

Emerson Cooling Controls

TXV - Selection And Sizing



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What Are 4 Main Components In Refrigeration?



Compressors



Condensers



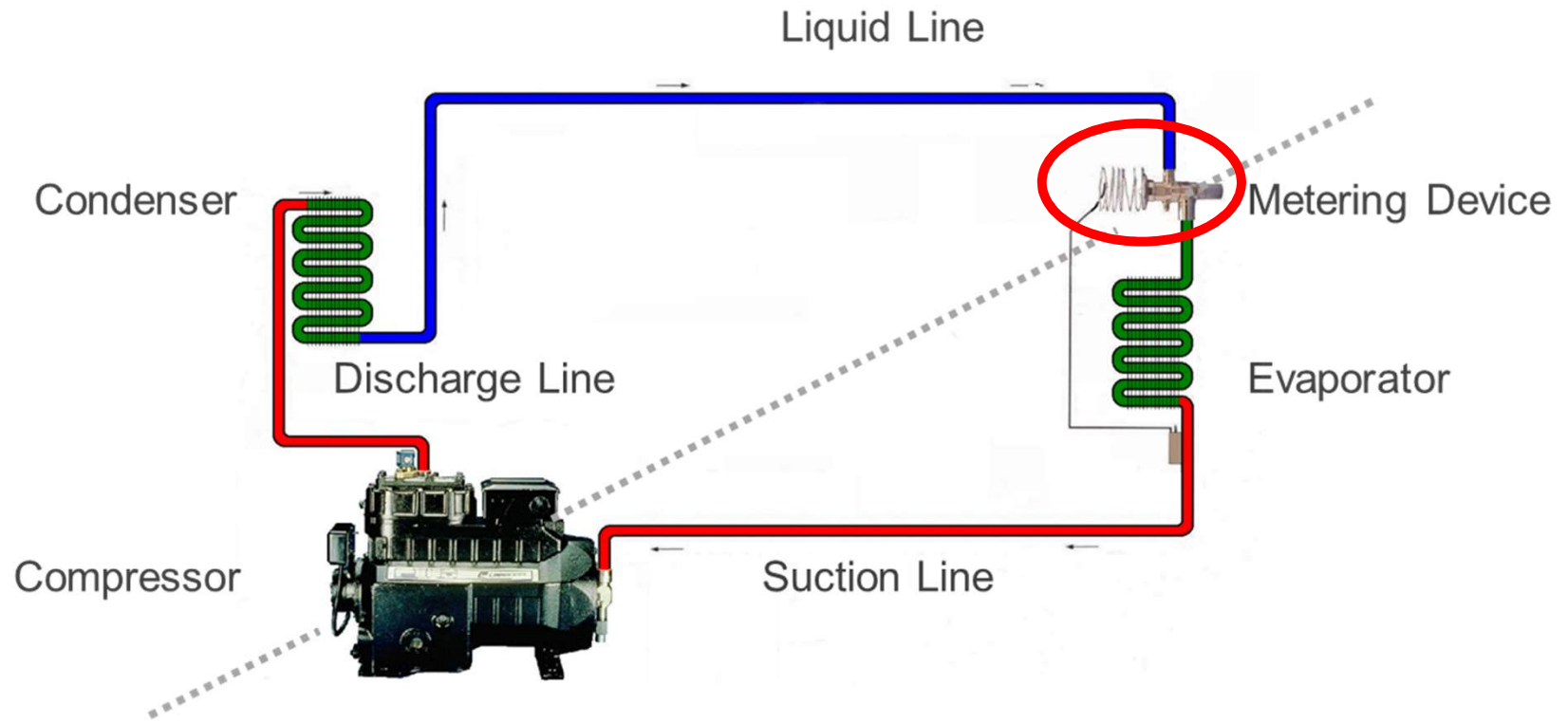
Evaporators



Metering Devices



Basic System & Three Phases of Refrigeration



Purpose Of A TXV

Controls Evaporator Superheat

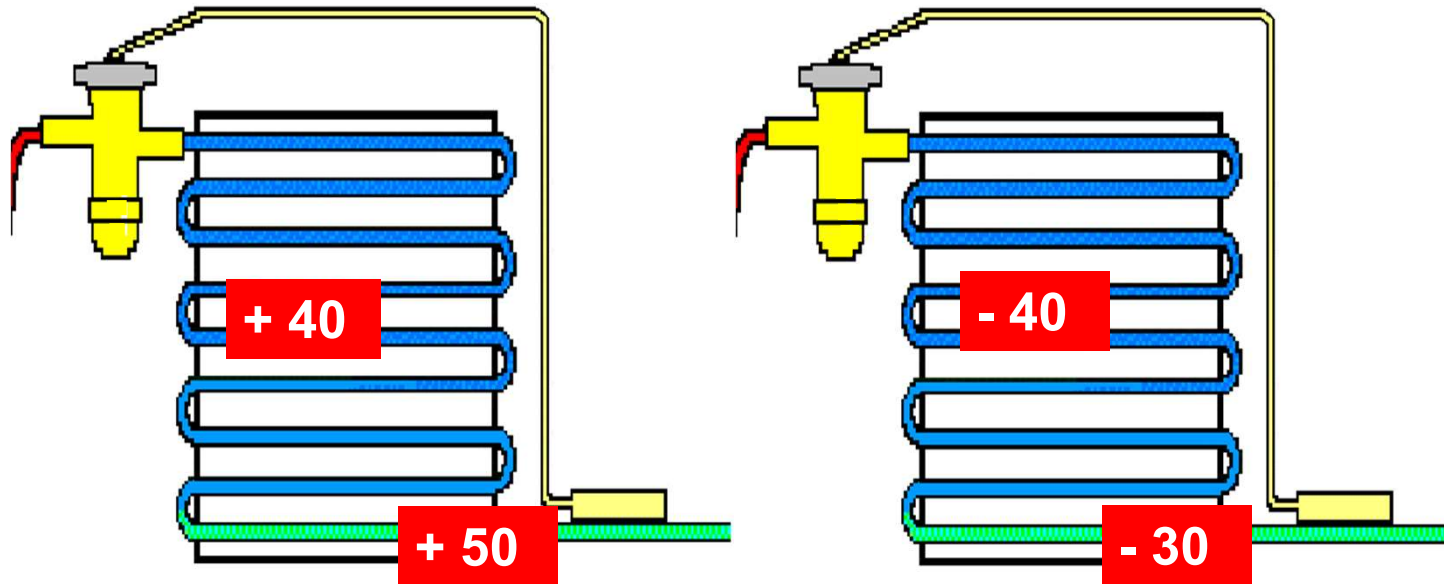
- Responds To Temperature And Pressure Only

Does Not Control:

- Space Temperature
- Head Pressure
- Capacity
- Suction Pressure
- Humidity



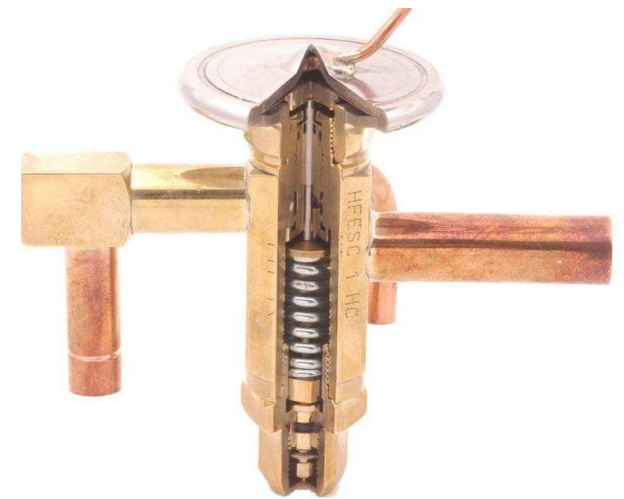
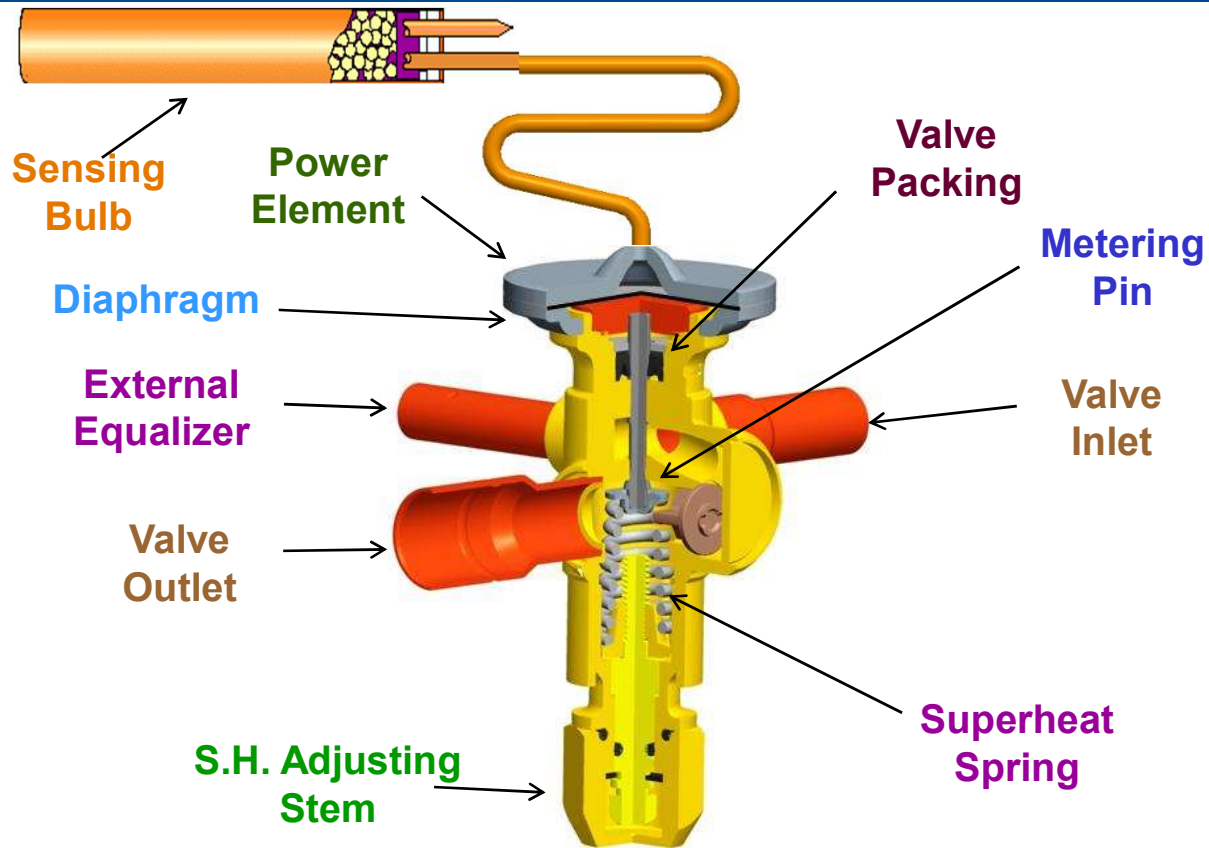
Superheat Is A Temperature Difference *Not Just A Temperature*



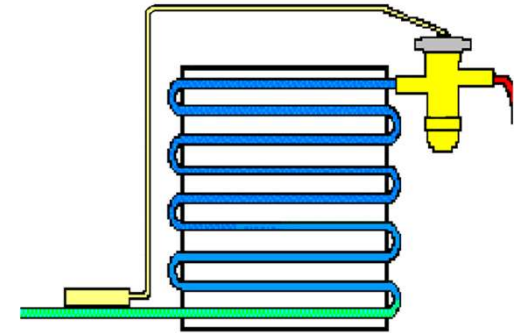
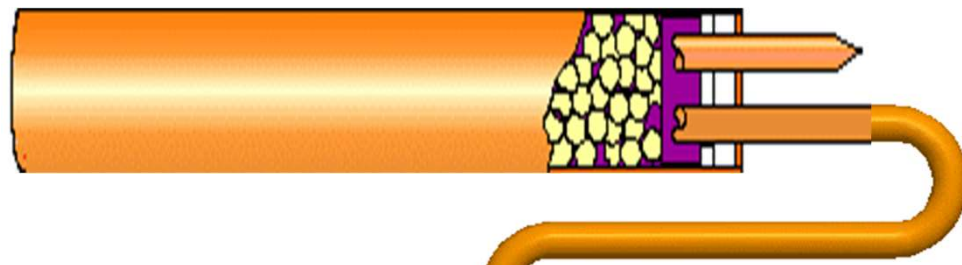
10°F Superheat

10°F Superheat

Anatomy



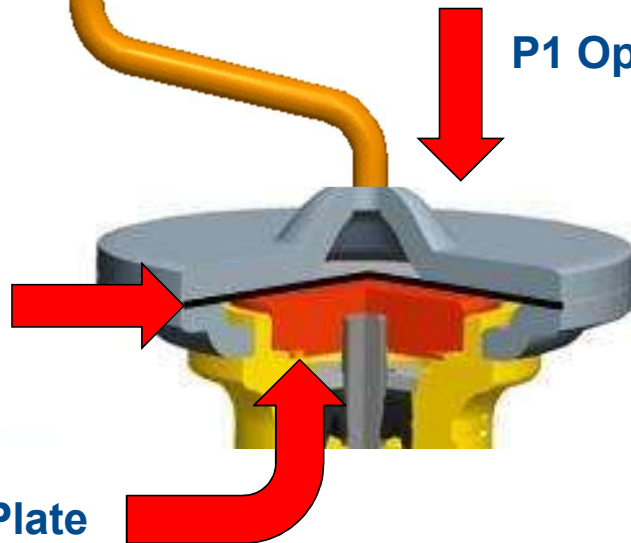
Power Assembly



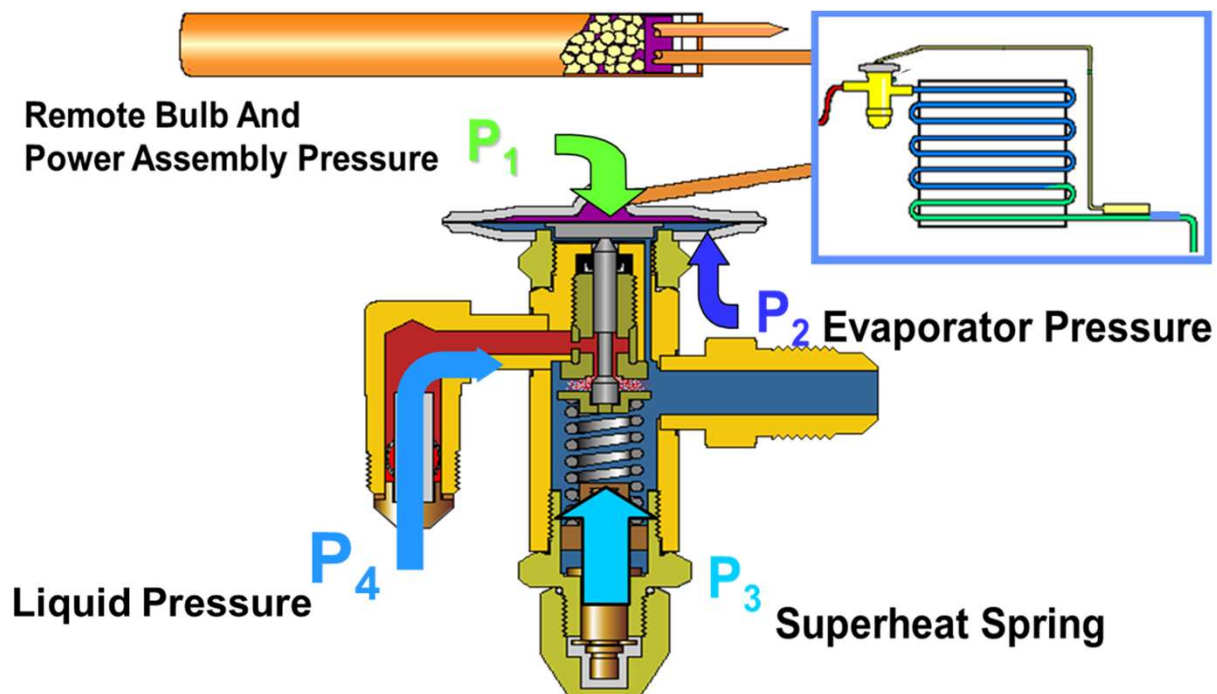
P1 Opening Force

Diaphragm
Stainless Steel

Buffer Plate



TXV Operation – Forces Acting On the Valve



**Valve is in Balance
When;**

$$P_1 + P_4 = P_2 + P_3$$

P1 = Bulb Pressure – Opening Force

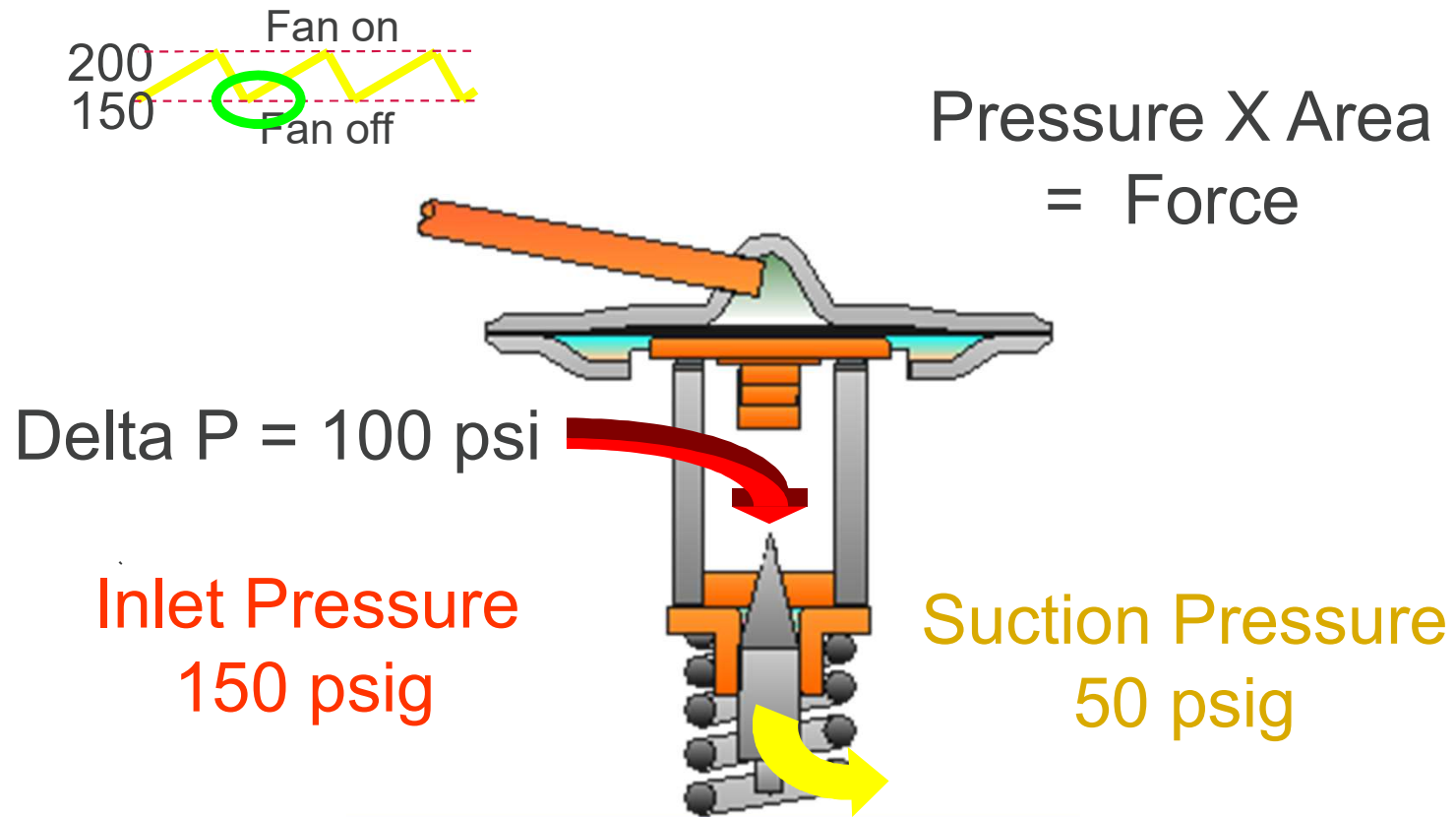
P2 = Evaporator Pressure – Closing Force

P3 = Superheat Spring Pressure – Closing Force

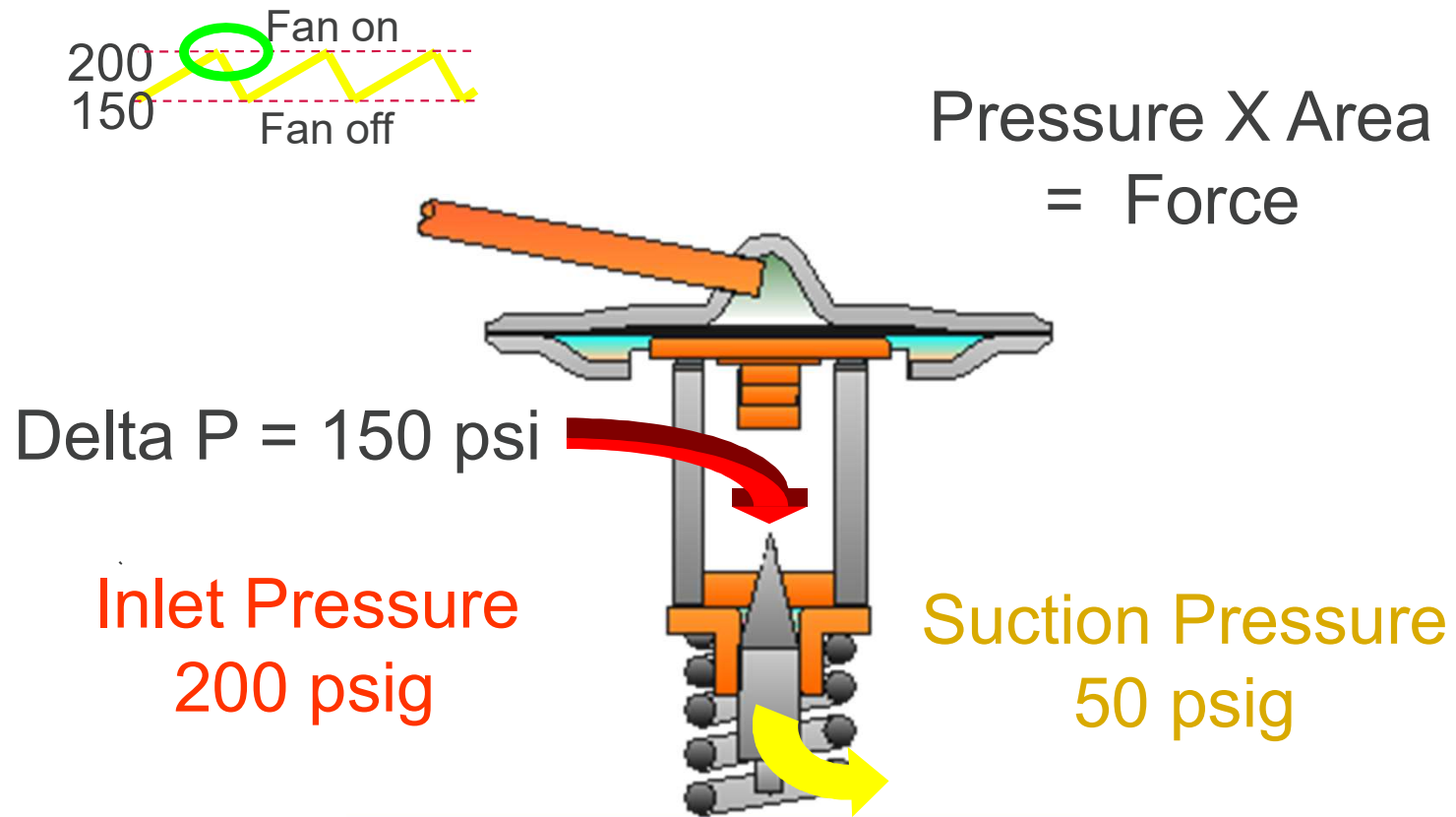
P4 = Liquid Pressure – Opening Force

Liquid Pressure Varies by Changing Head Pressure, Creating Imbalanced Forces in Conventional TXV

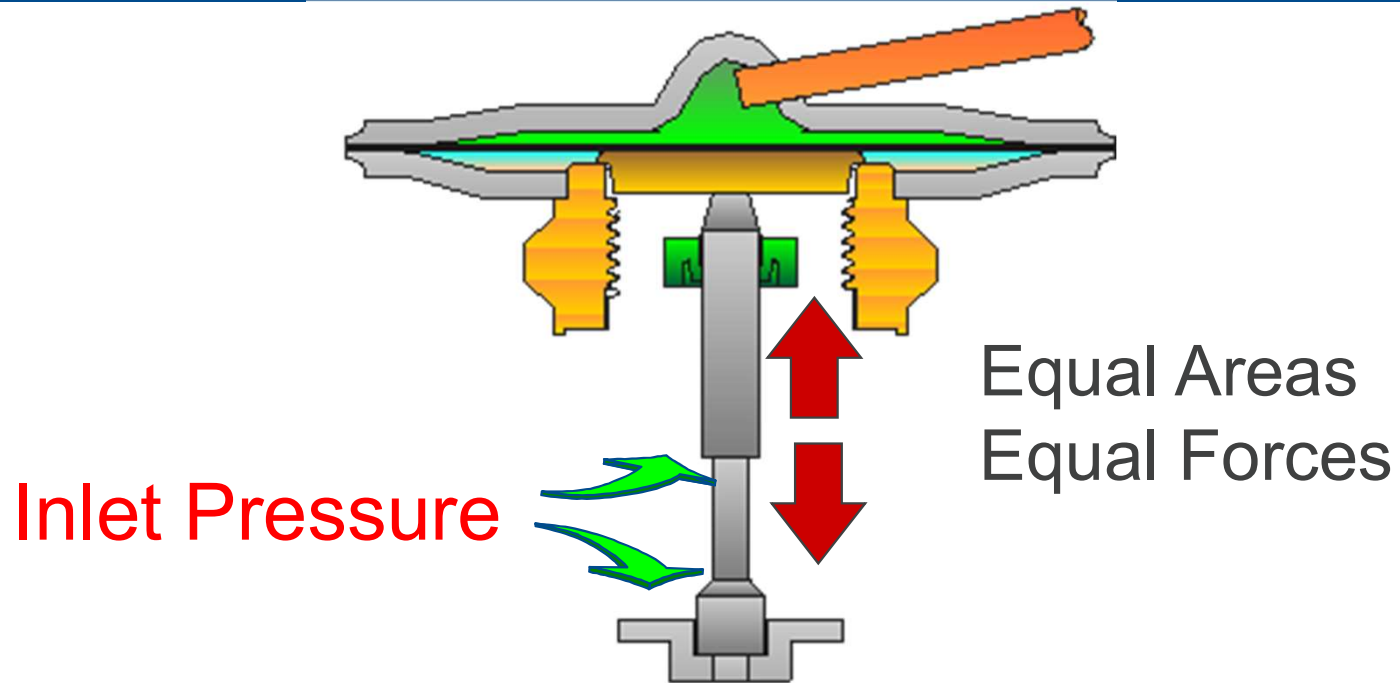
Conventional Metering Pin



Conventional Metering Pin



Balanced Port

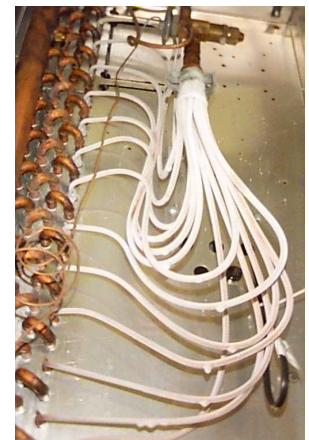
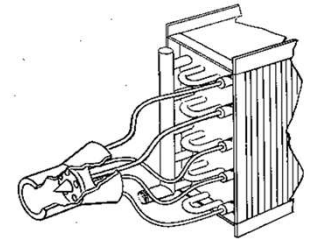
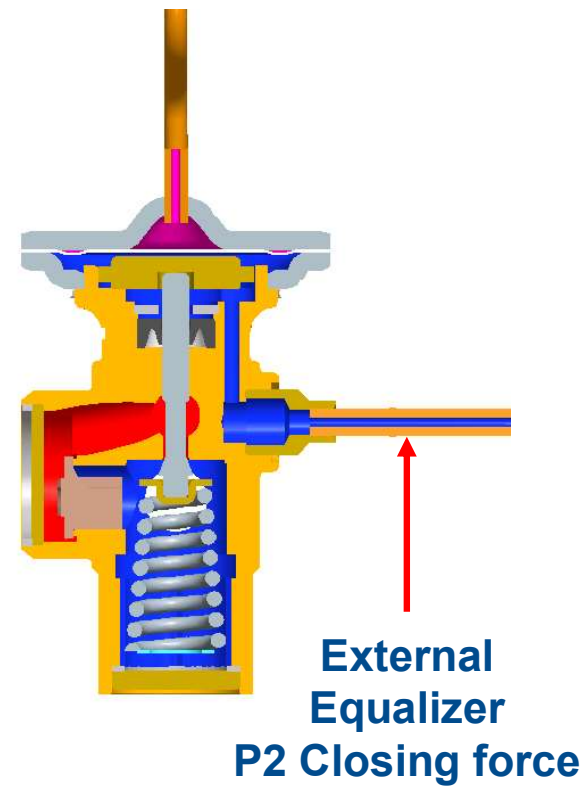
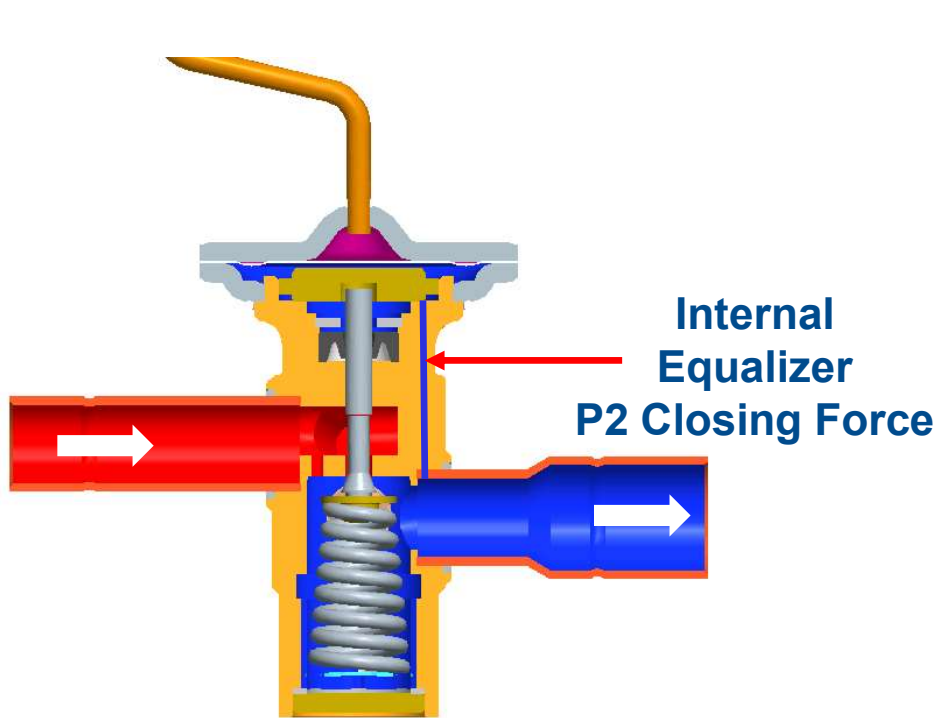


Smoother Operation on Floating Head Pressure Systems
and Fan Cycling Condensers

Balanced Port TVX cancels out the Liquid Force as it acts on equal areas in opposite directions

Thermal Expansion Valve

Internal & External Equalizers Applications



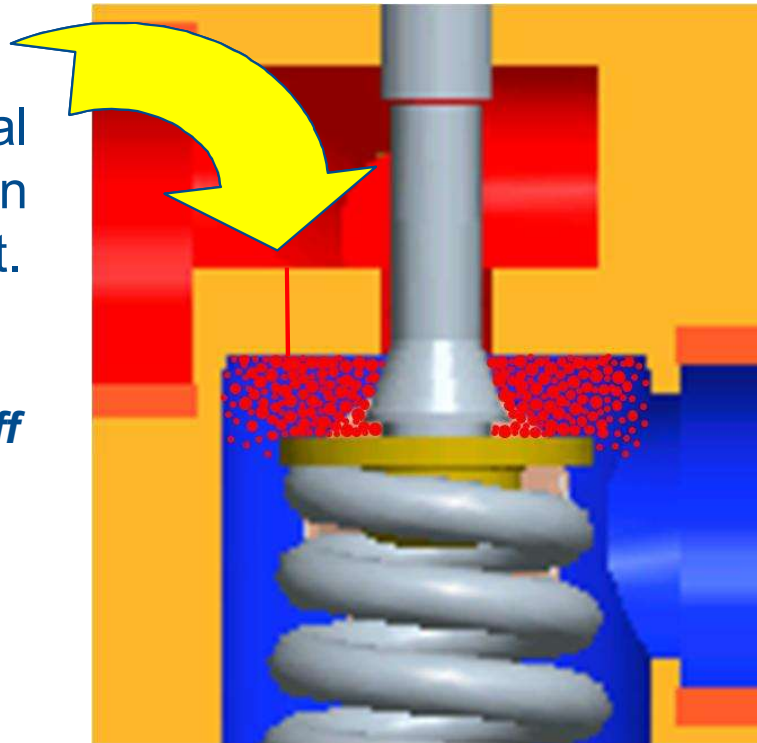
Distributor Pressure Drop → Venturi Type ~15 psig / Orifice Type ~25-35 psig

Thermal Expansion Valve

Internal Bleed Option

A bleed port is an internal passage directly between the valve inlet and outlet.

→ Provides For System Equalization During The Off Cycle



CW Increases Superheat

Allows high and low side system pressures to equalize during the off cycle thereby allowing the use of low start torque compressors

Emerson TXV Product Range



A - Series Thermostatic Expansion Valves



The A-Series is used for heat pump, air conditioning, food service and commercial refrigeration applications.

Features:

- Stainless steel power element prevents corrosion and valve failure
- **Hermetic**, leak-free construction
- Compact size allows installation in limited spaces
- Ratings from **1/8 to 5 tons**

MODEL NUMBER NOMENCLATURE - Example: **AACE 2-1/2HAA-01G**

SERIES	SUPERHEAT ADJUSTMENT	INTERNAL CHECK VALVE	EQUALIZER	BLEED HOLE	CAPACITY	SYSTEM REFRIGERANT CODE	CHARGE CODE	SEQUENTIAL IDENTIFIER	CUSTOMER SPECIAL	PACK TYPE
A	A	C	E		2-1/2	H	AA	-01	G	
Hermetic Design	A = Adjustable N = Non-Adjustable	C = Internal Check Valve for Reverse Flow Bypass (Heat Pump) Applications (Omit for No Check)	E = External (Omit for Internal)	B = Bleed Hole (Omit for No Bleed Hole)	Nominal Rating in Tons	B = R-448A/R-449A D = R-450A/R-513A F = R-12 H = R-22 M = R-134a N = R-407C P = R-507 R = R-502 S = R-404A T = R-290 Z = R-410A	A = Medium & Low Temp AA = Wide Range C = Medium Temp CA = Heat Pump W(MOP) = Press. Limiting Z = Low Temp	-01 thru -999	G = Customer Special (Omit for Standard)	B1 = Bulk Pack (Omit for Individual Pack)

For information on our extensive range of customizable products please contact a member of our sales team.

B - Series Thermostatic Expansion Valves



The B-Series strainer and balanced port valve is used for refrigerated cases, coolers, freezers, ice machines and air conditioning systems that operate over widely varying operating

Features:

- Stainless steel power element eliminates corrosion and prevents valve failure
- **Balanced port** design compensates for changes in operating pressures due to varying ambient or widely varying evaporator loads
- Ratings from **1/2 to 6 tons**

Nomenclature example: BAESB 1/2 HC 5 FT 3/8 x 1/2 ODF

B	A	E	S	B	1/2	H	CA	5 FT	3/8 x 1/2	ODF
Valve Series	Superheat Adjustment A = Adjustable	Equalizer E=External	Strainer Removable Inlet Screen	Bleed Hole (optional)	Capacity Nominal Rating in Tons	Refrigerant Code	Charge Code	Capillary Tube Length	Inlet x Outlet Connection Sizes	Connection Type
Hermetic Balanced Port Design	N = Non-Adjustable	(Omit for Internal)		(Omit for no bleed hole)	(See nominal capacity table below)	+F = R-12 • H = R-22 +M = R-134a • N = R-407C *P = R-507 *R = R-502 *S = R-404A *B = R-448A /R-449A +D = R-450A /R-513A	C = medium temp CA = heat pump W(MOP) = press. limiting Z = low temp	30 IN (std) & 5 FT (std)	1/4 x 3/8 3/8 x 1/2 1/2 x 5/8 5/8 x 7/8	ODF = solder

- + = R-12, R-134a, R-450A/R-513R are interchangeable refrigerant charges
- * = R-507, R-502, R-404A, R-448A and R-448A are interchangeable refrigerant charges
- = R-22 and R-407C are interchangeable refrigerant charges

HF/HFK - Series Thermostatic Expansion Valves



The HF series is a **balanced ported** valve designed for refrigeration, air conditioning and heat pump applications.

Features:

- **Stainless steel replaceable** power element eliminates corrosion and prevents valve failure
- **Two body sizes** provide capacities from **1/4 to 20 tons**

Nomenclature example HFESC 2 HC 5 FT 3/8 x 1/2 ODF S/T

HF	N	E	S	C	B	2	H	C	5 FT	3/8 x 1/2	ODF	S/T
Valve Series Balanced Port Design	Superheat Adjustment N = Non-Adjustable Omit for Adjustable	Equalizer E=External (Omit for Internal)	Connection Type S = Solder (Omit for SAE Flare)	Removable Inlet Strainer (optional) C = Inlet Strainer (ODF only)	Bleed Hole (optional) (Omit for no bleed hole)	Capacity Nominal Rating in Tons (See nominal capacity table below)	Refrigerant Code +F = R-12 • H = R-22 +M = R-134a • N = R-407C * P = R-507 * R = R-502 * S = R-404A *B = R-448A /R-449A +D=R-450A /R-513A	Charge Code C = medium temp CA = heat pump W(MOP) = press. limiting Z = low temp AA = wide range	Capillary Tube Length 5 FT (std)	Inlet x Outlet Connection Sizes 1/4 x 3/8 3/8 x 1/2	Connection Type SAE = flare ODF = solder	Configuration ANG = 90° angle S/T = straight-thru

+ = R-12, R-134a, R-450A and R-513A are interchangeable refrigerant charges
 * = R-507, R-502, R-404A, R-448A and R-449A are interchangeable refrigerant charges
 • = R-22 and R-407C are interchangeable refrigerant charges

TXV Troubleshooting

TXV - Troubleshooting

Problem	Symptom	Cause	Fix
Flooding / Overfeeding	Low Superheat	Superheat Setting Oversize TXV Overcharge Bulb Location Dirty Evaporator	Adjust Replace Remove Refrigerant Relocate Clean
Starving / Underfeeding	High Superheat	Superheat Setting Undercharge Damaged Power Head Clogged Drier Ice Forming	Adjust Add Refrigerant Replace Change Change Drier
Hunting	Fluctuating Superheat	Bulb Location Oversize TXV Superheat Setting	Relocate Replace Adjust

Selecting & Sizing A TXV

Expansion Valve Selection

1. Refrigerant Type
2. Evaporator Temperature
3. Evaporator Capacity
4. Condensing Temperature/Pressure
5. Liquid Temperature
6. Distributor Type (Venturi 15 psig or Orifice 30 psig)

Note: The valve is sized to the evaporator and not the compressor.

How to get there?

The screenshot shows the Emerson Climate Technologies website. The navigation menu includes: Products, Industries, Training & Support, Tools & Resources, and Expertise. The 'Products' menu is expanded, showing: Controls & Monitoring Systems, Heating & Air Conditioning, Refrigeration, Sensing & Protection Devices, and Thermostats. The 'Thermostats' menu is further expanded to show: THERMOSTATS, Do-It-Yourself Thermostats, Professional Thermostats, Programmable Thermostats, Thermostat Manuals, Fit Matters, Sensi for Professionals, and Sensi Homeowner. A red arrow points to the 'BRANDS' section, which lists: White-Rodgers, Sensi™, and Verdant. Below the brands list is a link for 'All Climate Brands'. The website footer includes: PRODUCTS, TRUSTED BRANDS, INNOVATION, and STEWARDSHIP. A cookie notice is visible at the bottom of the page.

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https://climate.emerson.com/en-us/brands/white-rodgers

1:58 PM 2020-04-02

How to get there?

The screenshot shows the website climate.emerson.com/en-us/brands/white-rodgers. The navigation bar includes links for Emerson.com, About Us, Investors, Careers, Contact Us, News & Events, Sign In, and United States (English). The main menu features CLIMATE TECHNOLOGIES, Products, Industries, Training & Support, Tools & Resources, and Expertise. A search bar and shopping cart icon are also present.

The main content area displays four cards:

- Find My Manual**: Locate a manual for your Emerson, White-Rodgers or Sensi Thermostat.
- Cross Reference & Product Information**: Access product information with our powerful cross reference for OEM, competitive or White-Rodgers products.
- Air Conditioning & Refrigeration Product Selector**: Find the right valves, controls and system protectors for your air conditioning or refrigeration application. (A red arrow points to this card.)
- Quick Reference Guide**: Access cross-reference and product information for our top products, all in one quick reference guide.

A cookie notice is visible at the bottom of the page, stating: "HOW WE USE COOKIES: We use cookies and similar technologies to improve our website, to personalize website content to you, and to deliver advertising messages and offers on content that are relevant to you. For more specific information on how we use cookies and to change your cookie preferences, see our [Cookie Notice](#). WE COLLECT PERSONAL INFORMATION SUBJECT TO THE CALIFORNIA CONSUMER PRIVACY ACT. Learn more [here](#). Understand and don't want to see this message again? Click the X to close this notice."

The browser's address bar shows the URL: <https://webapps.emerson.com/wrproductselector/flowcontrols.aspx>. The Windows taskbar at the bottom shows the time as 1:59 PM on 2020-04-02.

Product Selection Webpage



WHITE-RODGERS™

Home / Product Family / Air Conditioning & Refrigeration

Air Conditioning & Refrigeration



System Protectors



Expansion Valves



Solenoid Valves & Coils



Oil Controls



Shut Off Valves



Temperature Pressure Controls

<https://webapps.emerson.com/wrproductselector/flowcontrols.aspx>

TXV Selection Software Demonstration



WHITE-RODGERS™

Home / Product Family / Air Conditioning & Refrigeration / Expansion Valves

Expansion Valves

Thermostatic Expansion Valves

Thermostatic Expansion Valves

AUTO CONVERT

REFRIGERANT

LIQUID TEMPERATURE °F °C

OTHER PRESSURE DROPS (optional) PSIG BAR

DESIGN CAPACITY (optional) - +

CONDENSING TEMPERATURE °F °C

EVAPORATING TEMPERATURE °F °C

CAPACITY BTUH

SEARCH >

You can also use the WR Product Selector



EMERSON

WHITE-RODGERS

White-Rodgers Cross-Reference and Product Information

Select Popular Products by Features and Attributes

Search Replacement Heating Controls by Major OEM Brand

ENTER MODEL NUMBER

Windows taskbar: 8:03 PM 2020-04-01

Product Selector



WHITE-RODGERS

White-Rodgers Cross-Reference and Product Information

Home / Product Family

Choose a Product Family



Product Selection Webpage



WHITE-RODGERS

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Air Conditioning & Refrigeration



System Protectors



Expansion Valves



Solenoid Valves & Coils



Oil Controls



Shut Off Valves



Temperature Pressure Controls

<https://webapps.emerson.com/wrproductselector/flowcontrols.aspx>

TXV Selection Software Demonstration



WHITE-RODGERS™

Home / Product Family / Air Conditioning & Refrigeration / Expansion Valves

Expansion Valves

Thermostatic Expansion Valves

Thermostatic Expansion Valves

AUTO CONVERT

REFRIGERANT

LIQUID TEMPERATURE °F °C

OTHER PRESSURE DROPS (optional) PSIG BAR

DESIGN CAPACITY (optional) - +

CONDENSING TEMPERATURE °F °C

EVAPORATING TEMPERATURE °F °C

CAPACITY BTUH

SEARCH >

TXV Selection

Exercise – Walk In Box

Refrigerant	R-134A
Condensing Temp	+100 F
Evaporator Temp	+30°F
Liquid Temp	+ 70°F
Evaporator Load	2 Tons
Distributor	15 psi
Externally Equalized, Adjustable SH, Straight Through Valve, 3/8x1/2” Brazed	

TXV Selection

Exercise – Walk In Box

Refrigerant	R-134A
Condensing Temp	+100 F
Evaporator Temp	+30°F
Liquid Temp	+ 70°F
Evaporator Load	2 Tons
Distributor	15 psi
Externally Equalized, Adjustable SH, Straight Through Valve, 3/8x1/2” Braze	

2 - HFES 1 3/4 MC = 065647