

Variable Speed Drives OMRON/YASKAWA F7Z - series



Short manual:
**F7-series with Software for
Speed control of
compressors with
integrated compound
controller**

PED
Power Electronics Deutschland GmbH
Conradtstrasse 41
90441 Nürnberg

Tel.: +49 911 99 43 99 - 0
Fax.: +49 911 99 43 99 - 8
E-mail: info@ped-deutschland.de

Short Form F7 Refrigeration Software

Remark: This manual will be completed with be with standard manual no:
KA-CIMR_F7Z_DE_07.04

1. Function of the display unit

Display:

- Line 1 Left on top: "DRIVE"
The VSD is currently in mode "DRIVE" or "running".
- Line 2 Function displayed as text
- Line 4 Displays operating hours of comp1

MENU Pressing "MENU" Button Changes mode:

- > Drive or Running
- > Quick Start
- > Advanced Programming
- > Modified Constants
- > Auto-Tuning

UP - key
Selects Parameter and increases values

SHIFT / RESET - Key
Sets the active digit, Additional function as RESET-key

LOCAL/REMOTE - Key
Local: Control via display
Remote: Control via terminals

FWD/REV - Key
Selects the motor direction in display mode

RUN - Key
Starts the inverter



Zeile 1 Right on top VSD status:
Rdy = Ready

Zeile 3 Parameter No:
Display feedback value in Bar

Zeile 5 Displays operating hours of comp2.

Pressing "DATA / ENTER" button Changes mode:

- > Displays status and monitor screens
- > Settings of the most useful parameter
- > Settings of all Parameter
- > Settings of the changed parameter
- > Measuring of the motor data

DOWN - Key
Selects Parameter res. decreases values

ESC - Key
Returns to the status before DATA/ENTER was pressed

JOG - Key
Aktivates JOG speed in display mode

STOP - Key
Stops the inverter

2. Programming example:

Adjustment of the pressure setpoint in Parameter P1-03 from 3,0 to 4,0 Bar

Press key until text is readable:

MENU Advanced Programming

DATA/ENTER

DOWN P1-01
lower setpoint
pressure transducer

SHIFT/RESET P1-01
upper setpoint
pressure transducer

UP P1-03
Suction pressure

DATA/ENTER

UP 3.0
Pressure reference

DATA/ENTER P1-03 4.0 Bar
New pressure reference value

MENU Drive
mode

DATA/ENTER Feedback pressure
U1-91 = XX.X Bar

Remarks:

Enables access to all parameters

Both digits on the left side are blinking (e.g. A1) und show the selected parameter group
P1- blinking
Parameter group P1 has been selected

01- blinking
Parameter P1-01 has been selected

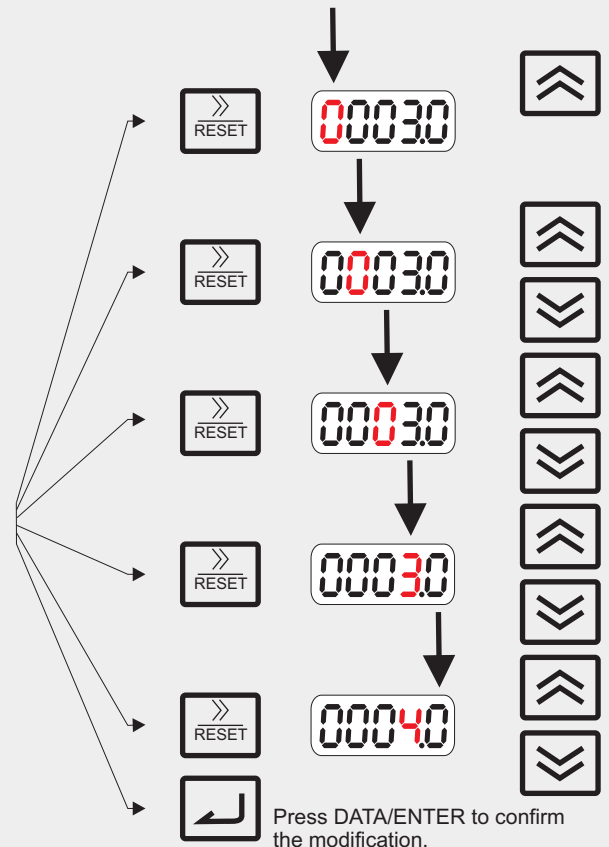
03- blinking
Parameter P1-03 ist gewählt

3.5 is blinking (as default value)
Displays value of parameter P1-03

Press "UP" and "DOWN" key to select the target value

The pressure reference value has been changed; To re-start it is necessary to select the menu DRIVE.
Press MENU to change mode.

The feedback pressure depends on the pressure in the system.





- + Input of the suction pressure in Bar
- + Display of the suction pressure in Bar
- + Integrated low pressure auto-OFF
- + Day/Night change over through digital inputs
- + Summer/Winter change over through digital inputs

Pressure transducer
e.g.: 4-20mA = 0-7Bar



Compressor controlled
by a variable speed drive



Control via output relays:

Compound control up
to 3 compressors

ADD on:

- + Numeric or
- + After working hours

Integrated Overload protection:

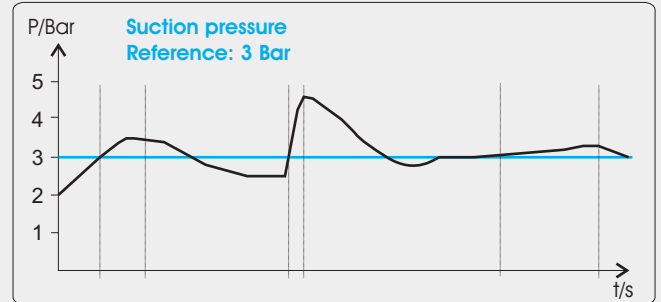
Max. Starts per hours adjustable.
Automatic change-over to the
compressor with the lowest working
hours.

Displays the working hours of:

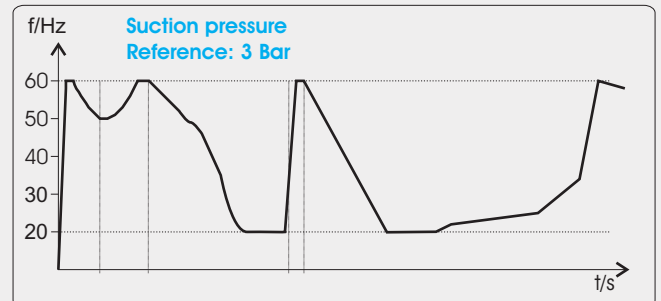
- + Inverter
- + Individual compressors



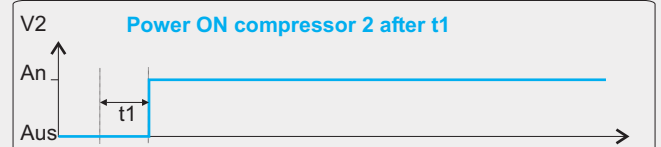
Pressure at low ambient temperatures.



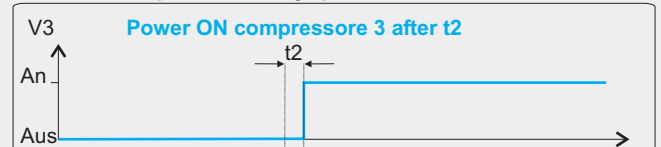
Output speed of the inverter



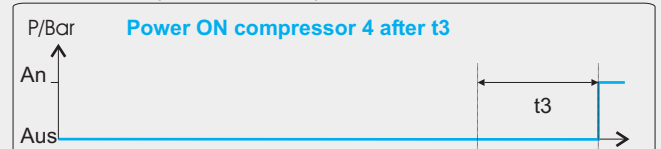
Power ON compressor 2 at normal pressure increase



Power ON compressor 3 at high pressure increase



Power ON compressor 4 at low pressure increase



The inverter is equipped with a special software. It cannot be used as a compound controller with the standard software.

Some default values were changed to simplify commissioning. Due to these changes the inverter could not work in standard applications with this software. It may trip with an error message.

Dynamic compound control:

Compressors will be activated after temperature increase:

t1: Normal ambient temperature

Compressors will be activated as per default value (10s).

t2: High ambient temperature

Compressors will be activated faster.

t3: Low ambient temperature

Compressors will be activated slower

3. Overview on all additional Parameter:

Parameter No.:	Default Value:	Range:	Change during Operation Y/N	Manual Page:			
P1-01	0	0	9999	N	S. 43	MENU	1. Press MENU key until Programming occurs and DATA/ENTER key afterwards.
						DATA ENTER	
						UP/DOWN	2. UP/DOWN key changes the parameter groups.
						RESET	3. RESET key changes into the selected SUB-menu.
P1-01	-08	-10	500	N	CASE		Pressure sensor: Low Level Determines the minimum level of the pressure transducer. DATA Input in "Bar".
P1-02	70	00	1000	N	CASE		Pressure sensor: High Level Determines the maximum level of the pressure transducer. DATA Input in "Bar".
P1-03	30	00	600	N	CASE		Pressure Reference Determines the Setpoint of the System pressure, DATA Input in "Bar".
P1-04	00	00	300	N	CASE		AUTO-OFF Pressure Determines the pressure level in the system where the inverter switches OFF automatically. DATA Input in "Bar".
P1-05	00	00	3000	N	CASE		AUTO-OFF Pressure: Time Determines the time to switch OFF depending on the settings of Parameter P01.04.
P1-06	10	00	100	J	CASE		AUTO-ON Pressure Hysteresis Determines the pressure difference in "Bar" to switch ON again automatically.
P1-07	00	00	3000	J	CASE		AUTO-ON Pressure: Time Determines the time to switch ON depending on the settings of Parameter P01.06.
P1-08	00	00	200	N	CASE		Boost-factor 1 Suction pressure This value will be added to P1-03, once a signal is given to the digital input S6.
P1-09	0	00	200	J	CASE		Boost-factor 2 Suction pressure This value will be added to P1-03, once a signal is given to the digital input S7. P1-09 has got priority against P1-08.
P1-10	25	0	250	N	CASE		OFF Pressure Compressors The compound compressors will be switched off at this pressure in the time interval adjusted in P2-01.
P2-01	0	0	3000	N	CASE		ADD ON time compressors Once the inverter is running at max. speed the compound compressors will be activated in this time interval.
P2-02	0	0	1	N	CASE		Auto-Dynamic Compound control In AUTO mode (=1) the compound compressors will be switched ON/OFF depending on the steepness of the pressure increase.
P2-03	0	0	1	N	CASE		ON-mode compressors The compound compressors will be switched ON/OFF because of the lowest working hours (=1) or in sequence (=0).
P2-04	8	2	99	N	CASE		Maximum Starts per hour For thermal protection the compound compressors will not exceeds the amount of starts per hour as per this parameter.
P2-05	0	0	1	N	CASE		Relay M1 / M2 N.C. or N.O. Determines whether the selected output relay operates as normally close (nc=1) or normally open (nc=0) relay.
P2-06	0	0	1	N	CASE		Relay M3 / M4 N.C. or N.O. Determines whether the selected output relay operates as normally close (nc=1) or normally open (nc=0) relay.
P2-07	0	0	1	N	CASE		Relay M5 / M6 N.C. or N.O. Determines whether the selected output relay operates as normally close (nc=1) or normally open (nc=0) relay.
H2-01	40	0	40	N	CASE		Relay M1 / M2 Compressor 2 In mode 40 the function of the output relay M1/M2 is used to control compressor No.: 2.
H2-02	41	0	41	N	CASE		Relay M3 / M4 Compressor 3 In mode 41 the function of the output relay M3/M4 is used to control compressor No.: 3.
H2-03	42	0	42	N	CASE		Relay M5 / M6 Compressor 4 In mode 42 the function of the output relay M5/M6 is used to control compressor No.: 4.

Remark: In case of only 1 additional compressor in the compound, it is necessary to select relay M1/M2 for controlling the 2nd compressor. In case of two additional compressors in the compound it is necessary to select M1/M2 for comp. No.: 2 and M3/M4 for comp. No.: 3. The relays not in use can be programmed to other functions or de-activated (mode=f).

Controlling by the amount of working hours or in sequence:



Maximum Starts per hour:

In case the compound compressors will be activated more times than the value in the parameter P2-04 an ALARM message will occur:
Max. Starts Compressor 1, 2 or 3. If this happens the next compressor will be activated through an output relay. Once the amount of starts per hour is underneath this setting the compressors will be activated again in case it is needed.

Relay function Normally Closed (NC) or Normally Open (NO)

Depending on the configuration of the output relays it is possible to select the mode of the output relays. The relays are specified for either 24VDC, max. 1A or 230V/AC, max. 1A. The contacts do have a purely control function.

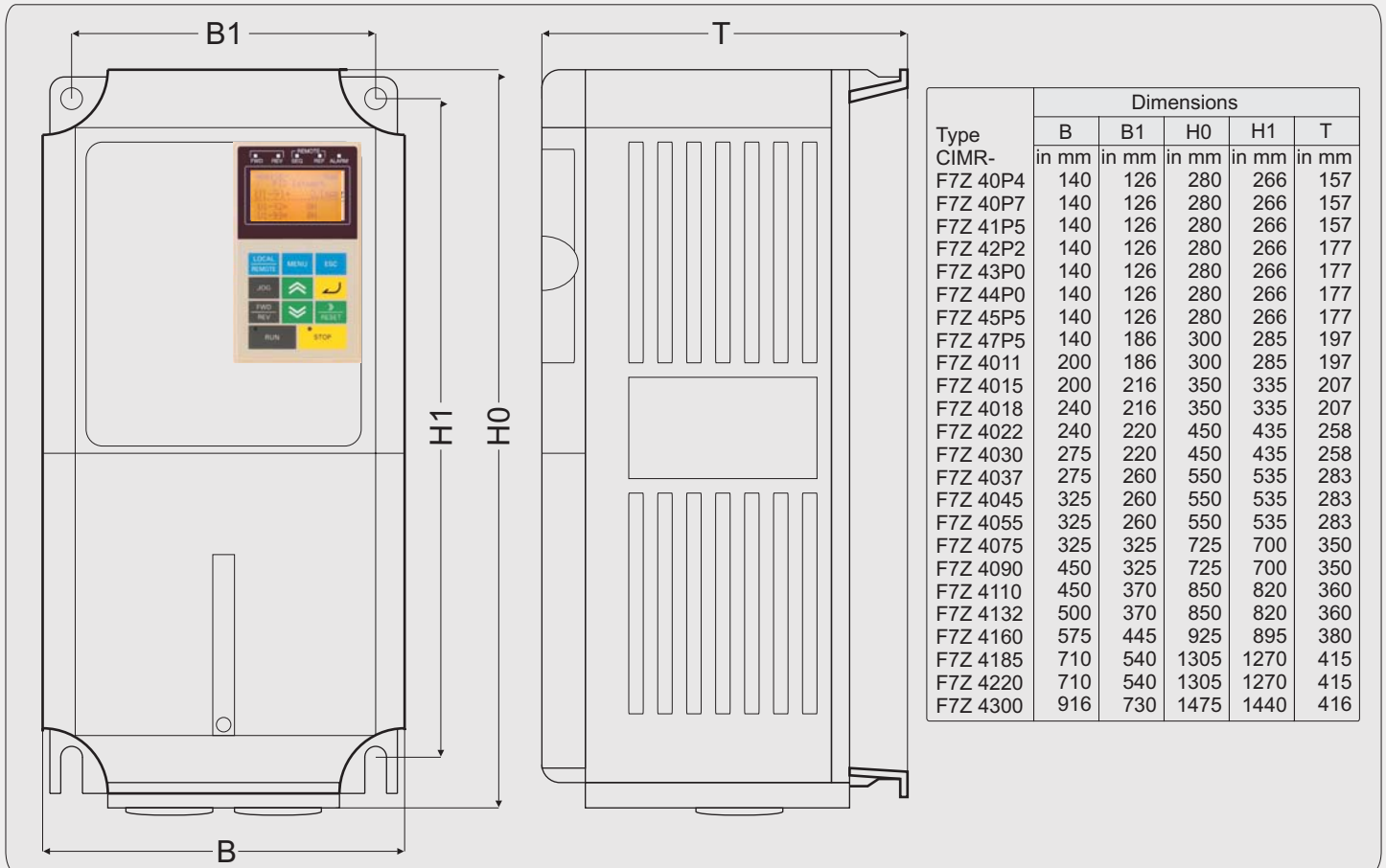
4. Standard-parameter different from the default values

Parameter No.:	Default Value:	Range: min. max.	Change during Operation Y/N	Manual Page:			
P1-01	0	0 9999	N	S. 43			
<p>1. Press MENU key until Programming occurs and DATA/ENTER key afterwards.</p> <p>2. UP/DOWN key changes the parameter groups.</p> <p>3. RESET key changes into the selected SUB-menu.</p>							
b1-01	5	0 5	N	S. 11	Reference source	Determines the reference: Mode 5=Refrigeration-Software Mode 0=Display; Mode 1=Analogue Input at the terminals.	
b1-02	5	0 5	N	S. 11	Command source	Determines Start/Stop command: Mode 0 Start/Stop via Display; Mode 1 Terminals; Mode 5 Refrigeration-Software.	
b1-03	1	0 1	N	S. 11	Stop mode	Determines whether the motor decelerates (Mode 0) or makes a spin Stop (Mode 1) in case of a Stop command.	
b5-01	1	0 4	N	S. 13	Mode PID Loop	Aktivates the internal PID-Loop for speed control with a feedback signal via analogue inputs.	
b5-02	3	000 2500	J	S. 13	Proportional-gain	Sets the proportional gain of the PID loop as a factor.	
b5-03	2	00 3600	J	S. 13	Integration-time	Determines the integration time of the PID loop in seconds.	
b5-09	1	0 1	N	S. 13	PID invers	In Mode 1 the PID output signal is invers. A pressure increase determines also an increase of the output speed.	
c1-01	3	00 6000	J	S. 15	Acceleration time	Determines the acceleration time from 0 Hz to the max. output frequency.	
c1-02	3	00 6000	J	S. 15	Deceleration time	Determines the deceleration time from the maximum output frequency to 0Hz.	
d2-02	50	00 100	N	S. 19	Lower Frequency limit	Determines the lower limit of the output frequency in percentage of the maximum output frequency.	
e1-03	b	0 f	J	S. 21	V/Hz Curve	Modus b = 60Hz, High starting torque requirement Modus 9 = 50Hz, High starting torque requirement	
e2-01	8888	00 8888	N	S. 22	Motor current	The rated motor current is used as an internal reference to calculate a thermal model of the motor for protection.	
H3-09	b	0 f	N	S. 30	Funktion Analogue Input A2	Mode "b" determines analogue input A2 as the feedback pressure source.	
01-01	51	4 51	N	CASE	Select display mode	Determines the display setting. Mode 91 is a special parameter to show the pressure in the system.	
01-02	4	1 4	J	S. 35	Display mode after Power ON	Determines the display mode after power ON. This line will be enlarged.	

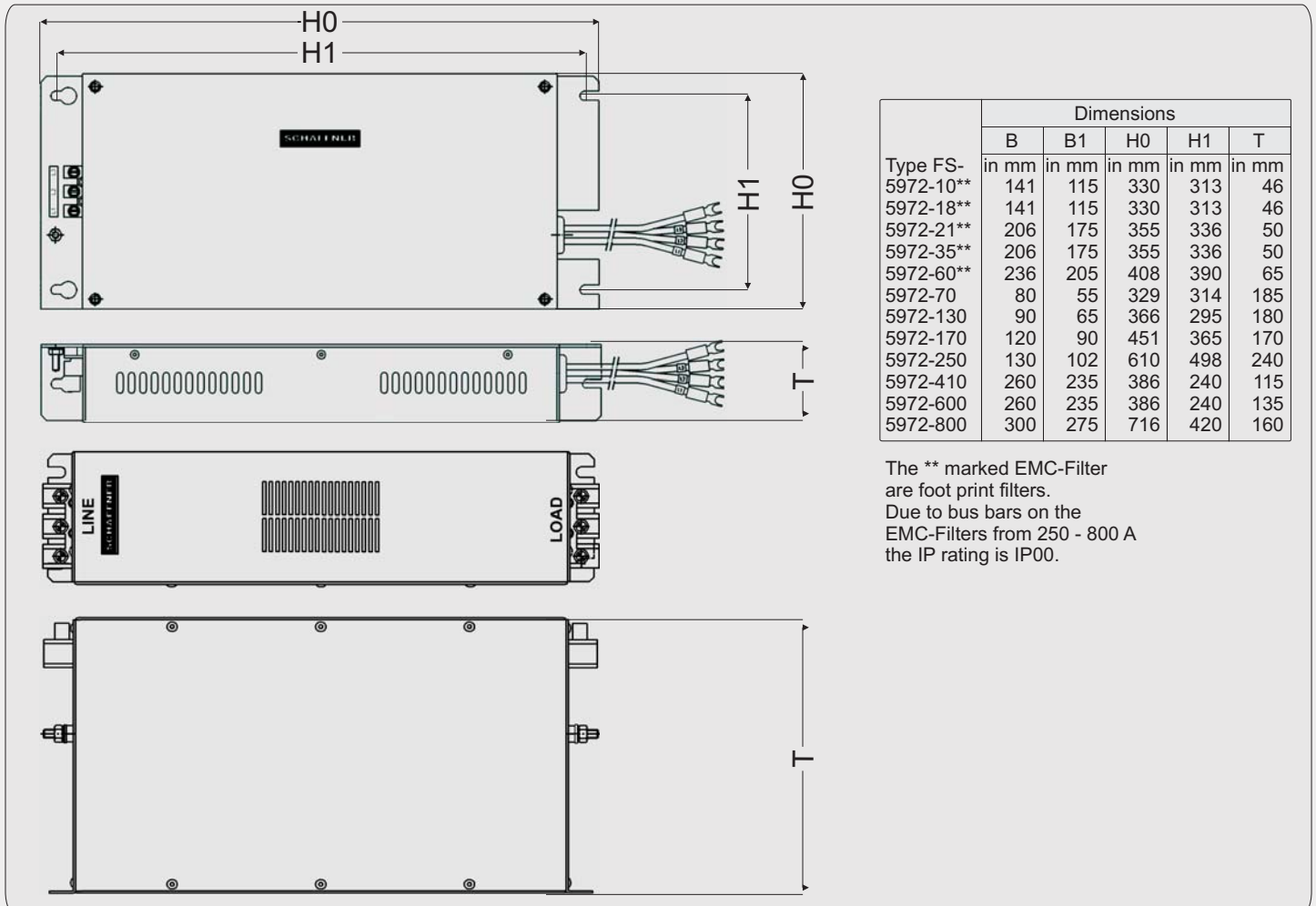
5. The most important monitor screens

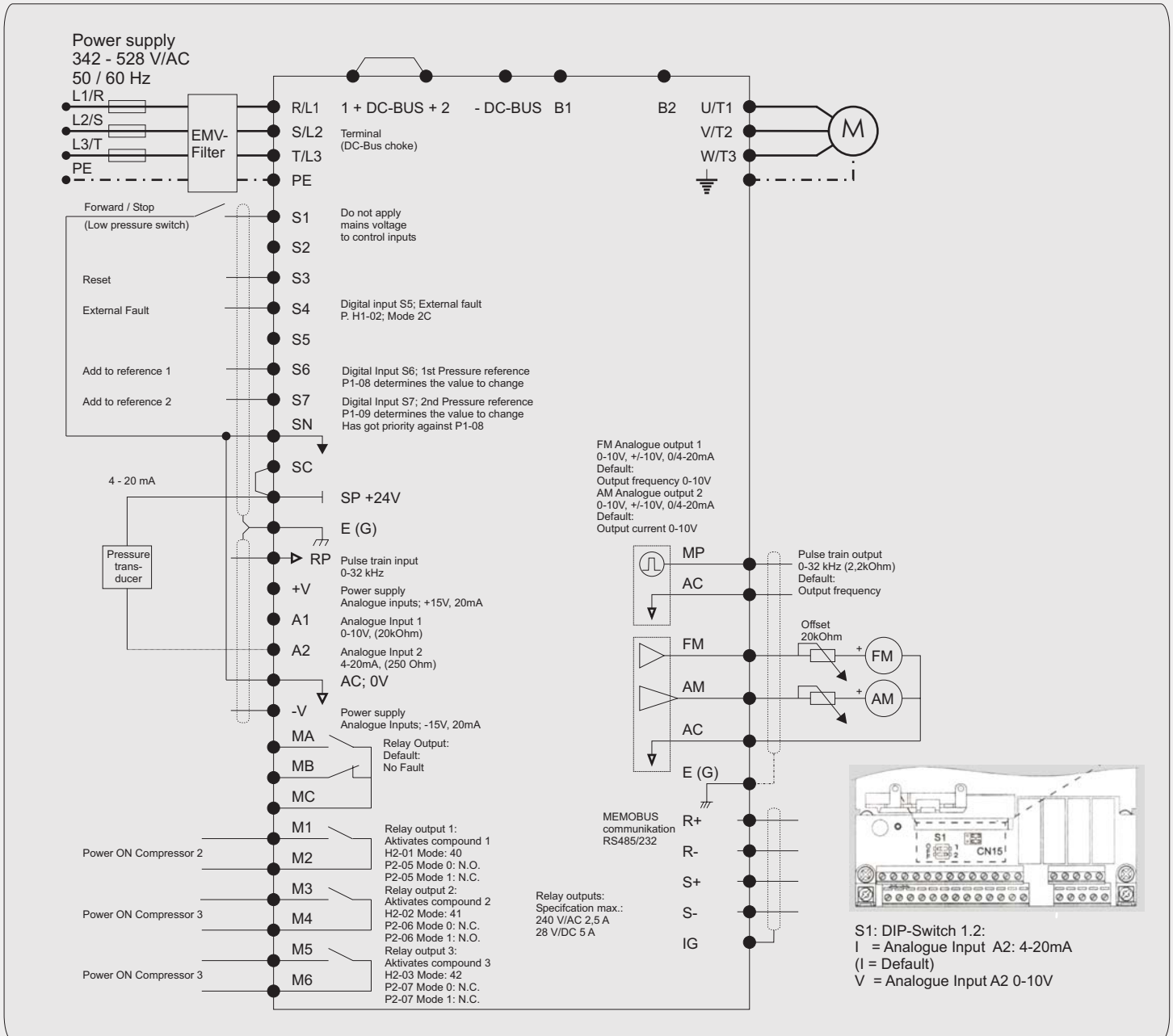
Monitor No:	Unit:	Manual page:	Further Monitor functions are described in the manual of the frequency inverter.			
U1-01		S. 43				
<p>1. MENU Button and DATA/ENTER changes to Drives mode.</p> <p>2. UP/DOWN button changes between U1-01 and U1-94</p> <p>3. Button > / RESET changes between U1-XX, U2-XX and U3-XX</p>						
U1-01	Hz	S. 43	Reference-frequency	Displays the reference frequency in Hertz. Without function in the refrigeration software.		
U1-02	Hz	S. 43	Output-frequency	Displays the output frequency in Hz. .		
U1-03	A	S. 43	Ausgangsstrom	Displays the output current of the inverter in Amps..		
U1-07	V	S. 43	DC-bus Voltage	Displays the voltage in the DC-bus. Input voltage = U/DC * 1,414		
U1-10		S. 43	Status Inputs	Displays status of the Multi-function-inputs:		High signal at S1. All others are not active.
U1-11		S. 43	Status Ausgänge	Displays status of the Multi-function-outputs:		Fault relay MA/MB-MC is active. M1/M2 is ON; M3/M4 & M5/M6 are OFF
U2-01	Code	S. 43	Fault analysis Last fault	Screens U2-01 to U2-14 display the status of the inverter in the moment where it has tripped last time.		
U3-01	Code	S. 43	Fault memory last 10 faults	Stores the last 10 failure codes and the hours when the inverter has tripped because of a fault..		
U1-90	Bar	S. 43	Reference pressure in Bar	Displays the pressure reference in Bar as per parameter P-03.		
U1-91	Bar	S. 43	Pressure value in Bar	Displays the pressure in the system.		
U1-92	h	S. 43	Hour meter 1 & 2	The monitor screen U1-13 displays the working hours of the inverter. U1-92 displays the working hours of relay M1/M2.		
U1-93	h	S. 43	Hour meter 3	U1-93 displays the working hours of the output relay M3/M4.		
U1-94	h	S. 43	Hour meter 4	U1-94 displays the working hours of the output relay M5/M6.		

6. Frequency inverter, dimensions



7. EMC-Filter, dimensions





Specification of the In- and Outputs

Supply voltage tolerance:	380 to 480 V/AC; -15% to + 10%
Mains frequency tolerance:	50 to 60 Hz; +/- 5%
Control method:	Sinus-Wave PWM (Closed loop or Open Loop Vector control, V/Hz with/without Feedback)
Frequency range:	(For constant torque applications) 0,01 to 150 Hz.
Frequency accuracy:	+/- 0,2 % Open Loop Vector (25°C; +/- 10K)
Frequency setting resolution:	Digital reference: 0,01Hz; Analogue: 0,025 Hz at a max. Frequency of 50 Hz (11 bit plus sign)
Output frequency resolution:	0,01 Hz
Frequency setting signals:	0/4 to 20 mA (250 Ohm); 0-10 V (20 kOhm); +/-10 V (20 kOhm)
Acceleration / Deceleration time:	0,01 to 6000 s (4 selectable combinations of indepenend ramp rates).
Braking torque:	Approx. 20 % without; Approx. 125 % with braking resistor; Built in chopper up to 18,5 kW
V/Hz - mode:	customized settings possible
Overload protection:	150% rated inverter current for 60s
DC-bus voltage:	380 V/DC to 820 V/DC; Inverter will trip once these settings are exceeded.
Momentary power loss ride through:	Selectable: Trip with alarm or continue to run.
IP-rating:	IP20 to 18,5 kW; IP00 to 300 kW
Ambient operating humidity:	Maximal 95% (without condensation)
Ambient temperature:	von -10° to +40° C
Storage temperature:	von -20° to +60° C
Application site:	Indoor (no corrosive gas or dust)
Altitude:	Max. 1000m
Vibration:	Max. 9,8 m/s ² (1g) from 10 to 20 Hz; Max. 2 m/s ² (0,2g) from 20 to 50 Hz

Technical data

Inverter type: Yaskawa CIMR F7Z-series

	Input			Output				EMC-Filter				
	Power	Fuse	Voltage	Current	I max for 60s	Power	Losses	Weight	Dimensions	Name	Weight	Dimensions
Typ CIMR-	in kVA	in A	in V	in A	in A	in kW	in W	in kg	W x H x D (mm)		in kg	W x H x D (mm)
F7Z 40P4	1,4	10	400	1,8	2,7	0,75	53,0	3,0	140x280x157	**FS-5972-10-07	1,1	141x330x46
F7Z 40P7	1,6	10	400	2,1	3,2	1,10	58,0	3,0	140x280x157	**FS-5972-10-07	1,1	141x330x46
F7Z 41P5	2,8	10	400	3,7	5,5	1,50	84,0	3,0	140x280x157	**FS-5972-10-07	1,1	141x330x46
F7Z 42P2	4,0	16	400	5,3	8,0	2,20	115,0	4,0	140x280x177	**FS-5972-10-07	1,1	141x330x46
F7Z 43P0	5,8	20	400	7,6	11,4	3,70	148,0	4,0	140x280x177	**FS-5972-10-07	1,1	141x330x46
F7Z 44P0	6,6	25	400	8,7	13,0	4,00	161,0	4,0	140x280x177	**FS-5972-18-07	1,3	141x330x46
F7Z 45P5	9,5	36	400	12,5	18,7	5,50	209,0	4,0	140x280x177	**FS-5972-18-07	1,3	141x330x46
F7Z 47P5	13,0	36	400	17,0	25,5	7,50	307,0	6,0	200x300x197	**FS-5972-35-07	2,1	206x355x50
F7Z 4011	18,0	50	400	24,0	36,0	11,00	410,0	6,0	200x300x197	**FS-5972-35-07	2,1	206x355x50
F7Z 4015	24,0	63	400	31,0	46,5	15,00	498,0	10,0	240x350x207	**FS-5972-60-07	4,0	236x408x65
F7Z 4018	30,0	63	400	39,0	58,5	18,50	634,0	10,0	240x350x207	**FS-5972-60-07	4,0	236x408x65
F7Z 4022	34,0	80	400	45,0	67,5	22,00	725,0	21,0	275x450x258	FS-5972-70-52	3,4	80x329x185
F7Z 4030	46,0	100	400	60,0	90,0	30,00	995,0	21,0	275x450x258	FS-5972-70-52	3,4	80x329x185
F7Z 4037	57,0	125	400	75,0	112,5	37,00	1144,0	36,0	325x550x283	FS-5972-100-35	4,5	90x326x150
F7Z 4045	69,0	150	400	91,0	136,5	45,00	1316,0	36,0	325x550x283	FS-5972-130-35	4,7	90x326x150
F7Z 4055	85,0	150	400	112,0	168,0	55,00	1698,0	36,0	325x550x283	FS-5972-130-35	4,7	90x366x180
F7Z 4075	110,0	200	400	150,0	225,0	75,00	1974,0	88,0	450x725x348	FS-5972-170-35	6,0	120x451x170
F7Z 4090	140,0	250	400	180,0	270,0	90,00	2285,0	89,0	450x725x348	FS-5972-250-35	11,7	130x610x240
F7Z 4110	160,0	300	400	216,0	324,0	110,00	2950,0	102,0	500x850x358	FS-5972-250-03	11,7	230x300x125
F7Z 4132	200,0	400	400	260,0	390,0	132,00	3390,0	120,0	500x850x358	FS-5972-410-99	10,5	260x386x115
F7Z 4160	230,0	400	400	304,0	456,0	160,00	3938,0	160,0	575x916x378	FS-5972-410-99	10,5	260x386x115
F7Z 4185	280,0	500	400	370,0	585,0	185,00	4609,0	160,0	710x1305x415	FS-5972-410-99	10,5	260x386x115
F7Z 4220	390,0	630	400	506,0	759,0	220,00	5277,0	160,0	710x1305x415	FS-5972-600-99	11,0	260x386x135
F7Z 4300	510,0	800	400	675,0	1.012,5	300,00	8158,0	160,0	916x1475x416	FS-5972-800-99	31,0	300x716x160
										** Footprint-filter		

Caution: The max. current of the Compressor should be less than the rated current of the inverter.

Notes:

This short manual does not replace the original manual.
 All settings are recommendations based on our experience in field applications.
 Due to individual adjustments on site, some or other Parameter may differ.
 Date: 02. February 2006; SF_F7_PED21_E_A4.CDR