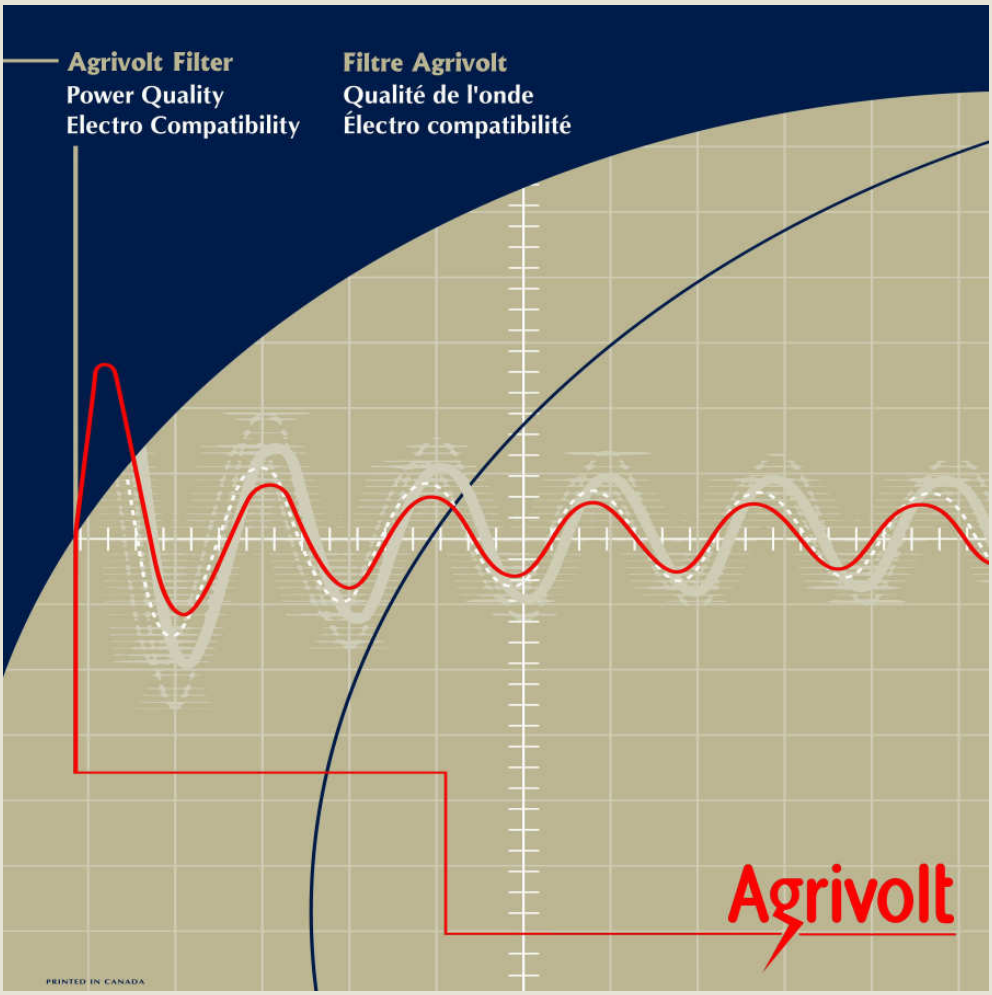
Agrivolt

A Nuvolt Corporation Inc. Company

Agrivolt Filters

For electronic noise



Technical Specifications

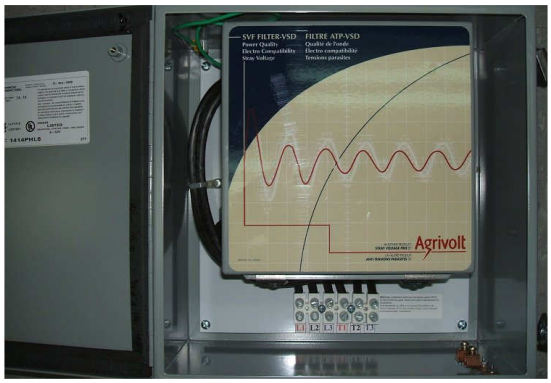
and

Installation Manual

8780 Boul. de la Rive-Sud
Lévis, Québec, G6V 9G9
Téléphone : (418) 833-0773
Télécopie : (418) 833-4055
Sans Frais : 1-800-463-3486
info@agrivolt.com

Agrivolt
A Nuvolt Corporation Inc. company

Agrivolt Filters

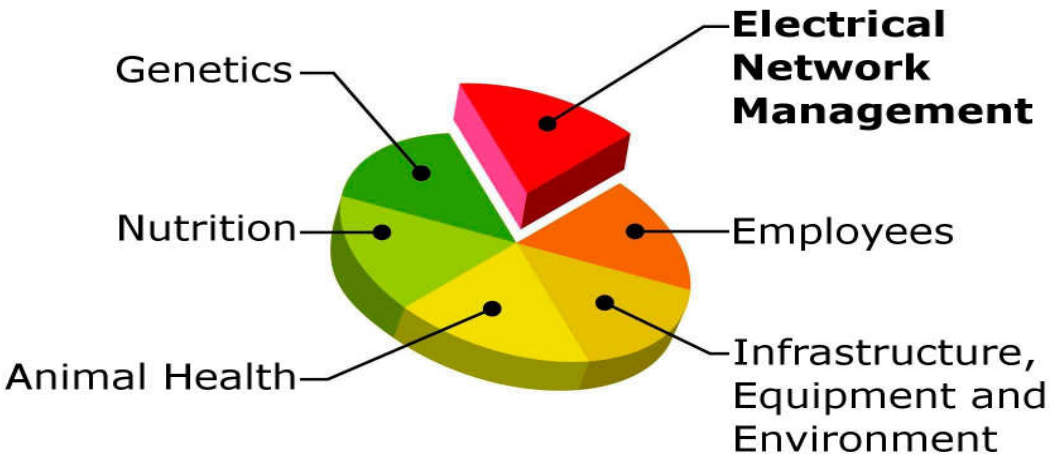


A range of Filters for electronic noise conceived for AGRIVOLT for livestock farm facilities in order to prevent current flow at medium frequencies on grounding and bonding networks. These currents are produced by various noise generators such as **Variable Speed Drives, electronic ventilation, electronic lighting ballasts, and electrical fences**, among others.

AGRIVOLT FILTERS also protect the equipment and eliminate problems from electromagnetic incompatibility between the various components.

AGRIVOLT considers that a 200 mA current at 1KHz frequency or above, measured at the noise generating equipment, is a safe threshold. This threshold is based on the IEC standard 1479-2.

Managing your electrical network: <<A Must>>



1.0 Agrivolt Filter Selection Table

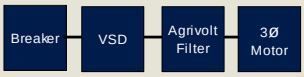
Variable Speed Drives (1ø & 3ø)

- F11B3Q-AM — 600VMax 3 Phases 11Amps
- F22B3Q-AM — 600VMax 3 Phases 22 Amps
- F32B3Q-AM — 600VMax 3 Phases 32 Amps
- F52B3Q-AM — 600VMax 3 Phases 52 Amps
- F68B3Q-AM — 600VMax 3 Phases 68 Amps
- F80B3Q-AM — 600VMax 3 Phases 80 Amps
- F110B3Q-AM — 600VMax 3 Phases 110 Amps
- F136B3Q-AM — 600VMax 3 Phases 136 Amps

Applications:

Well Pumps
Vacuum Pumps
Milk Pumps
etc.

Installation - Single and Three Phase



Installation recommandations:

- Distinct Circuit per VSD
- PVC Conduit and THHN Wire (or equivalent)
- Do not use any shielded, teck or extension cord type wiring
- Remove any EMI type Filters (internal or External)
- Reduce the Carrier Frequency
- Install the Agrivolt Filter between the VSD and the Motor
- Locate the VSD as close to the motor as possible
- See full specification sheet for more details

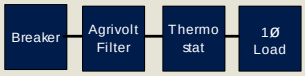
Heating and Ventilation

- F11B1Q-AM — 600VMax 1 Phase 11Amps
- F22B1Q-AM — 600VMax 1 Phase 22Amps
- F11B3Q-AM — 600VMax 3 Phases 11Amps
- F22B3Q-AM — 600VMax 3 Phases 22Amps

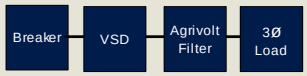
Applications:

Large Electronic Fans
Tunnel Fans
Variable Speed Thermostats
etc.

Installation (Thermostat) - Single Phase



Installation (VSD) - Single and Three Phase



Installation recommandations (Thermostat):

- Install the Agrivolt Filter between the Breaker and the Thermostat
- Multiple Thermostats may be controlled with one Agrivolt Filter as long as it is not overloaded
- See full specification sheet for more details

Installation recommandations (VSD):

- Distinct Circuit per VSD
- PVC Conduit and THHN Wire (or equivalent)
- Do not use any shielded, teck or extension cord type wiring
- Remove any EMI type Filters (internal or External)
- Reduce the Carrier Frequency
- Install the AgrivoltFilter between the VSD and the Motor
- Locate the VSD as close to the motor as possible
- See full specification sheet for more details

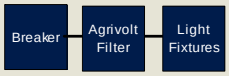
Lights

- F22B1Q-AM — 600VMax 2 wires 22Amps
- F22B3Q-AM — 600VMax 3 wires 22Amps
- F22B4Q-AM — 600VMax 4 wires 22Amps

Applications:

Compact Lighting
Electronic Ballasts
Dimmers
etc.

Installation (Electronic Lighting)



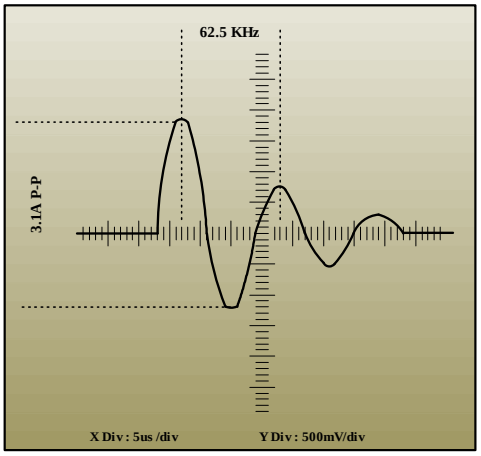
Installation recommandations:

- Install the Agrivolt Filter between the Breaker and the light fixtures
- Multiple light fixtures may be controlled with one Agrivolt Filter as long as it is not overloaded
- Remove any EMI type Filters
- Keep wiring of the lighting away from RF ID antennas and data cables.
- See full specification sheet for more details

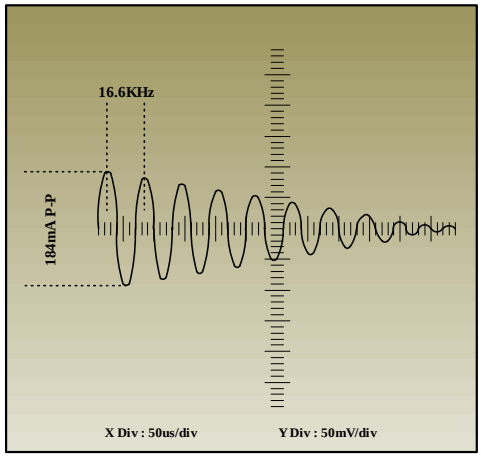
2.0 Characteristics of Agrivolt Filters

2.1 Technical description of the product

Agrivolt Filter, by design, modifies the characteristics of the impulse produced by noise generating equipment by having high impedance at medium frequency in differential-mode and common-mode while avoiding any bond with the grounding network. By avoiding redirecting this capacitive leak to the grounding and bonding networks, contrary to an EMI Filter, the Agrivolt Filter protects the animal and the equipment in livestock facilities. Moreover, it prevents the problems of electromagnetic incompatibility between various equipment components.



Without Agrivolt Filter



With Agrivolt Filter

2.2 Differential-mode, common-mode

Differential Mode Noise: This type of noise is found between the lines of a circuit.

Common Mode Noise: This type of noise is found between one or several lines of a circuit and the ground conductor.

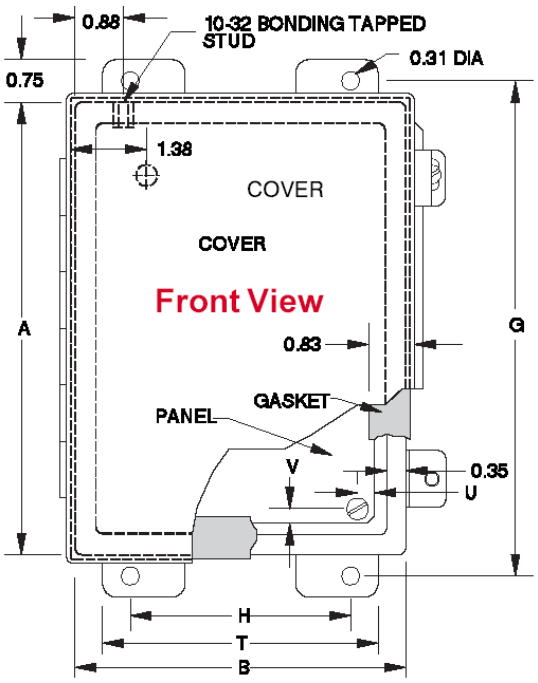
2.3 Single-phase or three-phase current

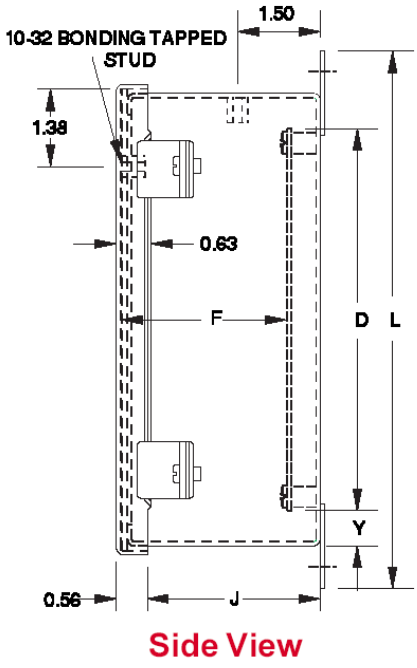
Agrivolt Filters can be used on a single-phase or three-phase current network.

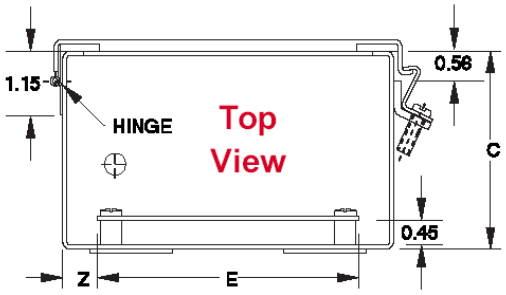
2.4 Temperature range

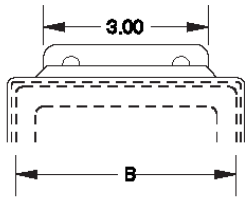
Operating temperature range: 32°F to 104°F (0°C to +40°C)
Storage temperature range: -85°F to 194°F (-65°C to +90°C)

2.5 Size and weight

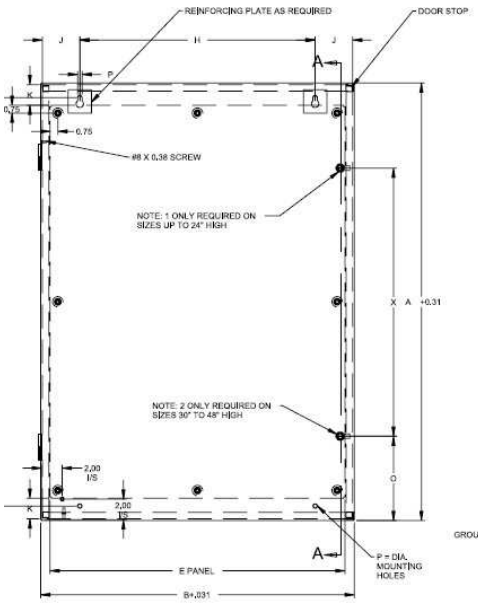




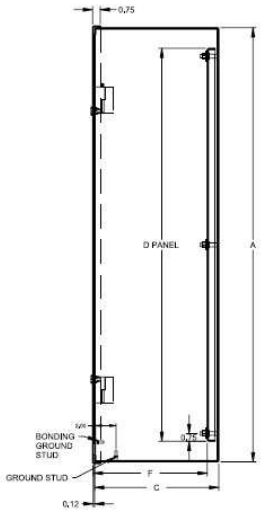




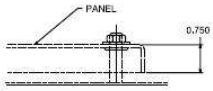
	Box Dimensions Inch / cm			Centers Inch / cm			Weight (Pound/Kg)
Products	A	B	C	G	H	L	
F11B1Q-AM	8/20.3	8/20.3	4/10.2	8.75/22.2	6/15.2	9.5/24.1	12.0 / 6.0
F22B1Q-AM	8/20.3	8/20.3	4/10.2	8.75/22.2	6/15.2	9.5/24.1	12.0 / 6.0
F11B3Q-AM	8/20.3	8/20.3	4/10.2	8.75/22.2	6/15.2	9.5/24.1	12.0 / 6.0
F22B3Q-AM	10/25.4	8/20.3	6/15.2	10.75/27.3	6/15.2	11.5/29.2	18.0 / 8.0
F22B4Q-AM	10/25.4	8/20.3	6/15.2	10.75/27.3	6/15.2	11.5/29.2	18.5 / 8.3
F32B3Q-AM	12/30.5	12/30.5	6/15.2	12.75/32.4	10/25.4	13.5/34.3	30.0 / 14.0
F52B3Q-AM	12/30.5	12/30.5	6/15.2	12.75/32.4	10/25.4	13.5/34.3	30.0 / 14.0
F68B3Q-AM	16/40.6	14/35.6	8/20.3	16.75/42.5	12/30.5	17.5/44.5	48.0 / 22.0



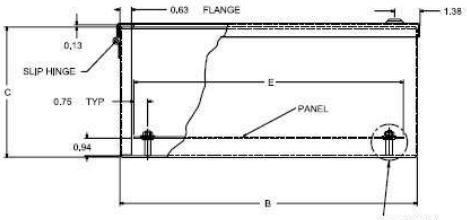
Front View



Side View



Detail A
Typ. for N1A423012, N1A423612 and N1A483612



Bottom View

When A=	X=
30	18.00
36	22.00
42	26.00
48	30.00

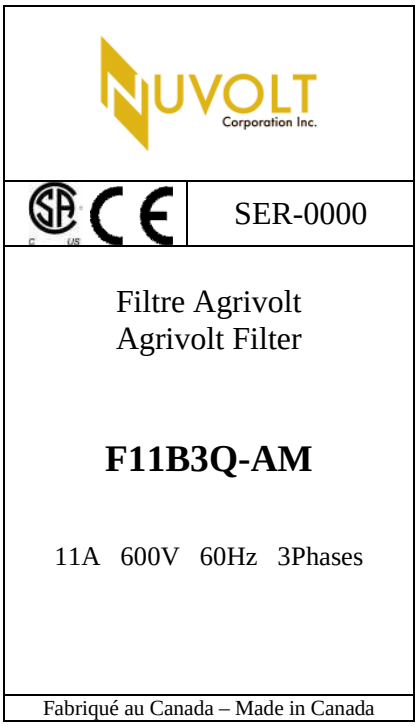
	Box Dimensions Inch / cm			Centers Inch / cm			Weight (Pound/Kg)
Products	A	B	C	G	H	J	
F80B3Q-AM	16/40.6	20/50.8	7/17.8	13.9/35.3	15/38.1	2.5/6.35	72.0 / 33.0
F110B3Q-AM	24/60.9	20/50.8	7/17.8	21.9/55.6	15/38.1	2.5/6.35	108.0 / 54.0
F136B3Q-AM	36/91.4	24/60.9	9/22.9	33.5/85.1	16.75/42.5	3.63/9.22	221.0 / 100.0

2.6 Terminal blocks

Reference	Amperage	Voltage	Wire
F11	25 A	600 V	22-10
F22	35 A	600 V	22-10
F32	50A	600 V	14-8
F52	65 A	600 V	14-6
F68	85 A	600 V	14-4
F80	175 A	600 V	2/0-#14
F110	175 A	600 V	2/0-#14
F136	175 A	600 V	2/0-#14

2.7 Certifications / Identification Label

CSA(us) certification and CE Marking



2.8 Patents

Product patent # US 6,690,565 - CA 2,424,857

2.9 Manufacturing

Agrivolt Filters are manufactured in Canada by Nuvolt Corporation Inc.

3.0 Agrivolt Filters Installation Procedure

3.1.1 Reception of the product

- Make sure the Agrivolt Filter corresponds to the noise generator you want to correct.
- Make sure Agrivolt Filters are not damaged in transport.

3.1.2 Handling

- It is recommended to keep Agrivolt Filters in their original packing until use.

3.1.3 Pre assembly precautions

- Agrivolt Filter must be easy to reach and located in a dry place.
- Avoid locating the Agrivolt Filter close to a heat source.
- Leave enough free space to allow good air flow.
- Install the Agrivolt Filter vertically.
- One must remove the EMI Filter before installing the Agrivolt Filter.
- No lightning protector or power factor corrector can be used on the output side of the noise generator.

3.1.4 Agrivolt Filter Assembly

- The installation of the Agrivolt Filter and the material used must be in compliance with applicable codes.
- Physically separate the input and output wiring of the Agrivolt Filter.
- Physically separate the input and output conductors of the noise generator.
- Firmly set the Agrivolt Filter on a wall
- We recommend the use of the following wires for the input and output connection to the Agrivolt Filter: copper conductors, 600 volts, 105ºC (221ºF), strands;

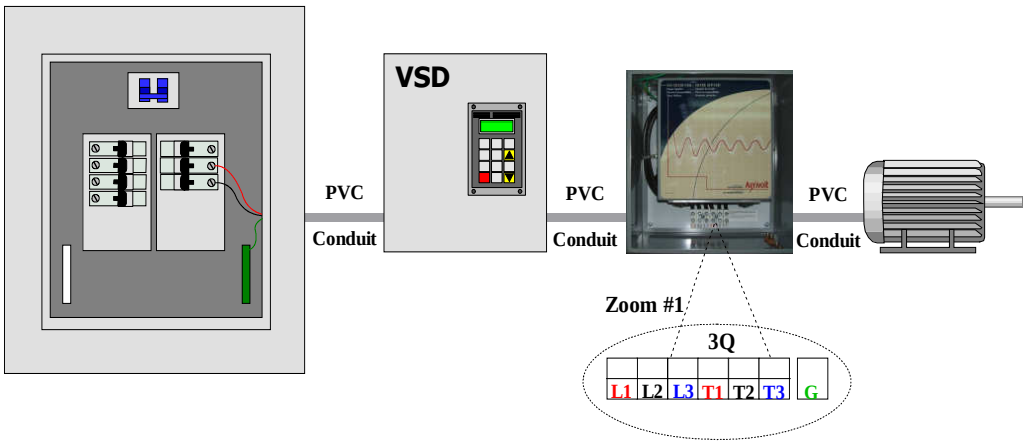
<u>USA & Canada</u>
REW - XLPVC
TEW

- The acceptable minimal distance between power wires and control wires is 7 cm (3 inches).

4.0 Installing Agrivolt Filter with a Variable Speed Drive (VSD)

1Q or 3Q

4.1 Diagram



4.2 Installing Agrivolt Filter with a Variable Speed Drive (VSD)

- The Variable Speed Drive must at all time be powered from a separate circuit.
- **EMI filters** must be removed from the Variable Speed Drive circuit.
- Do not use line reactor or power factor corrector between the circuit breaker and the motor.
- Separate conductors required: under no condition should the power wire of the Variable Speed Drive run with other networks in the same conduit, auxiliary gutters, wire shelves, etc
- A rigid or flexible non-metallic conduit is required for connection between motor, Agrivolt Filter and Variable Speed Drive.
- We recommend the use of the following wires for the input and output connection to the Agrivolt Filter: copper conductors, 600 volts, 105ºC (221ºF), strands;

<u>USA & Canada</u>
REW - XLPVC
TEW

- The input and output wires of the Variable Speed Drive must be in separate conduits.
- Wiring is copper, minimum #14 strands.
- Wiring for connection between the motor and the Variable Speed Drive must be copper 600 volts, 90ºC (194ºF) minimum (THHN, MTW, etc…)
- Only rigid 600Volts 105ºC (221ºF) minimum wire connectors should be used.

- The gauge of the grounding and bonding wire is prescribed by the Electric Codes. Wire must be isolated type.
- If any current remains in the grounding and bonding wire, it is necessary to change, to move or to give up one or more grounds. (CEC, 10-200 / NEC, 250,6,B)

4.3 Check-up Procedure before starting Agrivolt Filter

Make sure

- There is no risk of condensation in the case.
- The grounding wires are well connected.
- The wires used respect Agrivolt recommendations and the National Electric Codes.

4.4 Check-up Procedure after starting Agrivolt Filter

1) The Variable Speed Drive is incompatible with another component:

- Several power lines from different networks are running through the same conduit.
- There is an EMI Filter in the circuit.
- Check the acceleration ramp
- Use the lowest value at the *carrier frequency*.
- Check for electric arc (circuit breakers, etc…)
- Check the variation of tension (%) of the power line.
- Check if there is any non-filtered noise generating component.

2) *The electrical circuit leakage capacitance is high*

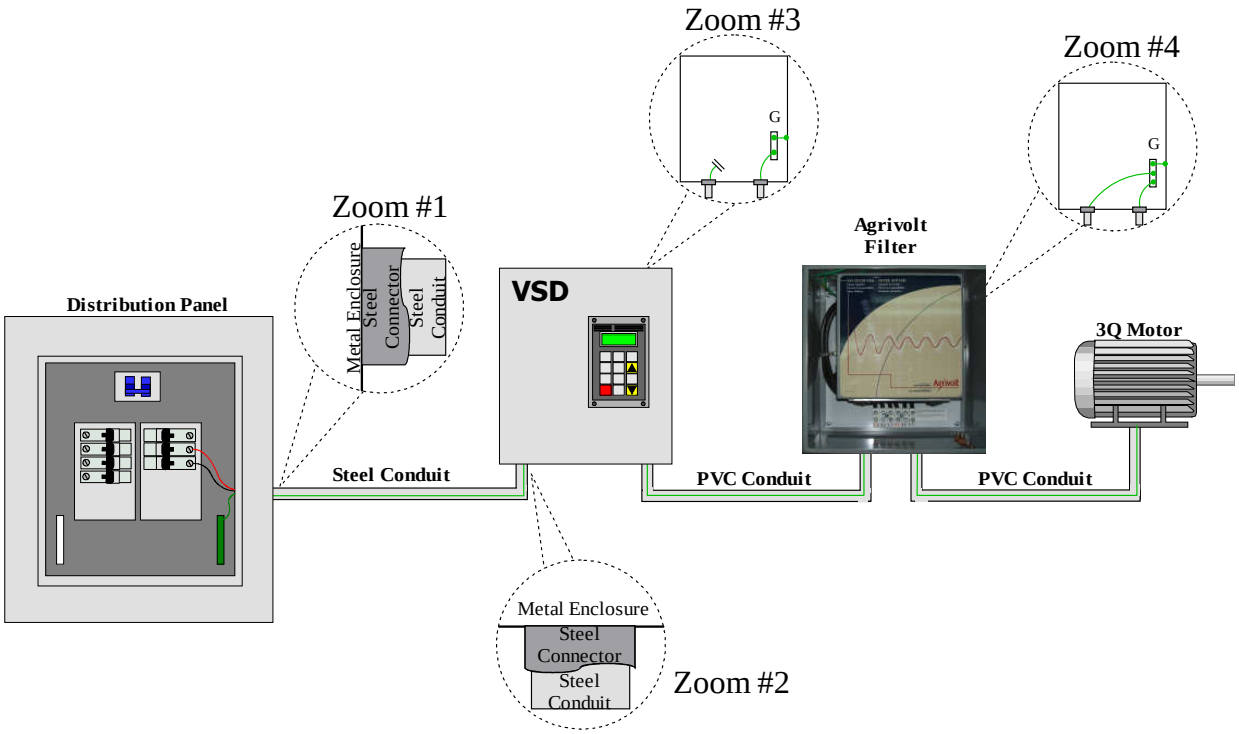
The leakage capacitance of the electrical circuit (of the Variable Speed Drive, lines, motors, etc) is important for good performances. For instance, pay special attention to installations connected to submersible pumps.

In many cases, in the presence of a high leakage capacitance, a noise is perceptible at the Agrivolt Filter. To eliminate this noise, it is necessary to improve the leakage capacitance of the electrical circuit of the Variable Speed Drive. Wires between the Variable Speed Drive and the motor are the most solicited and must have at all time a low leakage capacitance.

3) *Presence of a current loop*

It is possible that an existing installation use a metal conduit as well as a ground wire for grounding. A problem of induction then develops. Induction generates a current which circulates (in loop) in the ground wire and the metal conduit. This current in turn radiates and generates a current in the adjacent communication or electrical networks. To solve the problem, disconnect the secondary side from the grounding and bonding wire.

Here is an example:



Zoom #1 Represents the primary side of the steel conduit, this side is grounded

Zoom #2 Represents the secondary side of the steel conduit, this side is grounded.

Zoom #3 Represents the ground wire in the steel conduit disconnected and isolated at the secondary side. You also can see that a ground wire is assuring a ground continuity to the VSD enclosure since a PVC conduit is present.

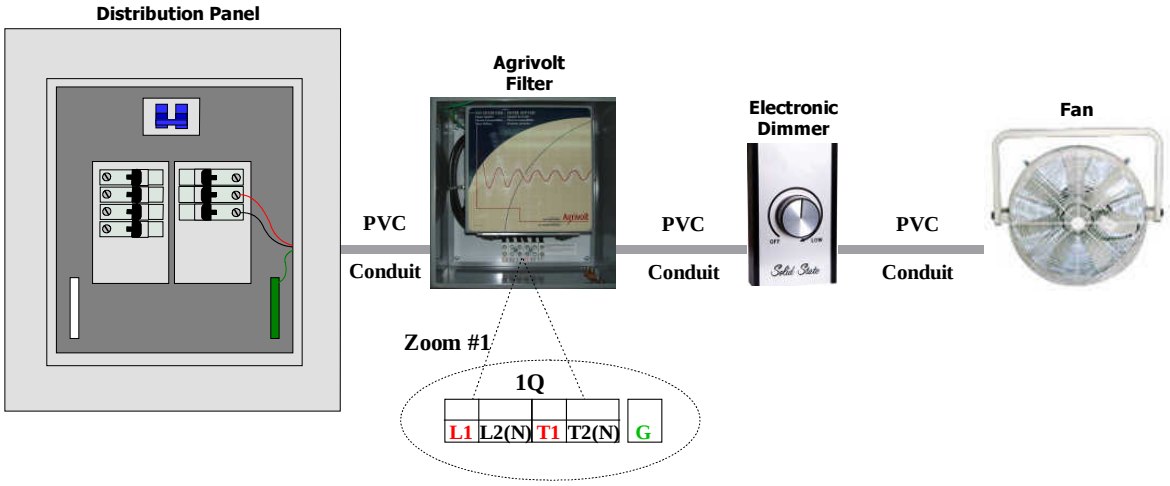
Zoom #4 Represents the ground wire used has continuity to the motor

4.5 Motor with long wires

The location of the Variable Speed Drive (VSD) and of the Agrivolt Filter must be within 50 feet (15 meters) of the motor (ventilation).

5.0: Installation of an Agrivolt Filter with electronic ventilation

5.1 Installation Diagram



5.2 Installation of the Agrivolt Filter

- The noise generator must at all time be powered from a separate circuit.
- **EMI filters** must be removed from the circuit.
- The input and output wires of the noise generating component must be separated.
- Separate wires required: under no condition should the power wires of the noise generating component run with other networks in the same conduit, auxiliary gutters, wire shelves, etc
- Wiring is copper, minimum #14 strands.
- Wiring for connection between the circuit breaker and the load must be copper, 600 volts, 90ºC (194ºF) minimum (THHN, MTW, etc…)
- Only rigid 600Volts 105ºC (221ºF) minimum wire connectors should be used.
- The gauge of the grounding and bonding wire is prescribed by the Electric Codes. Wire must be of isolated type.
- If any current remains in the grounding and bonding wire it is necessary to change, to move or to give up one or more grounds. (CEC, 10-200 / NEC, 250,6,B)

5.3 Check-up Procedure before starting Agrivolt Filter

Make sure that:

- There is no risk of condensation in the case.
- The ground wires are well connected.
- The wires used respect Agrivolt recommendations and the National Electric Codes.

5.4 Check-up Procedure after starting Agrivolt Filter

1) The noise generator is incompatible with another component.

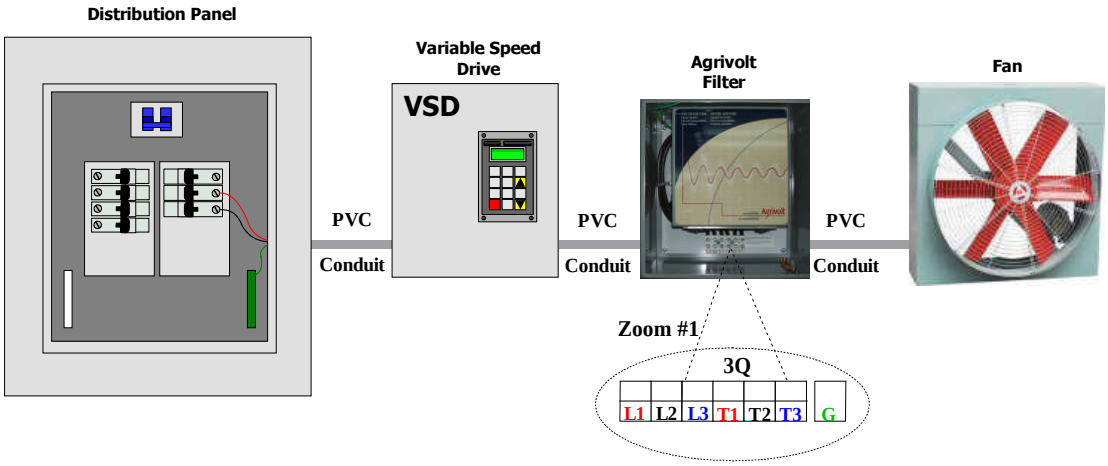
- Several power wires from different networks are running through the same conduit.
- There is an EMI Filter in the circuit.
- Check for electric arc (circuit breakers, etc…)
- Check if there is any non-filtered noise generating component.

2) The electrical circuit leakage capacitance is high

The leakage capacitance of the electrical circuit including the noise generator, wires, load, is important for good performances. In many cases, in the presence of a high wiring leakage capacitance, a noise is perceptible at the Agrivolt Filter. To eliminate this noise, it is necessary to improve the leakage capacitance of the electrical circuit.

5.5 Installation of an Agrivolt Filter with a variable speeds type electronic ventilation (VSD)

5.5.1 Installation Diagram



5.5.2 Installation Procedure for the Agrivolt Filter.

- The Variable Speed Drive must at all time be powered from a separate circuit.
- **EMI filters** must be removed from the Variable Speed Drive circuit.
- Do not use line reactor or power factor corrector between the circuit breaker and the motor.
- Separate conductors required: under no condition should the power wire of the Variable Speed Drive run with other networks in the same conduit, auxiliary gutters, wire shelves, etc
- A rigid or flexible non-metallic conduit is required for connection between motor, Agrivolt Filter and Variable Speed Drive.

- We recommend the use of the following wires for the input and output connection to the Agrivolt Filter: copper conductors, 600 volts, 105ºC (221ºF), strands;

USA & Canada

REW - XLPVC

TEW

- The input and output wires of the Variable Speed Drive must be in separate conduits.
- Wiring is copper, minimum #14 strands.
- Wiring for connection between the motor and the Variable Speed Drive must be copper, 600 volts, 90ºC (194ºF) minimum (THHN, MTW, etc…)
- Only rigid 600Volts 105ºC (221ºF) minimum wire connectors should be used.
- The gauge of the grounding and bonding wires is prescribed by the Electric Codes. Wire must be of isolated type.
- If any current remains in the grounding and bonding wires it is necessary to change, to move or to give up one or more grounds. (CEC, 10-200 / NEC, 250,6,B)

5.5.3 Check-up Procedure before starting Agrivolt Filter

Make sure that:

- There is no risk of condensation in the case.
- The ground wires are well connected.
- The wires used respect Agrivolt recommendations and the National Electric Codes.

5.5.4 Check-up Procedure after starting Agrivolt Filter

1) The noise generator is incompatible with other components

- Several power lines from different networks are running through the same conduit.
- There is an EMI Filter in the circuit.
- Check the acceleration ramp.
- Use the lowest value at the *carrier frequency*.
- Check for electric arc (circuit breakers, etc…)
- Check the variation of tension (%) of the power line.
- Check if there is any non-filtered noise generating component.

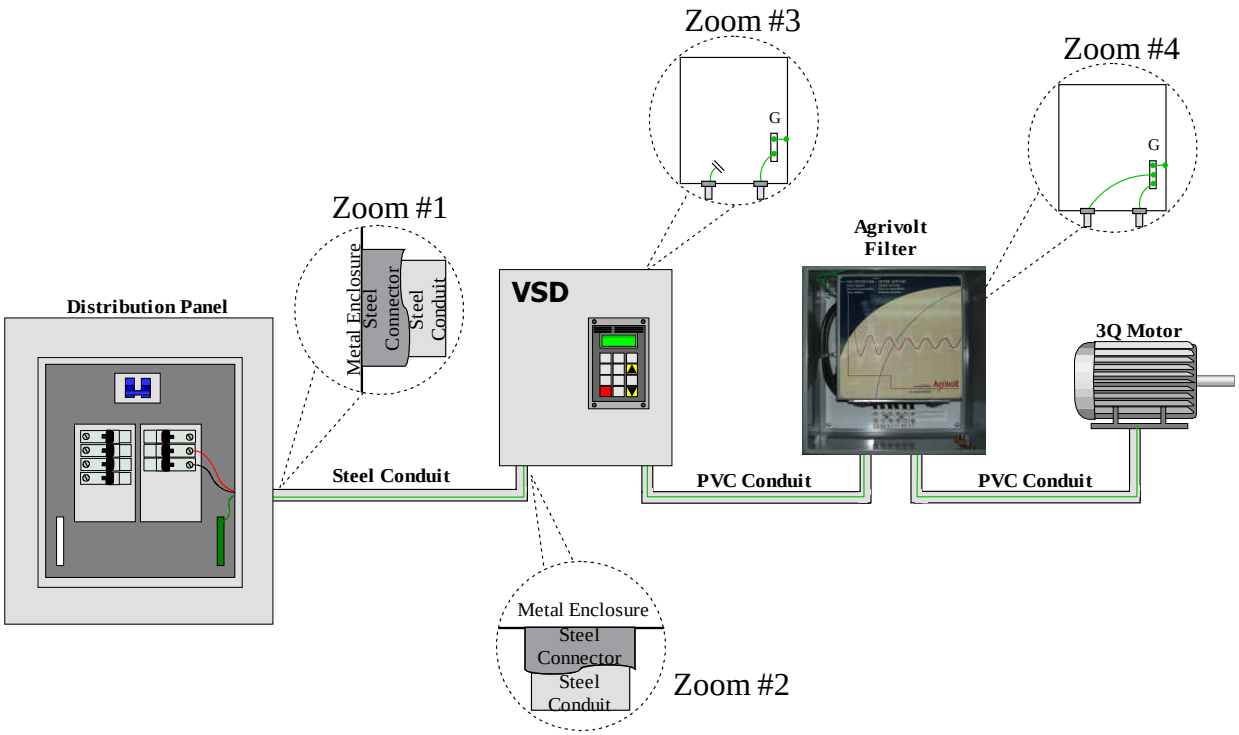
2) The electrical circuit leakage capacitance is high

The leakage capacitance of the electrical circuit including the components (Variable Speed Drive, lines, motors, etc) is important for good performances.
In many cases, in the presence of a high wiring leakage capacitance, a noise is perceptible at the Agrivolt Filter. To eliminate this noise, it is necessary to improve the leakage capacitance of the electrical circuit of the Variable Speed Drive. Wires between the Variable Speed Drive and the motor are the most solicited and must have at all time a low leakage capacitance.

3) Presence of a current loop

It is possible that an existing installation use a metal conduit as well as a ground wire for grounding. A problem of induction then develops. Induction generates a current which circulates (in loop) in the ground wire and the metal conduit. This current in turn radiates and generates a current in the adjacent communication or electrical networks. To solve the problem, disconnect the secondary side from the ground wire.

Here is an example:



Zoom #1 Represents the primary side of the steel conduit, this side is grounded

Zoom #2 Represents the secondary side of the steel conduit, this side is grounded.

Zoom #3 Represents the ground wire in the steel conduit disconnected and isolated at the secondary side. You also can see that a ground wire is assuring a ground continuity to the VSD enclosure since a PVC conduit is present.

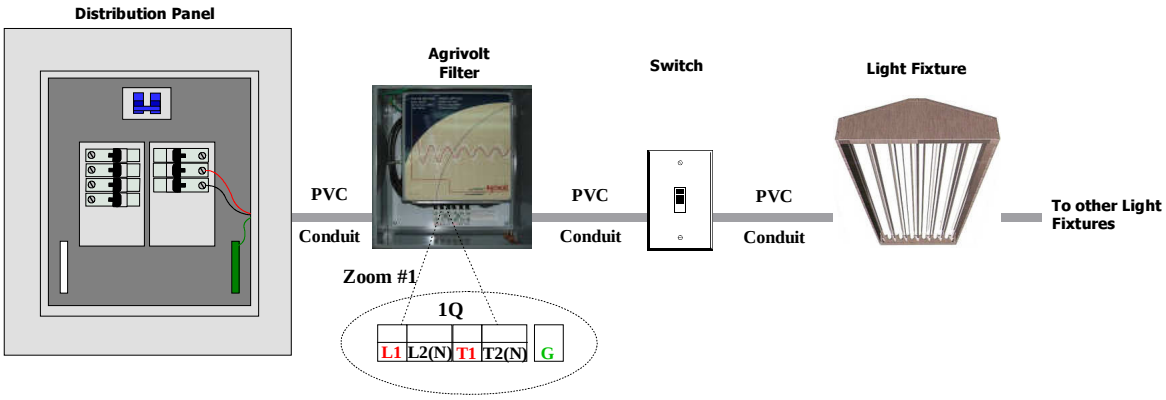
Zoom #4 Represents the ground wire used has continuity to the motor

4) Motor with too long a wire

We recommend the installation of the Variable Speed Drive and of the Agrivolt Filter within 50 feet (15 meters) of the motor (ventilation).

6.0 Installation of an Agrivolt Filter with electronic lighting ballasts

6.1 Installation Diagram



6.2 Installing the Agrivolt Filter

- Electronic lighting ballasts must at all time be powered from a separate circuit.
- **EMI filters** must be removed from the circuit.
- Do not use Line Reactor or Power Factor Corrector between the circuit breaker and the load.
- Separate conductors required: under no condition should the power conductor of the electronic lighting ballasts run with other networks in the same conduit, auxiliary gutters, wire shelves, etc
- Wiring is copper, minimum #14 strands.
- Wiring for connection between the breaker and the load must be copper, 600 volts, 90ºC (194ºF) minimum (THHN, MTW, etc…)
- Only rigid 600Volts 105ºC (221ºF) minimum wire connectors should be used.
- The gauge of the grounding and bonding wire is prescribed by the Electric Codes. Wire must be of isolated type.
- If any current remains in the grounding and bonding wire it is necessary to change, to move or to give up one or more grounds. (CEC, 10-200 / NEC, 250,6,B)

6.3 Check-up Procedure before starting Agrivolt Filter

Make sure that

- There is no risk of condensation in the case.
- The ground wires are well connected.
- The wires used respect Agrivolt recommendations and the National Electric Codes.

6.4 Check-up Procedure after starting Agrivolt Filter

1) Electronic lighting ballasts remain incompatible with another component.

- Several power lines from different networks are running through the same conduit.
- There is an EMI Filter in the circuit.
- Check for electric arc (circuit breakers, etc…)
- Check if there is any non-filtered noise generating component.

2) The electrical circuit leakage capacitance is too high

The leakage capacitance of the electrical circuit including wiring and load is important for good performances. In the presence of a high wiring leakage capacitance, a noise is perceptible at the Agrivolt Filter. To eliminate this noise, it is necessary to improve the leakage capacitance of the electrical circuit.

7.0 Warning about breakdown service on Agrivolt Filter

Before performing any intervention, it is necessary to shut down the Agrivolt Filter. Wait 3 minutes after shut down to allow for the condensers to discharge.

The Agrivolt Filter is likely to evolve technically with time. The manufacturer cannot be held responsible for modifications to the equipment, be it to improve performance, appearance or use.

Installing and starting the Agrivolt Filter must be in compliance with National and Local Standards as applicable at the place of use. This responsibility lies with the Installer.

8.0 Validation Procedure

Physical installation

- Check the ambient conditions of operations
- Check the conformity of installation on a vertical wall
- Check the conformity of the power line wiring
- Check the conformity of wiring to the electrical circuit
- Check the absence of EMI Filter
- Check the grounding

Electrical installation

- Check the electric charge according to the Agrivolt Filter
- Check the conformity of connections
- Check the color coding of phases
- Check the direction of rotation of the motor

Note: One cannot take measurements in voltage in the environment of a noise generator and more particularly with Variable Speed Drives. The output of Variable Speed drives varies in relation to the mass. This situation explains why we can measure voltage impulse up to 2000V whatever is the supply voltage of a variable speed drive. Moreover, the measuring equipment being used performs at high impedance and is easily influenced by radiated noise. It is thus necessary to take a measure in current for more accuracy. It is completely impossible to reduce the amount of electronic noise to zero in the animal environment with Agrivolt Filters.

9.0 Maintenance

Before performing any intervention on the Agrivolt Filter, cut power off and wait for the condensers to discharge (approximately 3 minutes).

The tension at the connector blocks can reach 600V depending on the tension of the network. In the event of anomaly with setting into service or exploitation, first make sure that the recommendations relating to the environment, the assembly and connections were respected.

The Agrivolt Filter does not require preventive maintenance. Nevertheless, it is recommended, on a regular basis, to :

- check the state of connections
- make sure that the temperature in the vicinity of the apparatus remains at an acceptable level
- Vacuum-clean the Agrivolt Filter if necessary.

AGRIVOLT TECHNICAL SERVICE

10.0 Warranty

NUVOLT Corporation Inc.

WARRANTY

Nuvolt Corporation Inc.
Tel : (418) 833-1072
Fax: (418) 833-4055
Email: info@nuvolt.ca
Web Site : www.nuvolt.ca

WARRANTIES OF NUVOLT CORPORATION INC.

1 Nuvolt Corporation Inc. guarantees that all of its products are free from defects in material and workmanship for a period of one (1) year from the date of original purchase.

2 If a product proves to be defective within this period, Nuvolt Corporation Inc. shall replace the same by an identical or equivalent product. In this event, the substituted product wil remain under warranty for the remainder of the one year period running from the date of original purchase. In order for this warranty to be enforceable, Nuvolt Corporation Inc. must receive written notice within five (5) working days following the first appearance of the defect .

3 Save and except Nuvolt Corporation Inc.'s obligation to replace any defective product under the therms set forth in section 2 other warranty express or implied applies to Nuvolt Corporation Inc.'s products. Nuvolt Corporation Inc. shall not be liable for damages of any nature, direct or indirect suffered by the customer or third parties, resulting from any defects or its products or parts of such product or any other cause.

4 This warranty shall not apply to any Nuvolt Corporation Inc.'s product improperly installed or subjected to misuse, abuse, neglect or anything other than normal and ordinary use. Shall be deemed improperly installed any Nuvolt Corporation Inc. product which is not installed in strict compliance with Nuvolt Corporation Inc.'s instructions.

The terms of this warranty shall be governed and construed in accordance with the laws of the Province of Québec, Canada.

Nuvolt Corporation Inc. – Agrivolt Division
8780 Rive-Sud Blvd., Levis (Quebec) Canada G6V 9G9
Phone: (418) 833-0773 ● Fax: (418) 833-4055
Toll Free: 1-800-463-3486
E-mail: info@nuvolt.ca ● Web site: www.nuvolt.ca

Agrivolt Inc.
4310, Madison Avenue, Suite 205, Kansas City, Missouri
Phone: (816) 268-1018 ● Fax: (816) 753-7088
Toll Free: 1-866-574-1753
E-mail: info@agrivolt.com ● Web Site: www.agrivolt.com

Printed in Canada
Agri0004-TechmanFiltersA-R090827