



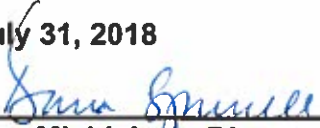
Department of Municipal Affairs and Environment
Pollution Prevention Division

GUIDANCE DOCUMENT

Title: Determination for Annual Leak Testing Requirements

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Determination for Annual Leak
Testing Requirements
GD-PPD-080

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1.0 Subject

Method for determination of compressor power ratings and annual leak testing requirements.

2.0 Objective

To provide direction for determining power ratings on compressors to ensure consistent compliance determination of annual leak testing requirements with the *Halocarbon Regulations NLR 41/05* under the *Environmental Protection Act*.

3.0 Definitions

LRA means the Locked Rotor Amperage of the compressor

RLA means the Rated Load Amperage of the compressor

4.0 Background

The *Halocarbon Regulations NLR 41/05* are applicable predominantly in the air conditioning, refrigeration and fire suppression sectors. They pertain to ozone depleting substances and their halocarbon alternatives as well as provide direction for the safe handling and use of these substances to ensure protection of the environment. As part of the *Halocarbon Regulations NLR 41/05*, there is a requirement for leak testing of equipment that uses these regulated substances. Section 15 of the *Halocarbon Regulations NLR 41/05* state that:

Leak testing

15. (1) The owner of air conditioning or refrigeration equipment shall ensure that an approved person conducts a leak test once a year of all components of the equipment that are in contact with a refrigerant.

(2) Subsection (1) shall not apply to

(a) air conditioning or refrigeration equipment with a compressor power rating of less than 3 horsepower;

(b) motor vehicle air conditioners; or

(c) heat pumps used for domestic purposes.

(3) A person shall not add a refrigerant to a device, container or equipment for the purpose of leak testing in a manner that may cause the release of that refrigerant into the environment.

(4) Subsection (3) shall not apply to the servicing of a motor vehicle air conditioner where

(a) the refrigerant pressure in the motor vehicle air conditioner is too low to permit leak detection;

(b) the refrigerant added to the motor vehicle air conditioner is the same type as the residual refrigerant; and

(c) testing is carried out in accordance with the CFC code of practice.

(5) A person performing a leak test on air conditioning or refrigeration equipment shall inform the owner of that equipment of the results of the test.

(6) Where a leak test reveals that refrigerant is leaking from air conditioning or refrigeration equipment, the person conducting the test shall

(a) ensure that the equipment is immediately and effectively repaired so that further leaking cannot occur; or

(b) ensure that the refrigerant is immediately recovered from the equipment and handled in accordance with these regulations and the CFC code of practice, and attach a notice to the equipment indicating that the equipment is not in working order and that it would be an offence to recharge it with refrigerant unless it is first repaired; or

(c) notify the department within one working day of the particulars of the leak test where that person is prevented from complying with either paragraph (a) or (b).

With respect to this section, there have been numerous inquiries as to the determination of the 3 HP compressor power rating. This guidance document will provide several calculations, as well as examples to assist with determining the power rating from the specification of the compressor.

5.0 Power Rating Calculations

Power rating determination is based on Ohm's Law. Ohm's Law can be expressed as:

$$V = R * I = P / I = (P * R)^{1/2}$$

where

P = Power (Watts, W)

V = Voltage (Volts, V)

I = Current (Amperes, A)

R = Resistance (Ohms, Ω)

Additionally, rearranging the equation provides:

$$P = V * I = R * I^2 = V^2 / R$$

$$I = V / R = P / V = (P / R)^{1/2}$$

$$R = V / I = V^2 / P = P / I^2$$

Considerations:

1. In some instances, the power rating of the compressor is given in the specifications of the unit and calculation is not necessary.
2. When the power rating is not provided directly with the compressor specifications, it can be calculated using voltage and amperage ratings. The amperage rating that should be used is the Rated Load Amps (RLA) of the compressor. The RLA is the maximum current a compressor should draw under any operating conditions. Often the compressor specifications will also include a rating for **Locked Rotor Amps (LRA)**. The LRA is the current expected under starting conditions when full voltage is applied. For this determination, RLA should be used and not LRA.
3. A power factor must be incorporated in the calculation determination if the compressor uses a three phase motor. The RLA must be multiplied by 1.732 to account for this type of motor.

6.0 Examples

1. Includes a Three (3) Phase Motor

Compressor with voltage phase = 575/3/60, RLA = 7.9 and LRA = 50.0

From the voltage phase it can be determined that:

575 = Voltage (V)

3 = 3 phase motor

60 = number of cycles and is not necessary for this type of calculation

RLA = Amperage (A) = 7.9

Therefore,

$$\begin{aligned}\text{Power} = P &= V * I \\ &= 575V * 7.9 A * 1.732 \\ &= 7868 \text{ watts}\end{aligned}$$

But,

1 HP = 746 watts

So,

$$\text{Power} = P = 7868 \text{ watts} = 10.5 \text{ HP}$$

In this example, the power rating of the compressor is 10.5 HP and therefore must be leak tested annually as per Section 15 of the *Halocarbon Regulations NLR 41/05*.

2. Does not include a Three (3) Phase Motor

Compressor with voltage phase = 208/230, RLA = 11.6 and LRA = 60.0

From the voltage phase it can be determined that:

208 = Voltage (V)

Single phase motor (there is no 3 designation; some ranges may actually indicate 1)

230 = number of cycles and is not necessary for this type of calculation

RLA = Amperage (A) = 11.6

Therefore,

$$\begin{aligned}\text{Power} = P &= V * I \\ &= 208V * 11.6 A \\ &= 2412.8 \text{ watts}\end{aligned}$$

But,

1 HP=746 watts

So,

Power = P = 2412.8 watts = 3.2 HP

In this example, the power rating of the compressor is 3.2 HP and therefore must be leak tested annually as per Section 15 of the *Halocarbon Regulations NLR 41/05*.

7.0 References

http://www.engineeringtoolbox.com/electrical-formulas-d_455.html

<http://www.hvacinfo.com/definitions.htm>