QUICK START GUIDE

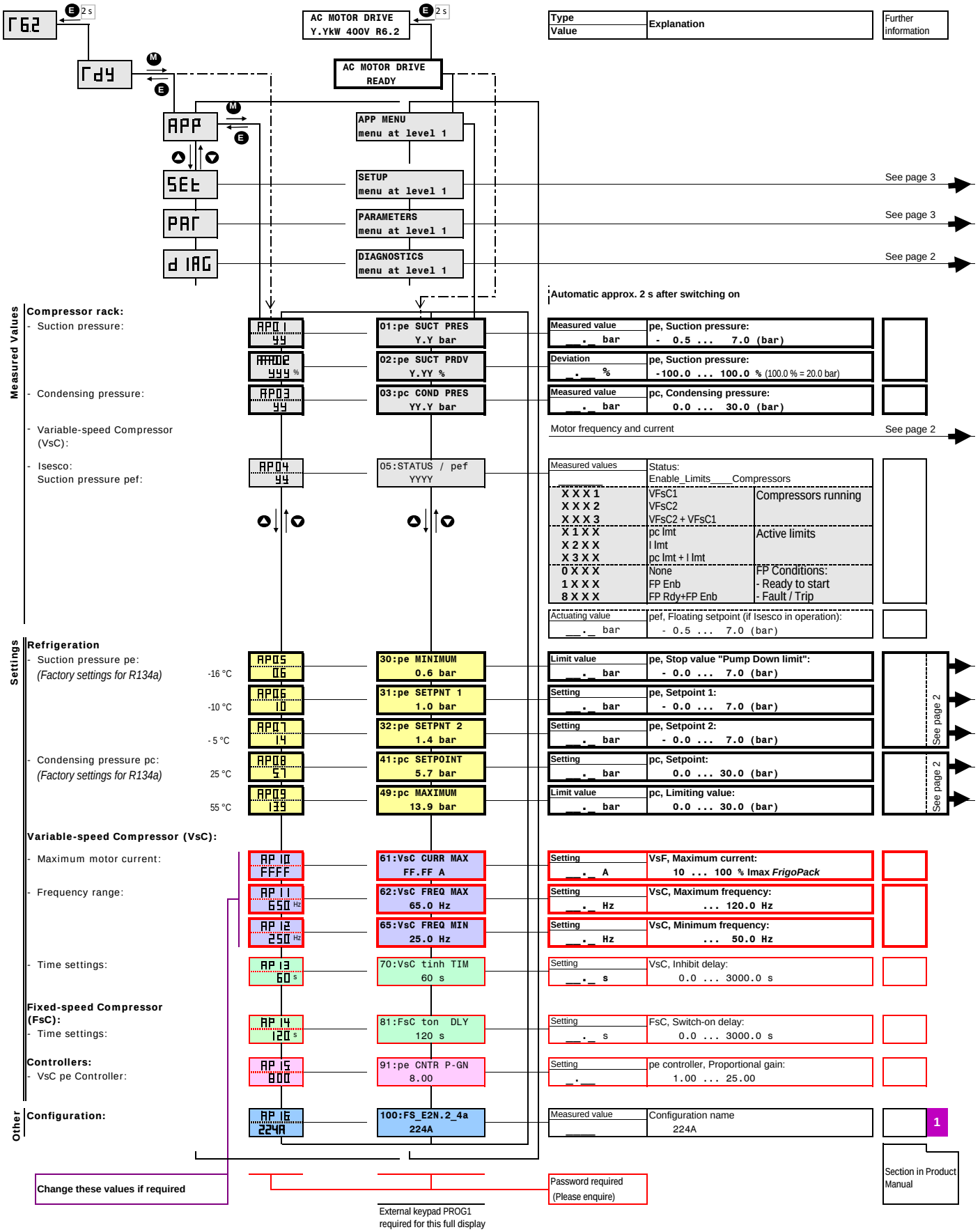
KIMO RHVAC Controls

FrigoPack E FMV

FPEI FMV/17
FrigoSoft E2N

REFR/COOL
R134a MT All

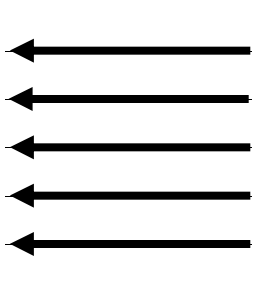
PARAMETERS:



Type / Value	Explanation	Further information
Measured value __._ bar	pe, Suction pressure: - 0.5 ... 7.0 (bar)	
Deviation __._ %	pe, Suction pressure: -100.0 ... 100.0 % (100.0 % = 20.0 bar)	
Measured value __._ bar	pc, Condensing pressure: 0.0 ... 30.0 (bar)	
Measured values	Status: Enable_Limits___Compressors	
X X X 1 X X X 2 X X X 3	VFsC1 VFsC2 VFsC2 + VFsC1	Compressors running
X 1 X X X 2 X X X 3 X X	pc lmt I lmt pc lmt + I lmt	Active limits
0 X X X 1 X X X 8 X X X	None FP Enb FP Rdy+FP Enb	FP Conditions: - Ready to start - Fault / Trip
Actuating value __._ bar	pef, Floating setpoint (if Isesco in operation): - 0.5 ... 7.0 (bar)	
Limit value __._ bar	pe, Stop value "Pump Down limit": - 0.0 ... 7.0 (bar)	
Setting __._ bar	pe, Setpoint 1: - 0.0 ... 7.0 (bar)	
Setting __._ bar	pe, Setpoint 2: - 0.0 ... 7.0 (bar)	
Setting __._ bar	pc, Setpoint: 0.0 ... 30.0 (bar)	
Limit value __._ bar	pc, Limiting value: 0.0 ... 30.0 (bar)	
Setting __._ A	VsF, Maximum current: 10 ... 100 % Imax *FrigoPack*	
Setting __._ Hz	VsC, Maximum frequency: ... 120.0 Hz	
Setting __._ Hz	VsC, Minimum frequency: ... 50.0 Hz	
Setting __._ s	VsC, Inhibit delay: 0.0 ... 3000.0 s	
Setting __._ s	FsC, Switch-on delay: 0.0 ... 3000.0 s	
Setting __._	pe controller, Proportional gain: 1.00 ... 25.00	
Measured value ____	Configuration name 224A	

Abbreviations:	
VsC:	Variable-speed Compressor
FsC:	Fixed-speed Compressor
VfG:	Variable-speed fan group (Condenser / Dry cooler)
YYY.Y %:	Measured value depending on operating point
FFF.F %:	Factory default value depending on frame size and rated power
X:	Any value

Standard refrigeration settings:
Based on EN 12900



				Factory setting																							
				R134a			R404A / R507			R407C		R407F			R448A / N-40			R449A / XP40			R450A N13		
				MT	IT	HT	LT	MT	IT	IT	HT	LT	MT	IT	LT	MT	IT	LT	MT	IT	MT	IT	
-16 °C*	AP05 06	30:pe MINIMUM 0.6 bar		-16	-5	1	-37	-30	-5	-5	1	-37	-16	-5	-37	-16	-5	-37	-16	-5	-16	-5	°C
				0,6	1,4	2,0	0,5	1,0	4,1	2,9	3,8	0,2	1,9	3,4	0,2	1,9	3,4	0,2	1,9	3,3	0,4	1,2	bar
-10 °C*	AP06 10	31:pe SETPNT 1 1.0 bar		-10	0	5	-30	-10	0	0	5	-30	-10	0	-30	-10	0	-30	-10	0	-10	0	°C
				1,0	1,9	2,5	1,0	3,3	5,0	3,6	4,5	0,6	2,6	4,2	0,6	2,7	4,2	0,6	2,6	4,1	0,8	1,7	bar
- 5 °C*	AP07 14	32:pe SETPNT 2 1.4 bar		-5	4	8	-24	-5	4	4	8	-24	-5	4	-24	-5	4	-24	-5	4	-5	4	°C
				1,4	2,4	2,9	1,6	4,1	5,8	4,3	5,0	1,1	3,4	5,0	1,1	3,4	5,0	1,1	3,3	4,9	1,2	2,1	bar
25 °C*	AP08 57	41:pc SETPOINT 5.7 bar				25			30	30		30			30			30			25		°C
						5,7			13,3	12,6		14,0			13,8			13,5			5,2		bar
55 °C*	AP09 139	49:pc MAXIMUM 13.9 bar				55			52	52		52			52			52			55		°C
						13,9			23,2	22,2		24,4			24,0			23,6			12,9		bar

Refrigerant glide considered at these condensing pressures

Diagnostics

dIAG — DIAGNOSTICS menu at level 1

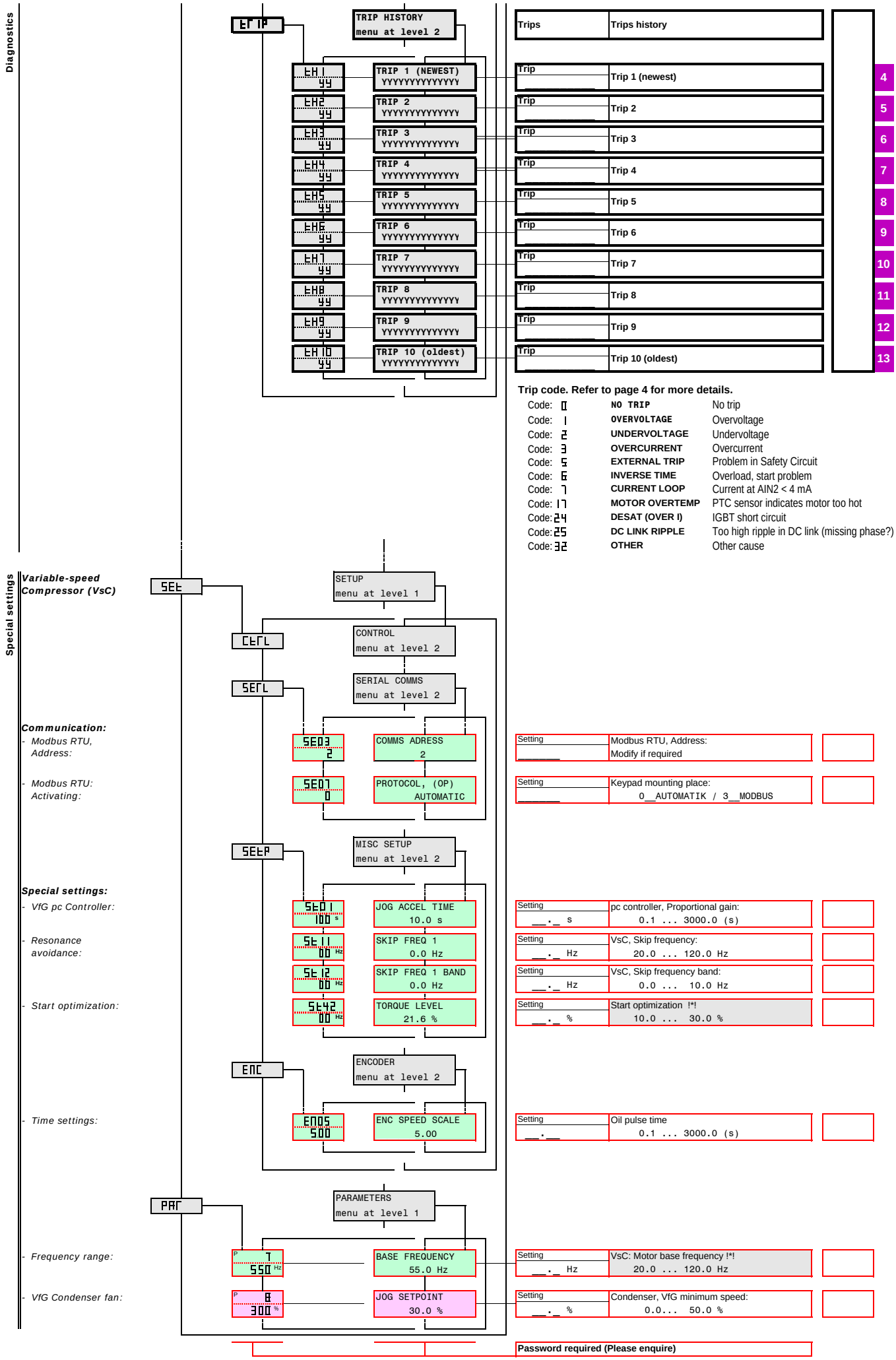
YYY Hz	DRIVE FREQUENCY YY.Y Hz	Measured value __._ Hz	Variable-speed Compressor: Motor frequency
YYY %	SPEED SETPOINT YY.Y %	Measured value __._ %	VsC: Actuating value of Frequency: % of maximum frequency
YYY V	DC LINK VOLTS YY.Y V	Measured value __._ V	DC link voltage
YYY A	MOTOR CURRENT YY.Y A	Measured value __._ A	Variable-speed Compressor: Motor current
IN	INPUTS menu at level 2	Measured values	Inputs
dIN YYYY	DIGIN WORD YYYY	Measured values ____	Digital inputs: 0000 ... 0073 (hex) — 2

YYYY	DIN7 [13]	DIN6 [12]	DIN5 [11]	DIN2 [8]	DIN1 [7]
00X0	X	X	X	0	0
00X1	X	X	X	0	1
00X2	X	X	X	1	0
00X3	X	X	X	1	1
000X	1	0	0	X	X
001X	1	0	1	X	X
002X	1	1	0	X	X
003X	1	1	1	X	X
004X	0	0	0	X	X
005X	0	0	1	X	X
006X	0	1	0	X	X
007X	0	1	1	X	X
	Safety Circuit	Activate Setp. pc2	Activate Setp. pe2	Lubric. f>=50 Hz	Start

IPA1 YYY %	ANIN 1 VALUE YY.Y %	Measured value __._ %	Analog input 1: 0.0 ... 100.0 (%)
IPA2 YYY %	ANIN 2 VALUE YY.Y %	Measured value __._ %	Analog input 2: 0.0 ... 100.0 (%)
OUt	OUTPUTS menu at level 2	Measured values	Outputs — 3
dOUt YYYY	DIGOUT WORD YYYY	Measured values ____	Digital outputs: 0000 ... 0006 (hex)

YYYY	DOUT3 [RL1A-B]	DOUT2 [10A-10B]	DOUT1 [9A-9B]	
0000	1	0	0	Ready
0001	1	0	1	Operation VsC
0003	1	1	1	Operation VsC + FsC
0004	0	0	0	Trip
0006	0	1	0	Emergency operation FsC
	VsC Ready	Activate FsC	VsC in Operation	

OPA1 YYY %	ANOUT 1 VALUE YY.Y %	Measured value __._ %	Analog output 1: Condenser Fans: 0.0 ... 100.0 (%)
OPA2 YYY %	ANOUT 2 VALUE YY.Y %	Measured value __._ %	Analog output 2: 0...+10 V 0.0 ... 100.0 (%)


Diagnostics
tRIP
TRIP HISTORY
menu at level 2
tH1 yy
TRIP 1 (NEWEST) YYYYYYYYYYYYYY
tH2 yy
TRIP 2 YYYYYYYYYYYYYY
tH3 yy
TRIP 3 YYYYYYYYYYYYYY
tH4 yy
TRIP 4 YYYYYYYYYYYYYY
tH5 yy
TRIP 5 YYYYYYYYYYYYYY
tH6 yy
TRIP 6 YYYYYYYYYYYYYY
tH7 yy
TRIP 7 YYYYYYYYYYYYYY
tH8 yy
TRIP 8 YYYYYYYYYYYYYY
tH9 yy
TRIP 9 YYYYYYYYYYYYYY
tH10 yy
TRIP 10 (oldest) YYYYYYYYYYYYYY
Trips
Trips history
Trip
Trip 1 (newest)
Trip 2
Trip 3
Trip 4
Trip 5
Trip 6
Trip 7
Trip 8
Trip 9
Trip 10 (oldest)
4
5
6
7
8
9
10
11
12
13
Trip code. Refer to page 4 for more details.
Code: 0 NO TRIP No trip
Code: 1 OVERVOLTAGE Overvoltage
Code: 2 UNDERVOLTAGE Undervoltage
Code: 3 OVERCURRENT Overcurrent
Code: 5 EXTERNAL TRIP Problem in Safety Circuit
Code: 6 INVERSE TIME Overload, start problem
Code: 7 CURRENT LOOP Current at AIN2 < 4 mA
Code: 17 MOTOR OVERTEMP PTC sensor indicates motor too hot
Code: 24 DESAT (OVER I) IGBT short circuit
Code: 25 DC LINK RIPPLE Too high ripple in DC link (missing phase?)
Code: 32 OTHER Other cause
Special settings
Variable-speed Compressor (VsC)
SEt
SETUP
menu at level 1
CtrL
CONTROL
menu at level 2
SErL
SERIAL COMMS
menu at level 2
Communication:
- Modbus RTU, Address:
- Modbus RTU: Activating:
SE03 2
COMMS ADRESS 2
SE07 0
PROTOCOL, (OP) AUTOMATIC
Setting
Modbus RTU, Address:
Modify if required
Setting
Keypad mounting place:
0__AUTOMATIK / 3__MODBUS
SEtP
MISC SETUP
menu at level 2
Special settings:
- VfG pc Controller:
- Resonance avoidance:
- Start optimization:
SE01 100 s
JOG ACCEL TIME 10.0 s
SE11 00 Hz
SKIP FREQ 1 0.0 Hz
SE12 00 Hz
SKIP FREQ 1 BAND 0.0 Hz
SE42 00 Hz
TORQUE LEVEL 21.6 %
Setting
pc controller, Proportional gain:
0.1 ... 3000.0 (s)
Setting
VsC, Skip frequency:
20.0 ... 120.0 Hz
Setting
VsC, Skip frequency band:
0.0 ... 10.0 Hz
Setting
Start optimization !*!
10.0 ... 30.0 %
EnC
ENCODER
menu at level 2
- Time settings:
EnOS 500
ENC SPEED SCALE 5.00
Setting
Oil pulse time
0.1 ... 3000.0 (s)
PAr
PARAMETERS
menu at level 1
- Frequency range:
- VfG Condenser fan:
P 1 550 Hz
BASE FREQUENCY 55.0 Hz
P 8 300 %
JOG SETPOINT 30.0 %
Setting
VsC: Motor base frequency !*!
20.0 ... 120.0 Hz
Setting
Condenser, VfG minimum speed:
0.0... 50.0 %
Password required (Please enquire)
!*!: Refer to KIMO RHVACC before changing these values

TRIPS, DIAGNOSIS, FAULT FINDING

TRIP MESSAGE	POSSIBLE CAUSE	HINTS FOR FAULT FINDING	REMEDIES
*** TRIPPED *** OVERVOLTAGE Code: 1 → dCH I *(Code: See page 3)*	* Voltage of supply too high	- Measure and document the voltage in all three input phases	- Rectify cause of any high voltage
	* Compressor motor defect	- Test if compressor motor will run with DOL supply	- Replace compressor motor
	* Safety contactor not controlled correctly	- Measure resistance of motor winding and compare with manufacturer's data - Check insulation beween phases and to earth - Check wiring of control circuit and compare function with KIMO RHVACC recommendations	- Modify wiring
*** TRIPPED *** UNDERVOLTAGE	* Voltage of supply too low	- Measure resistance of motor winding and compare with manufacturer's data	- Rectify cause of any low voltage
*** TRIPPED *** VDC RIPPLE	* Phase of supply voltage missing		
*** TRIPPED *** DESAT (OVER I)	* Safety contactor not controlled correctly	- Check wiring of control circuit and compare function with KIMO RHVAC recommendations	- Modify wiring
*** TRIPPED *** OVERCURRENT Code: 2 → dCLO Code: 25 → dCrP Code: 24 → SHrt Code: 3 → OC *(Code: See page 3)*	* Compressor motor defect	- Test if compressor mtor will run with DOL supply - Measure resistance of motor winding and compare with manufacturers's data - Check insulation beween phases and to earth	- Replace compressor motor
	* Power section of FrigoPack faulty	- Remove motor cable connections to FrigoPack / iSpeed Check if operation of FrigoPack without a motor connected is possible (No trip message: Probably OK; Trip message: Probably defect)	- Replace FrigoPack
	* Incorrect motor connection	- Test operation with a small test motor - Check wiring to motor terminals (choice of star/delta, part winding etc.)	- Modify wiring
*** TRIPPED *** EXTERNAL TRIP Code: 5 → Et *(Code: See page 3)*	* Safety contactor not controlled correctly	- Check wiring of control circuit and compare function with KIMO RHVACC recommendations	- Modify wiring
	* Safety device in safety circuit tripped	- Check safety circuits. Possibly missing supply voltage at a monitoring device.	- Reset if necessary
	* Wiring fault in safety circuit	- Check wiring of control circuit and compare function with KIMO RHVACC recommendations	- Modify wiring
	DC 24 V control voltage missing	- Check DC 24 V control voltage at FrigoPack	- Modify wiring
		- Short circuit with DC 24 V control voltage ?	
*** TRIPPED *** CURRENT LOOP Code: 7 → LOOP *(Code: See page 3)*	* Suction-pressure transducer not connected or connections swapped	- Check if blue LED at the input of FrigoPack / iSpeed lights	- Verify correct connection to transducer for suction pressure. Exchange leads if necessary
	* Transducer for suction pressure faulty	- Measure current from transducer for suction pressure at input to FrigoPack (must be at least +4 mA)	- Replace transducer for suction pressure
*** TRIPPED *** INVERSE TIME Code: 6 → It *(Code: See page 3)*	* Compressor start aborted	- Liquid refrigerant in compressor?	- Contact KIMO RHVAC for advice
		- Defect compressor - Incorrect size of FrigoPack or motor connected in delta instead of star.	
*** TRIPPED *** MOTOR OVERTEMP Code: 17 → Ot *(Code: See page 3)*	* Missing link TH1A-TH1B or MOT/TEMP ?	- Check wiring of motor protection circuit	- Modify wiring
	* No connection to motor protection PTC		
	* Faulty connection to external PTC relay		
	* Motor winding too hot	- Compressor overloaded - Unsuitable FrigoPack settings	- Contact KIMO RHVACC for advice
*** TRIPPED *** ?ANYTHING ELSE?	* Other		- Contact KIMO RHVACC for advice

Important note:

These messages are of common trips likely to occur during commissioning.
Other trip messages can occur in fault conditions.

When requesting advice from your supplier, always make an exact note of the following:
- Exact trip message (if appropriate message indicated in both lines of display)
- Message displayed when key 'E' is pressed for at least 2 s.

Cannot find fault ?:

Note the follwign parameters and send to KIMO RHVACC:

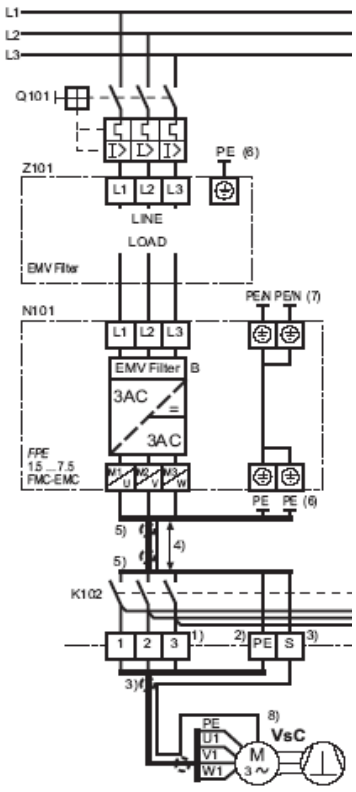
- Parameters AP01 ... AP16 on Page 1:
- Fowwing settings on pages 1 ... 3:

1 ... 13

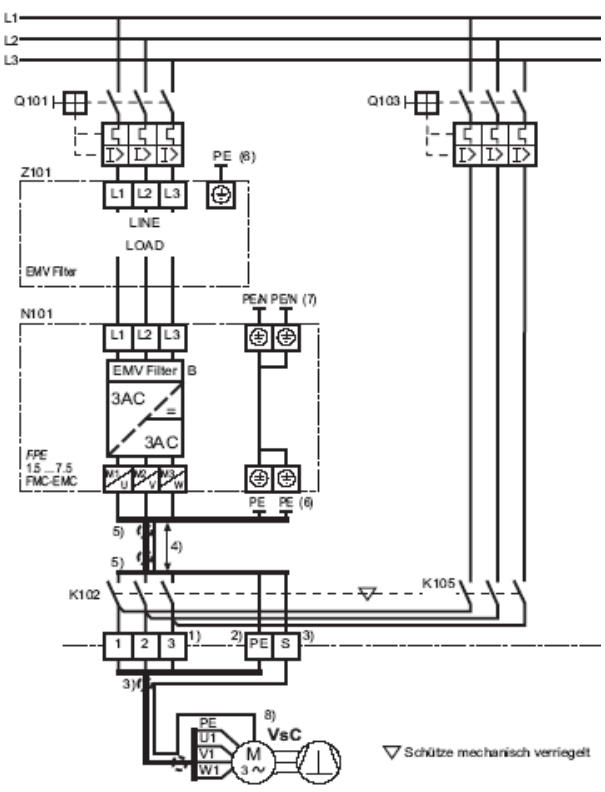
Manufacturer	Agent / Partner	Customer	Installation	
KIMO RHVAC ControlsLtd Tel.: +49 911-8018778 Fax: +49 911-9976118 applications@frigokimo.com www.frigokimo.com				
			Name	**Date**

POWER SECTION

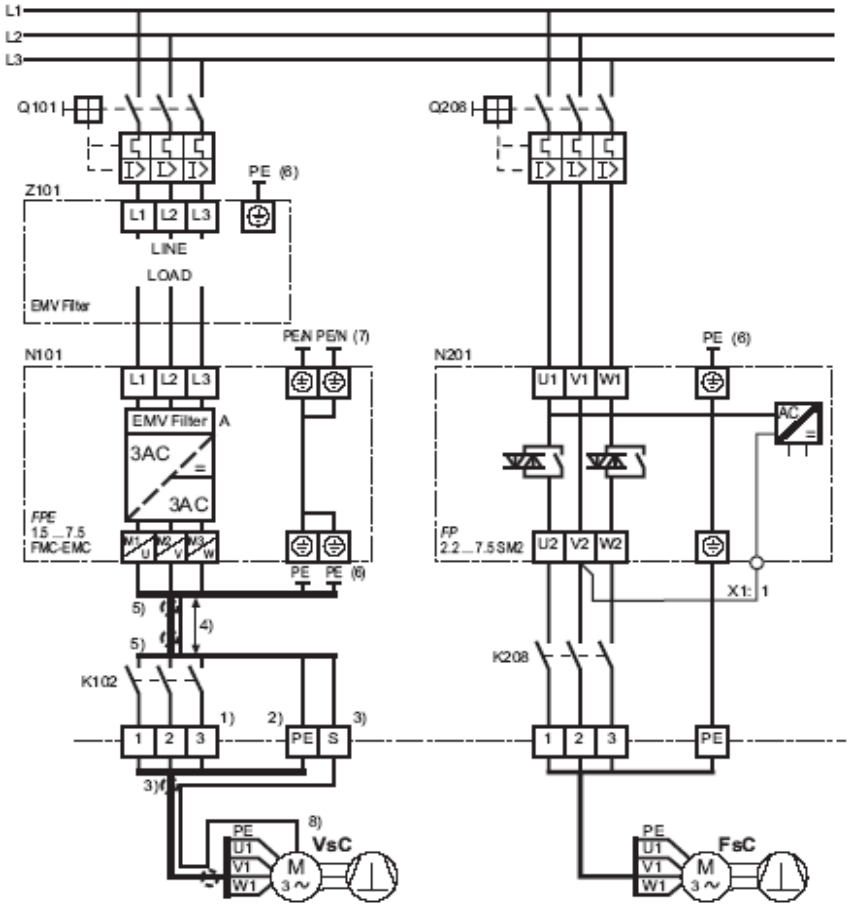
Power connections



FPE FMV / FPEI FMV
Power wiring (basic connection)



FPE FMV / FPEI FMV
Power wiring with bypass for emergency operation (recommended)



FPE FMV / FPEI FMV
Power wiring with bypass for emergency operation using a soft starter for bypass (recommended)

Power terminals

Terminal / Designation	Signal / Function	Explanation	Further information
PE	**Protective Earth connection 1 to supply**	- Observe all safety and EMC requirements	**7.7.1**
L1 **L2/N** **L3**	**Three phases of voltage supply**	- Ensure that supply voltage agrees with data on FrigoPack name plate	**7.7.1**
PE	**Protective Earth connection 2 to supply (both to be connected)**	- Left-hand screw of cable clamp - Observe all safety and EMC requirements	**6.7** **6.8.4**
DC+ (DBR) DC-	**Do not use**	- Risk of damage to FrigoPack	
M1/U **M2/V** **M3/W**	**Compressor motor**	- Variable-speed Compressor via safety contactor	**7.7.1/** **7.7.2**
PE	**Protective earth connection to compressor motor**		**7.7.2**

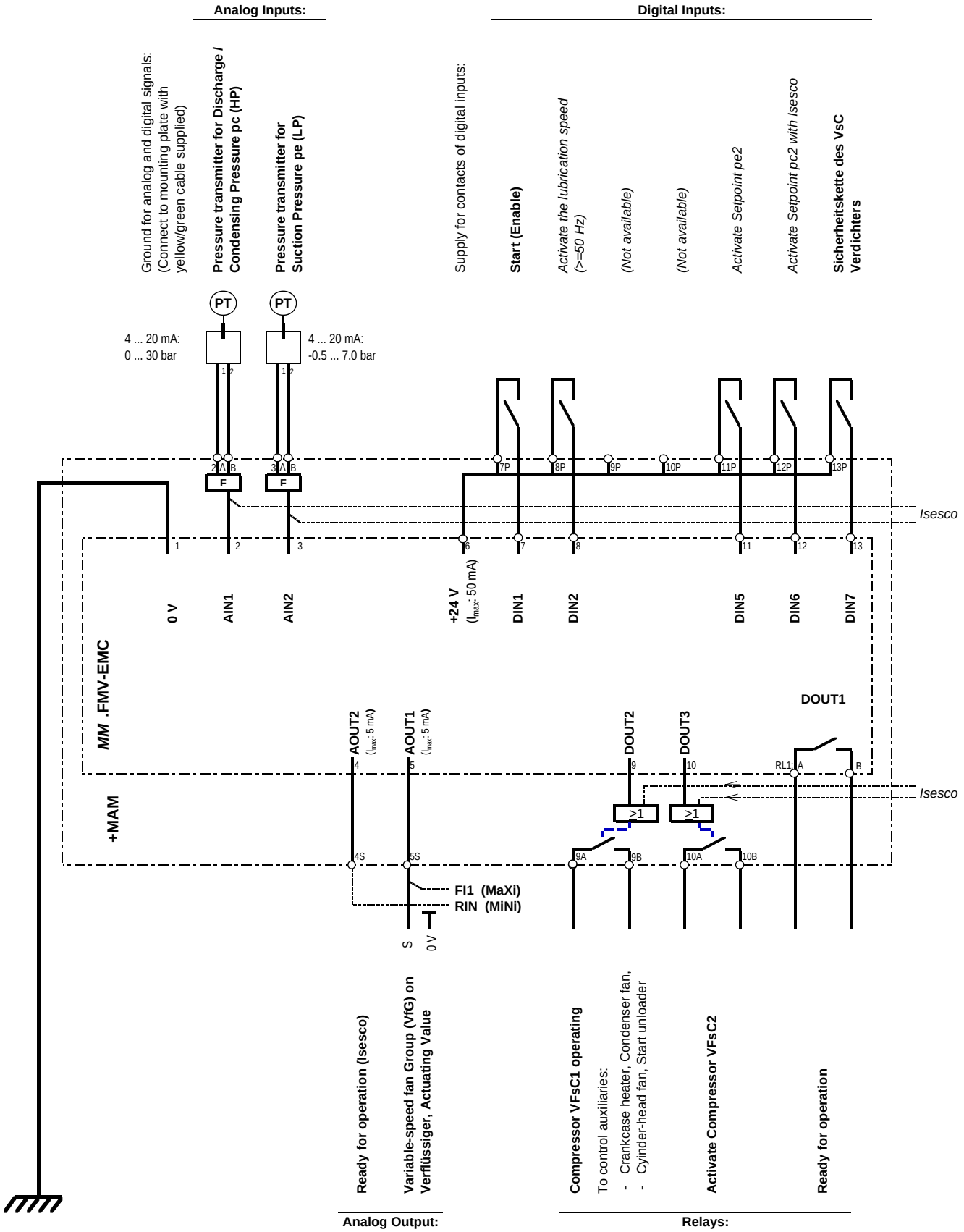
Terminals for motor protection

Terminal / Designation	Signal / Function		Explanation	Further information
X2:				
TH1A - TH1B	**Alternative a), Without processing:**		- Thermistor protection is processed in safety circuit, these two terminals must be linked	**6.2**
	Alternative b), Direct processing of motor thermistors:		- Connect motor thermistors between these two terminals	
	Alternative b), Processing an external thermistor relay:		- Connect the "normally open" contacts of external thermistor relay (e.g. KRIWAN) between these two terminals	
	Alternative b), Processing an external thermistor relay:		- Connect the "Normally open" contacts of an auxiliary relay wired to an external thermistor relay (e.g. KRIWAN) between these two terminals.	

Alternative methods of motor protection

The terminals for the connections to the thermistor motor protection are situated above the power terminals

Control connections



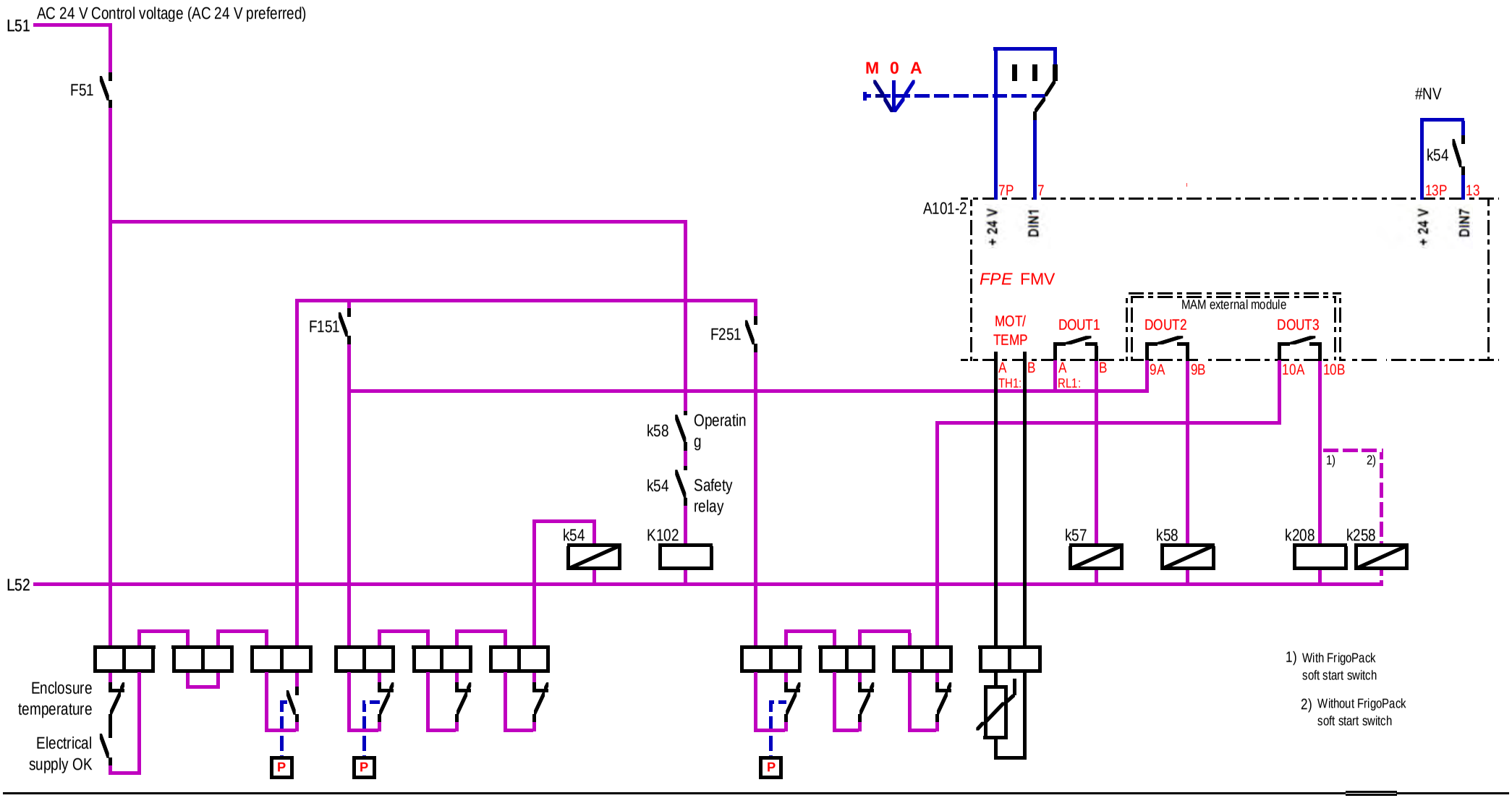
VFsC: Variable-speed Compressor

VfG: Variable-speed fan group (Condenser / Dry cooler)

Terminals for control functions

Terminal / Designation	Signal / Function	Explanation	Further information
FPE FMV:			
7	**DIN1**	**Digital Input:** **Start (Enable)** **+24 V: Start** **0 V: Controlled stop**	- Must be used:	
8	*DIN2*	*Digital Input:* *Activate Lubrication Speed (>=50 Hz)* *+24 V: Lubrication speed* *0 V: Normal operation*	- *Optional use* - *Requires external timer*	
11	DIN5	*Digital Input:* *Activate Setpoint pe2* *+24 V: Setpoint pe2* *0 V: No action*	- *Optional use*	
12	DIN6	*Digital Input:* *Activate Setpoint pc2* *+24 V: Setpoint pc2* *0 V: No action*	- *Optional use*	
13	**DIN7**	**Digital Input:** **Safety Circuit of the VsC compressor** **+24 V: Fault free (normal operation)** **0 V: Fault (immediate stop)**	- Must be used - Interrupt if there is a fault - (Required to stop inverter operation immediately)	
RL 1A **-** **RL 1**B	**DOUT3**	**Relay Output:** **"Ready" (without fault)** Closed: **Ready (no fault)** Open: **No supply, fault or alarm**	- Max load: AC 230 V / 250 VA	
MM O-FMV-MAM:				
⊥	0 V	Ground for analog signals		
2A **- 2**B	**AIN1**	**Analog Input:** **Pressure transmitter for Discharge / Condensing** **20 mA: +30.0 bar** **4 mA: 0.0 bar** **0 mA: Fault**	- Optional use - Suitable pressure transducer: - A REFR-P-TRANSD-HP30+PL - Connections: - 1 --> 2A; 2 --> 2B	
3A **- 3**B	**AIN2**	**Analog Input:** **Pressure transmitter for Suction Pressure pe (LP)** **20 mA: +7.0 bar** **4 mA: -0.5 bar** **0 mA: Fault**	- Must be used - Suitable pressure transducer: - A REF-P-TRANSD-LP7+PL - Connections: *- 1 --> 3A; 2 --> 3B*	
4S - ⊥	A0UT2	Analog Output: Internal +10 V reference	- Do not use	
5S **- ⊥**	**AOUT1**	**Analog Output:** **VfG Condenser fan, actuating value** **+10 V: 100.00 %** **0 V: 0.00 %**	- Max load: AC 230 V / 250 VA	
9A - **9**B	**DOUT1**	**Relay Output:** **"Operating"** Closed: **Starting / Operating** Open: **Inhibited / Not operating**	- To control auxiliaries such as: - Crankcase heater - Condenser fan - Start unloader - Max load: AC 230 V / 250 VA	
10A - **10**B	**DOUT2**	**Relay Output:** **Activate CC** Closed: **Activate CC** Open: **Deactivate**	- Max load: AC 230 V / 250 VA	
7P ... **13P**	**P24**	**Supply for contacts of digital inputs:**	- Max load: 10 mA	

CONTROL SECTION


AC 24 V Control voltage (AC 24 V preferred)
L51
F51
M 0 A
#NV
k54
13P
13
7P
7
A101-2
+ 24 V
DIN1
+ 24 V
DIN7
FPE FMV
MAM external module
MOT/ TEMP
DOUT1
DOUT2
DOUT3
A TH1:
B
A RL1:
B
9A
9B
10A
10B
F151
F251
k58
Operating
k54
Safety relay
K102
k54
k57
k58
k208
k258
1)
2)
L52
Enclosure temperature
Electrical supply OK
P
P
P
1) With FrigoPack soft start switch
2) Without FrigoPack soft start switch
°C, Electrical safety
External safety
Suction pressure
High pressure
Lubri-cation
Reserve
Safety relay
Safety contactor
High pressure
Lubri-cation
Motor temperature
Motor temperature
Relay Ready
Relay Operating
Motor Contactor
Safety: Compressor rack
Safety: Variable-speed Compressor 1 (VFsC1)
Safety: Fixed-speed Compressor 2 (VFsC2)
Operation: Variable-speed Compressor 1 (VFsC1)
Operation: Fixed-speed Compressor 2 (VFsC2)

FIRST-TIME POWER UP

Mounting and electrical safety:

Ensure that all recommendations in the Product Manual have been adhered to.

UL compliance where appropriate:

Ensure that all recommendations in the Product Manual for UL compliance have been adhered to.

EMC compliance:

Ensure that all recommendations in the Product Manual for EMC compliance have been adhered to.

Language selection:

The language is only relevant when the two-line keypad from the FP(E) FEP ranges are used for commissioning.

Selection of this refrigeration application:

This refrigeration application is programmed in the refrigeration application software and can only be changed in the factory.

Storing configurations and parameter changes:

Storing parameter changes is automatic.

Pressure transducers:

This refrigeration application is designed for use with the following pressure transducers.

- pe: -0.5 ... 7.0 bar	**-7.25 ... 101.53 psi**	Relative (gauge) pressure
- pc: 0 ... 30 bar	**0.00 ... 435.11 psi**	

WARNING: Only use approved pressure transducers.

Recommended basic commissioning steps:

- Verify that the power circuit corresponds to the suggestions on the following pages: 5 … 6
- In particular ensure that a safety contactor is fitted between the FrigoPack refrigeration inverter and the compressor.
- Verify that the control circuit corresponds to the suggestions on the following pages: 7 ... 9.
- In particular ensure that two isolated contacts of a safety relay are connected to the safety contactor and also to the following input of the FrigoPack refrigeration inverter: DIN7: 13P ... 13.
- Remove Start Command: DIN1: 7P ... 7.
- Connect main power supply.
- Verify that the blue LED near terminals 3A and 3B from the suction pressure transducer lights. If not, then check the wiring to the transducer.
- Verify that the red LED near terminals 2A and 2B from the discharge pressure transducer lights if fitted. If not, then check the wiring to the transducer.
- Measure the pressures with a refrigeration pressure gauge. Verify that the pressure indicated at parameters AP01: and AP03: agree with these external measurements.

Filling with refrigerant:

- Ensure that FrigoPack is not running by putting the control switch in the OFF position or by removing the connnection to DIN1 (Terminal 7) .
- Switch to LOCAL mode as follows depending on which keypad is used.

- Small keypad fitted:
- Press key 'E' until Rdy is displayed.
- Press key 'O' until a hand is displayed.

- Large external keypad used:
- Press key 'L/R'. LEDs "SEQ" and "REF" should light.

- Start the compressor by pressing the green key 'I'. After the start sequence the compressor will operate at the minimum set frequency.
- Stop the compressor by pressing the red key 'O'.
- Switch back to automatic operation on completion process by removing the electrical power, waiting until the keypad is dark, and then re-applying the electrical power.
- Reconnect DIN1 (Terminal 7) for automatic operation.

Manufacturer	Agent / Partner	Customer	Installation
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