DNV·GL

SURVEY REPORT

FOR FLAME DETECTION AND FIRE FIGHTING SYSTEM

Report No:
N141VUE4
Rev.02

Particulars of Product

Product Name:	**Flame detection and Fire fighting system**
Type designation:	**DeFlameTec model no. VFK-FD-1, deluge system model N-pipe I-C1,5 and N-pipe 3V-C2b**
Application/context:	**Flame detection and Fire fighting system**
Serial/Tag no:	**N.A.**
The product is intended for:	**STOCK**
Requirements are based on:	**Customer specification**

The product / material has been marked: N141VUE4 on:

Particulars of Vendor and Purchaser

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

Issued at **Denmark CMC** on **2019-10-16**

for **DNV GL**

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

Lindelof, Kristian
Surveyor

Survey extent and result

Survey extent:
Witness fire detection and extinguishing according to DFL Test Protocol
DFL-TM-190307-1276-1 and DFL-TM-180719-1289-4

Survey result:
Test results according to DFL test report nos. 180911-221-VFK and 190829-236

Report

Successfully testing witnessed by DNV-GL at Danish Fire Laboratories (DFL), accredited according to ISO 17025, on 2019-06-26 and 2019-08-29.
Reference is made to the attached test reports and Fire-Kill DIOM, Conveyor Protection, No.: 190717-01-01 Rev. 1

Test report no: 190829-236

Customer:	VID FIRE-KILL ApS, Svalbardvej 13, 5700 Svendborg, Denmark.
Project:	Response time test of flame detector model: DeFlameTec model no. VFK-FD 1
Test Protocol:	DFL-TM-190307-1276-1 March 2019.
Location of tests:	DFL - Danish Fire Laboratories, Denmark.
Tests witnessed by:	Mr. Kristian Lindelof, DNV GL, Denmark.
Operators DFL:	Peter Kierans & Ove Andersen.
Test period	August 29th, 2019.

Synopsis:

VID FIRE-KILL ApS, has August 29th 2019 conducted a series of tests, at DFL (Danish Fire Laboratories) in Svendborg, Denmark.

The purpose of the tests was to measure the response time of the flame detector, FIRE KILL™ DeFlameTec model no. VFK-FD 1 to the test method DFL-TM-190307-1276-1.

The test was performed by covering the detector's field of view with a piece of cardboard and measuring the time from which it was removed until an output signal was given(manual shutter).
And by turning off the power supply and measure the time, from switching on of the power supply until an output signal was given (boot up).

The longest response time was measured to be 4,0 sec.

All tests were conducted in accordance with test method DFL-TM-190307-1276-1.

Main results

Test method	DFL-TM-190307-1276-1 March 2019.			
Detector and control model	FIRE KILL™ DeFlameTec model no. VFK-FD 1			
DFL Test no.	O-190829-1	O-190829-2	O-190829-3	O-190829-4
Distance between detector and test flame	18,65 m	18,65 m	18,65 m	18,65 m
Temperature at test start	26,7 °C	26,9 °C	26,9 °C	27,0 °C
Measured time delay	4,0 sec.	3,3 sec	2,6 sec	3,0 sec.

Report checked and approved by:

Date of signature: 30/8-2019

Ove Andersen

Laboratory Manager

Date of signature: 30/8-19

Alex Palle

CEO

TEST Reg.No. 487
Member of EA MLA

1 SCOPE

1.1 Scope and purpose

VID FIRE-KILL ApS has August 29th, 2019 conducted a series of tests at DFL (Danish Fire Laboratories) in Svendborg, Denmark.

The purpose of the tests was to measure the response time of the flame detector, FIRE KILL™ DeFlameTec model no. VFK-FD 1 (Appendix B) to the test method DFL-TM-190307-1276-1.

2 TEST SET-UP

2.1 Test Hall

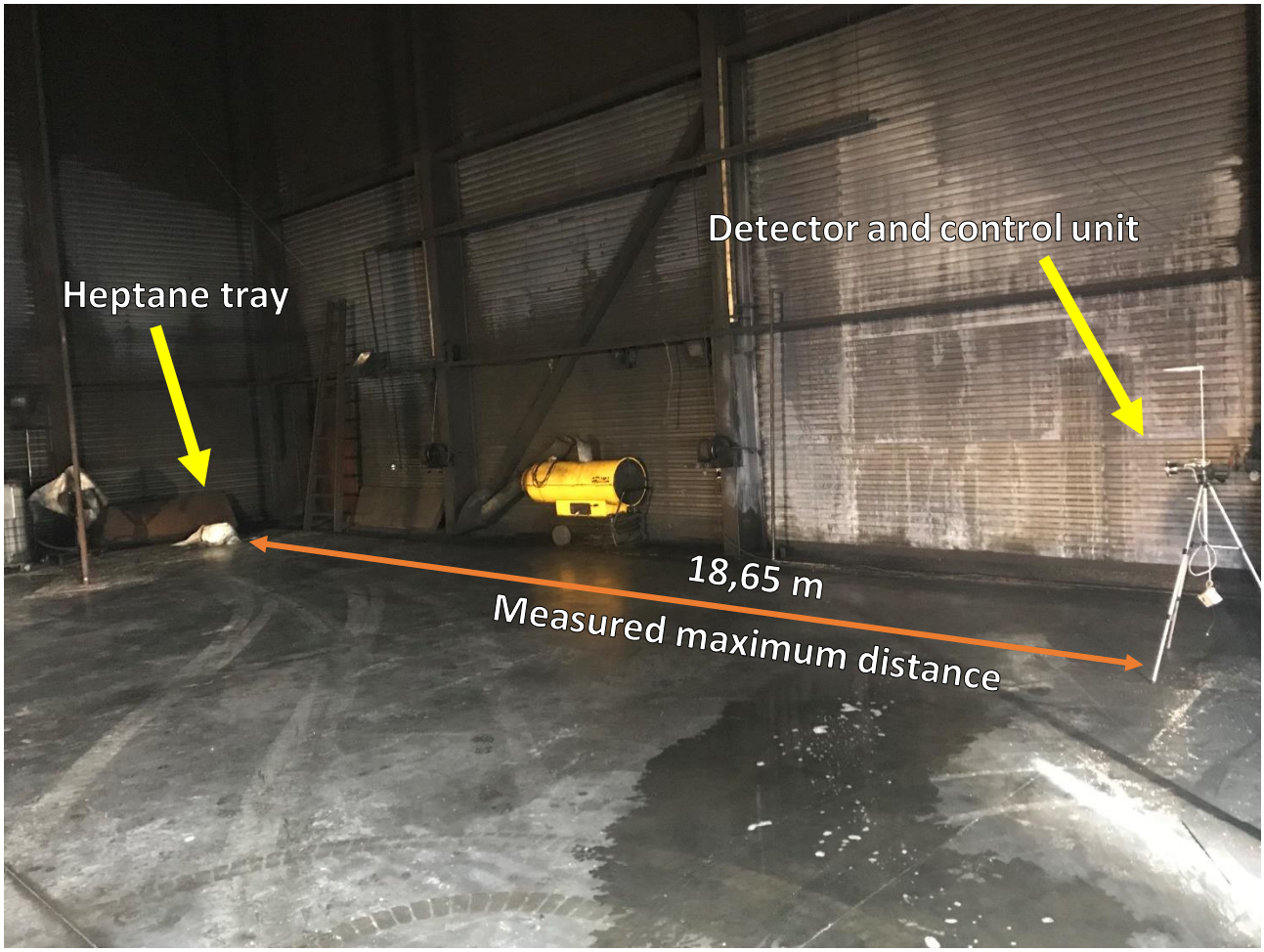
All tests were conducted inside DFLs main test hall which is insulated and heated. The test hall volume has a floor area of 20m x 20m and a height of 15m, ensuring plenty of oxygen for the tests. The test laboratory has water storage tanks and continuous fresh water supply, pump station with controlled water pressure supply and installations for handling of smoke and wastewater.

2.2 The test set-up

All the tests were conducted accordingly to test method DFL-TM-190307-1276-1 March 2019.

2.2.1 The test mock-up

The test was conducted with the detector mounted on a tripod and having the test flame positioned 18,65m (maximum measured distance) away from the detectors.



Picture of test setup

2.2.2 Test fuel

The test flame was generated with a metal tray filled with heptane. The metal tray was 0,30m wide, 0,10m high and 0,30m long, and made of 2mm thick sheet metal. Prior to each test a waterbase of 30mm depth was inserted into the tray followed by an amount of heptane ensuring 5 min – 6 min burning time.

2.2.3 Instrumentation and recordings

- A stopwatch was used for measuring the time from exposing, the detector to an output signal was given, to document this a camcorder was used (APPENDIX A).
- One thermocouple located in the test hall to confirm starting temperature.

The equipment has the following DFL identification:

- Stopwatch: DFL-106-M
- Thermocouples: DFL-107-M
- Videocamera: DFL-101-W

Temperatures were logged with 1 sec. sample time, using an Agilent data logger and a computer. Measurements in Excel file are available on request.

3 TEST PROCEDURES

All the tests were conducted accordingly to test method DFL-TM-190307-1276-1, March 2019.

The test was performed by:

1. Covering the detector's field of view with a piece of cardboard and measuring the time from which it was removed until outputsignal was given (manual shutter).
2. By turning off the power supply and measure the time, from switching on of the power supply until outputsignal was given (boot up).

3.1 Test description

1. The test mock-up was checked to be in accordance with the specifications.
2. Measuring devices were placed and checked.
3. Enclosure temperatures were checked.
4. Data-logging and video were started.
5. Test flame fire was ignited.
6. Start of tests by either exposing the detector (manual shutter) or respectively connecting the power supply (boot up).
7. Once the outputsignal was given the time was stopped, and the test was complete.
8. Recordings (video and datalogging) were stopped and saved.
9. All systems where reset and the test flame was extinguished.

4 RESULTS

Main results

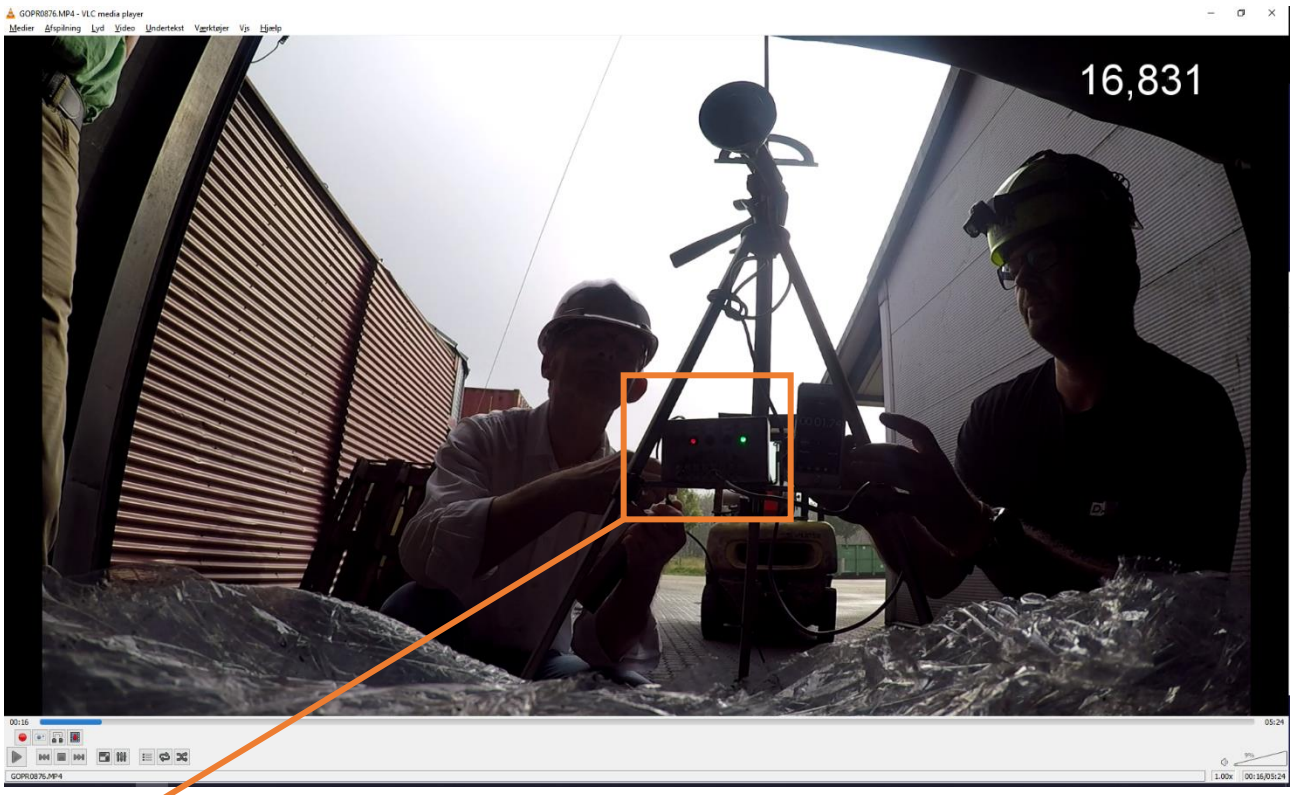
Test method	DFL-TM-190307-1276-1 March 2019.			
Detector and control model	FIRE KILL™ DeFlameTec model no. VFK-FD 1			
DFL Test no.	O-190829-1	O-190829-2	O-190829-3	O-190829-4
Distance between detector and test flame	18,65 m	18,65 m	18,65 m	18,65 m
Temperature at test start	26,7 °C	26,9 °C	26,9 °C	27,0 °C
Measured time delay	4,0 sec.	3,3 sec	2,6 sec	3,0 sec.
Shutter type	Boot up	Manual	Manual	Boot up

5 CONCLUSION.

The VID FIRE-KILL DeFlameTec model no. VFK-FD 1 was tested to the DFL test method no 190307-1276-1. Two scenarios were tested, "manual" shutter and "boot up". The longest response time achieved was 4 seconds obtained through the boot up shutter method.

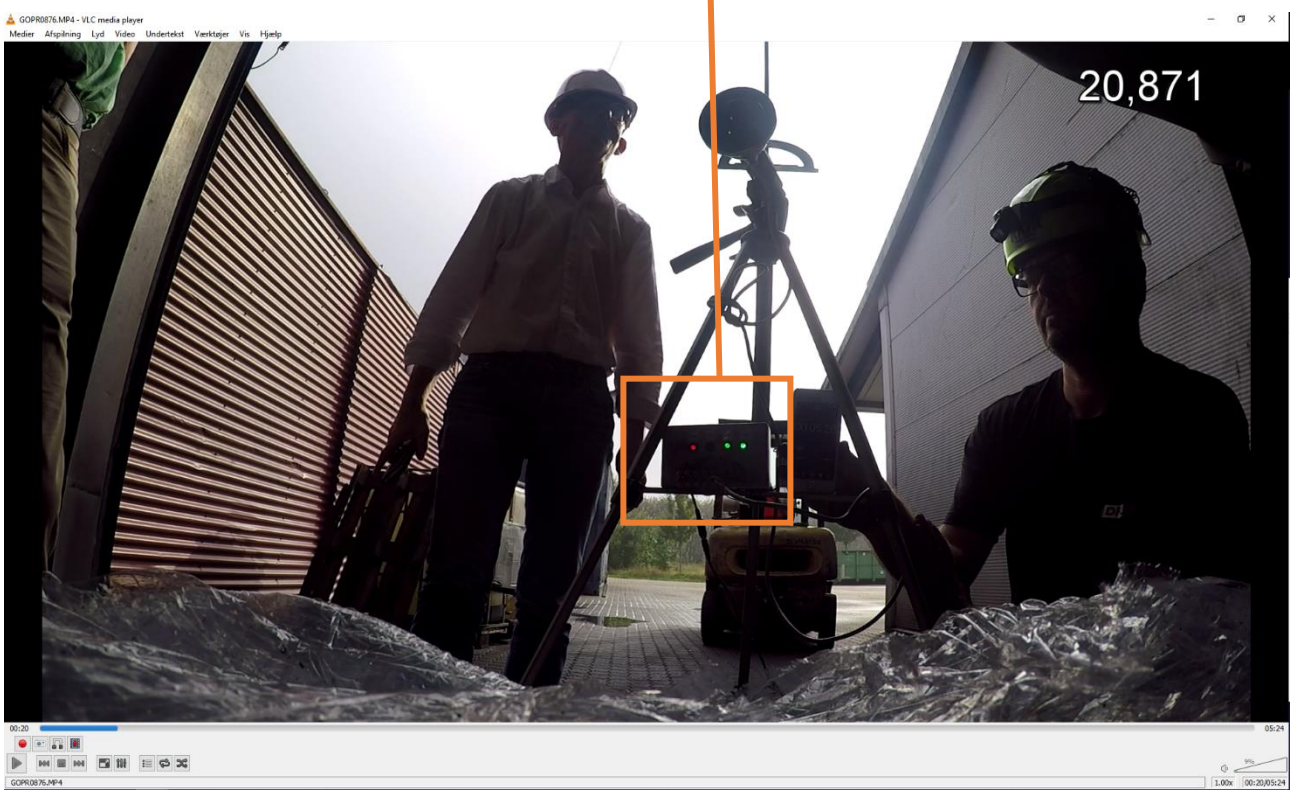
6 APPENDIX A

6.1 Testnumber: O-190829-1 (Boot up)

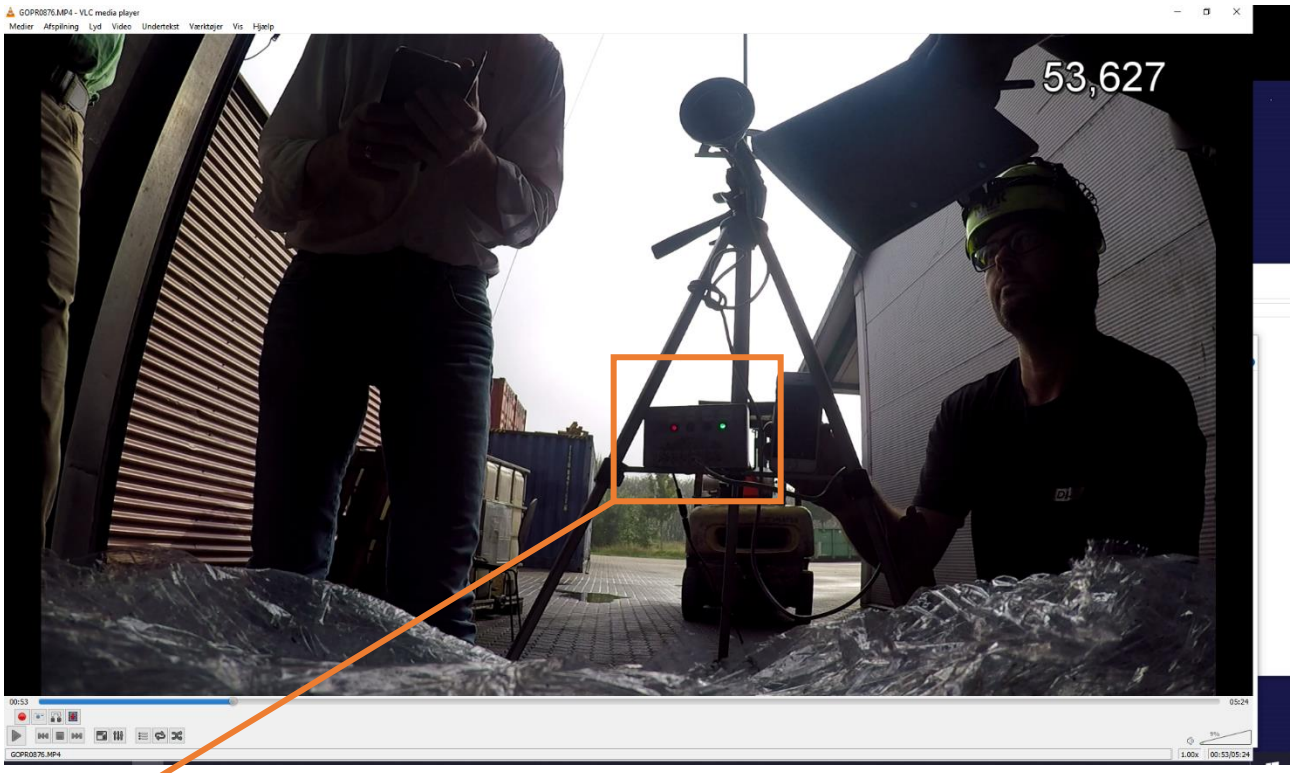


: Power on - no fault

:Power on – Output set – No fault

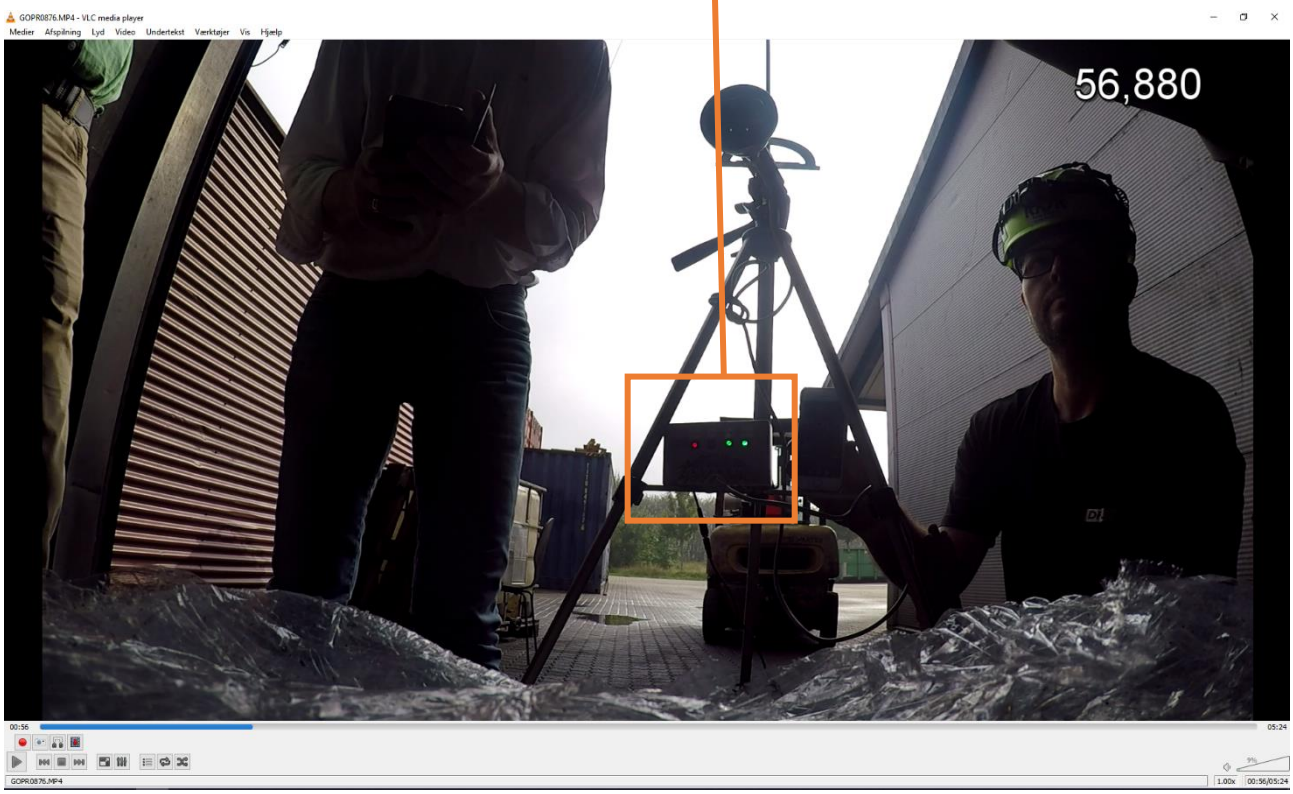


6.2 Testnumber: O-190829-2 (Manual shutter)

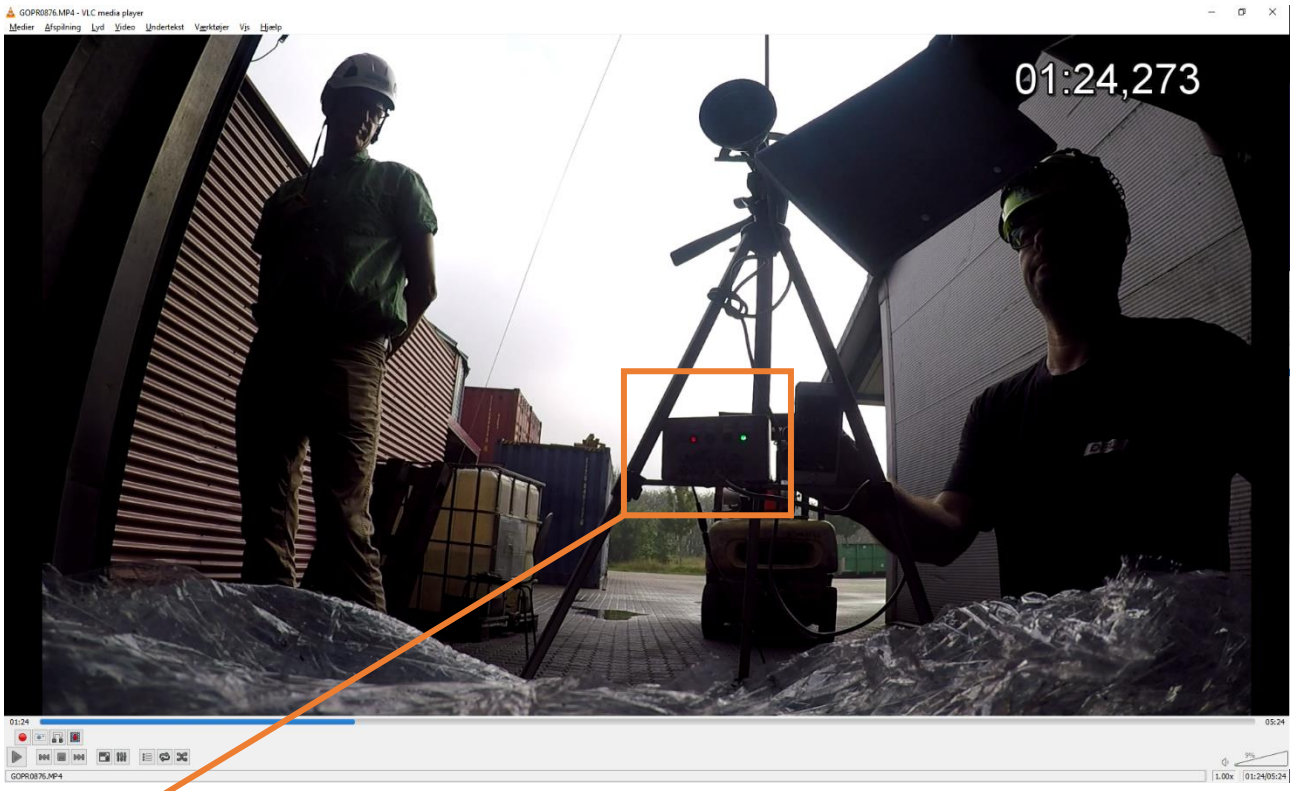


: Power on - no fault

:Power on – Output set – No fault

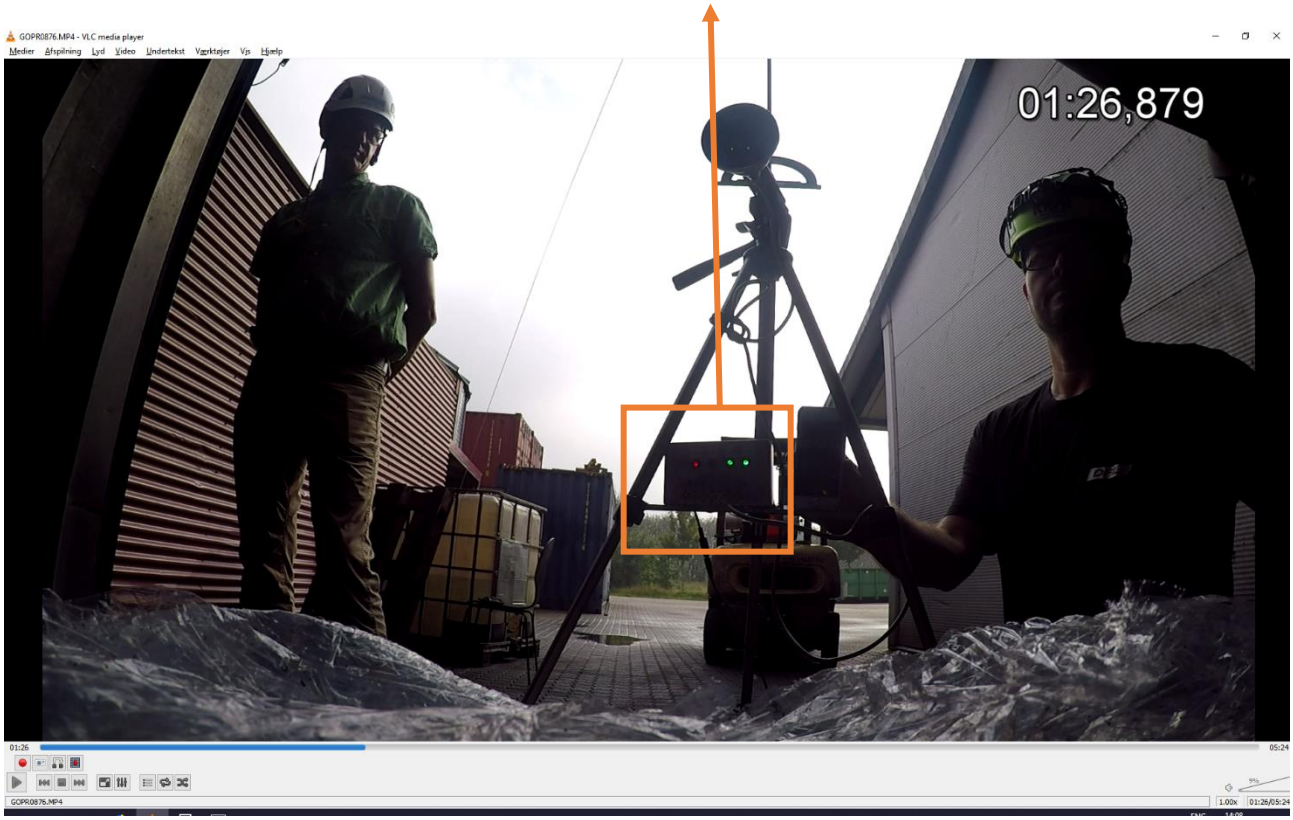


6.3 Testnumber: O-190829-3 (Manual shutter)

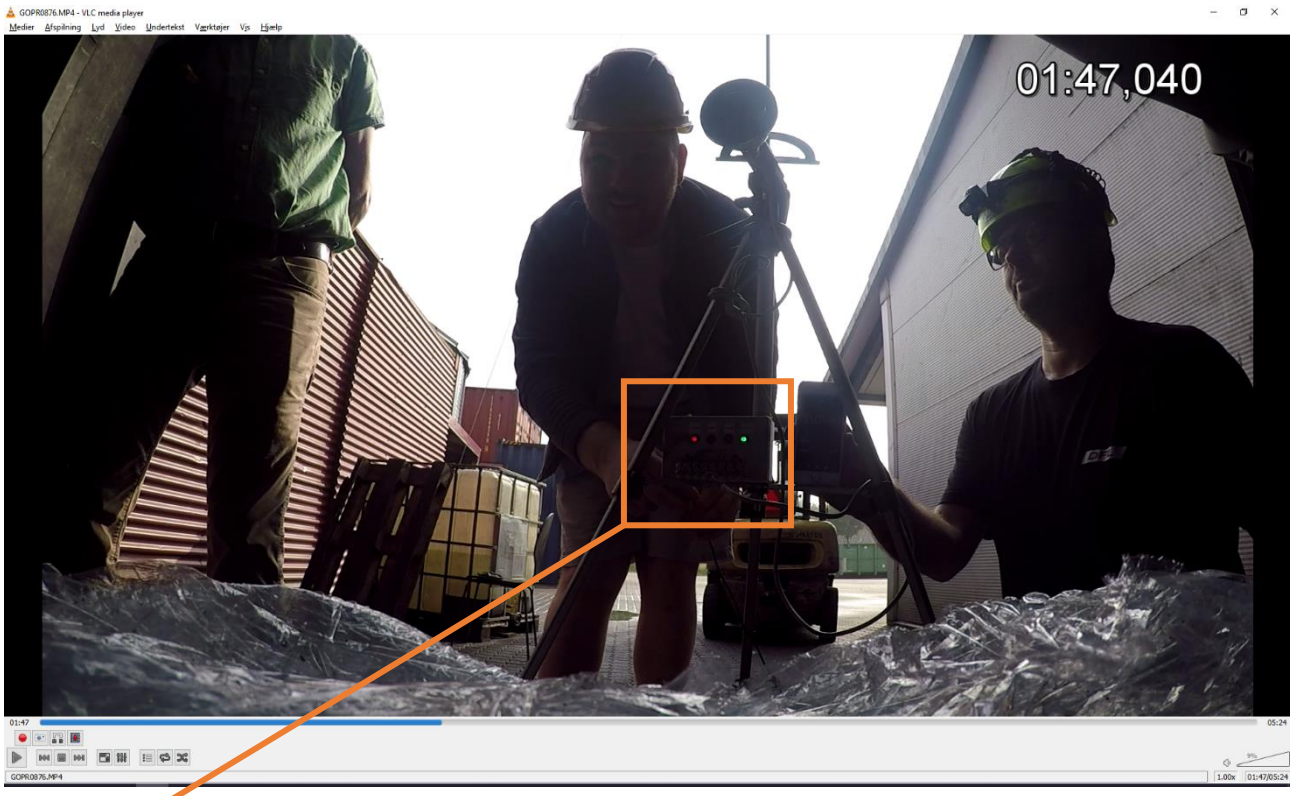


: Power on - no fault

:Power on – Output set – No fault

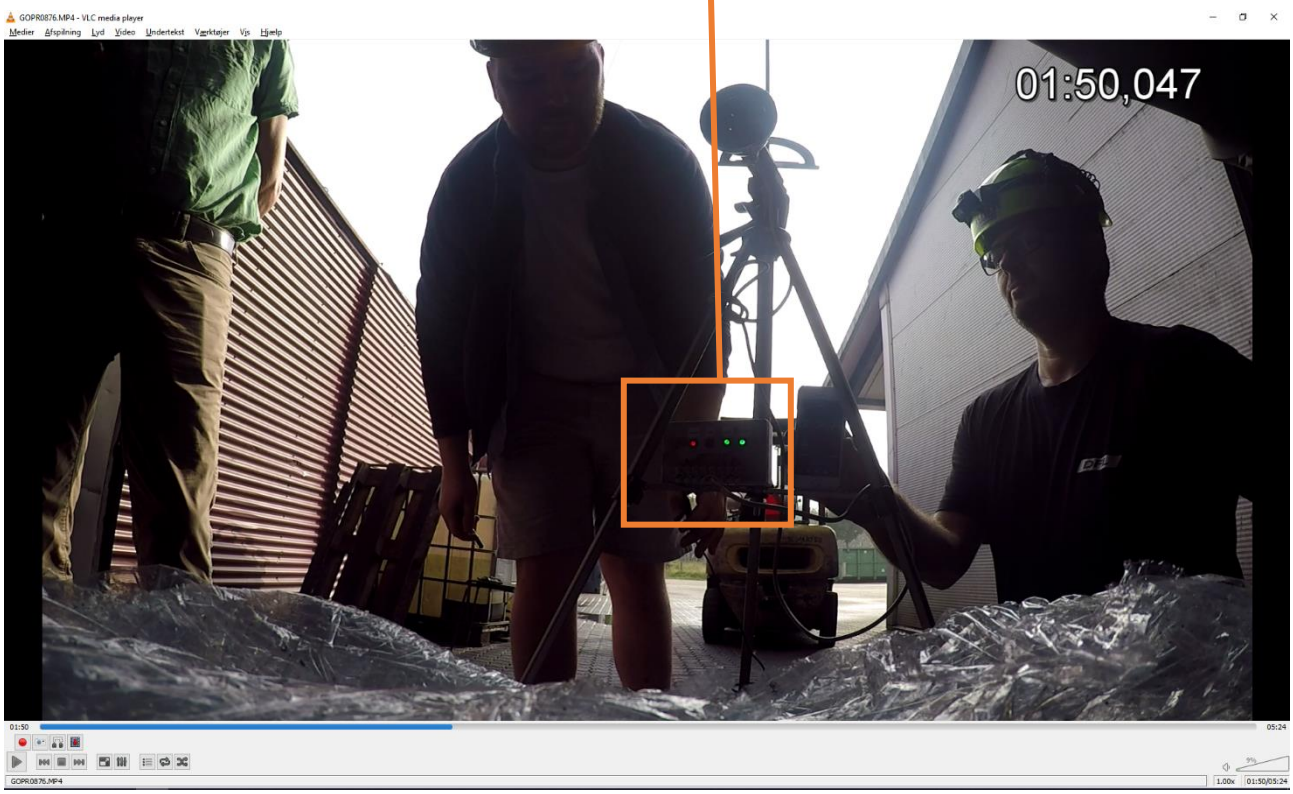


6.4 Testnumber: O-190829-4 (Boot up)



: Power on - no fault

:Power on – Output set – No fault



7 APPENDIX B

7.1 Datasheets

Product Data Sheet
DeFlameTec Flame Detector
Model VFK-FD1

FIRE KILL™
by VID Fire-Kill ApS

Description

The FIRE KILL™ DeFlameTec model no. VFK-FD1 is a series of patented, robust and reliable flame detectors.

DeFlameTec detectors provide the means of reducing risks of false alarms to a minimum. DeFlameTec detects fires exclusively from the narrow spectral range, which equals the light radiated from carbon oxidation.

DeFlameTec flame detectors are patented by VID Fire-Kill.
EN54-10:2002, Class 1 flame detector,
CE Electronics,
IP 67.7 stainless steel ANSI 316L housing,
Ex II 3G/D nA T4
Flame detection in large areas, (30 m),
Fire detection insensitive to hot surfaces,
Fire detector insensitive to minor blurring of the lens,
Custom set time delays, with LED indication on detector, available,
Indoor and outdoor use,
Potential free alarm relays (NO/NC) suitable connection to alarm panel,
Built-in Lens check for easy check of blurring of the lens, with LED indication on detector,
Independent signal circuit,
Simple installation and enclosed stainless steel installation bracket,
2 meter flying wire connection,
Low maintenance,

Technical data

Technical data		
Material	Housing	ANSI 316 L
	Gasket	EPDM
	Lens	Clear Fused Quartz
Weight	Net	0,35 Kg
	Gross	0,50 Kg
Storage Temperature	-20°C to 95°C	
Operating Temperature	-10°C to 55°C	
Spectral detection range	185 nm – 260 nm	
Field of View	See Fig. 3	
LED Signals	See table no. 2	
Electrical data		
Power supply	Min	21 VDC
	Max	27 VDC
	Nominal	24 VDC
Power consumption	Standby	62 mA@24 VDC
	Alarm	90 mA@24 VDC
Output signals		
Relay	Max	100 mA/50 VDC
Voltage free	NO / NC	

Voltage free outputs			
Version	Normally open		
	Alarm contact	Lens test contact	Fault contact
Detector de-energized	Open	Open	Open
Detector energized	Open	Open	Closed
Alarm activated	Closed	Open	Closed
Lens test activated	Open	Closed	Closed
Detector fault	Open	Open	Open
Power loss	Open	Open	Open

Version	Normally closed		
	Alarm contact	Lens test contact	Fault contact
Detector de-energized	Open	Open	Open
Detector energized	Closed	Closed	Closed
Alarm activated	Open	Closed	Closed
Lens test activated	Closed	Open	Closed
Detector fault	Closed	Closed	Open
Power loss	Open	Open	Open

VID Fire Kill ApS
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Page 1 of 4

Title: Model VFK-FD 1
No.: DS-180201-01-01 Flame
Rev. 01
Date of first issue: 01-02-2018
Date of revision: 01-02-2018

8

Application

The DeFlameTec flame detector provides the means of reliable fire detection in most areas, with a simple installation, low maintenance and easy test of performance.

Typical applications are as follows:

Useful in both indoor and outdoor applications,
Process areas, machinery spaces, production lines,
Inventories, storages,
Infrastructure tunnels, cable tunnels,
Areas with equipment prone to have hot surfaces,
Areas divided into fire zones, etc.
Onshore applications,
Offshore applications,
Maritime applications.
Areas containing explosive atmospheres

Certification:

DeFlameTec flame detector:

EN 54-10:2002, class 1.

Detector electronics:

CE to EN 50130, EN 61000-6-3

Housing: IP 67

ATEX EX II 3G/D nA T4

This means that the detector is certified for the protection all applications, except mining ducts, of which hazardous gas or dust rich atmospheres may occur. The detector will not create sparks and will not overheat, diminishing the chance of the detector causing a rapid combustion.

Check:

Prior to the installation:

Type of detector match the requested type and that the detector no damage to the unit.

Detectors which have been dropped or damaged in any way should not be installed.

Only detectors with intact factory seals should be installed.

It is to be checked that the factory seal is complete and not broken or in any way tampered with.

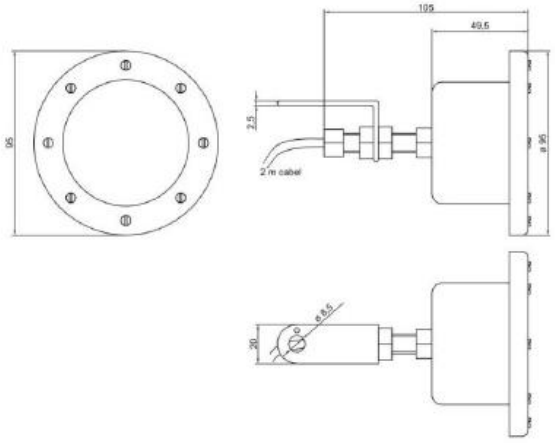
Table 2

LED Color	Detector response			
Green (flashing)	Power ok			
Green (constant)	Ongoing test by Incandescent light (Lens check)			
Yellow	Fire detected, pre-warning			
Red	Fire detected, alarm relay activated			
Sensitivity				
Version	No of pulses	Seconds	Dip switch	Model
1	50	5	1 on / 2 off	1
2	100	5	1 off / 2 on	2
3	5	1	1 off / 2 off	3
4	50	30	1 on / 2 on	4

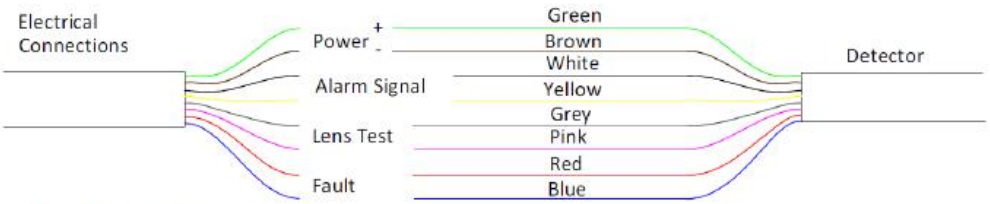
Product Data Sheet
DeFlameTec Flame Detector
Model VFK-FD1

FIREKILL™ by VID Fire-Kill ApS

Dimension (Fig 1)



Electric wiring (Fig 2)



Field of view (Fig 3)

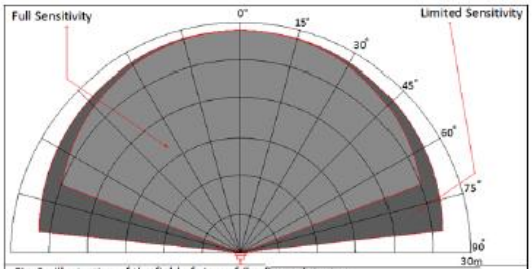


Fig. 3. Illustration of the field of view of the flame detector.
Illustrates the areas in which the flame detector will reliably detect fires.
Data collected from flame detector detecting a methane flame through an aperture 20 cm x 3 cm in size.

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Internet: www.vid.eu

Test report no: 180911-221 - VFK

Customer:	VID FIRE-KILL ApS, Svalbardvej 13, 5700 Svendborg, Denmark..
Project:	Enclosed and freestanding conveyors.
Test Protocol:	DFL-TM-180719-1289-4 + pr/EN14972 Annex A.
Location of tests:	DFL - Danish Fire Laboratories, Denmark.
Tests witnessed by:	Mr. Gary Howe, Zurich, UK and Mr. Niels OHMANN, DNV GL, Denmark.
Operators DFL:	Peter Kierans, Tommy Spangsgaard & Ove Andersen.
Test period	June 26th 2019

SYNOPSIS:

VID FIRE-KILL ApS has June 26th 2019 conducted a series of tests, at DFL (Danish Fire Laboratories) in Svendborg, Denmark according to the test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A, in the presence of Zurich, UK and DNV, Denmark.

The purpose was to test the firefighting performance, of the deluge system model N-pipe Type I-C1,5 and deluge system model N-pipe Type I-C1,5, VID FIRE-KILL ApS.

All tests were conducted in accordance with test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A and the test results can be found in this report.

The systems successfully conducted the tests for class A fires and class B fires, at 6,0 bar water pressure by a minimum height of 1,25m and a maximum height of 1,75m for both 1,5 and 2,5 wide conveyors.

Main results

Test method	Test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A.			
Test method reference	Test protocol for enclosed and freestanding conveyors.			
Test method test number	Test 5 (A.4.3.6)	Test 7 (A.4.3.8)	Test 8 (A.4.3.9)	Test 6 (A.4.3.7)
DFL Test no.	O-190626-1	O-190626-2	O-190626-3	O-190626-4
Pressure	6 bar	6 bar	6 bar	6 bar
Height	1,25m	1,25m	1,75	1,75
Extinguish time	60 sec	62 sec	89 sec	20 sec
Test method	Test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A.			
Test method reference	Test protocol for enclosed and freestanding conveyors.			
Test method test number	Test 4 (A.4.3.5)	Test 2 (A.4.3.3)	Test 1 (A.4.3.2)	Test 3 (A.4.3.4)
DFL Test no.	O-190626-5.2	O-190626-6	O-190626-7	O-190626-8
Pressure	6 bar	6 bar	6 bar	6 bar
Height	1,75	1,75	1,25	1,25
Extinguish time	47 sec	559 sec	608 sec	89 sec

Report checked and approved by:

Date of signature: 22/7-19

Ove Andersen

Laboratory Manager

Date of signature: 22/7-19

Alex Palle

CEO

TEST Reg.No. 487
Member of EA MLA

1 PURPOSE OF THE TEST

VID FIRE-KILL ApS has June 26th, 2019 conducted a series of tests, at DFL (Danish Fire Laboratories) in Svendborg, Denmark.

The purpose was to test the firefighting performance, of the deluge system model N-pipe Type I-C1,5 and deluge system model N-pipe Type I-C1,5, according to the test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A, for Firefly AB, Heliosgatan 3, 120 30 Stockholm, Sweden.

2 TEST FACILITIES:

The fire tests were conducted by Danish Fire Laboratories (DFL) in DFL´s fire test facilities at Svalbardvej 13, DK-5700 Svendborg, Denmark.

DFL is an international accredited fire test laboratory, accredited in accordance with DS/EN ISO/IEC 17025:2005 by DANAK. Accreditation No. 487.

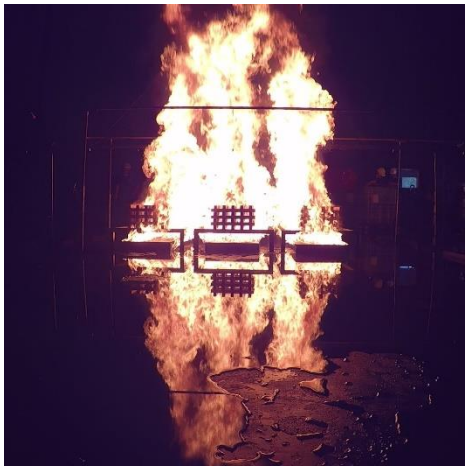
The test facilities consist of a hall that is insulated and heated, with an area of 19,5m x 19,5m x 15m (Length x Width x Height). The test hall is equipped with an adjustable pendent ceiling. Size of the ceiling, position and height are adjustable. The test laboratory has water storage tanks and continuous fresh water supply, pump station with controlled water pressure supply and installations for handling of smoke and wastewater.

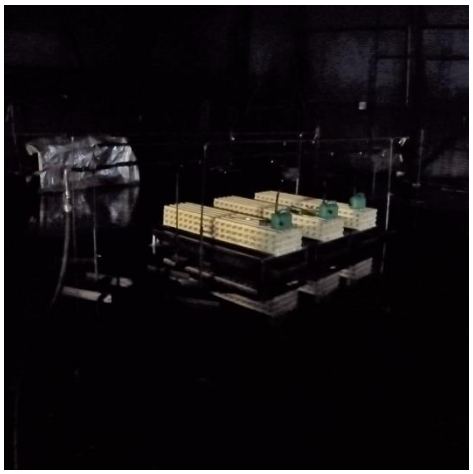
Fire test set up.

Four setups were made, one for conveyor of 1.5 m - and one for conveyor of 2.5 m width, and for class A and class B fires respectively.

The test set-up for both 1.5 conveyor and 2.5 conveyor consisted of a 10 m long pipe, with a diameter of 1inch.

The nozzles were placed as shown in the drawings in appendix B for 1.5 conveyor and for 1.5 conveyor respectively.





Test muck-up.

Drawings of test muckup for class A and class B fires respectively are shown in appendix C.

Test fuel

Test: O-190626-1

Wood Crip 0,50 m x 2,10 m x 0,27 m (WxLxH). Nozzle height 1,25 m from floor.

Nozzle spacing and position see Appendix B.

Test: O-190626-2

Ø 1,48 m. tray with a water base of 18 liters equal to 10 mm depth and 37 liters of diesel equal to approximately 20 mm depth. Nozzle height 1,25 m from floor.

Nozzle spacing and position see Appendix B.

Test: O-190626-3

Ø 1,48 m. tray with a water base of 18 liters equal to 10 mm depth and 37 liters of diesel equal to approximately 20 mm depth. Nozzle height 1,75 m from floor.

Nozzle spacing and position see Appendix B.

Test: O-190626-4

Wood Crip 0,50 m x 2,10 m x 0,27 m (WxLxH). Nozzle height 1,75 m from floor.

Nozzle spacing and position see Appendix B.

Test: O-190626-5

Ø 0,92 m. tray with a water base of 7 liters equal to 10 mm depth and 14 liters of diesel equal to approximately 20 mm depth. Nozzle height 1,75 m from floor.

Nozzle spacing and position see Appendix B.

Test: O-190626-6

Wood Crip 0,50 m x 1,30 m x 0,27 m (WxLxH). Nozzle height 1,75 m from floor.

Nozzle spacing and position see Appendix B.

Test: O-190626-7

Wood Crip 0,50 m x 1,30 m x 0,27 m (WxLxH). Nozzle height 1,25 m from floor.

Nozzle spacing and position see Appendix B.

Test: O-190626-8

Ø 0,92 m. tray with a water base of 7 liters equal to 10 mm depth and 14 liters of diesel equal to approximately 20 mm depth. Nozzle height 1,25 m from floor.

Nozzle spacing and position see Appendix B.

3 MEASURING SYSTEMS.

All measuring instruments used to collect data during the fire tests, were calibrated and registered in accordance with the quality assurance procedures of DFL. Documentation for calibration see appendix D.

Water pressure:

System water pressure were measured using a pressure-transmitter.

Time Measurements:

Time was logged using stopwatch and computer/datalogger.

Temperature measurements:

Temperatures were measured using 0,5mm thermocouples type K.

Temperature data were logged with 1 sec. sample time, using an Agilent Data Logger and a computer.

Flow measurements:

Water-flow was logged in 1 sec. sample time using an Agilent Data Logger, connected to a calibrated flow-meter.

4 TEST PROCEDURES

All the tests were conducted accordingly to test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A

Test description

1. The test setup was checked to be in accordance to the specifications.
2. Measuring devices were placed and checked.
3. Temperature sensors were checked.
4. Data-logging and video were started.
5. Pump was started.
6. Fire was lit.
7. Pre burn time was measured and the system was activated.
8. After finishing the test, recordings (video and datalogging) were stopped and saved.
9. All systems where reset.

5 REQUIREMENTS OF EXTINGUISHING TESTS.

The requirements for the fire test according to the test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A are:

Wood cribs:

- If the system can extinguish the fire, within 15 minutes from when the system is manually activated the test has passed.
- If the fire does not reignite within 10 minutes from extinguishing the test has passed.

Diesel trays:

- If the system can extinguish the fire within 5 minutes, and the diesel can be reignited, the test has passed.

6 RESULTS

Test method	**Test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A.**			
Test method reference	**Test protocol for enclosed and freestanding conveyors.**			
Test method test number	Test 5 (A.4.3.6)	Test 7 (A.4.3.8)	Test 8 (A.4.3.9)	Test 6 (A.4.3.7)
DFL Test no.	O-190626-1	O-190626-2	O-190626-3	O-190626-4
Pressure	6 bar	6 bar	6 bar	6 bar
Height	1,25m	1,25m	1,75	1,75
Extinguish time	60 sec	62 sec	89 sec	20 sec
Test method	**Test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A.**			
Test method reference	**Test protocol for enclosed and freestanding conveyors.**			
Test method test number	Test 4 (A.4.3.5)	Test 2 (A.4.3.3)	Test 1 (A.4.3.2)	Test 3 (A.4.3.4)
DFL Test no.	O-190626-5.2	O-190626-6	O-190626-7	O-190626-8
Pressure	6 bar	6 bar	6 bar	6 bar
Height	1,75	1,75	1,25	1,25
Extinguish time	47 sec	559 sec	608 sec	89 sec

7 CONCLUSION.

The VID FIRE-KILL ApS deluge system model N-pipe Type I-C1,5 and deluge system model N-pipe Type I-C1,5, VID FIRE-KILL ApS., has been successfully tested to the test method DFL-TM-180719-1289-4 + pr/EN14972 Annex A. Both nozzle types were tested at a maximum height of 1,75m and a minimum height of 1,25m to the from the wood crib bottom to the nozzle outlet. And at a water pressure of 6 bar.

The system has successfully completed the protocol regarding extinguishing time.

APPENDIX A.

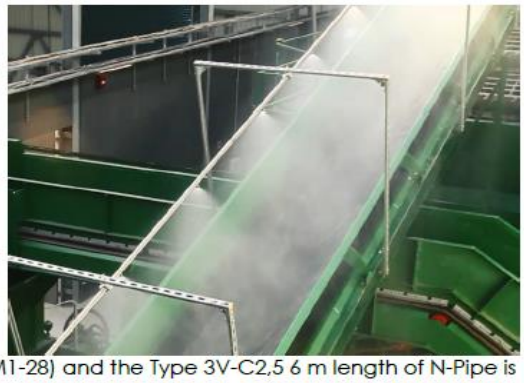
Datasheet for deluge system model N-pipe Type I-C1,5 and deluge system model N-pipe Type I-C1,5.

Application Data Sheet
Deluge system for Conveyors
Application: Conveyor

FIRE KILL™ by VID Fire-Kill ApS

Description

The FIRE KILL™ low pressure, fine water spray deluge systems Model N-pipe Type I-C1,5 and Model N-Pipe Type 3V-C2,5 were created for the protection of conveyors.
This datasheet covers the protection of closed, semi closed and open conveyors.
The Model N-Pipe Types I-C1,5 and 3V-C2,5 are supplied in 6 m pre-fabricated lengths, which lowers the time required for designing and installing the system and makes it easier to incorporate into existing locations.



The Type I-C-1,5 6m length of N-Pipe is fitted with 6 low pressure fine water spray nozzles (Model BM1-28) and the Type 3V-C2,5 6 m length of N-Pipe is fitted with 18 nozzles (BM1-20 and BM1-28).

Model N-pipes Type I-C1,5 and 3V-C2,5 are installed in one line or parallel rows, covering the entire conveyor width and length, either as a total flooding design, where all pipes are connected to the same riser pipe, or as zones where each zone of N-pipe are connected to a zone deluge valve.

Tests and Applications

N-pipes Type I-C1,5 and 3V-C2,5 has been successfully tested in accordance with DFL TM 180719-1289-4, designed accordingly to prEN 14972 annex A, for installation in systems including detectors in accordance with DFL test protocol 190307-1276-1.
Based on the testing the N-pipes Type I-C1,5 and 3V-C2,5 can protect closed, semi-closed or open conveyors transporting clean wood residues from forestry or other wood processing activities, coal, wood pellets, etc.

Technical data

General description		
N-Pipe type / nozzle	I-C 1,5	3V-C 2,5
Minimum water pressure	6 bar	6 bar
Maximum water pressure	16 bar	16 bar
K-factor 6,0m N-pipe (metric)	16,8	45,6
Flow 6 m pipe (l/min@4 Bar)	41,15	111,7
Drop size	DV_{90} < 300 µm	
Application		
Width covered by 1 N-pipe	1,50 m	2,50 m
Min height above object	1,00 m	1,00 m
Max height above object	1,50 m	1,50 m
Hydraulics		
Water density (mm/m2)	4,5	7,4
System operation time	30 min	

Specific description	
Pipe Dimensions	6 meter Ø28x1.2mm
Pipe material	SS AISI 316L
Micro Nozzle material	SS AISI 304 or SS 316L
Pipe for press fittings	28mm
Related products	
Control Valve	C-EL
Filter	Model F

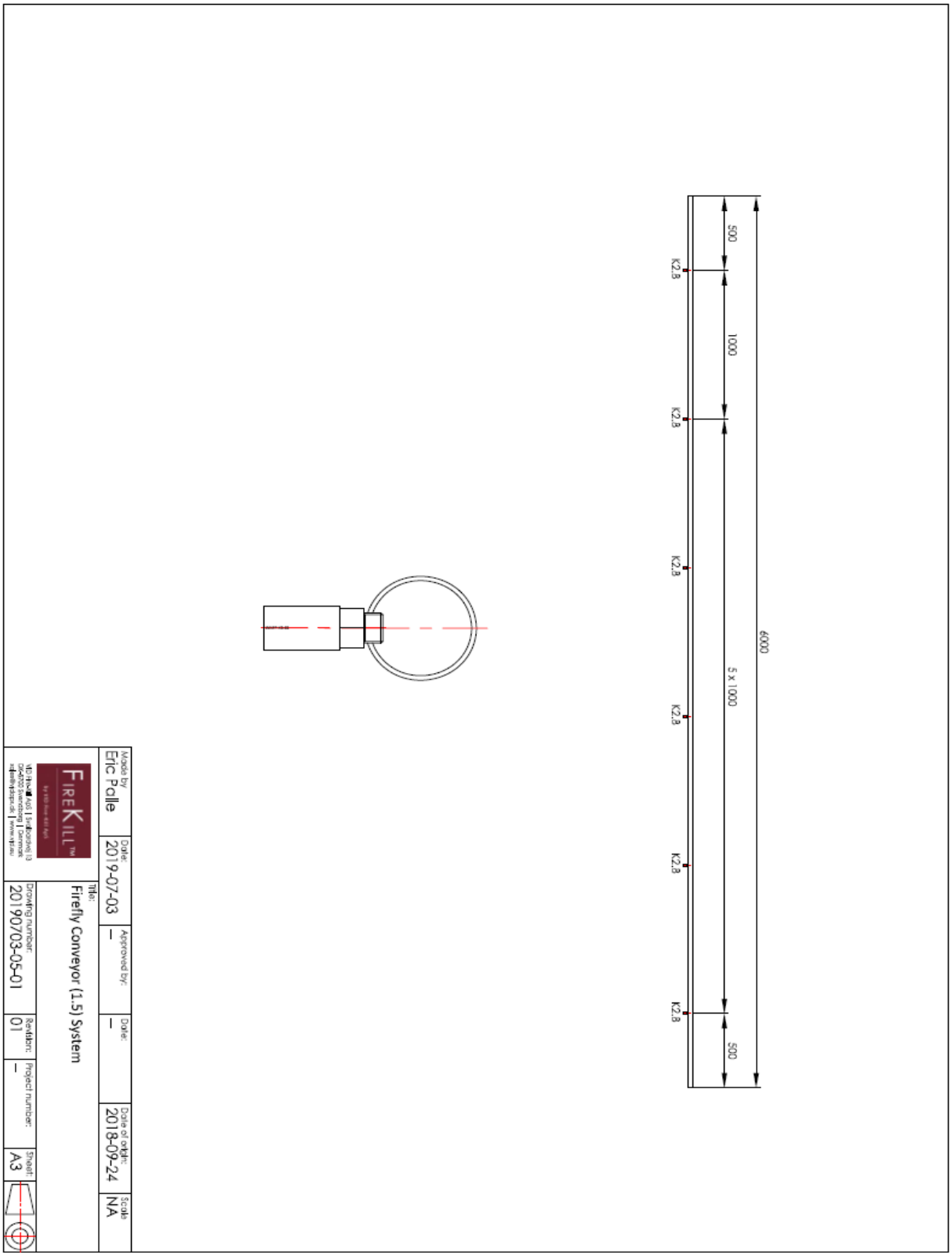
VID Fire Kill ApS
Svalbardvej 13,
DK-5700 Svendborg
Denmark

Phone: +45 62 62 10 24
Fax: +45 62 62 36 61
E-mail: sales@vidaps.dk
Internet: www.vid.eu
Page 1 of 2

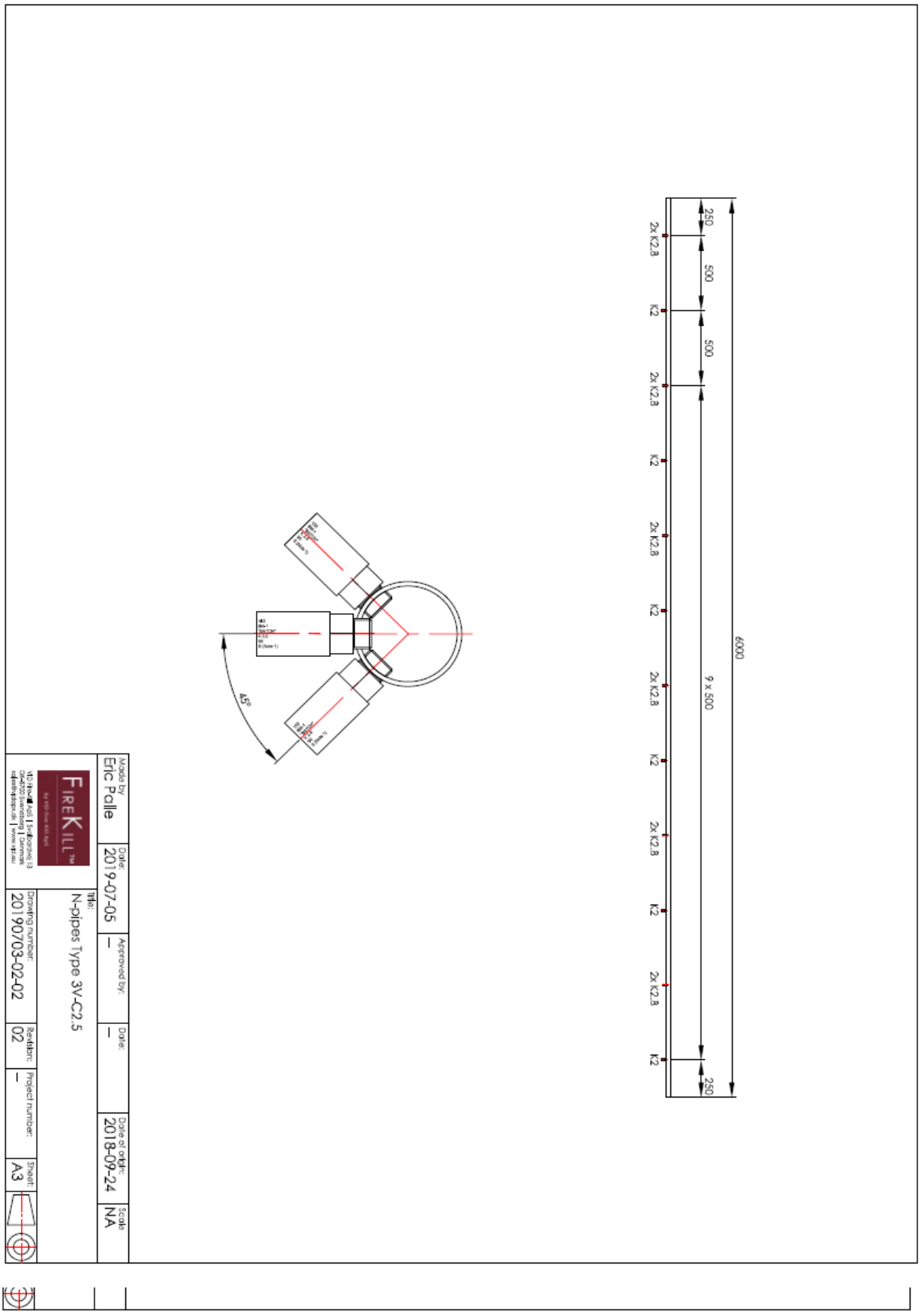
Title: DS Conveyor
No.: 190709-01 DS Conveyor
Rev. 01
Date of first issue: 09-07-2019
Date of revision: 09-07-2019

APPENDIX B.

Fire Kill conveyor (1.5) system

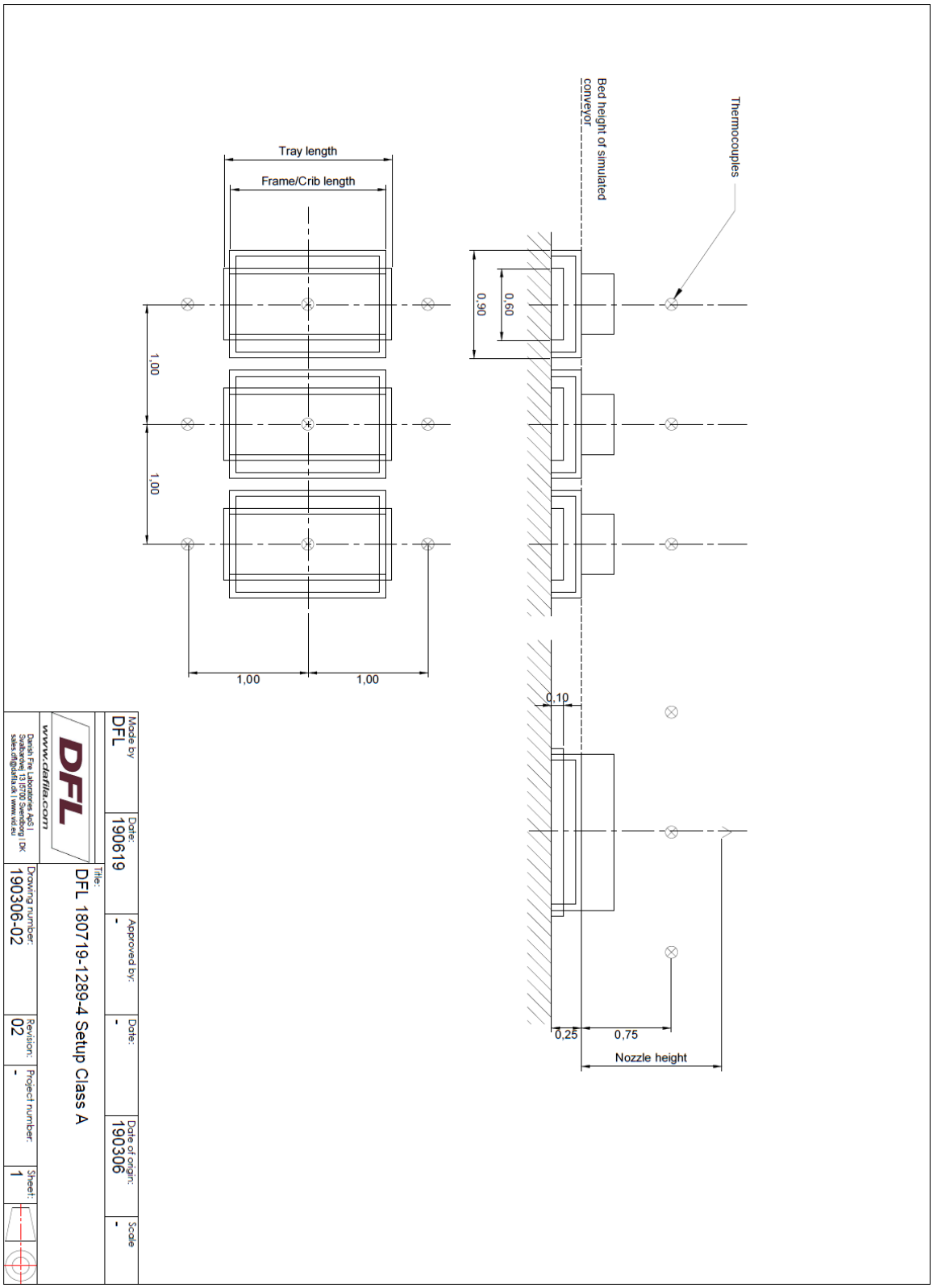


Fire Kill conveyor (2.5) system

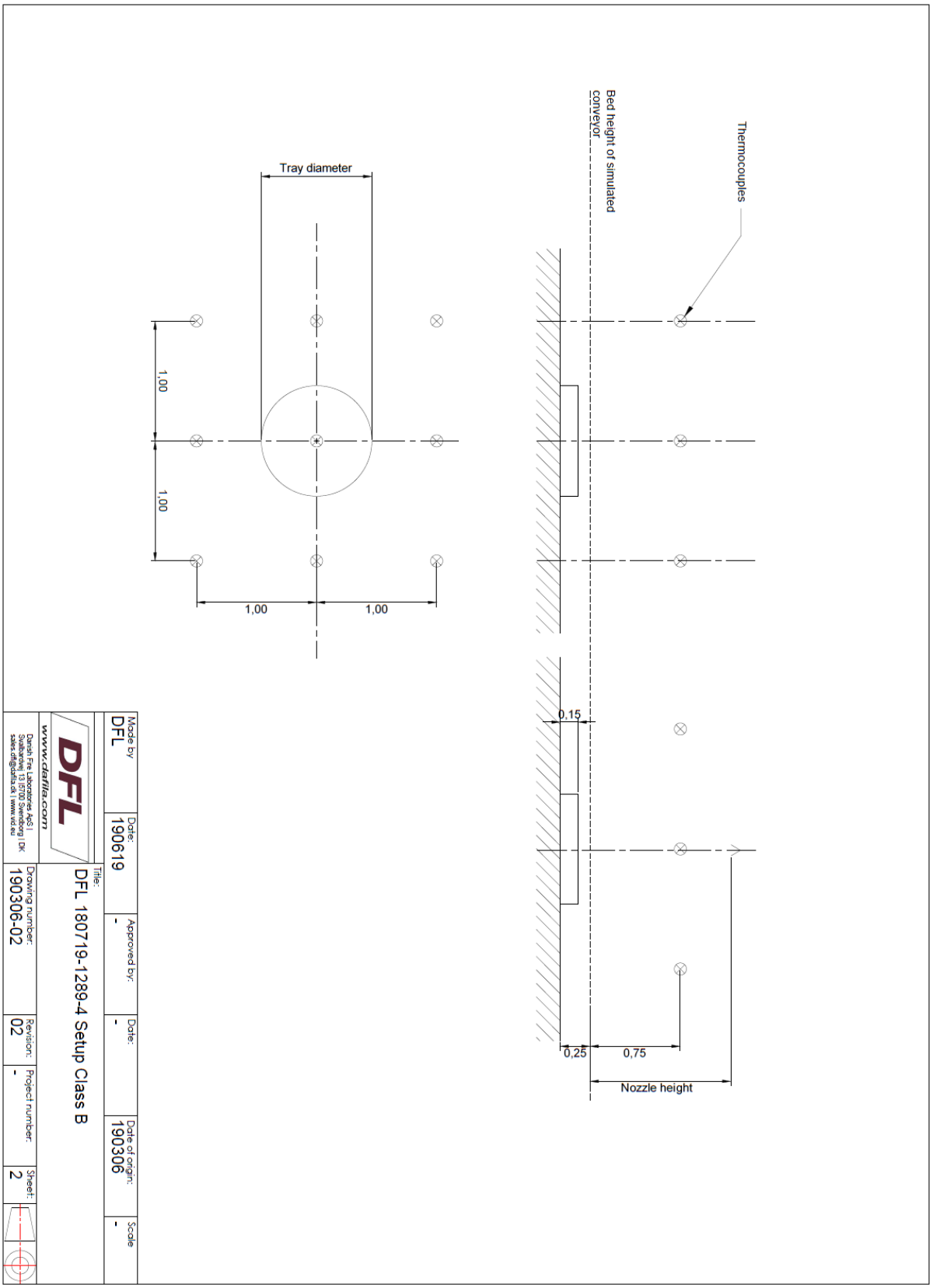


APPENDIX C.

Drawing A4 – Test mock-up and class A fuel package.



Drawing A5 – Test mock-up and class B fuel package.



APPENDIX D.

Calibration certificate for datalogger.

TEKNOLOGISK
INSTITUT
Teknologiparken
Kongsvang Allé 29
Bygning 14
8000 Aarhus C
Tlf. +45 72 20 20 00
info@teknologisk.dk
www.teknologisk.dk

KALIBRERINGSCERTIFIKAT

CERTIFIKATNR.:
200-E-20671

Side 1 af 11
Antal bilag: 0

Rekvirent:	Vid Fire-Kill ApS Ove Andersen Svalbardvej 13 5700 Svendborg			
Emne:	**Datalogger**			
	Fabrikat:	Agilent	Model:	34970A
	Serienr.:	**MY41023317**	Kundemærke:	**DFL-014-M**
	Tilbehør:	2 stk. indstikskort: ID: DFL-016M, S/N: MY41018126 i slot 200 og ID: DFL-017-M S/N: MY41053508 i slot 200		
Periode:	Modtaget:	07-09-2018	Kalibreret:	**07-09-2018**
Procedure:	D1-7.1			
Bemærkninger:	Kanal 106 ikke mulig at kalibrere pga. defekt.			
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:	Javier I. Camacho, 72 20 25 92, jcam@teknologisk.dk			

Godkendt og digitalt signeret 21-09-2018 af:

Jan Nielsen
Cand. Scient

ilac-MRA DANAK
CAL Reg.nr. 200

Dette PDF dokument er kun gyldigt, hvis det er digitalt signeret med OCES digitalsignaturen for Jan Nielsen, Teknologisk Institut.

Calibration certificate for flowmeter.

DANISH TECHNOLOGICAL INSTITUTE
Teknologiparken
Kongsvang Allé 29
Building 14
DK-8000 Aarhus C
Denmark
Phone +45 72 20 20 00
info@dti.dk
www.dti.dk

CALIBRATION CERTIFICATE

CERTIFICATE NO.:
200-F-23671

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

Object: **Flowmeter**

Make:	Siemens	Model:	MAG5100W
Serial No:	**630913T076**	Client mark:	**DFL-013-M**
Range:	0 - 333,33 l/min	Type:	Magnetic Inductive
Output signal:	4 - 20 mA	Diameter:	DN 50
Accessories:	MAG5000 with serialnumber: 336913N096		

Order No.: DFL

Period: Received: 2018-09-18 Calibration date: **2018-09-21**

Procedure: D1-1

Remarks: The flowmeter is calibrated as found.
The flowmeters current output is calibrated.

Conditions: Calibration was carried out in compliance with the guidelines laid down for the Laboratory by DANAK (The Danish Accreditation Fund, www.danak.dk), and in accordance with Danish Technological Institute's General Terms and Conditions regarding Commissioned Work, that was in force at the time of the agreement. The calibration results apply to the objects tested only. This calibration certificate must not be quoted in extract without the prior written permission of the Laboratory.

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

Approved and digitally signed 2018-09-25 by:
Tonni Olsen
Technical Metrologist

CIPM MRA
ilac-MRA
DANAK
CAL Reg.nr. 200

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

Calibration certificate for Pressure transmitter.

TEKNOLOGISK INSTITUT

Teknologiparken
Kongsvang Allé 29
Bygning 14
8000 Aarhus C
Tlf. +45 72 20 20 00
info@teknologisk.dk
www.teknologisk.dk

KALIBRERINGSCERTIFIKAT

CERTIFIKATNR.:
200-P-24599

Rekvirent: DFL Danish Fire Laboratories ApS
Ove Andersen
Svalbardvej 13
5700 Svendborg

Emne: **Tryktransmitter**

Fabrikat:	BD Sensors	Model:	DMP 331
Serienr.:	**10286204**	Kundemærke:	**DFL-122-M**
Område:	0 - 16 bar	Udgangssignal:	4 - 20 mA

Periode: Modtaget: 12-10-2018 Kalibreret: **16-10-2018**

Procedure: D1-3.1

Bemærkninger:

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: Henrik Jørgensen, 72 20 10 61, hejo@teknologisk.dk

Godkendt og digitalt signeret 17-10-2018 af:

Kenn Øholm
Konsulent, tekniker

ilac-MRA DANAK
CAL Reg.nr. 200

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Calibration certificate for Thermocouples type K.

TEKNOLOGISK INSTITUT
Teknologiparken
Kongsvang Allé 29
Bygning 14
8000 Aarhus C
Tlf. +45 72 20 20 00
info@teknologisk.dk
www.teknologisk.dk

KALIBRERINGSCERTIFIKAT

CERTIFIKATNR.:
200-T-22605

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

Emne: **Termoføler, Termotråd**

Fabrikat:	SensyMIC	Serienr.:	**7960117**
Kundemærke:	**120775**	Område:	-200 - +400 °C
Type:	Type K		

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.

ilac-MRA DANAK
CAL Reg.nr. 200

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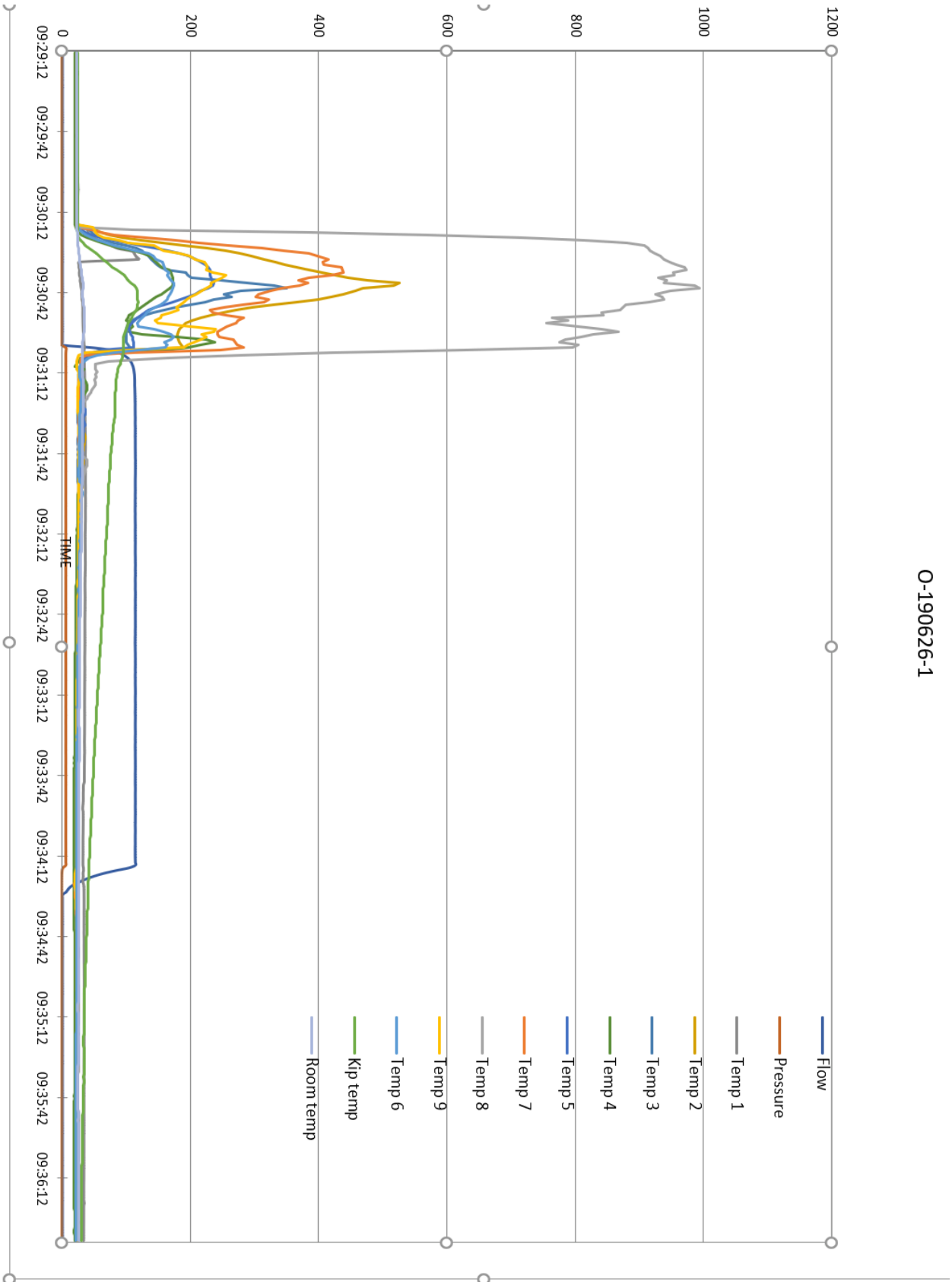
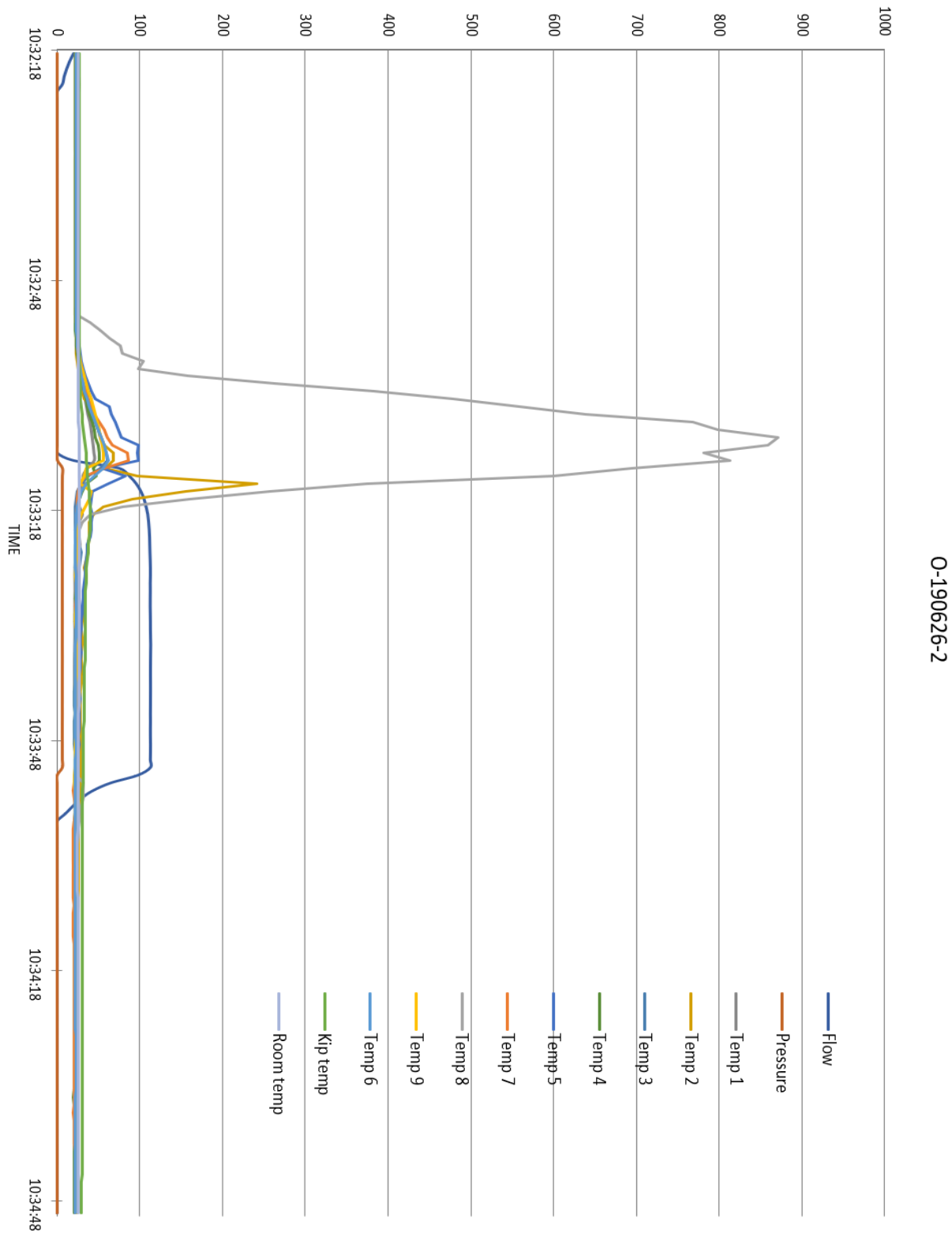
APPENDIX A.

Temperature curves.

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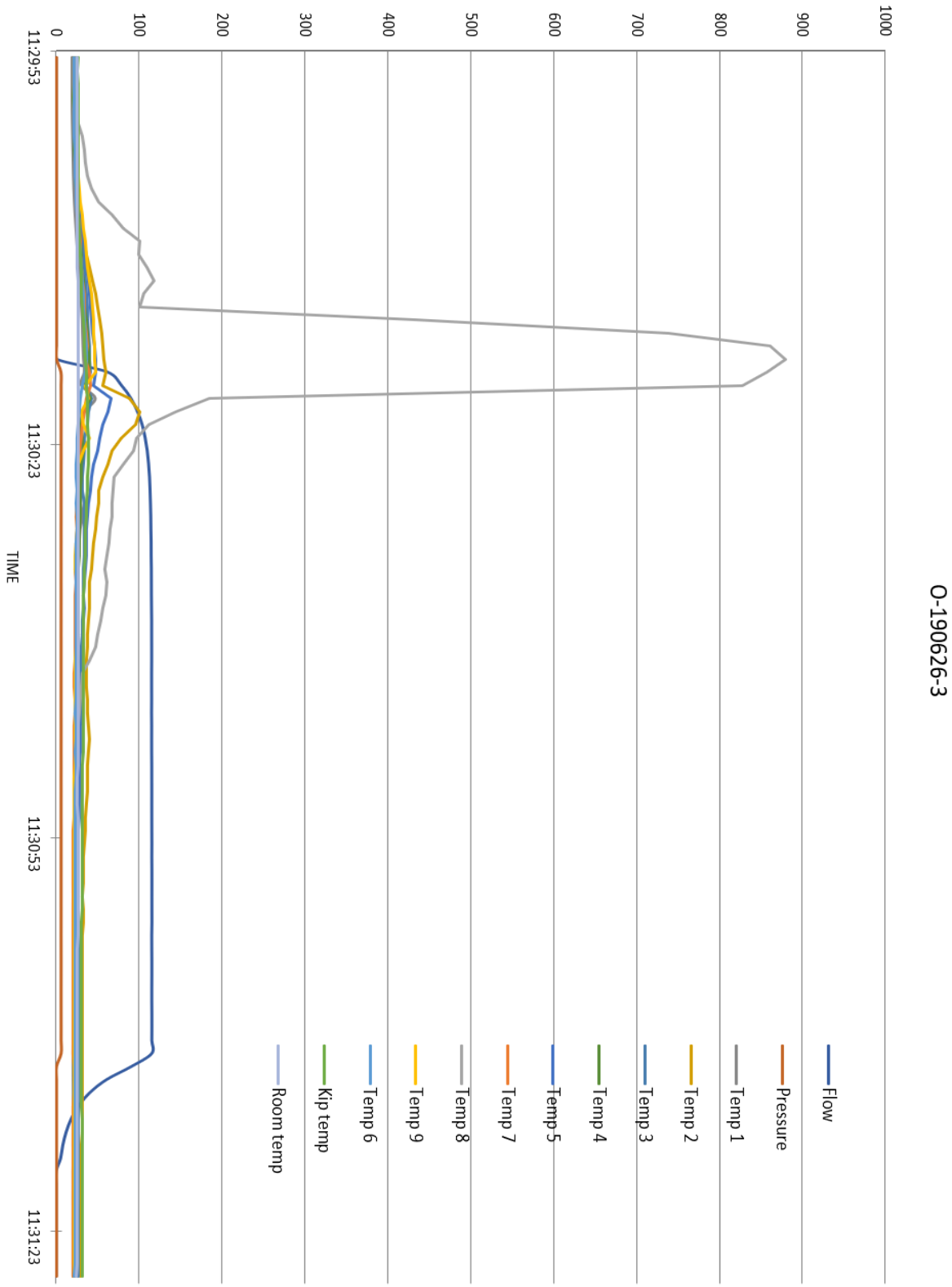
Temp 2
Temp 3
Temp 4
Temp 5
Temp 7
Temp 8
Temp 9
Temp 6
Kip temp
Room temp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Temp 3
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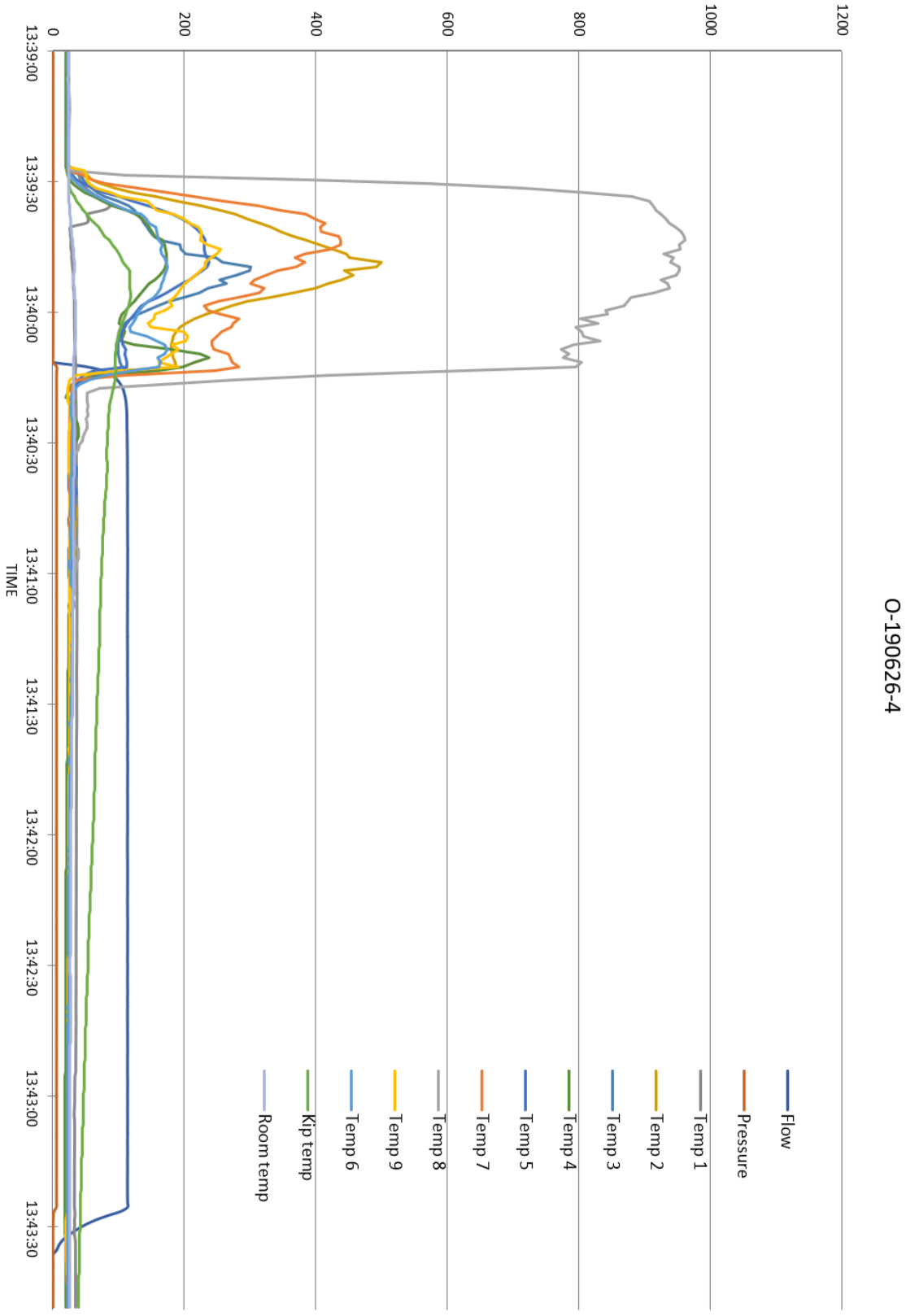
Temp 6
Kip temp
Room temp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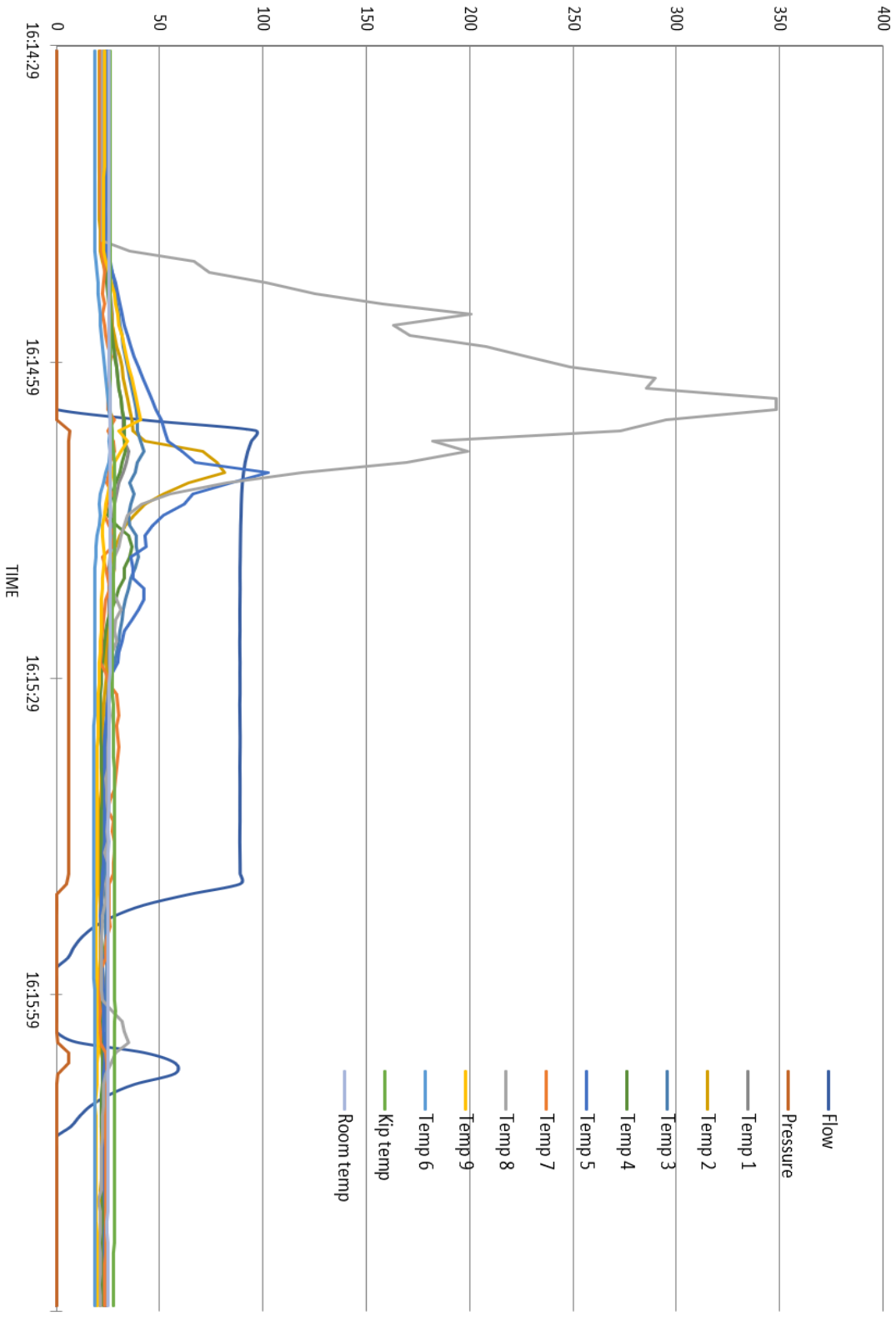
Kip temp
Room temp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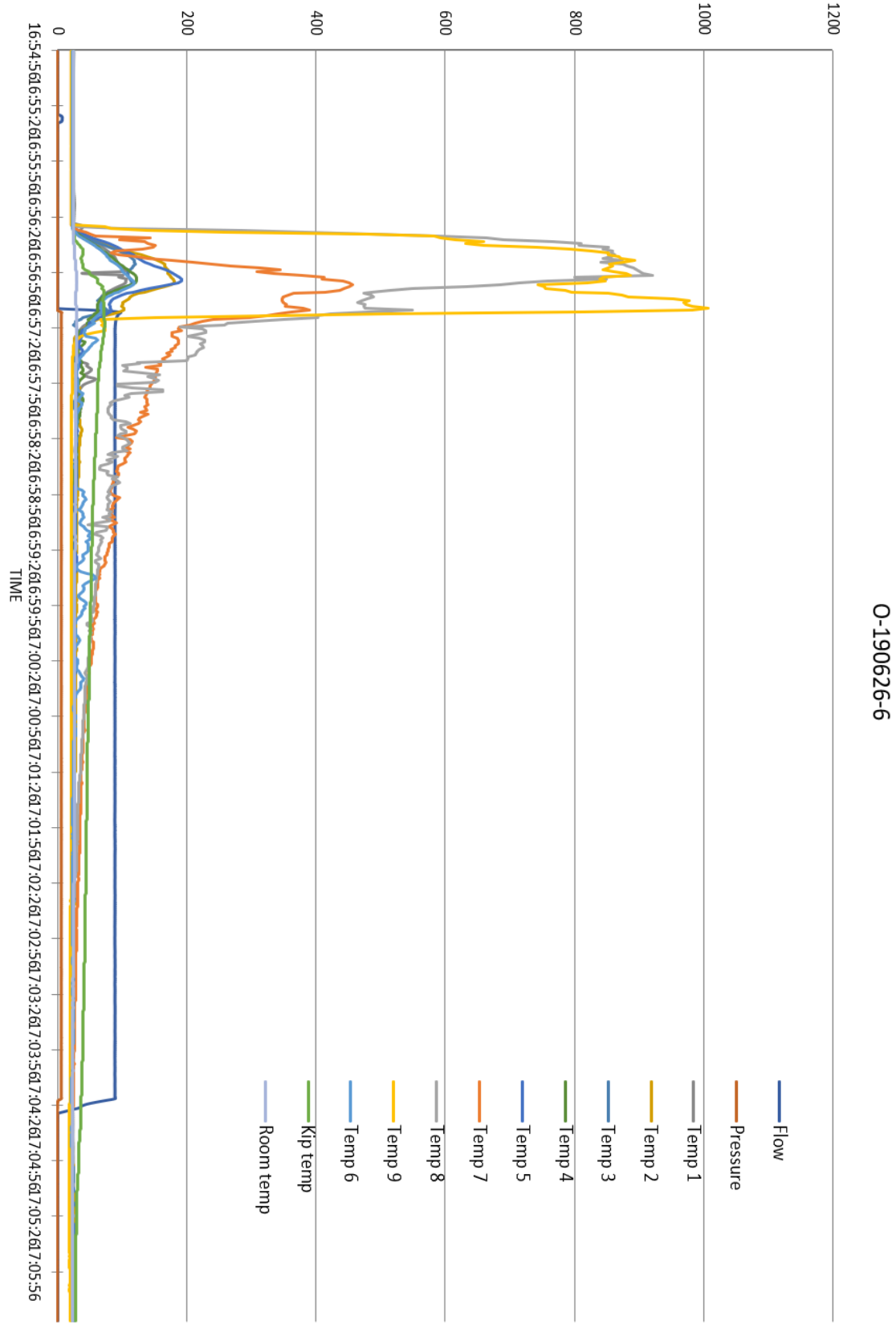
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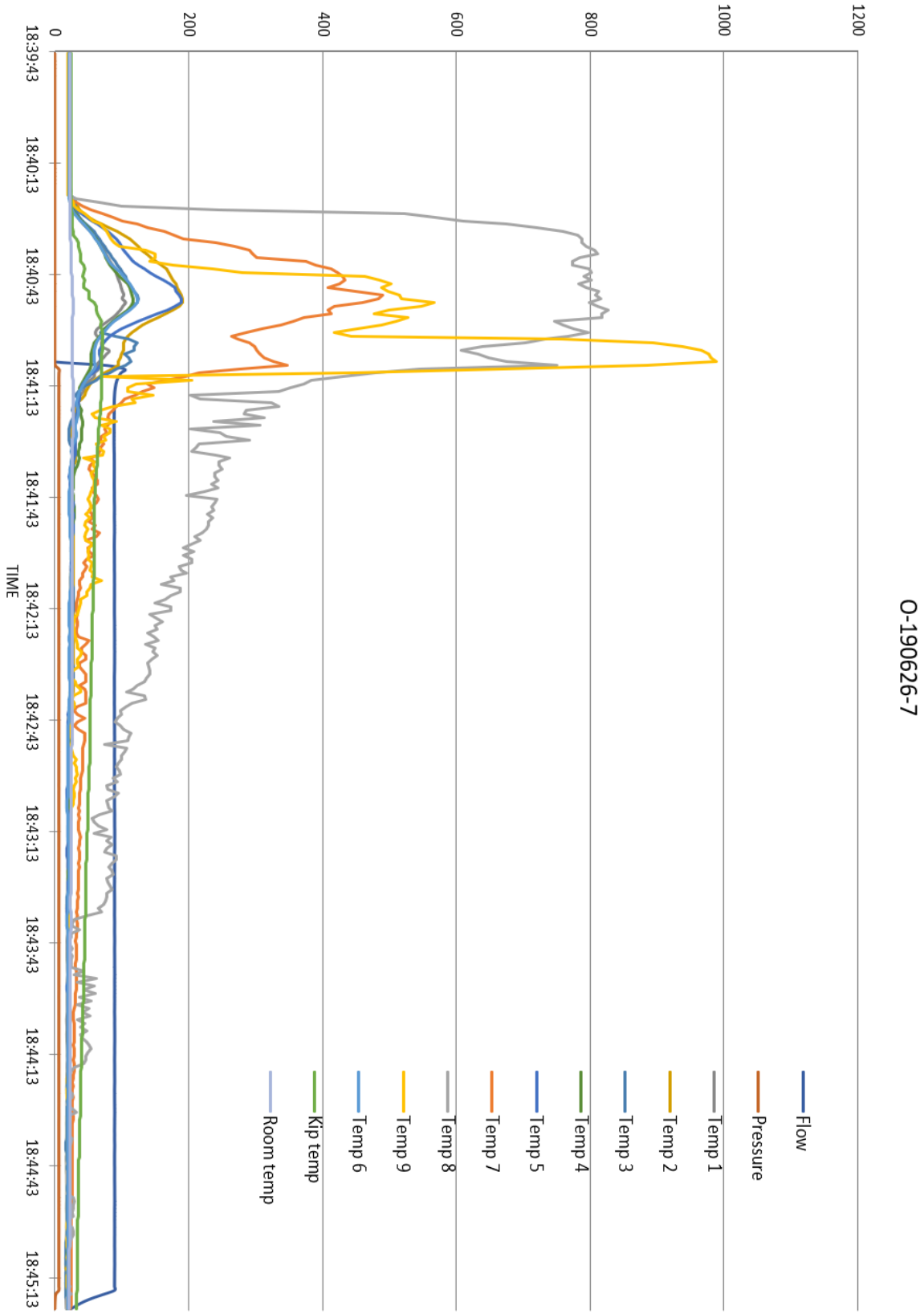
Room temp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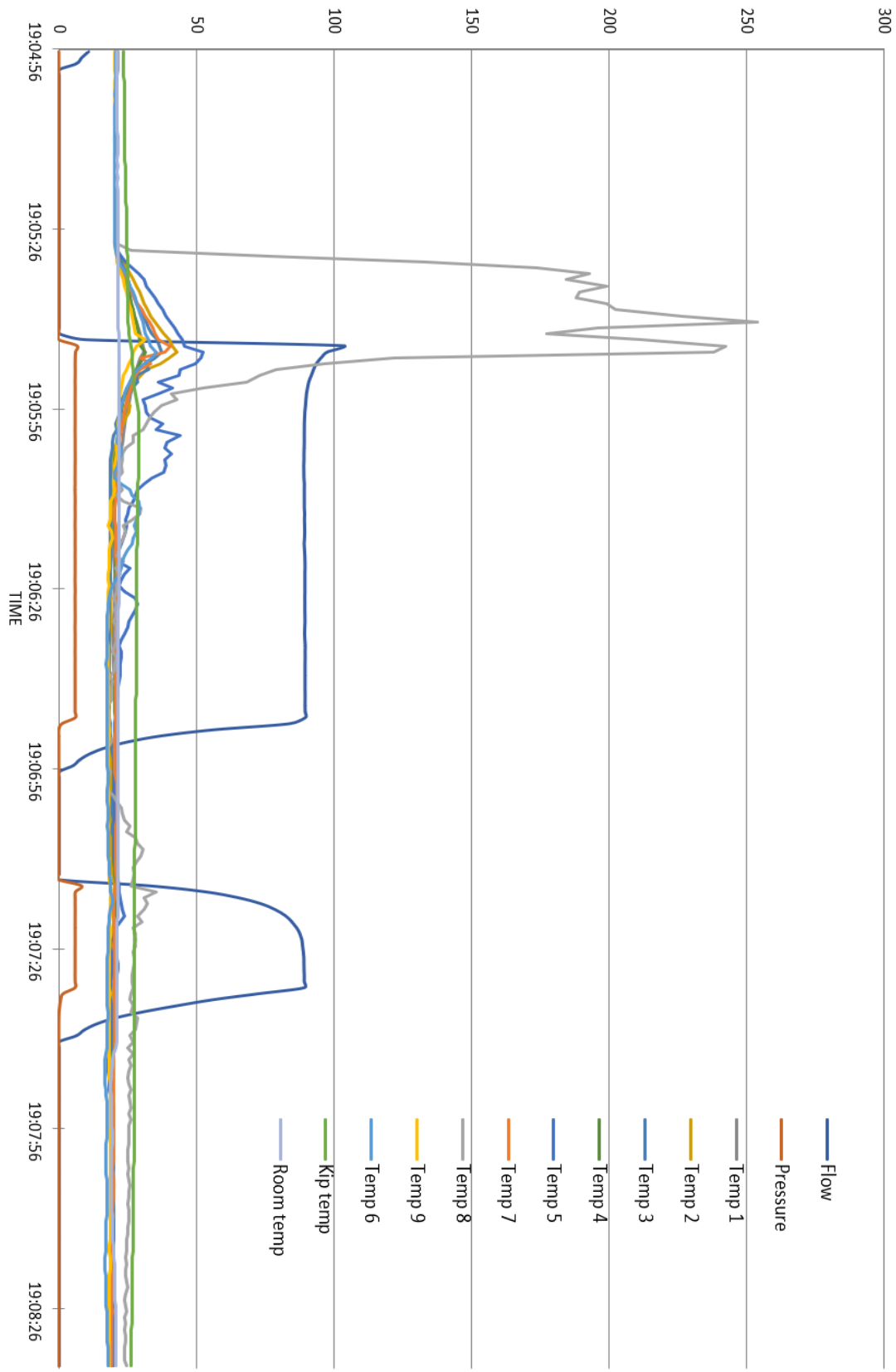
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TIME
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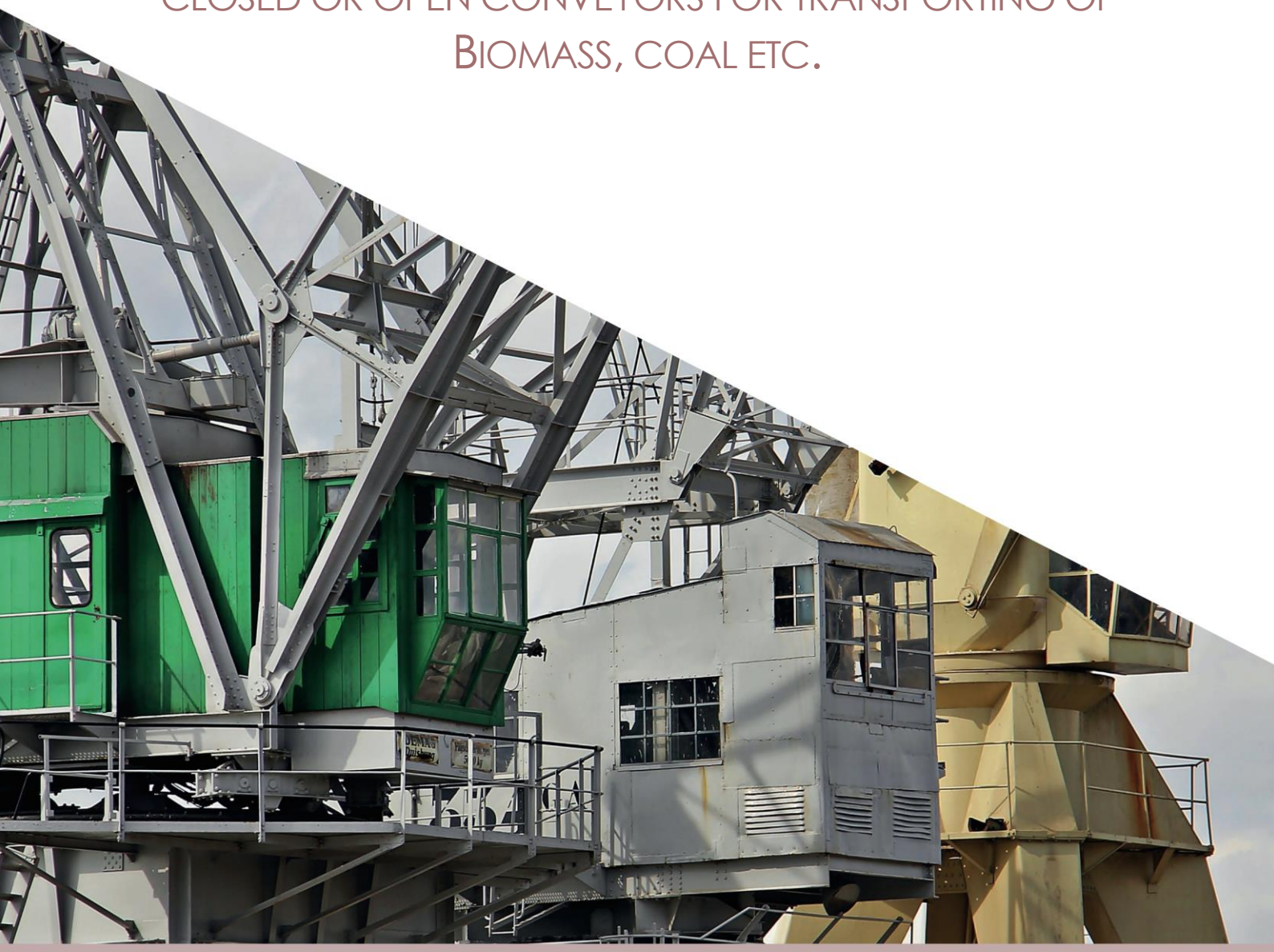
Pressure
Temp 1
Temp 2
Temp 3
Temp 4
Temp 5
Temp 7
Temp 8
Temp 9
Temp 6
Kip temp
Room temp

FireKill™

by VID Fire-Kill ApS

Fire-Kill™ Model N-pipe Conveyor Protection System Type I-C 1,5 and 3V-C 2,5 Design, Installation, Operation and Maintenance (DIOM) Manual for the protection of closed, semi-closed or open conveyors for transporting of Biomass, coal etc.



MORE THAN JUST FIRE PROTECTION

AMENDMENT INCORPORATION RECORD		
Amendment number / Date	**Brief Description on Content**	**Name of Person Incorporating Amendment**
01 / 2019-07-17	Issued for information	L. Elsrud

TABLE OF CONTENT

Foreword

This manual has been created with the purpose of educating designers, installers, maintenance inspectors and other personnel in the use and installation of the VID Fire-Kill Model N-pipe Conveyor Protection System (in the following called type I-C 1,5 and 3V-C 2,5), the connected hydraulic system and related VID Fire-Kill Products. It is therefore recommended that any persons in contact with Model type I-C 1,5 and 3V-C 2,5, to read the following manual with the goal of understanding the operations and requirements of the system before proceeding with designing, installing or inspecting the system.

This manual may be subject to change, it is therefore recommended that eventual users of Model N-pipe type I-C 1,5 and 3V-C 2,5 systems keep themselves updated on the matter regarding the system to ensure that it is installed correctly. The newest version/revision of this document may be found on the VID Fire-Kill website, www.vid.eu

Should any queries arise, VID Fire-Kill welcomes readers to contact the company headquarters. Concerns and corrections regarding this manual or any other documents, products or services of which VID Fire-Kill provides are welcome as well. VID Fire-Kill's contact information can be found at the bottom of this page as well as on the website, www.vid.eu

It shall be noted that VID Fire-Kill will not be accountable for any mistyping or spelling errors.

1 General Description

The VID Fire-Kill low pressure, fine water spray deluge system Model N-pipe type I-C 1,5 and 3V-C 2,5 was created for the protection of closed, semi-closed and open conveyor belts. This DIOM covers the use of Model N-pipe type I-C 1,5 and 3V-C 2,5, as described above, for transporting Biomass, pellets, coal etc.

The Model N-pipe type I-C 1,5 and 3V-C 2,5 has been designed with a zoned approach in mind, which lowers the time required when designing and installing the system and makes it easier to incorporate into existing locations. To further ease installation, the systems utilize Model N-Pipe type I-C 1,5 and 3V-C 2,5 of ordinarily 6 m in length. Each 6 m length of N-pipe is fitted with 6 or 18 low pressure fine water spray nozzles (BM-1 nozzles) designed specifically for the location size. If needed other configurations with more nozzles can be manufactured.

Model N-pipe type I-C 1,5 and 3V-C 2,5 systems are installed in one rows, covering the entire conveyor in its whole width and length, either in a total flooding design, where the pipes are connected to the same riser pipe, or in zones where each zone of n-pipe is connected to a zone deluge valve. Parallel pipes can be installed when the width of the conveyor exceeds the dimensions tested.

2 Applications and Risk Areas

Application	Typical fire load
Closed, semi-closed or open conveyors covered by a single row of N-pipes	Biomass, wood pellets, coal, ore, waste from households etc.

3 Test method and acceptance.

Test Method	Acceptance
DFL TM 180719-1289-4	Tested in ISO 17025 accredited test lab and with 3. Party witness.
DFL test method no. 190307-1276-1	Test protocol for flame detectors to be used with nozzles tested to DFL test method 180719-1289-3
*Test method in accordance with Pr/EN 14972	

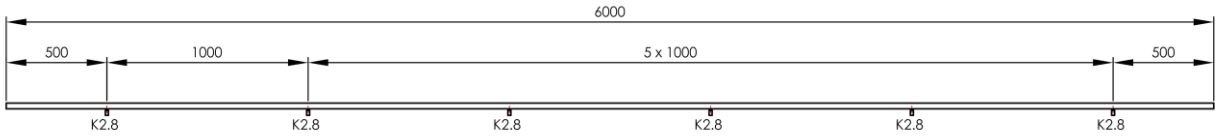
4 SPECIFIC SYSTEM DESCRIPTION

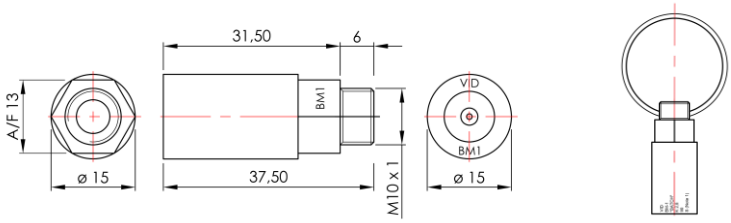
4.1 MODEL N-PIPE TYPE CPS USED IN TOTAL FLOODING DESIGN

Design type	One or multiple strings of N-pipe Type I-C 1.5 or 3V-C 2.5 covering the entire length and width of the conveyor, with a maximum nozzle spacing of 1,0 with type I-C 1.5 and 0.5m with type 3V-C 2.5
System components:	Supplied in 2 versions, described underneath. 1 x N-pipe with 6/18. The pipe is predrilled with M10x1mm inserts female thread. N-pipe to be made in Ø28, Ø35, Ø42 or Ø54 mm stainless steel press pipe.
Materials – Pipes:	Stainless Steel 316L
Materials - Nozzle:	Stainless Steel 316L or 304
Water Pressure:	6 - 16 bar

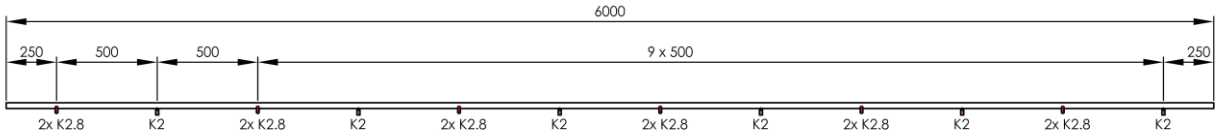
Description	Conveyor width max 1,50 m	Conveyor width max 2,50 m
N-Pipe type	1-C 1,5	3V-C 2.5
Number and type of nozzles:	6 x Kv 2,8	12 x Kv 2,8 / 6 x Kv 2
K-Factor 6 m pipe:	16,8 (l/min@1bar)	45,6 (l/min@1bar)
Nominal Flow-rate:	41,2 (l/min)	111,6 (l/min)
Spacing – nozzle	1m	0,5m
Water Density	4,5 mm/min	7,4 mm/min
Max width of conveyor (NOTE 1)	1,50 m	2,50 m
Max. height above object:	1,50 m	1,50 m
Min. height above object:	1,00 m	1,00 m
Design area:	Whole width. Long conveyors may be divided into zones	
Recommended min operation time:	30 min.	
Additives:	None	
Other requirements:	Only 1 row of N-pipe can be used for this combination. It's recommended, in case of fire, to shut down the conveyor, release the zone where fire is detected and its two neighbor zones.	
NOTE 1	If the conveyor is wider multiple parallel pipes can be installed.	

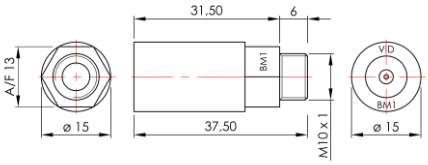
4.1.1 N-Pipe type I-C 1,5

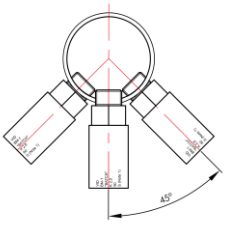




4.1.2 N-Pipe Type 3V-C 2,5







4.2 MODEL N-PIPE TYPE I-C 1,5 AND 3V-C 2,5 USED IN ZONED DELUGE SYSTEM DESIGN

Design type	Zoned deluge system, where each zone consists of x numbers of N-pipes, each with an addressable fire detector corresponding with the zone control valve.
System components for a pipe covering x m zone:	Required N-Pipe type I-C 1,5 or Type 3V-C 2,5 depending on the size of the conveyor. One Model C-EL Control Valve.
Zone size:	Basically, the size depends on the hydraulic calculations and water consumption. It's recommended, in case of fire, to shut down the conveyor, activate the zone where fire is detected and its two neighbor zones (See 5.1).
Materials – Pipes:	Stainless Steel 316L
Materials - Nozzle:	Stainless Steel 316L or 304
Water Pressure:	6 - 16 bar

4.3 RELATED PRODUCTS

4.3.1 Model Deflametec

Robust and reliable flame detector able to detect the light radiated specifically from carbon oxidation. Applicable in on-shore, maritime and off-shore applications, the Model Deflametec has been found to be highly applicable in a multitude of applications and locations and is used for both indoor and outdoor fire-detection at short and long range alike. When used for conveyor detection, maximum spacing is 18 meter and maximum speed of the conveyor is 4 m/sec. These values have been determined through tests conducted on the Deflametec to DFL test method 190307-1276-1

See Model Deflametec on www.vid.eu

4.3.2 Model C-EL Control Valves

An electrically operated control valve designed primarily to operate deluge systems. Robust, reliable and easy to maintain as the valve can easily be disassembled from the system and is capable of functioning in highly corrosive environments as all exposed parts are in AISI 316L stainless steel.

See Model C-EL datasheet on www.vid.eu

4.3.3 Model F Filter

The 1000 µm (ASTM E11-87 mesh 50) Model F Filter with differential pressure gauge and switch is supplied with visual and electronic indication measuring the differential pressure between the inlet and the outlet. This will indicate if the strainer must be removed for maintenance. The strainer shall be installed between two DIN PN16 flanges and is capable of functioning in highly corrosive environments as all exposed parts are in AISI 316L stainless steel.

See Model C-EL datasheet on www.vid.eu

5 DESIGN

The system shall be designed in accordance with the applicable standards, to the requirements of the authorities having jurisdiction, and to the guidelines of this manual and to the standards applicable regarding the additional products used.

The system shall not be installed in locations containing materials which may produce violent reactions or significantly hazardous materials when reacting with water and should be installed in locations where it is not likely to sustain physical damage.

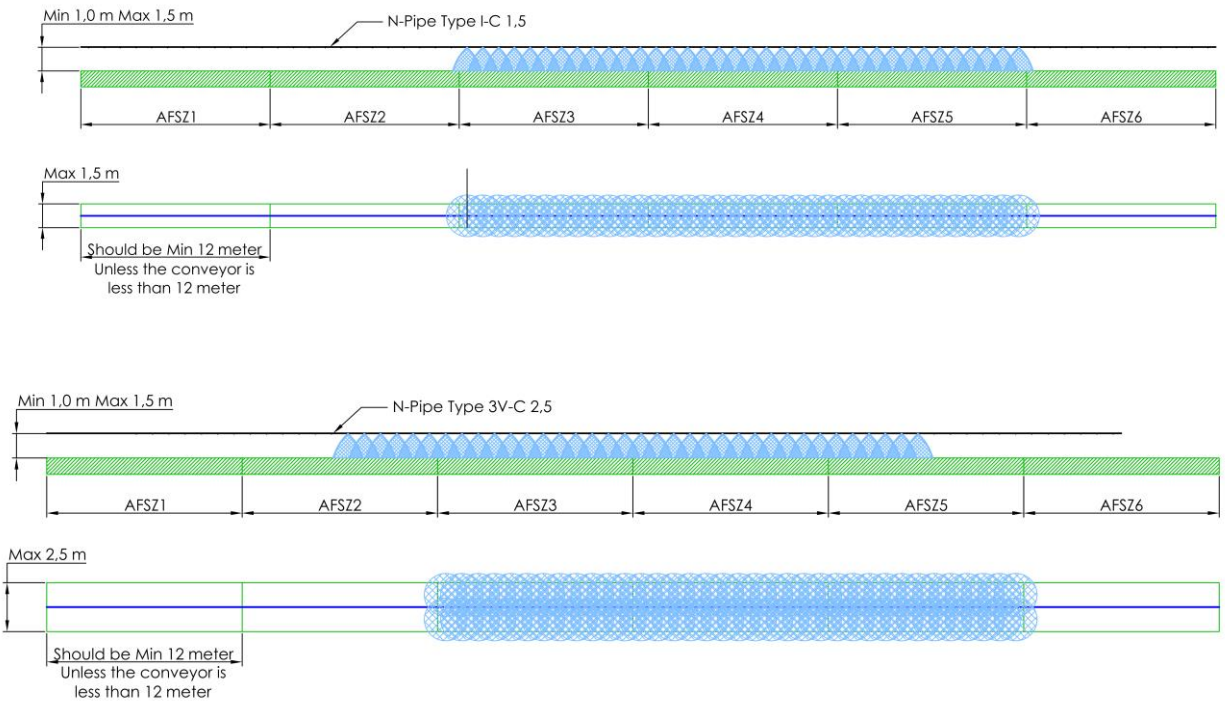
The system shall be designed in accordance with each components requirement and every aspect of the surrounding environment shall be considered in regard to each component.

5.1 DESIGNING THE SYSTEM

When designing the system, system designers can divide the location into several smaller zones if needed, so called Area Fire Zones (AFZ). Each AFZ shall be designed to employ its own means of fire-detection, its own means of distributing fine water spray and its own means of directing water at the correct pressure and flow from the main water-pipe to the N-Pipes and employed nozzles.

As earlier mentioned, its recommend activating 3 zones in the event of fire, unless conditions like natural ventilation slope of conveyor etc. indicates that eventual fire only will spread in one direction. In that case activating 2 zones might be sufficient. The minimum zone size recommended is 12m.

AFZ1-AFZ2-AFZ3-AFZ4-AFZ5-AFZ6



Above we have 6 zones installed after each other. If fire is detected in AFZ4 (fire), the procedure would be to shut down the conveyor and activate AFZ4 (activated zone) + AFZ3 and AFZ5 being neighbor zones.

This means that each AFZ shall contain its own means of fire-detection, enough Model N-pipe conveyor Protection to cover the zone, its own branch of the main water-pipes and its own set of control valves.

5.1.1 Fire detection

To minimize the risk of false detection of fires and therefore false actuations, the overall system shall employ its own system for fire-detection, which shall regulate each AFZs means of fire-detection. The fire detection should be tested to DFL test method no. 190307-1276-1. This ensures that the system will be able to localize the fire and suppress it. The cause of action following a fire detected shall stop the conveyor and activate the fire suppression system. The test carried out in accordance with the protocol shall determine maximum distance between the detectors and maximum speed of the conveyor.

5.1.2 Design general

Each component in each AFZ and components not directly affiliated with an AFZ (pumps, main water-supply pipes etc.) shall be in accordance with the presiding regulations and requirements required by the applicable component and system manuals, standards and by the authorities and classes having jurisdiction.

5.2 OBSTRUCTIONS

Care shall be given when deciding significance of obstructions.

Major obstructions shall be defined as structures or objects which significantly hinders the system's ability to disperse fine water spray within the area of operation or of which hinders the system from protecting a critical portion of the location.

If the location houses one or more major obstructions, additional nozzles shall be installed adjacent to the mentioned obstruction(s). If it is not possible to protect the area underneath or next to the obstruction through adjacent nozzles, additional nozzles shall be installed beneath the obstruction.

5.3 VENTILATION

For the system to be as efficient as possible, air circulation shall be at a minimum in the protected area once the system has been actuated. It is therefore strongly recommended that any forced ventilation be automatically turned off once the system has been activated if the system is Type I-K1.

5.4 GENERAL SYSTEM DESIGN

The system shall be designed in accordance with the requirements and regulations given by the authority having jurisdiction as well as the applicable standards, such as:

- Pr/EN 14972
- NFPA 750
- Etc.

The system shall be capable of supplying all the nozzles in the most demanding area of the system with, at the least, the minimum requirements to pressure and flow in the required period stated in the applicable standards.

When designing the fire protection system, it is important that functionality and ease of maintenance is considered. The systems shall be both reliable and robust, created in materials limiting component corrosion, and shall be securely installed, through approved means, onto/into solid, sturdy constructions, as to prohibit movement of otherwise static components and parts making up the fire protection system. Hydraulic calculations shall tell whether the system is able to supply the needed water flow and water pressure to the nozzles in the most demanding area for the required period stated in the applicable standards.

Notice: The water-supply and pump system shall be installed away from any hazardous areas and shall not utilize pressurized gasses in its actuation process and all electrical connections shall be surveyed.

5.4.1 Calculations

All calculations shall be in accordance with the applicable standards for watermist.

5.4.1.1 Flow Calculations

Calculating water-flow requires the k-factor and the working pressure of the employed nozzle. The equation used to calculate the system water-flow is the following:

$q = K \sqrt{p}$

In which:

q is the flow rate (l/min)
p is the minimum working pressure of the nozzle.
K is the k-factor

5.4.1.2 Pressure-Loss Calculations

The system shall undergo hydraulic pressure-loss calculations calculating the pressure-loss between the most demanding area of the system to the water supply and pump units.

Calculating water-flow shall be done through the use of the Hazen-Williams equation. Should the system pressure exceed 12 bar the Darcy-Weisbach equation shall be substitute the Hazen-Williams equation.

The Hazen Williams equation is as follows:

$V = k \circ C \circ R0.63 \circ S0.54$

In which:

V is the velocity of the water,
k is a constant (k = 0.849 when using SI units),
R is the radius of the pipes,
S is the rate of pressure loss,
C is dependent on the material used for piping and components.

The Darcy-Weisbach equation is as follows:

$\Delta p = fD \circ L/D \circ \rho V2/2$

In which:
Δp is the pressure loss,
L is the length of the pipe system,
D is the diameter of the pipes,
ρ is the density of the fluid,
V is the velocity of the fluid,
fD is the Darcy Friction Factor, describing the turbulent flow in the system.

5.4.1.3 Water Supply Calculations

The system shall have a water supply capable of supplying the system during a theoretical or improbable worst case scenario. Theoretical or improbable worst case scenarios involve actuation of multiple AFZs and vary between designs.

Since minimum 2 or 3 zones are recommended to release, the minimum design area for the Model N-pipe Conveyor protection is number x lengths of zones activated.

The system water supply shall be designed to supply the design area with water for a minimum of 60 min.

5.4.2 Water Quality

As with the rest of the system, the quality of the water is the responsibility of the designers and installation managers. The water-supply shall consist of clean, sweet, potable water, free from impurities, salts and chlorides etc. which may cause clogging of filters and nozzles or corrosion in system components. The water shall contain no foreign bodies greater than 1mm in diameter.

The system is not to utilize additives.

5.4.3 Filtration of water.

The system shall utilize approved high capacity strainers with a mesh size no greater than 1.5mm when placed between the system and the nozzle. No impurities larger than 1mm shall be allowed in the system. Strainers shall be placed in accessible areas for inspection, maintenance and general cleaning purposes.

Strainer capacities shall be determined by the water quality, flow and amount that will be needed to sustain the amount of nozzles in the location for, at the least, the required amount of time.

5.4.4 System Specifications.

The system components shall be tested and approved in accordance with the applicable standards and shall be approved by the authorities and classes having jurisdiction.

As many low pressure fine water spray systems have the same basic requirements as contemporary sprinkler systems and deluge systems, often the same system set-ups can be used for both systems.

Pipes and system components shall, as a minimum, be able to withstand an internal pressure equal to 1.5 times or greater than the maximum working pressure of the nozzle and shall be able to supply the required amount of water at the required pressure to the most demanding area of the system for the required period stated in the applicable standards.

Electrical installations regarding pumps and the surveillance of the fire protection system are to be compliant with the presiding regulations concerning sprinkler systems utilizing pumps and surveillance systems in equivalent locations with equivalent risk classes.

5.4.5 Materials

The fire protection system shall not consist of material combinations with risks of causing galvanic corrosion in system components. It is advised that the system utilize

components in stainless steel, AISI 304 or AISI 316 or copper alloys to minimize the risks of corrosion and clogging of components.

It is prohibited to use components with black iron, hot galvanized or electro galvanized parts, due to risks of corrosion and loose zinc flakes in the system.

6 INSTALLATION.

Notice: VID Fire-Kill offers installation/inspection managers, designers and other such personnel a course in which they will be trained to correctly install and/or inspect the system. For more on the course see section 9 of this manual.

6.1 SYSTEM INSTALLATION.

Upon arrival, the systems and other components shall be subjected to a thorough visual inspection. Should the original packaging appear to have been breached, dented or in any way harmed or compromised, the compromised package(s) shall be returned to VID Fire-Kill. No components of which have been deemed compromised shall be installed into the system but shall be returned to VID Fire-Kill.

The components shall be checked that they live up to the specifications listed in the system plans and to the requirements listed in this manual. When handling the components and pipes the handler shall be cautious not to compromise the components by dropping, bumping or otherwise physically damaging the components and great caution shall be paid not to let the pipes or other components come into contact with materials of which may compromise the aforementioned components.

The components and pipes shall be cleaned/flushed from debris, shavings and impurities and welded items shall be cleaned, leaving no loose debris within the components. Great care shall be given to properly seal every hydraulic connection. VID Fire-Kill recommends using PTFE sealant tape for sealing threaded connections. VID Fire-Kill further recommends using Loctite or other such products, accepted and approved by the authorities and classes having jurisdiction and of which will not compromise the system, for sealing connections between N-Pipes and system nozzles. The installer shall be cautious not to get sealant into the system, and, when refitting threaded components, to remove all old sealant from threaded elements of the part before installing the new components.

It should be checked extensively that the components are positioned correctly according to the system plans and specifications and in accordance with this manual and appropriate standards.

All components shall be securely fastened to rigid robust structures by approved means and shall be installed slanted, making it possible to drain the system if the need should arise.

When installing N-Pipes every hydraulic connection, dry-pipe connections included, are to be properly sealed.

Once the N-pipes have been installed, the system shall undergo a hydrostatic test in which the wet parts of the system is filled with water and pressure corresponding to the employed nozzles pressure parameters is applied to the system. The pressure tests shall

minimum be done with 1.5 times working pressure for a minimum of 10 min. It is strongly advised that the N-Pipes be included in this hydrostatic test. This requires threaded N-Pipe plugs, which can be acquired by contacting VID Fire-Kill. Sufficient means of relieving the system of water without compromising the location or connected locations should be installed before the hydrostatic test is conducted. Should any leakages of the fire protection system occur, the leakages shall be repaired and the test shall be rerun. If no occurrence of leakage takes place within two hours, without pressure fails, the system can be considered functional. Because of the systems use of multiple nozzles, the installer shall be very cautious to how the nozzles are installed into the N-Pipe, see more in Annex B.

After the N-Pipes have been successfully installed and tested, the nozzles are to be installed into the N-Pipes. Hydraulic connections between N-Pipes and nozzles shall be properly sealed

Notice: The batch number and location of systems shall be documented and archived.

7 MAINTENANCE AND SERVICING.

The N-Pipes and nozzles shall regularly be checked for damages and obstructions of system and nozzle filters and strainers and nozzle apertures.

Maintenance, inspection and servicing shall be conducted in accordance with the applicable manuals, datasheets, and standards and in accordance with the authorities and classes having jurisdiction.

Notice: Nozzles which have been damaged shall be returned to VID Fire-Kill for refurbishing.

7.1 INSPECTION AND MAINTENANCE OF N-PIPES.

N-Pipes shall be visually inspected at least once a year, which can be done in conjunction with the annual nozzle inspections.

The N-Pipes shall be cleaned regularly to limit interference of the nozzles water outlets.

7.2 INSPECTION AND MAINTENANCE OF NOZZLES.

The nozzles, strainers and filters included, shall be cleaned regularly to limit interference of the nozzles water outlets.

Inspection and Maintenance of System

The system shall be inspected, maintained and tested in accordance with the given components manufacturer's descriptions on the subject and relevant standards.

The wet system is to be flushed, tested at 2.8 bar for 24 hours and have the strainers cleaned or replaced. Any leakages, during the 24 h pressure test, that results in a loss of 0.1 bar or more shall be repaired.

Water supplies shall be regularly inspected and, if necessary, maintained in accordance with NFPA 25. If the system utilizes a water reservoir, the reservoir shall be emptied, cleaned and refilled in accordance with the applicable standards.

7.3 MAINTENANCE OF SURROUNDING AREAS.

Should the area surrounding the nozzles and/or N-Pipes need to be maintained, it is important to protect the nozzles and N-Pipes from any damage or from getting in contact with compromising chemicals (including cleaning fluid, paint etc.) or fairly dirty water as it can lead to clogging or obstructions of the nozzles water outlet.

8 POST-DISCHARGE RESTORATION

After system activation, the water-supply system and fire-protection system shall be the object of several restorative procedures before it can be considered operational. The fire-zone is not to be considered protected after system discharge and until the below mentioned procedures have been successfully conducted and the system has been restored correctly and in accordance with this manual.

A multitude of the procedures and requirements required after system activation has been described in the previous sections of this manual. System restoration shall therefore be in accordance with this section of the manual as well as any other section of named manual.

8.1 RESTORATION PROCEDURES

The following procedures are to be conducted when restoring the fire-protection system.

All system nozzles shall be inspected and have their strainers cleaned or replaced depending on the degree of obstruction of the filter. Should any uncertainty arise regarding the nozzles capacity, VID Fire-Kill shall be contacted.

All system components shall be inspected in accordance with their respective manuals and standards and shall be maintained and serviced in accordance with the applicable manuals and standards as to restore them to a satisfactory state regarding the components and other system components requirements and that of the authorities and classes having jurisdiction. Components deemed unreliable or unsatisfactory in regard to their respective manuals, standards or in regards to this manual and of which cannot be restored through servicing shall be replaced.

Any system components which have been removed from the system for inspection, testing or servicing shall have all its thread sealing and gaskets replaced.

The system shall be flushed and cleaned in its entirety and strainers shall be cleaned or replaced according to the applicable manuals and standards. Wet parts of the system shall be filled with water in accordance with the requirements stated in system documents.

The system shall undergo hydrostatic tests as well as be inspected and checked before being deemed operational.

Restoration, maintenance and servicing shall be in accordance with this manual.

9 COURSES.

Though low pressure fine water spray systems are much alike traditional sprinkler systems, certain requirement must be met when handling low pressure fine water spray systems.

To educate designers, installation- and inspection managers, VID Fire-Kill offers courses in handling, installing, maintaining and inspecting systems utilizing N-Pipes and fine water spray nozzles.

These courses involve the education in the standards, tests and approvals of Model N-Pipe Type 2V systems, related products and the requirements of the system in general as well as the theoretic properties of fire protection systems, the nozzles and pipes, the general effect of fine water spray nozzles in large locations, as well as the theoretical and practical limitations of the system and the connected hydraulic system along with full scale fire tests as to give the attendant first hand impressions on what happens during a large scale fire.

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