



VERIFICATION STATEMENT

FOR WATER SPRAYING FIRE EXTINGUISHING SYSTEM

Statement No:
N1427Y32

Valid for products not subject to DNV classification requirements.

Particulars of Product

Product Name:	Water spraying fire extinguishing system
Type designation:	FIREKILL OH-VSO
Application/context:	Public Spaces
ID/Serial/Tag no:	N.A.
The product is intended for:	STOCK
Requirements are based on:	EN 14972 -Water Mist Systems, Appendix A

Deviations and limitations, if any, are stated on page 2 onwards.

The product / material has been marked: **N1427Y32** on:

Particulars of Vendor and Purchaser

Vendor:	Vid Fire-Kill ApS
Vendor reference:	
Purchaser:	
Purchaser reference:	

Issued at **Denmark CMC** on **2021-10-25**



for **DNV**

This document has been digitally signed and will therefore not have handwritten signatures

Lindelof, Kristian
Surveyor

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Verification extent and result

Verification extent:

Fire-fighting performance test according to Danish Fire Laboratories(DFL) High ceiling height test method for automatic nozzles no. TM 210415-1

Verification result/comments:

The VID Fire-Kill OH-VSO nozzle, designed by VID, Vision Idea Design, Svendborg, Denmark, have successfully been tested according to DFL TM 210415-1; 12 m ceiling height, nozzle spacing 4,5 x 4,5 m and 8 bar water pressure, in accordance with DIOM 140605-03-07.

Report

On 2021-05-27 the undersigned witnessed successfully testing at Danish Fire Laboratories (DFL), test facility accredited according to ISO 17025.

Reference is made to the attached DFL test report no.210310-272a.

Test Report No: 210310-272a

Customer: VID Fire-Kill ApS, Denmark.

Project: Fire testing according to DFL test method no. 210415-1 dated April 2021.

Test method: DFL test method no. 210415-1 - "High ceiling height test method for automatic nozzles"

Tested technology: Low Pressure Watermist

Tested product(s): Model OH-VSO automatic pendent watermist nozzle

Location of test: DFL - Danish Fire Laboratories, Svendborg, Denmark

Operators DFL: Peter Kierans, Tommy Spangsgaard, Martin Fredslund & Niclas Meincke.

Date of testing: 2021-05-26 to 2021-05-27

Synopsis:

VID Fire-Kill did in May 2021 conduct a series of fire tests at DFL, Danish Fire Laboratories, Svendborg. The purpose of the tests was to test the VID Fire-Kill Low Pressure Water Mist Nozzle Model OH-VSO automatic nozzles ability to successfully perform at 12m ceiling height when fire protecting EN 14972 and EN 12845 OH1 risks, and EN 14972 and EN12845 OH4 auditorium and similar risks where the potential fuel load is class A fuels (e.g. chairs, sofas etc.) located on the floor level.

Although all the tests were conducted at 12m ceiling and nozzle installation height, no more than 4 nozzles activated in any of the tests.

In all the fire tests did the Model OH-VSO nozzle perform better than the pass /fail criteria set for ceiling and gas temperatures, heat flux, fire spread control and fire damage control that are all defined in DFL test method no. 210415-1. We can therefore conclude that all the tests are successfully passed.

Report checked and approved by:

DFL, September 30th, 2021



Peter Kierans
Laboratory Manager

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1.0 Purpose of tests

The purpose of the tests was to evaluate the firefighting performance of the VID Fire-Kill Low Pressure Watermist Automatic Nozzle Model OH-VSO for risks such as:

- EN 14972 and EN 12845 OH1 risks.
- EN 14972 and EN12845 OH4 auditorium and similar risks where the potential fuel load is class A fuels (e.g. chairs, sofas etc.) located on the floor and where the walls inside the room are noncombustible.

The purpose of the tests was furthermore to determine the nozzle design specifics such as:

- Nozzles model,
- Nozzle min. water pressure,
- Nozzle spacing,
- Nozzle k-factor,
- Nozzle installation height maximum,
- Nozzle orientation.
- Number of nozzles activated in the fire tests giving the number of nozzles that the system needs to be designed with in real designs (see DFL test method 210415-1, chapter A.3.2).

2.0 Test hall

DFL is an international accredited fire test laboratory. The fire test laboratory is accredited in accordance with DS/EN ISO/IEC 17025:2017 by DANAK and has registration no. 487.

The test hall is insulated and heated, and the test hall volume is 6000 m³ (floor area of 20m x 20m and a height of 15m.)

The test laboratory has water storage tank and continuous fresh water supply, pump station with controlled water pressure supply and installations for handling of smoke and wastewater. The test hall is equipped with an adjustable pending ceiling. The ceiling size, position and height are adjustable.

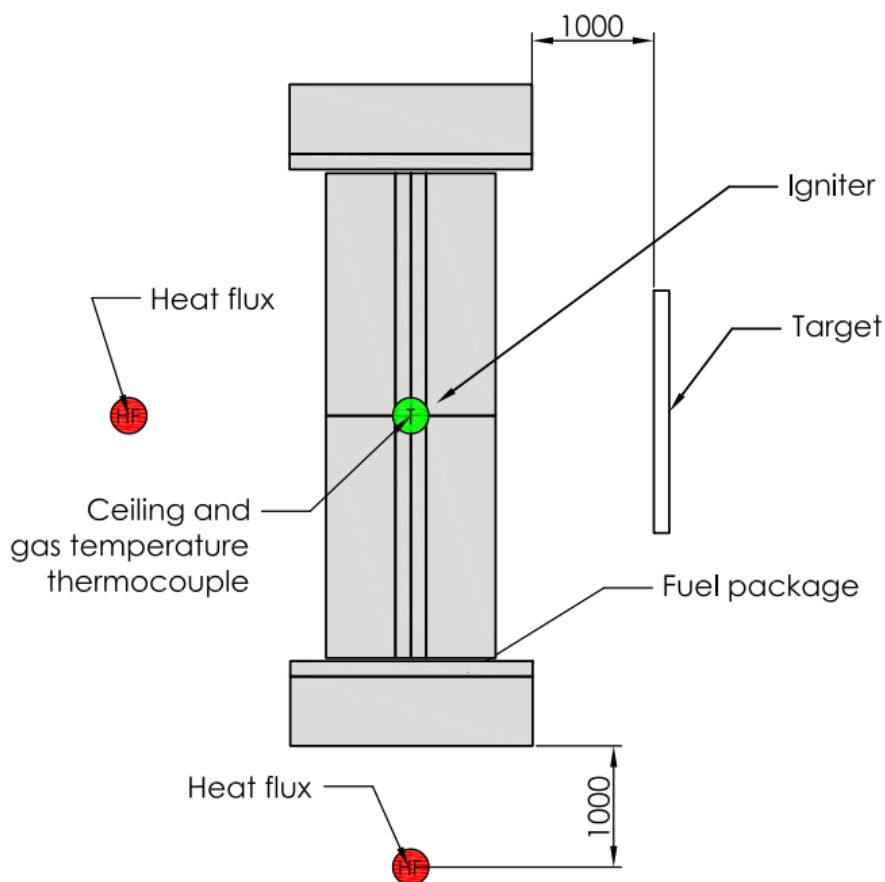
For the reported tests the ceiling was installed at 12m height and covered a ceiling surface area of 225m² (15m x 15m). The ceiling was made of non-combustible ceiling material rated maximum flame spread index of 25 when tested in accordance with ASTM E84. Directly above ignition source, a cellulose acoustical ceiling tile was used being 1.2m x 1.2m.

Prior to each test the entire test hall was dried out and heated to 20°C ± 10°C when measured at the ceiling level.

3.0 Test setup

In all fire tests the following test setup was used:

- 6 sofas each consisting of three components: two mattresses and a steel frame. Each mattress consists of a 2m by 0.8m by 0.1m piece of polyether foam with a cotton fabric cover. The mattresses and sofa steel frames were accordingly to the requirements of the test protocol.
- 1 target furniture located made accordingly to the requirements of the test protocol and located 1m away from the main fuel package as shown in the below drawing.
- 2 thermocouples type K, 0.5mm thickness was located directly above ignition point. One was embedded in the ceiling and the other was located 76mm below the ceiling. The ceiling gas thermocouple was shielded with a metal umbrella to prevent directly wetting. Both thermocouples were installed in accordance with the requirements of the test protocol.
- 2 heat flux meters were installed 1m away from the main fuel package on both sides (see below drawing) and were accordingly to the requirements of the test protocol.



4.0 Firefighting system

The watermist nozzles tested were the VID Fire-Kill Model OH-VSO. See nozzle datasheet in Appendix D.

The nozzles were tested with 4.5m x 4.5m spacing, at 8 bar water pressure and in pendent position imbedded in the ceiling. The nozzles where installed and operated accordingly to its datasheet. Exact position can be see in chapter 4.1

The nozzles has been successfully component tested by FM Approvals accordingly to FM5560 and therefore component testing is not a part of this report.

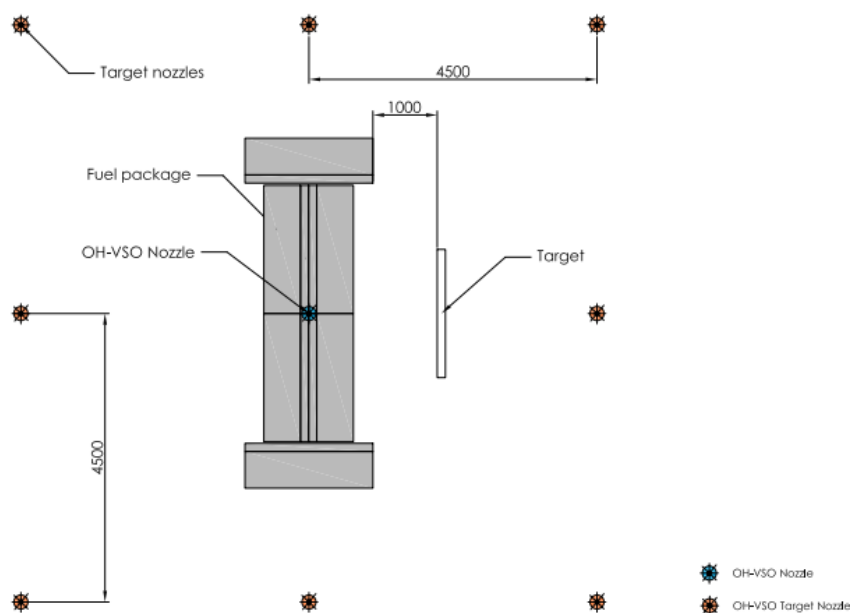
The k-factor ($K = \frac{Q_{min}}{\sqrt{P}}$) of all the nozzles that operated in the fire tests were after the fire test series measured. A total of 6 nozzles, 2 from the “below 1” test and 4 from the “between 4” test was tested and all of them had k-factors within 5% of the average measured k-factor.

The k-factor of the tested Model OH-VSO nozzles were found to be $16.7 \pm 5\%$.

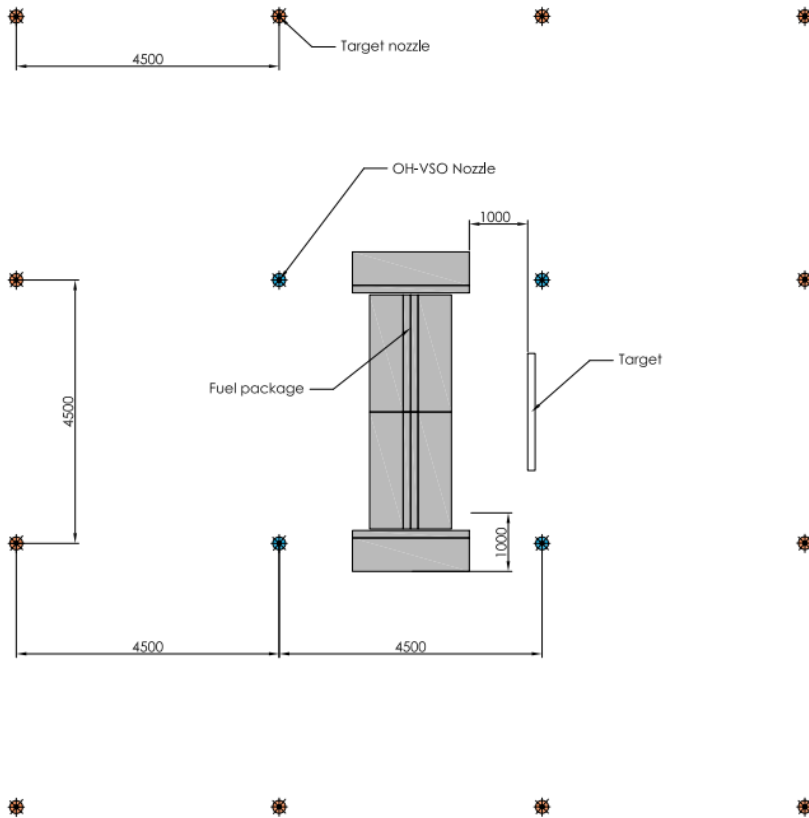
In all tests the nozzles were fed with water from DFLs frequency converter pump unit system enabling stabile pressure independent of flow.

4.1 Nozzle layout

“Below 1” nozzle test”



“Between 4” nozzle test



5.0 Measuring Systems.

All measuring instruments used to collect data during the fire tests were traceable calibrated in accordance with the quality assurance procedures of DFL. Calibration certificated of all the used equipment can be found in appendix C.

- The water pressure was measured using a pressure transmitter fitted the nozzle pipe system at the hydraulically most remote location from the pump.
- Waterflow was measured with a flowmeter located between pump and the nozzles.
- Temperatures were measured with type K thermocouples
- Heat flux were measured with heat flux meters.
- All data collected was logged with a data logger.

6.0 Test procedures

All tests were conducted, and observations done and recorded following the test procedures described underneath.

1. The nozzles were installed in accordance with the guidelines of the manufacturer.

2. The test mock-up was measured and checked to be in accordance with the protocol.
3. The systems pressure was adjusted to the correct pressure.
4. The fuel package was installed.
5. Data logging and video were started.
6. The accelerant was ignited according to the test protocol and the test time started.
7. 10 min after the systems activation, the remaining fire, if any, was manually extinguished.
8. All measurements were after the test saved, cameras stopped, and the data evaluated.

7.0 Pass/fail criteria and test results

Pass / fail criteria

The results obtained in the watermist tests regarding maximum measured temperature, damage percentage and heat flux shall be less than the pass / fail criteria.

Furthermore, the target simulated furniture is not ignited throughout the test, but minor charring is allowed (maximum up to 50% of the front surface area).

Test results

Test description.	“below 1” nozzle	Pass/fail	“between 4” nozzle	Pass/fail		
Test number	210526-1		210527-1			
Test method reference.	A.4.3.1	NA	A.4.3.2	NA		
Tested product	OH-VSO nozzle		OH-VSO nozzle			
Number of nozzles installed	9		16			
Activate nozzles during the fire test	2		4			
Water pressure (average over 10 min)	7.94 bar		8.03 bar			
Flow (average from when all nozzles are activated)	95.3 l/min		191.7 l/min			
Test density	2.35 mm/min		2.36 mm/min			
Time to first nozzle activated	3 min 0 sec		2 min 48 sec			
Maximum gas temperature	40.1 °C		Maximum 120 °C		36.3 °C	Maximum 120 °C
Maximum ceiling temperature	59.7 °C		Maximum 80 °C		52.8 °C	Maximum 80 °C
Fuel package damage	49%	Maximum 72%	55%	Maximum 55%		
Maximum heat flux	6.5 kW/m ²	Maximum 23.7 kW/m ²	11.3 kW/m ²	Maximum 22.1 kW/m ²		
Target package damage	0% (no ignition or charred)	Maximum 0%	0% (no ignition or charred)	Maximum 0%		

Note: Pictures examples from the test can be found in Appendix A (all test pictures and videos can be presented upon acceptance of request) and full data graphs from the test can be found in Appendix B.

8.0 Conclusion

In all the fire tests did the Model OH-VSO nozzle perform better than the pass /fail criteria set for ceiling and gas temperatures, heat flux, fire spread control and fire damage control that are all defined in DFL test method no. 210415-1. We can therefore conclude that all the tests are successfully passed.

Appendix A – Pictures examples from tests

Note: More pictures and fire test videos from both tests can be handed out by request.

Test setup front view – test no 210526-1 – “below 1 nozzle”.



Test setup side view – test no 210526-1 – “below 1 nozzle”.



Damages on main fuel after test – test no 210526-1 – “below 1 nozzle”.

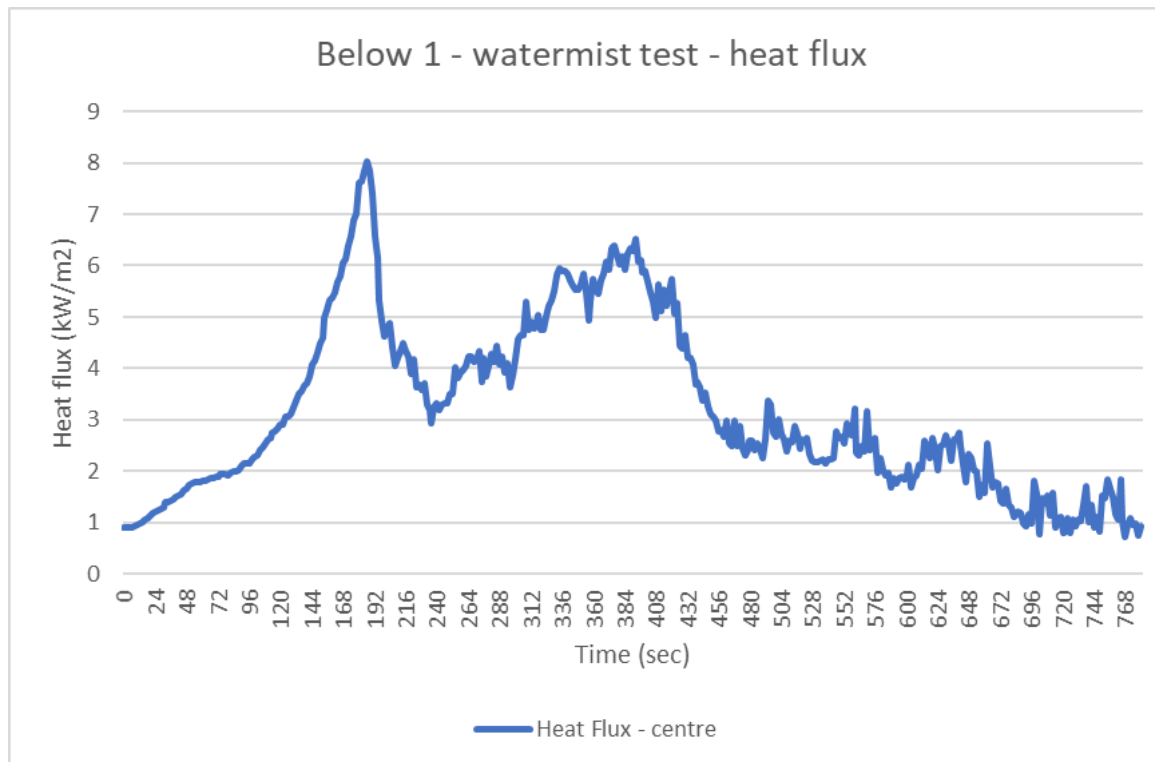
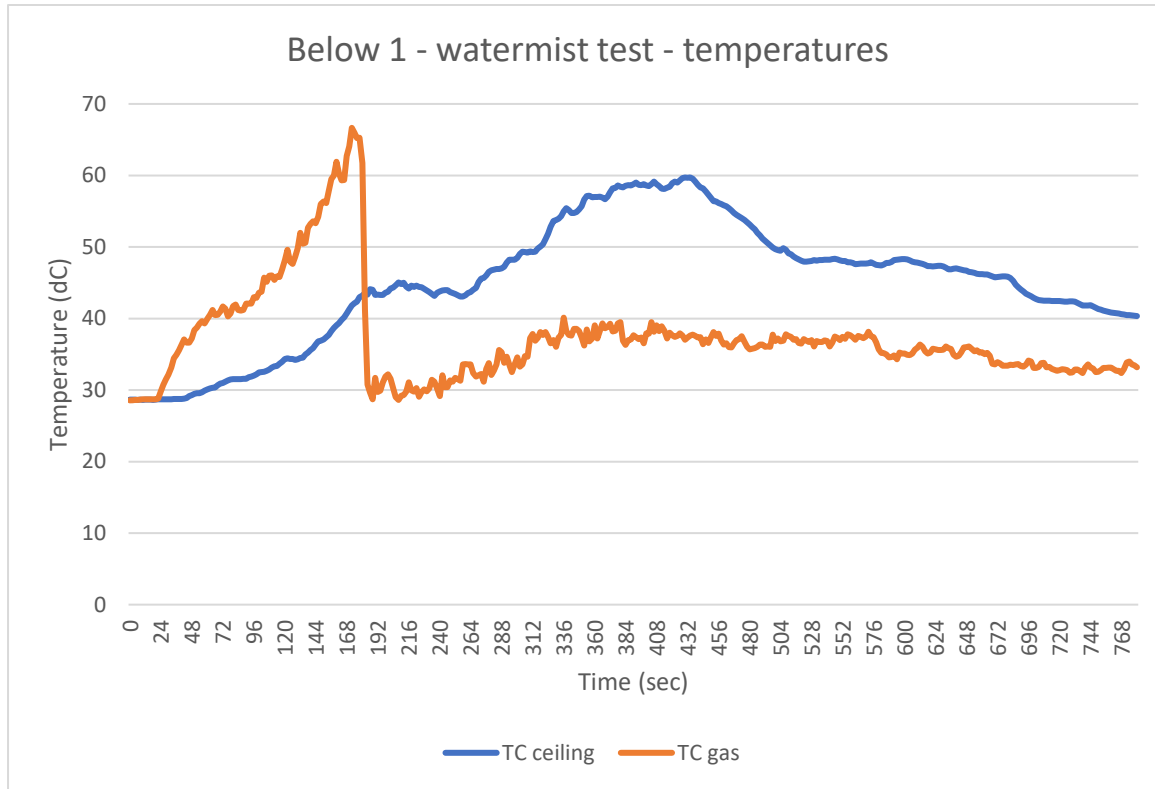


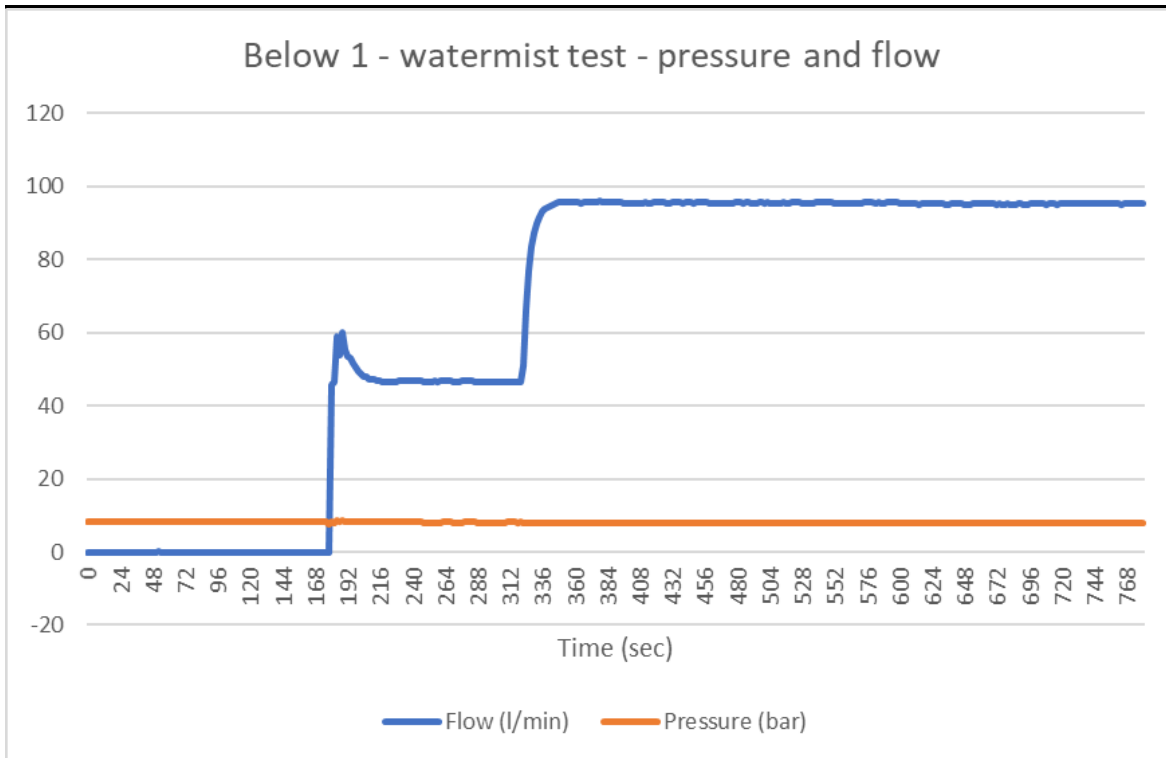
Target furniture after test – test no 210526-1 – “below 1 nozzle”.



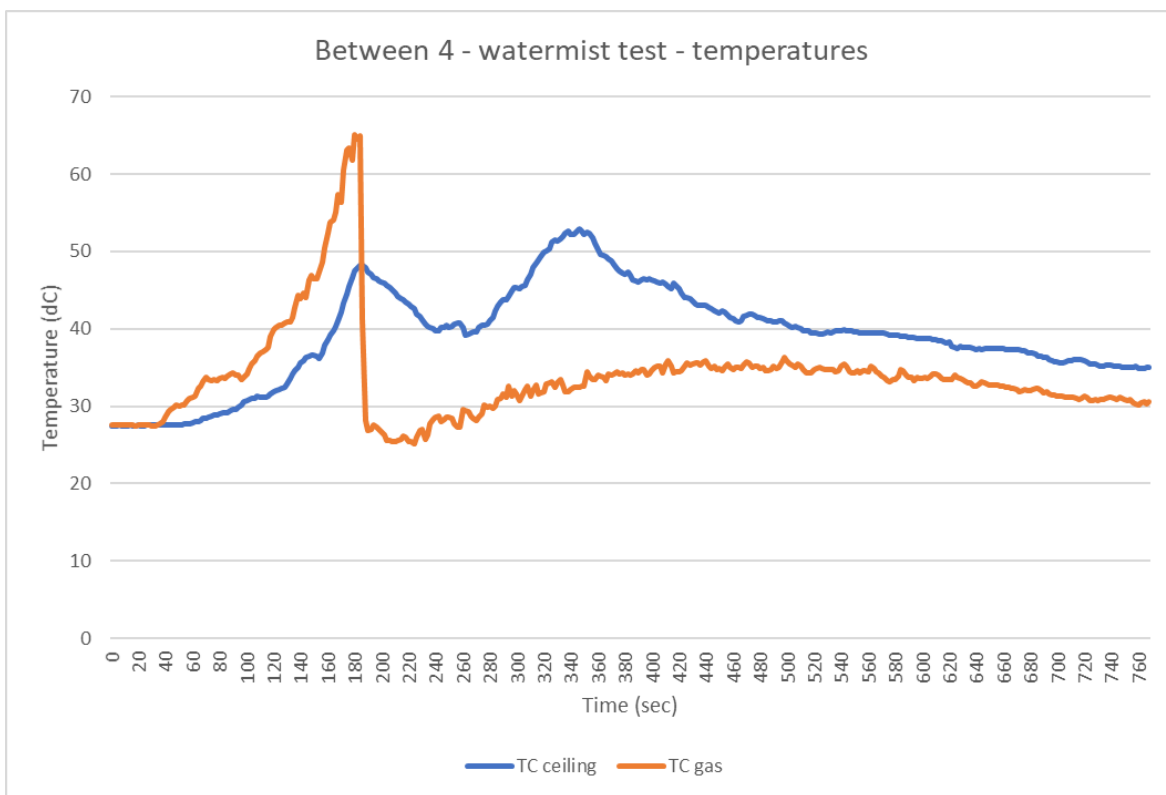
Appendix B – Measurements

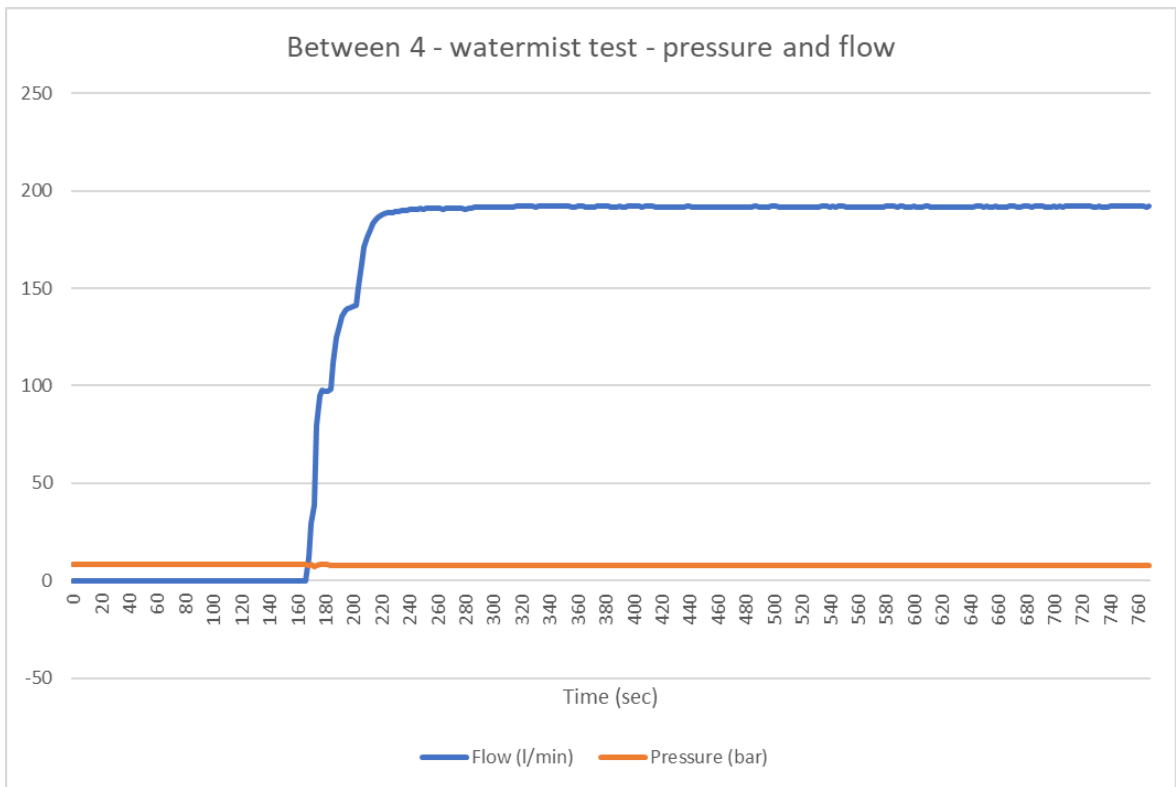
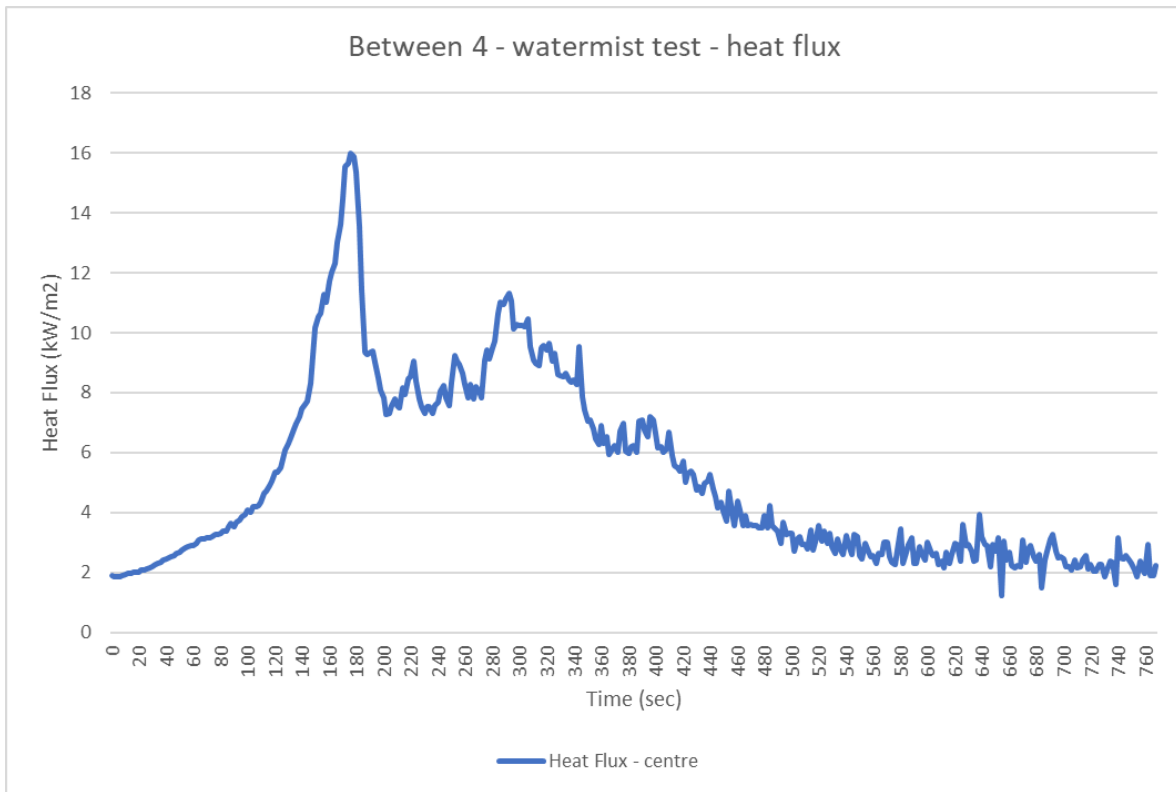
Measurements - Test no 210526-1 – “below 1 nozzle”





Measurements - Test no 210527-1 – “between 4 nozzle”





Appendix C – measurement equipment

Used equipment:

- Flow meter (DFL equipment no. 12-M)
- Thermocouple type K (DFL equipment no. 126-M)
- Pressure transmitter (DFL equipment no. 122-M)
- Datalogger (DFL equipment no. 14-M)
- Flux meter (DFL equipment no. 129-M)



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www.dti.dk

CALIBRATION CERTIFICATE

CERTIFICATE NO.:

200-F-24360

Page 1 of 4
No. of app.: 0
Init:
TOS/SORH

Client: DFL Danish Fire Laboratories ApS
Svalbardvej 13
DK-5700 Svendborg

Object: **Flowmeter**
Make: Siemens Model: MAG5100W
Serial No: **784713T116** Client mark: **DFL-012-M**
Range: 0 - 83,3 l/min Type: Magnetic Inductive
Output signal: 4 - 20 mA Diameter: DN 25
Accessories: MAG5000 with serialnumber: 959119N158

Period: Received: 2021-03-03 Calibration date: **2021-03-04**

Procedure: D1-1

Remarks: The flowmeter is calibrated as found.
On result page the current output is converted to calculated flow.
[4-20 mA = 0 - 83.3 l/min].

Conditions: This Accredited calibration was carried out in accordance with international requirements (DS/EN ISO/IEC 17025:2017) and in accordance with the General Terms and Conditions of Danish Technological Institute. The calibration results solely apply to the tested item. This calibration certificate may be quoted in extract only if Danish Technological Institute has granted its written consent.

Calibrated by: Tonni Olsen, +45 72 20 12 23, tos@dti.dk

Approved and
digitally signed
2021-03-05 by:

Tonni Olsen
Technical Metrologist



This PDF document is only valid if digitally signed with the OCES digital signature for Tonni Olsen, Danish Technological Institute.



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www.teknologisk.dk

KALIBRERINGS CERTIFIKAT

CERTIFIKATNR.:

200-T-22605

Side 1 af 4
Antal bilag: 0

Rekvirent: Vid Fire-Kill ApS
Ove Andersen
Svalbardvej 13
5700 Svendborg

Emne: Termoføler, Termotråd

Fabrikat: SensyMIC
Kundemærke: **120775**
Type: Type K

Serienr.: **7960117**
Område: -200 - +400 °C

Periode: Modtaget: 01-02-2018

Kalibreret: **11-04-2018**

Procedure: D1-4.1

Bemærkninger: Føleren har under kalibreringen været i tætsluttende glasrør. Føleren har under kalibreringen været neddyppet mere end 15 gange diameteren. Ved 0 °C er der anvendt ispunkt som reference.

Vilkår: Kalibreringen er udført i henhold til gældende vilkår fastlagt af DANAK, jf. www.danak.dk, og i henhold til Teknologisk Instituts almindelige vilkår, som er gældende på tidspunktet for aftaleindgåelsen. Kalibreringsresultater gælder udelukkende for det kalibrerede emne. Kalibreringscertifikatet må kun gengives i uddrag, hvis laboratoriet skriftligt har godkendt uddraget.

Kalibreret af: Bjørn Kjærsgaard Nielsen, 72203534, bjni@teknologisk.dk

Godkendt og
digitalt signeret
25-04-2018 af:

Søren Andersen

Søren Lindholt Andersen
Konsulent, Ph.d.



DANAK
CAL Reg.nr. 200



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www.teknologisk.dk

KALIBRERINGS CERTIFIKAT

CERTIFIKATNR.:

200-P-25527

Side 1 af 7

Antal bilag: 0

Init: BJNI/KOH

Rekvirent: DFL Danish Fire Laboratories ApS
Svalbardvej 13
5700 Svendborg

Emne: Tryktransmitter

Fabrikat: BD Sensors

Serienr.: **10286204**

Område: 0 - 16 bar

Model: DMP 331

Kundemærke: **DFL-122-M**

Udgangssignal: 4 - 20 mA

Periode: Modtaget: 06-11-2020

Kalibreret: **11-11-2020**

Procedure: D1-3.1

Bemærkninger:

Vilkår: Kalibreringen er udført akkrediteret i henhold til internationale krav (ISO/IEC 17025:2005) og i henhold til Teknologisk Instituts almindelige vilkår. Kalibreringsresultater gælder udelukkende for det kalibrerede emne. Kalibreringscertifikatet må kun gengives i uddrag, hvis Teknologisk Institut skriftligt har godkendt uddraget.

Kalibreret af: Bjørn Kjærsgaard Nielsen, 72203534, bjni@teknologisk.dk

Godkendt og
digitalt signeret
11-11-2020 af:

Kenn Øholm
Konsulent, tekniker



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CALIBRATION CERTIFICATE

CERTIFICATE NO.:

200-E-20933

Page 1 of 11
No. of app.: 0
Init: JCAM/JNN

Client: DFL Danish Fire Laboratories ApS
Svalbardvej 13
DK-5700 Svendborg

Object: **Data Logger**
Make: Agilent Model: 34970A
Serial No: **MY41023317** Client mark: **DFL-014-M**
Accessories: 2 pcs. insert cards: ID: DFL-017-M, S/N: MY41053508 in slot 1 (100)
and ID: DFL-016M, S/N: MY41018126 in slot 2 (200).

Period: Received: 2020-09-04 Calibration date: **2020-09-10**

Procedure: D1-7.1 & D1-7.3

Remarks:

Conditions: This Accredited calibration was carried out in accordance with international requirements (ISO/IEC 17025:2005) and in accordance with the General Terms and Conditions of Danish Technological Institute. The calibration results solely apply to the tested item. This calibration certificate may be quoted in extract only if Danish Technological Institute has granted its written consent.

Calibrated by: Javier I. Camacho, +45 72 20 25 92, jcam@dti.dk

Approved and
digitally signed
2020-09-14 by:

Jan Nielsen
M. Sc. (Physics)



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Hukseflux Thermal Sensors B.V.
www.hukseflux.com
info@hukseflux.com

Product certificate

Pages: 1
Release date: 29 JAN, 2019

Product code **SBG01-100**
Product identification **serial number 12402**
Product type water cooled heat flux sensor
Measurand heat flux

Calibration result

Sensitivity **$S = 0.153 \times 10^{-6} \text{ V}/(\text{W}/\text{m}^2)$**
Calibration uncertainty **$\pm 0.010 \times 10^{-6} \text{ V}/(\text{W}/\text{m}^2)$**

Reference conditions $\Phi_0 = 100 \times 10^3 \text{ W}/\text{m}^2$

the number following the \pm symbol is the expanded uncertainty with a coverage factor $k = 2$, and defines an interval estimated to have a level of confidence of 95 percent

Measurement function $\Phi = U/S$
With Φ heat flux in $[\text{W}/\text{m}^2]$, U voltage output in $[\text{V}]$

Product specifications

1: resistance **24.8 Ω**
2: rated measurement range **100x 10³ W/m²**
3: cable length **2 m**

Table 0.1 connections

WIRE		MEASURING SYSTEM
White	signal [+]	voltage input [+]
Black	signal [-]	voltage input [-] or ground
Blank	ground	ground

Calibration procedure according to Hukseflux SBGC01. Traceability of calibration is to ITS-90.

Please consult the user manual for information on measurement uncertainty during actual use and for product set up, operation and maintenance instructions.

Calibration performed by:

M. Rietveld

Date:

29 JAN, 2019

Person authorising acceptance and release of product:

Z. Obrdalj-Dzampo

Date:

29 JAN, 2019

Appendix D – Nozzle datasheet

Product Data Sheet
Automatic low-pressure nozzle
Model OH-VSO



Description

The FIREKILL™ Low Pressure Water mist nozzle OH-VSO is an automatic, pendent low-pressure water mist nozzle ideal for residential areas, offices, data processing areas, meeting rooms, hotels, museums, restaurant seating areas, institutions, schools, and such applications. The different finishes and optional painted finishes make the system blend in with almost every type of surface.



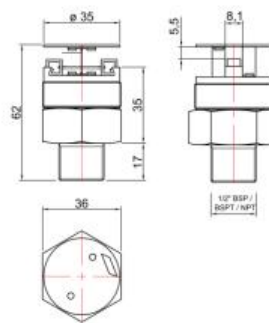
Approvals

The FIREKILL™ OH-VSO nozzle has been successfully tested and approved to the FM5560 standard for FM HC1 occupancies. This means that the system can be used in most Light Hazards defined in NFPA13 and 750, and Ordinary Hazard 1 defined in EN 14972.

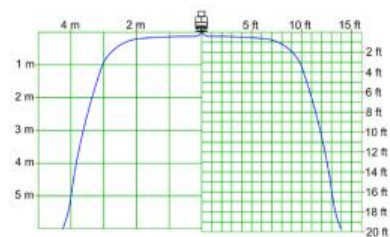
Technical data

General Description	
Minimum water pressure	8 bar
Maximum working pressure	16 bar
K-factor (metric)	16.7 (l/min@1 bar)
FM approved nominal release temp.	57°C
Other nominal release temperatures	68°C, 79°C, 93°C
Time Response Index (metric)	RTI < 50 Fast Response Class
Drop size	DV90 < 300 µm
Application	
Spacing (max)	20.25 m2 (4.5m x 4.5m)
Distance to wall (max)	2.25 m
Room size (max)	Unlimited m2
Height (max) FM Approved	5 m
EN 14972 with DnV OH1	0 - 6 m
EN 14972 with DnV OH1	6 m - 12 m
EN 14972 with DnV OH4	6 m - 12 m
Specific Description	
Weight	0.211 kg
Housing	Brass
Coating	NiSn
Strainer	Stainless Steel
Thread	½" BSP/BSP-T/NPT
Standard Finish	Chrome, White RAL 9010
Other Finish	Other RAL colors
Hydraulic System	
Water density	2.3 mm/m ²
Minimum system operation time	As required by AHJ
Minimum design area	As required by AHJ
Other Products FM approved in the system	
Name	Model
Alarm Check Valve	WAC
OH Rosette	OH-R(2)-T / OH-R(2)-TH
OH Pipe Spanner	OH-S42

Dimension



Spray pattern



* OH4, Auditoriums and similar areas with non-combustible walls

Product Data Sheet
Automatic low-pressure nozzle
Model OH-VSO



Installations

The OH-VSO nozzles are installed recessed in a ceiling, using the OH-S42 nozzle spanner, as not to damage either nozzle or the surrounding ceiling, with a maximum distance of 4,5 m between the nozzles and a maximum of 2,25 m to any wall.

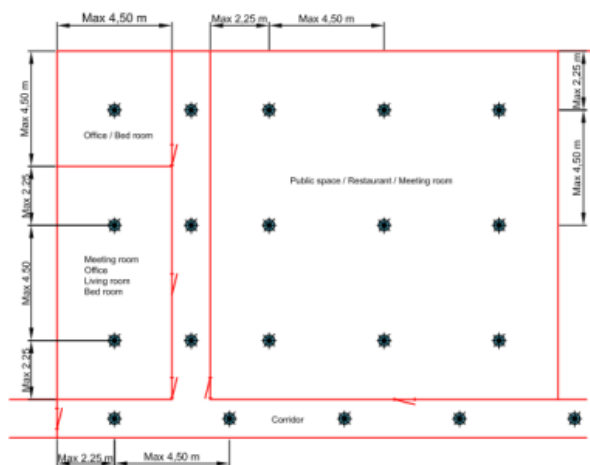
The FIREKILL™ OH-VSO should only be installed in clean, non-corrosive pipe systems, which do not cause galvanic corrosion to the nozzle, the system components and pipe hangers, and with clean rinsed internal surfaces free of impurities. The water quality should be free of chlorides and impurities. After successful installation of the nozzle, the OH-R(2)-T or OH-R(2)-TH rosette is to be screwed on to the nozzle, thus completing the installation process. The nozzle may also be surface mounted into open pipe work. The system should be installed using materials found acceptable by the authorities having jurisdiction.

Caution

The FIREKILL™ OH-VSO is a fragile component, containing a glass release element under pressure. Only VID OH-spanners should be used in the installation of the FIREKILL™ OH-VSO nozzle.

Dropped or otherwise damaged nozzles should not be reinstalled.

Typical lay-out



Contact

For further information on FIRE KILL™ products, please contact our sales department at Sales@vidfirekill.com

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Internet: www.vidfirekill.com
Page 2 of 2

Title: Model OH-VSO
No.: DS-171117-01-04 OHVSO
Rev. 04
Date of first issue: 17-11-2017
Date of revision: 28-08-2021