

Natural Refrigerant Training Summit

Building a Sustainable Workforce

EEV and Valve Control Intro

Chris Butler

Application Specialist - CAREL



NORTH AMERICAN
Sustainable
Refrigeration
Council

Natural Refrigerant Training Summit

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Who We Are

A 501c3 nonprofit working to create a sustainable future for supermarket refrigeration by removing barriers to natural refrigerant adoption.




160+
member
companies



55K+
food retail
locations



Goals

-  Build a sustainable technician workforce
-  Increase funding for natural refrigerant equipment
-  Improve technology options, education, and awareness

What are Natural Refrigerants?

CO₂

R744
Carbon Dioxide

C₃H₈

R290
Propane

NH₃

R717
Ammonia

BETTER CONTROL
BETTER ENVIRONMENT

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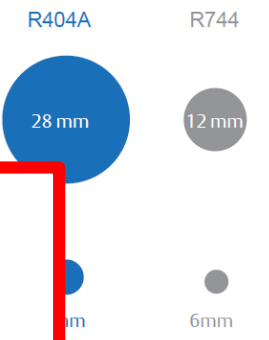
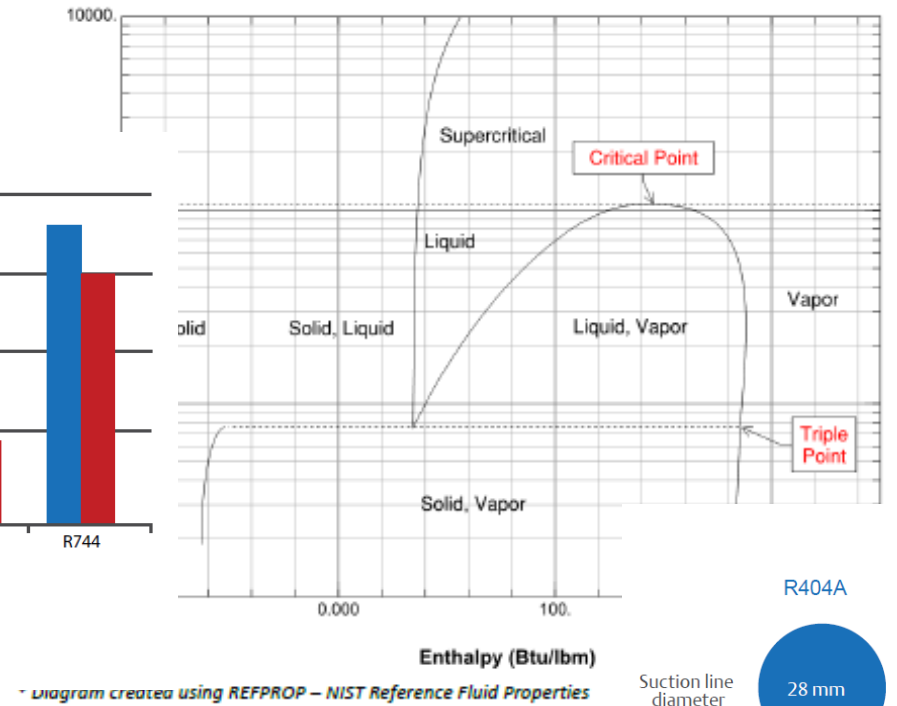
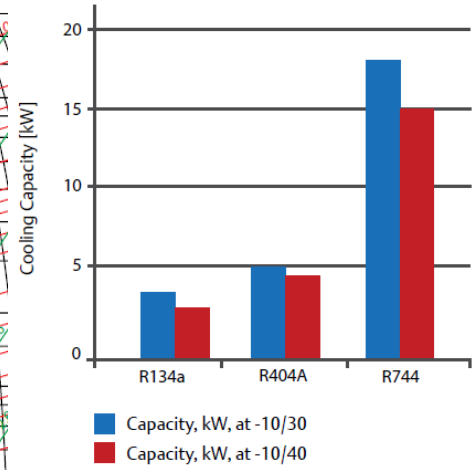
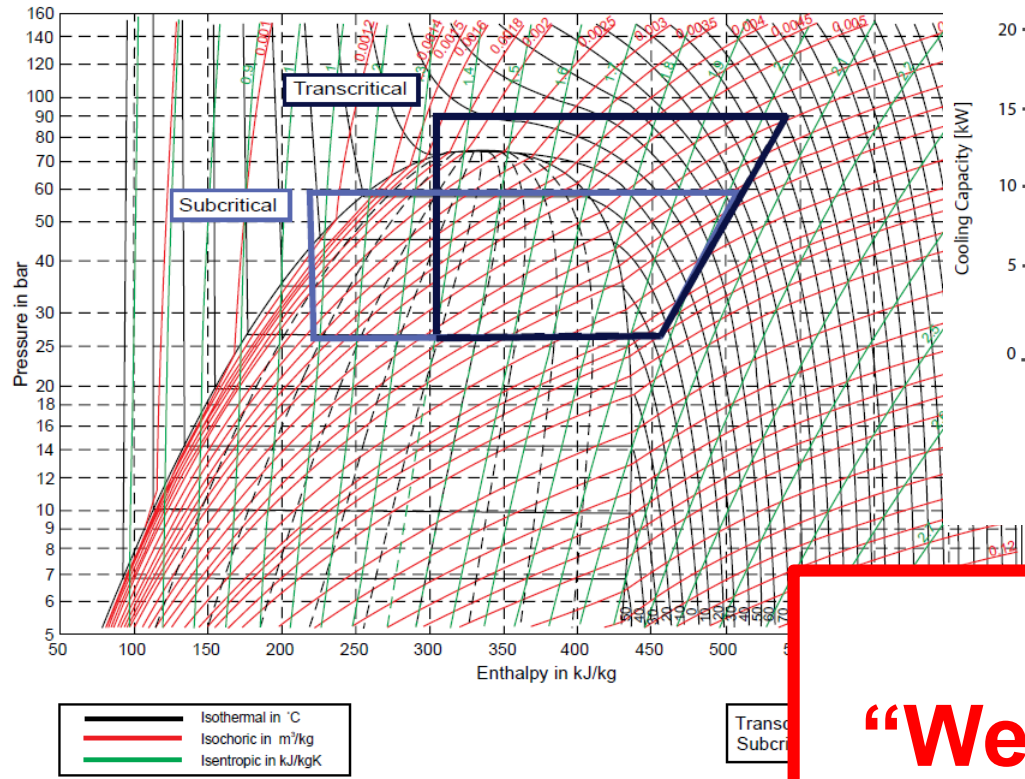
EEV & EVD Training

***Valve, EVD mini, EVD ice, & EVD Evo
Operation***

Chris Butler
Feb 2023

Expectations

What we are NOT covering...



“Well this other controller...”

CAREL

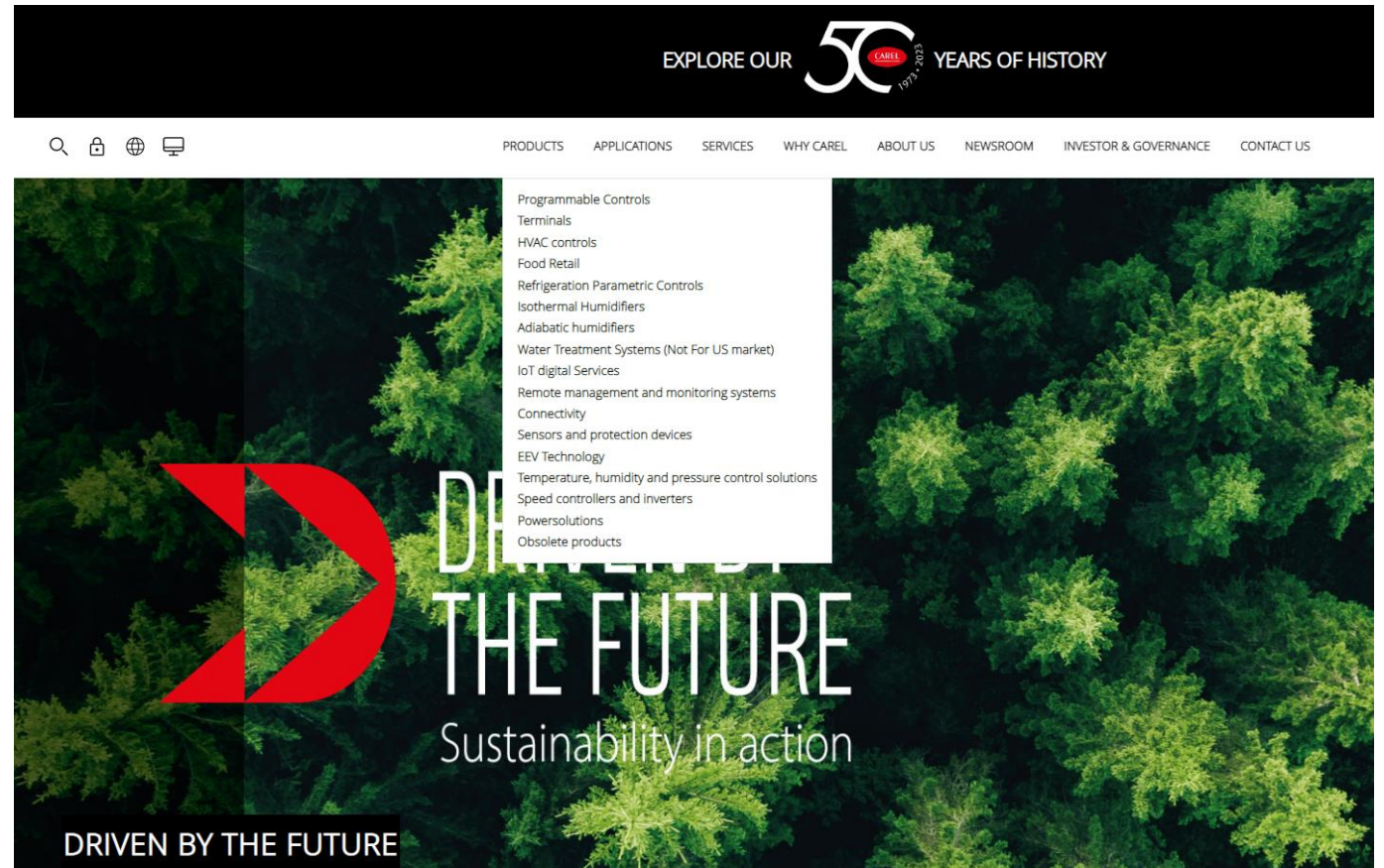
SERVICES

Technical Support

Online Info

Visit the CAREL website

- <https://www.carelusa.com/>



Online Info

Visit the [CAREL YouTube Channel](#)

The screenshot displays the CAREL YouTube channel interface. On the left, there is a navigation menu with options: Home, Shorts, Subscriptions, Library, History, Watch Later, Liked videos, Subscriptions (Music, Sport, Gaming, Movies & TV), and Explore (Trending, Shopping, Music, Movies & TV, Live, Gaming, News). The main content area features a banner image with icons for snowflake, cloud, heart, flame, and water drop. Below the banner is the channel name 'CAREL' (@CARELHQs) with 6.23K subscribers and a 'Subscribe' button. A video player is shown for the video 'Relative humidity and respiratory infections' (598 views, 6 months ago). The video description states: 'The human body is designed to live in environments where relative humidity is within a specific range, between 40 and 60%. This ideal range is due to several different mechanisms: - the innate immune defences of the respiratory system function best only when the incoming air is not too dry, to the extent where it defeats the action of "mucociliary clearance" - many viruses have reduced infectivity at humidity values above...'. Below the video, there is a section 'About CAREL' with a 'Play all' button and a row of six thumbnail images.



Online Info

Visit the CAREL Courses website

- <https://learning.carel-deutschland.de/en/courses>

****Be sure to click the
“SIGN UP” button****

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COURSES | watch learn innovate

CATEGORY ▾ LEVEL ▾ GENRE ▾

↓ SORT BY 🔍

FREE
CAREL *iJW:*
the Refrigeration Controller
for Smarter Field
Commissioning
Stefano Soggia
Piero Zanchetta
12/2022

IJ-W | Launch Event
Various Artists

FREE
IJ-W
Piero Zanchetta

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with MPXpro
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1-833-809-7267

- **By Email:**
SERVICES.USA@CAREL.COM

- **Canadian Based Customers:**
1-412-446-3646

- **For Field Visit Request:**
FIELD.SERVICES@CAREL.COM

REPAIRS



SPARE PARTS



TECHNICAL SUPPORT

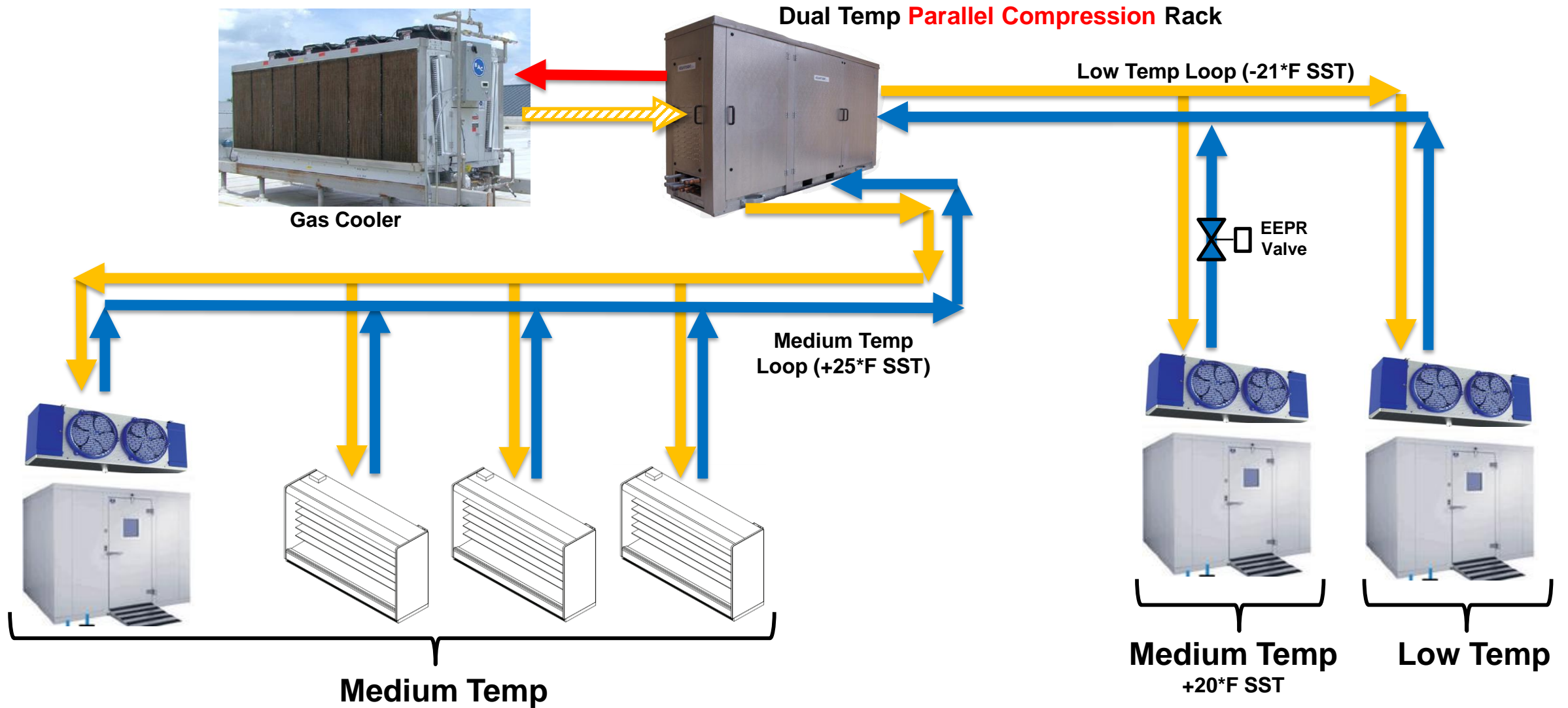


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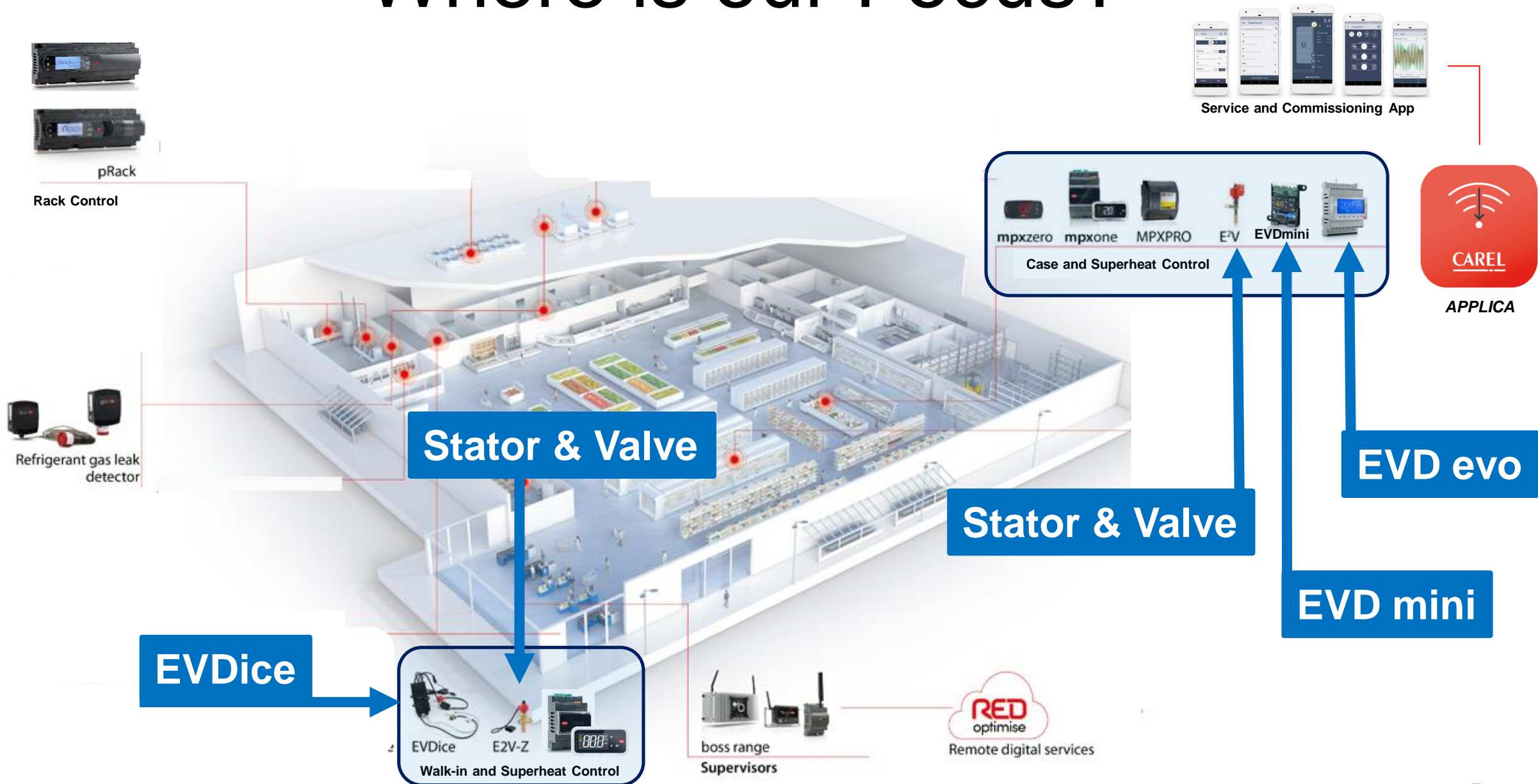
Where are we and what
are we controlling?

Superheat!

CO2, Parallel compression, Loop Piping



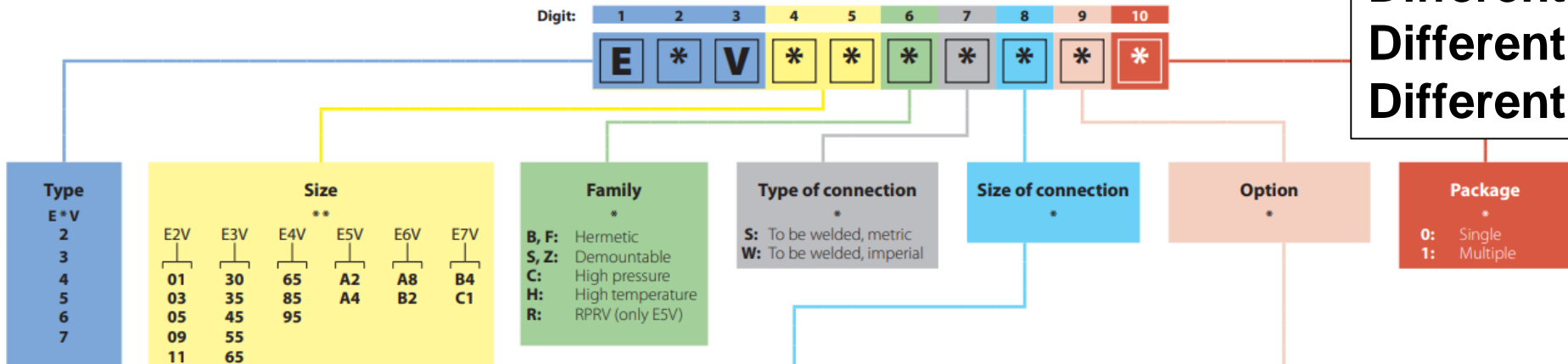
Where is our Focus?



Devices: Stators and Valves

Electronic Expansion Valves – The CATALOGUE and Identification

Different **types**.
 Different **sizes**.
 Different **families**.



[Download here](#)



Type of connection	Inlet/Outlet	E2V-F	E2V-S/-Z/-H	E2V-C	E3V-H/-S	E3V-B	E4V-B/-H	E4V-F	E5V	E6V	E7V
S (mm)	8x8 (5/16")	A									
	10x10	B	0								
	12x12	F	F	F							
	13x13				1						
	16x16 (5/8")	M	M			M					
	18x22				R						
	22x22					R					
	22x28			S							
	28x28							S	S		
	28x35							T			
W (inches)	35x35 (1.3/8")							T			
	35x35							T	T		
	42x42									V	
	54x54										Z
	3/8x3/8	A	A								
	1/2x1/2	F	F								
	3/4x7/8				R						
	7/8x1/8			S							
	7/8x7/8				R	R					
	5/8x5/8				M						
1.1/8x1.1/8							S				
1.1/8x1.3/8							T				
1.1/8x1.5/8									V	V	

Type	E2V				E3V		E4V	E5V/E6V/E7V	
Family	S/Z	C	F	H	S/H	C	B	-	-
Option (*)	0	Bip, W SG	Bip	Bip		Bip, W SG	Bip		W SG
	1	Bip, W/O SG		Uni, CL 1m	Bip, W/O SG	Bip, W/O SG		Bip	W/O SG
	2	Uni, W SG, CL 1m		Uni, CL 2m		Uni, W SG, CL 1m			
	3	Uni, W/O SG, CL 1m		Uni, CL 0,3m		Uni, W/O SG, CL 1m		Uni, W/O SG, CL 1m	
	4	Uni, W SG, CL 2m		Uni, CL 0,7m		Uni, W SG, CL 2m			W SG, W gas. HNBR
	5	Uni, W/O SG, CL 2m				Uni, W/O SG, CL 2m		Uni, W/O SG, CL 2m	
	6	Uni, W SG, CL 0,3m				Uni, W SG, CL 0,3m			
	7	Uni, W/O SG, CL 0,3m				Uni, W/O SG, CL 0,3m		Uni, W/O SG, CL 0,3m	
	A	W/O S, W SG							W/O S, W SG
	B	W/O S, W/O SG							W/O S, W/O SG
C		W/O S	W/O S	W/O S	W/O S, W/O SG		W/O S		

Note: - W/O = without; W = with; S = stator; SG = sight glass; Uni. = unipolar; Bip. = bipolar; CL = cable length; gas. = gasket
 - not all the combinations are available
 - for E4V/E5V/E6V/E7V only the bipolar stator is available

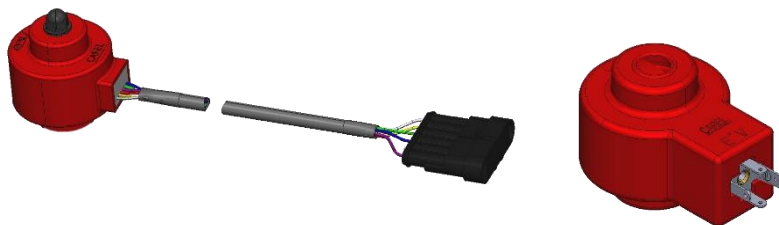


Electronic Expansion Valves – The ACCESSORIES

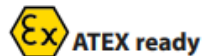
Unipolar & Bipolar stators:

e2V

e3V



For **e2V-F**



NEW



Only bipolar stators for:

e4V e6V

e5V e7V

STATOR								
ExV Family	Code	Unipolar	Bipolar	Stator IP	Cable	Length [m]	Terminal	
E2V	E2VSTA037*	✓		67	YES	0.7	JST	
	E2VSTA031*	✓		67	YES	1	JST	
	E2VSTA032*	✓		67	YES	2	JST	
	E2VSTAS31*	✓		69K	YES	1	JST	
	E2VSTAS32*	✓		69K	YES	2	JST	
	E2VSTAS22*			✓	69K	YES	2	Free
	E2VSTAX31*	✓	Ex		67	YES	1	JST
	E2VSTAX32*	✓	Ex		67	YES	2	JST
	E2VSTAX3T*	✓	Ex		67	YES	3	JST
	E2VSTAX21*			✓	67	YES	1	-
	E2VSTAX2T*			✓	67	YES	3	-
	E2VSTA033*	✓			67	YES	0.3	Superseal
	E2VSTAS33*	✓			69K	YES	0.3	Superseal
	E2VSTAS23*			✓	69K	YES	0.3	Superseal
E2VSTA020*			✓	67	NO	-	-	
E3V	E3VSTA031*	✓		67	YES	1	JST	
	E3VSTA032*	✓		67	YES	2	JST	
	E3VSTA033*	✓		67	YES	0.3	Superseal	
	E3VSTA035*	✓		67	YES	0.5	Superseal	
	E3VSTA020*			✓	67	NO	-	-
E4V&E7V	E4VE7VSTA*		✓	67	NO	-	-	
E5V&E6V	E5VE6VSTA*		✓	67	NO	-	-	

CABLES						
Code	Unipolar	Bipolar	Shield	Length [m]	Stator	Driver
E2VCABS3U0	✓		YES	3	Superseal	JST
E2VCABS6U0	✓		YES	6	Superseal	JST
E2VCABS9U0	✓		YES	9	Superseal	JST
E2VCAB03I0		✓	NO	3	Superseal	Free
E2VCAB06I0		✓	NO	6	Superseal	Free
E2VCAB09I0		✓	NO	9	Superseal	Free
E2VCABS3I0		✓	YES	3	Superseal	Free
E2VCABS6I0		✓	YES	6	Superseal	Free
E2VCABS9I0		✓	YES	9	Superseal	Free
E2VCAB0300		✓	NO	3	Direct	Free
E2VCAB0600		✓	NO	6	Direct	Free
E2VCAB0900		✓	NO	9	Direct	Free
E2VCABS300		✓	YES	3	Direct	Free
E2VCABS600		✓	YES	6	Direct	Free
E2VCABS900		✓	YES	9	Direct	Free
E2VCABSAS0		✓	YES	15	Direct	Free

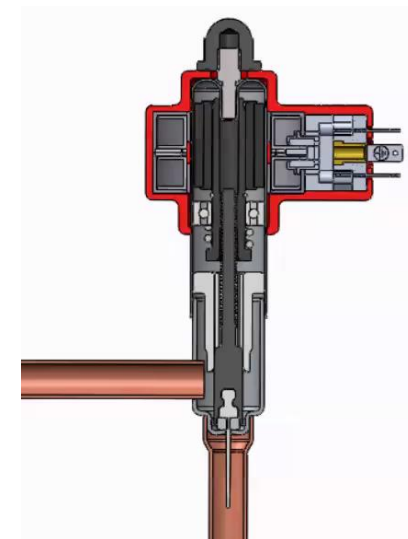
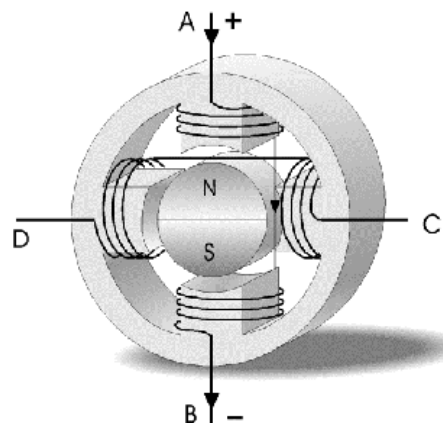


Scan me

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Stators and Valves

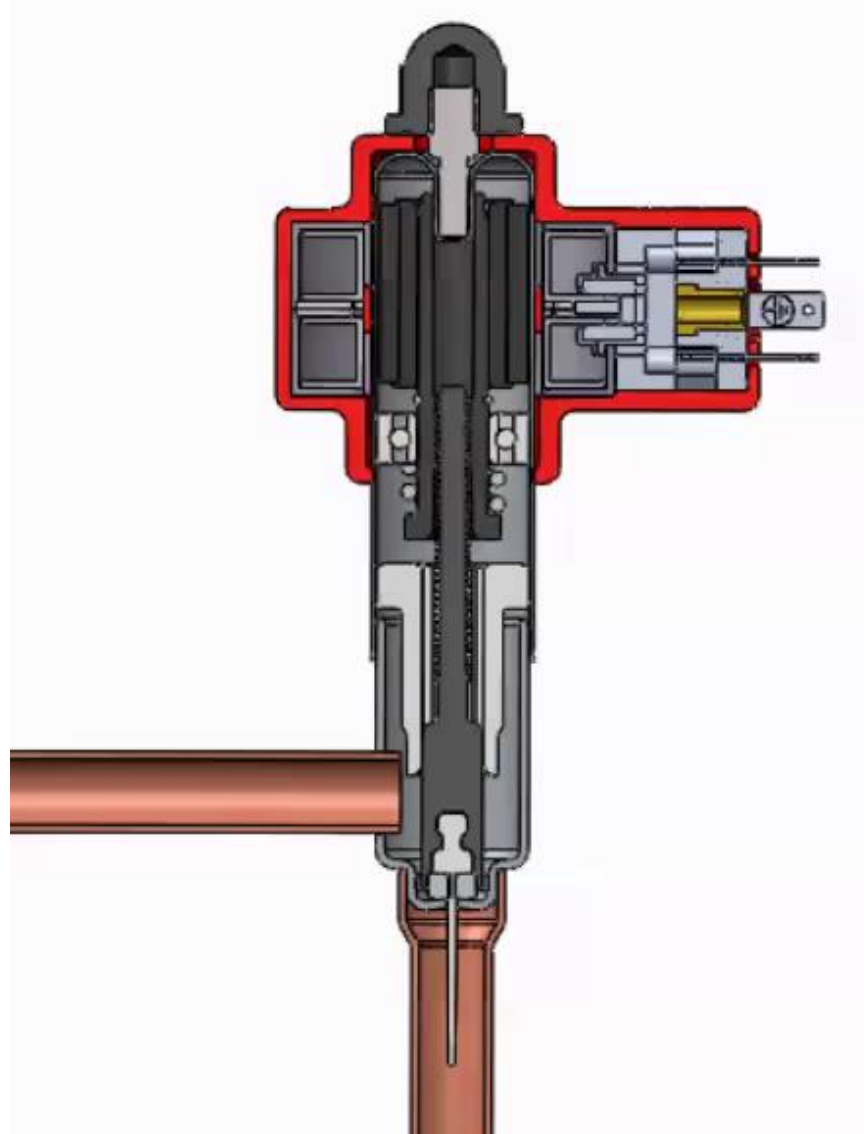
How do the stator and valve operate?



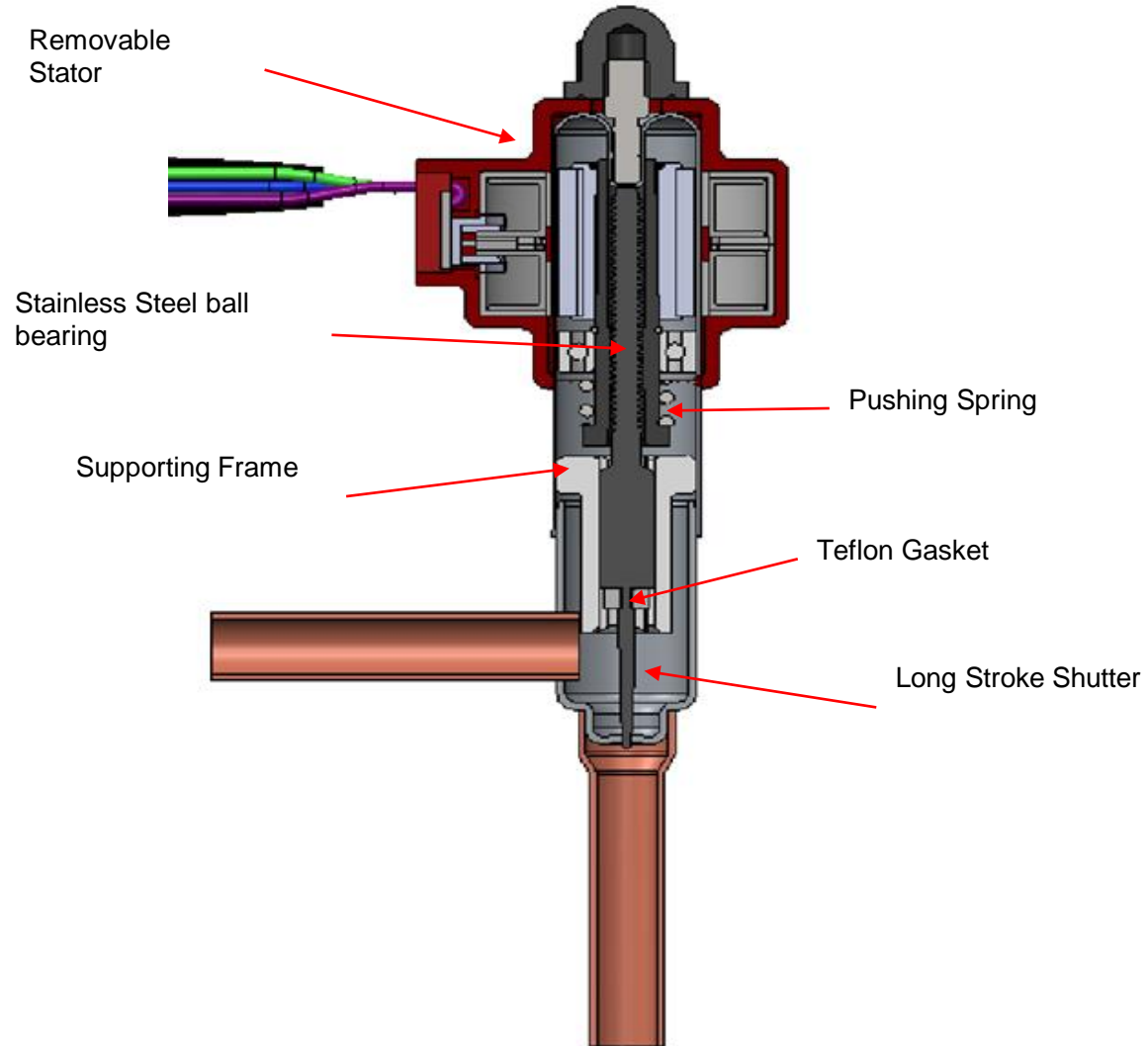
1. Driver feeds the coils in the stator with specific voltage and frequency
2. Coil in the stator generates a magnetic field
3. In response, a magnet in the valve rotates and moves the needle with endless thread
4. This needle rises or falls, **without rotating**, controlling the refrigerant flow.

Stators and Valves

...and here's a short movie:



Stators and Valves



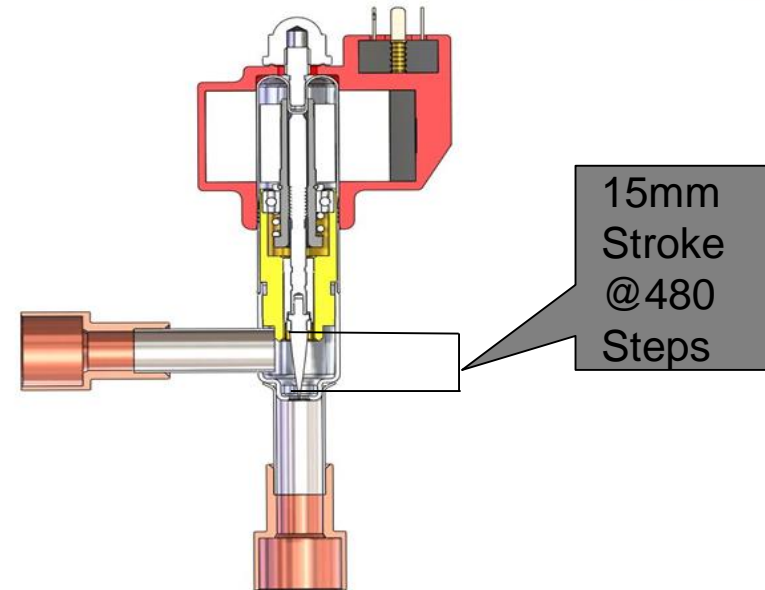
**E2V-F Valve
Non-serviceable**

Stators and Valves

- 480 steps over 15mm (0.59")
- 500 total steps for closing (20 additional steps)
- Each step is 0.031mm (0.0012")
- **VALVES SHIP 75% OPEN**
- Teflon gasket
- Needle and Teflon gasket **DO NOT ROTATE!**
- Pressing spring
- Can act as a solenoid valve w/ Ultracap
- **Carel valves are just valves...can be used as EEPR valve, EEV, and more**

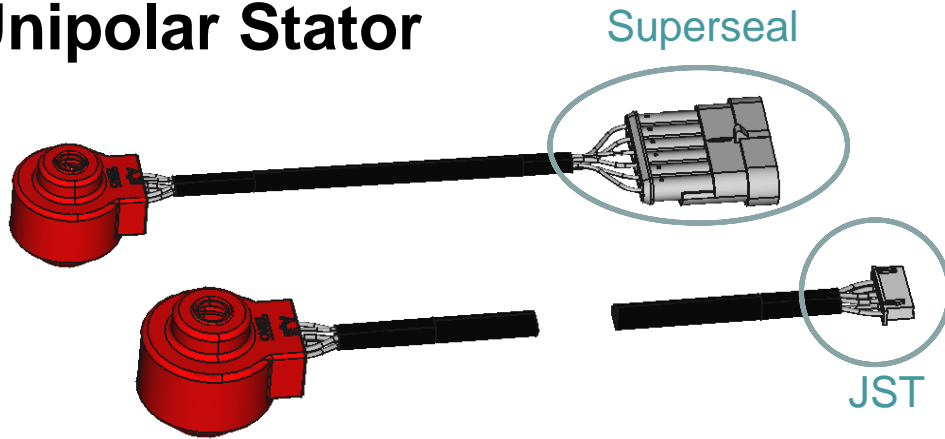


Carel E4V



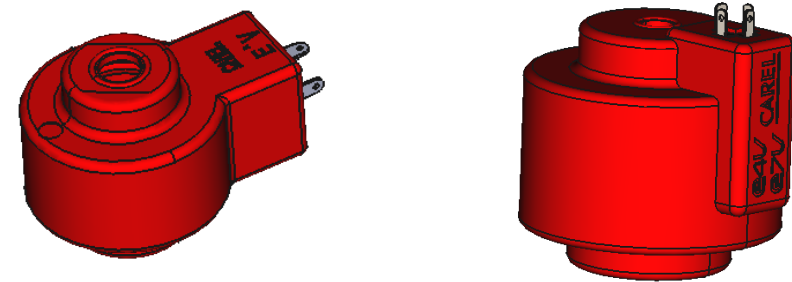
Stators and Valves

Unipolar Stator



- **6 wires**
- Only for E2V and E3V valves
- Always has an integrated connector
- JST (6 wire) or Superseal connector
- Limited length cable (elec. characteristics)
- Big E2V & E3V sizes have limited MOPD

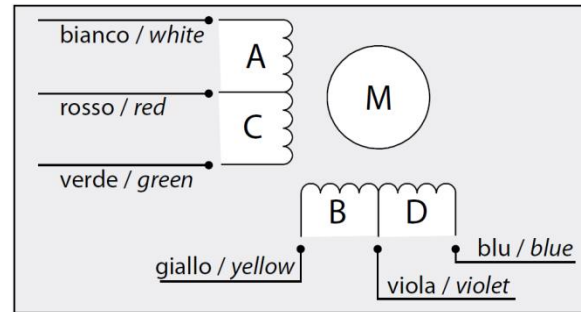
Bipolar Stator



- **4 wire**
- For all valves
- Free wires (no integrated connector)
- Some integrated connector (not common)
- Ready-to-use extensions up to 49 ft but can be extended (wire size considerations)
- No MOPD limitations

Stators and Valves

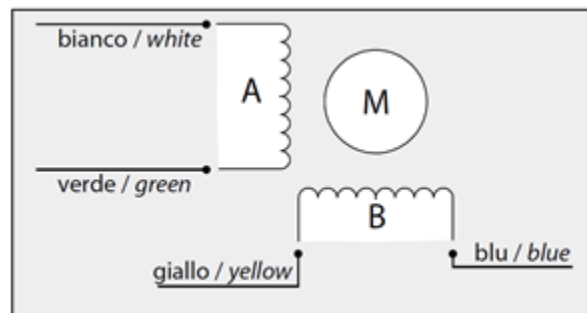
Unipolar Stators – 6 wires!



- Provide lower power, suitable for small size valves only.
- Control is less complex.
- Shorter overall cable lengths vs. bipolar
- Current flows through half winding in one direction, starting at center tap
- Both windings can be energized simultaneously, but only half winding each

Stators and Valves

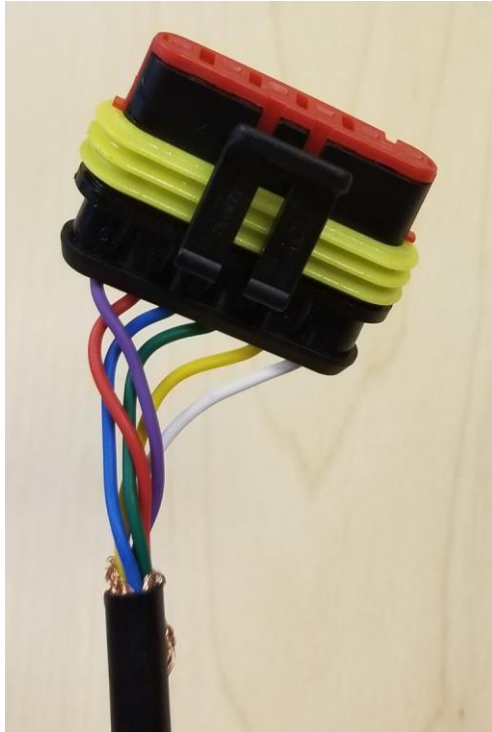
Bipolar stators – 4 wires!



- High power: larger valves (larger MOPD) can be driven
- More precise and smoother movement
- Longer cable lengths
- Current flows through entire winding in both directions
- Both windings can be energized simultaneously

Stator Connections

IP69 Superseal - Stator to Cable



Driver connection Options

JST-6 wire



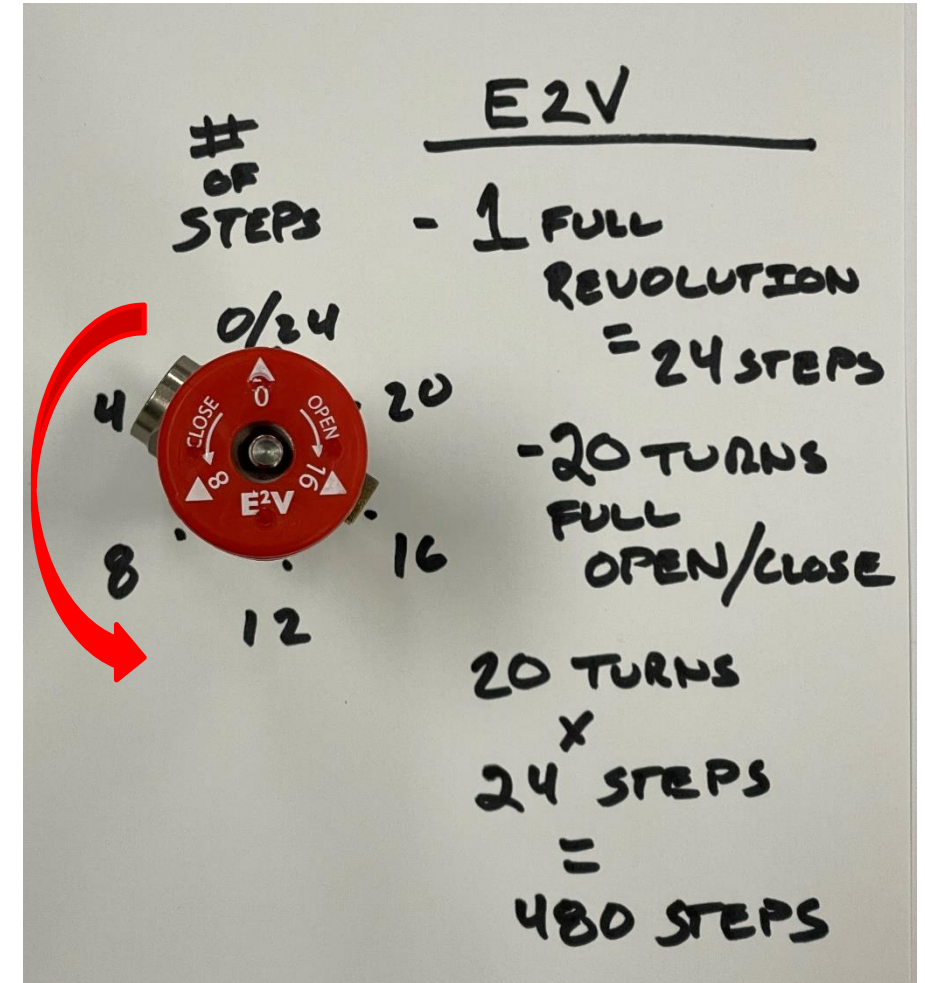
4 wire cable stripped ends



Stators and Valves

Using the Magnet Tool

- E3V and E5V, E6V magnet combo: E5V, E6V numbers are the same but E3V numbers are **double**, which means **10 full turns to open/close**. Interestingly enough, the E5/E6 valves have the same # of turns as the E2 valves.

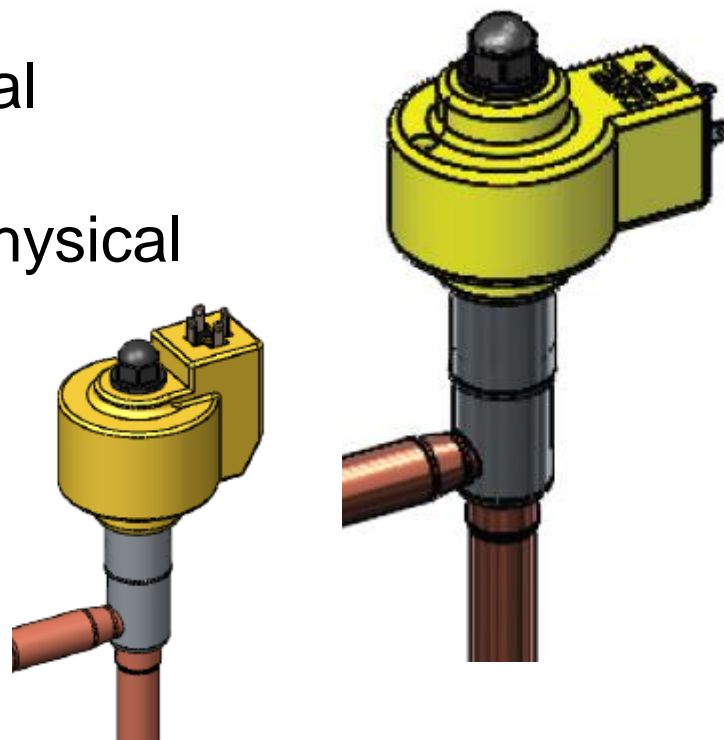


LOOK OUT!!

DO NOT INTERCHANGE HEATCRAFT WITH STANDARD CAREL VALVE/STATORS

Heatcraft uses a custom stator and valve:

- Yellow
- Different electrical characteristics
- Different valve physical characteristics



Yellow Heatcraft Stator/Valve Characteristics

STATOR CHARACTERISTICS

BIPOLAR STATOR: 2 PHASES - 24 POLAR SHOES

PHASE CURRENT: 205mA (0mA HOLDING CURRENT)

DRIVE FREQUENCY: 40 STEP/S (UP TO 175 STEP/S FOR EMERGENCY CLOSING)

PHASE RESISTANCE (20°C / 68°F): 150 OHM ±10%

INDEX OF PROTECTION: IP67
WITH E2VCAB****

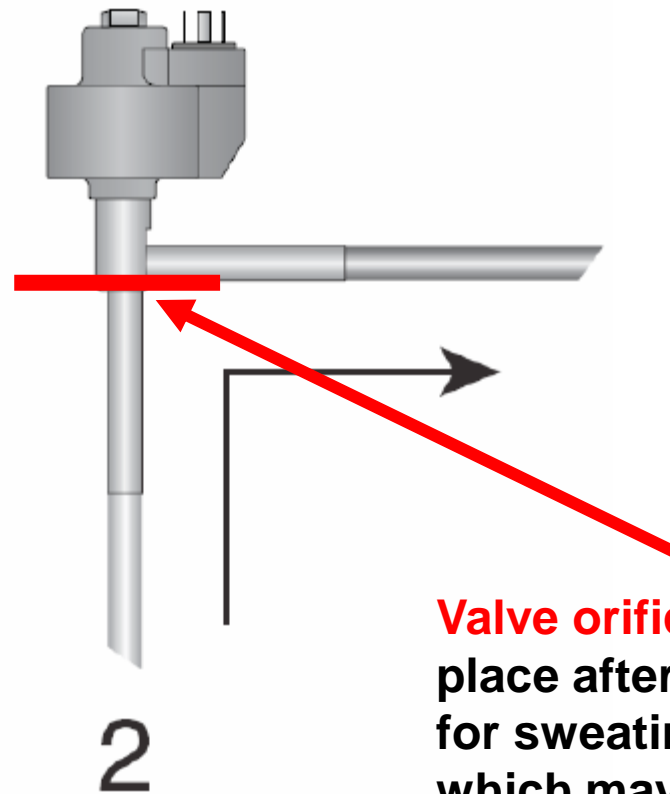
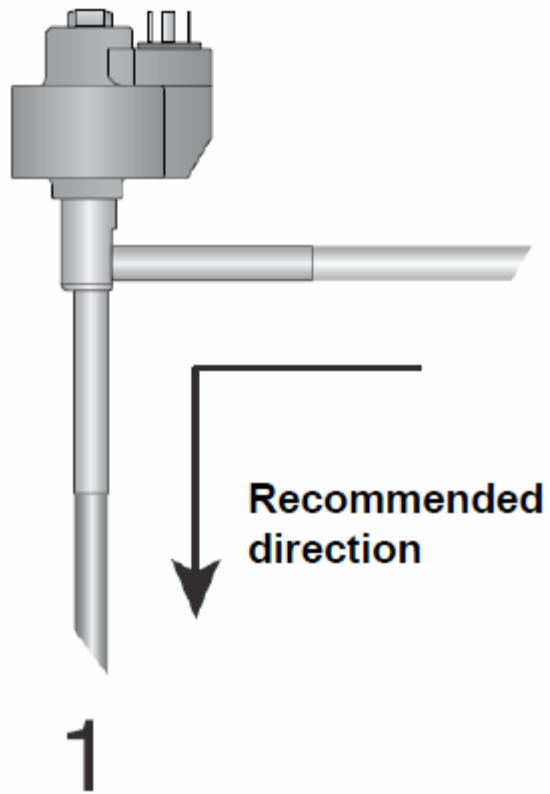
STEP ANGLE: 15°

LINEAR ADVANCE / STEP: 0.033 mm (0.0012 in)

COMPLETE CLOSING STEPS: 305

CONTROL STEPS: 255

Installation



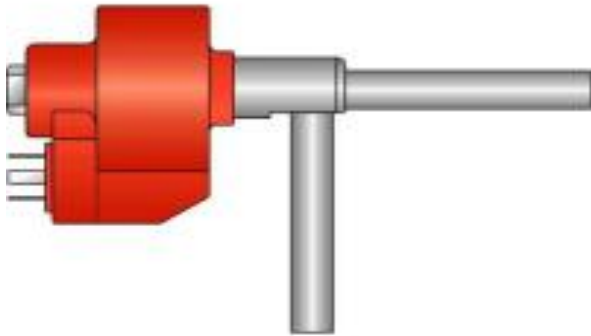
Valves are bi-flow with some considerations:

- Pressure limitations in reverse flow
- Possible sweating on valve stem in reverse flow

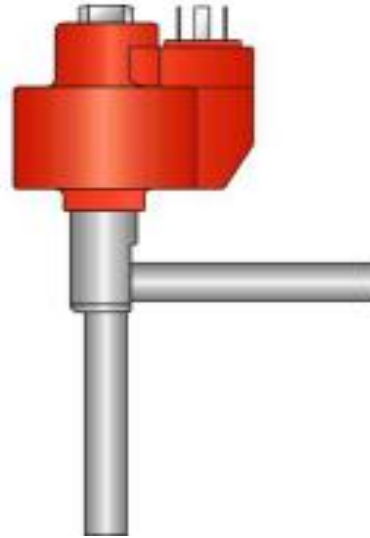
Valve orifice here. Expansion takes place after this **line**, thus potential for sweating to occur on valve stem, which may impact stator life

Installation

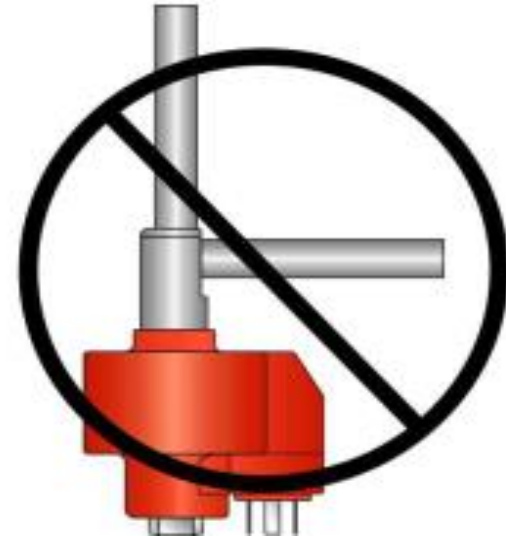
OK



OK



NO

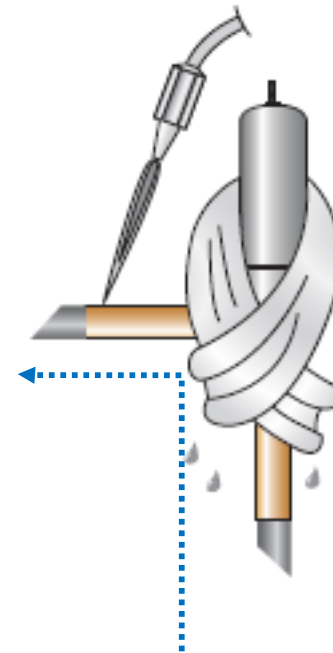


Don't be that guy and do this....

Installation

Proper Brazing Practices

- 1.5 - 3 psig of nitrogen needs to be flowing through the valve during the brazing process... **FLOW N2!**
- The valves need to be open before being brazed.
Carel valves come 75% open from the factory
- **Remove the stator!**
- The valve needs to be wrapped in a wet cloth before brazing (Do not exceed 212°F on the cartridge)
- Always try to cut out (with tubing cutters) suspected “failed” valves



*Flow should direct
heated nitrogen away
from valve*



Install Gone Wrong



New valve

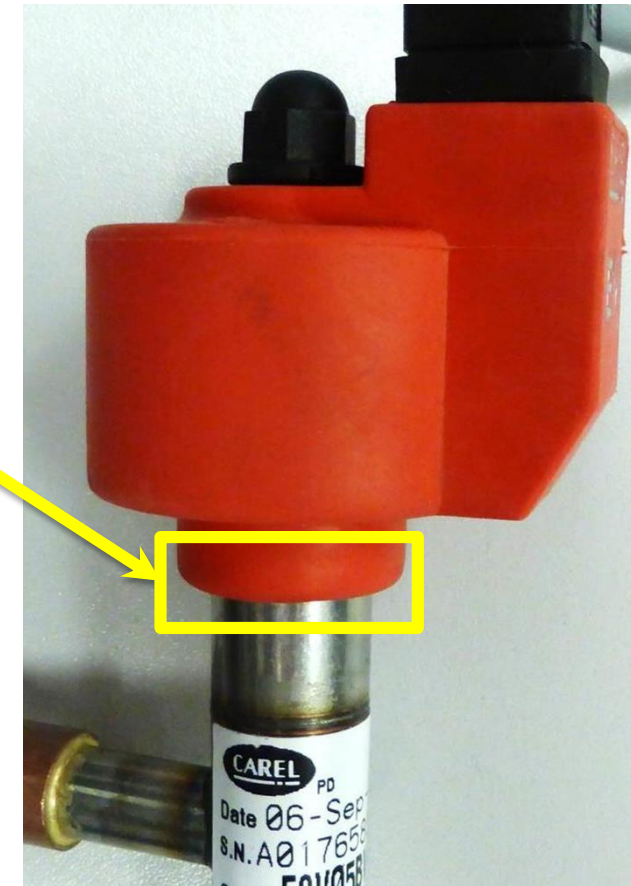
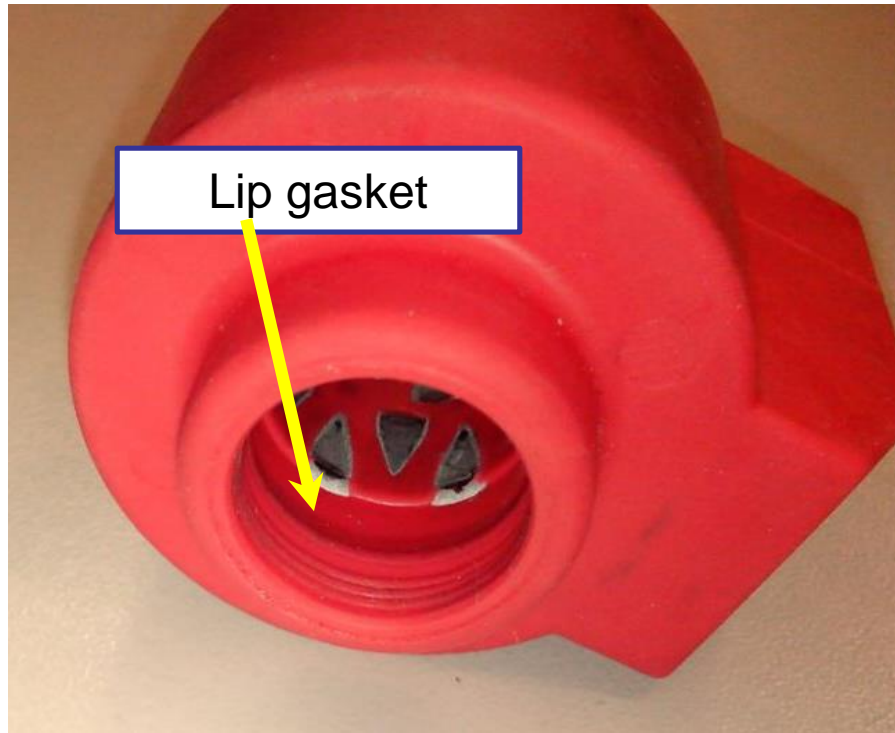


Wrong brazing procedure



Stators and Valves

Keep the valve
cartridge clean and
REMOVE label that
may be on the valve
stem



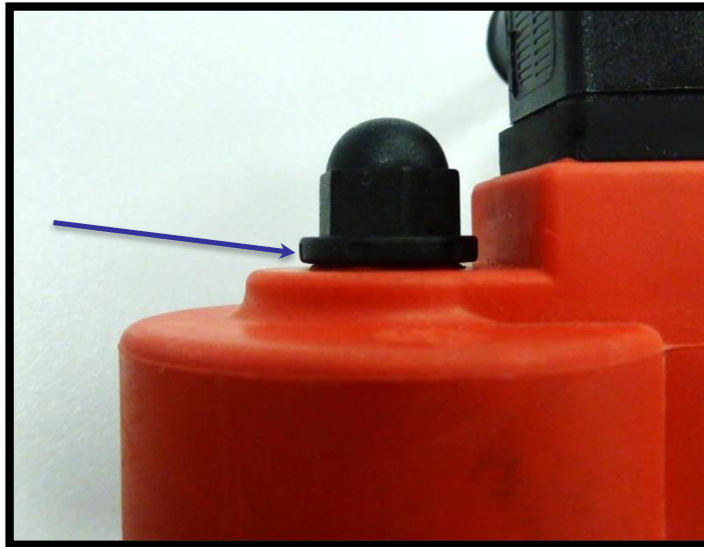
Stators and Valves

Tighten the black nut until the rubber ring is deformed on the stator

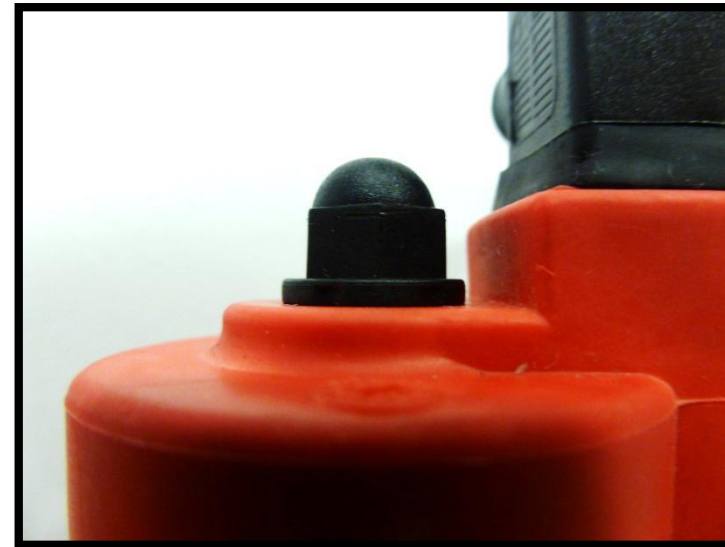
Further notes:

- Dry the valve before installing the stator
- Do not rotate the stator after tightening the stator nut

NOPE!



GOOD!



LOOK OUT!!

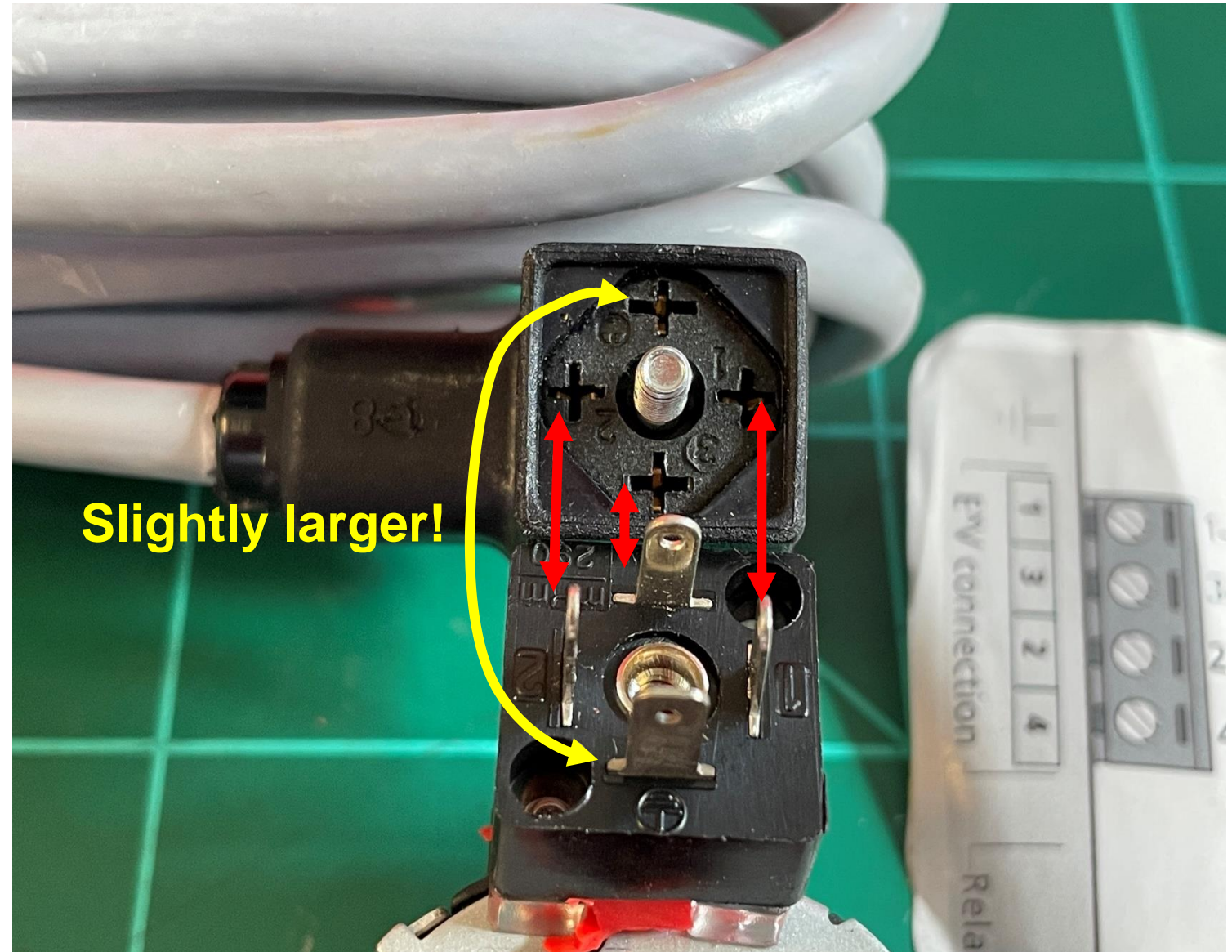


Water Damage!

- E2V stator damaged by moisture inside the coil. Checking resistance of coils in the stator show one is open

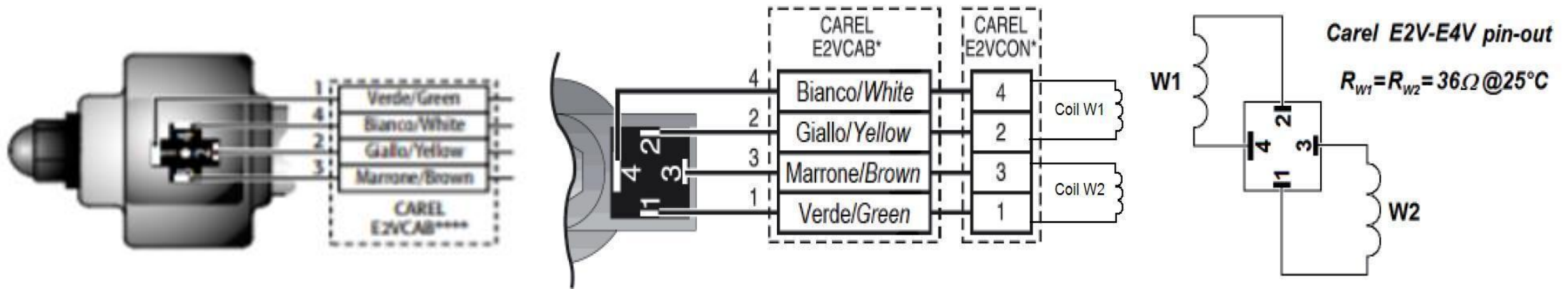
LOOK OUT!!

Plug is directional!



Stators and Valves

Cable, connections, and winding identification

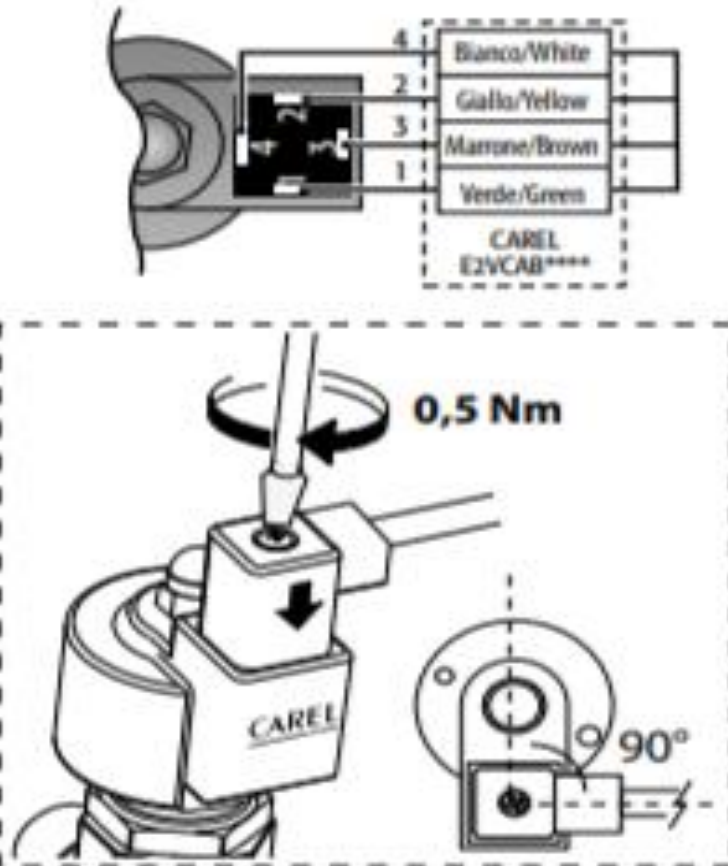


Should the valve works in reverse mode, swap the 2 wires of only one coil

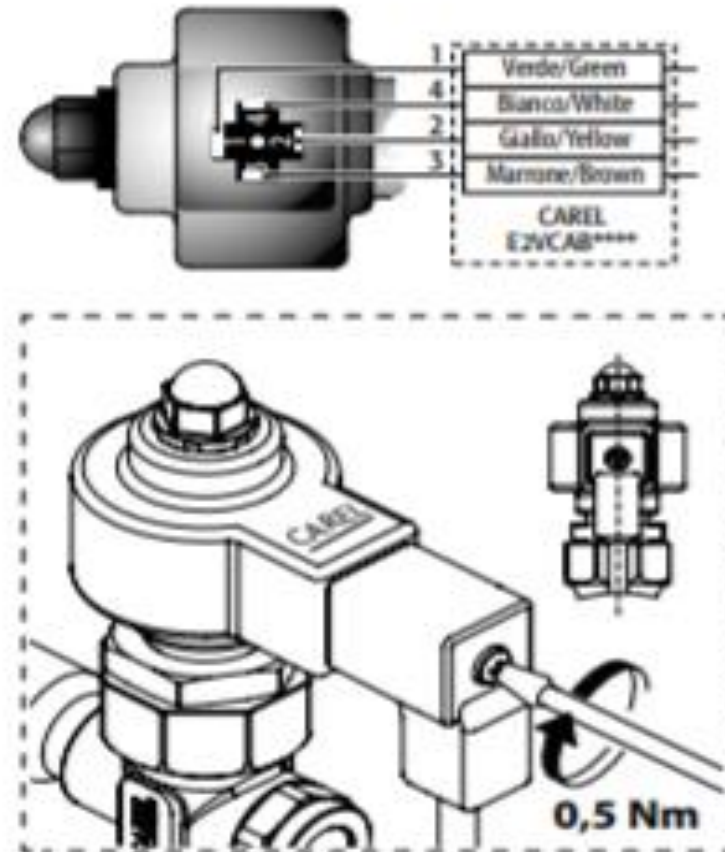
Stators and Valves

Bipolar connections identification

Old Style



New Style



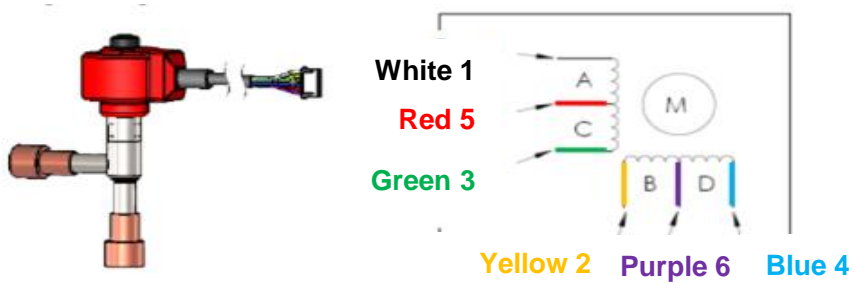
Stator Details

Checking Unipolar Stators

- Measure the resistance between all the wires

	1	2	3	4	5	6
Ω	White	Yellow	Green	Blue	Red	Purple
1	White		80		40	
2	Yellow			80		40
3	Green	80			40	
4	Blue		80			40
5	Red	40	40			
6	Purple		40	40		

Voltage reading to a winding will be around **12-13VDC** and cycling **FAST**. With a “standard” meter you’ll likely see **-7 to +7 VDC** on the active winding.

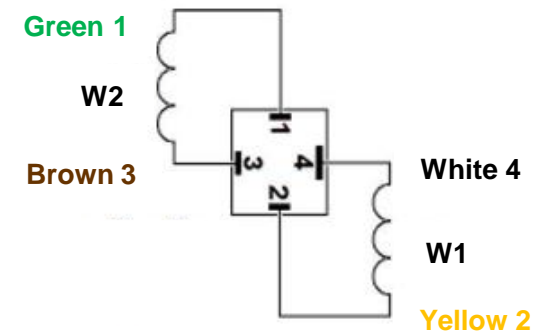


Checking Bipolar Stators

- Measure the resistance between terminals
- Terminal #'s match EVD Evo terminal numbering

	1	3	2	4	
Ω	Green	Brown	Yellow	White	
Winding #2	1	Green	0	35	
3	Brown	35	0		
Winding #1	2	Yellow		0	35
4	White		35	0	

Voltage reading to a winding will be around **16-18VDC** and cycling **FAST**. With a “standard” meter you’ll likely see **-7 to +7 VDC**. When the stator is holding position you’ll see around **3.7VDC** or higher on the active winding.



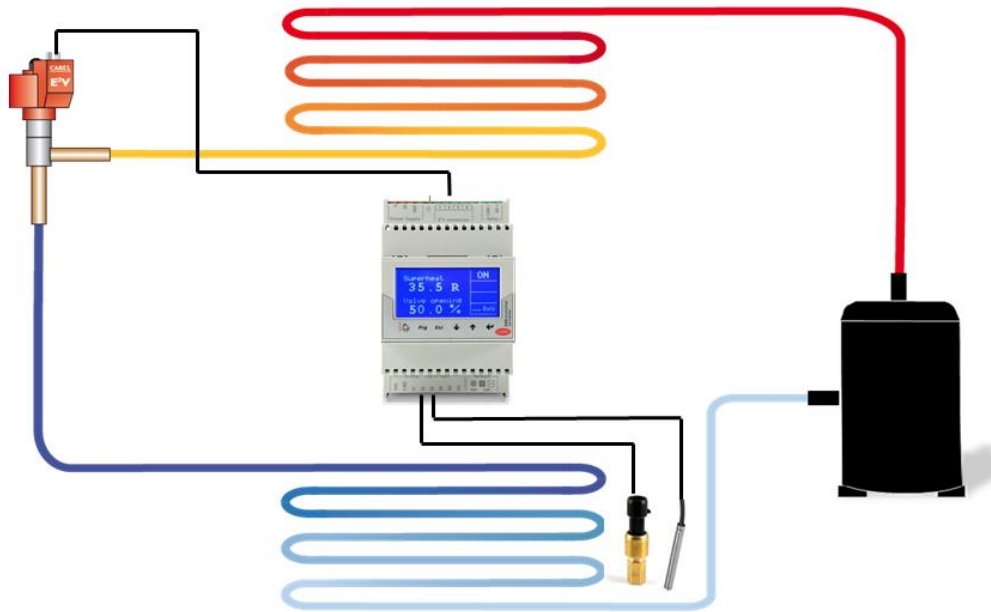
LOOK OUT!!

These stators don't look seated fully but they are!



Devices: EVD mini

Control Intro



Closed loop suction superheat control sequence

1. Measure suction temperature and evaporator pressure
2. Convert evaporator pressure to saturated evaporator temperature
3. Calculate superheat
4. Compare superheat vs superheat set point
5. New valve position to correct superheat error by means of PID algorithms
6. New position to correct flow rate

Remember, control is only as good as our inputs!

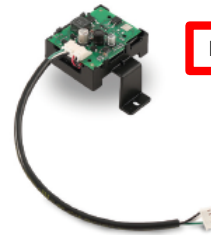
EVD mini

MPXone Medium + EVD mini = Case Control

P# AX3000PS20031



P# EVDMU00N0



P# EVDM001N00



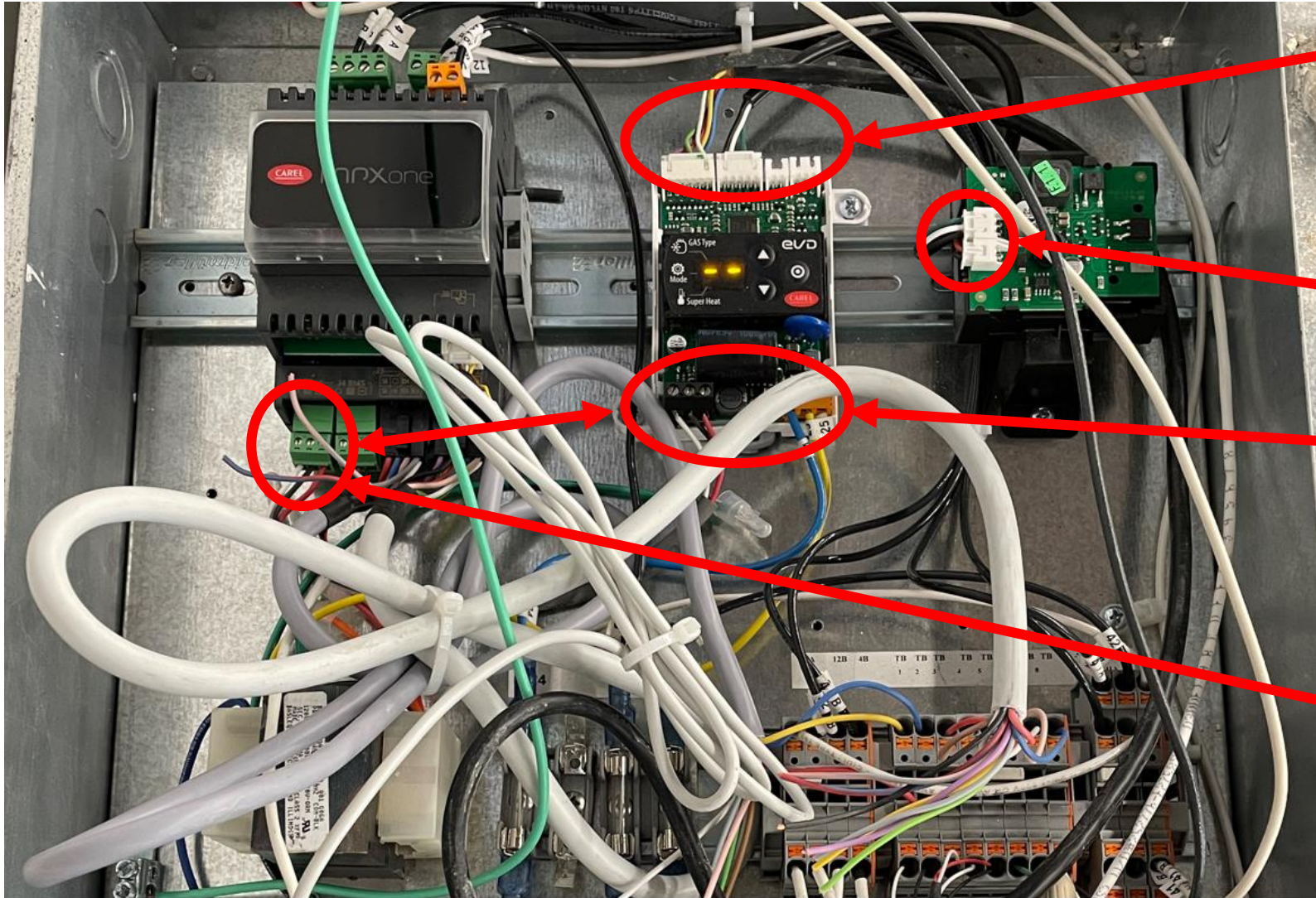
EVD mini

EVD mini is designed for superheat control

- **ONLY CONTROLS SUPERHEAT**
- **FOR UNIPOLAR STATORS ONLY**
- 115/230Vac Switching Power Supply (EVD mini 230V)
- 24Vac/Vdc Power Supply (EVD mini 24V)
- Ultracap available (JST connection on Ultracap)
- IP00 Rating
- -13°F to 140°F Operating Temperature
- Modbus RTU (RS-485) is standard
- Firmware can be updated. Contact Carel for details. Docs available.



EVD mini



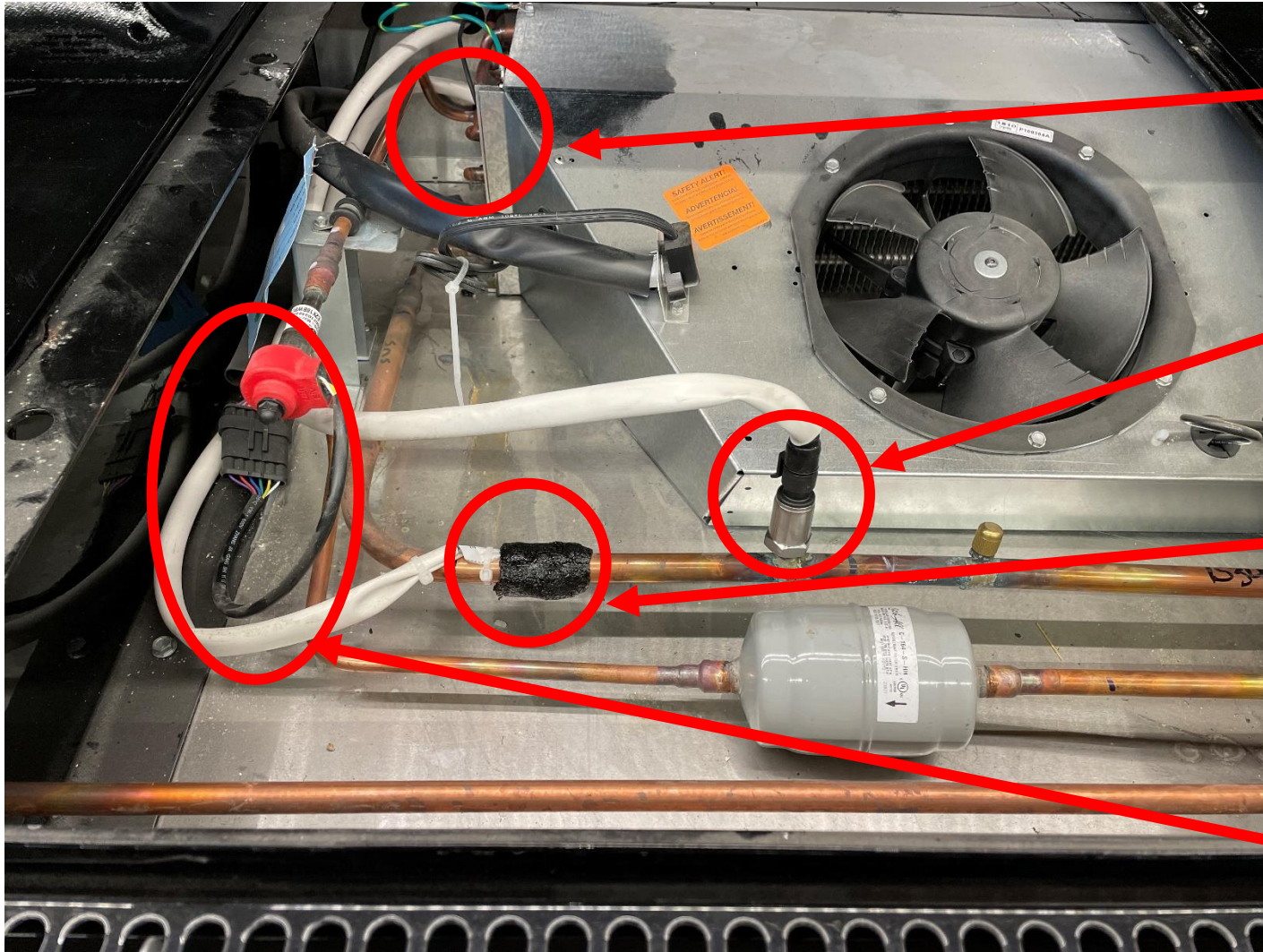
EVD mini unipolar valve
connection (JST, 6 pin) and
Ultracap connection (JST, 3 pin)
EVD mini (24Vac)

Ultracap (JST, 3 pin)

EVD mini network (left)
and power (right)
connection

J5 Connection
(Fbus) to EVD
mini

EVD mini Sensors and P#'s

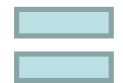


Coil (Defrost) Temp

Suction Pressure Sensor



Suction Temp Sensor



Superheat

Unipolar Stator

EVD mini

EVD mini (120/230Vac)



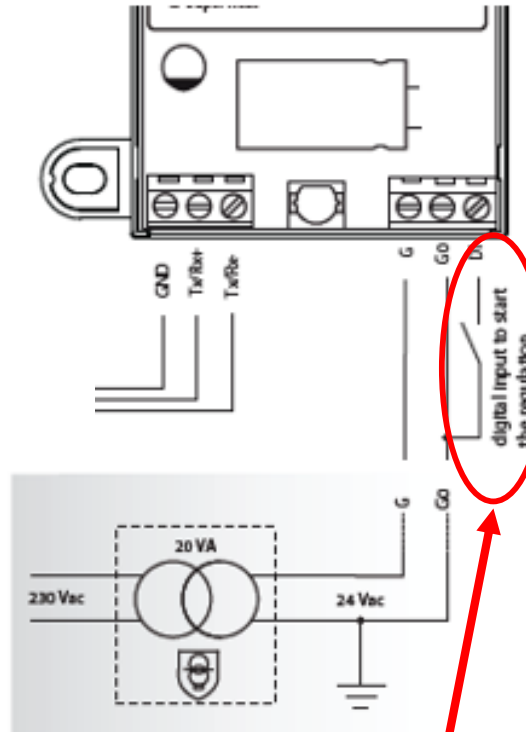
EVD mini (24Vac)



Ultracap for EVD mini

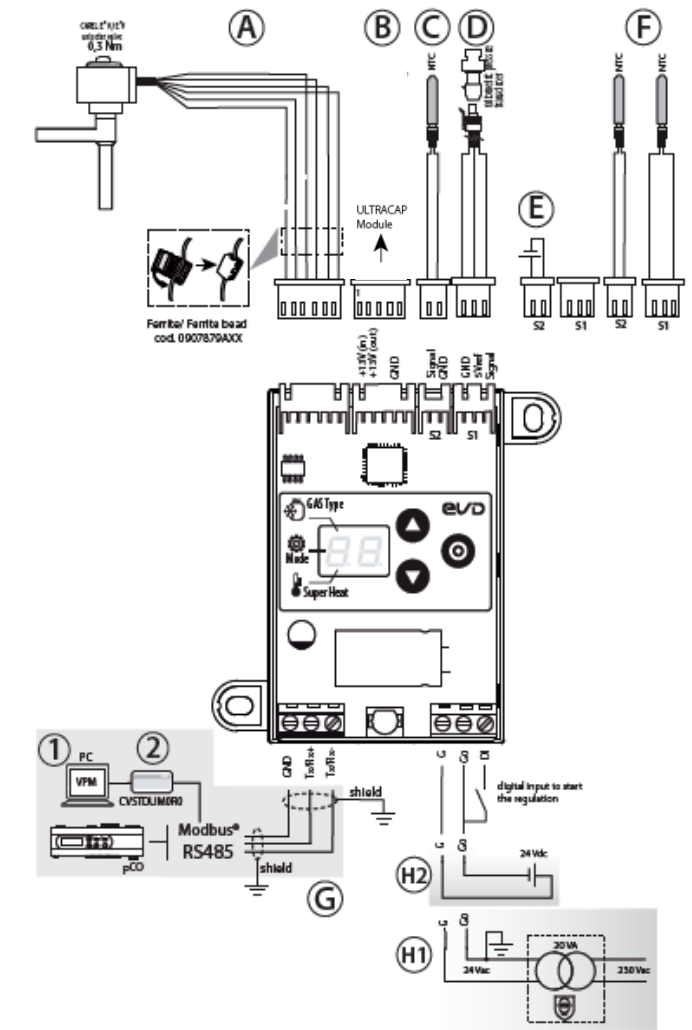
Special wiring considerations:

- EVD mini (24V) input wiring terminal is arranged differently than EVD mini (120/230V)
- EVD mini (24V) digital input voltage free or transistor to GND
- EVD mini (120/230V) digital input high voltage (optoisolated) activated
- See latest manual for further info

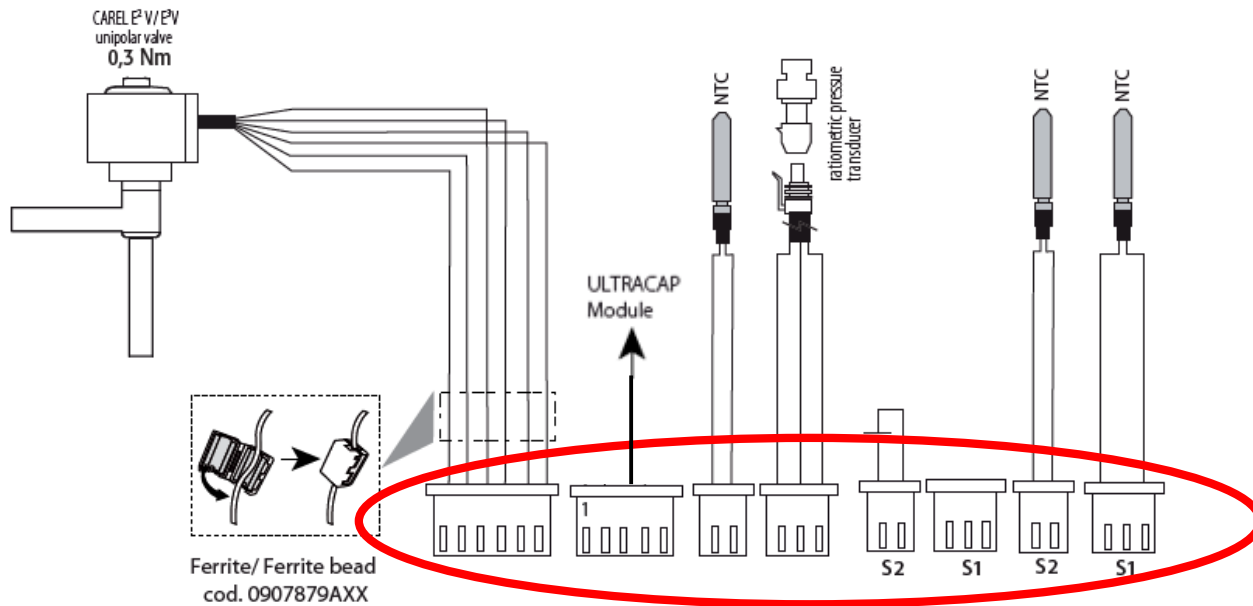


DI closure not necessary when wired to MPXone

EVD mini 24 V



EVD mini



EVD mini (24Vac)

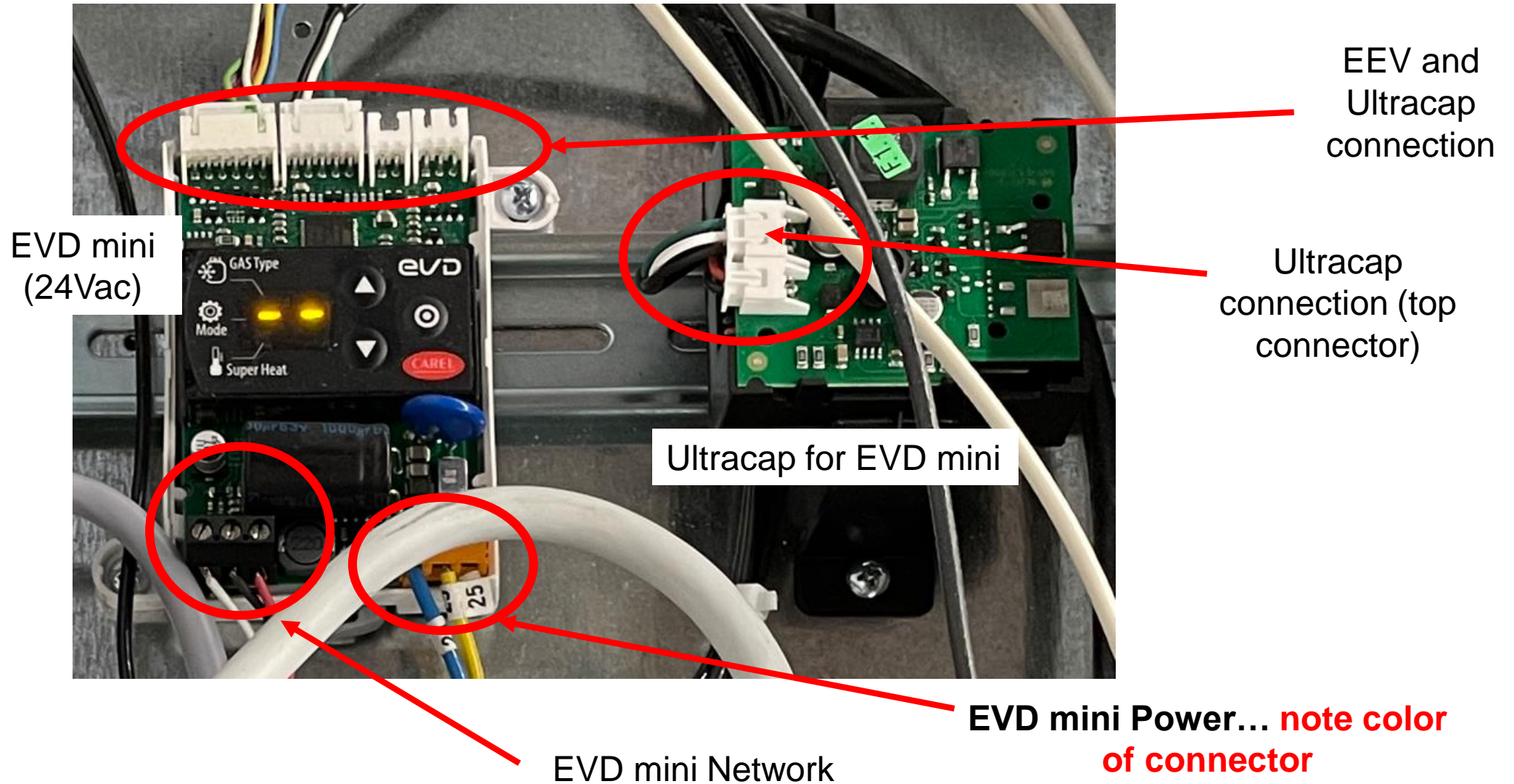


Valve, Ultracap, sensor, and transducer connect to EVD mini via JST connector. These connectors are directional.



Ultracap for EVD mini

EVD mini Wiring



EEV and
Ultracap
connection

Ultracap
connection (top
connector)

Ultracap for EVD mini

**EVD mini Power... note color
of connector**

EVD mini Network

EVD mini
(24Vac)

Devices: EVD ice

EVD ice

MPXone Medium + EVD ice = Walk in Control

P# AX3000PS20031



P# EVDMU00R10



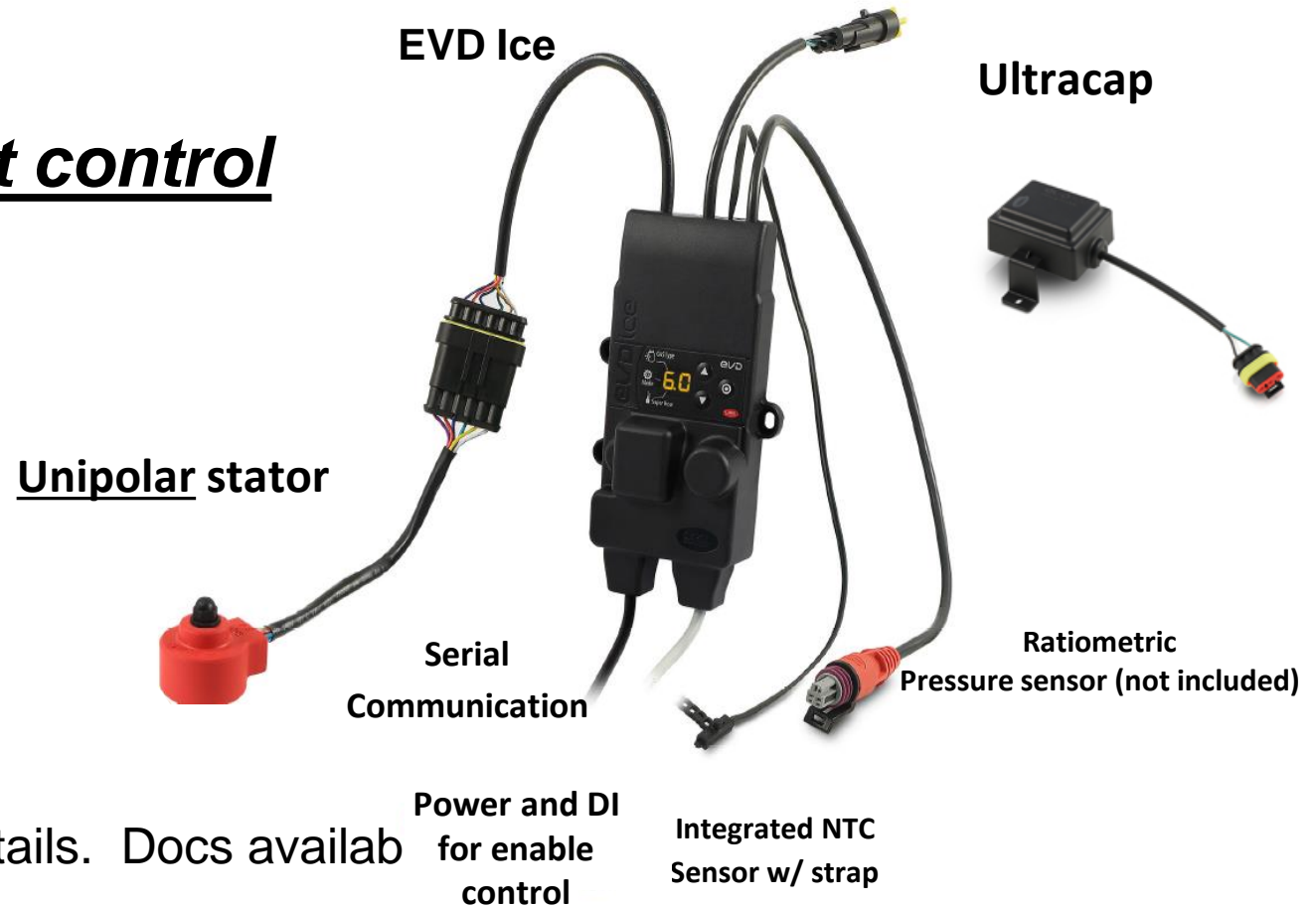
P# EVDM011S60



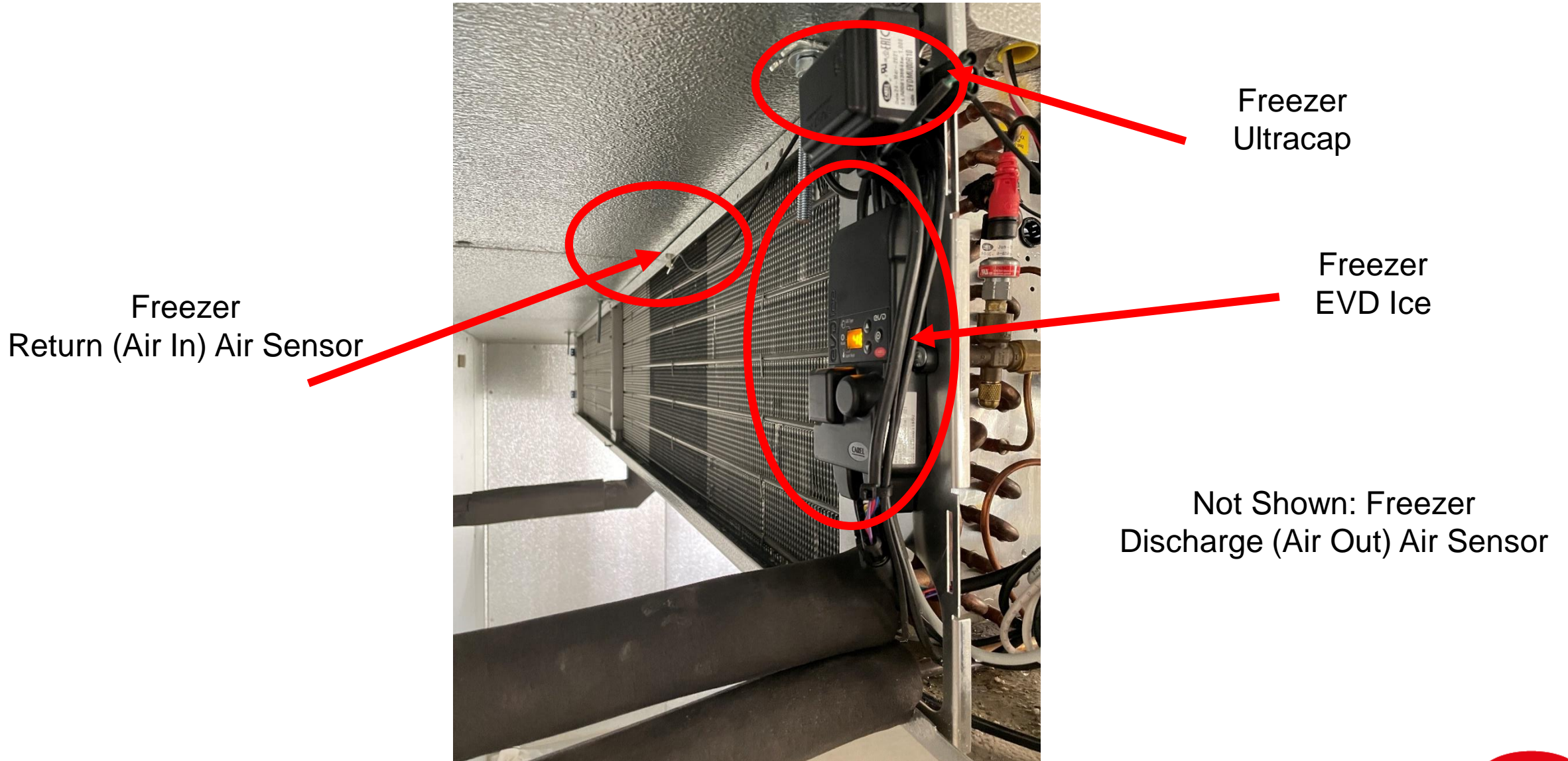
EVD ice

EVD Ice is designed for superheat control

- ONLY CONTROLS SUPERHEAT
- FOR UNIPOLAR STATORS ONLY
- 115/220VAC Switching Power Supply
- IP67 Rating
- -22°F to 104°F Operating Temperature
- Modbus RTU (RS-485) is standard
- Firmware can be updated. Contact Carel for details. Docs available



EVD ice



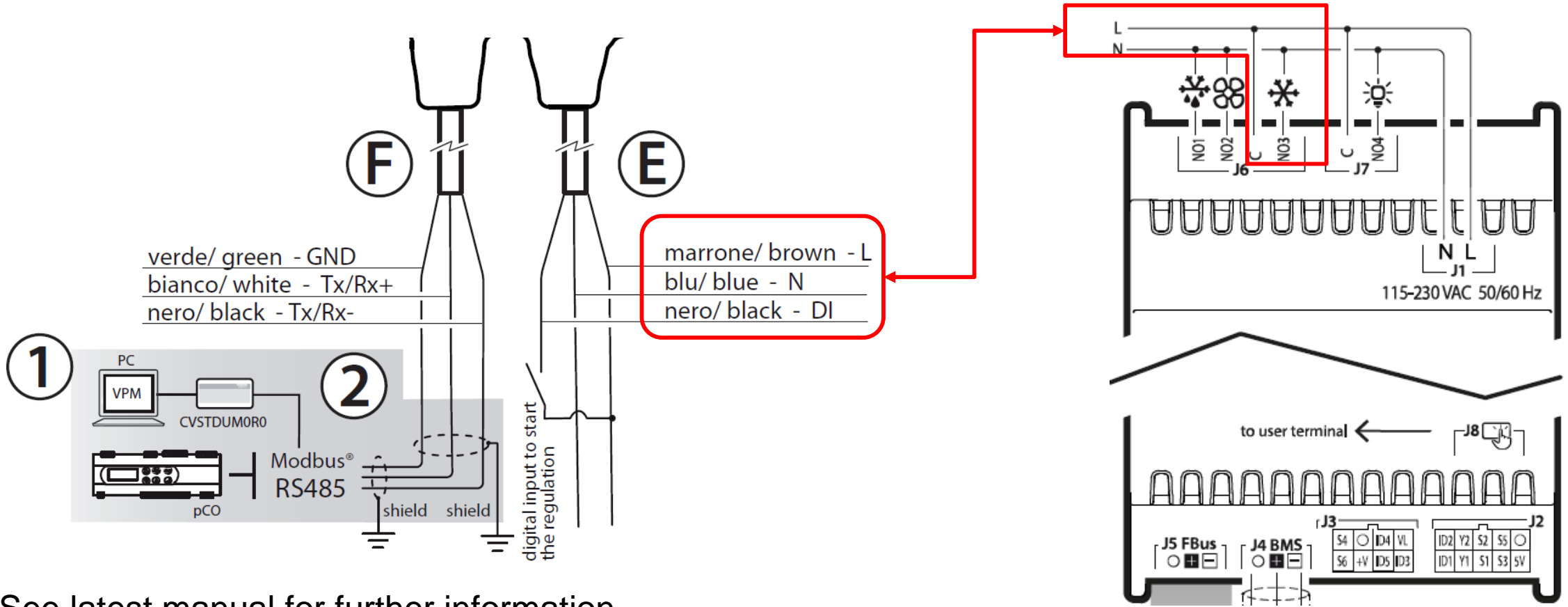
Freezer
Return (Air In) Air Sensor

Freezer
Ultracap

Freezer
EVD Ice

Not Shown: Freezer
Discharge (Air Out) Air Sensor

EVD ice

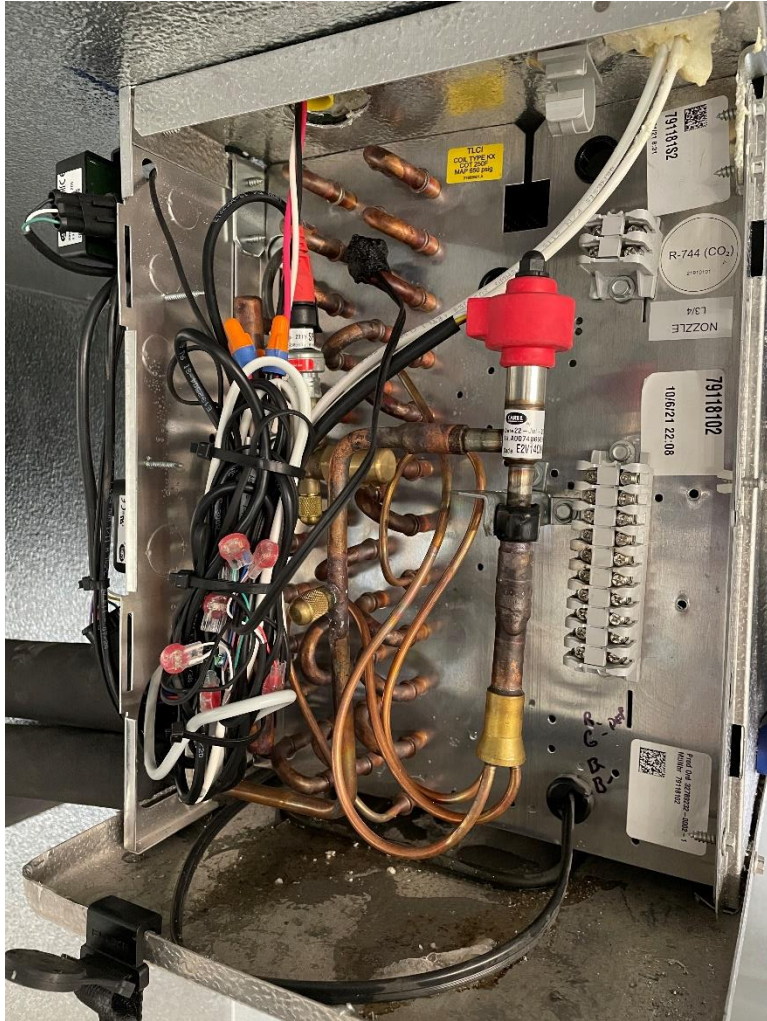


See latest manual for further information

At call for cooling by the MPXone, relay NO3 (J6) closes. This activates superheat control on EVD Ice through the integrated digital input.

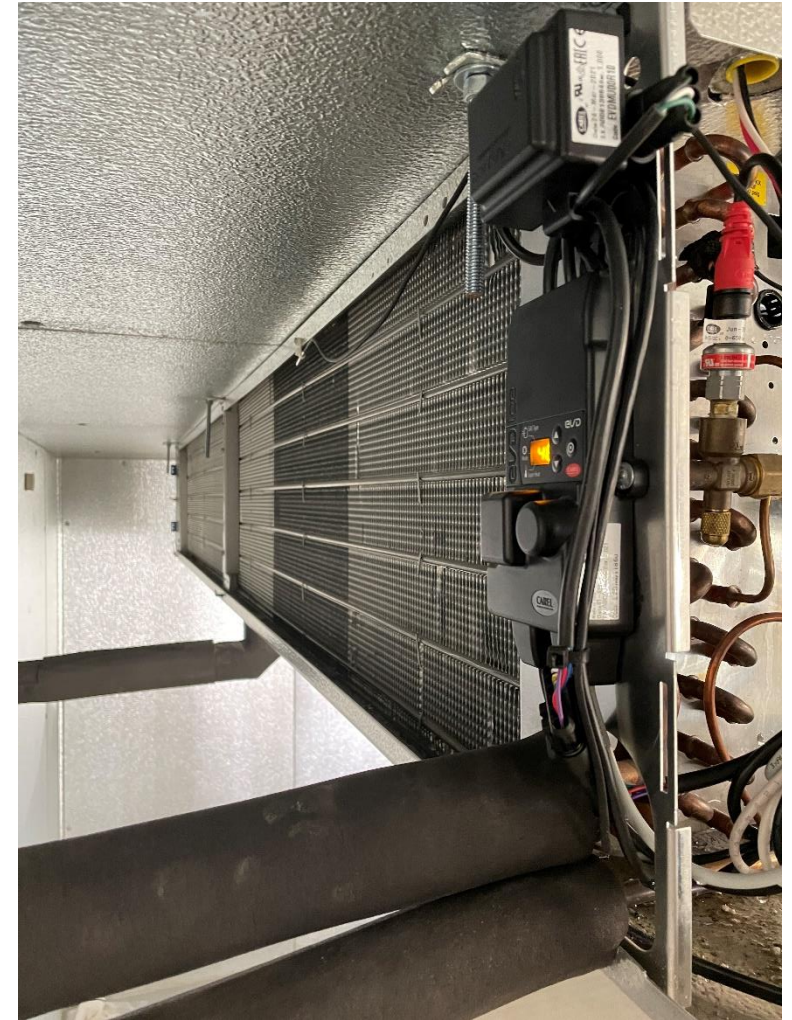
L (brown) = 115V, N (blue) = neutral, DI (115V black) = Cooling Activation

EVD ice

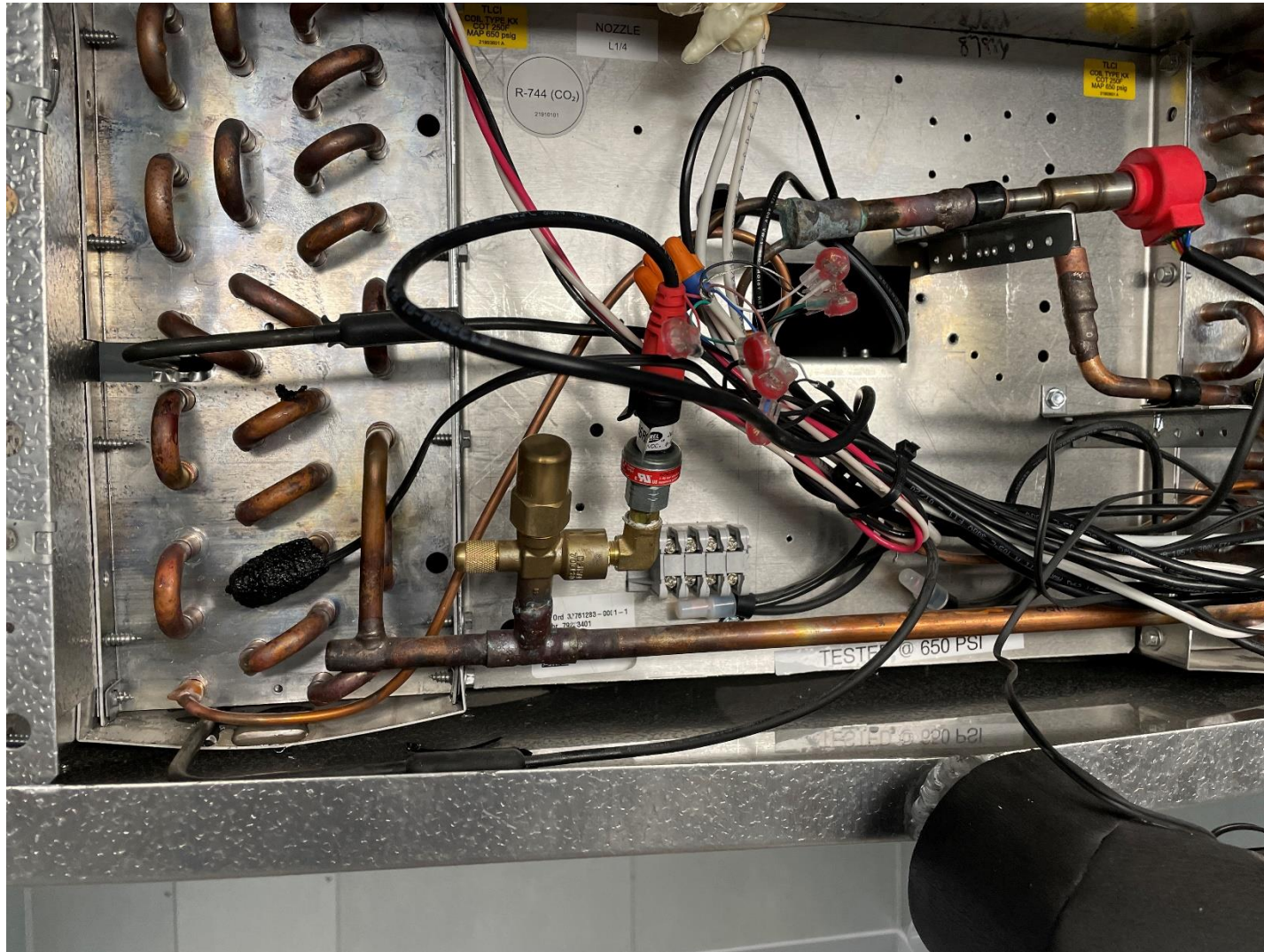


Typical evap installation

- EVDice is installed on the rear side of the evaporator.
- Networking and Regulation Enable cabling is field installed back to MPXone's



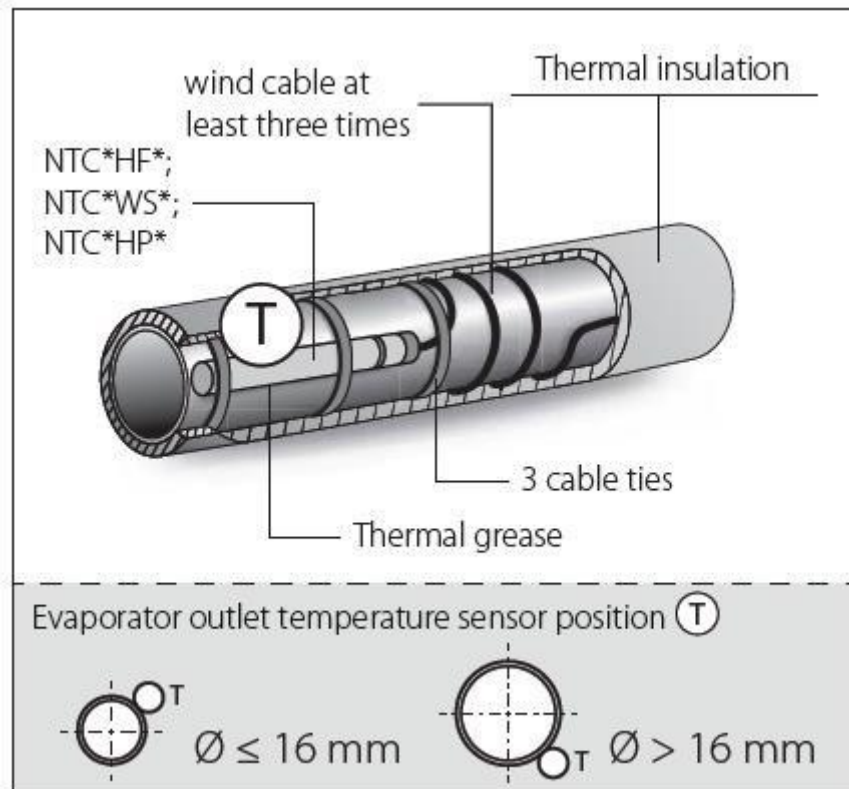
EVD ice



- **Low Profile Evap Installation**
- **EVDice is installed on the side of the evaporator**

EVD ice

- Closer to evaporator output
- Use conductive paste and thermal insulation



EVD mini/ice Programming

Restore Factory Defaults:

- Press all three buttons at the same time
- After 5 seconds, the display will show “rS”
- Release buttons
- You have 10 seconds to press PRG/SET button for 3 seconds
- **if you realize you don't want to do this, don't press PRG/SET, and the Restore procedure will be canceled
- At the end of a successful Restore procedure, the controller will briefly display two dashes, indicating the controller is ready to be commissioned
- Display will now show one dash adjacent to GAS Type icon.



EVD mini/ice Programming

Modifying the Service parameters

The Service parameters include, in addition to the parameters for the configuration of input S1, those corresponding to the network address, probe readings, protectors and manual positioning. See the param. table.

Procedure:

1. press UP and DOWN together and hold for more than 5 s: the first parameter is displayed: P1 = probe S1 reading;
2. press UP/ DOWN until reaching the desired parameter;
3. press PRG/ Set to display the value;
4. press UP/ DOWN to modify the value;
5. press PRG/ Set to confirm and return to the parameter code;
6. repeat steps 2 to 5 to modify other parameters;
7. (when the parameter code is displayed) press PRG/Set and hold for more than 2 s to exit the parameter setting procedure.

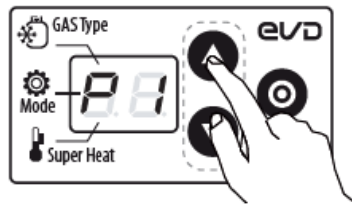

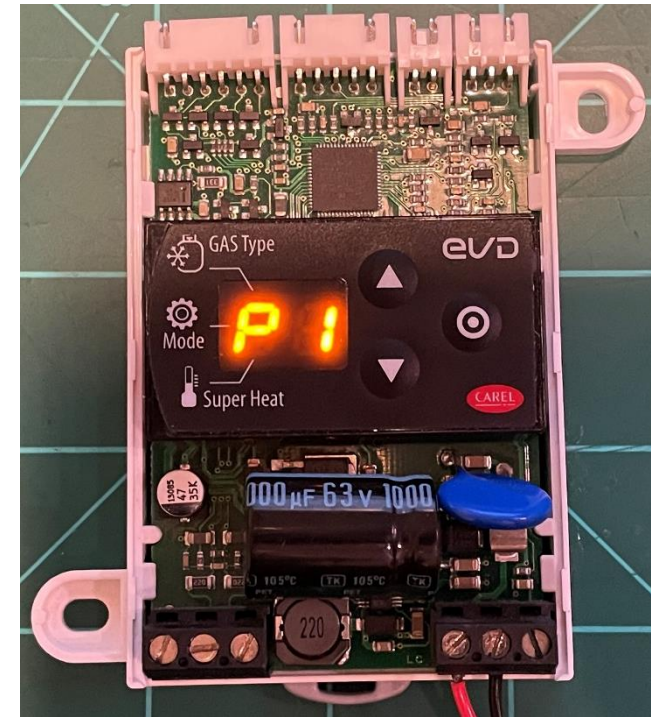


Fig. 3.d

 **Note:** if no button is pressed, after around 30 s the display automatically returns to standard visualisation.

S1 = Pressure probe
S2 = temperature probe

Default pressure sensor is a ratiometric (0-5V) with a range of -1 – 9.3 barg



If you change the refrigerant type during commissioning, you may need to change the type of pressure probe

EVD mini/ice Programming

In an emergency service situation, if you don't have a matching range pressure sensor, but something close (and meets all the other sensor characteristics), you can simply modify Parameter S1 to match what you have.



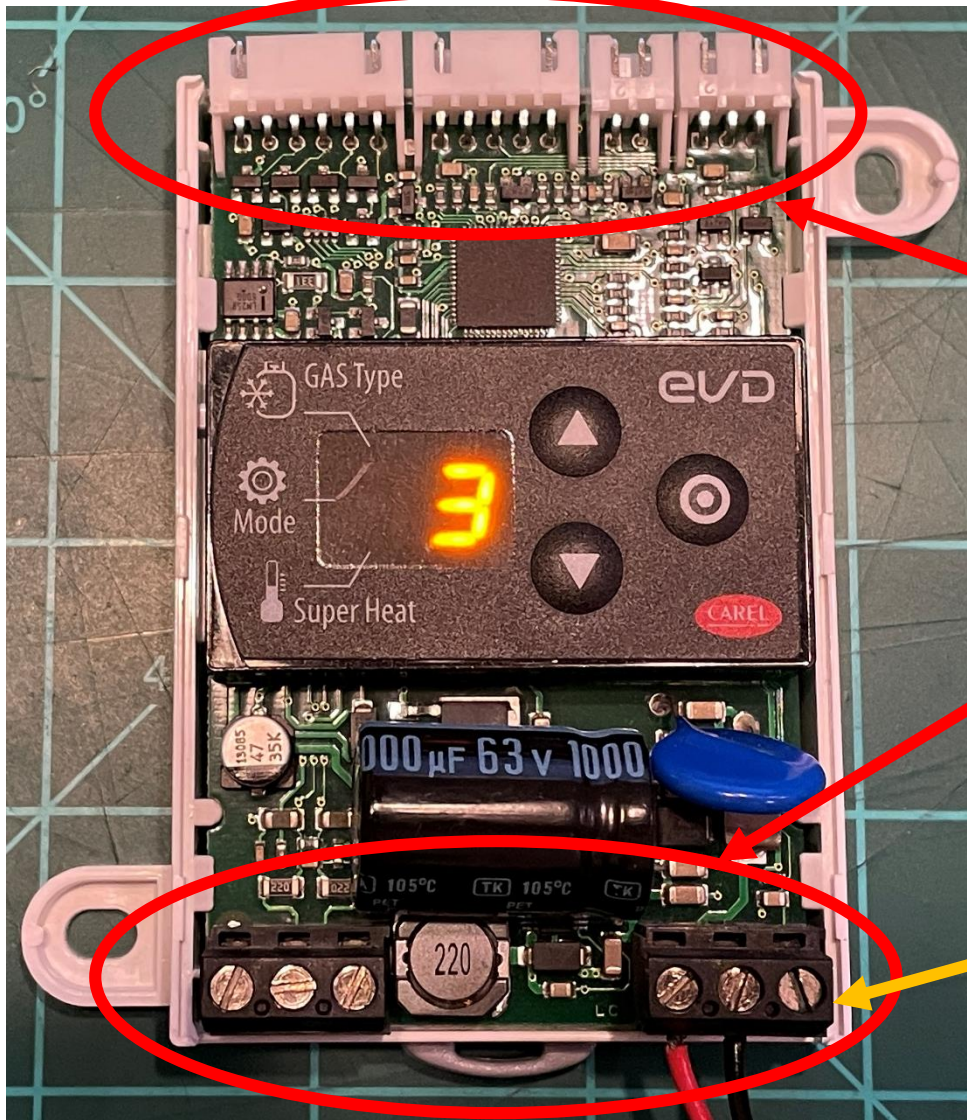
S1	Type of probe S1
	Ratiometric (OUT=0...5V)
	1 = -1...4.2 barg
	2 = 0.4...9.3 barg
	3 = -1...9.3 barg
	4 = 0...17.3 barg
	5 = 0.85...34.2 barg
	6 = 0...34.5 barg
	7 = 0...45 barg
	8 = -1...12.8 barg
	9 = 0...20.7 barg
	10 = 1.86...43.0 barg
	11 = NTC (-50...105°C)
	12 = Ratiometric (OUT=0-5V) 0-60 barg
	13 = Ratiometric (OUT=0-5V) 0-90 barg
	14 = Remote pressure probe from RS485
	15 = Fast high temperature NTC (0-140°C)

S1 = Pressure sensor

S2 = temperature sensor

Default pressure sensor is a ratiometric (0-5V) with a range of -1 – 9.3 barg (Parameter S1 = 3)

LOOK OUT!!



None of the terminals are labeled!

On newer versions the power connector is ORANGE

LOOK OUT!!

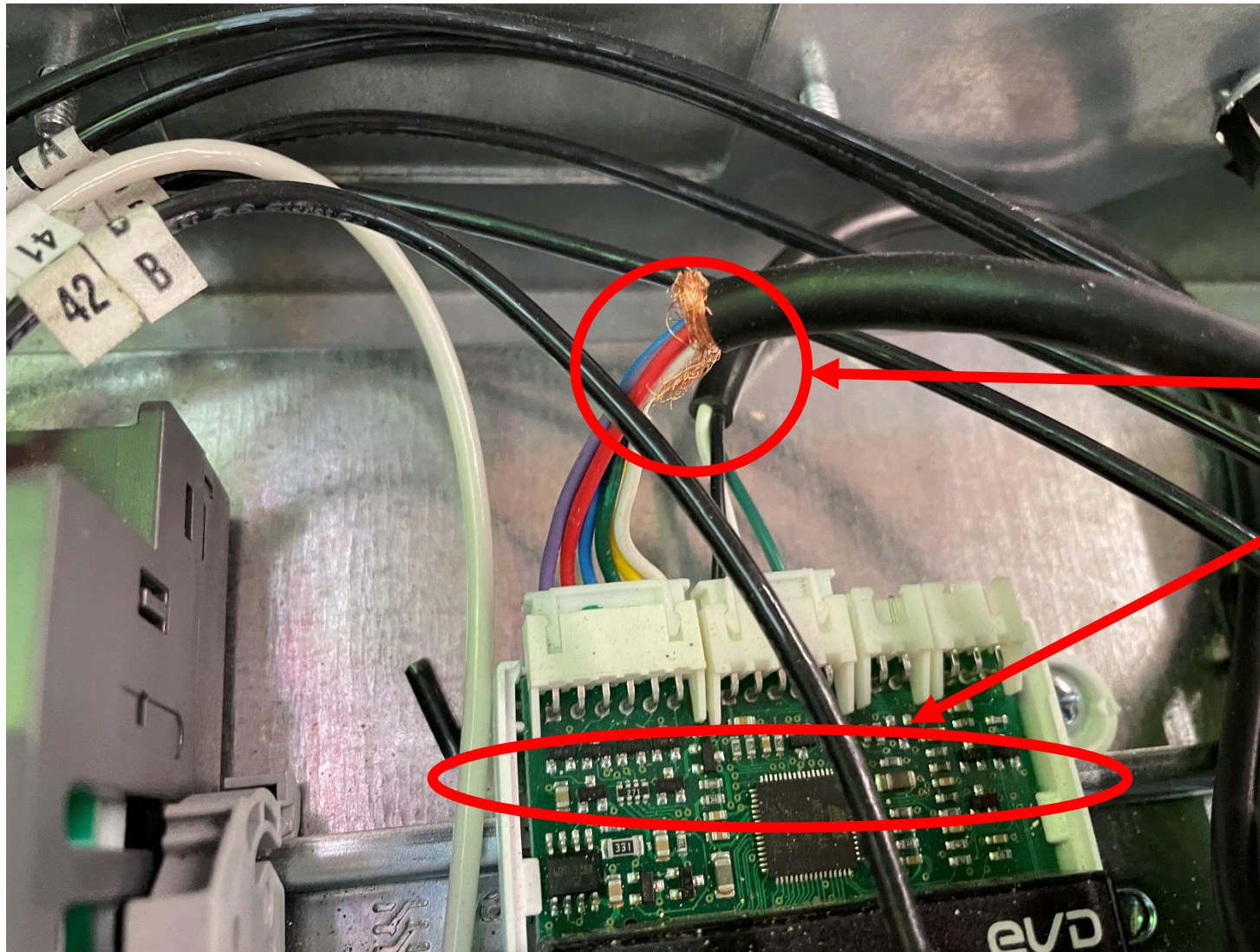


**Note the
cable
colors!**

- **Black is network**
- **Grey is power (120V)**

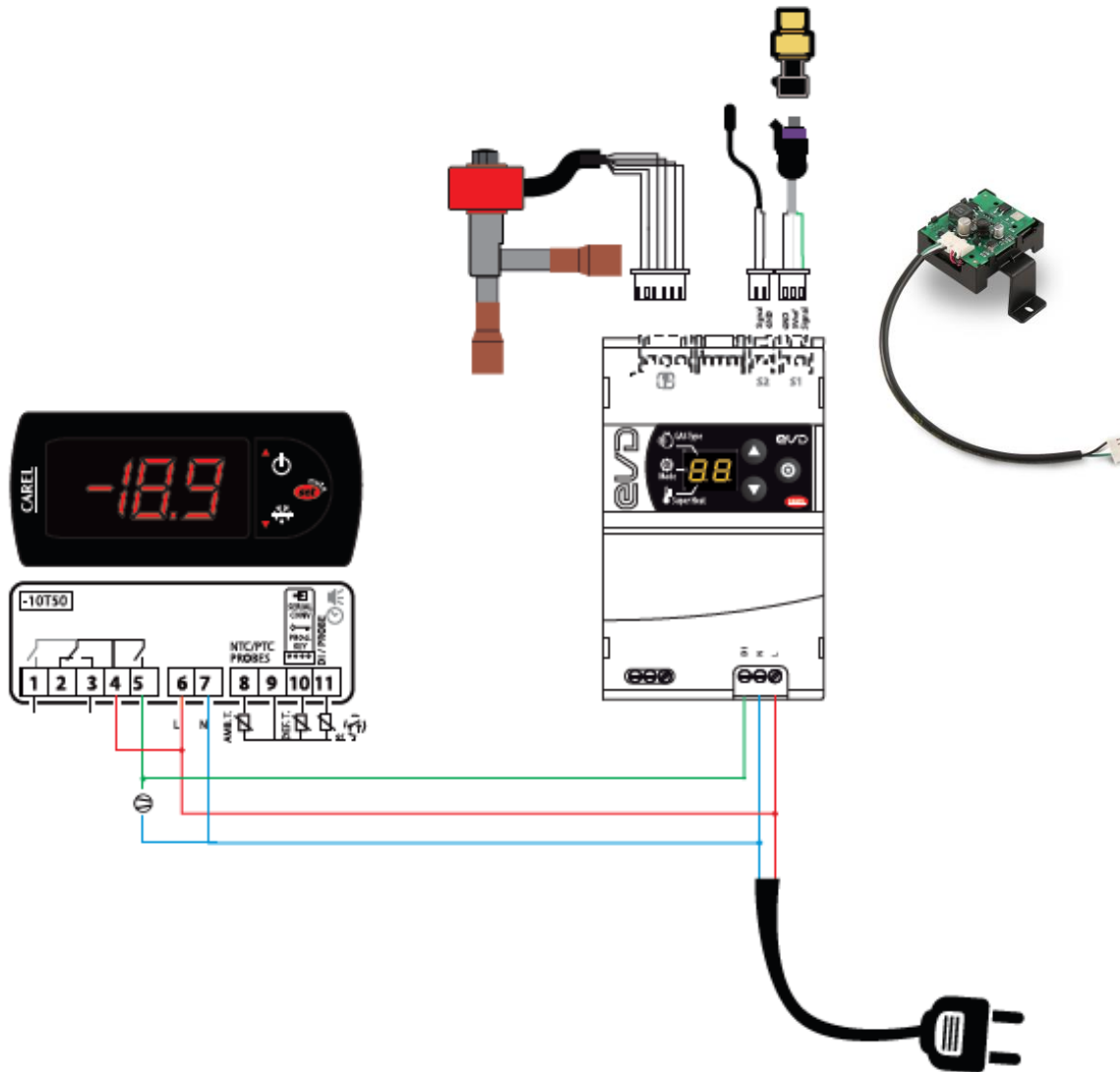
**We expect the opposite, so
if they are crossed you will
have a bad day.**

LOOK OUT!!



**This may
cause
issues...**

LOOK OUT!!



Can be used with a simple thermostat...hello 1609-101! Or any thermostat.

So if you have a controller go bad, in a pinch you might be able to make something work.

Devices: EVD Evo

EVD Evo Intro



Necessary for Superheat Control

Pressure Transducer:

- Ratiometric 0 - 5V
- Electronic 4 - 20mA
- Transducer Cable

BE SURE TO READ THE MANUAL!!

Temperature Sensor

- NTC 10k @ 25°C (NTC030HF0*)

Expansion Valve

- Bipolar Valve with Stator
- Bipolar Valve Cable

Auxiliary Devices

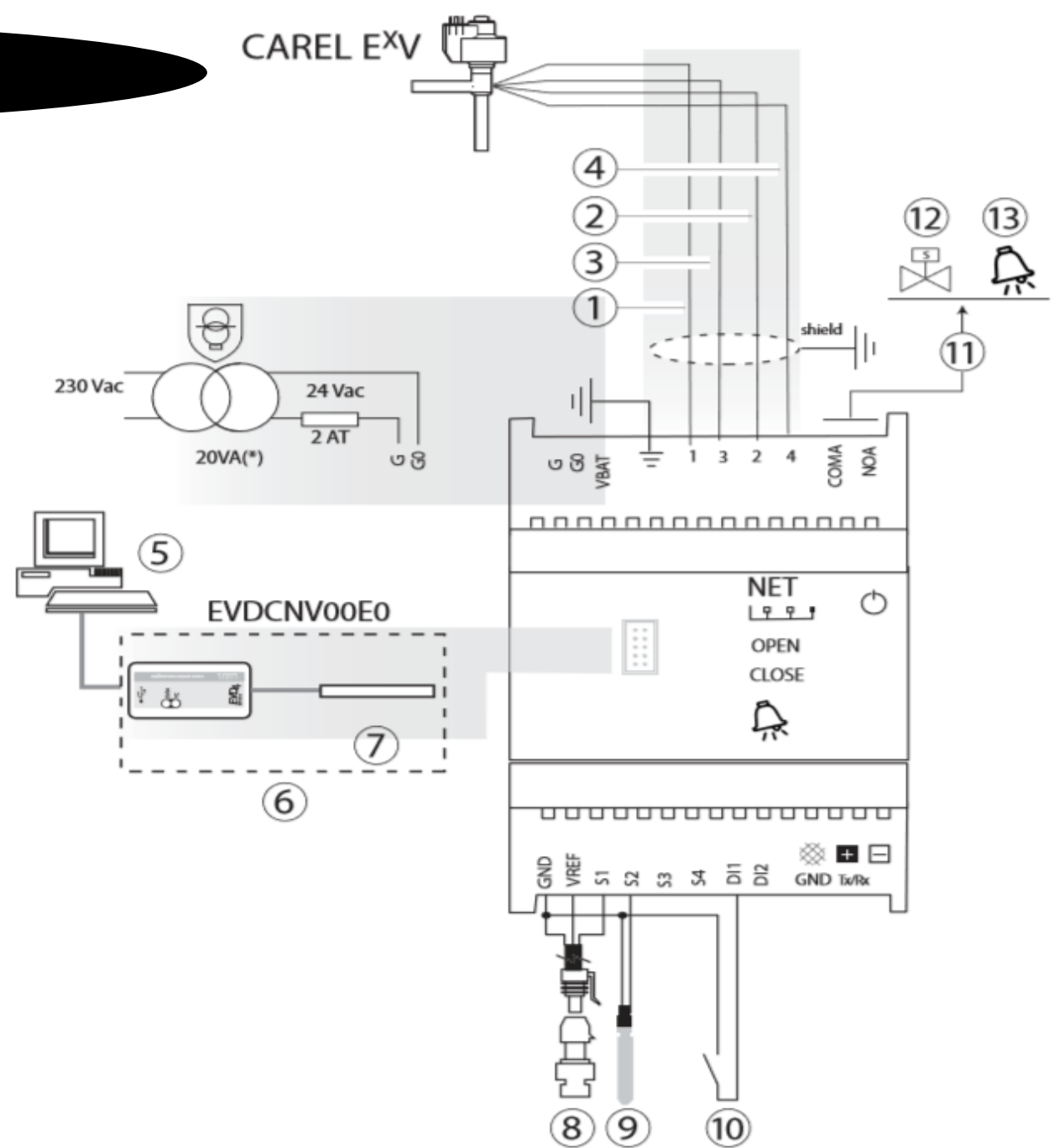
- Ultracap Module (EVD0000UC0)
- IP65 Connector (E2VCON0000)
- USB/RS485 Converter (CVSTDUMOR0 only for RS485/Modbus)
- USB/tLAN Converter (EVDCNV00E0 only for tLAN)



EVD Evo

EVD Evo Single - Wiring Diagram

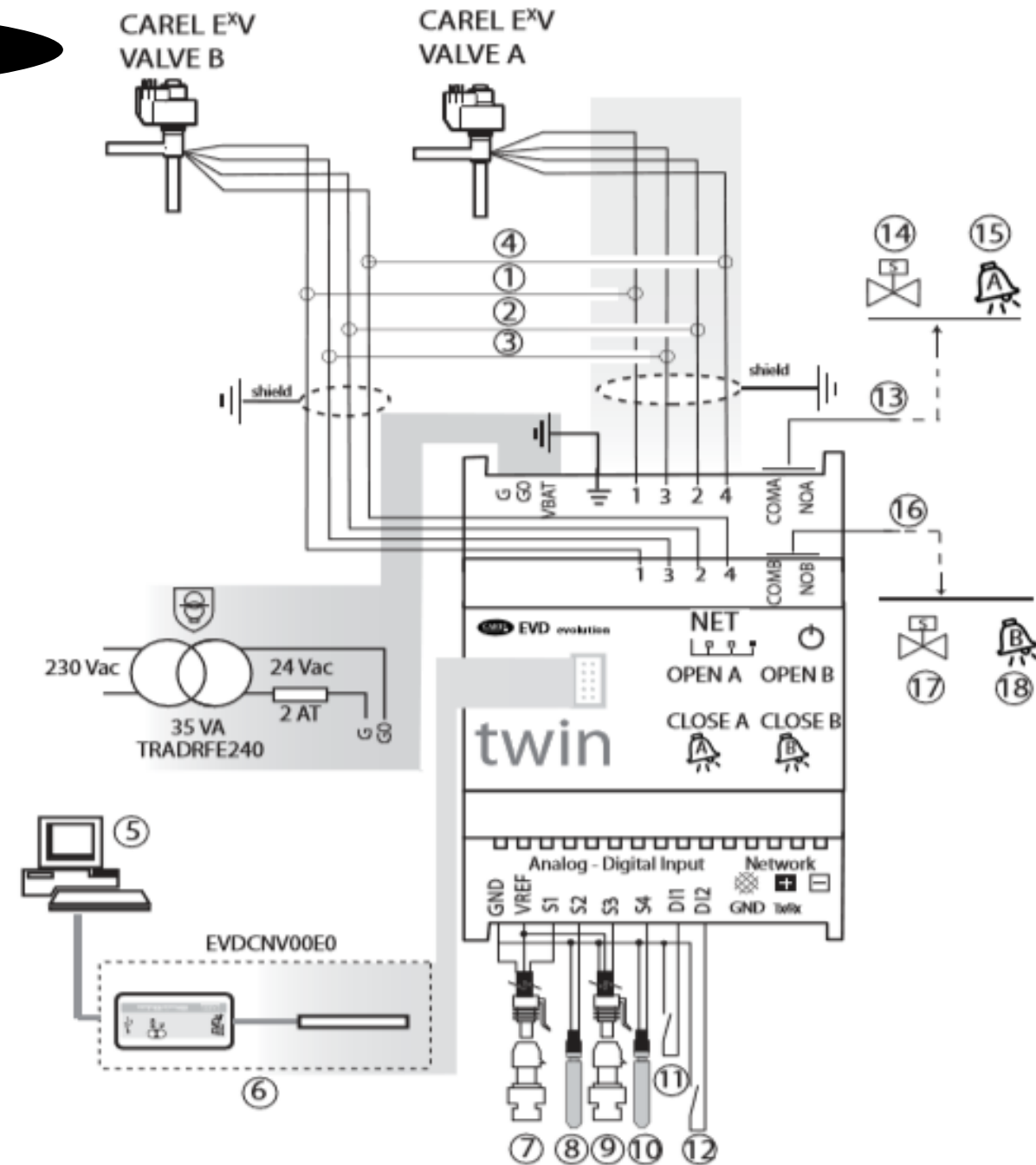
1	Green
2	Yellow
3	Brown
4	White
5	PC for configuration
6	USB/tLAN converter
7	Adapter
8	Ratiometric pressure transducer
9	NTC temperature sensor
10	Digital input 1
11	Free contact
12	Solenoid valve
13	Alarm signal



EVD Evo

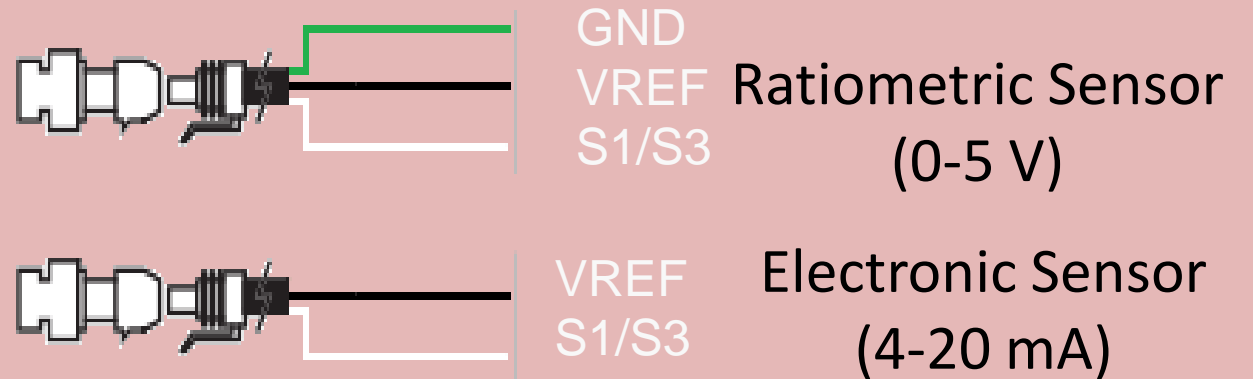
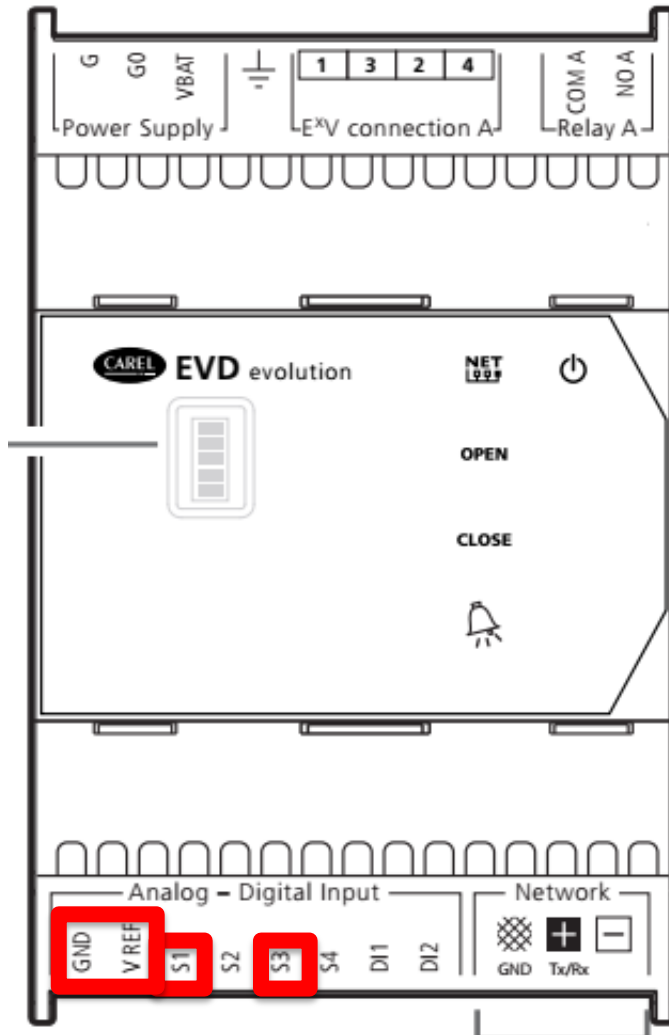
EVD Evo Twin - Wiring Diagram

1	Green	14	Solenoid Valve A
2	Yellow	15	Alarm Signal A
3	Brown	16	Voltage-free Contact B
4	White	17	Solenoid Valve B
5	PC for configuration	18	Alarm Signal B
6	USB/tLAN converter		
7	Pressure trans. A		
8	NTC temp sensor A		
9	Pressure trans. B		
10	NTC temp sensor B		
11	Digital Input Driver A		
12	Digital Input Driver B		
13	Voltage-free Contact A		



Pressure Inputs

Inputs S1 and S3 - Accept voltage signals (0-5 V) or current (4-20 mA)



S1 and S3 always operate with the same signal type

**PICK ONE PRESSURE SENSOR
TYPE!! NO MIXING!!!**

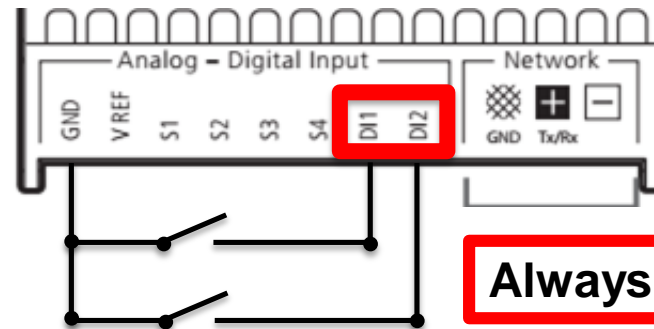
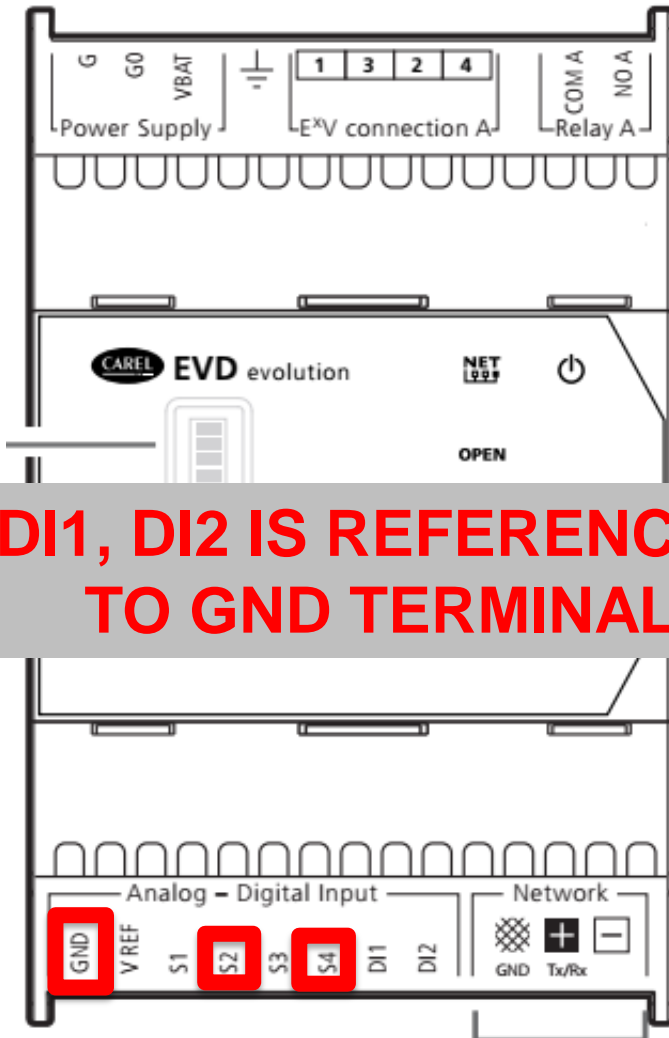
Temp and DI Inputs

Input S2 - NTC temperature reading
or external signal voltage (0-10V)

Input S4 - NTC temperature reading

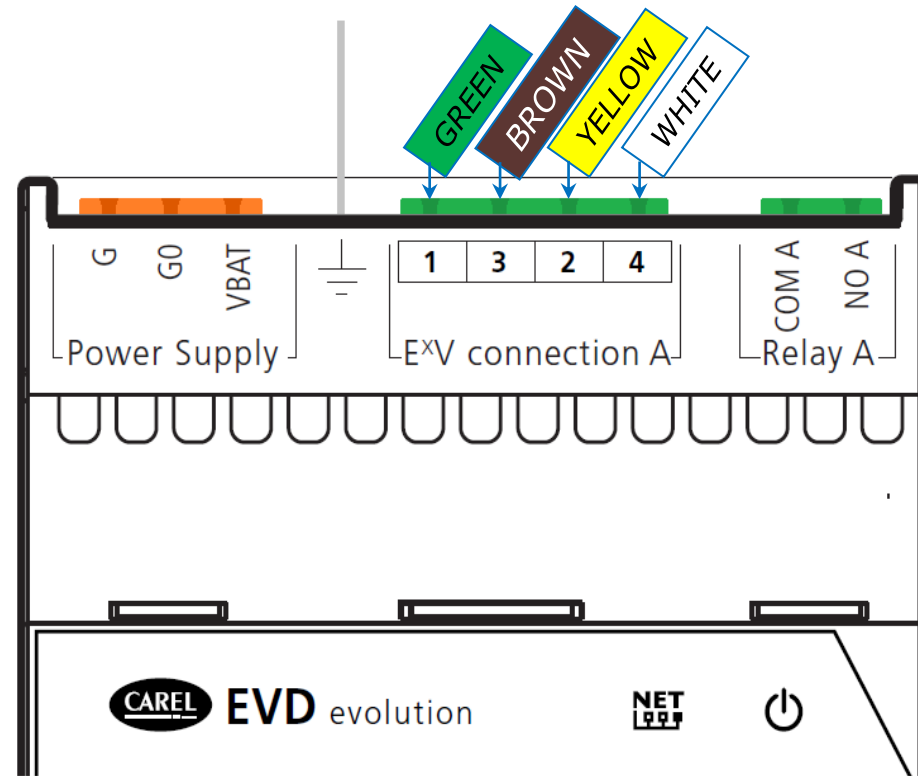
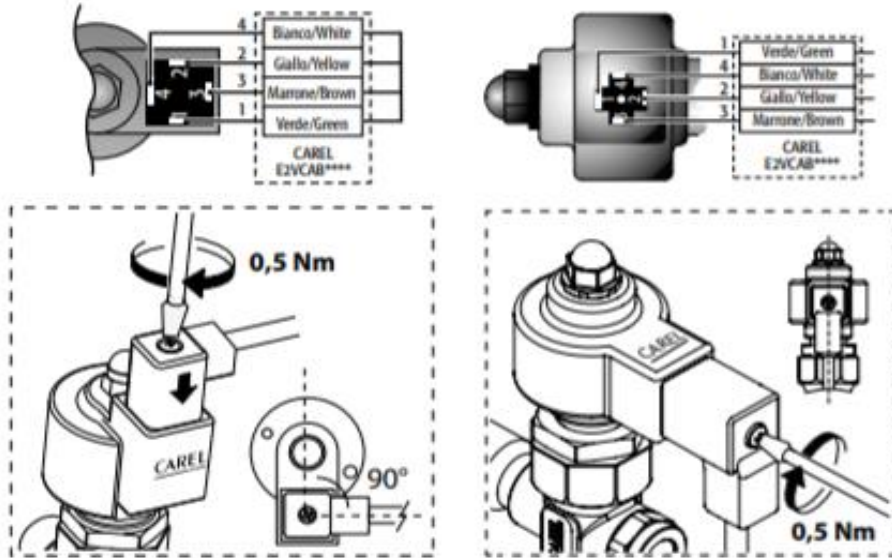
One side of temp probe connects to GND

**DI1, DI2 IS REFERENCED
TO GND TERMINAL**



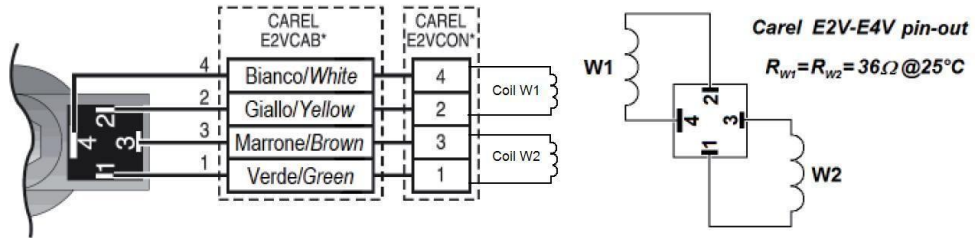
Always referenced with Ground

EVD Evo



Good ?
 Beer ?
 Y ?
 Work ?

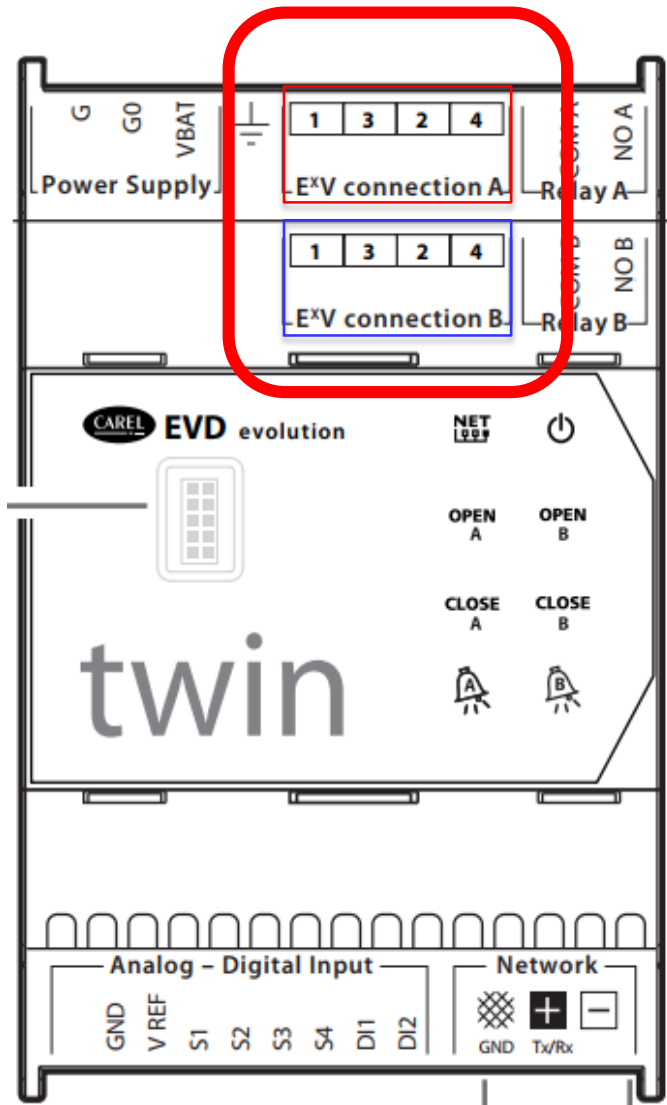
↑
 Something better??



Should the valve works in reverse mode. swap the 2 wires of only one coil

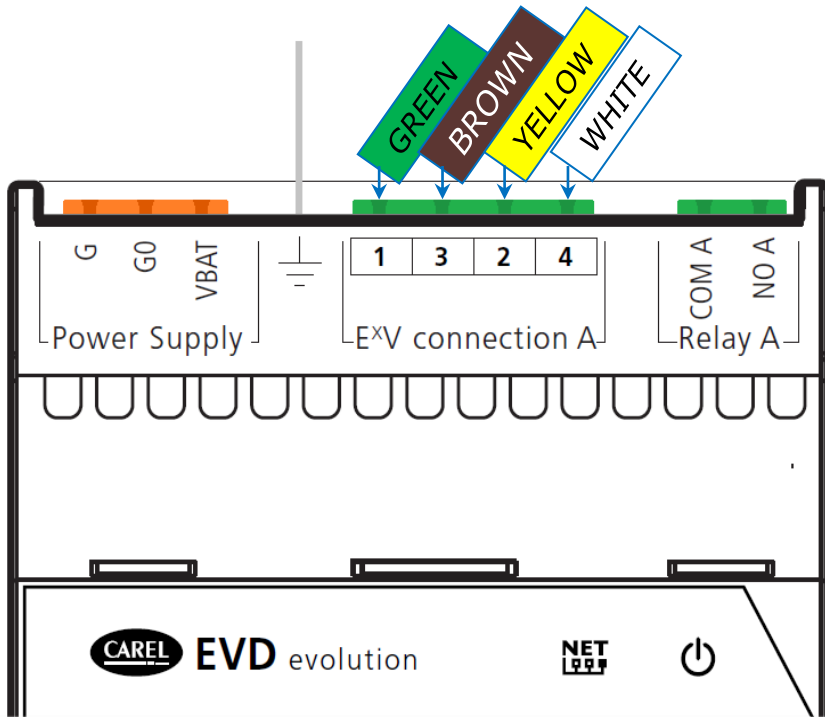


Look Out!!



If using single valve control for an EVD Evo TWIN, the Twin must be configured for operation as an EVD Evo Single

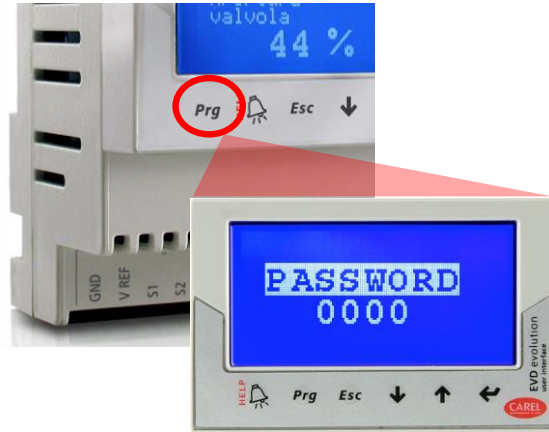
Look Out!!



Crossed Wiring

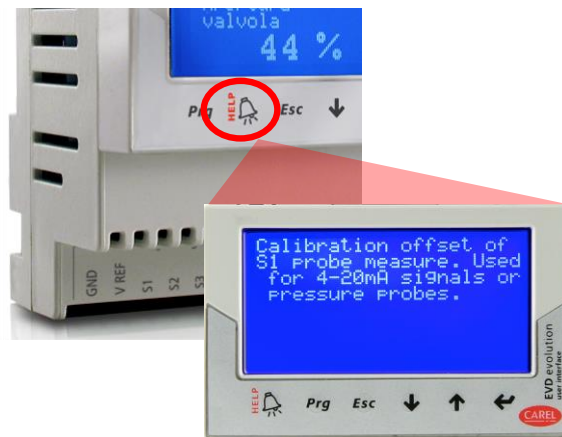
- Reversing #2 (yellow) and #3 (brown) generally results in a very noisy valve, the display in the upper right showing "CLOSE", the display flashing "ALARM", and pressing the alarm button will display "EEV motor error". Correct the wiring, and you'll see the EVD detect the correction and regulate the valve.
- You'll get the same "EEV motor error" alarm if you simply disconnect the stator.
- If you reverse polarity in one pair, the valve will operate in reverse. Correct the wiring. You can then power cycle the controller at this point to re-zero the valve.
- **CHECK YOUR CABLE!!**
- **PROCESS OF ELIMINATION!!**

EVD Evo - Display



✓ User management

There are two different levels of configuration, one for installer (**password 0022**) and one for manufacturer (**password 0066**). The installer can reconfigure starting parameters and other parameters with multiple choice menu. The manufacturer can configure all the parameters that require numeric value. To access press "Prg", Enter, Up/Down Arrow to change number, Enter to set number. After last #, press Enter to access full config menu.



✓ On-line "HELP"

With manufacturer level (password 66) it is possible to show, for each parameter, a wider description, that can help the user to understand specific functions.

EVD Evo - Display

Reset or Uploading/Downloading Parameters to the Display



HOLD for 5 Seconds

- ✓ load/download parameters from display
- ✓Reset EVD to out-of-box default parameters

You can access these functions pushing "help/alarm" and "←" button at the same time for 5 seconds .

2.10 Upload, Download and Reset parameters (display)

Procedure:

1. press the Help and ENTER buttons together for 5 seconds;
 2. a multiple choice menu will be displayed, use UP/DOWN to select the required procedure;
 3. confirm by pressing ENTER;
 4. the display will prompt for confirmation, press ENTER;
 5. at the end a message will be shown to notify the operation if the operation was successful.
- UPLOAD: the display saves all the values of the parameters on the source controller;
 - DOWNLOAD: the display copies all the values of the parameters to the target controller;
 - RESET: all the parameters on the controller are restored to the default values.
 - See the table of parameters in chapter 8.

EVD Evo - Display

3.3 Switching between drivers (display)

Procedure:

press the Help and Enter buttons together. Switching when programming the parameters displays the parameters for driver A and driver B on the same screen.

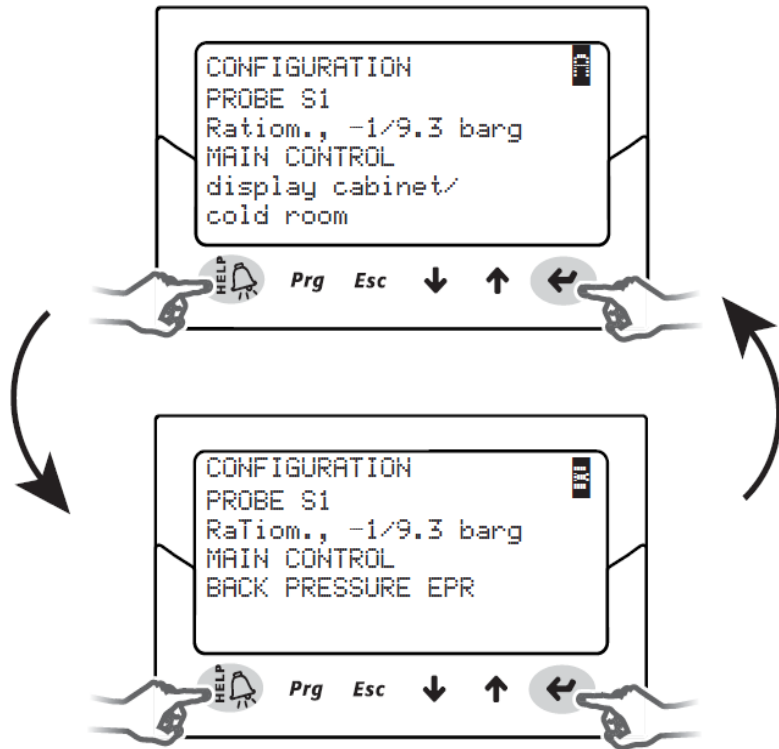
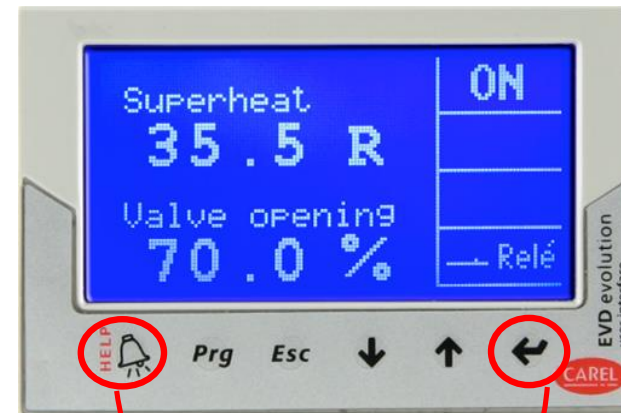


Fig. 3.d



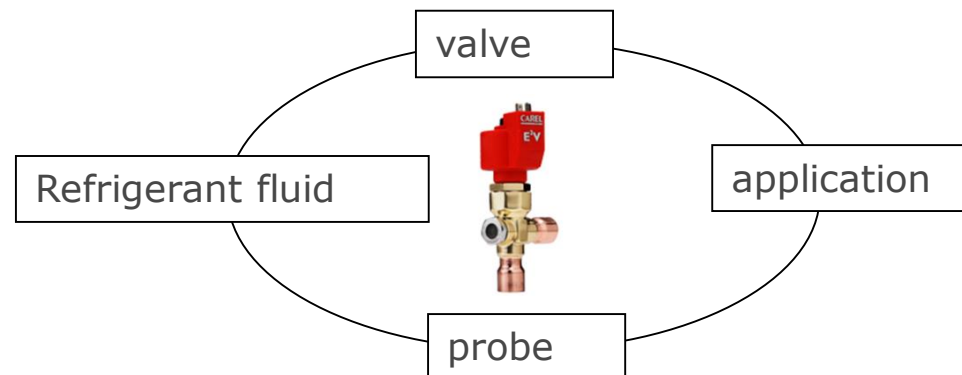
Short press

EEV Driver - Wizard



✓ **easy to configure**

start-up configuration with only 4 parameters:



Graphic interface allows you to select the parameter's value by multiple choice menu, so you can immediately understand the meaning of the selected value.

EVD Evo

EEV Driver User Access Screens (read only)

Accessed by pressing
the **DOWN ARROW** from
the home screen



EVD Evo

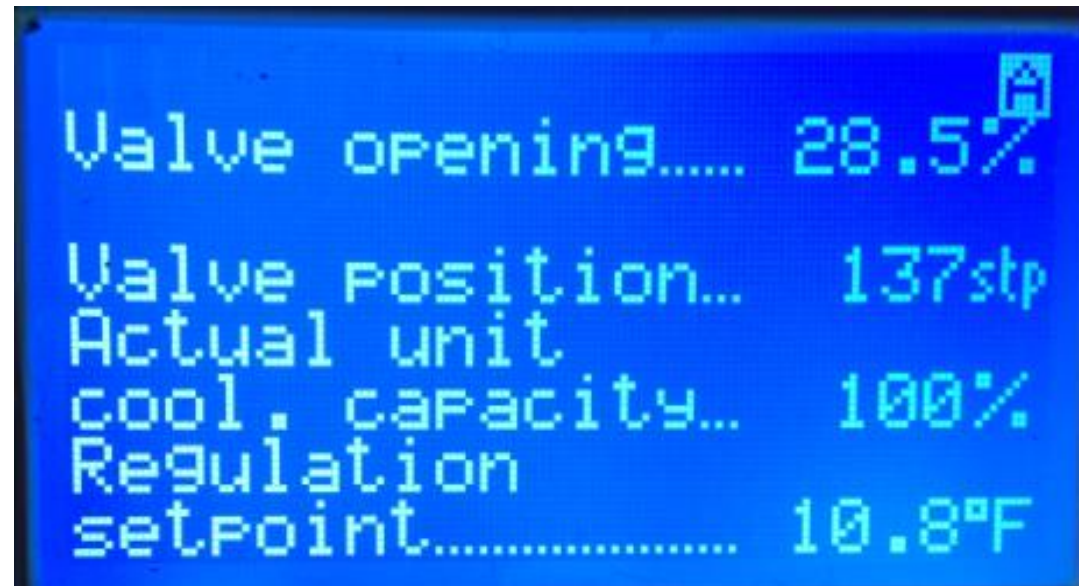
EEV Driver User Access Screens (read only)

Accessed by pressing
the **DOWN ARROW** from
the home screen



EEV Driver User Access Screens (read only)

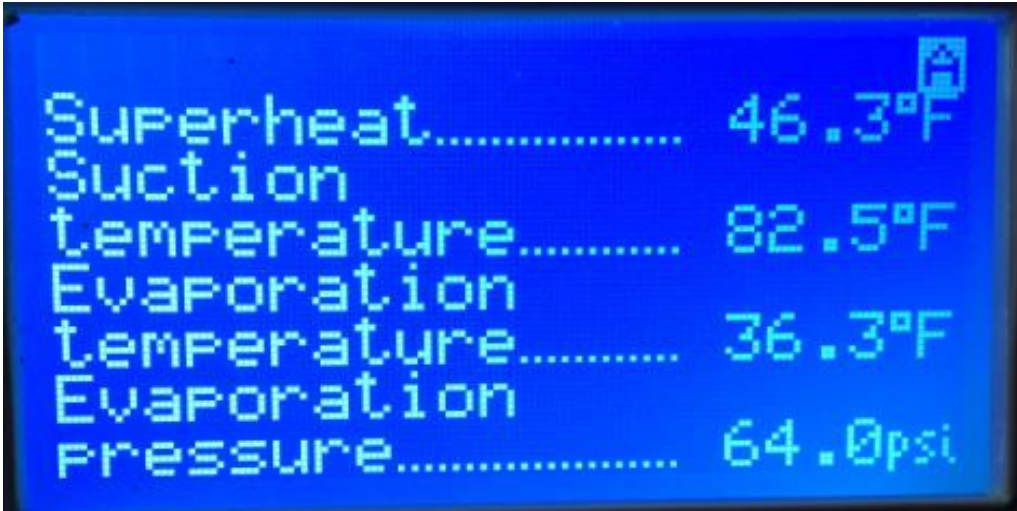
Accessed by pressing
the **DOWN ARROW** from
the home screen



EVD Evo

EEV Driver User Access Screens (read only)

Accessed by pressing
the **DOWN ARROW** from
the home screen



A screenshot of a blue LCD display showing the EEV Driver User Access Screens. The screen displays the following data:

Superheat.....	46.3°F
Suction temperature.....	82.5°F
Evaporation temperature.....	36.3°F
Evaporation pressure.....	64.0psi

EVD Evo

EEV Driver User Access Screens (read only)

Accessed by pressing
the **DOWN ARROW** from
the home screen

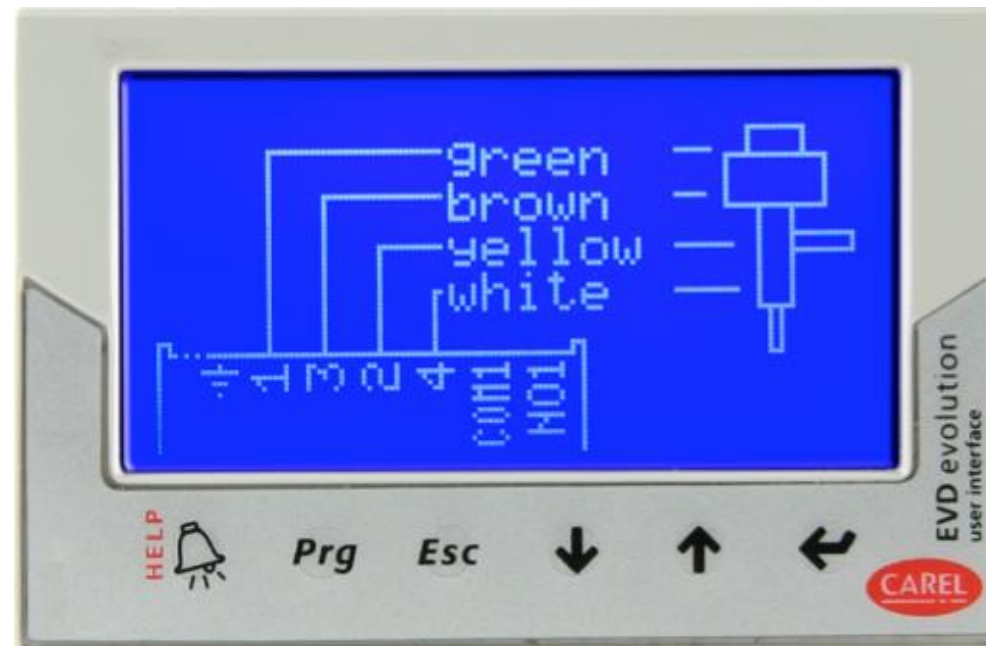


S1 Probe	
measurement.....	64.0psi
S2 Probe	
measurement.....	82.5°F
S3 Probe	
measurement.....	152psi
S4 Probe	
measurement.....	72.0°F

EVD Evo

EEV Driver User Access Screens (read only)

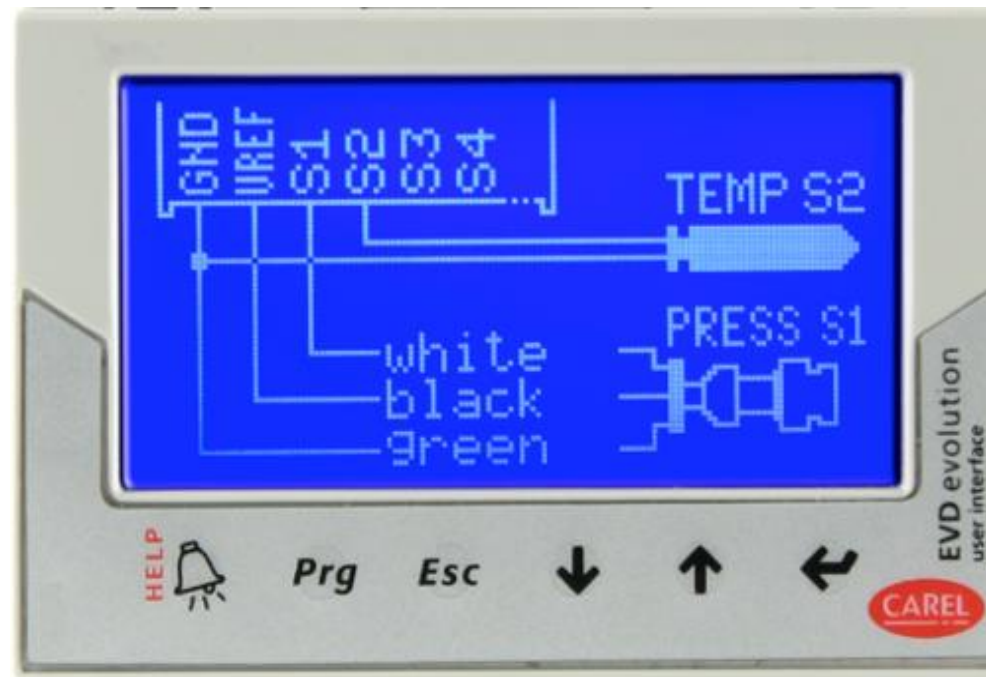
On screen valve wiring
diagram



EVD Evo

EEV Driver User Access Screens (read only)

On screen sensor wiring
diagram



Look Out!!

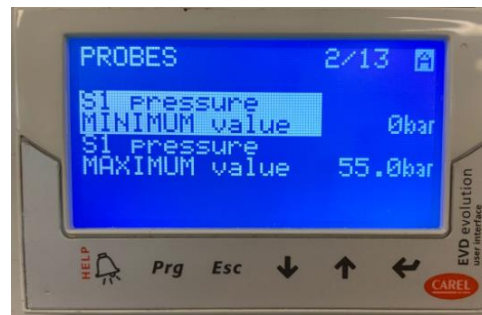
Pressure probes not on the list?

- Probes S1 and S3 must be of the same type : Ratiometric (0-5V) or 4-20mA
- **It is possible to use pressure transducers not on the list.**

- Under manufacturer menu (Password 0066)

- Probes

- Minimum value
- Maximum value



BE SURE TO READ THE MANUAL!!

- S1/S3 configuration: User defined.

- It will respect the type of probe configured during wizard.



EVD Evo



Custom Valve settings

Driver can be set to control just about any bipolar valve provided you know:

- EEV Min Steps
- EEV Max Steps
- EEV Closing Steps (total, not %)
- EEV Step Rate (shown as Hz, which is just steps per second)
- EEV Nominal Current
- EEV Holding Current
- Duty Cycle

BE SURE TO READ THE MANUAL!!

Troubleshooting

Issue : Valves will not open, even though no alarms are present:

Possible Cause: Verify power supplied to the controller. Should be 24 volts AC. If DC is applied, controller thinks it's on battery and valves remain closed. Switch to AC, or change 'Power supply mode' parameter to 1. Driver will then operate normally on AC power. Also verify power is on terminals G and G0. If applied to VBAT, valves will remain closed

Issue : One or both valves remain closed, no alarms present

Possible Cause: DI1 (for valve A) and DI2 (for valve B) must be connected to ground for valve to operate. Either jumper to the GND terminal, or run through a thermostat relay to GND.

Issue : EEV motor error

Possible Cause: Verify that the valve cable is connected to the driver, and cable to the valve. Check coil status

Issue : Valve seems to operate opposite; closes when SH is high, opens when SH is low

Possible Cause: The valve may be wired backwards, without causing an EEV error. Refer to correct wiring connections above.

Troubleshooting

Issue : No errors, valves are operating, however one or the other may slowly drift towards full open or full closed, not regulating SH well.

Possible Cause: Verify that pressure sensor on S1 and temp sensor on S2 are reading press. and temp (respectively) of coil that valve A is supplying. Also verify that pressure sensor on S3 and temp sensor on S4 are reading press and temp (respectively) of coil that valve B is feeding. This may need to be done by disconnecting the terminal blocks and verifying continuity. If the valves or sensors become swapped, it can cause all readings to look correct, however the driver gets confused and does not regulate well or at all.



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