

CORE FUNCTIONS CONTROLLERS FOR NLVE-CN COMPRESSORS



105N4100 Core Functions · 115-127V | 50/60 Hz (US GFCI-Conformity)



Variable-Speed
Efficiency

Core Functions
Controller

Commercial
Applications

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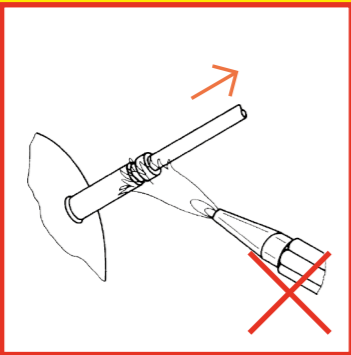
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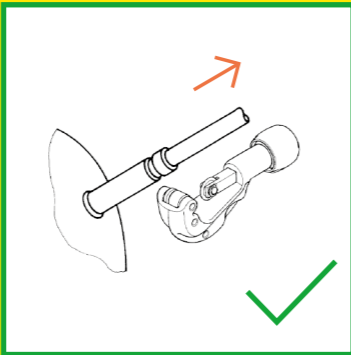
INSTALLATION

WARNING!

 To remove a compressor from a system the tubes must be cut.
Never use a torch to remove brazed tubes.

R290





Brazing on Suction Connectors (Direct Intake*)
* not valid for type 105H7374

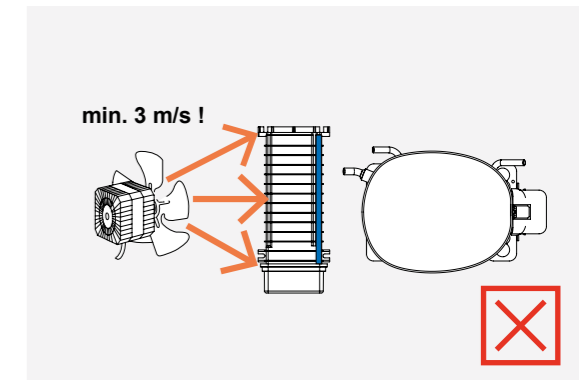
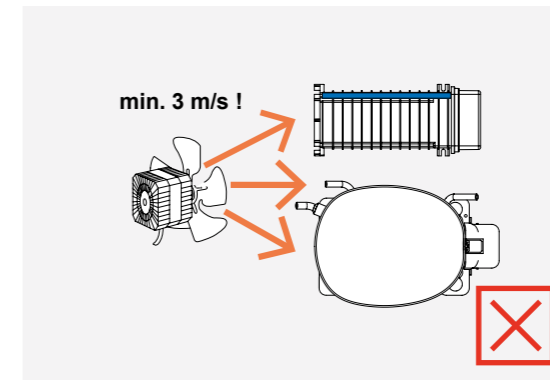
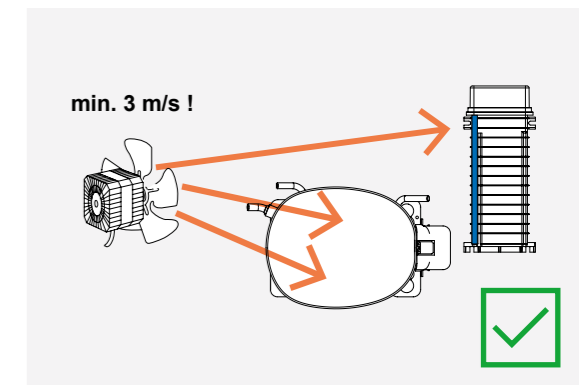
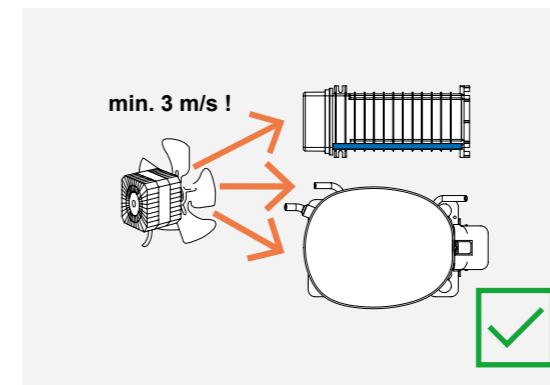
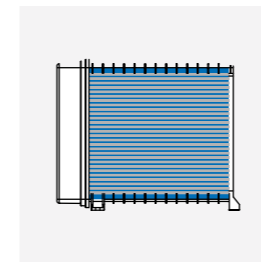
representative image



! max. 150°C/302°F !
at socket
brazing solder: phosphor (LP7) or silver

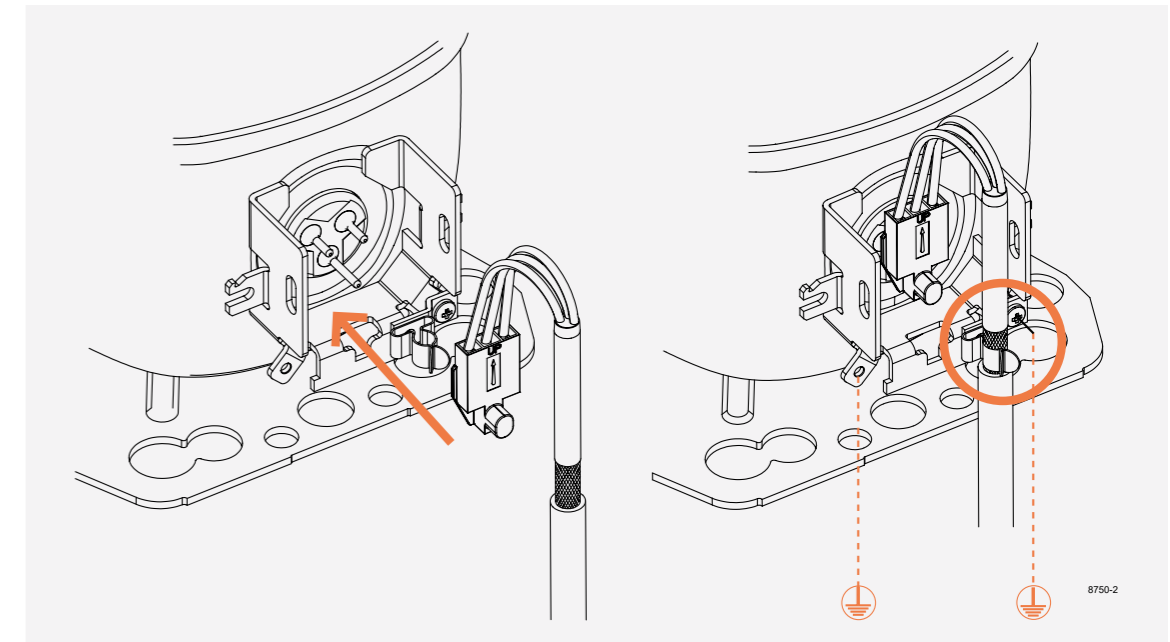
Refer to Product Bulletin:
Brazing on Suction Connectors
(Compressors with Direct Suction Intake)

1.1 Airflow



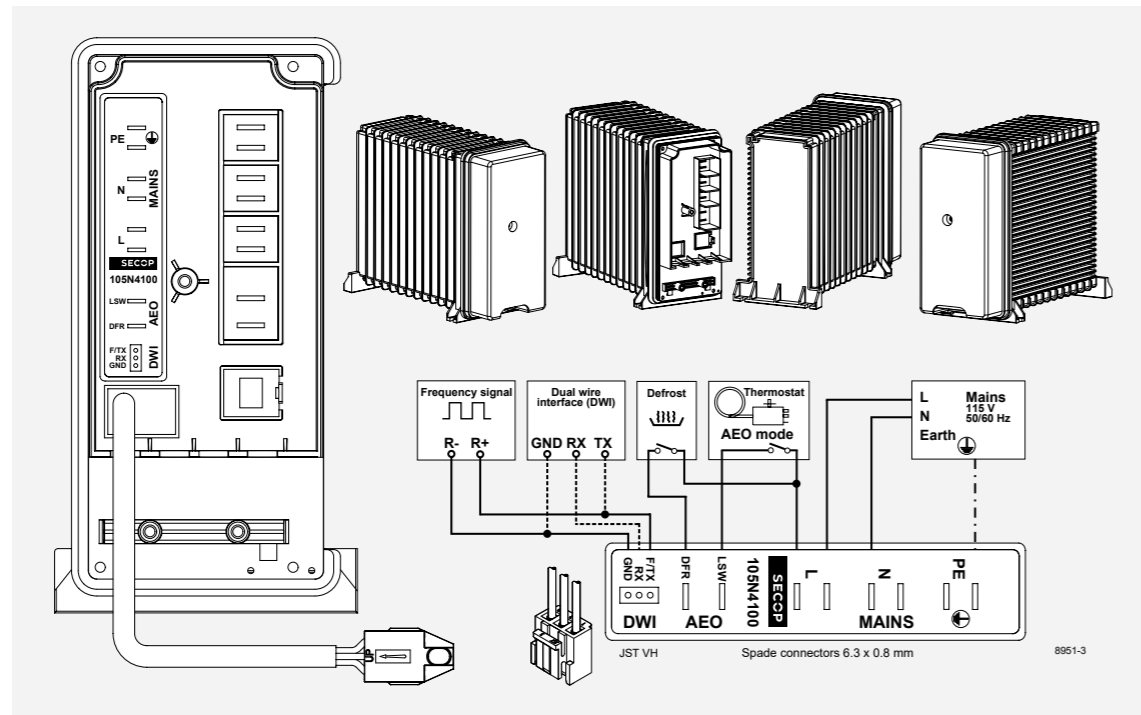
Ensure proper airflow of 3 m/s at both compressor and electronic units.
The airflow for the electronics must be directed to the heat sink.

1.2 Earthing the Compressor and Controller



- For optimum EMC performance, the copper shield of the controller cable must be fastened properly in the clip at the compressor.
- Compressor and controller must be connected to PE (Protective Earth) to avoid risk of electrical hazard.
- All protective earth lines, PE, in the application must be collected to one star point. This prevents loop currents which could cause problems concerning the electronic components, communication lines, and sensors. The star-point is normally a screwed terminal on the chassis.

1.3 Wiring Diagram



- Installation must only be done by trained personal.
- Do not remove the cover of the controller when the unit is powered on.
- Disconnect from power and wait 30 seconds before accessing terminals.
- The maximum cable length should not exceed 3 meters for signal connections. A cable length of more than 3 m could alter the EMI performance.
- Signal lines must be separated from power lines.

1.4 Connections

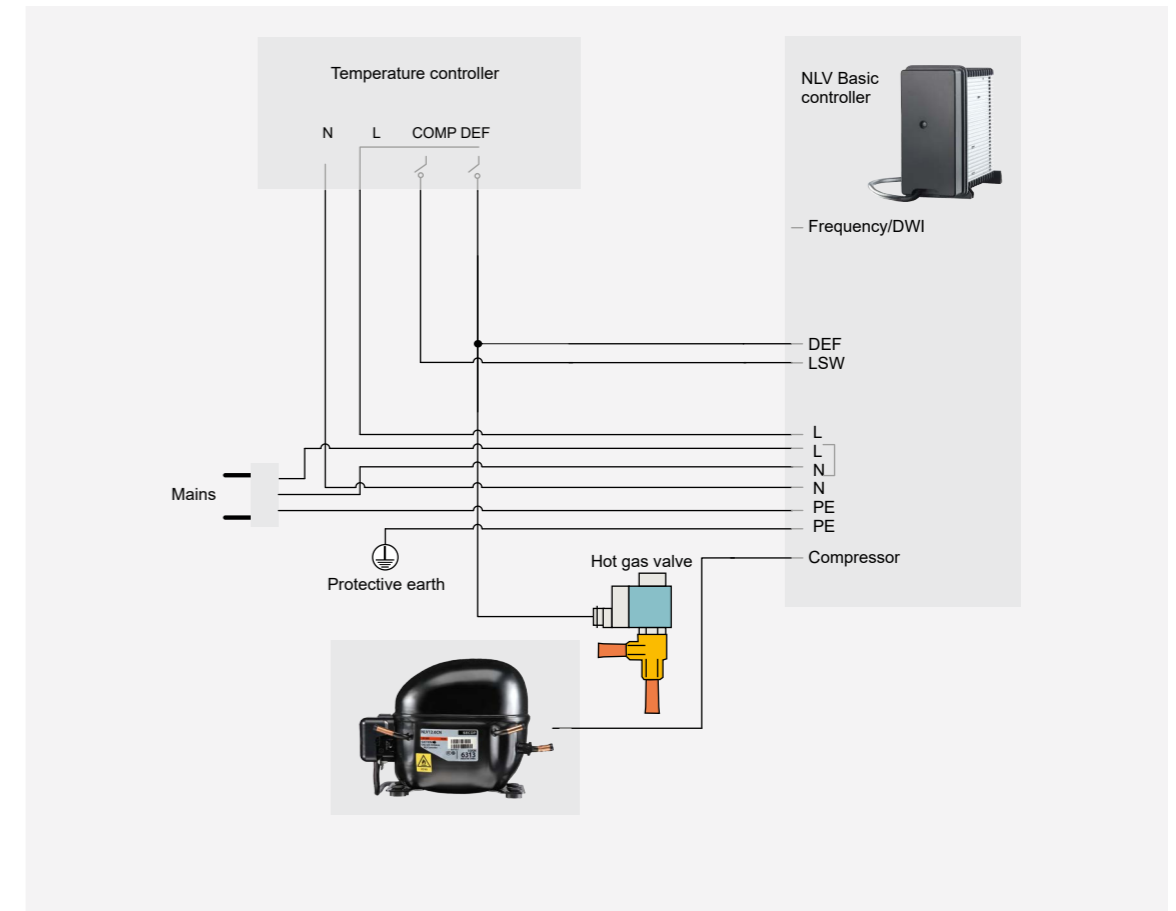


- ① 2x Protective Earth
- ② 2x Neutral
- ③ 2x Line
- ④ Thermostat/AEO
- ⑤ Defrost
- ⑥ Frequency and DWI

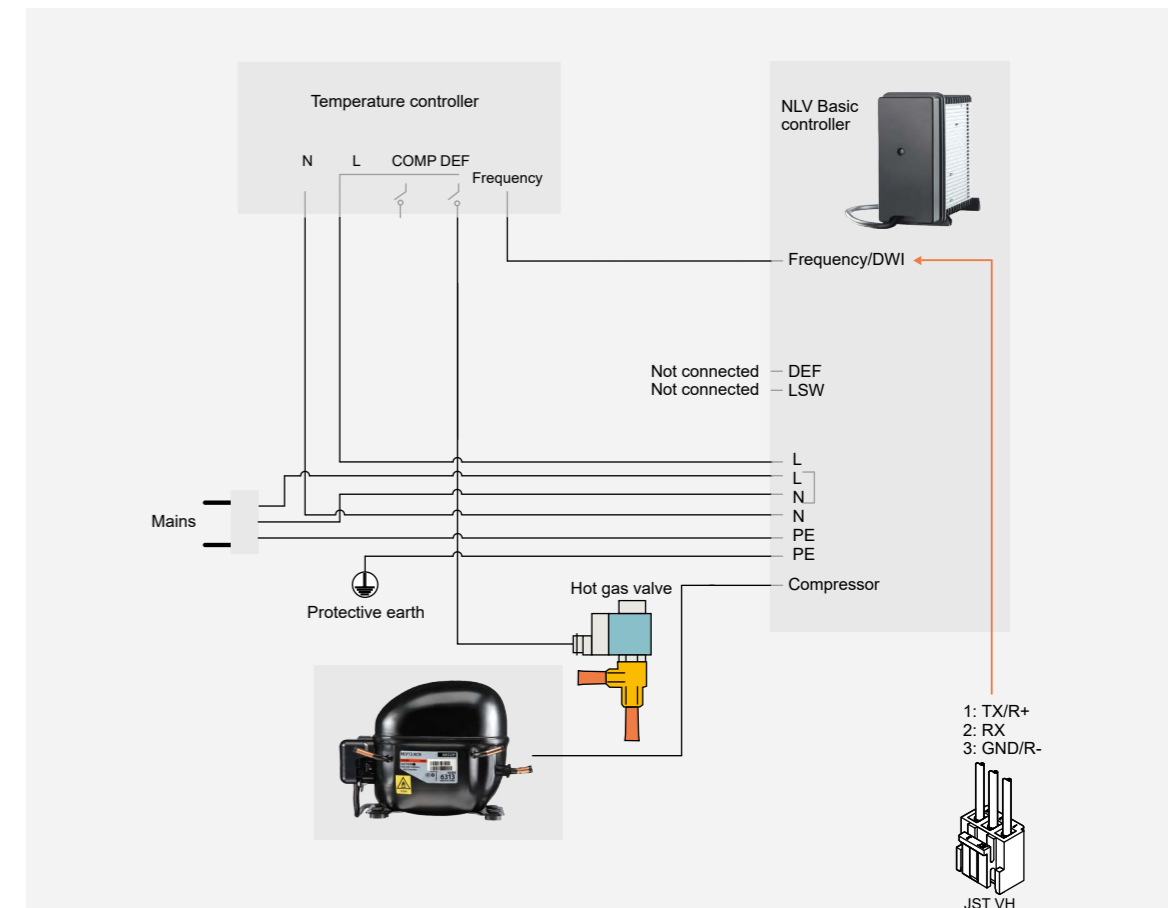
| No. | Description | Type | Note |
|-----|------------------|------------------------|------------------------------|
| 1 | Protective Earth | FASTON 6.3 mm × 0.8 mm | Mandatory, must be connected |
| 2 | Neutral | FASTON 6.3 mm × 0.8 mm | Mandatory, must be connected |
| 3 | Line | FASTON 6.3 mm × 0.8 mm | Mandatory, must be connected |
| 4 | Thermostat | FASTON 6.3 mm × 0.8 mm | For AEO only |
| 5 | Defrost | FASTON 6.3 mm × 0.8 mm | For AEO and defrost only |
| 6 | Frequency/DWI | JST VH | For frequency or DWI only |

1.5 Wiring for Thermostatic Operation

For optimal hot-gas defrost performance, the relay output of the controller should be connected to the DEF input of the controller. This ensures that the compressor operates at full speed when the hot-gas valve is activated.



1.6 Wiring for Frequency Operation/DWI Communication



2

SPEED CONTROL

Secop's Core Functions controller is equipped with three different inputs for speed control to ensure easy integration.

Almost any temperature controller can be used to control the speed without needing to change the setup. The Core Functions controller has automatic input detection and will automatically select the input which is active.

1. Frequency signal.
2. Thermostatic operation with AEO, Adaptive Energy Optimization.
3. DWI, Dual Wire Interface with separated RX and TX lines.

- If more signals are connected, the input with highest priority (1–3) will be used.
- DWI input has the lowest priority and can be used for monitoring in combination with the other inputs.
- If DWI sends an active start command, the DWI input will change priority to 1 and overrule all other input signals.

US GFCI-Conformity

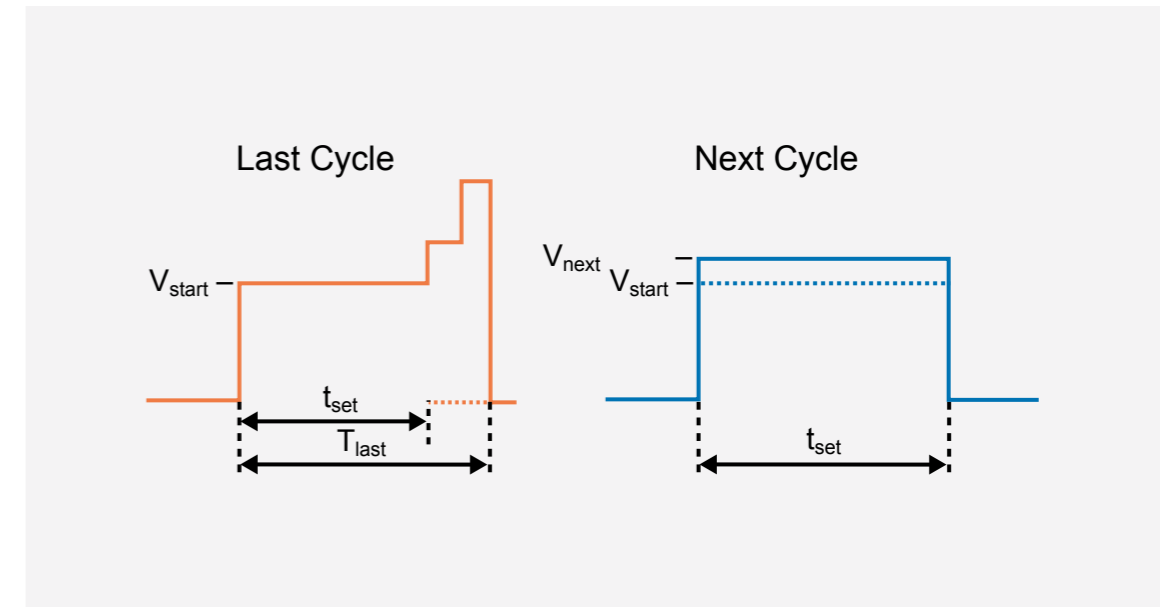
Secop Core Functions controller with code number 105N4100 comply with the US GFCI requirements.

All tests were done with GFCIs according to the Class A specification (5±1 mA).

- The GFCI will not trip within the normal operating.
- Please see the tested and recommended GFCI brands in the table below.
- Deviations from the table below can occur due to various auxiliary consumers in the system.

| GFCI Trademark | Single Compressor |
|-----------------|--------------------|
| Hubble GFRST83W | Pass (recommended) |
| EATON TRSGF20 | Pass |
| EATON SGF20 | Pass |

2.1 Thermostatic Operation with AEO



AEO is the only control mode where there is no direct relation between speed and input signal. The speed is automatically calculated based on the runtime (time between cut-in and cut-out).

The AEO can be interfaced by a normal thermostat or relay.

Advantages of the AEO:

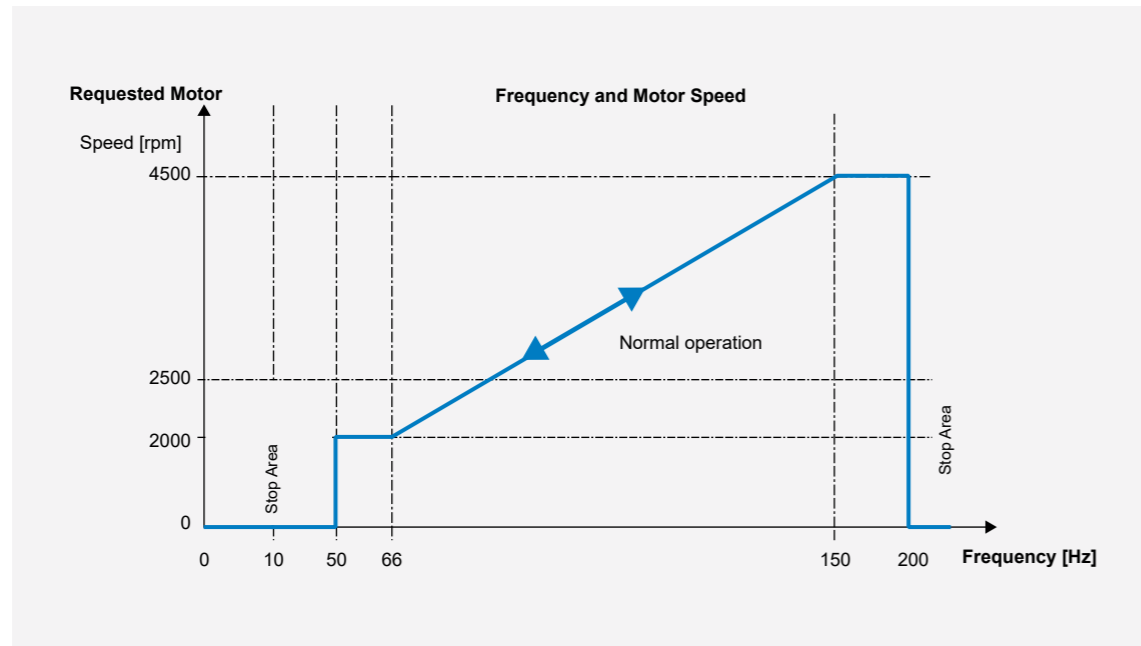
- Easy to interface.
- Mechanical thermostat.
- Electronic control with relay output.
- Perfect for applications with stable conditions, such as freezers, catering equipment.

The AEO operates with a target runtime and will automatically adapt the speed until the target runtime is met.

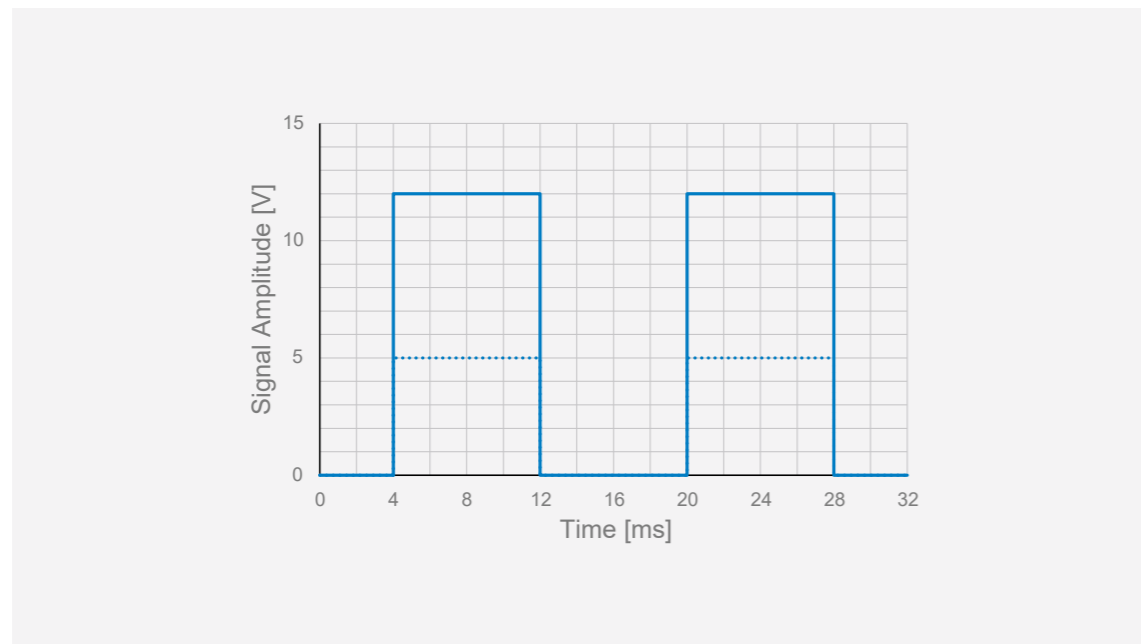
- If the compressor runtime is shorter than the target time, the speed in the next cycle will be reduced.
- If the runtime is longer than the target time, the speed in the current cycle will be increased until the cut-out is reached. The next cycle is calculated as the average speed for the last cycle.

| % Runtime | % Speed |
|-----------|---------|
| 100 | 105 |
| 110 | 110 |
| 120 | 120 |
| 140 | 130 |
| 160 | 140 |
| 190 | 180 |
| 220 | 225 |

2.2 Frequency Speed Control



- The speed can be controlled by applying a low voltage frequency signal to the frequency input
- The speed is changed linearly between 66 Hz and 150 Hz.
 - The frequency of 66 Hz corresponds to 2000 rpm, 150 Hz to 4500 rpm (30 rpm/1 Hz by default).
 - If the frequency is between 10-50 Hz, the compressor stops.
 - The frequency signal should have a voltage of 5–12 V and a duty cycle of 50%.



2.3 DWI Serial Communication

| Communication Specification | |
|-----------------------------|---------------------------|
| Baud Rate: | 600 Baud |
| Start Bits: | 1 |
| Data Bits: | 8 |
| Stop Bits: | 1 |
| Parity: | No |
| Frame Size: | 5 Bytes |
| Appliance Controller: | Master |
| Compressor Controller: | Client |
| Start Bit: | 1 → 0 (logic level) |
| Data Bits: | Inverted logic (0V → "1") |
| Stop Bit: | 0 → 1 (logic level) |
| Control Mode: | Half duplex |

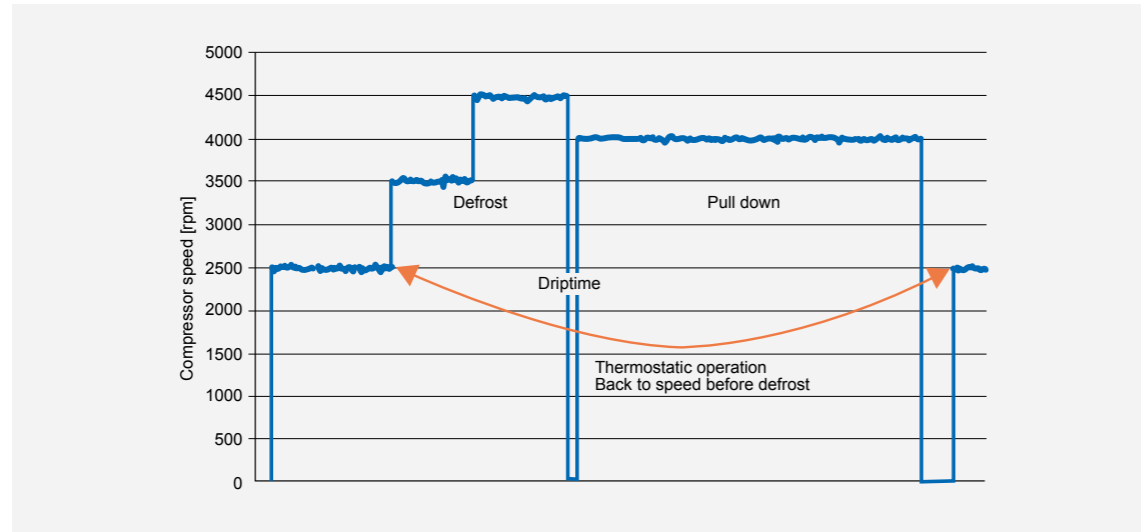
The DWI, Dual Wire interface, is a bidirectional communication protocol that allows the temperature controller to communicate with the compressor controller.

In addition to speed, the temperature controller can get different information from the controller, such as power-consumption, actual speed, electronic temperature, and fault status.

The communication interface is shared with the frequency interface. A full description of the interface and a list of supported commands may be requested from Secop.



2.4 Defrost Control with AEO



When variable-speed compressors are used in self-adapting capacity modes, defrosting may not work properly since the compressor speed cannot be controlled during defrost: The compressor lacks capacity for hot gas and the following pull-down.

To improve defrost when AEO is used, the Core Functions controller has an extra input that can be connected to the defrost relay output of the temperature controller.

- Hot-gas defrosting: When the defrost and AEO input are activated simultaneously, the Core Functions controller switches to a defined speed (defrost low speed). After a defined defrost low speed time, the compressor will increase to defrost high speed until the defrost is completed.
- The two-speed defrost is a new feature of all next generation controllers to avoid liquid refrigerant inside the compressor.
- Electrical defrosting: When only the defrost input is activated, the compressor will remain stopped, but the information is used to trigger pull-down after defrosting.
- After defrosting, the Core Functions controller will run the first cycle at high speed to ensure that the heat is removed as fast as possible.
- After the pull-down it reverts to the speed it had before defrost.



3

TECHNICAL DATA

3.1 Controller Data

| | Electronic Unit | 105N4100 |
|------------------|-------------------------------|----------------------------------------------|
| Power supply | Nominal voltage | 115–127V AC |
| | Minimum operating voltage | 95V AC |
| | Minimum starting voltage | 100V AC |
| | Maximum voltage | 140V AC |
| | Frequency | 50–60 Hz |
| | Max power input | 1000 W |
| | Power Factor Corrector | No |
| | Motor cable length | 680±20 mm / 26.0-27.6 in. |
| Environment | IP class | IP31 |
| | Humidity | 30–90% rH |
| | Maximum operating temperature | 50°C / 120°F |
| | Minimum operating temperature | 0°C / 32°F |
| | Storage temperature | -30 to 70°C / -22°F to 158°F |
| Approvals/Safety | Compressor protection | Software protection + internal in compressor |
| | RoHs Conformity | IEC 62321 |
| Speed-Control | Frequency input | 5–12 V, max. 8 mA, 0–200 Hz |
| | AEO Thermostat input (Lsw) | 95V–140V AC, non-isolated |
| | AEO Defrost input (Def) | 95V–140V AC, non-isolated |
| | RX/TX interface (DWI) | 5–12 V, max. 8 mA, 600 baud |

3.2 Compressor Data

| | NLVE13CN | |
|------------|-------------------------|---------------------------------|
| Compressor | Application | LBP/MBP |
| | Evaporating temperature | °C / °F -40 to 0 / -40 to 32 |
| | Voltage range/frequency | V/Hz 95–140/50/60 |
| | Speed range | rpm 2000–4500 |

3.3 Capacity and Performance Data NLVE13CN

| Performance Data ASHRAE LBP (115 V, 50/60 Hz • fan cooling) @ -23.3°C (-10°F) evaporating temperature | | | | | |
|-------------------------------------------------------------------------------------------------------|--------|------|------|------|------|
| Speed | rpm | 2000 | 3000 | 3500 | 4500 |
| Cooling capacity | W | 438 | 672 | 781 | 971 |
| | BTU/h | 1496 | 2296 | 2666 | 3317 |
| Power consumption | W | 247 | 374 | 441 | 572 |
| COP | W/W | 1.77 | 1.80 | 1.77 | 1.70 |
| EER | BTU/Wh | 6.05 | 6.14 | 6.04 | 5.79 |

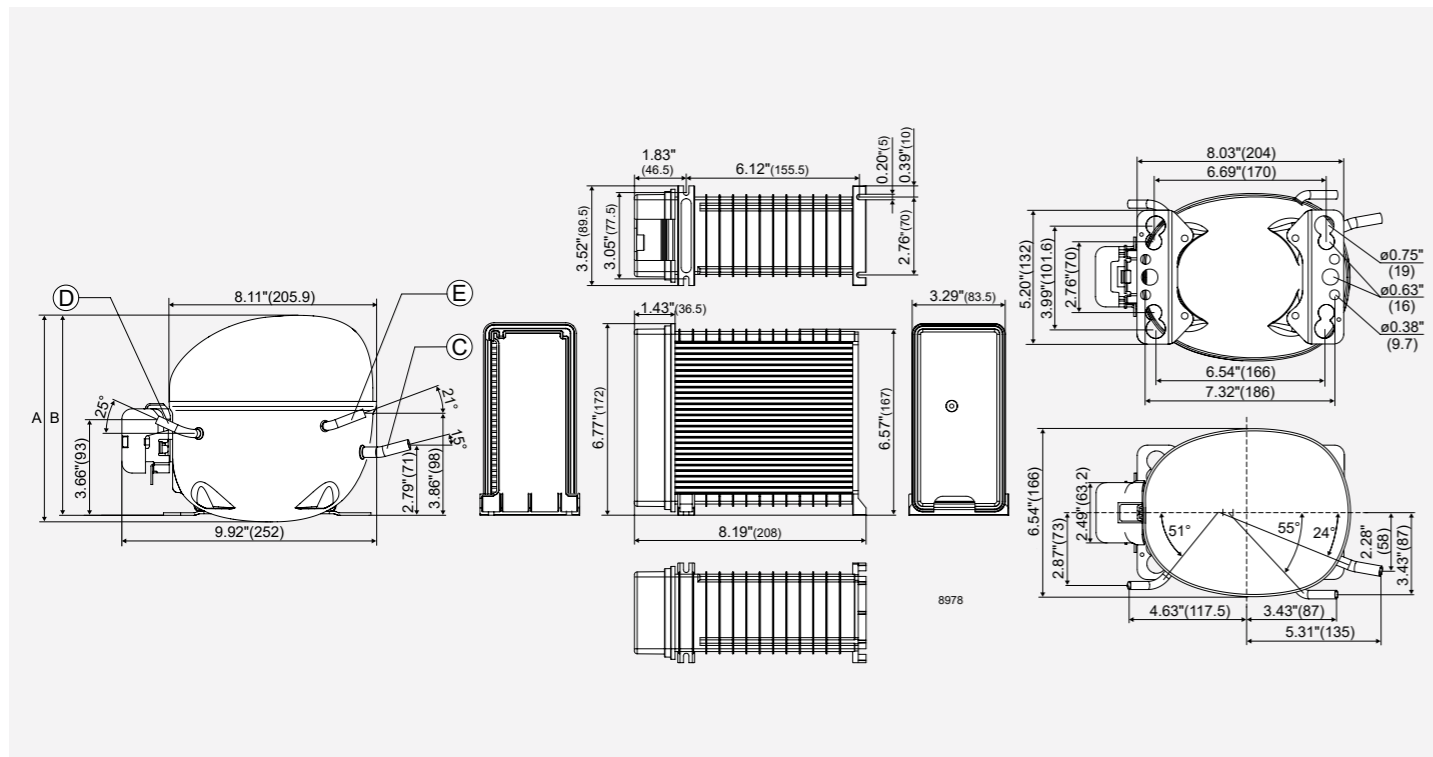
Test conditions
 Condensing temp.: 54.4°C [130°F] | Suction gas temp.: 32.2°C [90°F]
 Ambient temp.: 32.2°C [90°F] | Liquid temp.: 32.2°C [90°F]

| Performance Data ASHRAE MBP (115 V, 50/60 Hz • fan cooling) @ -6.7°C (20°F) evaporating temperature | | | | | |
|-----------------------------------------------------------------------------------------------------|--------|------|------|------|------|
| Speed | rpm | 2000 | 3000 | 3500 | 4500 |
| Cooling capacity | W | 767 | 1190 | 1377 | 1686 |
| | BTU/h | 2619 | 4065 | 4703 | 5759 |
| Power consumption | W | 341 | 545 | 646 | 821 |
| COP | W/W | 2.25 | 2.19 | 2.13 | 2.05 |
| EER | BTU/Wh | 7.68 | 7.46 | 7.29 | 7.01 |

Test conditions
 Condensing temp.: 54.4°C [130°F] | Suction gas temp.: 35°C [95°F]
 Ambient temp.: 32.2°C [90°F] | Liquid temp.: 46.1°C [115°F]

4 DIMENSIONS

| Compressor Dimensions | | NLVE13CN | |
|-----------------------|---------------------------------------------------|---------------------|---------------------------------------------------------------|
| Height | mm (in.) | A | 203 (7.99) |
| | | B | 197 (7.76) |
| Suction connector | location/I.D. mm (in.) angle material seal | C | 8.2 (0.320-0.327) 15° Copper Rubber plug |
| | | D | 6.5 25° Copper Rubber plug |
| Discharge connector | location/I.D. mm (in.) angle material seal | E | 6.5 (0.252-0.259) 21° Copper (0.252-0.259) Rubber plug |
| | | Connector tolerance | I.D. mm |



5 ORDERING

| | Item | Code No. | Comment |
|------------------------|--------------------------------------------------|----------|---------------------------------|
| Controller | Electronic controller (Core Functions), 115 V AC | 105N4100 | single unit |
| | NLVE13CN compressor | 105H7374 | compressor with inch connectors |
| Compressor Accessories | Cover for compressor | 103N2008 | |
| | Bolt joint for one compressor | 118-1917 | |
| | Bolt joint in quantities | 118-1918 | |
| | Snap-on in quantities | 118-1919 | |



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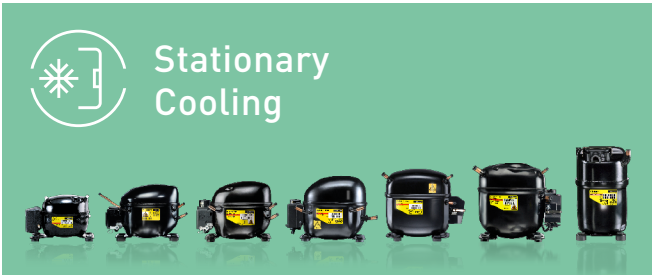
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Secop is the expert for advanced hermetic compressor technologies and cooling solutions in commercial refrigeration. We develop high performance stationary and mobile cooling solutions for leading international commercial refrigeration manufacturers and are the first choice when it comes to leading hermetic compressors and electronic controls for refrigeration solutions for light commercial and DC-powered applications.

Secop was formerly known as Danfoss Compressors and is one of the founding fathers of modern compressor technology with years of experience that goes back to the beginning of the 1950s.

-  **Flensburg:** Sales and R&D
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