CAP 836 Service Manual APRIL, 2019 Rev. D





iCommand – Basic Controller

# Service Manual



WARNING



Personal injury and/or equipment damage will be result by failing to pay attention to the vital safety information and instructions in this manual. Carefully read, understand, and retain all safety information and instructions before operating this compressor.

## Operating instructions FSCurtis iCommand – Basic

Software version: V1.81 (Hardware version)

#### Note: Version information on the Back of Controller

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#### Note:

All information provided is up to date with the current development level. Changes may be made at any time without prior notification. We accept no liability for printing mistakes. This document replaces all older versions.



#### Information on these operating instructions

These instructions enable you to use the machine safely and efficiently. The instructions are a component part of the machine and must be accessible for staff at all times.

Staff must have carefully read and understood these instructions before starting all work. The basic prerequisite for safe working is compliance with all the safety instructions and instruction for actions included in these operating instructions.

The local occupational health and safety regulations and general safety rules for operational area of the machine also apply.

The instructions for the machine do not cover operation of the controller. Therefore, the instructions and content of the instructions for the controller in question must also be taken into account.

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The manufacturer assumes no liability for damages caused by:

- Failure to adhere to these instructions
- Improper use
- Use of unqualified staff
- unauthorized conversions
- Technical modifications
- Use of non-approved spare parts

The actual scope of supply may differ from the descriptions and illustrations in these instructions in the case of special designs, the inclusion of additional ordering options or as a result of the latest technical modifications.

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#### **Customer service**

Our Technical Support department is available to provide technical information.

In addition, our employees are always interested in receiving new information and hearing of your experiences from usage which could be valuable for the improvement of our products.



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## 1.0 Safety notices

The iCommand-Touch is equipped with a color graphic display with a touch screen.

BEFORE BRINGING THE CONTROL SYSTEM INTO OPERATION, YOU MUST READ THE FOLLOWING OPERATING INSTRUCTIONS!

- 1. Only trained specialist staff is permitted to bring the control system into operation, undertake parameter settings and maintain it. This applies when changing batteries in particular.
- Environmental conditions for storage: Ambient temperature range (storage) 32 to 131°F Humidity (storage) max. 60%; noncondensing
- Environmental conditions during operation: Ambient temperature range (operation) 37 to 113°F Humidity (during operation) max. 60%; noncondensing
- 4. FSCurtis retains the right to make changes, additions or improvements to this product (hardware and software). This does not imply any duty to update any devices already supplied.
- 5. Display: the life expectancy of the display is strongly dependent on the environmental conditions. Protect the control system against direct sunlight and high temperatures so that you can benefit from the high quality of the display for as long as possible!



### 2.0 **Control function and connection (hardware)**



**2.1 Overview** Fig. 1: Key pad and display of the ICommand-Basic.

The control consists of the following function blocks:

- **a)** Micro processing logic (with EEPROM memory for data security) for all control, monitoring and display functions
- b) Keypad with 6 keys for switching the compressor on and off, as well for entering of target and limit values
- c) Customized, LCD display to show the current actual/target values and the operational state, as well as faults / warnings.
- d) Analog processing of discharge pressure, compressor temperature and oil temperature
- e) Digital inputs/outputs to control the compressor
- f) RS-485 connection to control the frequency converter

#### Micro-processing logic

- 16-bit CISC Micro controller with Watchdog
- 256 KByte Flash EPROM,
- 20 KByte RAM,
- 8 KByte EEPROM (for data security),



#### Display and keyboard

The control is equipped with a customized keypad (see Figure 1) with 6 buttons (with pressure points) and two integrated LEDs (green, red). THE display has the following data

(See Figure 2):

- LCD customized, multi-color with about 3 inch \* 1.7inch display surface
- 7-Segm.A => 3 digit 7 segment display
- 7-Segm.B => 3 digit 7 segment display
- 7-Segm.C => 8 digit 7 segment display
- Units: %, °C, °F, K, bar, psi, MPa, min, m<sup>3</sup>/h, s, h
- Additional symbols (in part in color) for: Faults, warnings, frequency converter, motor, solenoid valve, heating, ventilation, remote (remote operation), restart, automatic (operating types)

#### Inputs and outputs

3x Analog inputs - galvanically separated, sensor voltage 24 VDC

- 1 Input 4-20mA (discharge pressure)
- 2 Inputs for temperature sensors (PT1000)

8x Digital inputs galvanically separated, sensor voltage 12 VDC and 24 VDC;

- 7 Normal inputs
- 1 Input for PTC temperature sensors
- 7 Digital outputs:
- 6 Relay outputs, closer with resp. connection, 250 VAC 6A,
- 1 Relay output, two-way contact, 250Vac, 6A;

#### Interfaces

- RS-485 interface (standard)
- RS-485 interface (control FU / optional)
- MK200 Bus module (optional)
- Analog piggyback board (optional)



## 2.2 ICommand-Basic terminal assignment

Pin	Designation	Function	Plug
1	PE	Functional earth (EMC)	Phoenix
4	0V AC		MINI-COMBICO
5	18V AC 24V AC	Supply for control	N pitch 3.81 mm, 3-pole
6	Relay output A 1 – A 6 COM	Common connection for terminal 7 to 12	Phoenix COMBICON
7	Relay output A 1	Main contactor	MSTBA pitch
8	Relay output A 2	Star contactor	5.0 mm
9	Relay output A 3	Delta contactor	
10	Relay output A 4	Solenoid valve (with varistor)	
11	Relay output A 5	Cooling fan	
12	Relay output A 6	Condensate valve (with varistor) Otherwise: * Heater / Dryer (with varistor)	
13	Relay output A 7 NC		Phoenix
14	Relay output A 7 Common		COMBICON
15	Relay output A 7 NO	Collective fault	MSTBA pitch 5.0 mm 3-pole
16	PE	Screen connection	Phoenix
17	GND	Ground for analogous inputs AE 2 and AE 3	MINI-COMBICO N pitch 3.81 mm,
18	Analogue input AE 3	PT1000 (compressor temperature)	6-pole
19	Analogue input AE 2	PT1000 (dew point temperature)	
20	Analogue input AE 1	4 – 20 mA (discharge pressure)	
21	24V DC	limit switch voltage for AE 1	
22	Dig. Input E 8	LLC: Load/idle run	



## **Control functions and connection**

23	Dig. input E 7	Remote In/Out or LLC Ok	Phoenix MINI-COMBICO N pitch 3 81 mm
24	Dig. input E 6	Emergency off	
25	Dig. input E 5	Diff. pressure oil precipitator	10-pole
26	Dig. input E 4	Direction of rotation fault	
27	Dig. input E 3	Overpressure	
28	Dig. input E 2	Overcurrent	
29	Dig. Input E 1 (PTC)	Motor temperature	
30	12V DC	Limit switch voltage 12V DC (PTC)	-
31	24V DC	Limit switch voltage 24V DC	
32	GND		Phoenix
33	RS-485 B(-)	DC 195 Standard	MINI-COMBICO
34	RS-485 A(+)	KS-405 Standard	N pitch 3.81 mm,
35	Not in use		4-pole
36	SIG-B		Phoenix direct plug
37	SIG-A		ZEC1.5/5-ST-5.0
38	GNDX	Interface for MK200	5-pole
39	0V AC Bus module supply	Bus module	
40	18V AC Bus module supply		
44	GND		Phoenix
45	RS-485 B(-)		MINI-COMBICO
46	RS-485 A(+)		IN pitch 3.81 mm,
47	Not in use		

Important: Ensure the "A2, A3, A5, A6" relay outputs are assigned correctly!!!





## 3.0 Operation of the ICommand-Basic

## 3.1 Assignment of keys

There are six keys/buttons available with different functions:

	: Editing target values/limit values/codes
ENTER	: Apply the edited value in the current variable
INFO	: <b>In the basic display:</b> Display of the most important settings: by pressing the info button several times and scrolling is done through the following parameter lists.

Display of	f the bottom row	Parameter
1	###	Switch-on pressure
2	###	Switch-off pressure
3	###	Safety pressure
4	###	Minimum pressure/LLC
5	41	Min. compressor temperature
6	230	Max. compressor temperature
7	#####	Hours of operation
8	#####	Load hours
9	#####	Remaining time air filter
10	#####	Remaining time oil filter
11	######	Remaining time oil separator
12	######	Remaining time motor lubrication
13	<del>#####</del>	Remaining time oil
14	#####	Annual maintenance time remaining
15	#####	Dryer time remaining



<b>O</b> (1)		If compressor is ON:	Switches the compressor off		
		After occurring fault:	Confirming the fault message (= RESET button)		
	(2)	Button pressed for more than (only possible if system is OF	3 seconds: Initiated code input F);		
I		: Switches the compressor	on;		
<red led=""></red>		: Flashes during warnings/maintenance; continuous light during faults;			
<green led=""></green>		: Operating mode display (lights the compressor is expected to s	up, if the compressor is switched on/ flashes, if start at any time.		

## 3.2 Basic display representation on the LCD of the operating display unit



Figure 2: All segments of the customized LCD.

Top:

- 7 Segment display ( "7-Segm.A" )
- Symbols for MPa, psi, bar
- 7 Segment display ( "7-Segm.B" )
- Symbols for %, °C, °F, K,
- Digits 1 to 7

#### Centre:

- Tool = Fault
- Symbols for warnings/maintenance, frequency converter, motor, solenoid valve, heating, ventilation, restart, automatic, remote in part colored!

Bottom:



- 7 Segment display ( "7-Segm.C" )
- Symbols for h, min, s, m<sup>3</sup>/h, %



Basic display



Figure 3: Basic display while compressor is in operation (load run: motor in operation, control valve open).

In the basic display, the following data can be displayed:

7-Segm.A: Current discharge pressure (in the example 7.2 bar)

7-Segm.B: Current compressor temperature (in the example 60°C)

Via the 7 button the current temperature of the second temperature sensor can be displayed (dew point temperature). After the value, 'T2' appears and is used to identify.

7-Segm.C: During fault/warning Number of current fault or warning and corresponding fault/warning text (abbreviation, 5 characters). On activated automatic restart after power failure, the expired delay time is shown here. A just expired shutdown or stopping time will also appear here.

#### 3.3 Code input

In order to be able to change parameters, a code must be entered. This code (customer code, service code or SERVICE code) determines which values can be edited.

Entering a code is only possible when the compressor is switched off.

The input mask for the code appears once the Off button (O) is pressed for about three seconds (see illustration 3).



Figure 4: Code input



Using the arrow keys the respective code can be entered. With the ENTER key, the code is confirmed, using the 0 key the input is deleted and a switch to the basic display is performed.

The following codes are available:

Code	Authorization	Subsequent display
00001	Customer code	Display of the first menu item of the customer menu
03846	Service code	Display of the first menu item of the service menu

#### Variable factory codes

The factory code is variable after commissioning. To obtain the currently valid factory code, the second parameter should be read in menu item (code level) 9999. It contains a random number to generate a temporary valid factory code. The factory code allows access to all menu items for 24 hours.



Figure 5: Display after entering and confirming the customer code. Upper row: Code 1 - below Menu item (code level) 2.



### 3.4 Menu system - Parameter inputs

All setting parameters can be changed by selecting the respective menu item (code level). For this, the correct code must be entered (see section 3.3). Subsequently you can scroll with the arrow keys in the menu items in the selected menu. With the Enter button, a menu item is selected (see Figure 6).



#### Figure 6: Operating mode: Menu item (code level) 2, first parameter

Each menu item code level may contain one or several parameters. This is indicated by green numbers. Using the Enter key scrolling in the parameters is possible. If a value can be edited then it flashes and can be changed using the arrow keys. Using the Enter key a new value can be accepted and using the 0 key it can be deleted.

Using the 0 key the current menu item or the menu can be exited.

Note: The values, which are displayed in the basic display via the Info key, cannot be changed. They can be found in all menus (customer, service, and factory) under menu item 11.

				Access with code			
Menu item (Code level)	Content	Description in section	Without code	Customer	Service	Plant	
0	Display: FSCurtis	-	~	-	-	-	
2	Operating mode	3.5.1	Display only	*	~	~	
3	Automatic restart	3.5.2	Display only	*	~	~	
5	Heater / Fan / Dryer	3.5.3	Display only	-	-	~	
8	On-site/remote	3.5.4	Display only	*	~	~	
11	Operating Parameter: Pressure limits	3.5.5	-	v	~	r	



18	LLC operation	3.5.6	Display only	2	~	~
21	Acknowledge reset approval of maintenance intervals		-	-	~	r
30	Display fault memory	3.5.7	~	~	~	~
40	Edit dryer maintenance interval (only for "Combi with Dryer")	3.5.8	Display only	۲	~	۲
41	Edit air filter maintenance interval	3.5.8	Display only	-	~	~
42	Edit oil filter maintenance interval	3.5.8	Display only	-	~	~
43	Edit oil separator maintenance interval	3.5.8	Display only	-	~	~
44	Edit motor lubrication maintenance interval	3.5.8	Display only	-	۲	۲
45	Edit oil maintenance interval	3.5.8	Display only	-	~	r
46	Edit yearly maintenance interval		Display only	-	~	~
51	Edit idle mode/stop time, ramp-up time	3.5.9	Display only	-	-	~
60	Type selection System type, pressure range, delivery volume	3.5.10	Display only	-	-	r
62	Select pressure range	3.5.10	Display only	-	-	۲
65	Parameter for condensate valves (only for "Combi with Dryer")	3.5.11	Display only	-	۲	۲
69	Delivery volume (m³/h)	3.5.10	Display only	-	-	~
75	FC: Set regulating parameters	3.5.12	Display only	-	-	~
80	Selection: Without/with dryer (only for "Combi with dryer")	3.5.13	Display only	-	-	۲
88	Reset to factory settings	3.5.14	-	-	-	~
90	Pressure display in bar/MPa/psi	3.5.15	Display only	~	~	~
95	Temperature display in °C / °F/ K	3.5.16	Display only	~	~	~
105	Correction factor, pressure Correction factor, temperature(s)	3.5.17 3.5.22	Display only	-	r	r
111	Start commissioning sequence (only for frequency-regulated systems!)	4.0	~	-	-	-
130	Delete fault memory	3.5.7	-	-	~	~



255	Additional activate MK200-module	3.5.23	~	-	-	_
3846	Change Service code"	3.5.24	-	-	-	4
9900	Cleanup hours of operation / load release		-	-	-	2
9919	Edit operating/loaded hours		-	-	-	2
9929	Edit operating/loaded hours (+/- 1000)		Display only	-	-	*
9950	Edit RS485 address, mode, Baud rate, protocol, data format	3.5.18	Display only	-	v	~
9960	Select the type of the FC that is in use	3.5.19	Display only	-	~	۲
9980	Call EA test	3.5.20	Display only	-	r	~
9999	Display program version + display random number for plant code	3.3	r	r	r	~

#### 3.5 Menu item

#### 3.5.1 Operating mode

The operating mode is set via menu item 2.

Menu item (code level) 2					
Parameter no.	Meaning	Value range			
1	Operating mode	0 = AUTOMATIC 1 = LOAD/IDLE RUN			

If the "AUTOMATIC" operating mode is selected then this is displayed via the "Auto" symbol".



#### **3.5.2** Automatic restart after power failure

The automatic restart after power failure is set via menu item 3. On the effects on the process, see also section 4.8.

Menu item (code level) 3			
Parameter no.	rameter no. Meaning Value range		
1	Automatic restart after power failure	0 = Restart OFF 1 = Restart ON	

If restart is activated then it is indicated by the "Restart" symbol.

## 3.5.3 Additional heater, fan, dryer

The parameters in menu option 5 differ according to compressor type. On the effects on the process, see also section 4.6.

#### Heater I fan I dryer

Menu option (code level) 5			
Parameter No.	Meaning	Value range	
1	"Heating" function	0 = Without heating1 = Additional heating by comp. temp.2 = Additional heating by oil temperature	
2	Activation temperature for heating(ON, when temperature Š ##°C)	36 to 171°F	
3	Deactivation temperature for heating(OFF, when temperature > ##°C)	41 to 176°F	
4	"Recirculation" function	0 = recirculation OFF 1 = recirculation ON	
5	"With fan" function	0 = without fan 1 = with fan	



6	Activation temperature for fan (ON, when compressor temp. > ##°F)	50 to 194°F
7	Deactivation temperature for fan (OFF, when compressor temp. < ###°F)	50 to 176°F
8	Fan min. temperature	104 to 158°F
9	Fan max. temperature	158 to 202°F
10	With Dryer" function	0 = without dryer, 1 = with dryer
11	Dryer switch-on temperature	36 to 68°F
12	Dryer switch-off temperature	32 to 50°F
13	Min. deactivation time, dryer (before being switched on again)	30 to 180s

<u>Note</u>: If the "heating" is deactivated (Par. 1 = 0), the corresponding output is no longer controlled.

In this case the two parameters for the activation/deactivation temperature (Par. 2+3) are also hidden. If the "fan" is deactivated (Par. 5 = 0), the two parameters for the activation/deactivation temperature (Par. 6+7) are hidden. If the "dryer" is deactivated (Par. 8 = 0), Parameters 9 + 10 + 11 are hidden (see also Point 4.6).

#### 3.5.4 On-site operation, remote operation, feedback "LLC OK"

Menu item (code level) 8			
Parameter no. Meaning Value range			
1	On-site operation, remote operation	0 = on-site operation 1 = remote operation 2 = LLC-OK	

#### Remote control

ON, if terminal 23+31 = closed and on-site start button "I key" pressed,

OFF, if terminal 23+31 = open or via stop button "0 key";



If a switch to remote control occurred and the system is keyed-in, then it is indicated by the flashing "Remote" symbol.

If the system is switched off via the stop button "0 key", then the "Remote" symbol in the LCD is deleted!

#### LLC OK

LLC OK, if terminal23+31 = closed LLC fault, if terminal23+31 = open

#### **3.5.5** Operating parameter

The operating parameter can be opened without code input directly from the basic display by pressing the info key (display only).

In menu item 11 and 9919 the parameter can be changed; see notations below

Menu item (code level) 11 and 9919			
Parameter no.	Meaning	Value range	Can be edited under menu item
1	Switch-on pressure	Depending on system type	11
2	Switch-off pressure	Depending on system type	11
3	Safety pressure	Cannot be edited	-
4	Minimum pressure / LLC		11
5	Min. compressor. temp.	Cannot be edited 41°F	-
6	Max. compressor. temp	Cannot be edited 230°F	-
7	Hours of operation	Cannot be edited	9919
8	Load hours	Cannot be edited	9919
9	Remaining time air filter	Cannot be edited	-
10	Remaining time oil filter	Cannot be edited	-
11	Remaining time separator	Cannot be edited	-



12	Remaining time motor lubrication	Cannot be edited	-
13	Remaining time oil	Cannot be edited	-
14	Dryer time remaining (only if "With dryer")	Cannot be edited	-

By selecting a system type some parameters from a table are assigned.

#### 3.5.6 LLC operation

Menu item (code level) 18			
Parameter no.	Parameter no. Meaning Value range		
1	LLC operation system operates as LLC slave	0 = no LLC operation, meaning load/idle run Via local pressure sensor 1 =LLC operation Load run, if terminal 22+31 = closed, idle, if terminal 22+31 = open	

**CAUTION**: If input e02.6 was defined via menu item (Code level) 8 as feedback [LLC OK] and this signal (e02.6=0) is missing, then the LLC operation is automatically switched off and further processing is done with the local pressure sensor. (Until e02.6 = 1 again!)

If the LLC operation has been activated, then it is displayed by the static "Remote" symbol in the display. During LLC operation the local pressure sensor is only used to monitor the safety pressure (hi P).

During activated LLC operation the load/idle run prompt from the LLC Master can also occur via the RS-485 interface. In this case, the respective digital input signals are ignored until a control via the interface occurs. The control switches back to control via the digital inputs, if the data exchange via the interface was interrupted for more than 2 seconds.

Should the discharge pressure drop under the Minimum pressure threshold during LLC operation then, a switch to the local pressure sensor occurs and the warning [24:"Lower pressure threshold reached] appears. This warning must be confirmed using the 0 key prior to the LLC Master switching back to the load prompt.



## 3.5.7 Fault memory

Display fault memory

Menu item (code level) 30			
Parameter no.	Meaning	Display range	
1-20	Display fault memory	Position in the fault memory number of the fault/warning Operating hours when the fault/warning occurred	



If the "Warning triangle" symbol appears, then this entry is a warning/maintenance.



If the "Tools" symbol appears, then this

entry is a fault.

With the arrow keys it is possible to scroll 20 positions of the fault memory. Position 1 always contains the "newest" fault. The individual position of the fault memory is also saved in the EEPROM memory and is thereby also still available after a power failure. For a list of possible messages see section 3.6.



Fig. 7: Fault memory position 1 (most current entry): Fault number 64 Fault occurred at 3 operating hours.

Delete fault memory

Menu item (code level) 130			
Parameter no.	er no. Meaning Display range		
1	Delete fault memory	The fault memory is deleted	



### **3.5.8** Editing of target values for the maintenance intervals

For directions for resetting maintenance timers, see section 4.7.

Menu item (code level) 40			
Parameter no.	Meaning	Display range	
1	Dryer	Range:0-30000 h	
	*Standard compressor	Setting: 1000 h	
Menu item (code level) 4	11		
Parameter no.	Meaning	Display range	
1	Air filter	Range: 0-30000 h	
		Setting: 2000 h	
Menu item (code level) 4	12		
Parameter no.	Meaning	Display range	
1	Oil filter	Range: 0-30000 h	
		Setting: 2000 h	
Menu item (code level) 4	13		
Parameter no.	Meaning	Display range	
1	Oil separator	Range: 0-30000 h	
		Setting: 4000 h	
Menu item (code level) 4	14		
Parameter no.	Meaning	Display range	
1	Motor lubrication	Range: 0-30000 h	
		Setting: 20000 h	
Menu item (code level) 4	15		
Parameter no.	Meaning	Display range	
1	Oil	Range: 0-30000 h	
		Setting: 8000 h	
Menu item (code level) 46	3		
1	Annual maintenance	Range: 8760 / 8784h	

With the arrow keys the respective target value can be selected in 500 h intervals and confirmed with the ENTER key (range: 0-20000 h)



If the target value is confirmed with the ENTER key, then the respective interval (remaining time) is started anew with the target value.

#### 3.5.9 Idle run, shutdown times, delay Wye delta

Menu item (code level) 51			
Parameter no. Meaning Display range			
1	Idle time	Range: 10 - 1200s	
2	Shut-down time	Range: 0 - 60s	
3	Start-up time (delay Wye / delta)	Range: 3 - 30s	

With the arrow keys the respective target value can be set and confirmed with the ENTER key.

### 3.5.10 Setting the system type, pressure range and delivery amount

Menu item (code level) 60			
Parameter no.	Meaning	Display range	
1	Main type (group)	<b>Belt</b> , Combi, Variable, Direct, Gear, Flex	
2	System type(default setting for system-specific parameters)	e.g. "BE 11" (Belt 11)	
3	Pressure range (compressor's maximum pressure)	Range: 101 to 217 psi	
4	Maximum delivery volume(compressor's max. delivery volume in m³/h)	Range: 0 to 9999 m³/h	

Depending on the system type chosen here, the (setting) parameters Start-up time, Idle time)" and the Maintenance intervals are pre-assigned with the stored table values.



Pressure range: Switch-off pressure threshold is pre-assigned with the value selected here, and the Switch-on pressure is pre-assigned with the value Switch-off pressure – 29 psi", The pressure ranges set here serves as upper limit during editing of the Switch-on pressure and Switch-off pressure (also see section 3.5.5).

The pressure range (parameter 2) and the maximum delivery quantity (parameter 3) can also be adjusted individually in menu items 62 and 69. For this the factory code must also be entered.

## **3.5.11** Setting the pulse / pause times for the condensate valve

Menu item (code level) 65 – only for VARIO & COMBI compressors			
Parameter no.	ameter no. Meaning Display range		
1	Pulse time	Range: 1 – 99 s	
2	Pause time	Range: 1 – 999 s	
3	Control condensate valve if:	Range: 0 / 1	
	[0] = "Compressor motor on" [1] = "dryer on"		

<u>CAUTION:</u> The condensate valve is always controlled (pulse/pause control) if the terms at parameter [3] are fulfilled.

#### **3.5.12** Setting the control parameter of the frequency converter

Menu item (code level) 75 – must be supplied with optional RS485 module for FC			
Parameter no.	Meaning	Display range	
1	Frequency converter (FC) present If you switch from 0 (without FC) to a value > 0 (with FC), you must then start the "start-up sequence"	0 = without FC 1 = with FC (AA module) 2 = with FC (MK200-2AA) 3 = with FC (RS485/ModBus)	
2	Speed reduction from: Specify the pressure above which the maximum target value for the FC is limited.	Setting range: 73 to 189 psi Default setting: 73 psi	



3	Speed reduction to: Specify the pressure above which the maximum target value for the FC is not limited any further.	Setting range: 73 to 189 psi Default setting: 189 psi	
4	Speed reduction by: Specify the maximum by which the max. target value is to be reduced.	Setting range: 0 to 100 % Default setting: 50 %	
5	Percentage target value: Specify the target value within the current pressure tolerance range to which the FC is to be set.	Setting range: 0 to 100 % Default setting: 50 % Example: 0 % : Target value = switch-on pressure; 50 % : Target value = (switch-on pressure + shut-off pressure) / 2; 100 % : Target value = shut-off pressure;	
6	Control factor: This is where you set the control factor (P part of the controller)	Range: 1 to 999 Default setting: 100	
7	Reset time: Set the reset time (I part of the controller, for "0" => no I part)	Range: 0 to 9999 s Default setting: 10 s	
8	Min. Control range. This is where you specify the minimum percentage value for the speed, in the case of converters (idle mode speed). The value specified here must match the setting on the frequency converter!	Range: 0 to 100 % Default setting: 100%	
9	FC Max. Idle mode: This is where you specify the maximum percentage value for the speed. This threshold applies until the compressor reaches the specified compressor temperature ("VT min. idle mode) after being switched from idle mode to loaded.	Range: 0 to 100 % Default setting: 75%	
10	VT Min. Idle mode: Specify the temperature that must be reached, after a switch from idle mode to loaded, before the maximum speed is accepted for the FC.	Range: 0 to 100 % Default setting: 60%	

**<u>Caution:</u>** In systems with frequency converters (Par. 1 > 0), relay outputs "A2" and "A3" are assigned differently (message "Ready" and "Operation")

#### 3.5.13 Dryer control

Menu item (code level) 80 – only for VARIO & COMBI compressors			
Parameter no.	Meaning	Display range	
1	Dryer On/Off	0 = off 1 = on	
2	Dryer switch-off temperature	Range 32 to 43°F	
3	(Dryer differential temperature	Range 36 to 50°F	
4	Dryer minimum switch-off time	Range: 30 to 600s	
5	Off-set dew point temperature	Range: 14 to 50°F	
6	Release delay	Range: 05 minutes	
7	Dryer on at compressor off	0 = no; 1 = yes;	

- The dryer will be switched on if the dew point temperature is riding over the level dryer switch-off temperature + dryer difference temperature".
- The dryer will be switched off again, if the dew point temperature, for the given time (Param. 6 = switch off delay) at least, is fallen under level "dryer switch off temperature". After switching off the dryer, the time "dryer minimal switch-off time" have matured first before the dryer can be switched on again !
- If the parameter [7] is programmed to 1"(dryer on at compressor off), then the control of the dryer is affecting also if the compressor is switched off.
- Otherwise the dryer is switched off together with the compressor.

If the dryer is activated, then it is indicated by the symbol: 5 The dew point temperature can be displayed when in the basic display the 4 key is pressed is pressed (this is also when the "T2" appears =>2.Temp.).

If the  $\blacktriangle$  and ENTER key are pressed simultaneous, then the dryer can be switched on or off manually. If the dryer is switched off, then 55 the symbol flashes



#### 3.5.14 Default settings of the system data

With menu item (code level) 88 all settable parameters are reset to their default value and a change into the basic display occur.

CAUTION! Previously data created manually might be overwritten!

#### **3.5.15** Toggle the units for the pressure display

Menu item (code level) 90			
Parameter no. Meaning Display range			
1	Pressure unit	[0 = pressure display in [bar] 1 = pressure display in [MPa] 2 = pressure display in [psi]	

#### **3.5.16** Toggle unit for temperature display

Menu item (code level) 95			
Parameter no. Meaning Display range			
1	Temperature unit	0 = Temperature display in [°C] 1 = Temperature display in [°F] 2 = Temperature display in [K]	

## **3.5.17** Correction value for pressure measurement

Menu item (code level) 105			
Parameter no. Meaning Display range			
1	Pressure measurement correction value	-7 to +7	

Via this value the slope of the pressure characteristic curve is changed, to compensate for small variations on pressure sensors.



## 3.5.18 Setting the system address

Menu item (code level) 9950			
Parameter no.	Meaning	Display range	
1	System address	0 = RS485 connection is switched off <i>[ Default setting ]</i> 1-16 = The system can be contacted via the respective address.	
2	Modus (Mode)	<ul> <li>0 = Data can be read and edited via the interface.</li> <li>[ Default setting ]</li> <li>1 = Only data can be read via the interface.</li> </ul>	
3	Baudrate	0 = 4800 Baud <i>[ Default setting ]</i> 1 = 9600 Baud 2 = 19200 Baud	
4	Protocol	0 = Standard <i>[Default setting]</i> 1 = Modbus RTU	
5	Data format	0 = 1 start bit, 8 data bit, 1 stop bit, no parity <i>[ Default setting ]</i> 1 = 1 start bit, 8 data bit, 2 stop bit, no parity 2 = 1 start bit, 8 data bit, 1 stop bit, straight parity 3 = 1 start bit, 8 data bit, 1 stop bit, uneven parity	

Note: An additional address must be set for each connected system! The control must be equipped with the respective interface module (RS-485).

It is important to ensure that any connected system is set to the same baud rate (transmission speed), the same protocol and the data format!



## **3.5.19** Selection of the used FU type

Menu item (code level) 9960		
Parameter no. Meaning Display range		
1	FU type	0 = Yaskawa 1 = Emotron 2 = Bosch-Rexroth 3 = ABB (ACS510) 4 = Delta (C2000)

#### **3.5.20** Test of the digital inputs / outputs

Menu item (code level) 9980		
Parameter no.	Meaning	Display range
1-8	Input 1-8	0 = Off 1 = On
9-15	Output 1-7	0 = switch off 1 = switch on

Using the arrow keys on output signals can switch on or off the effected output. With the ENTER key a switch is done to the next input/output (here, the outputs are always switched off first). After the last step it is switched back to the basic display.

CAUTION: The compressor motor can start, if the individual outputs are activated in test mode!

#### **3.5.21** Monitoring dew point

Menu item (code level) 6			
Parameter no. Meaning Display range			
1	Dew point temp. max.	32 - 122°F (32 = monitoring off )	
2	Dew point temp. min.	14 - 122°F	
3	Message = Warning or Fault	0 = Warning; 1 = Fault	



If this function is active (Par.1 >  $32^{\circ}$ F) the dew point temperature sensor will be observed for the setting values and faults.

If the dew point temperature is over the barrier "dew point max." then the warning "dew point temp." will be generated.

If the compressor motor is running and the dew point temperature is sinking under the barrier "dew point min.", the warning/fault "dew point to low" will be generated.

If the compressor motor is running and the dew point temperature is rising over the barrier "dew point max.", then the warning/fault "dew point to high" will be generated.

#### **3.5.22** Correction value for temperature measurement

Menu option (code level) 105			
Parameter No.	Meaning	Display Range	
2	Correction value for compressor temperature	18°F to 50°F	(default: 32°F)
3	Correction value for oil temperature (or correction value for dew point temp.)	18°F to 50°F	(default: 32°F)
4	Correction value for dew point temperature(if module "MK200-4AE4RA", Addr. 7)	18°F to 50°F	(default: 32°F)

Use these values to specify an offset for each individual temperature measurement value. This will compensate for minor deviations in the values recorded by the temperature sensors.

#### 3.5.23 Activate additional MK200 modules

Menu option (code level) 255				
Parameter No.	Meaning	Display Range		
1	Profibus module present	0/1 = No/Yes (de	fault: 0)	
2	MK200-8E4RA (Addr. 2) present	0/1 = No/Yes (de	fault: 0)	

The control system must be equipped with a "bus module" before these modules can be connected! If one of these modules is activated, but is not actually available, this warning message is displayed"44 Module"



### 3.5.24 Change service code

Menu option (code-level) 3846				
Parameter No.	Meaning	Display/Value Ra	nge/Default	
1	Change active service code	1 - 9999	(Default: 3846)	

Here you can define a new "service code".

<u>Note:</u> If a code is entered, that was used otherwise since then; this (old) function is no longer available!

#### 3.6 Faults / Warnings

#### 3.6.1 Faults



Fig. 8: Example Error/fault message example: Fault no. 65 - power failure.

The "Tool" symbol flashes and the fault number and text are displayed in the bottom row in flashing red. The following fault messages are possible:

Number	"Text"	Meaning (fault)
61	EProM	Check all setting parameter
63	PAr	Wrong parameter" (check pressure target values!)
65	no AC	Power failure (Only if not "Automatic restart"!)
66	SE t	Cable def. T2 Temperature (monitoring: T2 temperature sensor)
67	SE t2	Cable def. oil temperature (monitoring: oil temperature sensor)
68	SE P	Cable def. pressure (monitoring: pressure sensor)



70	SE t3	"Cable defect dew point temperature" (if additional "MK200-4AE4R" module!)
71	EmErG	EMERGENCY OFF triggered (contact open = fault)
72	rotAt	Direction of rotation (contact open = fault)
73	Mot t	Motor temperature (PTC)
74	hiCur	Overcurrent (contact open = fault)
75	hi Pr	Overpressure (contact open = fault)
77	hi t	Temperature >max. con. temperature
78	hi P	Discharge pressure too high (pressure >safety pressure)
81	Fu	Converter fault (FU defective or no response)
82	diF P	Diff. pressure oil precipitator (contact open = fault)
89	Module	"Fault on IO module" - The external "MK200-4AE4RA" module (Addr. 7) reports a fault, or the module does not respond (although it has been activated)!
90	dP Mi	Dew point temperature to low
91	dp mA	Dew point temperature to high
93-95	SE W1/W2/W3	Cable defect "Winding temp. 1, 2 or 3 (sensor monitoring)
96-98	Hi W1/W2/W3	Winding temp1,2 or 3 too high (temp.> max. winding temperature)
99	FanFu	Fault converter

The compressor switches off during occurrence of a fault. The red LED lights up until the fault are acknowledged. Acknowledging with the 0 button is only possible, if the cause of the fault has been remedied!



## 3.6.2 Maintenance

The "Warning triangle" symbol flashes and the respective number and text are displayed in the bottom row with 7 segment elements.



Fig. 9: Intake filter maintenance message.

Number	"Text"	Meaning (maintenance)
1	M Air	Maintenance intake filter (remaining maintenance time < 100 h)
2	M Oil	Maintenance oil/oil filter (remaining maintenance time < 100 h)
3	M SEP	(Maintenance oil separator (remaining maintenance time < 100 h)
4	M Mot	Maintenance lubrication (remaining maintenance time < 100 h)
5	M Con	Maintenance compressor (remaining maintenance time < 100 h)
6	M dry	Dryer maintenance (time remaining < 100 hours   only if "with dryer")
8	M 365	Annual maintenance (<100Hr)

#### 3.6.3 Warnings

Number	"Text"	Meaning (warning)
21	hi t	Compressor temperature increased (Temperature > max. compressor temp 221°F)
22	hi P	Discharge pressure increased (Pressure > Safety pressure + 7 psi
23	Cold	Temperature too low Compressor Temp. < 41°F
24	min P	Lower pressure threshold reached The system is running as a LLC slave and the Minimum pressure threshold was undercut
25	OilHE	Oil heating/heating The Heating function is active and on input "E02.2" the signal is missing;
26	dEFEC	Wrong calibration parameter
35	dP tE	Dew point temperature Dew point temp. >Dew point max



38	dP Mi	Dew point temperature to low		
39	dP MA	Dew point temperature to high		
44	Modul	"EA-Module warning" - An external "MK200" module reports a fault, or does not respond (although it has been activated)! * The flashing icons listed below tell you which module is affected: [1] => MK200-2AA (Addr. 1) [2] => MK200-8E4RA (Addr. 2) [7] => MK200-4AE4RA (Adr. 7) otherwise => MK200-Profibus (Addr. 31)		

During a warning/maintenance the compressor is switched off. The red LED flashes until the cause of the warning has been remedied or until the respective maintenance

interval is confirmed. Normally a fault/warning is immediately displayed. However, if the operator has pressed the INFO button to select target or limit values, the fault / warning is only displayed when switching back to the basic display.

## 4.0 Information about the program

This only applies to frequency-regulated systems:

If the "Start-up sequence" for the compressor motor has not been performed yet, you see -OFFon the display and you cannot start the compressor! To start this "Start-up sequence", use code "111". When the "Start-up sequence" is running, the bottom 7-segment display

shows the current progress, the convertor's target value, and the time remaining for this step (for example, "1 40: 15 s"€ Step = 1; Target value = 40%; Time remaining = 15 seconds).

## 4.1 Operational states

a) the compressor is switched off:

- The green LED is off
- The "Motor" and "Solenoid valve" symbol are off (LCD)
- b) the compressor is switched on, but the current pressure is still above the switchon pressure (start-up safety).
  - Green light flashes
  - "Motor" and "Solenoid valve" symbol are off
- c) The compressor was switched on but the compressor temperature (or the oil temperature, while "with heating") is still below 34°F.
  - Green light flashes



- "Motor" and "Solenoid valve" symbol are off
- Symbol for the temperature unit flashes (LCD:  $^{\circ}C/^{\circ}F/K$ )

d) The compressor is in operation, but the load valve is switched off, meaning the compressor does not compress. (Start-up phase or idle )

- The green LED is on
- The "Motor" symbol is on
- The "Load valve" symbol is off

e) The compressor is in operation, but the load valve is switched on, meaning the compressor is compressing. (Load run)

- The green LED is on
- The green "Motor" symbol is on
- The green "Load valve" symbol is on

#### 4.2 Operating modes

#### a) AUTOMATIC operation

After reaching the switch-off pressure, the system switches into IDLE (run-on) for the duration of the idle time.

The decimal point left from the pressure display flashes if the idle run time is active. After the "Idle run time" has elapsed, the compressor switches off. After switching off the green (LED =>) get ready for restart flashes. The system restarts, as soon as the pressure drops below the switch-on pressure.

#### b) LOAD/IDLE operation

The compressor switches between "Load" and "Idle" operation; meaning it operates indefinitely.

#### 4.3 Switch-on process

If the current discharge pressure is higher than the set switch-on pressure during the switch on of the compressor, then the green LED (=operation ready) flashes. The compressor will only operate and the operating mode display (green LED) is continuously lit after the discharge pressure drops below the switch-on pressure. If



the compressor temperature (or oil temp. or if "with heating") is during the switch-on below +34°F, then the unit for the temperature ( $^{\circ}C/^{\circ}F/K$ ) flashes and the green LED also flashes. In addition, warning "4" is displayed. Should the temperature rise to at least +34°F, then the compressor is started.

## 4.4 Switch-off process

If the compressor is switched off via the 0 key (or via remote OFF) then it always changes initially to idle. The decimal point in front of the pressure display flashes in the display. The remaining time to switch off can be shown with the **A**button. The shutdown time is used as time. After the time expires the system switches off.

As long as the compressor is still in the "start-up" phase (meaning the star/triangle start up is not completed), it is immediately (without delay) switched off.

## 4.5 Safety pressure ("hi P")

The safety pressure is the set "Pressure range" + 14 psi. Example:"Pressure range" = 125 psi=>" 78: hiP" = 139 psi

A warning is provided, if the pressure rises above the "22: hi Pr + 7 psi" threshold. The compressor is switched off with a fault message, if the pressure rises over the "78: hi P" threshold.

#### 4.6 "Additional heater" I "Fan" I "Dryer" function

```
[ see also: 3.5.3 ]
```

a) "Heater = 1" / compressor motor is OFF / main switch is ON, If the <u>compressor</u> <u>temperature</u> falls below the "Heating ON" threshold, the output for the "<u>Additional</u> <u>heater</u>" is switched on. As soon as the compressor temperature rises above the "Heating OFF" threshold (again), the output for the "<u>Additional heater</u>" is switched off again.

b) "Heater = 2" / compressor motor is OFF / main switch is ON, if the <u>oil temperature</u> falls below the "Heater ON" threshold, the output for, the "<u>Additional heater</u>" is



switched on. As soon as the oil temperature rises above the "Heater OFF" threshold (again), the output for the "<u>Additional heater</u>" is switched off again.

c) If the additional heater is deactivated (heater = 0), or if the compressor motor is running, the output for the "Additional heater" is switched off!

#### d) "With fan"

If the compressor is activated, and the <u>compressor temperature</u> rises above the "Fan ON" threshold, the output for the fan is switched on. If the <u>compressor</u> <u>temperature</u> falls below the "Fan OFF" threshold, the output for the fan is switched off. If the "With fan" setting is active, the 7-relay output also controls the condensate valve (only for "combi-compressors"!).

#### e) "With recirculation"

If the "Recirculation" function is active (see Point 3.5.3), and the system is keyed in, the system starts when the <u>compressor temperature</u> falls below the 41°F threshold (the system runs in idle mode). As soon as the <u>compressor temperature</u> rises above the +59°F threshold again, the system is stopped again. Press the ENTER and 7 keys (in the base screen display) at the same time to switch the activated "Recirculation" function on/off temporarily.

f) "With recirculation" and "With heater" and "System keyed in" In this case the "heater" is not switched on until the temperature falls below the 34°F threshold.

 g) "With dryer" If the <u>dew point temperature</u> rises above the threshold [Dryer on], the "Dryer" output is switched on. As soon as the <u>dew point temperature</u> falls below the threshold [Dryer off], the "Dryer" output is switched off again.

\* If the "Heater" function is also activated, an additional "MK200-4AE4R" module (Addr 7) is required to record the dew point (CI. 5+6) and to control the dryer (CI. 12+13)



\* If the "Heater" function is deactivated, the 2nd temperature sensor (AE-2) and the "A6" output are used here (each on "ICommand-Basic").

If the "Recirculation" function is activated, the Sicon is displayed. This icon flashes if this function is temporarily switched off.

The compressor can usually only be started when the compressor temperature or the oil temperature has at least reached the +34°F threshold.

If the output for additional heating, or the fan, is switched on, the corresponding icon appears on the LCD display.

When the dryer is being controlled, you see a "4" on the display. If the "With dryer" function is activated, you can then press the A and ENTER keys at the same time to switch the dryer on/off manually. If you use this method to switch off the dryer, the "4" flashes on the display.

#### 4.7 Maintenance intervals

(Actual values see: 3.5.7)

a) Maintenance requirements

The corresponding intervals are counted down. Once one of the intervals is less than 100 hours, the corresponding message appears, and the red LED flashes (=> Maintenance). To acknowledge this message, first, enter your service code. Scroll to menu 21. Press the "Enter" key. The controller will return to the default screen. Press the 0-key once more. Thereby the relevant interval is reset to the default value.

## 4.8 Sequence during "Automatic restart", shutdown time

Has the "Automatic restart after power failure" been programmed? After the power returns, the time elapses that has been predetermined in the "Shutdown time" parameter. While this time elapses, the "Restart" symbol flashes.



If the system was in operation prior to the power failure, then it will restart after this time elapses, otherwise it will stay in STOP mode.

During active "Restart", the fault "Power failure" is not issued after the power failure.

#### **4.9** Settings for the frequency converter (FC):

Set the FC's interface parameters to the following values: [Mode: Remote control and target values specified via RS485 / ModBus ]

\* RS485 address: 1;

* Baud rate:	9600 baud;	
* Protocol:	RTU ModBus©	(ABB: EFB profile = "ABB DRV LIM")
* Data format:	Yaskawa:	1 start bit, 8 data bits, 1 stop bit, equal
	Bosch	parity; 1 start bit, 8 data bits, 1 stop bit,
	Rest:	1 start bit, 8 data bits, 2 stop bits, no parity:

#### 5.0 Transfer new program into the controller

- 1. Switch off the power supply to the control;
- 2. Press A and 0 simultaneous and switch on the power supply to the control again.
- 3. In the display the "FLASH: x.xx" appears.
- 4. Now it is possible to transfer the respective program (HEX file) to the control !
- 5. After the program has been successfully transferred to the control, the power supply must be briefly switched on and switched off again.

#### Fault in the control program memory

If a fault has been detected in the program memory (Flash EPROM) after the mains power is switched ON, then the following messages appears in the temperature display:

"noAPP", "FLASH" => The program must be transferred in the control anew here!



## 6.0 Document version

Version Document	Version Software.	Author	Content of changes
V 1.11	V 1.11	RB	At compressors with frequency converter, the message "operable" will shown at the output "A2" and the message "operation" will shown at the output "A3".
V 1.12	V 1.12	RB	Control for "YASKAWA-frequency converter" adapted.
V 1.13	V 1.13	RB	Offset for temperature measurement
V 1.20	V 1.20	RB	The menu "heating/ventilator" have been converted and adjusted for the function "dryer" At "Module-Warning" (MK200-module) the equal module will be marked now with a blinking symbol (1 / 2 / 7). At all frequency controlled compressors at first the "start up-sequence" has to be run.
V 1.30	V 1.30	RB	<ul> <li>Additionally submenu for the integration (activation) of additional MK200-moduls (see : Pos. 0).</li> <li>The module warning (MK200, Adr.7) would get a module disruption (only MK200-4AE4R!) The parameter "switch off heating"</li> <li>(till now Code 15) is to find up from now at the heating menu (Code 5).</li> <li>The logical record setup for the data recalculated the "Modbus-RTU" would be adjusted to the "AC-P" (only relevant data for the AC B)</li> <li>For the data recalculated via "Profibus-DP" the command "1/2/3" would be integrated also 2 additional frequency converter types would be integrated. (ABB, DELTA //</li> <li>The startup procedure (fc) now can be started without a service code. The changing of the compressor type is affected in 2 steps, first the group, second the type.</li> </ul>



V 1.31	V 1.31	RB	The "Modbus-data" would be added for the parameter "load" (Adr.23 / 0-100%). The control of the frequency converter "ABB" and "Delta" would be corrected again. At the variety "Compressor-type = Flex" the following setting up was changed : * Code 5 => without heating; * Pressure => 13 bar; The 1.service for "oil filter" after 500hours is cancelled complete .
V 1.32	V 1.32	RB	The compressor date for the types "Variable", "Flex" and "Combi" would be changed corresponding to the specifications of FS-Curtis. The function "LLC-OK" would be changed back (If "Code 8 = 2", then "LLC-OK
V 1.40	V 1.40	RB	Changes at the dryer control at Compressor type "Combi-T"
V 1.41	V 1.41	RB	Changing at the control of condensate valve at compressor type "Combi-T". Par. 3 now can be selected, when the control of the condensate valve is affected.
V 1.50	V 1.50	RB	The "Service-Code" is changeable now.
V1.51	V1.51		The delivery quantity of the compressor is now in Entered "m3 / min" and no longer in "m3 / h" (see pos. 3.5.10, par. 4).
V1.60	V1.60		There is now an additional maintenance interval "Annual Maintenance" (24h x 365 = 8760h). This interval is counted down as soon as the supply voltage of the controller is applied (see pos. 3.1, par. 14). Is the interval expired? (<100h remaining time), then the appears Warning [8] "M 365" (see pos. 3.6.2). The operating hours, load hours, load cycles and engine starts are now not in addition changeable meters (see pos. 3.5.25). The fault memory can no longer be deleted become!

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V1.61	V1.61	2 new asset groups have been added ("V-Drive" and "G-Drive"). If a setpoint is set for a maintenance interval Stored 0 hours, then this interval disabled (that is, there is no message). Setting range for the maintenance intervals
V1.62	V1.62	Disabling a maintenance interval by the entry of "0 hours" has been removed!
V1.63	V1.63	Now, the type "Combi with dryer" in the Code level 0005 in parameter 1 is the function "Circulation" on / off (Par. 1 = 0: circulation OFF Par. 1> 0: Circulation ON)
V1.70	V1.70	<ul> <li>a) Extension of the plant types "G-Drive" and "V-Drive" (New: 38, 45, 56, 75);</li> <li>b) "Storage temperature monitoring" option (see pos. 3.5.21)</li> <li>c) option "winding temperature monitoring" (see pos. 3.5.21)</li> <li>d) Changeover of the optional temperature display</li> <li>(T2) in the basic display (see pos. 3.2)</li> <li>e) Option "Fan control via FU" (see pos. 3.5.3)</li> <li>As a frequency converter is always the Type "Yaskawa" used, this then</li> </ul>
V1.71	V1.71	The temperature thresholds for the fan control have now been split up: (see pos. 3.5.3 / 4.6). a) Fan without FU "Fan ON" + "Fan OFF" b) Fan with FU "Fan MIN" + "Fan MAX"



V1.72	V1.72	The function "additional heating" has been changed: a) When "Heating = 1" (i.e., with Verd. Temperature), then now also the digital input "E 3" (oil level heater) with monitored. b) The adjustment range for the thresholds "Heating
V1.81	V1.81	Dryer maintenance interval can be changed "WITH DRYER" selection.



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