KM3NeT_QUAL_00n_ ARCA_base_module qualification_ DRAFT

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Abstract

This document reports the qualification tests applied to the titanium ARCA base module for the KM3NeT project.

Recipients

The KM3NeT PSC

Document Status

Revision	Date	Comment	Reviewed by	Approved by
			XX	YY

Revision History

Revision	Date	Description
Draft	01/09/2019	First draft

1 Table of Contents

2 Documentation

2.1 Abbreviations

Abbreviation	Description
DU	Detection Unit
DOM	Digital Optical Module
…	…..

2.2 Reference Documents

Abbreviation	Title	Reference
RD1	KM3NeT TDR	KM3NeT_DS_TDR
RD2	KM3NeT CRD	KM3NeT_DS_CDR
RD3	KM3NeT Qualification Plan	KM3NeT_QUAL_2018_001
RD4	KM3NeT Qualification Procedures	KM3NeT_QUAL_2018_002
RD5	…	

3 Introduction

This document describes the full set of qualification tests foreseen for the ARCA base module. The full set includes

1. Pressure test
2. Vibration and shocks tests
3. Climatic tests

The tests 2. and 3. have been validated by Test Readiness Review (TRR) that was held before to start the qualification processes. The procedure of the pressure test was approved by the PSC because the TRR was not yet established.

This document should include the following topics:

- Test procedures
- Tests configuration
- Tests set-ups
- Tests pass/fail criteria completeness
- Status of NCR, DCR, waivers for the item under tests
- When relevant: cleanliness condition, hazard and safety

The planning of the pressure tests was

Febraury 11st	Shipment of the container (closed and ready for the pressure test) from Bari to CPPM
Febraury 13rd	Container received at CPPM and shipment to Sopavib
Day 1 – Febraury 21th	Pressure test
Day 2 – Febraury 22th	Pressure test
Febraury 25th	Shipment from Sopavib to Bari (without opening the container)
February 27th	Container received at Bari
February 28th	Opening of the container and inspection

The planning of the vibration and the climatic tests was

…**TO COMPLETE WHEN THE PROGRAM WILL BE APPROVED……..**

4 Stress test

4.1 Hyperbaric test

4.1.1 Objectives and expected results

The base module MUST withstand a water pressure of 350 bar without leakage for 15 years. To verify this condition, the test was carried out in a hyperbaric chamber.

The goal of the test was to verify the i) absence of water ingress in the container through all its interfaces: a) interfaces between the cylinder and the 2 end caps (2 and 5 Figure 1, b) b) hole connectors in the end cap 2 and to verify the absence of buckling conditions/deformations.

4.1.2 Material configuration

4.1.2.1 Unit under test (UUT)

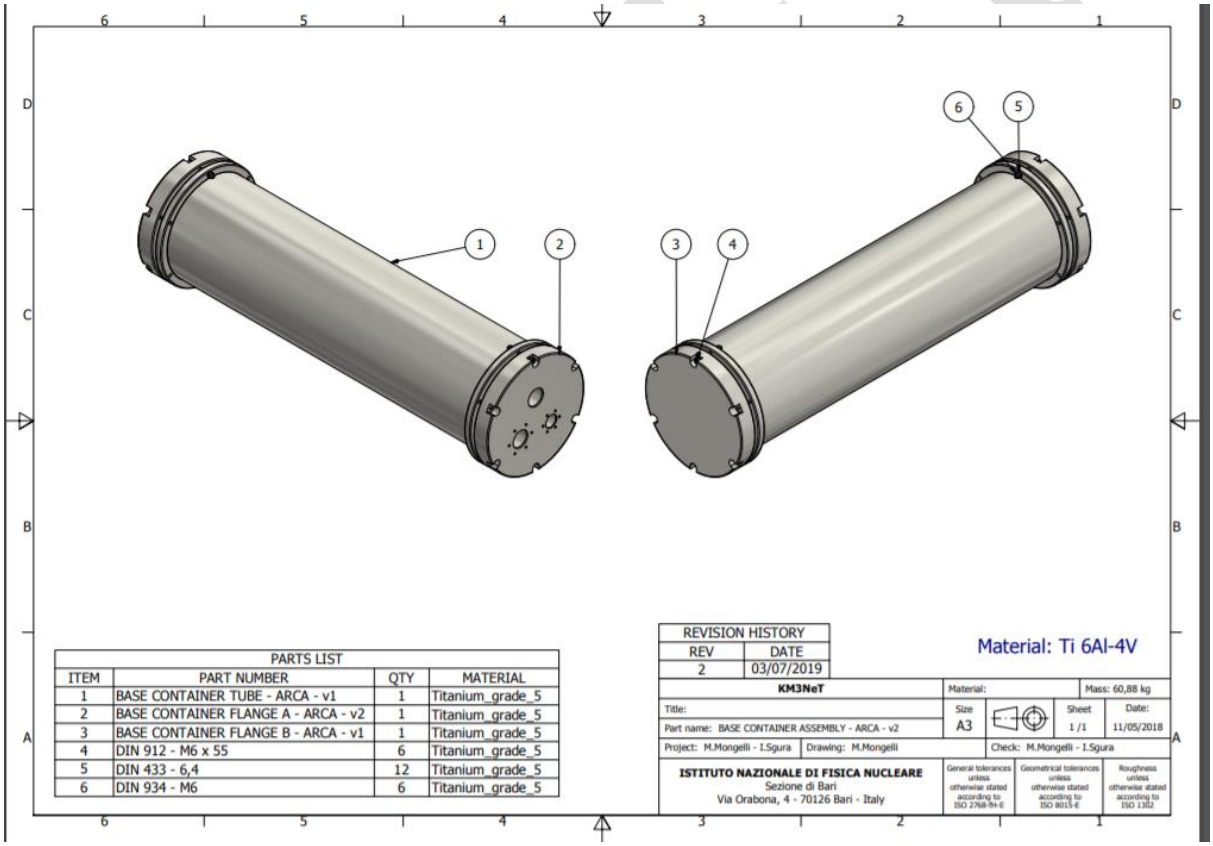


Figure 1 : mechanical drawing of the container without the connectors

The Figure 1 shows the mechanical drawing of the ARCA base container. The connector holes were closed by closed caps. At the time of the pressure test the the base penetrator was not finalized for this reason it was considered a bigger hole.

4.1.2.2 Test equipment

The test was performed in Sopavib's hyperbaric chamber.

Sylvain INPUT please may you complete with Hyperbaric chamber characteristics?

4.1.2.3 Mechanical support equipment

No mechanical support was used. The container has been inserted into the hyperbaric chamber by lifting it with belts attached to screws fixed to the work holes provided on the container flange.

Figure 2: Picture of the insertion of the base container in the chamber

4.1.3 Test and monitoring of the material

The container was inspected visually at the arrival at Sopavib. The inspection after the test was carried out at Bari soon after its reception at Bari where the container was opened.

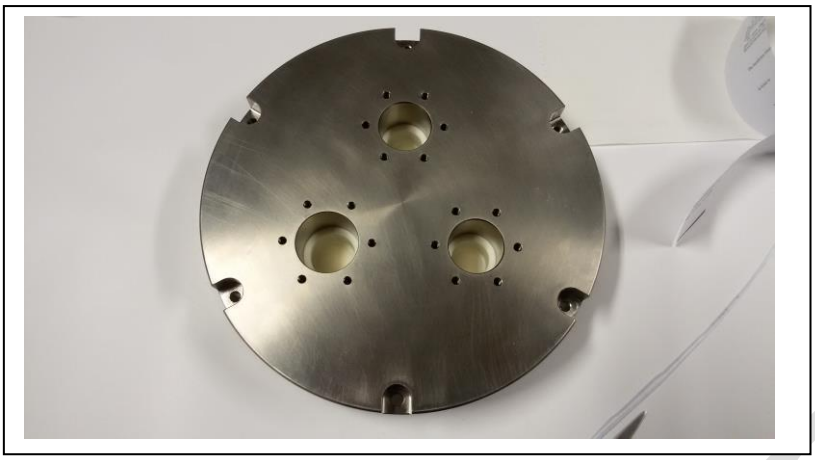
During the test, the pressure in the chamber was monitored in order to verify no decreasing of the pressure

4.1.4 Base container congfiguration

A single and sealed chamber (5 in total) filled with cestnut flour was coupled to each interface, in case of water ingress this should be revealed by its own chestnut flour.

Figure 3

Figure 3



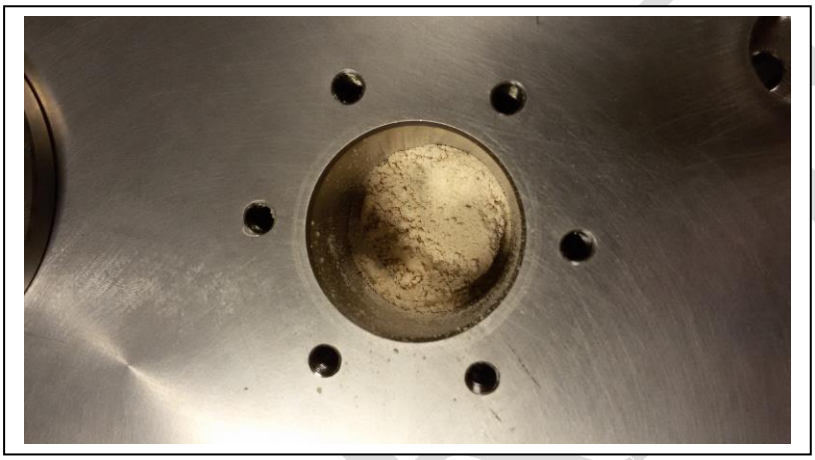


Figure 4

4.1.5 Pass Criteria

NO WATER in the flour that was used to fill the 5 chambers. In the case of a single drop the change of colour would have been observed

4.1.6 Test procedure

- In accordance to NF X10-812, the procedure consisted in:
  8h at 525 bar –
- 10 cycles: 1h at 350b

4.1.7 Tests organization

The test at Sopavib was followed by Sylvain Henry, the container was prepared and inspected by Maurizio Mongelli and Irene Sgura.

4.1.8 Tests results

The container was opened, no change of colour was observed neither clumps