Nilfisk PRO-E Nozzles :

No.	Item No.	Description
1	128334800	Rough Cleaning
2	128334900	Gentle Cleaning
3	128501202	Rough Cleaning (accessory/SP)
4	128501203	Gentle Cleaning (accessory/SP)
5	128334801	Rough Cleaning Husqvarna
6	128334901	Gentle Cleaning Husqvarna
7	128501250	Husqvarna Gentle Nozzle (SP)
8	128501251	Husqvarna Rough Nozzle (SP)
9		
10		
11		
12		
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16		
17		
18		

Title:	**Nozzle Specification PRO2020-E**
Project:	2020 PRO Enhancement Project
Project No.:	8999RD19106
Project Team:	Jacob Lundsgaard Nielsen, Hans Ingerslev Jakobsen, Lucy Peng, Eric Tian, Tahir Awan, Jens Jørgen Fuglsang, Jasson Zhang, Jens Ole Østergaard
Approved by:	Click here to enter project name.
Approval Date:	Click here to select a date.

Contents

1. Summary of the Pro2020 Nozzle Specification

Following need to be updated:

1. Gentle pressure and flow for ø1.28mm

2. Revision History

REVISION HISTORY				
Rev.	**Date**	**Initials**	**Section**	**Description/remark**
01-DRAFT	15-05-2019	JOO	All	Initial document
1.0	16-12-2019	JOO	All	1st update of the document.
1.1	18-12-2019	JOO	All	2nd update of the document.
1.2	19-12-2019	JOO	3.3	Flow and pressure table for 128334900 updated
1.3	21-07-2020	JOO	All	Reviewd and updated
1.4	05-11-2020	JOO	All	All chapters review and updated

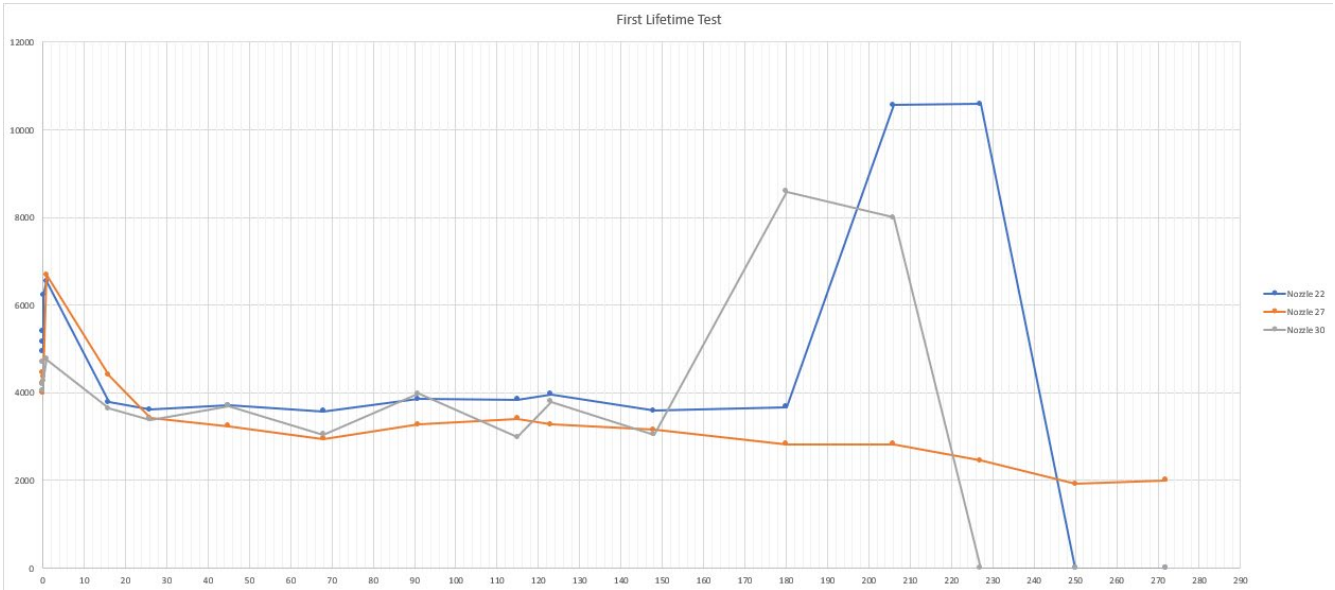
3. Product Specification

3.1 Rough Cleaning Variants:

	128334800	***128334801***	
	Nilfisk	Husqvarna	
Flow rate [l/min]	8,9± 1	8,9 ± 1	Test on 3,3KW MPU
Pressure before gun 3 bar inlet[Bar]	109.8 ± 4	109.8 ± 4	Test on 3,3KW MPU
RPM [min^{-1}] < 20 hour	3500 -7000	3500 - 7000	Test on 3,3KW MPU
CP	<1,74	<1,74	Test on 3,3KW MPU
Life time test	➢ 150 hours	➢ 150 hours	Test on 3,3KW MPU
Max temperature	60[°C]	60[°C]	
Color mark	Blue	Blue	Nilfisk ALTO Blue 9900190
Order no.: Short, packed	128501202	128501251	
Order no.: Short, Bulk	128334800	128334801	

Flow and pressure table can be found on the nozzle tip drawing 128334855.

RPM's doing a life time:



3.2 Rough Cleaning

#	Subject	Requirement	Standard/test description/remark
PRODUCT DESCRIPTION			
1	Regulatory requirements	Must fulfill regulatory requirement valid for accessories for High pressure washers	IEC/EN 60335-1:2012/A17:2017 IEC 60335-2-79:2016 EN 60335-2-79:2012
2	Cleaning shape	Circular O-jet	Max. 1cm total movement up and down when it's positioned 20 cm above ground
3	Design ID	Nilfisk A/S proprietary design ID (Chapter 4)	
4	Color mark	Blue.	Nilfisk ALTO Blue 9900190
5	Nipple interface	Nilfisk Bayonet Interface	According to Nilfisk interface specification.
6	Product combability	Nilfisk PRO series (all in range)	Premium 180 – 190 & PLUS
7	Features	General cleaning with a High pressure washer	
8	Environmental	Compliance to: NAC2020	Apply to all components of the power speed nozzle including plastic bag and label.
TECHNICAL DATA			
9	Pressure	Allowable pressure: 200 [bar] Rated pressure: 150 [bar]	
10	Burst pressure	2 x rated pressure: 300 [bar]	
11	Seat and body tip	Ceramic injection molding (CIM)	
12	Operating pressure and flow	Within specification described in chapter 6.	
13	Max. water temperature	60 ± 5 [°C]	
14	Rotational speed of jet	Stable between: Longbao body unit: 4.500 - 6.000 [rpm] Nilfisk body unit: 3.000 - 5.000 [rpm]	See chapter 8 for the test description.
15	Lifetime (12/3 cycle)	>150 hours: 1. 24 hours with water temperature 5 - 25[°C] 2. 24 hours with water temperature 60 ± 5[°C] 3. ~~ hours with water temperature 5 - 25[°C] -Maximum wear symptoms after lifetime test defined by physical master samples.	See chapter 8 for the test description.
MECHANICAL SAFETY			
16	Bayonet nipple fatigue strength	Mounting and unmounting 500 times	See chapter 8 for the test description.
17	Housing Strength (stepping force)	100 [kg] for 30 [s]	See chapter 8 for the test description.

#	Subject	Requirement	Standard/test description/remark
18	Drop test	1 [m] drop height	See chapter 8 for the test description.
19	Fixing of bayonet nipple with the outer housing	Left-hand thread is used for the nipple-assembly	See chapter 8 for the test description.
FUNCTION			
20	Leak proof assembly	The nozzle assembly has to be tight with no leakages	
21	Cleaning efficiency	According to the Nilfisk A/S specification	
22	O-jet start up	Must be capable to start up, at all time, pointing in all angles	See chapter 8 for the test description.
PRODUCT DIMENSIONS			
23	Overall dimensions	According to design ID and 2D/3D	-
MARKING			
24	Pressure and temperature marking	All pressure carrying parts must be marked with max pressure and max water temperature according to specification. (Chapter 3.1)	-

3.3 Gentle Cleaning Variants:

	128334900	128334901	
	Nilfisk	Husqvarna	
Flow rate [l/min]	8,9 ± 0,1	8,9 ± 0,1	Test on 3,3KW MPU
Pressure before gun 3 bar inlet[Bar]	115 ± 4	115 ± 4	Test on 3,3KW MPU
Low Pressure before gun 3 bar inlet [Bar]	<6,0	<6,0	Test on 3,3KW MPU
CP	<1,74	<1,74	Test on 3,3KW MPU
Life time test	➢ 250 hours	➢ 250 hours	Test on 3,3KW MPU
Max temperature	60[°C]	60[°C]	Test on 3,3KW MPU
Color mark	Blue	Blue	Nilfisk ALTO Blue 9900190
Order no.: Short, packed	127501203	127501250	
Order no.: Short, not packed	128334900	128334901	

Flow and pressure table can be found on the nozzle tip drawing 128334930.

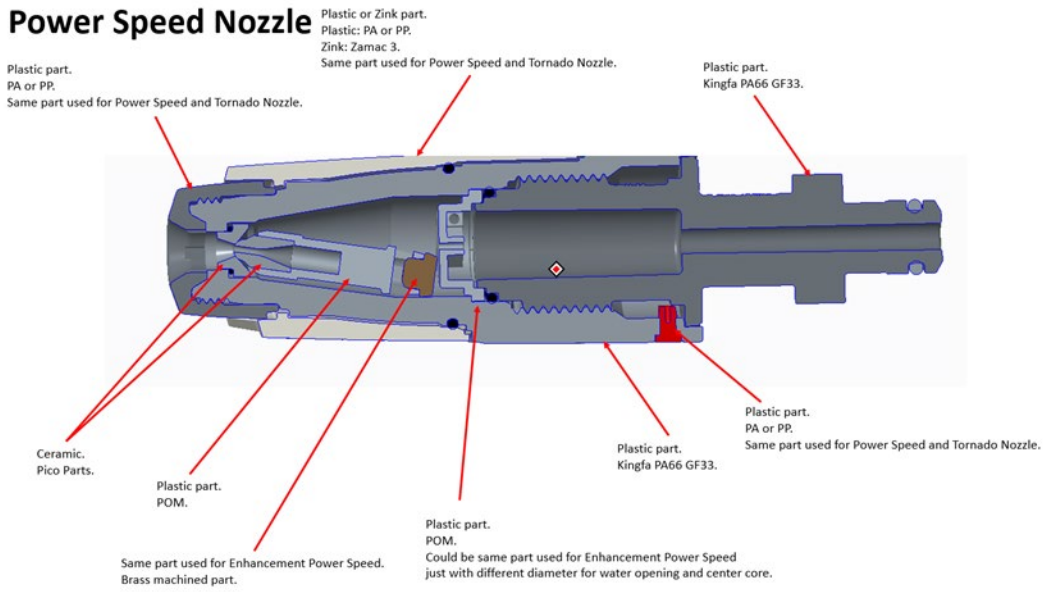
3.4 Gentle Cleaning

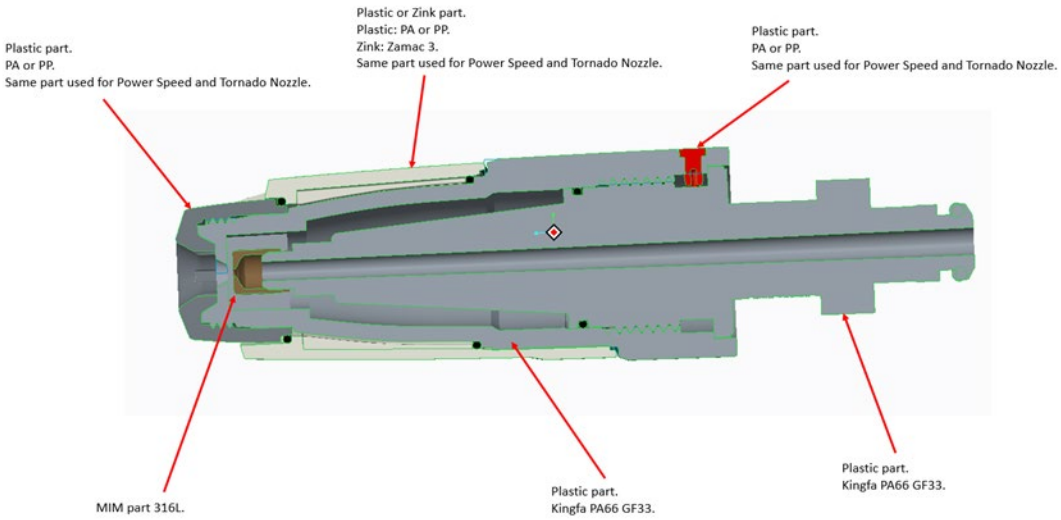
#	Subject	Requirement	Standard/test description/remark
PRODUCT DESCRIPTION			
4	Regulatory requirements	Must fulfill regulatory requirement valid for accessories for High pressure washers	IEC/EN 60335-1:2012/A17:2017 IEC 60335-2-79:2016 EN 60335-2-79:2012
5	Cleaning shape HP	Jet angle 22°	
6	Cleaning shape LP	Jet angle 42°	
7	Design ID	Nilfisk A/S proprietary design ID (Chapter 4)	
8	Color mark	Blue	-
9	Nipple interface	Nilfisk A/S bayonet Interface	According to Nilfisk interface specification
10	Product combability	Nilfisk PRO series (all in range)	Premium 180 – 190 & PLUS
11	Features	General cleaning with a high pressure washer.	
12	Environmental	Compliance to NAC2020	Apply to all components of the nozzle including plastic bag and label.
TECHNICAL DATA			
9	Pressure	Allowable pressure: 200 [bar] Rated pressure: 150 [bar]	
10	Burst pressure	2 x rated pressure: 300 [bar]	
11	Tip	Tip ø1,27mm made in SS316L by the MIM process.	
12	Operating pressure and flow	Within specification described in chapter 3.3.	
13	Max. water temperature	60 ± 5 [°C]	
14	Lifetime (12/3 cycle)	>250 hours: 1. 24 hours with water temperature 5 - 25[°C] 2. 24 hours with water temperature 60 ± 5[°C] 3. ~~ hours with water temperature 5 - 25[°C] -Maximum wear symptoms after lifetime test defined by physical master samples.	See chapter 8 for the test description.
MECHANICAL SAFETY			
15	Bayonet nipple fatigue strength	Mounting and unmounting 500 times	See chapter 8 for the test description.
16	Housing Strength (stepping force)	100 [kg] for 30 [s]	See chapter 8 for the test description.
17	Drop test	1 [m] drop height	See chapter 8 for the test description.
18	Fixing of bayonet nipple with the outer housing	Left-hand thread is used for the nipple-assembly	See chapter 8 for the test description.

#	Subject	Requirement	Standard/test description/remark
FUNCTION			
19	Leak proof assembly	The nozzle assembly has to be tight with no leakages	
20	Cleaning efficiency	According to the Nilfisk A/S specification	
21	Flow regulation before gun	Must be capable to regulate from 6.0 bar to max pressure.	
PRODUCT DIMENSIONS			
22	Overall dimensions	According to design ID	-
MARKING			
23	Pressure and temperature marking	All pressure carrying parts must be marked with max pressure and max water temperature according to specification. (Chapter 3.3)	-

4. Design ID

Design directions as below:





Tornado Nozzle

5. Packaging

4C boxes:

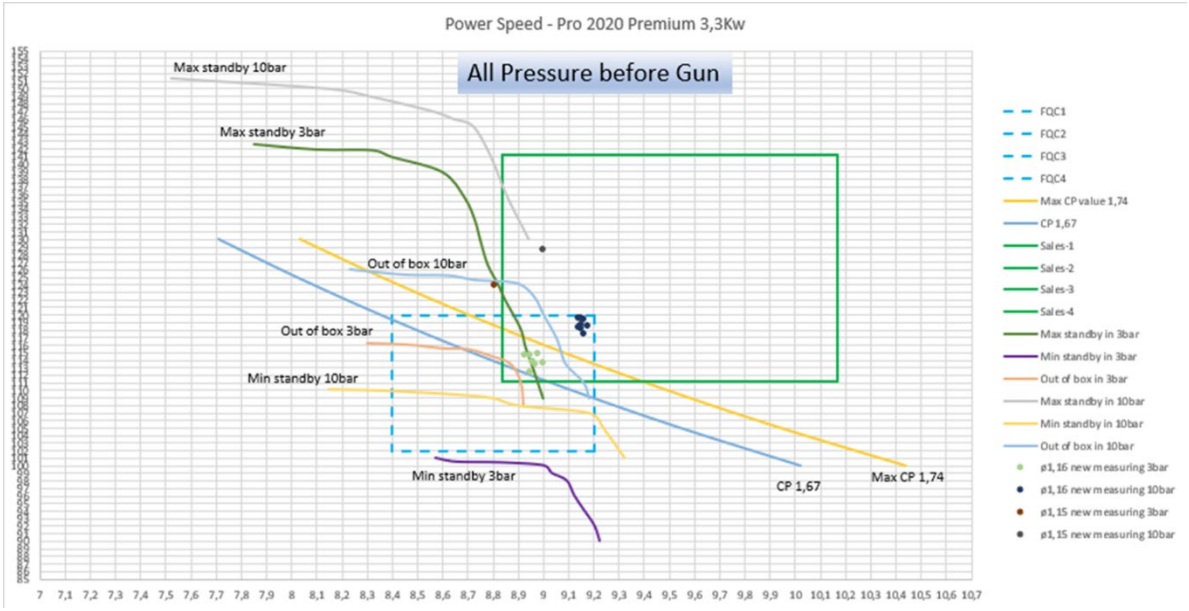
1. 128335971 4c Box 180 Premium
2. 128335976 4c Box 190 Premium PLUS
3. 128335977 4c Box Power Speed Nozzle Pro2020
4. 128335978 4c Box Tornado Nozzle Pro2020

6. Critical Characteristics (CC)

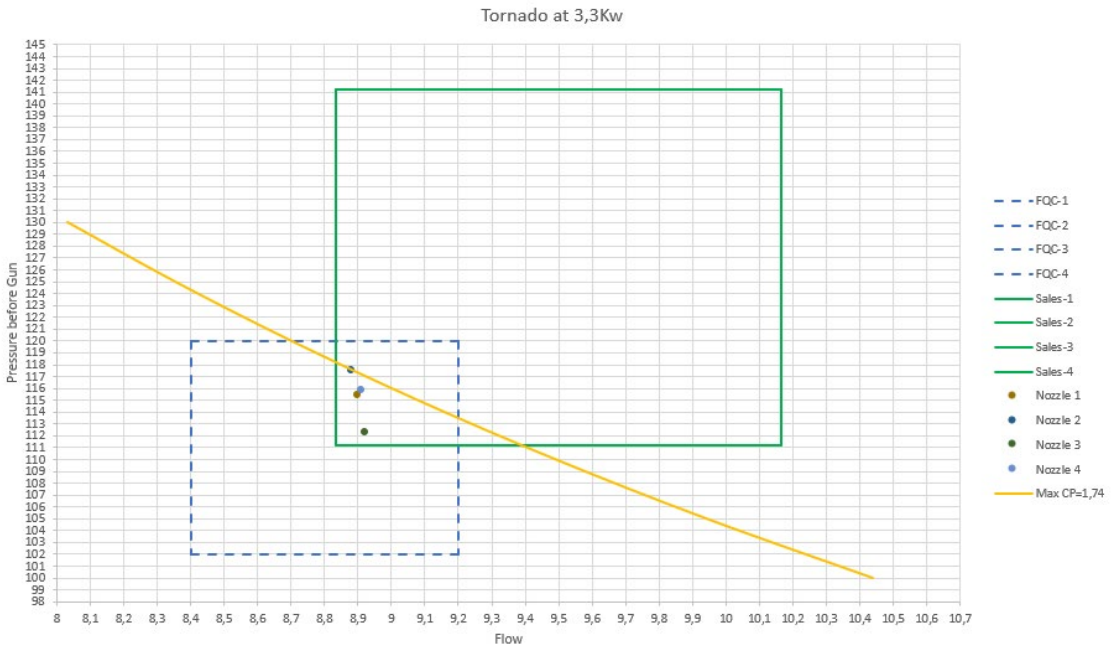
The Critical Characteristics must be controlled in relation to the PPAP process and the FQC.

7. Pressure/Flow for 3.3kW MPU

Rough Cleaning with ø1,14mm tip:



Gentle Cleaning with ø1,27mm tip:



8. Test Plan

The purpose of this test plan is to qualify and verify the power speed nozzle and tornado nozzle.
If not other mentioned the tests will be done in operation position.


Nozzle test

No.	Test Name	Test Description	Test Criteria
11.4.1	Water flow measurement	The flow measurement for the power speed and tornado nozzle is measured after following for time sheet:	Look into the attach Nozzle test doc.
11.4.2	Pressure measurement	The pressure measurement for the power speed and tornado nozzle is measured after following for time sheet:	Look into the attach Nozzle test doc.
11.4.3	Power speed revolutions	The rpm pressure measurement for the power speed is measured after following for time sheet:	Look into the attach Nozzle test doc.
11.4.4	Burst pressure test	The burst pressure test can't be done earlier than 24 hours after the plastic parts have been molded.	Look into the attach Nozzle test doc.
11.4.5	Life time testing	250 hours endurance test.	Look into the attach Nozzle test doc.
11.4.6	Fatigue	The bayonet nipple on the nozzle must be lifetime tested by mounting and dismounting it 500 times on a bayonet lance.	Look into the attach Nozzle test doc.
11.4.7	Stepping force resistance	A person weighing approximately 100 [kg] must stand on the accessories for 30 [sec] while it is placed on a hard concrete floor.	Look into the attach Nozzle test doc.
11.4.8	Drop test	Perform a drop test with the nozzle separately and mounted with:	Look into the attach Nozzle test doc.
11.4.9	Drop Test with the accessory box	Put a single gift box package with part through a drop test of two drops from a 1 meter drop height.	Look into the attach Nozzle test doc.

11.4.10	Leak proof assembly 	Connect the nozzle to the HPW machine and do the test in a room with the temperature on 20 ±5 [°C].	Look into the attach Nozzle test doc.
11.4.12	Salt Spray 	Salt water method test for the MIM tip and Zinc cover	Look into the attach Nozzle test doc.
11.4.13	Test of accessory storage 	Use the bump test for the machine to preform the test, where the nozzle are storage in the accessory storage and the nozzle on the lance/gun at the same time.	Look into the attach Nozzle test doc.
11.4.15	Test of the tornado HP spray pattern 		
11.4.16	Test of the tornado LP pressure and spray pattern 		
11.4.17	Test of the O-jet balance of the power speed 	Evaluate jet balance (movement)	Look into the attach Nozzle test doc.
11.4.18	Test the cleaning efficiency 	Cleaning efficiency test: Do the cleaning efficiency on a black foam plate on both Tornado and Power speed nozzle and do the analysis.	Look into the attach Nozzle test doc.
11.4.19	Test with quartz sand. 		
11.4.20	Spray handle Vibration 	The test must be done for the Power speed nozzle.	Look into the attach Nozzle test doc.
11.4.24	Tornado adjustment between LP and HP. 	Following test need to be done for the regulation between LP and HP: 1. Is the adjustment tight/untighten 2. Can the end stops be damaged	Look into the attach Nozzle test doc.
11.4.25	Color check 	Preform color check for different parts	Look into the attach Nozzle test doc.

11.4.26	Printing test 	According to Nilfisk printing test	

9. BOM

The BOM for Gentle Cleaning and Rough Cleaning can be found in PDM.

10. Incoming Quality Control (IQC)

The incoming quality inspection is the first step to get a good quality of the product. The listed parts need to part of the IQC. The two first parts 1&2 in the parts to Longbao need to be 100% inspected.

Parts to Longbao:

1: 128334926, Nozzle Tip, MIM Nozzle, Stainless Steel, 100% inspection
2: 128334890, Nozzle Tip, Ceramic, 100% inspection
3: 128334856, Nozzle Seat, Ceramic
4: 128334825, Housing Design Cap, Zink/Zamac3, Matte Chrome

Parts done by Longbao:

1: 128334820, Housing Power Speed, Kingfa PA66 G33 Jet Black
2: 128334821, Housing Nose, Yplene B380G Jet Black
3: 128334832, Color Mark, Alto Blue
4: 128334852, Bayonet PSN, Kingfa PA66 G33 Jet Black
5: 128334942, Bayonet, Kingfa PA66 G33 Jet Black
6: 128334860, PTR Distributor, Schulaform 9A Natural
7: 128334880, Nozzle Body, Schulaform 9A Natural
8: 128333886, Nozzle Body Weight, Brass
9: 128334960, Housing Tornado, Kingfa PA66 G33 Jet Black

All parts enter the assembly line need to be in spec. other parts need to be scrapped.

Data for each inspection under IQC must be recorded. All endurance tests done at and by Longbao must be documented and filled out in an agreed English format.

11. Final Quality Control (FQC)

This final quality control done in FQC is the final step and most important towards NOT shipping goods with defects towards customers. No errors must be found in these test.

This last control before shipment is taken from finish good stock **ONLY**. This test is 100% equal to the quality level which the end-customer will receive on their stock after shipment.

Document used for FQC:

1. 127600474 PRO2020 Power Speed FQC check list
2. 127600476 PRO2020 Tornado FQC check list
3. 127600477 Life time test sheet
4. 127600478 Tightness test of the Tornado

11.1 Frequency and type of (FQC) test

All FQC tests has to be done at and by Longbao.

1. **FQC test No. 1** is a short function test and visual inspection and all nozzles has to complete this test.
2. **FQC test No. 2** is an extended function test where the data will be recoded for 1 out of 500.
3. **FQC test No. 3** is a 16 hours endurance test. 1 out of every week production has to complete the test.
4. **FQC test No. 4** is burst pressure test. 2 pcs for burst pressure test per production day.

Data for each test performed under FQC must be recorded. All endurance tests done at and by Longbao must be documented and filled out in an agreed English format.

11.2 FQC Test no. 1 - Function Test

Is a visual and a short time function test of the product mounted on a Nilfisk machine and all nozzles has to complete this test.

The test must be performed according to following steps:

a) Mount the nozzle lance and connect it to the machine.

b) Check the high pressure [bar] and flow [l/m] are within the specification for the nozzle. (**Equipment Calibration needed each morning**)

Check that there is no leakage between nozzle housing and the interface to the lance, when subject to the high pressure. No leakage is tolerated.

c) .Check the low pressure [bar] and flow [l/m] are within the specification for the Tornado nozzle

d) Visually inspect of the O-jet for the power speed. It must be sharp and circular without moving up and down. Max. 1cm total movement up and down when it's positioned 20 cm above ground.

e) Visually inspect of the angle the tornado. It must be sharp and be inside the test plate.

The following conditions shall be used during testing:

- Water temperatur 5-60[°C]
- Room temperatur 5-45[°C]

11.3 FQC Test no. 2 - Function Test

Is a visual and a short time function test of the product mounted on a Nilfisk machine and all nozzles has to complete this test.

The test must be performed according to following steps:

a) Mount the nozzle lance and connect it to the machine.
b) Record the high pressure [bar] and flow [l/m] for the nozzle. (**Equipment calibration needed each morning)**
c) Check that there is no leakage between nozzle housing and the interface to the lance, when subject to the high pressure. No leakage is tolerated.
d) Record the low pressure [bar] and flow [l/m] for the tornado nozzle.
e) Record rotational speed of the jet[rpm] for the power speed nozzle.
f) Visually inspect of the O-jet for the power speed. It must be sharp and circular without moving up and down. Max. 1cm total movement up and down when it's positioned 20 cm above ground.
g) Visually inspect of the angle for the tornado. It must be sharp and be inside the test plate.
h) Record Data and check the data are within the specification

The following conditions shall be used during testing:

- Water temperature 5-60[°C]
- Room temperature 5-45[°C]

11.4 FQC Test no. 3 – 16 hours Endurance Test

16 hours endurance test. The tested nozzle can't be sold after test and must be disposed.

Use following doc for the test: 127600477 Life time test sheet

Pick out 1 pcs every weeks production and run it for 16 hours with following load cycle:

a) High pressure 12 second
b) No pressure 3 second.

The test must be performed according to following steps:

a) Mount the nozzle lance and connect it to the machine.
b) Record the high pressure [bar] and flow [l/m] for the nozzle. (**Equipment calibration needed each morning)**
c) Check that there is no leakage between nozzle housing and the interface to the lance, when subject to the high pressure. No leakage is tolerated.
d) Record the low pressure [bar] and flow [l/m] for the tornado nozzle.
e) Record rotational speed of the jet[rpm] for the power speed nozzle.
f) Visually inspect of the O-jet for the power speed. It must be sharp and circular without moving up and down. Max. 1cm total movement up and down when it's positioned 20 cm above ground.
g) Visually inspect of the angle for the tornado. It must be sharp and be inside the test plate.
h) Record Data and check the data are within the specification
i) Run the 16 hours and stop.
j) Record the high pressure [bar] and flow [l/m] for the nozzle. (**Equipment calibration needed each morning**)
k) Check that there is no leakage between nozzle housing and the interface to the lance, when subject to the high pressure. No leakage is tolerated.
l) Record the low pressure [bar] and flow [l/m] for the tornado nozzle.
m) Record rotational speed of the jet[rpm] for the power speed nozzle.
n) Visually inspect of the O-jet for the power speed. It must be sharp and circular without moving up and down. Max. 1cm total movement up and down when it's positioned 20 cm above ground.
o) Visually inspect of the angle for the tornado. It must be sharp and be inside the test plate.
p) Record Data and check the data are within the specification

The following conditions shall be used during testing:

- Recycle Water with filter/ water temperature 5-60[°C]
- Room temperature 5-45[°C]

After finished endurance test, the nozzle must be minimum as good as master sample, meaning not more side fogs/flicker than the master and the pressure and flow need to be in spec.

11.5 FQC Test no. 4 – Burst Pressure Test & Tightness Test

Make the burst pressure test for 2 pcs per production day according to specification.

Make the Tightness test each production day according to doc: 127600478 Tightness test of Tornado nozzle.

12. Accessory/Spare parts

There is defined nozzles as accessory, but no spare parts to the nozzles.

Nilfisk Accessory Parts:

Premium Rough Nozzle: 128501202

Premium Gentle Nozzle: 128501203

Husqvarna Spare Parts:

Husqvarna Gentle Nozzle: 128501250

Husqvarna Rough Nozzle: 128501251