and Group IIC environment.	N/A
7.5	Accessible metal parts	The tag reader batons are completely coated in conductive, 305 stainless steel; therefore capacitance is negligible.	Pass

SANS 60079-0: 2012 Ed 5/IEC 60079-0: 2011 Ed 6			
Clause	Requirement – Test	Result – Remark	Verdict
8	Metallic enclosures and metallic parts of enclosures		
8.1	Material composition	The documents of the manufacturer stated that the metallic enclosure consisted of 305 stainless and a brass insert.	Pass
8.2	Group I	The documents of the manufacturer stated that the metallic enclosure consisted of 305 stainless and a brass insert.	Pass
8.3	Group II	The documents of the manufacturer stated that the metallic enclosure consisted of 305 stainless and a brass insert.	Pass
8.4	Group III	The tag reader batons are intended for use in Group I and Group IIC environment.	N/A
9	Fasteners	Excluded.	N/A
10	Interlocking devices	Excluded.	N/A
11	Bushings	Excluded.	N/A
12	Materials used for cementing	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
13	Ex Components	The tag reader batons enclosures were not assessed as an Ex component.	N/A
14	Connection facilities and terminal compartments	Excluded.	N/A
15	Connection facilities for earthing or bonding conductors	Excluded.	N/A
16	Entries into enclosures	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
17	Supplementary requirements for rotating machines	Excluded.	N/A
18	Supplementary requirements for switchgear	Excluded.	N/A
19	Supplementary requirements for fuses	Excluded.	N/A
20	Supplementary requirements for plugs, sockets outlets and connectors	Excluded.	N/A
21	Supplementary requirements for luminaires	Excluded.	N/A

SANS 60079-0: 2012 Ed 5/IEC 60079-0: 2011 Ed 6

Clause	Requirement – Test	Result – Remark	Verdict
22	Supplementary requirements for caplights and handlights	Excluded.	N/A
23	Apparatus incorporating cells and batteries		
23.1	General	One CR2032 3V Lithium primary coin cell battery was used to power, model MR. 2xAA Energizer Alkali primary penlight cells were used to power model EX.	Pass
23.2	Batteries	The 2xAA Energizer Alkali primary penlight cells were connected in series to power model EX.	Pass
23.3	Cell types	Model MR, is powered by a primary Manganese Dioxide Lithium cell which has a maximum open circuit voltage of 3.7V as indicated in table 11 of SANS 60079-0. Model EX, is powered by a 2 x primary Manganese Dioxide Alkali cells which has a maximum open circuit voltage of $2 \times 1.65V = 3.3V$ as indicated in table 11 of SANS 60079-0	Pass
23.4	Cells in a battery	All cells in the model EX battery were of the same electrochemical namely alkali metal hydroxide. Model MR only used one primary cell.	Pass
23.5	Ratings of batteries	Model EX, the battery operated within the limits defined by the manufacturer, with a maximum short circuit current of 60mA. Model MR only used one primary cell.	Pass
23.6	Interchangeability	The batons only make uses of primary cells only	N/A
23.7	Charging of primary batteries	Primary batteries are permanent and non-rechargeable and will not be replaced.	N/A
23.8	Leakage	A sample of both AA cells and coin cell were fully tested for leakage in accordance with SANS 60079-11 clause 10.5.2.	Pass
23.9	Connections	Both AA and coin cells are permanently soldered in place on the PC board so no orientation fault can occur in hazardous areas. Cells and batteries will not be replaced.	N/A
23.10	Orientation	Both AA and coin cells are permanently soldered in place on the PC board so no orientation fault can occur in hazardous areas. The cells will not be replaceable.	Pass
23.11	Replacement of cells or batteries	Primary batteries are permanent, non-rechargeable and will not be replaced.	N/A
23.12	Replaceable battery pack	Primary batteries are permanent, non-rechargeable and will not be replaced.	N/A

SANS 60079-0: 2012 Ed 5/IEC 60079-0: 2011 Ed 6			
Clause	Requirement – Test	Result – Remark	Verdict
24	Documentation	The documentation supplied by the manufacturer Magtouch provided a complete and accurate specification of the explosion safety aspects of the ID baton. The drawings were assessed for compliance with IEC 60079-0, and IEC 60079-11. For a detailed list of documentation submitted by the manufacturer please refer to Annex 1 of this report.	Pass
25	Compliance of prototype or sample with documents	The tag reader batons were evaluated and found to comply with the manufacturer's documents as referred to in Clause 24.	Pass
26	Type tests		
26.1	General	All tests and assessments that are required for Group I and II intrinsically safe apparatus in accordance with Table 1 in SANS 60079-11 was conducted on the ID batons.	Pass
26.2	Test configuration	Tests were set up in such a manner that the most onerous conditions were considered.	Pass
26.3	Tests in explosive test mixtures	No explosive tests were required for the ID batons.	N/A
26.4	Tests of enclosures		
26.4.1	Order of tests	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11	N/A
26.4.2	Resistance to impact	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11	N/A
26.4.3	Drop test	The drop test was successfully carried out on both the small and large tag reader batons.	Pass
26.4.4	Acceptance criteria	The drop test did not produce damage to invalidate the protection of the equipment or cause any electrolyte leakage from the cells.	Pass
26.4.5	Degree of protection (IP) by enclosures		
26.4.5.1	Test procedure	A degree of protection of IP20 was required with accordance with SANS 60079-11 clause 6.1.2.2. The ID baton enclosure was tested in accordance with SANS 60529 for an IP 68 level of ingress protection.	Pass
26.4.5.2	Acceptance criteria	The client, Magtouch, indicated that the enclosure be tested in accordance with IP 68, however the safety did not depend on the IP rating.	Pass
26.5	Thermal tests		
26.5.1	Temperature measurement		
26.5.1.1	General	All the components inside the enclosure of the ID batons comply with Table 2 and Table 3a in SANS 60079-0; this ensures that the enclosure will have a maximum surface temperature lower than T4. See clause 5.3.1.	Pass
26.5.1.2	Service temperature	All the components inside the enclosure of the ID batons comply with Table 2 and Table 3a in SANS 60079-0; this ensures that the enclosure will have a maximum surface temperature lower than T4. See clause 5.3.1.	Pass

SANS 60079-0: 2012 Ed 5/IEC 60079-0: 2011 Ed 6			
Clause	Requirement – Test	Result – Remark	Verdict
26.5.1.3	Maximum surface temperature	All the components inside the enclosure of the ID batons comply with Table 2 and Table 3a in SANS 60079-0; this ensures that the enclosure will have a maximum surface temperature lower than T4.	Pass
26.5.2	Thermal shock test	The requirements of this clause have been excluded by clause 6.1.2.3 of IEC 60079-11.	N/A
26.5.3	Small component ignition test (Group I and Group II)		
26.5.3.1	General	All small components had a surface area smaller than 100mm ² and complied with the requirement of the maximum power dissipation being limited to 1.3W or 200°C in Table 3 of SANS 60079-0, to ensure that a temperature class rating of T4 can be issued. Thus no small component ignition tests are required.	Pass
26.5.3.2	Procedure	No small component ignition tests are required.	N/A
26.5.3.3	Acceptance criteria	No small component ignition tests are required.	N/A
26.6	Torque test for bushings	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
26.7	Non-metallic enclosures or non-metallic parts of enclosures	The ID baton was tested in accordance with SANS 60529 for an IP 68 ingress protection rating.	Pass
26.8	Thermal endurance to heat	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
26.9	Thermal endurance to cold	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
26.10.	Resistance to light	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
26.11	Resistance to chemical agents for Group I electrical equipment	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
26.12	Earth continuity	Excluded	N/A
26.13	Surface resistance test of parts of parts of enclosures of non-metallic materials	The area of the non-metallic part of the enclosure is 78.54mm ² . Due to the extremely small amount of non-metallic area exposed this clause omits the test.	N/A
26.14	Measurement of capacitance	Measurement of capacitance.	N/A
26.15	Verification of ratings of ventilating fans	Excluded	N/A
26.16	Alternative qualification of elastomeric sealing O-rings	The requirements of this clause have been excluded by clause 6.1.2.3 of SANS 60079-11.	N/A
27	Routine tests	Routine tests are not required to ensure the safety rating of the circuit board, its components and the ID baton enclosure.	N/A
28	Manufacturer's responsibility		
28.1	Conformity with the documentation	The manufacturer must ensure that each unit is verified to be manufactured and function as the approved prototype.	Pass

SANS 60079-0: 2012 Ed 5/IEC 60079-0: 2011 Ed 6			
Clause	Requirement – Test	Result – Remark	Verdict
28.2	Certificate	The equipment must be issued with a certificate of conformity confirming that the requirements of the applied standards are met.	N/A
28.3	Responsibility for marking	The manufacturer has provided the necessary documentation specifying the relevant information required by this clause.	Pass
29	Marking		
29.1	Applicability	The manufacturer has provided the necessary documentation specifying the relevant information required by this clause, which will be marked on the equipment complying with IEC 60079-0 and IEC 60079-11.	Pass
29.2	Location	The nameplates are located on the housing of the earth continuity relay and pilot control relay in a legible and indelible manner.	Pass
29.3	General	The marking includes the following information: -Manufacturer -Equipment type -Equipment Serial number -Ex certificate number: MS-XPL/18.1262 -Relevant special conditions (See IA Certificate)	Pass
29.4	Ex marking for explosive gas atmospheres	The Ex marking is indicated: Ex ia I/IIC T4 Ma Ga	Pass
29.5	Ex marking for explosive dust atmospheres	The tag reader batons are intended for use in Group I and Group IIC environment.	N/A
29.6	Combined types (or levels) of protection	The tag reader batons are certified for both group I and group IIC environments. Ex ia I/IIC T4 Ma Ga	Pass
29.7	Multiple types of protection	The tag reader batons are certified for both group I and group IIC environments. Ex ia I/IIC T4 Ma Ga	Pass
29.8	Ga equipment using two independent Gb types (or levels) of protection	The tag reader batons are Ga certified.	N/A
29.9	Ex Components	The tag reader batons were not certified as an Ex component.	N/A
29.10	Small equipment and small Ex Components	The tag reader batons are not considered a small component.	N/A
29.11	Extremely small equipment and extremely small Ex Components	The tag reader batons are not considered an extremely small component.	N/A
29.12	Warning markings	No warning markings are required on the tag reader batons.	Pass
29.13	Alternate marking of equipment protection levels (EPLs)	The following marking will be applied to the tag reader batons: Ex ia I/IIC T4 Ma Ga	N/A

SANS 60079-0: 2012 Ed 5/IEC 60079-0: 2011 Ed 6			
Clause	Requirement – Test	Result – Remark	Verdict
29.13.1	Alternate marking of type of protection for explosive gas atmospheres	The following marking will be applied to the tag reader batons: Ex ia I/IIC T4 Ma Ga	N/A
29.13.2	Alternate marking of type of protection for explosive dust atmospheres	The following marking will be applied to the tag reader batons: Ex ia I/IIC T4 Ma Ga	N/A
29.14	Cells and batteries	The tag reader batons do not require the user to replace cells or batteries.	N/A
29.15	Converter-fed electrical machines	Excluded	N/A
29.16	Examples of marking	The marking indicated the information as displayed by the examples.	Pass
30	Instructions		
30.1	General	It is the manufacturer responsibility to provide instructions with the hand held ID batons.	Pass
30.2	Cells and batteries	The batteries will not be replaced.	N/A
30.3	Electrical machines	Excluded.	N/A
30.4	Ventilating fans	Excluded.	N/A
Annex A (Normative)	Supplementary requirements for cable glands		
A.1	General	Excluded.	N/A
Annex B (Normative)	Requirements for Ex Components		
Annex C (Informative)	Example of rig for resistance to impact test		
Annex D (Informative)	Motors supplied by converters		
Annex E (Informative)	Temperature rise testing of electric machines		
Annex F (Informative)	Guideline flowchart for tests of non-metallic enclosures or non-metallic parts of enclosures (26.4)		

SANS 60079-11: 2012 Ed 4 / IEC 60079-11: 2011 Ed 6			
Clause	Requirement – Test	Result – Remark	Verdict
1	Scope		
2	Normative references		
3	Terms and definitions		
4	Grouping and classification of intrinsically safe apparatus and associated apparatus		
5	Levels of protection and ignition compliance requirements of electrical apparatus		
5.1	General	The tag reader batons were assessed for compliance with a level of protection ia.	Pass
5.2	Level of protection "ia"	The tag reader batons were assessed for compliance with a level of protection ia. The unit was assessed under the following conditions: a) In normal operation with the application of all non-countable faults which gives the most onerous condition. b) In normal operation with the application of one countable fault plus all non-countable faults which gives the most onerous condition. c) In normal operation with the application of two countable faults plus all non-countable faults which gives the most onerous condition.	Pass
5.3	Level of protection "ib"	The tag reader batons were assessed for compliance with a level of protection ia.	N/A
5.4	Level of protection "ic"	The tag reader batons were assessed for compliance with a level of protection ia.	N/A
5.5	Spark ignition compliance	The circuit was assessed to the requirements of IEC 60079-11 and was tested in accordance with clause 10.1.	Pass
5.6	Thermal ignition compliance		
5.6.1	General	The thermal test were conducted and in accordance with SANS 60079-0.	Pass
5.6.2	Temperature for small components for Group I and Group II	The maximum surface temperature of small components was evaluated with accordance with SANS 60079-0 Table 3a.	Pass
5.6.3	Wiring within intrinsically safe apparatus for Group I and Group II	The conductors used to connect the battery terminals of model EX and the conductors used on both models for the connection between the PCB and the brass tag reader had an area of 0.196mm ² . Each device had a maximum current of 60mA and 472mA with respect to model EX and model MR. Both models comply with table 2 of SANS 60079-11 and are classified as T6.	Pass
5.6.4	Tracks on printed circuit boards for Group I and Group II	With a minimum track width of 0.237 mm, the maximum permissible current for a T4 classification is 1.8 A. The following parameters however have to be taken into consideration: - PCB thickness of 0.74mm: Divide by 1.2 - Copper thickness of 18µm: Divide by 1.5 - Multi-layered board: Divide by 2 Taking the above factors into account, the maximum permissible current is 0.5 A in the circuit board to have a temperature rating of T4, to which both models comply. With model EX having a maximum current of 60mA and the MR model having a 472mA maximum current.	Pass

SANS 60079-11: 2012 Ed 4 / IEC 60079-11: 2011 Ed 6			
Clause	Requirement – Test	Result – Remark	Verdict
5.6.5	Intrinsically safe apparatus and component temperature for Group III	The tag reader batons are intended for use in Group I and Group IIC environment.	N/A
5.7	Simple apparatus	The tag reader batons did not make use of any simple apparatus.	N/A
6	Apparatus construction		
6.1	Enclosures		
6.1.1	General	The intrinsic safety of the tag reader batons do not rely on surface separation complying with Table 5 or Annex F. Both models of the tag reader batons are within the required parameters such that the device is incapable of producing an igniting spark in the specified hazardous area in accordance with Annex A Table A.1, Table A.2 and Figures A.1-A.6 of SANS 60079-11. The parameters of each device are stated in clause 10.1.	Pass
6.1.2	Enclosures for Group I or Group II apparatus		
6.1.2.1	General	The intrinsic safety of the tag reader batons do not rely on surface separation complying with Table 5 or Annex F. Both models of the tag reader batons are within the required parameters such that the device is incapable of producing an igniting spark in the specified hazardous area in accordance with Annex A Table A.1, Table A.2 and Figures A.1-A.6 of SANS 60079-11. The parameters of each device are stated in clause 10.1.	N/A
6.2	Facilities for connection of external circuits	The tag reader batons are standalone devices and will not have external devices connected. In a safe area the tag reader batons will be connected to a device which will download the data from the tag reader batons. The tag reader batons will use external tags to register positions by the user. The parameters of these tags were determined and considered part of the circuit when doing circuit analysis.	Pass
6.3	Separation distances	The intrinsic safety of the tag reader batons do not rely on surface separation complying with Table 5 or Annex F. Both models of the tag reader batons are within the required parameters such that the device is incapable of producing an igniting spark in the specified hazardous area in accordance with Annex A Table A.1, Table A.2 and Figures A.1-A.6 of SANS 60079-11. The parameters of each device are stated in clause 10.1.	N/A
6.4	Protection against polarity reversal	The batteries and cells were permanently connected to the PC board by soldering the terminals and the batteries/cells are not replaceable.	N/A
6.5	Earth conductors, connections and terminals	The tag reader batons are metallic hand held device and the tag was unearthed, therefore this test can be exempted.	N/A

SANS 60079-11: 2012 Ed 4 / IEC 60079-11: 2011 Ed 6

Clause	Requirement – Test	Result – Remark	Verdict
6.6	Encapsulation		
6.6.1	General	Encapsulation was used on model EX such that the current limiting resistor could be in accordance with clause 10.5.3. The material properties of the encapsulation were supplied by the manufacturer and comply with all the requirements of this clause.	Pass
6.6.2	Encapsulation used for the exclusion of explosive atmospheres	The tag reader batons enclosure had a IP protection level of IP68. This provides the PCB with reduction of pollution degree 2, as per cause F.2 of annex F of SANS 60079-11. Therefore Table F.1 was used to evaluate the casting compound thickness. Model EX encapsulation was greater than 0.2mm. Complied with the separation distance through casting compound in table F.1 of SANS 60079-11.	Pass
7	Components on which intrinsic safety depends		
7.1	Rating of components	Model EX used a current limiting resistor as a protection device. The power ratings of the resistor comply with the requirements of this clause, which states that either voltage/current/power of the resistor under fault conditions should not exceed 2/3 of the devices ratings. Rating of current limiting resistor: $R = 1.5 \times I_n^2 \times R_{VALUE}$ $= 1.5 \times (60 \times 10^{-3})^2 \times 100$ $= 0.54W$ The current limiting resistors were rated at 1W. Model MR had an intrinsically safe supply and required no safety components.	Pass
7.2	Connectors for internal connections, plug-in cards and components	The tag reader batons make use of external tags; however their connection does not affect the intrinsic safety of the device.	Pass
7.3	Fuses	Model MR used a fuse to protect the internal components of the baton. However the power supply of the baton is intrinsically safe in accordance with Table A.1 of SANS 60079-11, with a supply of 3.7 V and 472mA. Therefore the safety of the device does not depend on the fuse. The fuse does not require encapsulation as the supply operates below the minimum ignition current specified in Table A.1 of SANS 60079-11.	Pass
7.4	Primary and secondary cells and batteries		
7.4.1	General	Model EX made use of 2xAA Manganese dioxide alkali cells of type L as per IEC 60086-1. Model no. MR used Manganese dioxide lithium coin cell type C as per IEC 60086-1.	Pass
7.4.2	Battery construction	Both 2xAA Manganese dioxide alkali cells in model EX and manganese dioxide lithium coin cell in model MR were assed in accordance with clause 10.5.3 of SANS 60079-11.	Pass
7.4.3	Electrolyte leakage and ventilation	Both 2xAA Manganese dioxide alkali cells in model EX and manganese dioxide lithium coin cell in model MR were assed in accordance with clause 10.5.2.	Pass

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Clause	Requirement – Test	Result – Remark	Verdict
7.4.4	Cell voltages	The 2xAA Manganese dioxide alkali cells in model EX were placed in series with a maximum voltage of 2x1.65 = 3.3V in accordance with Table 11 of SANS 60079-0. The manganese dioxide lithium coin cell in model MR had a maximum voltage of 3.7V in accordance with Table 11 of SANS 60079-0.	Pass
7.4.5	Internal resistance of cell or battery	Model EX2xAA Manganese dioxide alkali cells had a total internal resistance of 0.39Ω. Model MR manganese dioxide lithium coin cell had a total internal resistance of 7.84Ω.	Pass
7.4.6	Batteries in equipment protected by other types of protection	The batteries/cells will not be replaced. The current limiting resistor is rated in accordance with clause 7.1 of SANS 60079-11.	Pass
7.4.7	Batteries used and replaced in explosive atmospheres	The batteries/cells will not be replaced.	N/A
7.4.8	Batteries used but not replaced in explosive atmospheres	The tag reader baton model EX used a current limiting resistor. The current limiting resistor was encapsulated and was subjected to the drop test. Both tag reader baton batteries/cells will not be replaced	Pass
7.4.9	External contacts for charging batteries	Batteries/cells of the tag reader baton were non-rechargeable.	N/A
7.5	Semiconductors	The tag reader batons do not use any semiconductors as safety devices.	N/A
7.6	Failure of components, connections and separations	The intrinsic safety of the tag reader batons does not rely on surface separation complying with Table 5 or Annex F. Both models of the tag reader batons are within the required parameters such that the device is incapable of producing an igniting spark in the specified hazardous area in accordance with Annex A Table A.1, Table A.2 and Figures A.1-A.6 of SANS 60079-11. The parameters of each device are stated in clause 10.1.	Pass
7.7	Piezo-electric devices	Piezo-electric devices shall be tested in accordance with 10.7. Refer to clause 10.7 of IEC 60079-11 of this report for test results.	N/A
7.8	Electrochemical cells for the detection of gases	No electrochemical cells were used.	N/A
8	Infallible components, infallible assemblies of components and infallible connections on which intrinsic safety depends		
8.1	Level of Protection “ic”	The equipment is not intended for level of protection “ic”.	N/A
8.2	Mains transformers	The tag reader batons did not use transformers.	N/A
8.3	Transformers other than mains transformers	The tag reader batons did not use transformers.	N/A
8.4	Infallible windings	The tag reader batons did not used Infallible windings.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
8.5	Current-limiting resistors	The current limiting resistor in Model EX was rated with accordance to clause 7.1 of SANS 60079-11. The current limiting resistor was of film type.	Pass
8.6	Capacitors	No infallible capacitors are used	N/A
8.7	Shunt safety assemblies	The tag reader batons did not use shunt safety assemblies.	N/A
8.8	Wiring, printed circuit board tracks, and connections	Both models of the tag reader batons are within the required parameters such that the device is incapable of producing an igniting spark in the specified hazardous area in accordance with Annex A Table A.1, Table A.2 and Figures A.1-A.6 of SANS 60079-11. The parameters of each device are stated in clause 10.1.	N/A
8.9	Galvanically separating components	The tag reader batons did not use galvanically separating components.	N/A
9	Supplementary requirements for specific apparatus		
9.1	Diode safety barriers	The tag reader batons did not use diode safety barriers	N/A
9.2	FISCO apparatus	The tag reader batons are not intended for use in a FISCO system.	N/A
9.3	Handlights and caplights	The equipment is not a handlight or caplight	N/A
10	Type verifications and type tests		
10.1	Spark ignition test	<p>The spark ignition test is not required as the tag reader batons are within the required parameters such that the device is incapable of producing an igniting spark in the specified hazardous area in accordance with Annex A Table A.1, Table A.2 and Figures A.1-A.6 of SANS 60079-11.</p> <p>Model EX $I_{MAX} = 60\text{mA}$ $V_{MAX} = 3.3\text{V}$ Lump sum capacitance = 300.03nF Lump sum inductance = 100.01μH</p> <p>Model MR: $I_{MAX} = 472\text{mA}$ $V_{MAX} = 3.7\text{V}$ Lump sum capacitance = 300.03nF Lump sum inductance = 100.01μH</p>	Pass
10.2	Temperature tests	The maximum surface temperature of the microcontroller, ATMEGA328p was determined as per this clause as 116°C with an ambient temperature of 25.2 °C.	Pass
10.3	Dielectric strength tests	Dielectric strength tests were not required.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
10.4	Determination of parameters of loosely specified components	All components had well defined parameters.	N/A
10.5	Tests for cells and batteries		
10.5.1	General	In model EX the battery had a maximum current and voltage rating of 60mA and 3.3V. With these parameters battery is not capable of producing an igniting spark as per Annex A, Figure A.1. In model MR the coin cell had a maximum current and voltage rating of 472mA and 3.7V. With these parameters cell is not capable of producing an igniting spark as per Annex A, Figure A.1.	Pass
10.5.2	Electrolyte leakage test for cells and batteries	10 samples of the 2xAA alkaline cells connected in series were short circuited until fully discharged and no leakage occurred. 10 samples of the coin cell battery were short circuited until fully discharged and no leakage occurred.	Pass
10.5.3	Spark ignition and surface temperature of cells and batteries	The spark ignition test was excluded as per clause 10.5.1 above. The maximum surface temperature test was conducted as per this clause part b. The surface temperature of the 2xAA alkaline cells with the encapsulated infallible current limiting resistor had a maximum surface temperature of 53.3°C with an ambient of 27.3 °C. Used in Model EX. The maximum surface temperature of the coin cell was 58°C with an ambient of 27.3 °C. Used in Model MR.	Pass
10.5.4	Battery container pressure tests	Separation distances within the cells/batteries are in accordance with Table 5 therefore this clause can be excluded.	N/A
10.6	Mechanical tests		
10.6.1	Casting compound	The encapsulation around the current limiting resistor in model EX was tested with a 30N for 10s and no permanent deformation occurred.	Pass
10.6.2	Determination of the acceptability of fuses requiring encapsulation	No fuses in the tag reader batons were encapsulated or required encapsulation.	N/A
10.6.3	Partitions	The tag reader batons had no partitions.	N/A
10.7	Tests for intrinsically safe apparatus containing piezoelectric devices	The tag reader batons made no use of piezoelectric devices.	N/A
10.8	Type tests for diode safety barriers and safety shunts	The tag reader batons made no use of diode safety barriers and safety shunts devices.	N/A
10.9	Cable pull test	No external permanently connected cables are used.	N/A
10.10	Transformer tests	No transformers are used.	N/A
10.11	Optical isolators tests	No optical isolators are used.	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
10.12	Current carrying capacity of infallible printed circuit board connections	The intrinsic safety of the tag reader batons does not rely on surface separation complying with Table 5 or Annex F. Both models of the tag reader batons are within the required parameters such that the device is incapable of producing an igniting spark in the specified hazardous area in accordance with Annex A Table A.1, Table A.2 and Figures A.1-A.6 of SANS 60079-11. The parameters of each device are stated in clause 10.1.	N/A
11	Routine verifications and tests		
11.1	Routine tests for diode safety barriers	The tag reader batons did not make use of diode safety barriers.	N/A
11.2	Routine tests for infallible transformers	The tag reader batons did not make use of transformers.	N/A
12	Marking	Refer to clause 29 of IEC 60079-0 for all marking applied to the tag reader batons.	Pass
13	Documentation	The documentation supplied by the manufacturer Magtouch provided a complete and accurate specification of the explosion safety aspects of the ID baton. The drawings were assessed for compliance with IEC 60079-0, and IEC 60079-11. For a detailed list of documentation submitted by the manufacturer please refer to Annex 1 of this report.	Pass
Annex A (normative)	Assessment of intrinsically safe circuits		
A.1	Basic criteria	The tag reader batons were assessed in accordance with Clause 5 where after a temperature rating of T4 was determined.	Pass

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Clause	Requirement – Test	Result – Remark	Verdict				
A.2	Assessment using reference curves and tables	Model EX parameters below:	Pass				
		Reference curve/table		Parameter	Resulting limitation	Pass/Fail	
		Figure A.1		12 V (sample 3.3V)	3.33 A (sample 60mA)	Pass	
		Figure A.3		4 V (sample 3.3V)	300 μ F (Sample: 300.03nF)	Pass	
		Figure A.4		1 A (sample 60mA)	0.2 mH (Sample: 0.1mH)	Pass	
		Model MR parameters below:		Reference curve/table	Parameter	Resulting limitation	Pass/Fail
		Figure A.1		12 V (sample 3.7V)	3.33 A (sample 472mA)	Pass	
		Figure A.3		4 V (sample 3.7V)	300 μ F (Sample: 300.03nF)	Pass	
Figure A.4	1 A (sample 472mA)	0.2 mH (Sample: 0.1mH)	Pass				
A.3	Examples of simple circuits	The tag reader batons were not assessed as simple circuits.	N/A				
A.4	Permitted reduction of effective capacitance when protected by a series resistance	No reduction of capacitance was used in the tag reader batons.	N/A				

Annex B (normative)	Spark test apparatus for intrinsically safe circuits		
B.1	Spark test apparatus for intrinsically safe circuits	The spark ignition test is not required as the ID batons are within the required parameters such that the device is incapable of producing an igniting spark in the specified hazardous area in accordance with Annex A Table A.1, Table A.2 and Figures A.1-A.6 of SANS 60079-11.	N/A

Annex C (informative)	Measurement of creepage distances, clearances and separation distances through casting compound and through solid insulation		
C.1	Clearances and separation distances through casting compound and through solid insulation	The tag reader batons enclosure had an IP protection level of IP68. This provides the PCB with reduction of pollution degree 2, as per clause F.2 of annex F of SANS 60079-11. Therefore Table F.1 was used to evaluate the casting compound thickness. Model EX encapsulation was greater than 0.2mm. complied with the separation distance through casting compound in table F.1 of SANS 60079-11	Pass
C.2	Creepage distances	The distance was measured as 0.5mm	Pass

Annex D (normative)	Encapsulation		
D.1	Adherence	The complete resistor was completely enclosed and there is no risk of contamination to occur.	Pass

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Clause	Requirement – Test	Result – Remark	Verdict
D.2	Temperature	The casting compound adhered to clause 6.6 of SANS 60079-11.	Pass

Annex E (informative)	Transient energy test
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Annex F (normative)	Alternative separation distances for assembled printed circuit boards and separation of components
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Annex G (normative)	Fieldbus intrinsically safe concept (FISCO) – Apparatus requirements
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Annex H (informative)	Ignition testing of semiconductor limiting power supply circuits
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3. MARKING

The following (or similar) information had to be clearly and permanently marked on all unit(s) covered by this report:

MAGTOUCH ELECTRONICS

Tag reader batons

Model : EX or MR
Manufacturer : Magtouch Electronics
Serial no. : ----
Ex rating : Ex ia I/IIC T4 Ma/Ga
IA No. : MS-XPL/18.1262 X

4. CONDITIONS

4.1 SPECIAL CONDITIONS OF USE (denoted by X after certificate number)

- Loctite 272 must be thoroughly applied on all threads.
- Batteries/cells may not be replaced by the user.
- The information from the tag reader baton may only be downloaded in a safe area.

4.2 INSTALLATION INSTRUCTIONS

It is the manufacturer's responsibility to supply installation instructions with each unit offered for sale as required by IEC/SANS 60079-0 Clause 30.

4.2 CONDITIONS OF MANUFACTURE

Refer to Clause 28 of IEC/SANS 60079-0.

5. CONCLUSION

The sample(s) as described in Paragraph 1 above have COMPLIED with the requirements as set out in standards listed on page 1 of this report.

The approved explosion protection rating of the equipment is: **Ex ia I/IIC T4 Ma/Ga**
Inspection Authority Certificate Number: **MS-XPL/18.1262 X**

6. VALIDITY

This report covers only the unit described in Paragraph 3 of this report. Other identical units will only be covered by:

- a. additional approvals covering all serial numbers, or
- b. approval of certified equipment under a product certification scheme accepted by the Department of Mineral Resources and/or the Department of Labour as relevant.

This type approval report remains valid unless modifications are made to the equipment without obtaining prior approval.

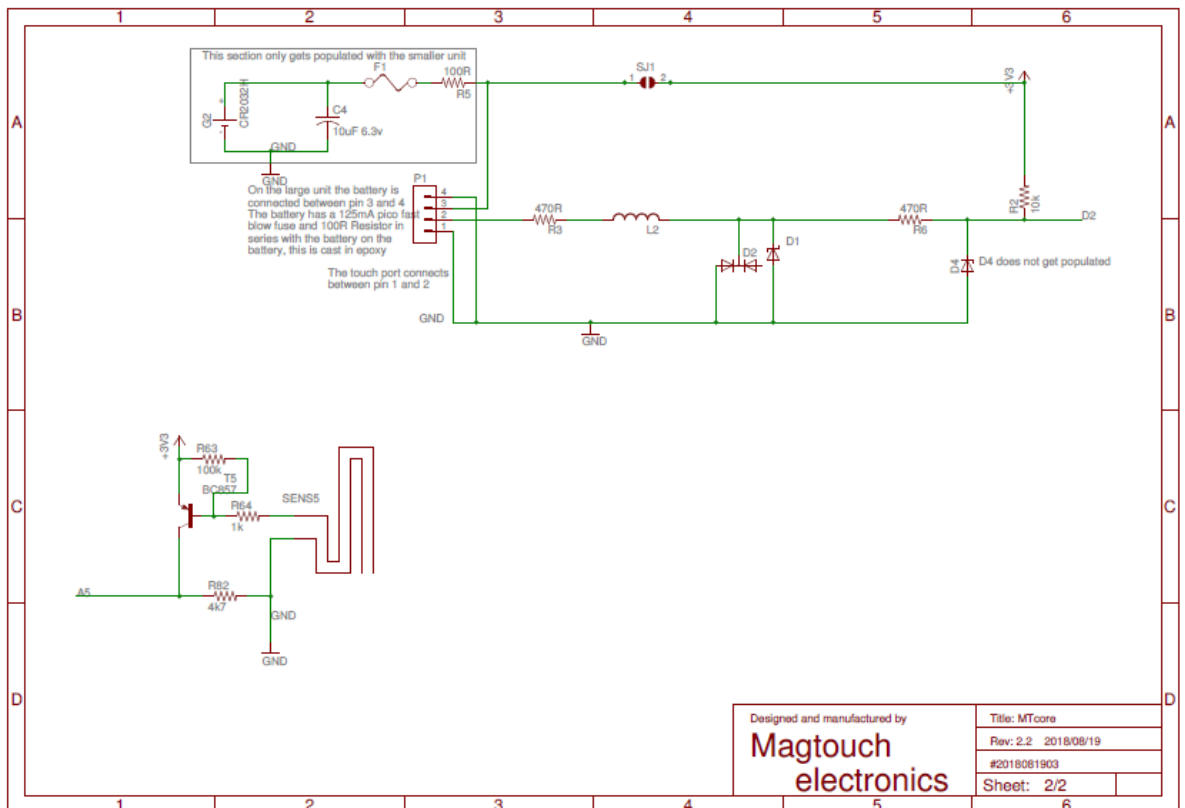
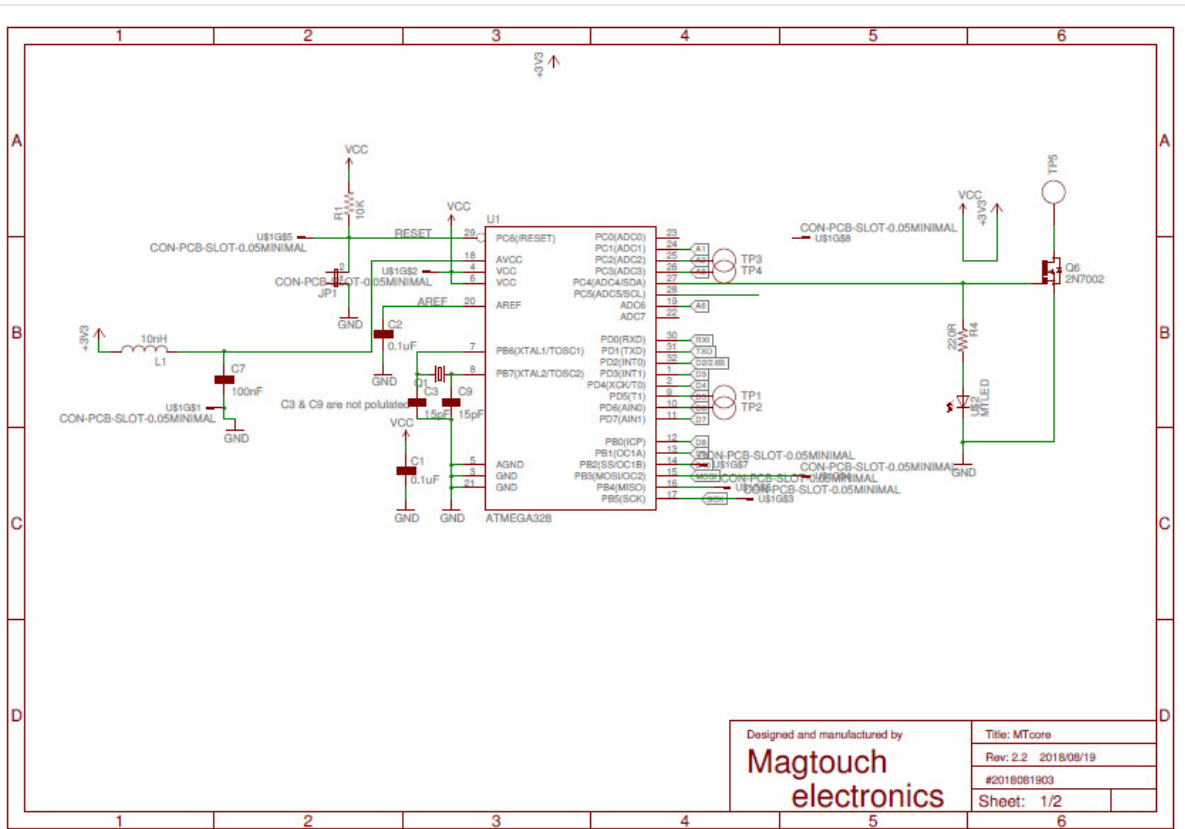
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The contents of electronic reports/certificates cannot be guaranteed. Original certification documents will be kept on file at Explolabs (Pty) Ltd.

ANNEX A

Circuit diagram:



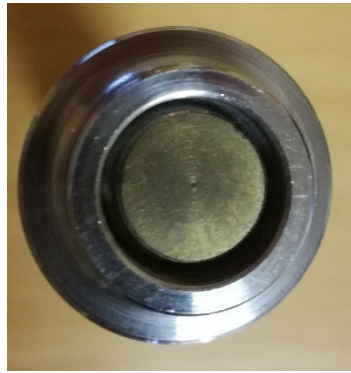
Picture of PCB:

Model no. EX:

Pictures



Top

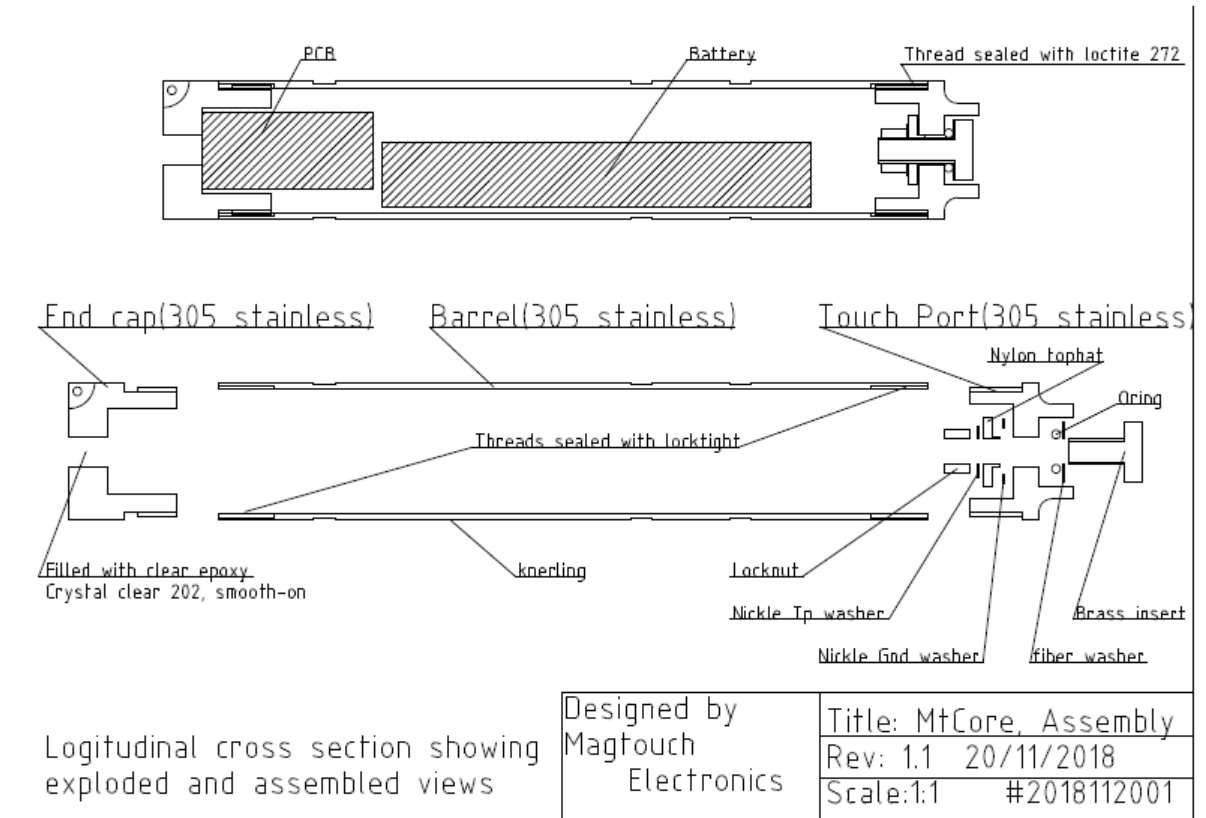


Bottom



Side

Mechanical Drawings



Model no. MR:

Pictures:



Top

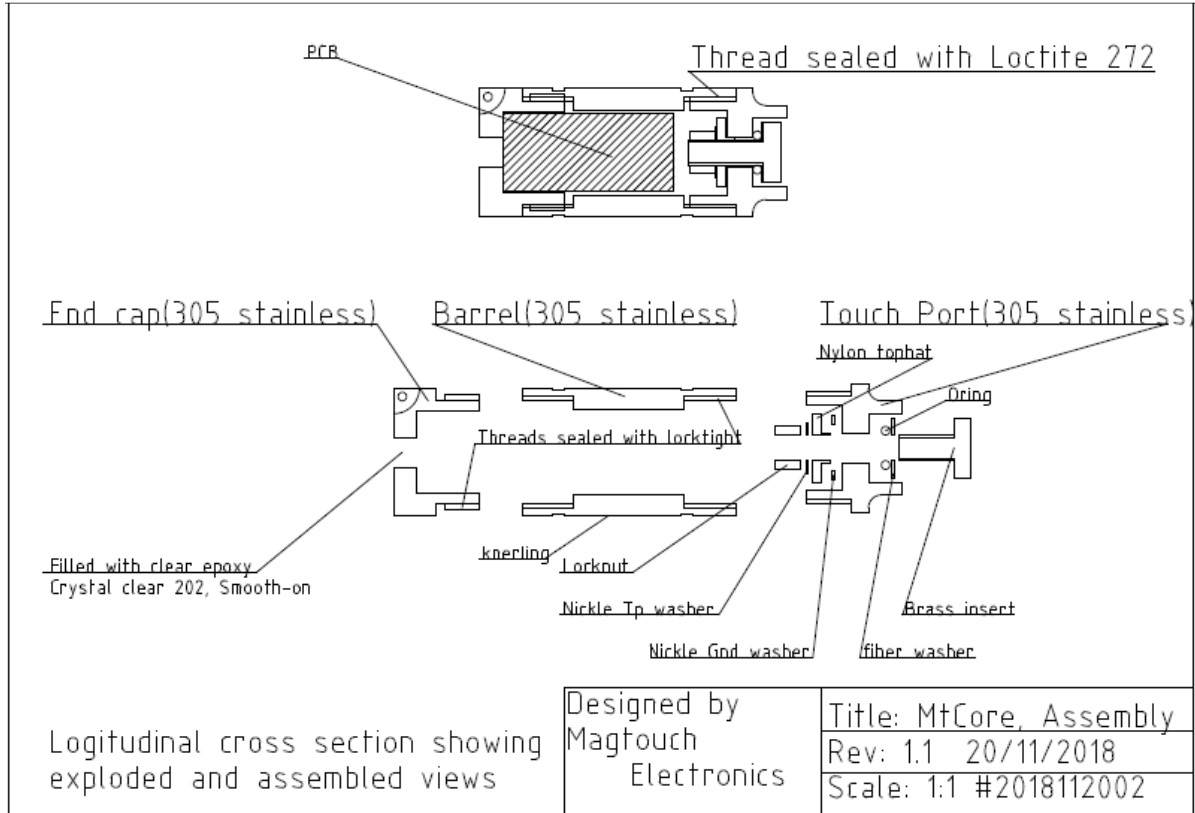


Bottom



Side

Mechanical Drawings



Picture of Tag:

