

Installation and service manual

Accessories control equipment Fan Inverter



Original installation and service manual

EN INSTALLATION AND SERVICE MANUAL

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1 Preface

Thank you for using a Nederman product!

The Nederman Group is a world-leading supplier and developer of products and solutions for the environmental technology sector. Our innovative products will filter, clean and recycle in the most demanding of environments. Nederman's products and solutions will help you improve your productivity, reduce costs and also reduce the impact on the environment from industrial processes.

Read all product documentation and the product identification plate carefully before installation, use, and service of this product. Replace documentation immediately if lost. Nederman reserves the right, without previous notice, to modify and improve its products including documentation.

This product is designed to meet the requirements of relevant EC directives. To maintain this status, all installation, maintenance, and repair is to be done by gualified personnel using only Nederman original spare parts and accessories. Contact the nearest authorized distributor or Nederman for advice on technical service and obtaining spare parts. If there are any damaged or missing parts when the product is delivered, notify the carrier and the local Nederman representative immediately.

2 Safety

2.1 Classification of important information

This document contains important information that is presented either as a warning, caution or note, according to the following examples:

WARNING! Risk of personal injury

Warnings indicate a potential hazard to the health and safety of personnel, and how that hazard may be avoided.

CAUTION! Risk of equipment damage

Cautions indicate a potential hazard to the product but not to personnel, and how that hazard may be avoided.

Note

Notes contain other information that is important for personnel.

2.2 General

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WARNING! Risk of electric shock

- Only a competent electrician may install Fan Inverter.
- Dangerous voltages are present when mains supply is connected. Wait at least 5 minutes after disconnecting the supply before removing the cover of Fan Inverter or the fan motor.
- Even when the motor is stopped there are dangerous voltages present at relay terminals 21 to 33 (R01 to RO3), power circuit terminals L1, L2 and L3, DC-, DC+/R+ and R-, U, V and W, and at the fan motor, see Section 22.2 Appendix B: Installation chart and Section 22.4 Appendix D: Circuit diagrams.

WARNING! Risk of personal injury

The fan starts up automatically after an input voltage interruption if the Fan Timer or external run command is active. Do not perform any service without first disconnecting power to the system.

CAUTION! Risk of equipment damage

No parameters in the frequency converter may be adjusted without detailed knowledge about the consequences.

Note

- See Figure 1. It is important to read the Installation Manual (A) that came with the product. For more information see the Application Manual (B) that came with the product.
- Fan Inverter is to be set from Normal mode to Monitor mode after it is installed to prevent accidental changes to parameter settings during normal operation.

2.3 ATEX

WARNING! Explosion risk

An EX motor with a converter supply must be selected for such an application.

According to EN 60079-14, for EX d, EX n and EX tD motors, there shall be a device for a direct temperature control by embedded temperature sensors specified in the motor manufacturer's documentation for limiting the surface temperature of the motor housing. The device electrically disconnects the motor if the housing becomes overheated.

If the STO and ATEX optional board is installed, see the VACON 100 OPTBJ STO and ATEX Option Board Safety Manual (C) in <u>Figure 1</u>. Contact Nederman for more information.

3 Description

3.1 Intended use

Nederman Fan Inverter is a frequency controller that is preprogrammed with an extraction fan application for Nederman fans. It is equipped with a pressure sensor and a PID controller that can maintain a constant negative pressure in an extraction system, and as a result, maintain an almost constant airflow in extraction devices. The fan capacity is regulated to the actual demand of the airflow, depending on the number of extraction devices in use at the same time.

The benefit of using Nederman Fan Inverter is that it reduces running costs, heat loss to the atmosphere and noise levels. It conserves energy and improves performance by regulating the system's power usage as the demand from extraction devices increases or decreases.

4 Frequency controlled fan

When a fan is frequency controlled by Nederman Fan Inverter, a constant pressure can be achieved within the entire working range of the fan, up to the fan maximum frequency. See <u>Figure 2</u> (A).

For example, if the fan frequency is reduced by half, the power is reduced to 1/8. As the power consumption increases dramatically with the frequency, using any frequency higher than the nominal frequency will overload the motor. See Figure 2 (B).

However, although the cooling effect from the motor cooling fan is reduced when the frequency is decreased, the power consumption is reduced even more, so there is normally no risk of overheating the fan motor by reducing the frequency.



WARNING! Risk of personal injury

For Nederman fans, the maximum frequency is the fan nominal frequency, which is normally either 50 or 60 Hz. Do not exceed the fan's nominal frequency since it imposes too much mechanical stress on the impeller.

5 Pressure control

Nederman Fan Inverter uses an integrated pressure sensor and pressure taps in the duct work. This makes the system operate more efficiently by measuring the system pressure, and adjust the fan speed in order to maintain a constant pressure. If the system pressure is low, Fan Inverter can increase its fan speed and vice versa.

5.1 Pressure sensor

See <u>Figure 3</u>. The pressure sensor is located in the middle on the right side. It senses the system pressure taken from the most distant extraction point in the duct system, or at the extraction unit that creates the highest pressure drop.

The pressure value for the system is then displayed through the unit's integral PID controller. The actual pressure value for the PID1 controller is shown in the display as 'PID1 Feedback', and the unit adjusts the speed of the fan in order to keep a constant pressure in accordance with the reference setpoint, 'PID1 Setpoint', which is set in the 'Control page'. See Figure 4: the 'Control page' displays 'Keypad SP1'.

The factory setting of 900 Pa is a useful start value for an extraction arm, but the setpoint can be adjusted to a value that gives the correct airflow from the extraction points. A second setpoint value for a higher or lower pressure value can be set as 'Keypad SP2'. This second setpoint, is used when Digital Input DI3 is activated.

The range for the pressure sensor is 0-2000 Pa or 0-5000 Pa and output is 0,5-4,5 V. It is connected to Al2 (analogue input 2). The lower port (minus) is connected with a silicon hose to the measurement hose.

5.2 Pressure measurement

A pressure tap with filter is to be inserted in the duct at a location where the greatest pressure drop is expected to occur, normally at the most distant extraction point. In this way, the required pressure in the connection point for an extraction arm, for example, can be controlled, compensating for a pressure drop in the filter and duct system. See Figure 5 (A).

If the duct system is equally branched, pressure taps can be used at the ends of the two branches with the highest pressure drop, and connect them with equal lengths of hose before the pressure signal to the unit in order to get an average pressure value. See Figure 5 (B).

Note

Transport velocity needs to be dimensioned correctly and adjustment dampers may be needed in extraction points closer to the fan.

5.3 Pressure measurement using pressure loss compensation

Note

- This is not the recommended installation.
- 'PID1 Feedback' displayed in the Multimonitor page, see <u>Figure 4</u>, is not a fixed value set in the control page 'Keypad SP1'.
- It is not recommended that supervision be used with pressure loss compensation, see <u>Chapter 13 Supervision</u>.

If the system is complex with many branches, the pressure can be measured and controlled using 'pressure drop compensation'. A pressure tap is inserted in a common duct closer to the fan but before any filter.

To compensate for the increasing pressure drop with increasing airflow, the PID1 set point is increased with a compensation that increases with the frequency. Compensation is calculated using the formula below:

(FreqOut - MinFreq)

Setpoint compensation = Maximum compensation x

(MaxFreg - MinFreg)

To set up pressure loss compensation, see Section 12.3 Pressure loss compensation settings.

5.4 Constant speed

Pressure control can be disabled and the fan run at a constant speed by activating DI4, see <u>Section 22.2 Appendix B: Installation chart</u>. The frequency is set in P.1.11, which is Preset frequency 1. Constant speed can be used, for example, to provide background ventilation when the local exhaust ventilation is not used.

6 Dimensions and technical data

See the VACON 100 Installation Manual for information about Fan Inverter dimensions and technical data.

7 Keypad

The table below shows the functions of the different Keypad buttons described in <u>Figure 6</u>. Note that certain buttons have more than one function. The keypad and menu for Fan Inverter are also described in the VACON 100 HVAC Application Manual, see <u>Figure 1</u> (B).

Button	Name	Function	Button	Name	Function
1	BACK/ RESET	 Move backwards in the menu. Exit Edit mode. Reset faults with a long press. Go to Main menu. 	6.	DOWN	 Scroll down in the menu. Decrease a setting value.
2	UP	 Scroll up in the menu. Increase a setting value. 	7.	ОК	 Enter the active level/item. Confirm the current selection.
З.	FUNCT	 Enter Choose action page. Change the control place. Enter the control page. 	8.	STOP	• Stop Fan Inverter locally.
4.	RIGHT	• Move the cursor right.	9.	LEFT	• Move the cursor left.
5.	START	• Start Fan Inverter locally.			

8 Display

The default view for the display is the 'Multimonitor' page displaying 9 parameters, see Figure 7.

8.1 Access the main menu

• From the 'Multimonitor' page, press the BACK/RESET button to access 'Main Menu'. See Figure 6 and Figure 8.

• Each menu has a number of submenus shown by the number in parentheses.

- If no button is pushed, the display returns to the 'Multimonitor' page after one minute.
- See the VACON 100 HVAC Application Manual for a definition of the parameters, such as P1 or P19.

'Main Menu' has the following menus:

- 1 Quick Setup
- 2 Monitor
- 3 Parameters
- 4 Diagnostics
- 5 I/O and Hardware
- 6 User Settings
- 7 Favourites
- 8 User Levels

8.2 Access the control page

The 'Control page', which displays 'Keypad SP1', is used to set the set point and to check the digital inputs and outputs for troubleshooting. See <u>Figure 6</u> and <u>Figure 9</u>.

Note

The 'Control page' can be edited in both Normal and Monitor mode. If DI3 is activated, 'Keypad SP2' is displayed in the 'Control page'.

- 1 Press the FUNCT button to access the 'Choose action' page.
- 2 Select the 'Control page' and press OK.

9 Before installation

Check the unit for any transport damage. In case of damage or missing parts, notify the carrier and your local Nederman representative immediately.

9.1 Contents

Check that the package contains the following items:

- One Fan Inverter with keypad and pressure sensor
- One pressure tap kit
- One VACON Accessories bag
- One Fan Inverter User manual
- One Fan Inverter Installation and service manual
- One VACON 100 Installation Manual
- One VACON 100 HVAC Application Manual

9.2 Accessories

There are a number of accessories that are recommended for use with Fan Inverter. Consult your local Nederman representative for available accessories, or see <u>www.nederman.com</u>.

9.3 Additional items needed for installation

Depending on the installation, the following items are also needed:

- Main switch. This item can be ordered as an accessory.
- Fuse for 1 phase (only 400V +N), for supply to, for example, a FilterMax. This item can be ordered as an accessory.
- Maintenance/Safety switch, EMC for shielded cable. This item can be ordered as an accessory.
- Remote Switch Fan Timer. This item can be ordered as an accessory.
- Mains cable.
- Shielded motor cable. For the maximum length, see the VACON 100 Installation Manual.
- Motor cable gland, EMC at motor terminal box.
- Motor cable glands at maintenance/safety switch, (M32, standard plastic type for Fan Inverter Main Switch/ Maintenance Switch 3 Pole 22kW).
- Shielded control cables:
 - -- To FilterMax: 6 conductors.
 - -- To Maintenance/Safety switch: 2 conductors.
 - -- To Remote Switch Fan Timer: 3 conductors.
 - -- To Connection box with relay: 2 conductors.
- Control cable glands at maintenance/safety switch, M16, standard plastic type for Fan Inverter Main Switch/ Maintenance Switch 3 Pole.
- Pressure measurement hose OD/ID = 6/4mm. This item can be ordered as an accessory.
- (Optional) OPTBJ STO and ATEX Option Board. This item can be ordered as an accessory.
- Suitable screws and tools.
- Volt meter and clamp Ampere meter.
- Micro manometer and pitot-static tube for airflow check and balancing.
- Airflow charts for Nederman extractor hoods. See Section 22.3 Appendix C: Airflow.

9.4 Fan Inverter and Fan motor identification and compatibility

The fan motor is to be a normal 3-phase induction motor with a voltage and frequency corresponding to the mains supply voltage and frequency. Fan Inverter output voltage will change with the output frequency, but it is limited to the actual supply voltage, see Figure 10.

Normal compatibility is when the fan motor power is equal to Fan Inverter power. Identify the Fan Inverter that is to be used with the fan, and write down the fan motor's data in <u>Section 10.2.1 Quick setup and programming parameters</u>.

9.5 Location requirements

Locate the unit indoors in a dry and clean place and in accordance with the ambient conditions listed in the technical data of the VACON 100 Installation Manual.

9.6 Electrical supply requirements

Install the main fuse according the VACON 100 Installation Manual.



Due to a leak current to ground from the internal RFI filter, a standard Ground Fault Interrupter (GFI)/ Residual Current Device (RCD) cannot be used. Special GFI/RCD for frequency converters can be used. See the VACON 100 Installation Manual for information.

10 Installation

WARNING! Risk of electric shock

Work with electric equipment is to be carried out by a qualified electrician.

WARNING! Risk of personal injury

Before installing the unit, ensure that the input power supply to Fan Inverter is off for at least 5 minutes.

10.1 Electrical installation

Note

The electrical installation of Fan Inverter is to be done according to the VACON 100 Installation Manual and the following additional information:

Fill in the information in Chapter 19 Warranty information and Chapter 21 EMC information.

- Section 22.2 Appendix B: Installation chart
- <u>Section 22.4 Appendix D: Circuit diagrams</u>

Note

If the STO and ATEX optional board is installed, see the VACON 100 OPTBJ STO and ATEX Option Board Safety Manual.

CAUTION! Risk of equipment damage

A main switch is to be installed on Fan Inverter power supply. A 4th pole for neutral and a fuse are required if the same main switch (with a 400 V, 3 phase +N supply) supplies FilterMax or any other 230 V single-phase equipment. See also <u>www.nederman.com</u>.

If the fan is located in a different location from the main switch, a maintenance/safety switch with a signal contact must be installed. The signal contact can be connected to 'run enable', terminals 6 to 9. Then if the switch is 'OFF', Fan Inverter will not start and will also not report "Ready" on relay RO1. Due to the Radio Frequency Interference (RFI) emission risk, the switch has to be RFI/EMC protected, and the cable shield must be connected properly.

Note

When the main and maintenance/safety switch is used as an emergency stop, its handle needs to be red with a yellow background.

CAUTION! Risk of equipment damage

Use an EMC cable gland at the motor for shielded cable.

10.2 Programming

The unit is preprogrammed for the Fan Inverter application. The Fan Inverter program is also stored in the keypad memory as a backup. If there is a problem, the unit can be restored to its Fan Inverter default settings with parameter P6.5.3 in the Parameter backup submenu (M6.5).

The basic parameters, P1.1 to P1.6, for the actual motor have to be set prior to use. See the table in <u>Sec-</u> tion 10.2.1 Quick setup and programming parameters.



For a 60 Hz network, set the maximum frequency (parameter: P1.9) to 60 Hz (according to the fan).



WARNING! Risk of personal injury

For Nederman fans, the maximum frequency is the fan nominal frequency, which is either 50 or 60 Hz. Do not exceed the fan's nominal frequency since it imposes too much mechanical stress on the impeller.

10.2.1 Quick setup and programming parameters

• From the 'Multimonitor' page, press the BACK/RESET button to access 'Main Menu'. See <u>Figure 6</u> and <u>Figure 8</u>. Select 'Quick Setup' to enter the motor data and maximum frequency according to the fan. See also <u>Section 12.3 Pressure loss compensation settings</u>.

Code	Parameter	Unit	Default value	Selected value	ID	Note		
P1.1	Motor nominal voltage	V	400		110	See motor nameplate		
P1.2	Motor nominal frequency	Hz	50.00		111	See motor nameplate and fan		
P1.3	Motor nominal speed	rpm			112	See motor nameplate		
P1.4	Motor nominal current	А	Varies		113	See motor nameplate		
P1.5	Motor Cos Phi		0.80		120	See motor nameplate		
P1.6	Motor nominal power	kW	Varies		116	See motor nameplate		
P1.7	Motor current limit	А	As rated		107	Max current to motor		
P1.8	Minimum frequency	Hz	15		101	See Section 5.2 Pressure measurement.		
P1.9	Maximum frequency	Hz	50.00		102	According to fan		
P1.10	I/O control frequency		P1D1 Ref	NA	117	Do not change		
P1.11	Preset frequency 1	Hz	25		105	Used at constant speed		
P1.12	Preset frequency 2	Hz	15		106	Notused		
P1.13	Acceleration time 1	S	10(15,30)		103	Do not change		
P1.14	Deceleration time 1	s	10		104	Notused		
P1.15	Remote control place		I/O Control	NA	172	Do not change		
P1.16	Automatic reset		Disabled	NA	731	Do not change		
P1.17	Thermistor fault		Fault, Coast	NA	732	Do not change		
P1.18	PID Mini-Wizard		Inactive	NA	1803	Do not change		
P1.19	MultiPump-Wizard		Inactive	NA	15581	Do not change		
P1.20	Startup-Wizard		Inactive	NA	1171	Do not change		
P1.21	Fire Mode Wizard		Inactive	NA	1672	Do not change		
Go to the menu, "Parameters - > Protections" to find parameters P3.9XX.								
P3.9.11	MotorStall fit		Fault		709			
P3.9.12	Stall current	A	Rated motor current		710	See motor nameplate		
P3.9.13	Stall time limit	s	10(15,20)		711			
P3.9.14	Stall frequency limit	Hz	14		712			

10.2.2 Protections

The parameter P1.4 Motor nominal current acts as the 'set point' for the overload protection, together with other parameters in P3.9.

The parameter P1.7 Motor current limit determines the maximum current supplied to the motor from the frequency converter and is set by default to the rating of the Fan Inverter.

The parameter P3.9.11 MotorStall flt protects the motor in case the fan impeller is locked or the motor has not reached the 'Frequency limit' within the 'Stall time limit' and still current higher than 'Stall current'.

Additional protection can be utilized by PTC thermistor in the motor and the accessory STO and ATEX(PTC) board OPTBJ.

10.3 Change display language

(i) Note

/ The only languages that can be selected depend on the language pack that came with Fan Inverter.

See Figure 11. Change the display language as follows:

- 1 Press the BACK/RESET button, to go to 'Main menu', see Figure 6.
- 2 Select 'Quick Setup' and press the OK button.
- 3 Select 'Startup Wizard' and press the OK button.
- 4 Select 'Edit' and press the OK button.
- 5 Select 'Activate' and press the OK button.
- 6 Select the language and press the OK button.
- 7 Press the BACK/RESET button repeatedly to get back to 'Main menu'.

10.4 Change real time clock

Note

The real time clock is set as the normal time. If daylight savings is selected during daylight savings time, set the clock one hour earlier than the present time. When the OK button is pushed to change the time, the clock will jump one hour ahead.

See Figure 12. Change the real time clock as follows:

- 1 Press the BACK/RESET button, to go to 'Main menu', see <u>Figure 6</u>. Select 'Quick Setup' and press the OK button.
- 2 Select 'Startup Wizard' and press the OK button.
- 3 Select 'Edit' and press the OK button.
- 4 Select 'Activate' and press the OK button.
- 5 Select the language and press the OK button.
- 6 Select the 'Daylight saving' and press the OK button.
- 7 Use the arrows to change the time and press the OK button.
- 8 Press the BACK/RESET button repeatedly to get back to 'Main menu'.

10.5 Commissioning

Commissioning must be done according to Section 'Commissioning' in the VACON 100 Installation Manual.

10.6 Favourites

See Figure 13. To make a menu item available for viewing and editing in Monitor mode that is normally only available in Normal mode, certain menu items can be added to 'Favourites' in the following way:

- 1 Press the BACK/RESET button, to go to 'Main menu', see Figure 6.
- 2 Select the menu item and press the OK button.
- 3 Select 'Add to favourites' and press the OK button.

If a menu item has been saved to 'Favourites', it can be accessed by selecting 'Favourites' and press OK. Press BACK/RESET repeatedly to get back to 'Main menu'. For more information see the VACON 100 HVAC Application Manual and section 'Change user level with default access code'.

10.7 Local and remote control places

Note

It is strongly recommended that a Remote Switch - Fan Timer is used for remote control. For more information about control places, see section 'Vacon keypad with graphical display' in the VACON 100 HVAC Application Manual.

The system can be controlled with either 'Local' or 'Remote' mode (I/O). If the unit is controlled in 'Local' mode, the system is started and stopped using the Start and Stop buttons on the keypad, see <u>Figure 6</u>. If Fan Inverter is controlled remotely, the default method of starting and controlling the system is by using Remote Switch - Fan Timer, see <u>Chapter 13 Supervision</u>. The system can also be controlled remotely by an optional potential free remote contact. The system can even be controlled by a combination of the Fan Timer and a remote contact.

See Figure 14. Select the control place as follows:

- 1 Press the FUNCT button, see Figure 6.
- 2 Use the UP and DOWN arrows to select 'Local/Remote'.
- 3 Press OK.
- 4 Use the UP and DOWN arrows to select either 'Local' or 'Remote'.
- 5 Press OK.
- 6 Mark which start method is selected to be used with this Fan Inverter in the box in <u>Section 10.8 Start mode</u> and in the User Manual.

At delivery, the unit is wired to start remotely with the Fan Timer by means of relay RO3. The timer is set to start at 07.00 and stop at 16.00, Monday to Friday. For control of the unit, a Remote Switch - Fan Timer can be used. See Figure 15 and www.nederman.com.

When connected to FilterMax and remotely controlled, Fan Inverter is controlled by FilterMax. The start button on FilterMax control box starts the system. When using Fan Timer, the relay RO3 is to be wired to remotely start FilterMax, see <u>Section 22.4.6 D6: Control FilterMAX</u>.

10.8 Start mode

When Fan Inverter is installed, it is set to be started either locally or remotely and this setting should be marked below and in the User manual.

Locally (Keypad)

Remotely (I/O)

Remotely (Fan Timer and I/O combination)

11 Fan Timer

See also <u>Section 10.4 Change real time clock</u>.

It is recommended that the Fan Timer is to be used for starting and stopping the system. By using the Fan Timer, the idling time of an extraction system with many extraction points will not be unnecessarily long, and the energy consumption is very low when all dampers are closed.

The installation benefit is that no wiring is needed from, for example, the automatic dampers. The relay RO3 is used as timer output and is at delivery wired to the remote start input DI1. When installing FilterMax, RO3 is wired to FilterMax remote start input according to the 'Control wiring diagram' for the FilterMax.

A remote switch can be installed for control of the Fan Timer from the workshop, see Figure 15.

This item, which can be ordered as an accessory, is strongly recommended when the Fan Timer function is used in combination with FilterMax. See <u>Section 22.4.6 D6: Control FilterMAX</u>.

Up to 5 time intervals can be configured, but by default only the following interval 1 is used: Start 07.00 and Stop 16.00, Monday to Friday.

Other intervals can be programmed however, if for example, Fan Inverter is to be turned off during lunch, or if it is to be turned off earlier on Fridays. See the following example:

- Interval 1 Start 07:00 Stop 12:00 Monday to Friday.
- Interval 2 Start 12:30 Stop 16:00 Monday to Thursday.
- Interval 3 Start 12:30 Stop 15:00 Friday to Friday.

Note

Used Intervals must be assigned to 'Time Channel 1'. To change the real time clock, see <u>Sec-</u> <u>tion 10.4 Change real time clock</u>.

The remote switch is also used to activate an overtime operation using 'Timer 1'. The preset time is +2h from the moment the '+2h' was activated. The overtime timer can be reset by briefly turning it to OFF and then back to AUTO.

Note

If the remote switch is not installed, the default function for the Fan Timer is AUTO.

WARNING! Risk of personal injury

The fan starts up automatically after an input voltage interruption if the Fan Timer or external run command is active. Do not perform any service without first disconnecting power to the system.

11.1 Fan Timer parameters

Code	Parameter	Default value	Selected value	ID	Note
P3.11	Timer Functions				
P3.11.1	Interval 1				
P3.11.1.1	ON Time	07:00:00		1464	
P3.11.1.2	OFF Time	16:00:00		1465	
P3.11.1.3	From Day	Monday		1466	
P3.11.1.4	To Day	Friday		1467	
P3.11.1.5	Assign To Channel	TimeChannel1	NA	1468	See <u>Section 22.4.5 D5: Con-</u> trol general, optional starts <u>delayed off</u> .
P3.11.2	Interval 2				

Code	Parameter	Default value	Selected value	ID	Note
P3.11.2.1	ON Time			1469	
P3.11.2.2	Off Time			1470	
P3.11.2.3	From Day			1471	
P3.11.2.4	To Day			1472	
P3.11.2.5	Assign To Channel	Not Used		1473	Change to TimeCh1
P3.11.3	Interval 3				
P3.11.3.1	ON Time			1474	Do not change
P3.11.3.2	OFF Time			1475	Do not change
P3.11.3.3	From Day			1476	Do not change
P3.11.3.4	To Day			1477	Do not change
P3.11.3.5	Assign To Channel	Not Used		1478	Change to TimeCh1
P3.11.4	Interval 4				
P3.11.4.1	ON Time			1479	
P3.11.4.2	OFF Time			1480	
P3.11.4.3	From Day			1481	
P3.11.4.4	To Day			1482	
P3.11.4.5	Assign To Channel	Not Used		1483	Change to TimeCh1
P3.11.5	Interval 5				
P3.11.5.1	ON Time			1484	
P3.11.5.2	OFF Time			1485	
P3.11.5.3	From Day			1486	
P3.11.5.4	To Day			1487	
P3.11.5.5	Assign To Channel	Not Used		1488	Change to TimeCh1
P3.11.6	Timer 1				
P3.11.6.1	Duration	7200 seconds		1489	Overtime +2h
P3.11.6.2	Assign To Channel	TimeChannel1	NA	1490	See Section 22.4.5 D5: Con- trol general, optional starts delayed off.

11.2 Fan Timer settings

If a Fan Timer is configured, Mark the following table for starting and stopping times: Mark also the same table in the User Manual.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
06:00							
07:00							
08:00							
09:00							
10:00							
11:00							
12:00							
13:00							
14:00							
15:00							
16:00							
17:00							
18:00							
19:00							
20:00							

12 Using Fan Inverter

	Note
U	The m

The motor data and certain parameters must be set before use, see <u>Section 10.2.1 Quick setup and pro-</u><u>gramming parameters</u>.

12.1 Initial start-up

Do a test run when starting the unit for the first time. This first start can be made in Local mode using the keypad. See <u>Section 10.7 Local and remote control places</u> or 'Changing control places' in the 'VACON 100 HVAC Application Manual'.

See Figure 16. Start and stop the unit with the Start and Stop buttons to check the fan rotation. To change the direction of the fan's rotation, change the wiring to the motor.



Dangerous voltages are present when mains supply is connected. Wait at least 5 minutes after disconnecting the supply before removing the cover of Fan Inverter or the fan motor.



WARNING! Risk of personal injury

The fan starts up automatically after an input voltage interruption if the Fan Timer or external run command is active. Do not perform any service without first disconnecting power to the system.

12.2 Setpoint parameters

Start the system with the START button. If there is any damper between the fan and the pressure tap, it has to be open. The fan will now accelerate up to a speed creating 900 Pa system pressure in the duct at the pressure tap.

Code	Parameter	Unit	Default value	Selected value	ID	Note
P3.12	PID Controller 1			NA		
P3.12.2	Setpoints			NA		
P3.12.2.1	Keypad SP 1	Pa	900		167	
P3.12.2.2	Keypad SP 2	Pa	500		168	

See Figure 6 and Section 8.2 Access the control page.

- 1 Press the FUNCT button to access the 'Control page'.
- 2 Adjust the setpoint by selecting the Setpoint, press OK, and then use the UP or DOWN arrow buttons on the Keypad to achieve the correct extract rate from the hoods and so on, see <u>Section 22.3.1 C1: Airflow measurement</u>.
- 3 Press OK to accept the new setting.

A suitable value to begin with is 900 Pa. The setpoint can also be set in the parameter P 3.12.2.1 using the 'Control page'. Please note the required pressure in the table when the system is balanced and all extraction points have sufficient airflow, .

If there is a need for a second alternative setpoint, it can be selected by activating digital input 3 (DI3). The setpoint value can be set in parameter P 3.12.2.2, or adjusted in the 'Control page' while DI3 is activated, see also <u>Section 5.4 Constant speed</u>.

12.3 Pressure loss compensation settings

See <u>Figure 5</u>. If the measurement point is installed closer to the fan, pressure loss compensation is used.

- 1 Enable pressure loss compensation with parameter P 3.12.6.1.
- 2 Open one remote extraction point. Set the required pressure with 'Keypad SP1', see Figure 4 to achieve sufficient airflow.
- 3 Read the frequency and set this value for 'Minimum frequency' in parameter P1.8, see <u>Section 10.2.1 Quick</u> <u>setup and programming parameters</u>. The maximum frequency 'MaxFreq' is either 50 or 60 Hz.
- 4 Open the maximum number of extraction points that the system is designed to operate simultaneously. Adjust the value for 'Setpoint 1 maximum compensation' (P 3.12.6.2) in steps until there is sufficient airflow from remote extraction points. Check the function and airflow with different numbers of extraction points in use.
- 5 If a second set point is used, then repeat this procedure for 'SetPoint 2 max compensation' (P3.12.6.4). Use the same 'Minimum frequency' set in P1.8. See also Figure 17.

Code	Parameter	Unit	Default value	Selected value	ID	Note
P3.12.6.1	Enable setpoint 1		Disabled		1189	Enables pressure loss compensation for set- point 1. 0=Disabled 1=Enabled
P3.12.6.2	Setpoint 1 max compens- ation	Pa	0		1190	Value added proportion- ally to the frequency. Setpoint compensa- tion = Max compens- ation * (FreqOut- Min- Freq)/(MaxFreq-Min- Freq)
P3.12.6.3	Enable setpoint 2		Disabled		1191	See P3.12.6.1
P3.12.6.4	Setpoint 2 max com- pensation	Ра	0		1192	See P3.12.6.2

12.4 Balancing the general ventilation

The local exhaust ventilation airflow affects the balancing of the general ventilation in the room.

Fan Inverter provides an analogue signal as an input to the general ventilation control system. The analogue output AO1 at terminals 18 - 19 delivers 0-10V corresponding to 0 - 50Hz (60Hz), or 0-20mA, by changing the switch for analogue settings.

The analogue signal corresponds to the frequency, but it is not linear to the airflow, see Figure 18.

To maintain the setpoint pressure at zero airflow, the fan has to run at a certain frequency. When the airflow increases, the frequency will, at low airflow, be constant but will then start increase fairly linearly to the airflow. It is over this linear part the balancing of the general ventilation is to be made.

In a simple system, a modulating damper 0-10V can be installed and controlled from A01 to reduce the extraction airflow of the general ventilation system according to the airflow in the local exhaust ventilation.

13 Supervision

It is important to have sufficient airflow in the extraction points. The unit controls the fan capacity to the actual demand. However, the system pressure may not be sufficient when, for example, too many extractors are open at the same time, the setpoint has been decreased, or the hose to the pressure tap is damaged.

The unit has an integrated system pressure supervision ability to create an alarm by using an alarm flashlight, which can be ordered as an accessory. Relay RO2 is assigned for the external signal warning system. See <u>Section 22.4.4 D4: Control general optional starts</u>.

When an alarm flashlight is installed together with FilterMAX, RO1 and RO2 are connected to FilterMax, and the alarm flashlight is controlled from FilterMAX. See <u>Section 22.4.6 D6: Control FilterMAX</u>.

Note It is not recommended that supervision be used with pressure loss compensation, see <u>Section 5.3 Pressure measurement using pressure loss compensation</u>.

14 Alarm Flashlight

Alarm Flashlight 24V DC 2W



If an alarm flashlight is connected, the alarm flashlight will flash briefly while Fan Inverter powers up, see Figure 19. After the fan starts, there is a delay and then the alarm flashlight flashes until the system pressure passes the supervision level. The alarm flashlight can also flash during operation if the system pressure drops below the supervision level, see Section 14.1 Setting the supervision pressure levels.

• Write down the Fan Inverter supervision level in the space below and in the Fan Inverter User Manual:

(Pa) Supervision level

Note

If the alarm flashlight continues to flash for approximately 30 seconds after Fan Inverter is started, or if it flashes continually during operation, there is a problem, see <u>Chapter 16 Troubleshooting</u>. To see if the alarm flashlight is functional, stop and restart Fan Inverter. If the alarm flashlight is connected to Fan Inverter, it does not flash if there is an input voltage interruption.

14.1 Setting the supervision pressure levels

The parameter Lower limit has to be adjusted according to the reference setpoint 'Keypad SP1' that is set in the 'Control page', see <u>Section 12.1 Initial start-up</u>

See <u>Figure 19</u>. The setpoint is 900 Pa. The Alarm level 'Lower limit' is set to the lowest acceptable level providing sufficient airflow in the extraction devices. 800 Pa is 11% lower than the setpoint pressure, but as it is in a square relation to the airflow, then the airflow is only 6% lower at the alarm level.

The relay RO2 is activated after a delay time. Adjust the delay time so there are a few flashes before supervision level is passed to indicate that the alarm flashlight is functional.

When Fan Inverter is connected to FilterMax and the airflow is low, there is an additional 60 second delay before a FilterMax alarm is activated. The FilterMax display shows 'hi EP'. In other words, the external pressure drop is high as if there had been, for example, a safety filter installed.

If 'Keypad SP2' is used, DI3 is activated and set to a lower value than the supervision level, an alarm will be activated. Supervision is disabled if a constant frequency is used, DI4 is activated.

14.2 Supervision parameters

Code	Parameter	Unit	Default value	Selected value	ID	Note
P3.5.3	Digital outputs			NA		
P3.5.3.2.4	RO2 Function	s	PID1 Super- vision		11004	Do not change
P3.5.3.2.4	RO2 ON Delay	S	10		11005	Delay after passing limit
P3.5.3.2.4	RO2 OFF Delay		0		11006	
P3.9	Protections					
P3.9.22	PID1 Supervision		Alarm		749	Do not change
P3.12.5	Process Supervision					
P3.12.5.1	Enable Supervision		Enabled		735	Do not change
P3.12.5.2	Upper Limit	Pa	 2000 (1,1-5,5 kW) 5000 (7,5 ≤ kW) 		736	Not used normally
P3.12.5.3	Lower Limit	Ра	800		758	
P3.12.5.4	Delay	s	60		737	Delay before alarm in display

15 Locking

At delivery, the Fan Inverter is set in User level "Normal" with full access. After installation and commissioning it is recommended that Fan Inverter is set to user level 'Monitor' with restricted access. It is also possible to set an access code. The setpoint can still be adjusted in the 'Control page'.



For more information about user levels, refer to 'User levels' in the VACON 100 HVAC Application Manual.

15.1 Change user level with default access code

(i) Note

The user level can be edited in both Normal and Monitor mode.

See <u>Figure 20</u>. Change the user level as follows:

- 1 Press the BACK/RESET button, to go to 'Main menu', see Figure 6.
- 2 Select 'User Levels' from the 'Main menu' and press the OK button.
- 3 Select 'User Level' and press the OK button.
- 4 Select 'Edit' and press the OK button.
- 5 Use the UP and DOWN arrows to select the desired user level and press the OK button.
- 6 Press the BACK/RESET button to get back to 'Main menu'.

15.2 Change default access code

Note

 $m \prime$ In order to change the default access code (00000), the user level must be set to 'Normal'.

See <u>Figure 21</u>. Change the access code as follows:

- 1 Press the BACK/RESET button, to go to 'Main menu', see Figure 6.
- 2 Select 'User Levels' from the 'Main menu' and press the OK button.
- 3 Select 'Access Code' and press the OK button.
- 4 Select 'Edit' and press the OK button.
- 5 Use the UP and DOWN arrows to select the desired access code and press the OK button to save the new access code.
- 6 Press the BACK/RESET button to get back to 'Main menu'.

Store the access code so that it can easily be found if needed. Make sure that the new access code is written in the space below:

Access code: ____

15.3 Change user level with customer set access code

(i) Note

The user level can be edited in both Normal and Monitor mode.

See <u>Figure 21</u>. Change the user level as follows:

- 1 Press the BACK/RESET button, to go to 'Main menu', see Figure 6.
- 2 Select 'User Levels' from the 'Main menu' and press the OK button.
- 3 Select 'User Level' and press the OK button.
- 4 Select 'Edit' and press the OK button.
- 5 Use the UP and DOWN arrows to select the desired user level and press the OK button.
- 6 Enter the 'Access Code' and press the OK button.
- 7 Press the BACK/RESET button to get back to 'Main menu'.

15.4 Reading values from the OPTBJ STO and ATEX Option Board

See Figure 22. Read the Fan Inverter values as follows:

- Press the BACK/RESET button, to go to 'Main menu', see Figure 6.
- Select 'I/O and hardware' and press the OK button.
- Select 'Basic I/O' and press the OK button.
- Select 'Slot E' and press the OK button.

16 Troubleshooting

For more troubleshooting information, see the VACON 100 HVAC Application Manual and the documentation for any units connected to Fan Inverter.

Note If Fan Inverter does not start after a reset, switch off and on power to Fan Inverter.			
Error	Possible cause	Solution	
Alarm in display. (Press BACK/RESET) for information about the alarm.)	PID1 supervision is equal to low pressure level.	• See Low pressure level under 'Alarm flashlight flashing' below. Reset the alarm with the BACK/RESET button when corrected.	
	'AI Low'	 Pressure sensor not connected. Check the connection and correct according to the circuit diagram. Pressure hose connected at wrong port. See that it is connected to the lower or minus port. Pressure sensor faulty. Replace the sensor. 	
	Other alarm or fault.	• See the VACON 100 HVAC Application Manual and the documentation for any unit that is connected to Fan Inverter, or consult a Nederman certified technician.	
Alarm flashlight flashing. (Fan not started.)	Fan Inverter is not ready.	 DIN2 status in the 'Control page' is set to ON when read see Figure 4. Check and switch on the safety switch at fan if it can be done safely, or consult a Nederman certified techniciar 	
	There is an alarm in the display.	• See the VACON 100 HVAC Application Manual and the documentation for the unit that is connected to Fan Inverter, or consult a Nederman certified technician.	
Alarm flashlight flashing. (Fan running.)	Low pressure level.	 If the pressure hose is disconnected or damaged, check the hose and repair it. If too many extraction points are open, close excessive extraction points. If there is a too high pressure drop in the system, check, for example, the filter pressure drop at FilterMax and clean the filter if applicable. Check the direction of the fan, see Section 12.1 Initial start-up. Consult a Nederman certified technician. 	

Error	Possible cause	Solution		
Fan Inverter does not start the fan.	Fan Inverter is not ready.	 DIN2 status in the 'Control page' is set to ON when read see Figure 4. Check and switch on the safety switch at fan if it can be done safely, or consult a Nederman certified techniciae 		
	Start signal from Fan Timer is missing.	 Check real time clock settings. Check Fan Timer settings. DO3 status in the 'Control page' is set to ON when Fan Timer Time channnel 1 is ON. DIN1 status in the 'Control page' is set to ON when the start signal is present. 		
	Start signal from ex- ternal contact is miss- ing.	 Check the equipment providing the start signal. DIN1 status in the 'Control page' is set to ON when the start signal is present. 		
	Fan Inverter is set to Local mode.	 Adjust to correct the control place, or consult a Neder- man certified technician. 		
Fan Inverter does not stop the fan.	Start signal from Fan Timer is still active.	 Check real time clock setting. Check Fan Timer settings. DO3 status in the 'Control page' is set to OFF when Fan Timer Time channnel 1 is OFF. 		
	Start signal from ex- ternal contact is still active.	 Check the equipment providing the start signal. DIN1 status in the 'Control page' is set to OFF when the start signal is present. 		
	Fan Inverter is set to Local mode.	• Stop system with STOP button. Adjust to correct the control place, or consult a Nederman certified technicia		
Fan Inverter does not reach set point.	Low pressure level.	 If the pressure hose is disconnected or damaged, check the hose and repair it. If too many extraction points are open, close excessive extraction points. 		
		 If there is a too high pressure drop in the system, check, for example, the filter pressure drop at FilterMax and clean the filter if applicable. 		
		 Check the direction of the fan, see <u>Section 12.1 Initial</u> <u>start-up</u>. Consult a Nederman certified technician. 		
Fan rotates in the wrong direction	Wiring to motor is incor- rect.	• Change the wiring to the motor.		
GFI/RCD trips.	The RFI filter drains cur- rent to earth.	• GFI/RCD with high sensitivity cannot be used. Special GFI/RCD for frequency converters may be used.		
Fan Inverter not working properly with the Remote Switch - Fan Timer.	Remote Switch - Fan Timer is not connected correctly.	 See Figure 9 and Figure 15. DIN5 in the 'Control page' is set to ON when the Remote Switch is in the OFF position. DIN6 in the 'Control page' is set to ON while the Remote Switch is turned to and held in the +2h position. 		

17 Spare Parts

 \land

CAUTION! Risk of equipment damage

Use only Nederman original spare parts and accessories.

Contact your nearest authorized distributor or Nederman for advice on technical service or if you require help with spare parts. See also www.nederman.com.

17.1 Ordering spare parts

When ordering spare parts always state the following:

- The part number and control number (see the product identification plate).
- Detail number and name of the spare part (see www.nederman.com/en/service/spare-part-search).
- Quantity of the parts required.

18 Recycling

The product has been designed for component materials to be recycled. Different material types must be handled according to relevant local regulations. Contact the distributor or Nederman if uncertainties arise when scrapping the product at the end of its service life.

19 Warranty information

Fan Inverter article number ⁽¹⁾		
Control number ⁽¹⁾		
Shop order number		
VACON Type		
VACON B.ID ⁽¹⁾		
VACON (S/N) ⁽¹⁾		
Date of commissioning		
Signature		
Name		
Phone number		
(1) This information is mandatory in the event of a warranty claim.		

EMC	Electromagnetic compatibility
GFI	Ground Fault Interrupter
LEV	Local Exhaust Ventilation
PID	Proportional Integral Derivative (Pressure controller)
РТС	Positive temperature coefficient (Thermistor in motor)
RCD	Residual Current Device
RFI	Radio Frequency Interference
STO	Safe Torque Off

20 Acronyms and abbreviations

21 EMC information

	Type and area	Length	Comply with installation manu- als (Yes/No/Comments)
Mains cable			
Motor cable			
Control cables			
Second protective con- ductor			

	Туре	Size	Comply with installation manu- als (Yes/No/Comments)
Supply fuse			
Main switch			
Safety switch at motor, EMC type			
EMC cable gland at motor			
PTC in motor			
IP 54			
Signature			

22 Appendix

22.1 Appendix A: Reading operating data

When the system is working correctly a reading and noting of operation data is recommended. With the maximum numbers of extractor points open, according to the dimensioning, read and note the operating data and let an electrician measure and note the mains voltage/current during maximum load.

(i) Note

Output Frequency to Unit Temperature are found under Main menu > Monitor > Basic.

Energy Counter and Run Time are found on the Multimonitor or under Main menu > Diagnostics > Total Counters.

Code	Name	Operating	data notes		
Date:					
Conditions:					
V2.2.1	Ouptput Frequency (Hz)				
V2.2.2	Freq Reference (Hz)				
V2.2.3	Motor Speed (rpm)				
V2.2.4	Motor current (A)				
V2.2.5	Motor Torque (%)				
V2.2.7	Motor Shaft Power (%)				
V2.2.8	Motor Shaft Power (kW/hp)				
V2.2.9	Motor voltage (V)				
V2.2.10	DC-link voltage (V)				
V2.2.11	Unit Temperature (°C)				
V4.4.1	Energy counter (kWh)				
V4.4.7	Run time (a=year, d=days)				
Measured Mains Voltage (V)					
Measured Mains Current (A)					
Airflow in extraction					

22.2 Appendix B: Installation chart



22.3 Appendix C: Airflow 22.3.1 C1: Airflow measurement





Airflow indicator



The Airflow Indicator is a simple device that indicates when the airflow is adequate in a Nederman extraction arm. It is available as an accessory.



22.3.3 C2: Airflow charts: NEX and NEX HD



NEX HD



22.4 Appendix D: Circuit diagrams

22.4.1 D1: Mains circuit 380 - 500V



22.4.2 D2: Mains circuit 400V



No rotary valve







22.4.4 D4: Control general optional starts







connection with Fan Timer.

Or to terminal 33 if Fan Timer shall not be used, (or to

terminal 12 to make the relay R03 available for other function.

22.4.5 D5: Control general, optional starts delayed off



Options









Connect external contact is used. Connect external contact to terminal 32 for a serial connection with Fan Timer, or to terminal 33 if Fan Timer shall not be used.

22.4.7 D7: Connect FilterMax C25









P 3.5.3.2.7 RO3 Function RUN









