



Quick Guide:

# HOW TO CALCULATE YOUR REFRIGERANT CHARGE

*(Essential Things for Facility Managers)*



[www.trakref.com](http://www.trakref.com)



(888) 834-0233



501 Union Street, Nashville



[Contact Us](#)





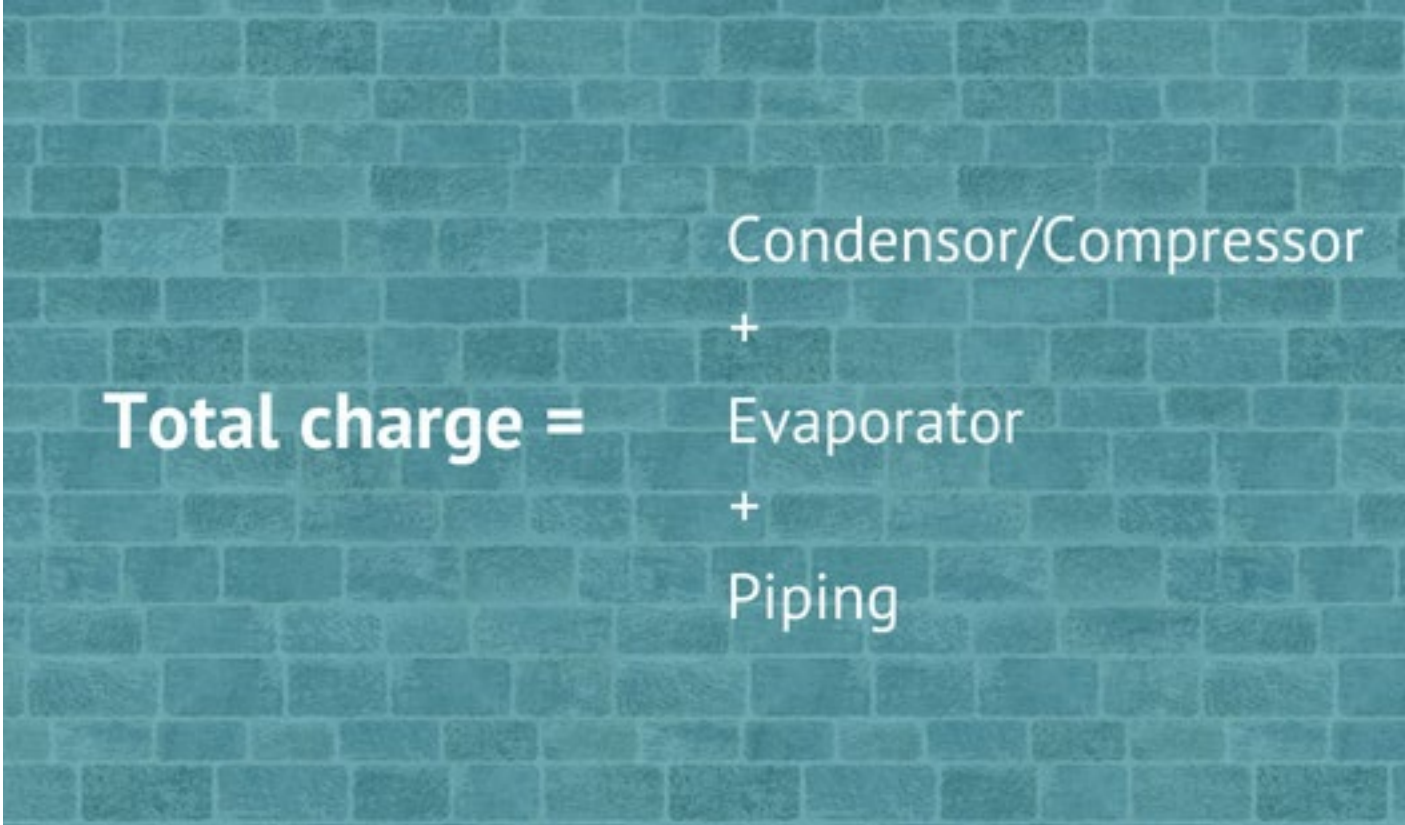
## “How do I determine the refrigerant charge of my HVAC/R system?”

It's a common question that can cause a lot of mishap, especially when it comes to field-assembled equipment. In fact, #DidYouKnow we've identified refrigerant charge miscalculations as one of the [3 common HVAC mistakes your facility should avoid](#).

That's why we created this simple quick guide, so you can accurately determine the refrigerant charges in your HVAC/R units.

Let's get started.

### 1.) You Have to Know the Total Charge Equation



The graphic shows the total charge equation for an HVAC/R system. It features a teal brick wall background. On the left, the text "Total charge =" is written in white. To the right of this, the components are listed vertically in white text: "Condensor/Compressor", followed by a plus sign "+", then "Evaporator", followed by another plus sign "+", and finally "Piping".

$$\text{Total charge} = \text{Condensor/Compressor} + \text{Evaporator} + \text{Piping}$$

## You Need to Take Into Account The Condensor and Evaporator Are Connected By Piping

There are many ways your tech staff are charging these systems; however, disregard the technicality of the process and focus instead on the weight / results.

### #HVACTips:

1. Ask for the end weight of all cylinders—Only allow the net gas to be listed as the charge amount.
2. Ask your service provider if he used a scale while filling.
3. Ensure that you do no over calculate the charge, add only the name plate + make up gas as initial charge.



## A.) The Condensor/Compressor Section

There are three options to determine the capacity:

- Read the nameplate – It can be very hard but start here:
- Remove all refrigerant and recharge into system.
- Estimate charge based on tonnage/size.

THE TRANE COMPANY  
A DIVISION OF AMERICAN STANDARD INC.  
CLARKSVILLE, TN 37040

**INTELLIPAK®**

MODEL NUMBER **SFHGD134HK00F#7D7001DEKRT#**

SERIAL NUMBER

REFRIGERATION MACHINE FOR OUTDOOR INSTALLATION ONLY  
SEE ADDITIONAL NAMEPLATE IN GAS HEAT SECTION WHEN USED

RATED VOLTAGE	460	HZ	60	PHASE	3
UTILIZATION VOLTAGE RANGE	414 – 506				
NOMINAL SYSTEM VOLTAGES	440 – 460 – 480				
MINIMUM CIRCUIT AMPACITY +			CIRCUIT – 1	CIRCUIT – 2	CIRCUIT – 3
			288		AMPS
RECOMMENDED DUAL ELEMENT FUSE +			300		AMPS
MAXIMUM OVERCURRENT PROTECTION DEVICE +			300		AMPS

	QTY	VOLTS	HZ	PHASE	RLA EA	LRA EA
COMPRESSOR MOTOR A	2	460	60	3	27.3	178
COMPRESSOR MOTOR B	2	460	60	3	27.3	178
COMPRESSOR MOTOR C	2	460	60	3	27.3	178
COMPRESSOR MOTOR D	2	460	60	3	27.3	178

	QTY	VOLTS	HZ	PHASE	FLA EA	HP EA
CONDENSER FAN MOTOR	12	460	60	3	1.8	1.00
EVAPORATOR FAN MOTOR	2	460	60	3	18.9	15.0
EXHAUST FAN MOTOR	– 0 –					
BURNER MOTOR	1	115	60	1	5.9	.25
ELECTRIC HEATER CKT	– 0 –					KW – 0 –
EVAPORATOR HEAT TAPE	– 0 –					VA
UNIT CONTROL CIRCUIT	460	60	1			VA 3

FACTORY CHARGED – EACH SYSTEM		CKT 1	CKT 2	LBS OF R – 22	
		132	132		
DESIGN PRESSURE	450 PSIG	TEST PRESSURE 450		HIGH (PSIG)	LOW (PSIG)
FOR NONRESIDENTIAL INSTALLATION ONLY				300	300

SYSTEM SHORT CIRCUIT CAPACITY	22000	65000
MINIMUM CIRCUIT AMPACITY	310	315

FACTORY CHARGED – EACH SYSTEM									
CKT 1 132 CKT 2 132 LBS OF R – 22									
DESIGN PRESSURE 450 PSIG TEST PRESSURE 450 HIGH (PSIG) 300 LOW (PSIG) 300									
FOR NONRESIDENTIAL INSTALLATION ONLY									



## B.) Piping

Refrigerant charge, as this chart shows, varies by type; These are examples of common refrigerants:



### ESTIMATED WEIGHT OF REFRIGERANT IN LIQUID LINE (POUNDS PER 100 LINEAL FEET OF TUBING).

#### REFRIGERANT R-22

<u>LINE SIZE: (O.D. / IN.)</u>	<u>POUNDS</u>
3/8"	3.9
1/2"	7.3
5/8"	11.7
7/8"	24.5
1-1/8"	41.0
1-3/8"	63.0
1-5/8"	90.0

#### REFRIGERANT R-404A / R-507

<u>LINE SIZE: (O.D. / IN.)</u>	<u>POUNDS</u>
3/8"	3.6
1/2"	6.6
5/8"	10.8
7/8"	22.3
1-1/8"	38.0
1-3/8"	58.0
1-5/8"	82.0

[https://www.arb.ca.gov/cc/rmp/Refrigerant\\_Weight\\_Calculator.xls](https://www.arb.ca.gov/cc/rmp/Refrigerant_Weight_Calculator.xls)  
[http://efficientcomfort.net/asp/LineSetCalc\\_Web/LineSetCalc\\_Web.asp](http://efficientcomfort.net/asp/LineSetCalc_Web/LineSetCalc_Web.asp)

## C.) Evaporator

The Evaporator is where the cooling is delivered into the building or the food processing area. Usually smaller than the condenser, it can contain a significant amount of refrigerant depending on the type of cooling device used to convert from liquid to vapor. Other components to keep in mind when determining system charge include receiver; accumulators; and any traps or heat transfer devices

## Now, Combine A + B + C to Get Full Weight (aka, System Charge)!

Yes, now that you've looked at the Condensor/Compressor, the Piping, and the Evaporator, you can add them all up to get the system charge.

$A + B + C = \text{Total System Charge}$

See how simple and quick that was?

Achieving optimal and consistent HVAC/R outcomes doesn't have to be difficult. You just have to make sure you're always up to date with regulatory requirements and industry best practices. And that's why we're here at [Trakref](https://trakref.com)!

## Need additional resources on this topic?

Many times people have questions about the piping. Typically if you know the refrigerant weight of the Condenser & Evaporator (AHU), then you can estimate that the piping (based on Section B).

However, the California Air Resources Board (CARB) has a handy Refrigerant Charge Calculator that is much more precise and can be useful for accuracy. It's available to download [here](#) in excel format.

For your convenience, we have provided this calculator on the next page.



## For Your Convenience: CARB Refrigerant Charge Calculator Template

Date: \_\_\_\_\_

Inspection Site: \_\_\_\_\_

Refrigerant:

System Size:  Btuh  0.0 Tons

	°F	Density			Inches Decimal	Cross Sectional Area in²
		Liquid lbs/ft³	Vapor lbs/ft³			
Suction Temperature:	<input type="text"/>	<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>
Liquid Line Temperature:	<input type="text"/>	<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>
Condensing Temperature:	<input type="text"/>	<input type="text"/>	<input type="text"/>		<input type="text"/>	<input type="text"/>
Suction Line OD:	<input type="text"/>	Type: <input type="text"/>		ID: <input type="text"/>	<input type="text"/>	<input type="text"/>
Hot Gas Line OD:	<input type="text"/>	Type: <input type="text"/>		ID: <input type="text"/>	<input type="text"/>	<input type="text"/>
Liquid Line OD:	<input type="text"/>	Type: <input type="text"/>		ID: <input type="text"/>	<input type="text"/>	<input type="text"/>
				Other: <input type="text"/>	<input type="text"/>	<input type="text"/>

	Cross Sectional Area in²	Pipe Length Ft	Refrigerant Density lbs/ft³	Lbs of Refrigerant	
Suction Line OD:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Hot Gas Line OD:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Liquid Line OD:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	% Capacity
Liquid Receiver:	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Total:				<input type="text"/>	

Note: Liquid receiver calculation will be a little high (10%), as calculations do not take in account for convex ends.

Copper ACR - Type	
O.D. - in.	Area - in²
7/8	0.484
1 - 1/8	0.825
1 - 3/8	1.26
1 - 5/8	1.78
2 - 1/8	3.1
2 - 5/8	4.77

Copper ACR - Type	
O.D. - in.	Area - in²
3 - 1/8	6.81
3 - 5/8	9.21
4 - 1/8	12
5 - 1/8	18.7
6 - 1/8	26.8
8 - 1/8	46.9

Cross Sectional Area Formula:

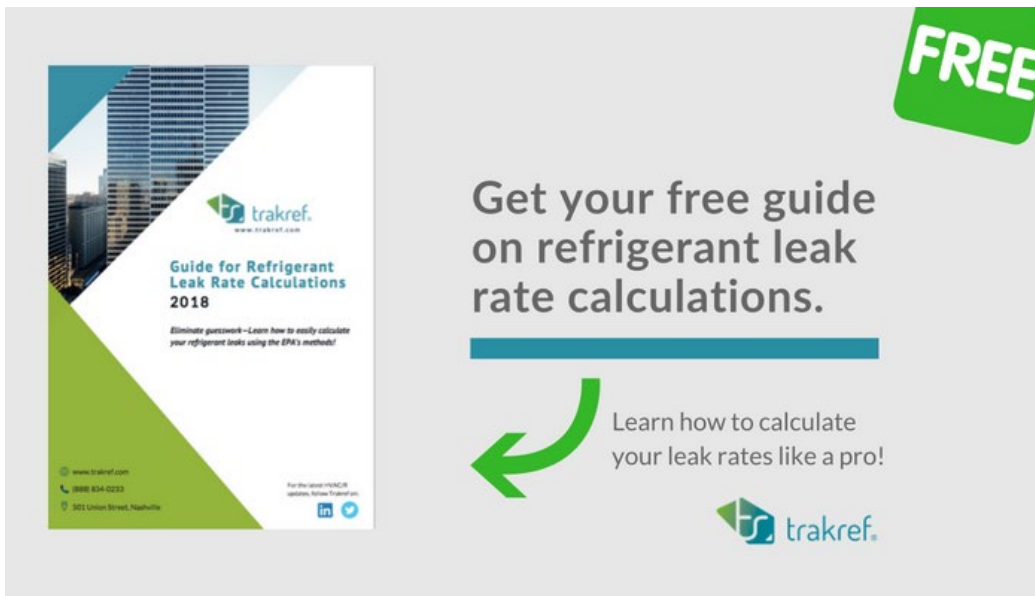
$$\text{Area} = r^2 \times 3.14$$

Online Calculator:

[http://www.engineeringcalculator.net/cross\\_section\\_properties.html](http://www.engineeringcalculator.net/cross_section_properties.html)

Managing your HVAC/R does not need to be complicated. In fact, we want to make it as simple as possible for you.

That's the goal we deliver on every day at Trakref. Learn more on our blog [www.news.trakref.com](http://www.news.trakref.com) or call (888) 834-0233.



The graphic features a green 'FREE' badge in the top right corner. On the left is a thumbnail image of the 'Guide for Refrigerant Leak Rate Calculations 2018' booklet, which includes the Trakref logo, website, and contact information. To the right of the booklet, the text reads 'Get your free guide on refrigerant leak rate calculations.' followed by a blue horizontal line. Below this, a large green arrow points left towards the booklet, with the text 'Learn how to calculate your leak rates like a pro!' and the Trakref logo.

**FREE**

Get your free guide on refrigerant leak rate calculations.

Learn how to calculate your leak rates like a pro!

trakref®

Visit <https://learn.trakref.com/refrigerant-leak-rate-calculator-guide> to claim yours now.

And don't forget to follow us on [LinkedIn](#)!