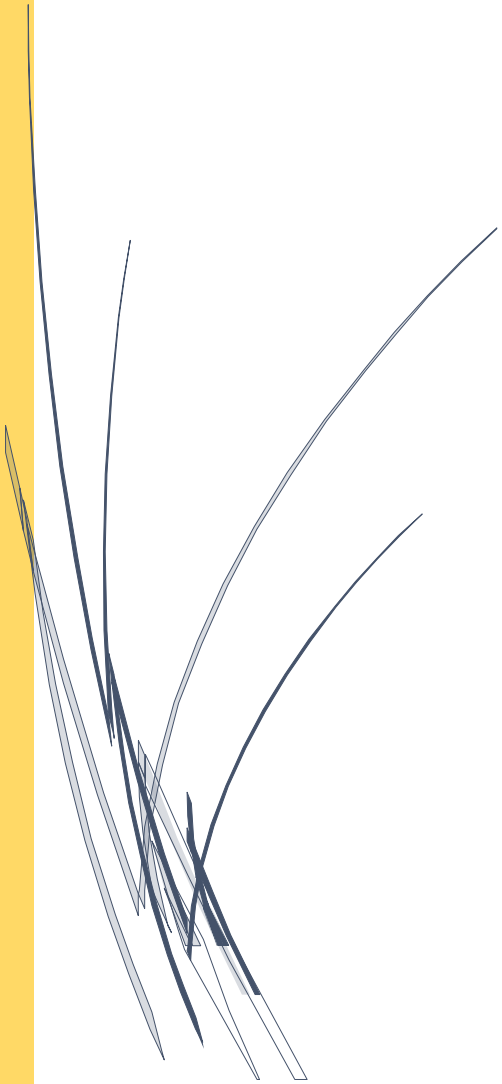
FALKONAIR

VARIABLE MASS FLOW

SMART COMPRESSOR CONTROL OPTIMIZATION



Compatible SCC Software

Reciprocating , Screw and Scroll Compressors

Table of Contents

General

Description

The Variable Mass Flow is a unique energy efficiency package designed and innovated for any brand of fixed-speed 3-phase compressors.

Applications

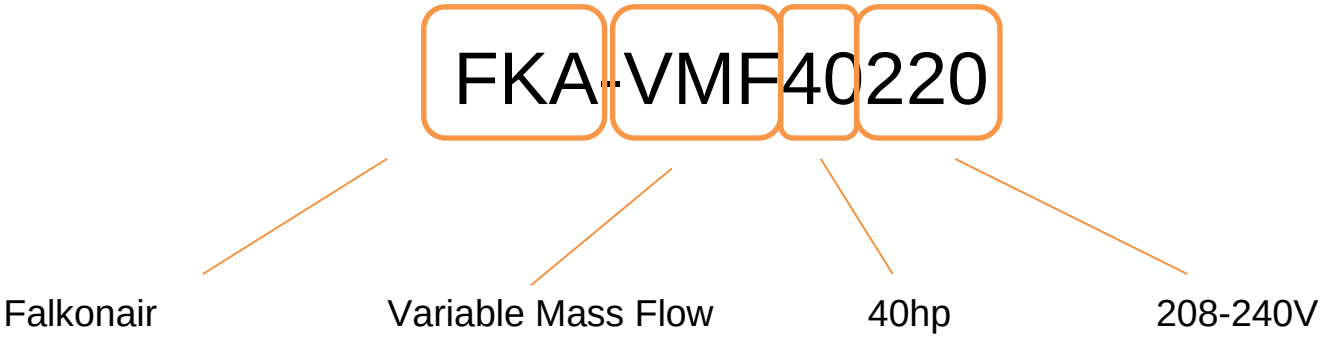
Complete management of a single compressor with oil management and short cycling control.

Main characteristics

- Direct control of the compressor frequency from 35 to 60 Hz
- Direct control of oil return sequence
- Direct control of the compressor's temperature
- Direct control of temperature displays Celsius or Fahrenheit
- Direct control of suction return set point
- Sleep time display
- Direct non-volt contacts for alarm fault
- Voltage optimizing
- Power factor corrector
- 3-Phase failure protection

Fitting Dimensions

Model numbers



Identification Data

VMF Model numbers

FKA-VMF5220	5hp	35H*24W*12D
FKA-VMF7220	7.5hp	35H*24W*12D
FKA-VMF10220	10hp	35H*24W*12D
FKA-VMF15220	15hp	35H*24W*12D
FKA-VMF20220	20hp	35H*24W*12D
FKA-VMF25220	25hp	35H*24W*12D
FKA-VMF30220	30hp	53H*36W*16D
FKA-VMF40220	40hp	53H*36W*16D
FKA-VMF50220	50hp	53H*36W*16D
FKA-VMF60220	60hp	53H*36W*16D
FKA-VMF75220	75hp	65H*36W*20D
FKA-VMF100220	100hp	65H*36W*20D

FKA-VMF5480	5hp	29H*24W*12D
FKA-VMF7480	7.5hp	29H*24W*12D
FKA-VMF10480	10hp	29H*24W*12D
FKA-VMF15480	15hp	29H*24W*12D
FKA-VMF20480	20hp	41H*24W*12D
FKA-VMF25480	25hp	41H*24W*12D
FKA-VMF30480	30hp	41H*24W*12D
FKA-VMF40480	40hp	41H*24W*12D
FKA-VMF50480	50hp	53H*36W*16D
FKA-VMF60480	60hp	53H*36W*16D
FKA-VMF75480	75hp	53H*36W*16D
FKA-VMF100480	100hp	53H*36W*16D
FKA-VMF150480	150hp	53H*36W*16D
FKA-VMF175480	175hp	72H*30W*18D
FKA-VMF200480	200hp	72H*30W*18D
FKA-VMF250480	250hp	72H*30W*18D
FKA-VMF300480	300hp	72H*30W*18D
FKA-VMF400480	400hp	72H*30W*18D

Installation

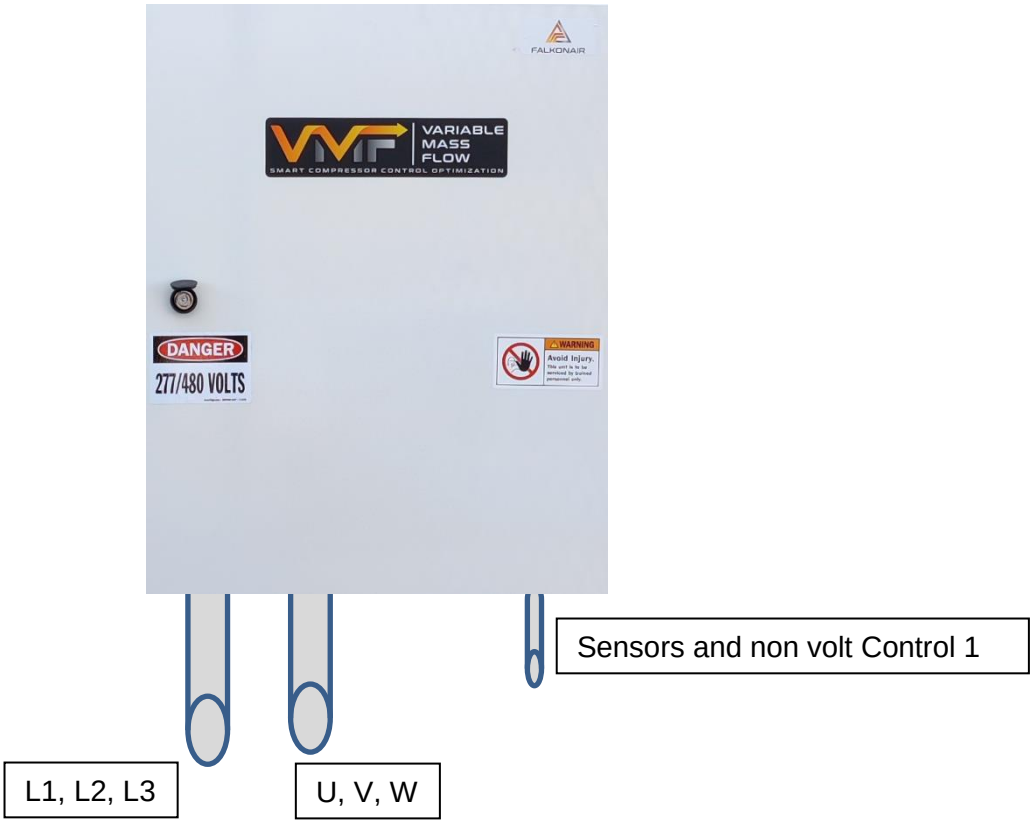
Installations to be performed by qualified persons:

1. Install the VMF package on a strong suitable wall in places where the protection rating is observed.
2. 3 separate conduits need to be installed, 1 for Supply Cable to the VMF, 1 for the UVW cables to the Compressor/motor and 1 for the low voltage and communications cables.
3. All Cable sizes should be followed to be the same size as what is already installed on the existing compressor and Contactor, do not install smaller AWG cable size.
4. All cables should be of an adequate fit for the provided connecting size, and amperes and voltage as specified on the VMF package data sheet.
5. If a sensor extension is required, use shielded cable.

Standard Supplied Accessories

- Two temperature sensors
- One operation and setup guide

Installing the VMF Package



1. Affix the VMF to your surface.

2. Install the sensors onto the system, as shown in figure 1. Sensor 1 must be installed on the suction pipe of the compressor, the cold pipe. Sensor 2 must be installed on the discharge pipe; this is the hot pipe that leaves the compressor. Install these sensors as close as possible to the compressor. (Sensors provided in package)

Figure 1

3. Cover the pipe sensors installed in step 3 with an insulation sleeve, as shown in figure 2

Figure 2

VMF Communication Wiring

Wiring connections for 1 & 2

You will use the current compressor contactor to instruct the Control to start and drive the compressor as usual. This will command and run the compressor.

Figure 3 below shows how to connect and install a non-volt contact cable to and from the compressor contactor to the SCC.

Note: The compressor contactor should now have no wiring connected to it except those installed previously. Also, note that certain brands and types of units require you to supply your own relay to send a non-volt contact to the SCC.

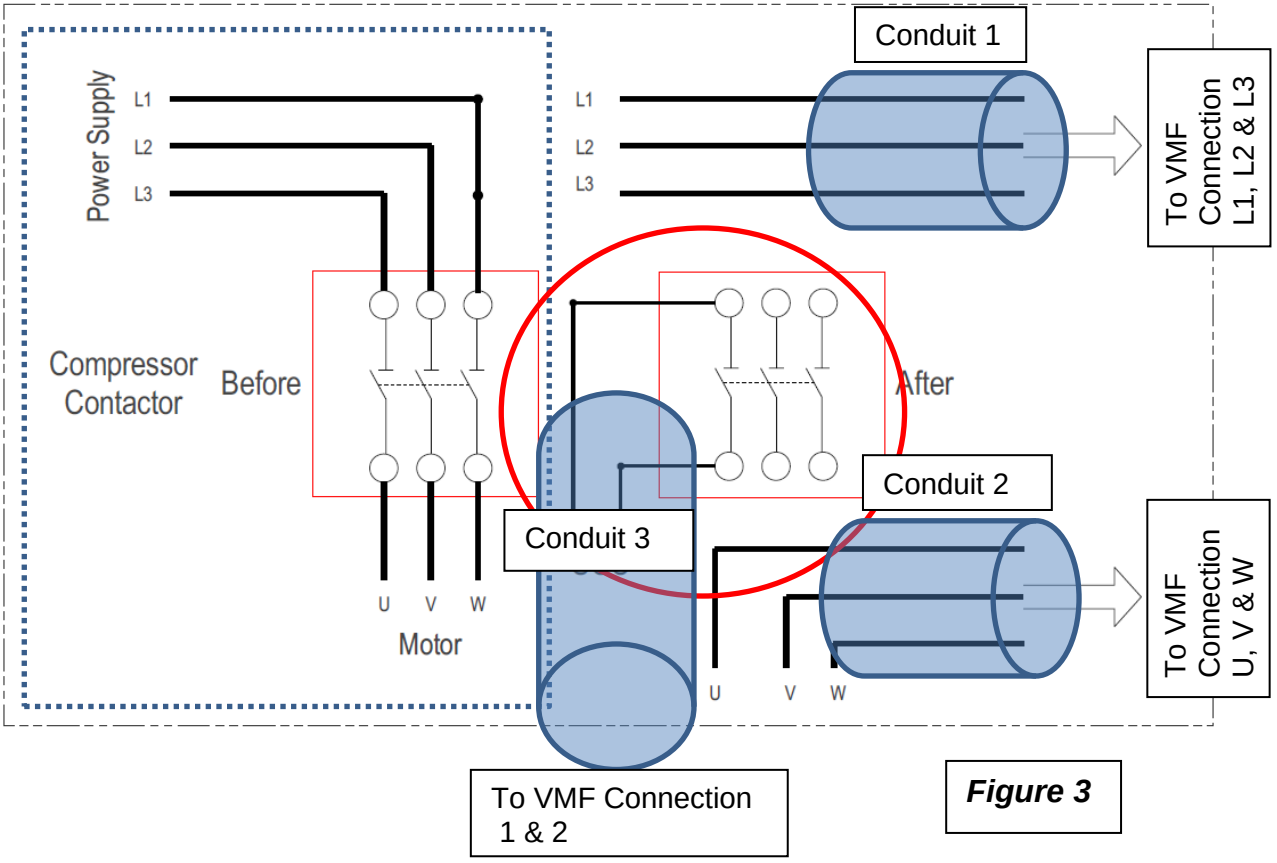


Figure 3

Sensor 1 & 2 installation

Sensors provided need to be installed and plugged in the below terminals T2 and T1

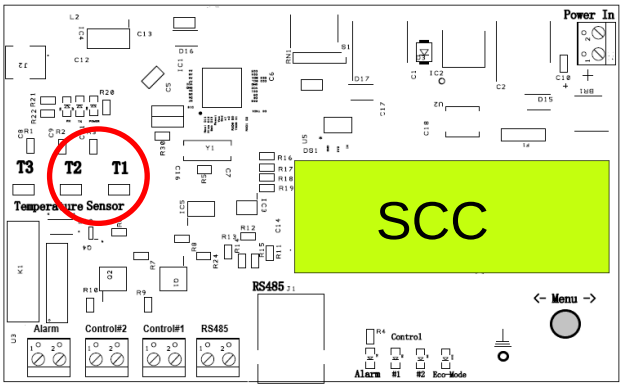
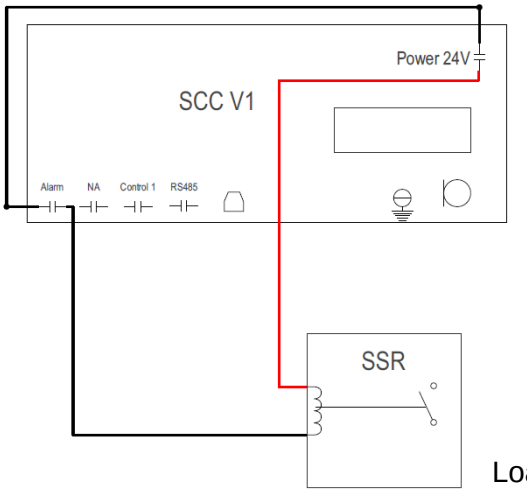


Figure 4

Alarm Connections

If you need a non-volt signal to an alarm or BMS system, this is a non-volt connection. An SSR (Solid State Relay) needs to be used (not supplied), as shown in figure 10 below.



Load side

Please note:
The SSR must have the coil voltage from 5-32V; the load side would need to be able to handle the load connected to it.

SCC Parameters

1. Inputting parameters

1. Ensure all cables are connected, and the VFD is powered and displaying. **STOP.**
2. Push the rotary dial on the SCC to access the menu and follow the menu step by step.
3. The two temperature parameters are the two temperatures noted in the installation phase (figure 4)

2. Understanding the eight different segments in the display setup menu

Press the menu knob as shown in figure 5

1: VFD Min-Input the minimum frequency value you want your compressor to run at.

2: VFD Max-Input the maximum frequency value you want your compressor to run at.

3: Set Point Cold-Input the temperature of the suction temperature taken before you switched off your compressor, as shown on page 5.

4: Compressor Temp-Input the temperature of the discharge taken before you switched off, as shown on page 5.

5: Auto Mode-ON/OFF- If set to ON, your setpoint on segment 3 will be ignored and done automatically; if set to OFF, your setpoint on segment 3 will be the determined-on manual.

6: Backlight ON/OFF-If set to ON, the light will be displayed on the display's background for 1 minute after your last input; if OFF, the backlight will remain OFF always.

7: Delay Timer: ON/OFF–This timer can be disabled if you have an oil pressure switch

8: Restore Defaults-When this is pressed, the settings will be lost and go back to factory reset.

9: Exit Setup Menu- Every time you change a parameter, you need to exit from this segment to save your latest settings.

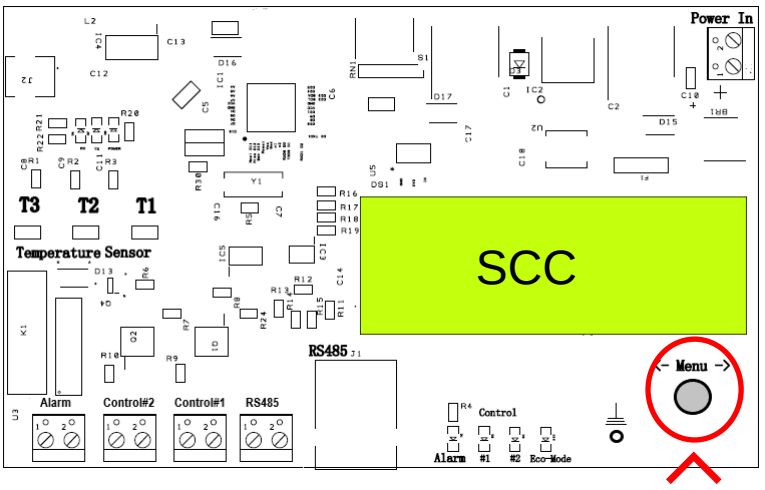


Figure 5

Setting the Dip Switches

- No.1 is to change the display temperature from Celsius **(OFF)** to Fahrenheit **(ON)**
- No.2 is to use the SCC as either a compressor **(ON)** or an evaporator Fan Motor **(OFF).** The LCD will change accordingly after resetting.
- No. 3 & 4 **Not in Use**.

Dip switch note: ON is Up, and OFF is down (see figure 6)

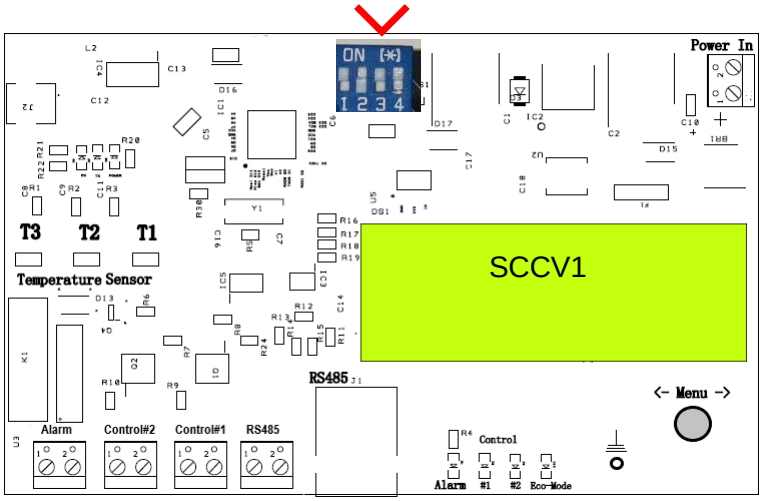
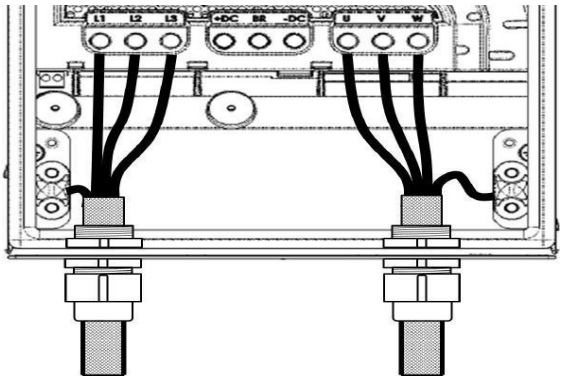


Figure 6

Parameters & Connection

VFD to Motor Connection

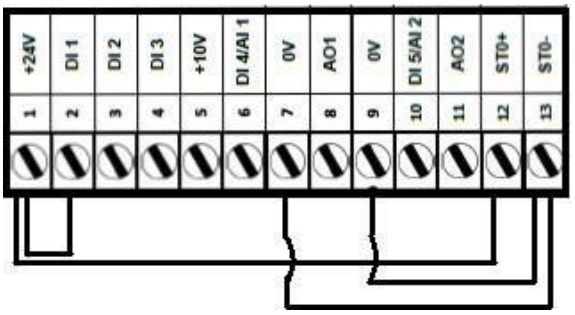
You are now ready to install the wiring on the VFD. The VFD wiring consists of two types, the high voltage type 3-phase supply (L1-L2-L3-Ground) and the compressor wiring (U-V-W-Ground).



Power Supply Motor/Compressor

You are now ready to install the specific wiring below to the VFD for the controller to be in command of the VFD.

- 1 to 2
- 1 to12
- 7 to 13
- 9 to 13



Inputting Parameters into the VFD

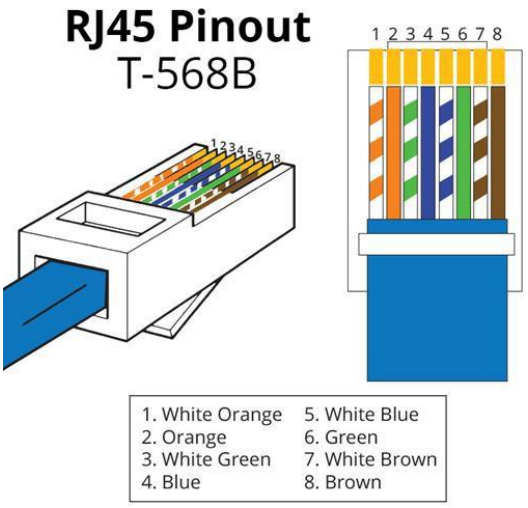
Setting up the VFD parameters. (These are only applicable for the FALKONAIR SCC set up.
Please note that the VFD needs to be powered, and the green wired connector needs to be unplugged for some parameters to be accessed.

P1-01	60 Hz		P1-12	4
P1-02	35 Hz		P1-14	201
P1-03	4 secs		P5-01	1
P1-04	4 secs		P5-03	19.2kbps
P1-05	1		P5-05	5 secs
P1-07	Your motor rated voltage		P4-01	1
P1-08	Your motor amperes + 1A			

SCC Connection to VFD via CAT 6 Cable

Use figure 14 to connect the SCC to the Invertek Optidrive drive.

Cut one end of the Cat 6 cable supplied and strip the wiring so you can use the following:



Connect as follows:

The Cat 6 cable is compatible directly with this drive; plug the Cat 6 cable directly into the drive from the SCC. Do not cut this cable.

Cat 6 connection on the VFD

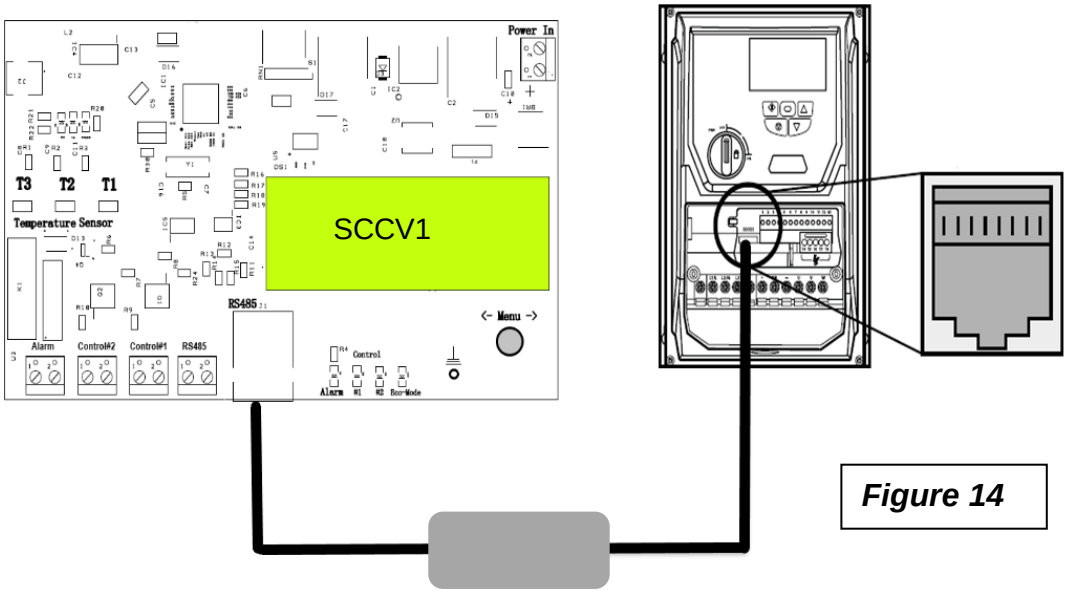


Figure 14

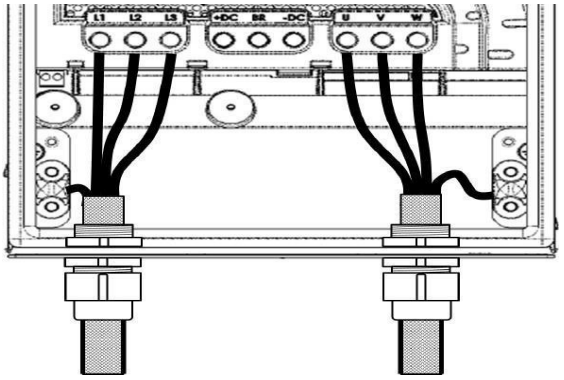
EMF Emitter clip over cable

Schneider Electric Parameters & Connection

VFD to Motor Connection

You are now ready to install the wiring on the VFD. The VFD wiring consists of two types, the high voltage type 3-phase supply (L1-L2-L3-Ground) and the compressor wiring (U-V-W-Ground).

Schneider Electric



Power Supply Motor/Compressor

Inputting Parameters into the VFD

Input Modbus parameter settings as shown below into the Schneider Electric ATV212 drive

F807	-	1		uLu/(vLv)	-	Motor rated Voltage
F820	-	0		F415	-	Motor rated Amps
F821	-	0		F417	-	Motor rated speed
F829	-	1		F601	-	FLA + 1.5A (F415)
AU1	-	1		F721	-	1
ACC	-	3		Fnod	-	4
dEC	-	1		Cnod	-	2
LL	-	35.0		F420	-	120%
FH	-	60.0				
UL	-	60.0			-	
tHr	-	FLA + 1A			-	
Pt	-	2			-	
uL/(vL)	-	60.0				

SCC Connection to VFD Via 3-Wire Screened Cable

1. The Modbus connection between the Schneider Electric ATV212 drive and the SCC should be as shown in figure 15 below.
2. A to B
3. B to A
4. GND to GND

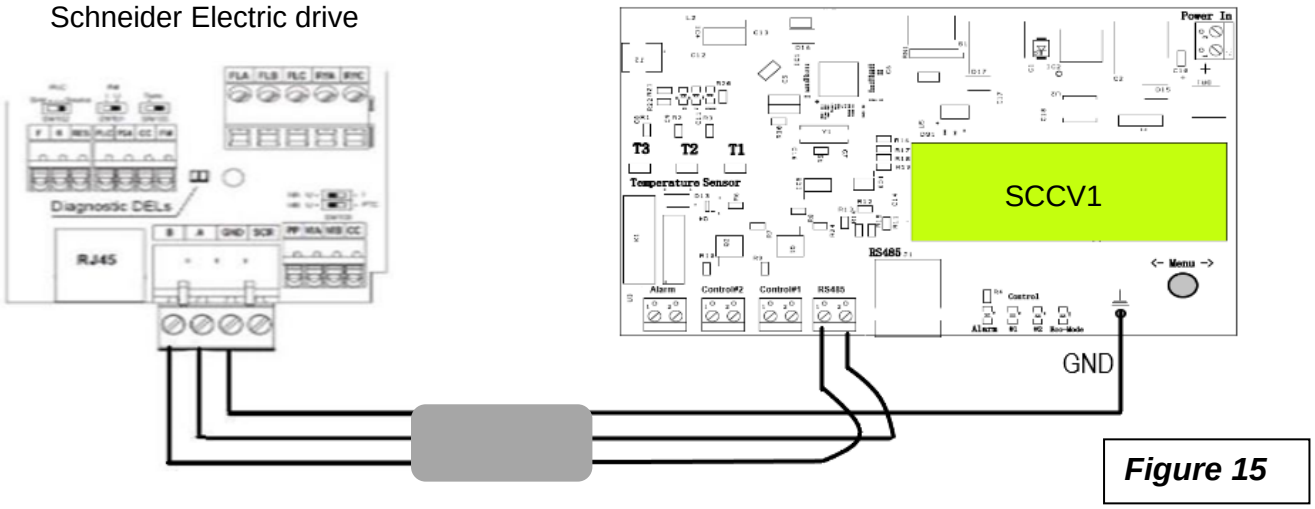


Figure 15

EMF Emitter clip over cable

Parameters & Connections

VFD to Motor Connection

Wire the VFD as shown in figure 16.

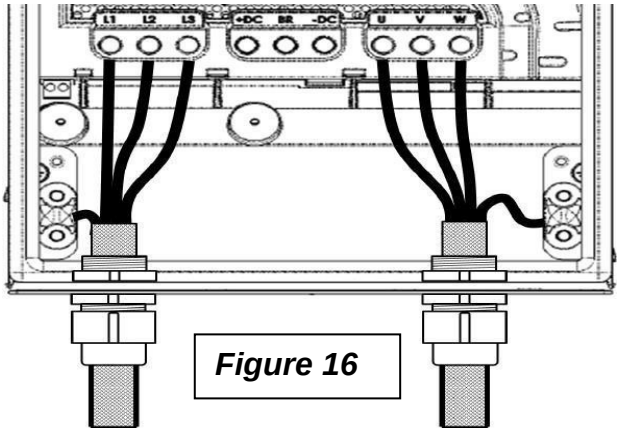


Figure 16

Power supply input Compressor connection

Inputting Parameters in the VFD

Input Modbus parameter settings below into the ABB ACH580 drive

10.05	DI 1 On delay	1 sec
19.11	Ext 1/Ext 2	(32) EFB MCWbit 11
20.01	Ext 1 commands	(14) Embedded field bus
20.03	Ext 1 in 1 source	(0) Always off
20.41	Start interlock 1	(0) Not used
25.02	Speed proportion gain	2.00
25.03	Speed integration time	0.00
25.15	Proportion gain em stop	10.00
28.11	Ext 1 frequency ref 1	(8) EFB ref 1
28.72	Frequency acceleration time 1	5 secs
28.73	Frequency deceleration time 1	2 secs
30.13	Minimum frequency	35 Hz
30.14	Maximum frequency	60 Hz
46.02	Frequency scaling	60 Hz
58.01	Protocol enable	(0) Modbus RTU
58.14	Comm loss action	(11) Fault
58.16	Comm loss time	10.00 sec
58.26	EFB ref 1 type	(5) Frequency
96.79	Legacy Control Profile	(1) ABB Drive
97.94	IR comp max Frequency	60%
99.06	Motor nominal current	***Your motor run Amps +1A***
99.07	Motor nominal voltage	***Your motor voltage***
99.08	Motor nominal frequency	***Your motor normal Hz***
99.10	Motor nominal Power in Watts	***Your motor KW***

SCC Connection to VFD Via 3-Wire Screened Cable

1. The Modbus connection between the ABB ACH580 drive and the SCC should be as shown in figure 17 below.
2. 1 to A
3. 2 to B
4. 3 to GND

ABB drive

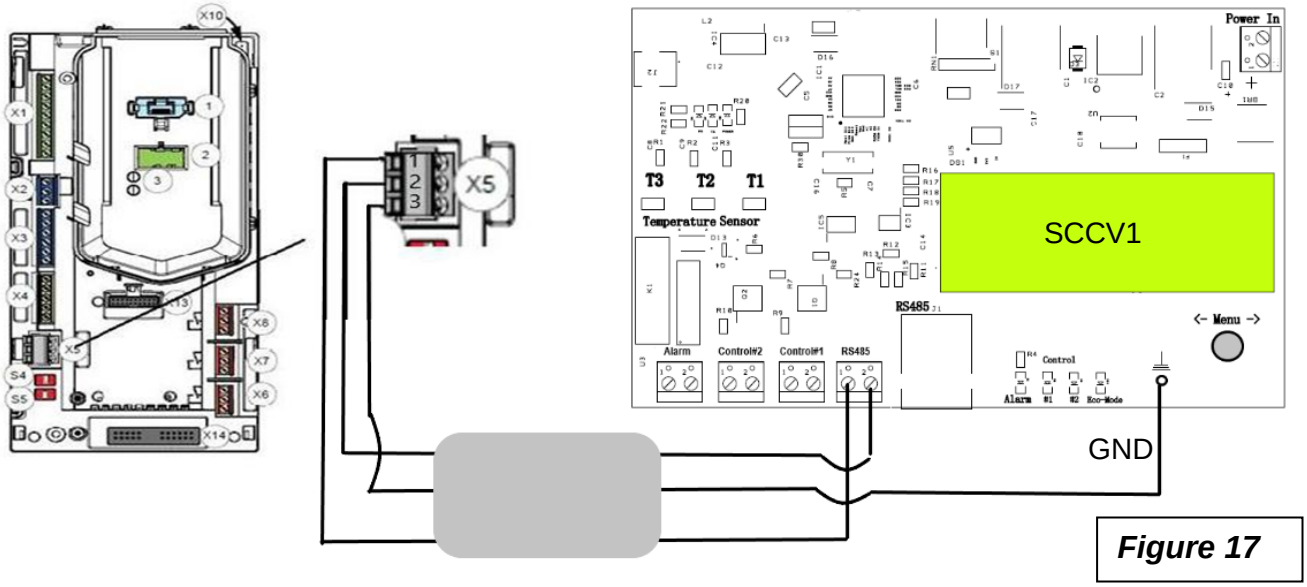


Figure 17

EMF Emitter clip over cable

YASKAWA Parameters & Connection

VFD to Motor Connection

1. VFD to Motor Connection

You are now ready to install the wiring on the VFD. The VFD wiring consists of two types, the high voltage type 3-phase supply (L1-L2-L3-Ground) and the Compressor wiring (U-V-W-Ground).

Power Supply Motor/Compressor

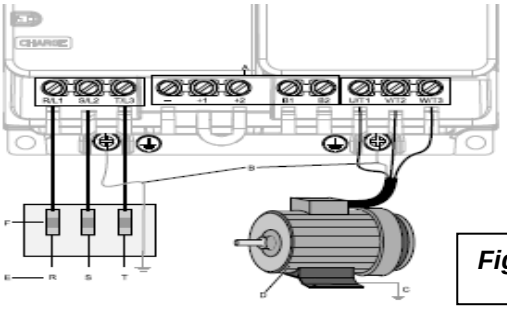
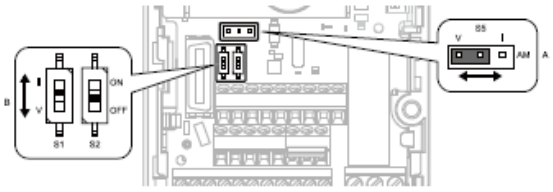


Figure 18

2. The S2 switch must be switched to the ON position as shown below



S2 needs to be switched to ON

3. Yaskawa GA500 parameter settings

A1	-	02	00		H5	-	01	01
b1	-	01	02		H5	-	02	03
b1	-	02	02		H5	-	04	01
C1	-	01	05		H5	-	09	10
C1	-	02	05		H5	-	12	00
d2	-	01	100			-		
d2	-	02	60			-		
E1	-	01	Voltage supply			-		
E1	-	03	*02 – 0F			-		
E1	-	05	Motor voltage			-		
E2	-	01	RLA			-		
	-							

NB :(*) If the supply in your region is 50Hz, input 02
If the supply in your region is 60Hz, input 0F

SCC Connection to VFD Via 3-Wire Screened Cable

YASKAWA

1. The Modbus connection between the Yaskawa GA500 drive and the SCC should be as shown in figure 19 below.
2. D+ to A
3. D- to B
4. AC to GND

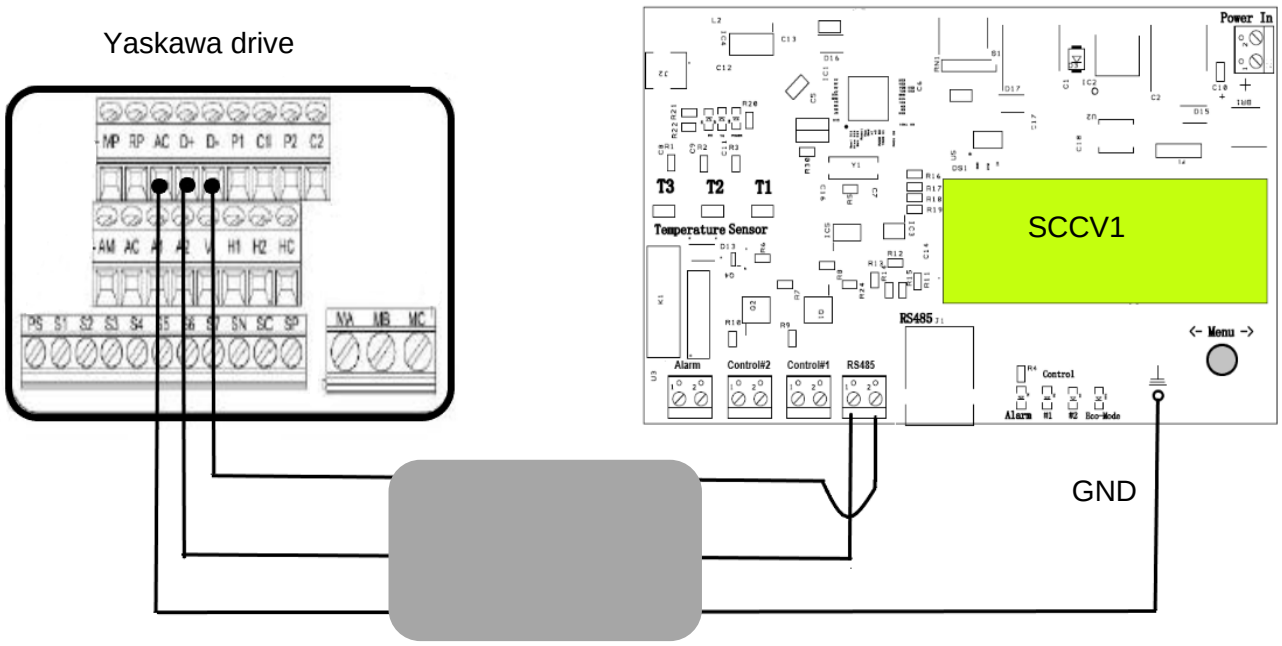


Figure 19

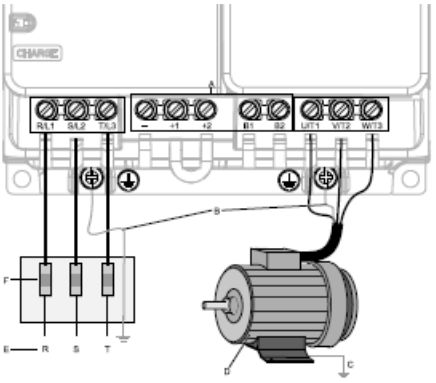
Fuji Electric Parameters & Connection

VFD to Motor Connection

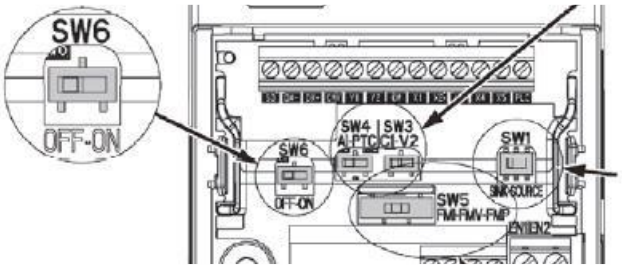
1. VFD to Motor Connection

You are now ready to install the wiring on the VFD. The VFD wiring consists of two types, the high voltage type 3-phase supply (L1-L2-L3-Ground) and the compressor wiring (U-V-W-Ground).

Power Supply Motor/Compressor



2. The SW6 must be switched to the ON position as shown below



3. Fuji Electric Frenic-Ace parameter settings

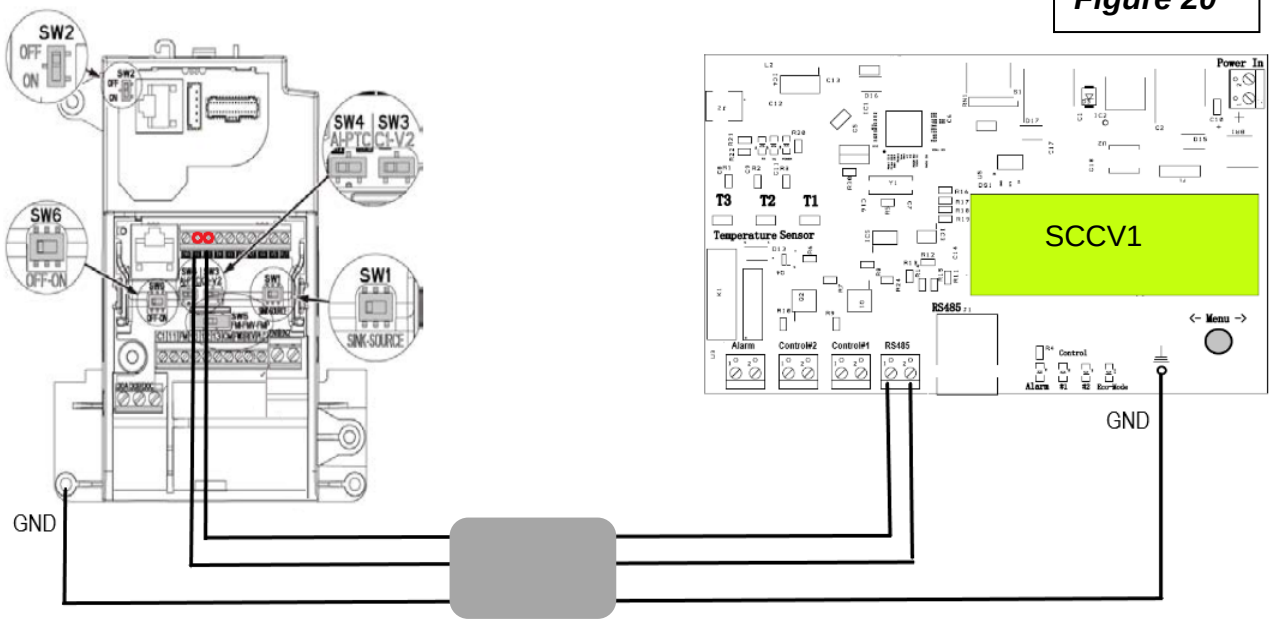
1F	01	11		1Y	07	01
1F	02	01		1Y	08	10
1F	03	60		1Y	10	00
1F	15	60		1Y	11	01
1F	16	35		1Y	12	00
1P	02	kWh of Compressor		1Y	14	02
1P	03	Amps of Compressor		1Y	18	05
1Y	01	1		1Y	20	00
1Y	04	02		1H	06	01
1Y	06	03		1H	30	08

SCC Connection to VFD Via 3-Wire Screened Cable

Fuji Electric

1. The Modbus connection between the Fuji Electric Frenic-Ace drive and the SCC should be as shown in figure 20 below.
2. DX+ to A
3. DX- to B
4. GND to GND

Figure 20



EMF Emitter clip over cable

Parameters & Connection

VFD to Motor Connection

1. Wire the VFD as shown in figure 21.

   You are now ready to install the wiring on the VFD. The VFD wiring consists of two types, the high voltage type 3-phase supply (L1-L2-L3-Ground) and the Compressor wiring (U-V-W-Ground).

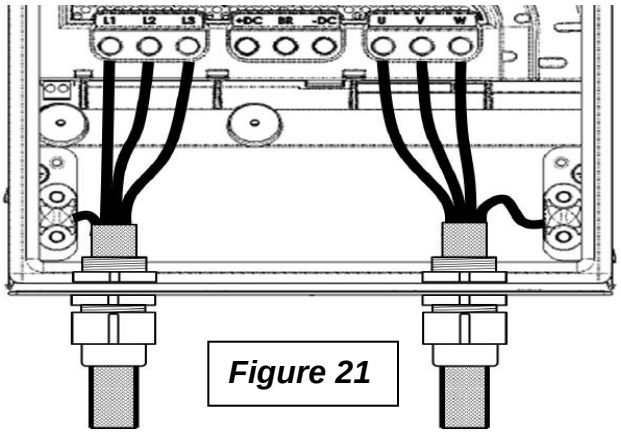


Figure 21

Power supply input Compressor connection

2. Teco-Westinghouse F510 parameter settings

00	02	2		09	01	0	
00	03	2		09	02	3	
00	05	3		09	03	0	
00	08	60Hz		09	04	0	
00	12	100%		09	06	5 secs	
00	13	60%		09	07	1	
00	14	3 sec		07	09	1	
00	15	2 sec		01	02	60 Hz	
00	32	5		01	03	Supply voltage	
02	01	Set to your compressor A		01	09	Your motor voltage	
02	04	Set to your compressor V		01	12	Supply Frequency	
02	06	60 Hz		01	13	Supply Voltage	
09	00	01		01	14	Supply voltage	

SCC Connection to VFD Via 3-Wire Screened Cable

1. The Modbus connection between the Teco-Westinghouse F510 drive and the SCC should be as shown in figure 22 below.
2. S+ to A
3. S- to B
4. GND to GND

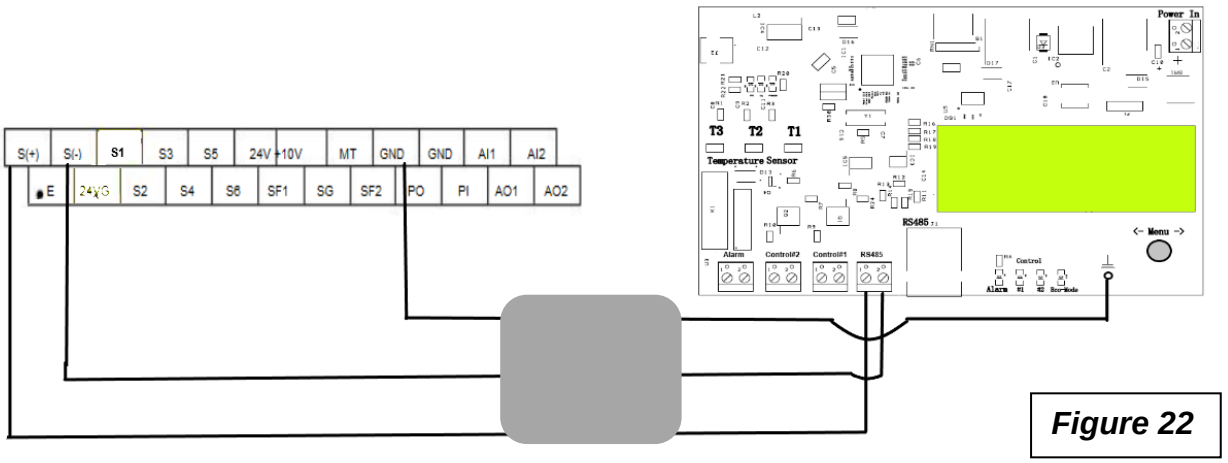


Figure 22

EMF Emitter clip over cable

Understanding the Display

Mode: Comp Stop represents the compressor is off, and the contact is open

T_1: 73 represents temperature feed from the suction pipe.

Auto: The algorithm is in **AUTO** mode set point

T_2: 74 represents temperature feed from the compressor discharge.

F_o: 60 Hertz represents the speed of the compressor sent from SCC (when the compressor comes on)

D_T 00:03:00 represents the delay start timer.

Commissioning Notes

When commissioning your compressor for the first time, it is particularly important to ensure that your first compressor run is monitored and that you are ready to switch it off immediately if needed. *We are referring to reverse rotation possibilities.*

Reverse rotation is when you are wiring a 3-phase motor, and the 3-phase wiring is installed incorrectly. On a normal 3-phase motor, the rotation is not important, as a reverse rotation will never be a problem. However, now that you are installing compressors, reverse rotation must be taken seriously; the main reason is that if you reverse rotate a scroll compressor, you will damage the scroll head of the compressor. To avoid this, do the following:

Start your compressor manually from the VFD. When the system asks for cooling or heating, check the temperature of the suction and discharge pipes, and notice the compressor noise.

If any of the following occurs, stop the compressor at once and change over any two phases on the VFD connection (U-V-W). Either the temperature of the suction and discharge pipes are unchanged, the compressor sounds abnormal, or your refrigerant gauge on your suction remains stable or hunting in the same position. ***In normal rotation, the suction pressure on your gauge should immediately start to go down from the balancing pressure.***

Trouble Shooting

Most Common Errors on Drives

- ***Communications error***

1. Check Modbus Cable from SCC to Drive

Solution: If damaged, change the cable to new.

2. Check Connections between the SCC and Drive

Solution: If not connected re install and check continuity on cable

3. Check Power on the SCC to be not more than 48V and not less than 24V.

Solution: If power not adequate change the transformer or correct to the right voltage

4. See if the Menu on the SCC is not active.

Solution: If active, exit and save the menu on the SCC to the normal operation window.

- ***High Current or abnormal current on Drive***

1. Check supply incoming voltage.

Solution: Correct the supply voltage

2. Check the Motor on Compressor to Ground

Solution: With a Megohmmeter check your compressor windings to ground, all resistance on your readings should be equal resistance

3. Check your cables insulation.

Solution: Change when necessary

Most Common Errors on the SCC

- ***Sensor T1 or T2 not Detected.***

1. Check wiring from and to sensors.

Solution: Fix wiring if damaged.

2. Check If plugged in the SCC tight.

Solution: if tight change sensor/s.

Please leave this manual on-site, in the unit, for future technicians to see your notes below.

Notes:

Note: Specifications are subject to change without notice.

This form is to be completed in by the commissioning Technician/Electrician installing the SCC.

End User Installation Site				Date:
Company Name	Contact Name	Contact Phone		
Street Address	City	State	Zip Code	Country

Purchased From			
Company Name	City	State	Contact Name & Tel No

Falkonair Product Information				
Unit	Model No	Serial No	Application Type	
1			Comp/Evap	
2			Comp/Evap	
3			Comp/Evap	
4			Comp Evap	
5			Comp/Evap	
6			Comp/Evap	

Compressor or Fan Motor Details	
1	
2	
3	
4	
5	
6	

Installation commissioning checks	
Supply voltage into the SCC	
Sensor disconnect check	
Modbus comms disconnect check	
Frequency check communication	
Suction set point in °C/°F	
Comp set point in °C/°F	
Amps at 60 Hz taken off the drive	
Amps at 45 Hz taken off the drive	
KW at 60 Hz taken off the drive	
KW at 60 Hz taken off the drive	

If you completed the printed version in your operation manual, please take a picture and email to info@falkonair.com

FALKONAIR

This is a product of Falkonair Inc.

www.falkonair.com
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