"AIR CONTROL 2"

1. General:



The control unit consists of the following functional blocks:

a) Microprocessor logic (with **EEPROM** memory for data back-up) for all control, monitoring and display functions;

b) **Keyboard** with 5 keys for switching the compressor on and off, and for entering recommended and limit settings;

c) Customized **LCD display** for showing the current actual and recommended parameters and the operating status, plus faults/warnings;

d) Analogue processing of network pressure, compressor temperature and air flow;

e) Digital inputs and outputs for selecting a compressor;

f) Serial interface (RS485) for selecting a frequency converter;

2. Hardware description:

2.1) Micro-processor logic:

Microprocessor controller with Watchdog, Power failure detection (mains failure > 30 ms), 64 kbyte Flash EPROM, 256 byte EEPROM (for data backup), 4 kbytes RAM.

2.2) Keyboard:

5 keys, Customised finish.

2.3) Display:

LCD with display area approx. 75mm* 50mm:

- 7-segment A => 3-digit, 7-segment display (top left);
- 7-segment B => 3-digit, 7-segment display (top right);
- 7-segment $C \Rightarrow 1\frac{1}{2}$ -digit, 7-segment display (left centre);
- 7-segment D => 5-digit, 7-segment display (down);
- symbols for units: °C, °F, °K, bar, psi and MPa;
- symbols also for: fault, warning, motor, solenoid valve,

heating, fan, remote operation, restart, automatic (mode), BLCO (GLW [Baseload Selection] mode);

1 LED (red);

2.4) Pressure sensor:

The sensor (0-16 bar) is on the board

2.5) Analogue inputs:

- 1 x temperature sensor input (KTY 11-7);
- 1 x 2nd temperature sensor input (present on "new" Air Control 2 only)
- 1 x fan current monitoring (0-16 A)

2.6) Digital inputs:

- 1 ×12V DC PTC temperature sensor input;
- 1 x input for air flow monitoring (only possible on Air Control-2);
- 5 additional inputs for option cards (only possible on Air Control-2)

2.7) Digital outputs:

3 x relay outputs, closers

1 x relay output, selector

2.8) Networking (Option)

1 x additional RS485 interface

2.9) Power supplies, terminals, casing

Power supply 230V AC (50/60 Hz);

2.10 Wiring:

1	Signal + (A)) [Frequency Converter: R+]
2	Signal – (B)) 1st RS485 interface [FU: R+]
3	Earth) (Frequency converter)
4	NC)
5	Common) group fault (potential-free)
6	NO)
7	Common) Heating selection
8	NO) (potential-free)
9	Mains phase)
10	N) 230V~ mains feed
11	Equipotential)
12	Motor phase)
13	N) Fan motor selection
14	Equipotential)
15 16 17	Valve phase N) Solenoid valve selections Equipotential))
18	Earth)
19	Signal - (B)) Option: 2 nd RS485 interface
20	Signal + (A)) [Viewing/GLW]

21	PTC sensor voltage (12V DC))	
22	PTC input) Motor temperature	
23	KTY input) Compressor tempera	ature
24	KTY earth)	
25 26	KTY 2 input KTY 2 earth) heating temperature	
27	Sensor voltage (24 V DC))	(1=OK)
28	Digital input "DE 1") Fan OK	
29	Sensor voltage (24 V DC))	(1=On)
30	Digital input "DE 2") Remote on/off	
31	Sensor voltage (24 V DC))	(1=load)
32	Digital input "DE 3") Remote load/idle	
33	Sensor voltage (24 V DC))	(1=OK)
34	Digital input "DE 4") GLW OK	
35	Sensor voltage (24 V DC)) Temp. restriction,	(1=OK)
36	Digital input "DE 5") heating	
37	Sensor voltage (24 V DC))	(1=OK)
38	Digital input "DE 6") Dryer OK	

Attention: Terminals 28 to 38 only exist on the "new" Air Control-2, whereby terminals 18 to 20(!) and 29 to 38 are to be found on the option board!

The inputs on the FU control will not be processed if an option board is available!!!

• 20 19 18 Schnittstelle 2 RS485 38 37 36 35 34 33 32 31 30 29 Optionsmodul DE 6 (Trockner ok) steckbar steckbares DE 5 (Temp.Begrenz.)) I/O Erweterungsmodul DE 4 (GLW ok) DE 3 (Fern Last/Leer) DE 2 (Fern Ein/Aus) 28 DE 1 (Lüfter ok) 0 28 DE 1 (Lüfter ok) 27 0 27 26 Grundplatine 0 26 KTY 2 (Heizung) \bigcirc 25 KTY 2 (Heizung) 0 25 9 12 13 14 15 17 23223 7 400 ⊳ ∞ 6 307 0 0 0 0 0 0 0 0 ø 0 0 0 0 . . . 00 000 KTY 1 (Verdichter temp.) Sammelstörung (potentialfrei) Netzeinspeisung Anschluß Drucksensor (Schlauch 6mm) Schnittstelle 1 RS485 (Frequenz-umrichter) Heizung (potentialfrei) Magnetventil Lüftermotor PTC

Terminal assignment on the "new" Air Control-2

Terminal assignment on the ''old'' Air Control-2



3. Software description:

3.1) Key assignment:

If a key is assigned to multiple use, then the next position is selected each time it is pressed.

- : Editing recommended/limit settings/codes \bullet .
- ENTER

- : Taking the edited value into the current variable;
- * Default display => display/editing of:

	7-segment C	7-segme	nt D Parameters				
	[1]	[##.#]	Lower pressure threshold	(3.5-15.0 bar)			
	[2]	[##.#]	Upper pressure threshold	(3.5-15.0 bar)			
	[3]	[##.#]	Safety pressure	(display only)			
	[4]	[05.0]	Minimum compressor temperature	(display only)			
	[5]	[110]	Maximum compressor temperature	(display only)			
	[6]	[#####]	Total runtime				
	[7]	[#####]	Runtime on load				
	[8]	[#####]	Remaining air filter time	(display only)			
	[9]	[#####]	Remaining time oil/oil filter	(display only)			
	[10]	[#####]	Remaining oil separator time	(display only)			
	[11]	[#####]	Remaining lubrication time	(display only)			
	[12]	[#####]	Remaining compressor time	(display only)			
0	(1) If comp	ressor ON:					
	Switch o	off compres	ssor;				
	(2) After a f	fault has oc	curred:				
	Clearing the fault report (= RESET key)						
	(3) Key pre	ssed longer than 3 seconds:					
	Enter the	code (only	y possible if system OFF);				
<red led=""></red>	: flashes for	warning/se	ervice message, steady light for fault	?			
I	: Switch on	compresso	r;				

Settings which you call up in the default display via the "ENTER" key can only be changed if the CODE 0011 is entered beforehand. Without this code, these values can only be displayed.

3.2) Other parameter inputs:

321	Mode	(refer	also	to.	Item	35	2)
J.4.1)	WIUUC.		a150	ω.	Ittill.	J.J.	4)

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Enter code 0002 \Rightarrow
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7-segment A,B 7-segment C 7-segment D

1 = Mode

0 = AUTOMATIC 1 = LOAD/NO LOAD 2 = OPTIONAL AUTOMATIC (II)

The following 2 parameters only then appear if OPTIONAL AUTOMATIC mode has been activated.

ENTER =>	7-segment A,B	000 002	
	7-segment C	∠ #.#	max. Pressure drop
	7-segment D		ge: 0 - 9.9 bar

max. pressure drop after selecting No Load

ENTER =>	7-segment A,B	000	002	
	7-segment C	3	##	max. no. of cycles
	7-segment D			ge: 1 - 55

maximum permissible cycles, compressor motor

- If AUTOMATIC mode is selected, then this is displayed using the **Automatic** symbol.
- If OPTIONAL AUTOMATIC mode is selected, then this is <u>also</u> marked by the **II** symbol under the temperature indicator.

3.2.2) Automatic restart after a power cut: (refer also to: item **3.5.10**)

enter code 0003 =>	7-segment A,B
	7-segment C
	7-segment D

000	003	
1	#	

0 = Restart OFF 1 = Restart ON

If restart has been activated, this is shown using the **Restart** symbol.

3.2.3) Local operation or remote control:

Enter code 0008 =>	7-segment 7-segment 7-segment	A,B C D	000 1	008 #	
0 = Local open	0 = Local operation		only v	via the l	keyboard)
1 = Remote co	ontrol	(ON via t or "S or "I (OFF via or "S or "I or vi	he opti 1" inp DE 2" i the op 51" inp DE 2" i a the 0	onal R ut of th nput of tional I ut of th nput of key)	S485 interface, if Local keyed; e FU control options board RS485 interface, e FU control options board

If remote control has been switched in and the systems is keyed (via the I key), then this is indicated by the **Remote symbol**

If the system is switched off using the **0** key, then the **Remote** symbol in the LCD is extinguished once more.

ATTENTION:The parameters must be assigned for the "S" input
on the FU control if they are to be processed by the "Air Control 2"!The FU control inputs are only processed if there is no option board is
present!

3.2.4) GLW mode (system works as GLW slave):

7-segment D

0 = not GLW mode, i.e. Load/No load via local pressure sensor

1 = GLW mode, Load/No load via the optional RS485 interface or input "S2" on FU control or input "DE 3" on option board

If GLW mode has been activated and the GLW OK signal from the GLW higher control unit (via RS485 or via input S4 on the Fu control or input "DE 4" on the option board) is present, then this is indicated by the **BLCO** symbol in the LCD

In GLW mode, the local pressure sensor is used purely for monitoring the safety pressure (P_ALLOWED).

If the data exchange via the interface is interrupted for more than 20 seconds and signal "GLW-OK" from input "S4" on the FU control or from input "DE 4" on the option board, then the control unit switches back to Local mode.

The BLCO symbol in this case is again extinguished in the LCD.

<u>Attention!</u>

Inputs "S2" and "S4" must be configured correspondingly on the FU control if they are to be processed by the Ai4rControl-2! Input "S4" is available from plant type "SOLO-11" for Air Control-2. For types "SOLO-6/7" this input is permanently configured to "0"!

The inputs from the FU control will only be processed if no option boards are present!

3.2.5) Editing the recommended service interval settings:

a) Air filter:		
Enter code 0041 =>	7-segment A,B 7-segment C 7-segment D	000 041 1 #####h
b) Oil/oil filter:		
Enter code 0042 =>	7-segment A,B 7-segment C 7-segment D	000 042 1 #####h
c) Oil separator:		
Enter code 0043 =>	7-segment A,B 7-segment C 7-segment D	000 043 1 #####h
d) Motor lubrication:		
Enter code 0044 =>	7-segment A,B 7-segment C 7-segment D	000 044 1 #####h
e) Compressor:		
Enter code 0045 =>	7-segment A,B 7-segment C 7-segment CD	000 045 1 #####h

You can use the arrow keys in steps of 500 to select the relevant recommended value, and then accept with the ENTER key (range: 0-20,000 hours).

If you accept a recommended setting with the ENTER key, then the relevant interval (remaining time) is also started afresh with the recommended setting.

3.2.6) No Load time/Shutdown time:

Enter code 0051 =>	7-segment A,B 7-segment C 7-segment D	000 051 1 ####s	1 = No load time Range: 10-1200 seconds
ENTER =>	7-segment A,B 7-segment C 7-segment D	000 051 2 ###s	2 = Shutdown time Range: 0-120 seconds
ENTER =>	7-segment A,B 7-segment C 7-segment D	000 051 3 ##s	3 = Run-up time Range: 1 - 60 seconds

The Run-up Time is used to delay Frequency Converter ON until the load valve is selected. Set the relevant recommended value with the arrow keys and then confirm with the ENTER key.

3.2.7) Pressure measurement correction setting:

Enter code 0105 =>	7-segment A,B	000 105
	7-segment C	1
	7-segment D	##•#

Now use the arrow keys to enter a setting of -0.5 to +0.5.

3.2.8) Supplementary heating/Upper temperature threshold

Enter code 0015 =>		7-segment A,B 7-segment C 7-segment D	000 015 1 #	1 = Mode
	Mode:	0 = no supplemen 1 = Supplementar	ntary heating ry heating) Cycle see) heading 3.5.7
ENTER =>		7-segment A,B 7-segment C 7-segment D	000 015 2 ##	2 = Upper threshold temperature.Range: $5 - 80^{\circ}C$

This temperature is only used for switching the supplementary heating on and off if Mode = 1 and the compressor is in operation. (refer also to heading **3.5.7**)

If the additional heating is deactivated (Mode = 0) then the KTY sensor (heating temperature / only available on "new" Air Control 2!) will no longer be monitored for line faults.

In this case, the 1st KRY sensor (compressor temperature) will be used for the control of relay outputs for the additional heating system.

3.2.9) Fan current monitoring:

Enter code 0005 =>	7-segment A,B 7-segment C 7-segment D	000 005 1 ##.# A	1 = max. fan current Range: 0.1 - 10.0A
ENTER =>	7-segment A,B 7-segment C 7-segment D	000 005 2 ##s	2 = Delay Range: 0 - 99 seconds
ENTER =>	7-segment A,B 7-segment C 7-segment D	000 005 3 ##.# A	3 = min. fan current Range: 0.0 - 10.0A

The fan is switched on and off using the compressor motor.

After the fan has been switched on, the set delay time (0-99 seconds) elapses before the fan current is monitored at the set threshold.

If the fan current is higher than the set maximum fan current (or input DE 1 / fan OK, terminals 27 + 28) are open after this delay time has elapsed, then the compressor is switched off with fault [7] "HiCur".

If the fan current is lower than the set minimum fan current after this delay time has elapsed, then the compressor is switched off with fault [8] "LoCur".

3.2.10) Convert temperature display unit:

7-segment A,B	000	090
7-segment C		#
7-segment D		
	7-segment A,B 7-segment C 7-segment D	7-segment A,B 7-segment C 7-segment D

- 0 = Pressure display in [bar]
- 1 = Pressure display in [MPa]
- 2 = Pressure display in [psi]

3.2.11) Convert temperature display unit:

Enter code 0095 =>	7-se
	7-se

7-segment A,B	000	095
7-segment C	1	#
7-segment D		

0 = Temperature display in [°C]

- 1 = Temperature display in [°F]
- 2 = Temperature display in [°K]

J.Z. 12/ Set System audiess.	3.	2.12)	Set	system	address:
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Enter code 9950 =>

7-segment A,B	
7-segment C	
7-segment D	

1 = Address

00 = The optional RS485 interface is switched off.

01..16 = The system is (e.g. from the PC) contacted via the relevant address.

<u>N.B.:</u> You must ensure that a separate address is set for each connected system. The relevant interface module (RS485) must also be available in the control unit.

ENTER =>	7-segment A,B 7-segment C	009 2	950 #	2 = Mode
	7-segment D			

(PC connection/viewing/GLW)

009

1

950

##

0 = Data can be read from the control unit via the interface, and the settings in the control unit can also be changed.

1 =Only data from the control unit can be read via the interface.

ENTER => 7-segment A,B
7-segment C
7-segment D

$$3 = Baud speed$$

0 = 4800 bauds (default setting)

1 = 9600 bauds

2 = 19200 bauds

<u>CAUTION:</u> You must ensure that the same baud rate (transfer speed) is set for each connected system.

3.2.13) Fault memory:

a) Display fault memory:

Enter code 0030 ...

If the symbol [warning triangle] is included, then this entry is a warning/service.

If the symbol [tool] is included, then this entry is a fault.

If the relevant item is unassigned, then the following display appears:

7-segment A,B =>	Err ###	
7-segment C =>		
7-segment D =>		

Use the arrow keys to scroll through the 20 items in the Item 1 always contains the most recent fault.

Individual items in the fault memory are stored in the EEPROM memory, and are therefore still available after a power cut.

b) Clear fault memory:

Enter code 0130 ... The fault memory is cleared.

3.2.14) Digital input/output test:

Enter code 9980 =>	7-segment A,B 7-segment C 7-segment D	009 980 1 #	1 = PTC input (0 = off / 1 = On)
ENTER =>	7-segment A,B 7-segment C 7-segment D	009 980 2 #	2 = Input 1 Fan OK $(0 = off / 1 = on)$
ENTER =>	7-segment A,B 7-segment C 7-segment D	009 980 3 #	3 = Input 2, Option card ($0 = $ off / $1 = $ on)
ENTER =>	7-segment A,B 7-segment C 7-segment D	009 980 7 #	7 = Input 2, Option card (0 = off / 1 = on)
ENTER =>	7-segment A,B 7-segment C 7-segment D	009 980 8 #	8 = Output 1 $(0 = off / 1 = on)$
ENTER =>	7-segment A,B 7-segment C 7-segment D	009 980 11 #	11 = Output 4 $(0 = off / 1 = on)$

Input 1 "Fan OK" only exists on the "new" Air Control-2. Inputs 2 to 6 (option card) only exist if the corresponding option card is installed (only possible on "new" Air Control-2).

With the output signals, you can use the arrow keys to switch the relevant output ON- (\checkmark key) or OFF (\checkmark key).

Press the ENTER key to switch to the next stage on each occasion (in this situation, the outputs are always switched off initially). You return to the default display after the final stage.

3.2.15) Control settings for selecting the frequency converter:

Enter code $0075 =>$	7-segment A,B	000 075	
	7-segment B 7-segment C	1 ##.#	Speed lowering from:

This presets the pressure from which the maximum recommended setting for the FU is limited. (Range: 5.0 to 13.0 bars//default setting: 5.0 bars on the "Solo 15": 8.0 bars)

ENTER => 7-segment A,B
7-segment C
7-segment D
$$\##.\#$$
 Speed lowering to:

This presets the pressure from which the maximum recommended setting for the FU is no longer limited. (Range: 5.0 to 13.0 bar//default setting: 13.0 bar)

ENTER =>	7-segment A,B	000	075	
	7-segment C	3	#	
	7-segment D		#	Speed lowering to:

This presets the current at which the maximum recommended setting is lowered furthest. (Range: 3 to 15 mA//default setting: 12 mA//20mA = FU 100%)

ENTER =>	7-segment A,B	000	075	
	7-segment C	4	###	
	7-segment D			Percentage recommended
				value:

This presets the recommended value within the current governed pressure range. (Range: 0 to 100% //default setting: 50%)

Example:	0% =>	recommended value = lower pressure threshold;
	50% =>	recommended value = (lower pressure threshold + upper
		pressure threshold)/2;
	100% =>	recommended value = upper pressure threshold;

ENTER =>	7-segment A,B	000	075	
	7-segment C	5		
	7-segment D		###	Control factor:

This sets the control factor (P proportion of the controller). (Range: 1 to 999//default setting: 110)

ENTER =>	7-segment A,B	000 075	
	7-segment C	6	
	7-segment D	####\$	Adjustment time:

The adjustment time is set here (I proportion of the controller at $0 \Rightarrow$ no I proportion). (Range: 0 to 9999 seconds//default setting: 8 seconds).

ENTER => 7-segment A,B
7-segment C
7-segment D
$$7-segment D$$

 $max.$ recommended value

Here you can define the maximum recommended value that may be sent to the FU. (Range: 50 to 100% //default setting: 100%)

ENTER =>	7-segment A,B	000	075	
	7-segment C	8	###	
	7-segment D			min. control range

Here you can define the minimum value as a percentage for the speed of the inverter machine (= idle speed). The value configured here must match the value configured for the frequency converter! (Range: 0 % to 100%)

3.2.16) Set system type, pressure range and quantity delivered:

Enter code $0060 \Rightarrow$	7-segment A,B	000 060
	7-segment C	1
	7-segment D	#####
	System type:	Solo 6/7/11/15

Dependent on the system type selected here, the following parameters: Run-up time, maximum number of cycles (ABO), No load time, speed reduction by (mA), mA) "speed reduction (bar)", min. control range (%) and the servicing intervals are preset with the backing table values.

ENTER =>	7-segment A,B 7-segment C 7-segment D	000 060 2 ##.#
	Pressure range:	7.0 - 15.0 bar

The upper pressure threshold is preset to the value chosen here and the lower pressure threshold is preset to 2.0 bar.

The pressure range set here is also used as the upper limit when editing the lower and upper pressure threshold settings (refer to: Item 3.1/ENTER key).



Pressure range: 7.0 - 15.0 bar

Max quantity delivered 0 – 9999 m³/h

The maximum quantity delivered for the compressor is specified here (in m³/h !)

3.2.17) Set "with dryer" option:

Enter code 0080 =>	7-segment A,B	000 080
	7-segment C	1
	7-segment D	#####

Range: 0 =without / 1 =with dryer

If the value "1" (i.e. "with dryer") is programmed, then a fault message will be triggered if signal "dryer OK" on input "S3" of the FU control is missing.

If an option board is installed then a fault message will be triggered if the signal "Dryer OK" (DE 6) is missing.

<u>Caution:</u> Input "S3" must be configured to the FU control if it is to be controlled by the "Air Control-2". This input is available only from plant type "SOLO-11" up for Air Control-2. For types "SOLO-6/7" this input is permanently configured to "1"!

The inputs from the FU control will only be processed if no option boards are available!

3.3) Depiction on the LCD of the operating/display unit:

Тор:	- left:	7-segment pressure indicator	("7-segment A");
		Symbols for: MPa, psi, bar;	
	- right:	7-segment temperature indicator	("7-segment B");
		Symbols for: °C/°F/°K	
Centre:	- 7-segment display (" 7-segment C ");		
	Symbols	s for: fault, warning/servicing, auton	natic, remote, restart,
		motor, solenoid valve, heating,	, fan;
Bottom:	- 7-segme	ent display (" 7-segment D ");	

- Symbols for: BLCO, hours, minutes, seconds;

3.3.1) Default display:

7-segment A:	- current network press	ure "10.2 bar"	
7-segment B:	- current compressor te	mperature " 52 • <i>C</i> "	
7-segment C:	 no display (no Load n number of the active f number of the active v 	node, no fault/warning); fault (if tool on); warning/servicing message (if warning triangle	e on);
7-segment D:	a) if fault/warning: b) no fault/warning:	fault/warning text (abbreviation, 5 characters running shutdown or tracking time; or current setting [0-100%] for frequency converter (in Load mode););

3.3.2) Input code:

In the default display, press the 0 key for approx. 3 seconds ...

7-segment A,B:	cod
7-segment C:	
7-segment D:	####

Now use the arrow keys to enter the relevant code.

Press the ENTER key to accept the code or the 0 key to reject the input.

3.4) Processing faults/warnings:

3.4.1) Fault:

The Tool symbol flashes and the relevant number is shown flashing in the "7-segment C" field.

7-Segm.C	<u>7-Segm.D</u>	
[1]	[Por] "Incorrect setting"	(Change recommended pressure settings)
[2]	[EPROM] "EEPROM?"	(Change all settings)
[3]	[Lo AC] "Low voltage"	(only if detection is activated/refer to: item 3.6)
[4]	[No AC] "Power cut"	(only if Automatic Restart is not set)
[5]	[DEFEC] "Incor.compens.setting"	(Check for repairs/compensation)
[6]	[mot t] "Motor temperature"	(PTC)
[7]	[hiCur] "Fan current too high"	Fan current $>$ max. fan current)_ and delay
[8]	[LoCur] "Fan current too low"	Fan current < min. fan current) cycled
[9]	[SE t] "Temp.sensor def."	(monitoring: KTY sensor 1 compressor temp.)
[10]	[SE P] "Press.sensor def."	(monitoring: pressure sensor)
[11]	[hi t] "Compr.temp.too high"	(Temperature > max. compression temperature)
[12]	[hi P] "Network pres.too high"	(Network pressure > Safety pressure)
[13]	[FU] "FU fault"	Frequency converter does not respond or registers a fault
[14]	[dryEr] "Dryer fault"	Signal "dryer OK" missing
[15]	[SE t2] "Heating temp.sens.fault"	(Monitoring: KTY sensor 2 / heating temperature)

If any of these faults appear, then this leads to the compressor switching off. The red LED stays on until the fault has been cleared. The fault can only be cleared with the **0** key if its cause has been rectified in the interim.

3.4.2) Warning/Servicing:

The Warning Triangle symbol flashes and the relevant number is shown flashing in the "7-segment C" field.

ure - $5^{\circ}C$)
5''

The compressor is not switched off if a warning or servicing message is displayed. The red light flashes until the reason for the warning is eliminated or until the relevant servicing interval has been cleared. Normally, a fault/warning is indicated immediately.

However, if the user has pressed the ENTER key, to enter recommended or limit settings, then the fault/warning is displayed only when the user has switched back to the default display.

3.5) Information on the programme:

3.5.1) Modes:

- a) the compressor is switched off:
 - the Motor and Solenoid Valve symbols are off (LCD)
- b) the compressor is switched on, but the current pressure is still higher than the lower pressure threshold (run-up guard).
 - the Motor and Solenoid valve symbols are off
 - the text "run" = is flashing in the lower 7-segment indicator
- c) The compressor is switched on, but the compressor temperature (or heating temperature if operated "with heating") is still less than $+1^{\circ}C$
 - the Motor and Solenoid valve symbols are off
 - the temperature unit symbol is <u>flashing</u> (LCD: °C/°F/K)
 - the text "cold" = is flashing in the lower 7-segment indicator
- d) The compressor is in operation, but the load valve is switched off, i.e. the compressor is not compressing. (run-up phase or no load)
 - the Motor symbol is on
 - the Load Valve symbol is off

If the compressor is in the "Automatic" operating mode, or "Automatic Opt." and the idling time is active, this is shown in the lower 7-segment display.*

- e) The compressor is in operation and the load valve is switched on,
 - *i.e. the compressor is compressing. (Load)*
 - the Motor symbol is on
 - the Load Valve symbol is on
 - the current setting for the frequency converter is shown in the bottom line (7-Segm.D) ("Fu ###" // ### = 0-100%)

3.5.1) Modes:

(refer also to: item 3.2.1)

a) AUTOMATIC mode:

After reaching the upper pressure threshold, the system moves to NO LOAD for the duration of the tracking time (see: 3.2.6).

After the no load time has elapsed, the motor switches off.

After switching off, the text **run** flashes => ready for a new start-up.

As soon as the pressure is again less than the lower pressure threshold, the system restarts.

b) LOAD/NO LOAD mode:

The compressor alternates between Load and No Load modes, i.e. it tracks with no time restriction.

c) OPTIONAL AUTOMATIC mode: (refer also to: Item 3.2.1)

The symbol II (to the right below the temperature display) and the Automatic symbol are selected as the coding for OPTIONAL AUTOMATIC MODE.

Whenever the system alternates between Load and No Load modes, then after 10 and 40 seconds respectively, the network pressure is memorised. If the pressure drop thus calculates is above the threshold (ABO PRESSURE DIFFERENCE), then the system remains in No Load mode for the "long" tracking time (Item 3.2.6/NO LOAD CYCLE) and, if not, then switches off after a "short" tracking time (45 seconds).

Each time the compressor motor starts up, an internal counter (number of switches) is incremented by 1. As soon as this counter reaches the preset maximum number of cycles (MAX. CYCLES), the motor no longer switches off after the tracking time has elapsed, but remains in No Load mode until the counter is again below the relevant threshold [MAX. CYCLES].

After one complete cycle (t_{SP} = 3600 seconds/max. cycles) the counter is decremented by 1 again.

3.5.3) Switch on process:

If the current network pressure is above the set pressure threshold when the compressor is switched on, then the text **run** flashes. Only when the network pressure falls below the threshold does the compressor start.

If the compressor temperature (or heating temperature if operated "with heating") when switching on is below $+1^{\circ}$ C, then the temperature unit (°C/°F/°K) flashes, as does the text "Cold".

If the temperature then rises to at least +1°C, then the compressor starts up. (refer to item 3.5.7)

3.5.4) Switch-off process:

If you switch the compressor of using the 0 key (or the optional RS485 interface, then it switches first into No Load mode. The remaining No Load cycle time is shown in the lower 7-segment indicator.

The shutdown time is used as the time here (see item 3.2.6).

Only after this time has elapsed does the system switch off completely.

3.5.5) Shutdown time:

(see: item 3.5.10/automatic restart)

3.5.6) Safety pressure: ("P_ZUL")

The safety pressure is the set pressure range + 0.8 bar. (For pressure range, refer to: Item 3.2.16)

Example: Pressure range = $10 \text{ bar} \implies "P_allowed" = 10.8 \text{ bar}$

If the pressure exceeds the "P_allowed – 0.3 bar", then a warning is registered. If the pressure exceeds the "P_allowed" threshold, then the compressor is switched off and a fault message is displayed.

3.5.7) Supplementary heating function: (refer also to: **3.2.8** + **3.2.9**)

a) "no heating"

If the heating temperature falls below the threshold [min. compressor temperature], the Supplementary Heating output is switched on.

As soon as the heating temperature rises above the threshold [minimum compression temperature $+ 2^{\circ}$ C], the output is switched off once more.

b) "heating"/compressor is OFF/master switch is ON

If the heating temperature falls below the threshold [minimum compression temperature], then the Supplementary Heating output is switched on. As soon as the heating temperature rises above the threshold [minimum compression temperature $+ 2^{\circ}$ C], the output is switched off again.

c) "heating"/compressor is ON

If the heating temperature is below the - 3°C switch-off temperature threshold (refer to item 3.2.8), then the Supplementary Heating output is switched on. As soon as the upper temperature threshold has been reached, or if the compressor is switched off, then the output switches off again.

If the function "heating" is activated, and the signal "temp.restriction" ("DE 5") is missing, then warning [5] ("oilleval/heating") will be displayed.

The "new" Air Control-2 must have its own KTY filter fitted for heating temperature (b + c). The "old" Air Control-2 always uses the compressor temperature!

In general, the compressor can only be started when the compressor temperature (or heating temperature if operated "with heating") has reached at least the threshold of $+1^{\circ}C$.

If the supplementary heating output is switched on, then this is shown in the LCD using the corresponding symbol.

3.5.8) Servicing intervals:

(Actual values, refer to: 3.1/recommended values refer to: 3.2.5)

a) Servicing requirement

The relevant intervals are enumerated below.

As soon as any of these intervals is less than 100 hours, the relevant message appears and the red light flashes (=> Servicing).

To clear this message, first enter the code **0021** and then press the **0** key. This resets the relevant interval to the recommended setting once more.

b) 1. Servicing for Oil/Oil Filter:

After the first service, the recommended value for the Oil/Oil Filter servicing interval is changed automatically from 500 hours to 2000 hours.

3.5.9) System data default settings:

Enter CODE 0088 => all variable parameters are set to fixed default settings.

(N.B.: data that has been set previously by hand will be overwritten).

3.5.10) Sequence on Automatic Restart

If automatic restart after a power cut has been programmed, then the time which has been preset in the *"Shutdown time"* (refer to item 3.2.6) will run after power has been restored. The Restart symbol flashes while this time runs.

If the system was in operation before the power cut, then it will restart after this time has elapsed, but will otherwise remain in STOP mode.

If Restart is activated, the *Power Cut* fault [4] will **not** be reported after power has been restored.

3.6) Codes used in the program:

<i>0002</i> => Selection:	AUTOMATIC, LOAD/NO LOAD, OPTIONAL AUTOMATIC mode (+ supplementary settings for OPTIONAL AUTOMATIC mode)
<i>0003</i> => Selection:	automatic restart (Y/N) + time
0005 => Selection:	Fan current monitoring settings
0008 => Selection:	Local operation or remote control
<i>0011</i> => Release:	Release editing of recommended/limit settings which are called up via the INFO key
0015 => Selection:	Supplementary heating settings
0018 => Selection:	GLW mode (0/1) [1 => System is GLW slave]
<i>0021</i> => Call-up:	Release COMPRESSOR SERVICING clearance You <u>then</u> clear with the 0 key)
<i>0030</i> => Call up:	Show fault memory
0041 => Call up: 0042 => Call up: 0043 => Call up: 0044 => Call up: 0045 => Call up:	Editing the Air Filter servicing interval Editing the Oil/Oil Filter servicing interval Editing the Oil separator servicing interval Editing the Motor Lubrication servicing interval Editing the Compressor servicing interval
<i>0051</i> => Call up:	Edit No Load, Shutdown time,
0060 => Call up: 0062 => Call up: 0069 => Call up: 0075 => Call up:	Select system, pressure range and quantity delivered (refer to: Item 3.2.16). Only select the pressure range (e.g. following a software update) Only enter quantity delivered (e.g. following a software update) Set the parameters for selecting the frequency converter; (see: Item 2.2.15)
<i>0080</i> => Call up:	(see: item 5.2.15) Program option "with dryer" (see section 3.2.17)

<i>0088</i> => Call up:	System data default settings (variable parameters)
0090 => Call up: 0095 => Call-up:	Convert pressure indicator unit Convert temperature indicator unit
<i>0105</i> => Call-up:	Define pressure measurement correction factor
<i>0130</i> => Call-up:	Erase fault memory
<i>9900</i> => Release:	 Initializing (then press the 0 key.) Set runtime/load time to 0; Servicing intervals => recommended values; Erase fault memory; N.B.: (only designed for 1 start-up.)
<i>9919</i> => Release:	Edit operating/load hours Next, call up the relevant settings using the INFO key
9929 => Release:	Edit operating/load hours The operating/load hours can be edited in steps of 1000 hrs.
<i>9950</i> => Call-up	Set system address, interface mode, and baud speed [PC link]
<i>9970 =></i> Call-up	Set the behavior when power is restored after a "Low Voltage" warning
9980 => Call-up	Test of inputs/outputs

9999 => Call-up Show current program version

13.0 AC2 P 1.16	⇔	Air Control-2 (standard: 13 bar) " OLD "
		Software version 1.16
10.0 AC2 2 P 1.16	⇔	Air Control-2 (version: 10bar) " NEW " Software version 1.16

3.7) Fault in the control unit programming memory

After switching the mains on, if an error in the programming memory (Flash EPROM) has been detected, the following message then appears in the lower 7-segment indicator:

"FLASH" => In this case, the program must be reloaded into the control unit.

3.8) Transferring a new program to the control unit;

- Switch off the power supply to the control unit;
 - Press the ▲ and 0 keys simultaneously and switch on the power supply again at the same time
 - FLASH now appears in the indicator.

=> The relevant program (hexadecimal file) can now be transferred to the control unit.

To do this, connect the control unit via an RS232/RS485 interface adapter via the first interface (= FU connection) with the relevant PC (PC software setting: 19200 bauds).

3.9) Frequency converter settings:

- You set the following FU interface parameters

* Recommended setting scaling:	0.1%
* control unit and recommended value:	MemoBus
* Slave address:	1
* Baud speed:	9600
* Parity:	even
* Pause when sending:	10 ms
* RTS control:	active