

Operating instructions

Compressor control airtelligence plus





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Operating instructions for the master compressor control airtelligence plus

BOGE KOMPRESSOREN Postfach 10 07 13 33507 Bielefeld

Otto-Boge-Straße 1-7 33739 Bielefeld

Fon: +49 5206 601-0 Fax: +49 5206 601-200 Mail: info@boge.com Net: www.boge.com

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Index

Part 1:

airtelligence plus

1.1	Purpose of these operating instructions	. 1
1.2	Orientation aid for reading these instructions	. 1
1.3	Function principle of the control	. 2
1.4	Components of the control Connections The operating unit Display Display "Station" Display "Compressor" Display "Settings" Display "Switch clock" Display "Info"	3 4 6 10 11 12 13
1.5	Parameterisation Enter modification code Change settings Detailed description of settings Behaviour of the control unit	15 15 17 18 23
1.6	Set switch clock Set real-time clock Set/change switch clock channel Detailed description of the setting of individual switch clock values	24 24 24 25
1.7	Warnings and faults Listing of warnings/faults Remedy warnings/faults	27 27 29
1.8	Servicing the airtelligence plus Change of battery Cleaning of the display Updating of software	30 30 30 31
1.9	Appendix Technical data of connections	31 31

1.1 Purpose of these operating instructions

These operating instructions are meant for final customers of the BOGE company, who have purchased the airtelligence plus master compressor control and thus want to control the compressed air production of several connected compressors.

These operating instructions are meant to enable you to operate the airtelligence plus control without any specific technical previous knowledge.

Not embodied in these operating instructions

Any safety-relevant information as to the individual compressors form part of the compressor operating instructions.

Since installation and initial operation are customarily performed by BOGE service personnel, the according operations will not be described in this chapter. More detailed information you will find in the separate operating instructions of the compressors.

1.2 Orientation aid for reading these instructions

In order to enable you to easily familiarize yourself with the airtelligence plus compressor control, the layout of the operating instructions is intended to give you better orientation and support.

1. Text passages helping to perform action steps are marked and characterized as follows:

a) Instructions with one action step only:

Means of design	Example
Start with a hyphen: -	– Press x… key
written in bold	

b) Instructions with several action steps:

Means of design	Example	
Start with step number: 1.,2.,3,	1. Press x… key 2. Press y… key 3. Press z… kev	

written in **bold**

1.1

c) Information about the state the system is in following an action step:

Means of design	Example
Arrow:>	→ You have set the value.

2. Text passages providing notes and further information are marked as in the following example:



Note!

This display is not intended to adjust any settings but merely to access further information.

1.3 Function principle of the control

The airtelligence plus is a master compressor control unit. This means that the control unit serves to control not only one but several linked compressors, viz. interconnected compressors.

Each of these compressors is equipped with its own (subsidiary) control. Any compressors equipped with the FOCUS, PRIME and RATIO type BOGE controls qualify for direct connection to airtelligence plus.

The subsidiary controls serve to exclusively monitor and adjust the settings and operation of the single compressors and need to be adjusted in comformity with the specifications of the master airtelligence plus in order to avoid any conflicts with the airtelligence plus.

The coordinated interaction of the compressors within the interconnected compressor system and the high efficiency of the compressed air production are exclusively controlled by the master airtelligence plus.



Note!

Prior to commissioning and before accomplishing any kind of maintenance or servicing work please read the functional descriptions of both control and compressor carefully. Please observe the **safety and accident prevention regulations** in the first chapter of the compressor operating instructions.

1.4 Components of the control

The airtelligence plus control is located in a separate switch cabinet of the protection type IP54. The operating temperature range is between -10 and $+45^{\circ}$ Celsius (relative humidity 0 to 90%, no dewing).

Connections

Here you find some information as to the control connections:

Power supply

The standard version is equipped with a universal 100 ... 240V power supply integrated in the switch cabinet. It can optionally be substituted by a 24V input power adapter (UL version).

The terminals of the mainboard (A1 and A2) are designed for 24V AC/DC.

Mainboard

The mainboard includes:

- 1. A battery-buffered real time clock,
- Two digital inputs for potential-free 24-V-DC contacts Pressure range change-over and manual operation/switch clock operation.
- 3. Three relay outputs for up to 230 V AC:
 - a) Make contact switch clock
 - b) Changeover contact fault signals faults like e.g. sensor breakage
 - c) Make contact warning

Flash device

A six-pole ISP plug is available for flashing of software. Either module uses LPC213x processors.

BOGE interface module

Compressors which are not equipped with a control with suitable Modbus-RTU interface, can be connected via a BOGE-Interface module.

The BOGE-Interface module must be connected to a 24 V / 0.2 A power supply. Up to a cable length of 200 meters the supply can be provided from the airtelligence plus switch cabinet.



Note!

We recommend that the control be installed by BOGE service personnel and to have it connected to the individual compressors of the planned compressed air network. You can contact BOGE service under the following phone number:

+49 5206 601-140

For a table of the technical specifications of the connections see chapter " Technical data of connections", page 31.

The operating unit

The operating unit illustrated below with integrated display is fastened in the door opening of the switch cabinet and can therefore also be used with the switch cabinet being closed:



Fig. 1.1: The operating unit of the airtelligence plus

Operating unit keys

The keys are located on the operating unit:

Кеу	Designation	Function		
Prof.	"Manual" key	This key serves to activate the pressure range 1 without any modification of the switch clock parametrization and for production compressed air. This key can also be used to switch off the clock (on pres-		
		sure range $3 = 0$ bar).		
\bigcirc	"Switch clock" key	This key switches back to normal operation.		
		This key exists five times underneath the display and may be programmed with different functions.		
	Functional key	The varying function assignments are being graphically illustrated above the functional key in the display (see Table of the functional key assignments on page 5).		

Tab. 1.1: Operating unit keys

Symbol	Meaning
	With this function you navigate to the left.
	With this function you navigate to the right.
	This function is intended to select the following (below) object. In some cases this function also serves – in the event of continuous activation – for fast downward scrolling.
	This function is intended to select the previous (next upward level) object. In some cases this function also serves – in the event of continuous activation –for fast upward scrolling.
i	You will now find an illustration containing detailed information
\diamond	After actuation of the key set to this function you need to enter a code au- thorizing you to change certain settings.
	This function is used to reduce a given value. As soon as the smallest value is reached, the highest value will be displayed after actuation.
+	This function is used to increase a given value. As soon as the highest value is reached, the smallest value will be displayed after actuation.
t	The Enter function is used to acknowledge the inputs.
С	This function serves to undo your input. It also serves to reset the prespec- ified values "max. and min. net pressure" shown in the "info" display.
Ð	This function serves to leave the editing mode.
Ð	This key serves to set the real time clock.

The functional keys of the control can be assigned as follows:

Tab. 1.2: Table of the functional key assignments



Note!

An RJ12 cable is used to connect the operating unit to the main board. Interconnection of the modules may only be carried out by means of suitable and zero-potential power lines!

Display

The airtelligence plus display serves to give you an overview of the single functions of the control, to carry out settings, and to check same.

The functional keys which are located underneath the arrows 🚺 📘 shown in the display, enable you to navigate through the individual main displays / tabs:

- With the right arrow functional key clockwise.
- With the left arrow functional key anti-clockwise

Depending on whether you are using the right or left arrow functional key, you will be guided to the following main displays / tabs:



Fig. 1.2: Navigation through the main displays

Display "Station"

After connecting the control unit to the power supply line, the control unit shows the display "Station". The display serves to give you the most important information on your interconnected compressors at a glance, but also on every other single compressor which is part of the interconnected system. The display details contain the current network pressure (in bar), the display of the pressure range as well as status messages on the connected compressors.



Fig. 1.3: Display "Station"

The symbols shown in figure 1.3 have the following meaning:

The green point next to the current net pressure value indicates that no internal fault is being identified by the airtelligence plus.
 Further symbols appearing at this point may be a small green point with a light yellow edge (warning) or a red cross (fault).
 When any of those symbols is displayed, the corresponding warning and/ or fault code will be displayed left beside the symbol (see Display "Station" with warning on page 8).

 The clock on the right next to the net pressure value serves to signal that the switch clock is activated and that switch clock channel 37 is currently active. Further symbols at this place and their meaning:

Symbol	Meaning			
P	The automatic mode resp. the cyclic change are active.			
I.	The control is in manual mode.			

Tab. 1.3: Symbols automatic/switch clock

 In the middle of the screen (blue area) the following information is displayed:

a. pressure range currently used for compressed air control (pressure range 1, as shown in example).

- **b.** if the switch clock mode or cyclical change are active, the time frame until the following change is shown in hours-minutes.
- The lower section contains the symbolic illustration of the current status of the connected compressors (C1 to C6). The following symbols are used:

Symbol	Meaning			
\otimes	Compressor is switched off.			
	Compressor operates in load -run			
\bigcirc	Compressor operates in idle-run			
\bigcirc	Compressor is ready for operation.			
\$	Compressor-fault.			
Ø	Communication faulty.			

Tab. 1.4: Compressor status-messages

 Above the symbols for the current compressor status, another optical information on the current status of the compressor is displayed:

Symbol	Meaning		
	No fault and warning message. Compressor is ready.		
۲	The compressor signals a warning/ service message. It is ready for operation again.		
×	The compressor signals a fault of the communication with this compressor is faulty. The compressor is shut down.		

Tab. 1.5: Symbols above the compressor status messages

 The number on the left of each compressor symbol shows the current priority of the compressor. If several compressors are in the same priority group the same number is shown for each compressor of this group.

If the control signals a warning or a fault, this will be indicated by the symbols 0 or X in the display on the left next to the net pressure value:



Fig. 1.4: Display "Station" with warning

_

If you want to obtain more detailed information as to warning/fault:

Press functional key below the symbol 1.

→ The message window opens for more details on the warning / fault:



Fig. 1.5: Message window

In the current window, the symbols or \times located right on top serve to indicate that it is a warning and/or fault message.

Below, you will find more information regarding the time of the occurence of the warning / fault and the net pressure at the specified time.



To acknowledge the warning/fault message and to leave the message window:

Press functional key below the symbol ■.
 → The control automatically shows the display "Station".

How to leave the message window without acknowledging the message:

- Press functional key below the symbol
 - → The control automatically shows the display "Station".



Note!

This display is not intended to adjust any settings but merely to access further information. Display "Compressor"

In this display you find detailed information as to the current operating status of the individual compressors and to the compressor runtimes.



Fig. 1.6: Display "Compressor"

The symbols shown in the figure above have the following meanings:

- The control unit shows the current runtime data of compressor 1 since the number 1 at the left edge of the display strongly contrasts to the other number (2...6).
- As already described in the display "Station", a symbol is located in the top left area showing the current operating status of the compressor including additional information on the current priority and the symbols for "ready"
 , warning/service and/or fault ×
- The number on the right side of the compressor symbol (in this case 3) shows its current priority.
- The percentage shown next to the word "load-run" and the bargraph indicate that it is a continuously controlled compressor with a momentary utilization of 69 %.
- The actual efficiency value (96 %) was calculated by means of the compressor integrated control on the basis of its operating and idle times.
- On the right side of the display the current runtimes (operation/idling) of the compressor are listed.
- The values shown under "service" and "fault" serve to describe certain warning/service or fault messages. If compressor 1 shows a warning/service or fault message, the control unit on the compressor takes care of transmitting this message onto the airtelligence plus control where it is displayed accordingly. Please consult the operating instructions of the subsidiary compressor control to determine the type of warng/service and/or fault. In the illustrated example no message occurred (both values are 0).
- The value "next service" indicates the remaining runtime in hours until the next required service (52 hours) of compressor 1.
- Use functional keys below display arrows and to receive respective data on additional compressors.



Note!

This display is not intended to adjust any settings but merely to access further information. Display "Settings"

This display serves to check the settings of the interconnected compressors (visualisation mode) and also to set and/or modify such settings after entering the applicable modification code (see Parameterisation on page 15).

Sta Comp Settings d	ock fo
P1.1	
Language	english
Sensor range	16 bar
No.of compressors	6
Pressure range 1	
Pmax	9.50 bar
Pmin	8.50 bar
Width of target area	60.0 %
◀ ▲ ≫ ╹	▼ ►

Fig. 1.7: Display "Settings" (visualisation mode)

If you want to obtain information as to the individual settings:

Press the functional keys below the display arrows and and until you have selected the required setting.

Holding one of the keys enables you scroll into the selected direction.

The selected setting is highlighted by a black frame. The setting breakdown P x.y in the top left area is intended to facilitate orientation. A list of the most important settings is shown from page 18.

If you want to set or change the setting:

- Press functional key below the symbol 🔉.
 - → The code input window opens:

Sta C	omp Settings I do	ck fo
P1.1		
Language	Code	english
Sensor rar		16 bar
No.of comp	**500	6
Pressure ra	500	
Pmax		9.50 bar
Pmin		8.50 bar
Width of t	carget area	60.0 %
C	- +	· +

Fig. 1.8: Code input window

This window enables you to access the editing mode where all modifiable settings can be changed. A detailed description concerning the input of the modification code into the code input window and the modification of parameters can be found in section "1.5 Parameterisation", page 15. Display "Switch clock"

This display serves for time dependent adjustment of the compressed air production of the interconnected compressors:

	Stat Com	Se	Switch clock	Info
8	Day of week Monda	ay	Time of day	: 35
10 11	Pressure range	1: 8,50	- 9,30 bar	
12 13 14	Priority	dfb	Relay output	pen
	< ▼	(> ▲	►

Fig. 1.9: Display "Switch clock"

Time dependent adjustment is also possible for the pressure range (ranging from ... to ...), the priorities according to which the respective compressors are to be switched on for compressed air production, and the relay output for potential additional functions of the control unit.

A weekly repeating period (from Monday 00.00 hrs. thru Sunday 23.59 hrs.) serves as the basis for the timing of the settings. This weekly period allows you to determin up to 50 time periods with different switch clock settings by means of the so-called switch clock channels.

The functional keys located below the display arrows \square and \square allow you to call up the different switch clock channels and to check the settings of the called switch clock channels. The respective switch clock channel can be determined by the number figuring in the tab of the left edge of the display.

The illustration above (display "Switch clock") means:

You have opted for switch clock channel 10.

- Activation of switch clock channel 10 starts on Monday 06:35 hrs.
- Pressure range 1 is selected (P_{min} = 8.50 bar, P_{max} = 9.30 bar).
- As of this point, the priority group "a" is given highest, the priority group "c" the second highest, the priority group "e" the third highest, the priority group "d" the fourth highest, the priority group "f" the fifth highest, and the priority group "b" lowest priority.
- The relay output switch clock is opened.

Each of the switch clock channels will remain active until the real time clock reaches the following predefined time period (switch clock channel) within the weekly time period. In case of a power failure, the channel whose switch-on point is closest to the current real time clock time, will be actuated first.

A detailed description how to set the switch clock is to be found in chapter "1.6 Set switch clock", page 24.

Real-time clock (on channel 0 in the display "switch clock")

A real time clock is integrated in the airtelligence plus which the control unit will refer to with regard to all time dependent settings. For this reason it is of utmost importance that the real time clock is always correctly set. Use switch clock channel 0 to check and set the real time clock (see Set real-time clock on page 24). The readings of the real time clock are shown as follows:



Fig. 1.10: Real-time clock on channel 0

Display "Info" This display serves to provide additional information on the airtelligence plus control and values of the compressed air network:

Stat Comp	Se	Switch c	Info	l
11				
Maximal net pressure				
Net pressure			5.63 bar	
Date			10.01.2011	
Time			05:41	
Current net pressure				
Net pressure			9.27 bar	
Minimal net pressure				
◀ ▼	c	;		

Fig. 1.11: Display "Info"

Use the functional keys underneath the display arrows \square and \square in the "info" display to call up the following data:

Max. net pressure	
Net pressure	Highest pressure value (in bar) that has occurred inside the com- pressed air net by then.
Date	Date when the highest pressure value occurred.
Time of day	Time of day when the highest pressure value occurred.
Current net pressure	Currently measured pressure inside the compressed air net
Min. net pressure	
Net pressure	Lowest pressure value (in bar) that has occurred inside the com- pressed air net by then.
Date	Date when the lowest pressure value occurred.
Time of day	Time of day when the lowest pressure value occurred.
Battery	
Voltage	Voltage of the battery for the real-time clock in millivolt (mV)
Release	
Compressor 1 Compressor 2	This serves to list a total of 6 compressors, viz. the maximum number of compressors which can be linked by means of the control unit. The following compressor statuses are registered by the control system: - yes: Release was issued by the control system for the according compressor to start compressed air production
Compressor 6	 no: Release was not issued by the control system for the according compressor to start compressed air production. n.a.: Not available – the compressor is not available.
Information about ver	rsion
Base module	The latest Software version of the base module
Operating unit	The latest Software version of the operating unit

Tab. 1.6: Components of the "Info" display



Note!

This display is not intended to adjust any settings but merely to access further information.

Exception:

Actuating the functional key underneath the symbol **C** for 2 seconds enables you to reset the values "max. and min. network pressure". The control system is designed to recalculate the values after reset.

1.5 Parameterisation

If you intend to use the control system to modify the parameter settings, you will be requested to first enter your modification code in the code input window.



Note!

Make sure to only modify the parameters of the compressor if you are certain that said modifications are not in conflict with the predefined settings of the controls on the individual compressors. In case of doubt please contact your BOGE dealer or BOGE service under the following phone number:

Telephone: +49 5206 601-140

Enter modification code As soon as you have opened the code entering window (see Display "Settings" on page 11) you see five zero digits. The first zero digit is blinking. Now enter the code to change the setting.

The code for changing the parameters is: 17391. To enter theses digits:

- 1. Press functional key below the symbol 🕂 once while the first zero digit is blinking.
 - → Digit 1 appears.
- 2. Now press functional key below the symbol
 → An asterisk appears instead of digit 1. Simultaneously the second zero digit starts blinking.
- 3. Now enter digit 7 below the symbols and the using the functional keys.
- Acknowledge with functional key below the symbol
 → An asterisk appears instead of digit 7. Simultaneously the third zero digit starts blinking.
- 5. Enter all other digits of the code 17391 in the same way.

In case you have entered a wrong digit:

Press functional key below the symbol C.

 \rightarrow The previous input is cancelled and you can enter the modification code once more.

Sta Comp Settings I clos	ck fo		
P1.1			
Language Code	english		
Sensor rar	16 bar		
No.of comp * * 5 0 0	6		
Pressure ra			
Pmax	9.50 bar		
Pmin	8.50 bar		
Width of target area	60.0 %		
c - +	بہ •		

Fig. 1.12: Code input window



Note!

After entering the modification code and leaving the display for modification of settings, you can also enter code **00000** in the code input window for repeated actuation of the modification display. This alternative code input remains activated up to 15 minutes after the first input of code **17391**.

After entering and confirming all numbers the display, in which you intend to modify any settings, will open:

Sta Comp Settings	l clock fo
P1.1	
Language	english
Sensor range	16 bar
No.of compressors	6
Pressure range 1	
Pmax	9.50 bar
Pmin	8.50 bar
Width of target area	60.0 %

Fig. 1.13: Modifiable settings (highlighted in green)

The chosen setting appears highlighted in colour:

- Highlighted in green means that this setting can be changed.
- Highlighted in red means that this setting cannot be changed.

Sta Comp Settings I dock	fo
P1.1	
Language	english
Sensor range	16 bar
No.of compressors	6
Pressure range 1	
Pmax	9.50 bar
Pmin	8.50 bar
Width of target area	60.0 %
◀ ▲ ◇ ▼	

Fig. 1.14: Non-modifiable settings (highlighted in red)



Note!

Selecting a non-modifiable setting, such setting will appear not only with a red frame. The Enter symbol will disappear at the same time causing the functional key underneath that symbol to be inactive. That implies that you cannot select this setting.

Change settings

To change a setting:

- 1. Select the setting using the functional keys below the display arrows ↓ and ↓.
- 2. Press functional key below the symbol **2**.
- Change the value using the functional keys below the symbols and +.
- 4. Press functional key below the symbol ☐ once more.
 → After resetting and/or predefining the value again you will now be able to select other settings for modification.

If you do not intend to modify a selected setting and/or have accidentally modified a setting:

- Press functional key below the symbol C

→ You leave the modification level of the setting, your input data will not be registered, and the original value of the setting will be kept and/or recovered.

If you have modified the selected setting you need to confirm such modifications in order to cause the control system to definitely accept them. To do so:

5. Press functional key below the symbol <a>[

→ A confirmation prompt window opens. You will be asked whether or not all modified settings are to be accepted.

Sta Comp Settings I clock	< fo
P1.1	
Language	english
s Accept changes ?	ar 5
P1 E yes	ar
Width of target area	60.0 %
- +	⊢

Fig. 1.15: Confirmation prompt window

If you want to accept the changed settings:

- Select "yes" using the functional keys below the display arrows and .
- 7. Acknowledge with functional key below the symbol .
 - → The control has accepted the changes.

If you do not want to accept the changed settings:

- Use the functional keys underneath the display arrows and to select "no" and confirm by means of the functional key underneath the symbol .
 - → The control has not accepted the changes.

Detailed description of settings

Hereafter the most important settings (P) that can be set with the airtelligence plus are explained.

P 1: Common settings

P 1.1: Language

With this setting the display language is determined.



Note!

If you intend to change the language into P1.1 no prior modification code is needed. It is possible to directly change the language as described in section " Change settings", page 17.

P 1.2: Sensor range

This setting serves to determine the measuring range of the pressure sensor.

P 1.3: Number of compressors

This setting serves to determine the number of interconnected compressors which are to be controlled by the airtelligence plus.

P 2: Pressure range 1

P 2.1: P_{max}

Highest value of a pressure range in bar. A pressure range is based on a minimal and maximal pressure value. P_{max} is the max. pressure and is therefore used to determine the max. pressure which may be reached by the interconnected compressors.

P 2.2: P_{min}

Lowest value of a pressure range in bar. P_{\min} is the minimal pressure and is therefore used to determine the min. pressure which may be reached by the interconnected compressors.

P 2.3: Width of target area

Within the pressure range, which is determined by the pressure zone between P_{min} and P_{max} , the parameter of the target area width allows you to select the pressure range in which the interconnected compressors are scheduled to normally produce compressed air. The specification as a percentage refers to the portion of the pressure range width.

Example: If the pressure range is between 9 and 10 bar while determining a target area width of 50 %, the target area width is 50 % of the pressure range width, viz. of 1 bar. Thus the width of target area is 0.5 bar.

P 2.4: Bottom distance of target area

In order to determine the pressure zone within the pressure range in which the interconnected compressors are scheduled to normally produce compressed air, you also need to specify, apart from the target area width, the target area bottom distance. In this case, too, the specification (in %) refers to the portion of the pressure range width.

Example: Your pressure range is between 9 and 10 bar while the width of target area is to be 50 %, viz. 0.5 bar. If the target area bottom distance is set at 20 %, this value corresponds to 0.2 bar. This 0.2 bar value is added to P_{min} (9 bar), thus the target bottom area distance is 9,2 bar. The target area starts a 9.2 bar with a width of 0.5 bar, viz. it ends at 9.7 bar. This is the upper target area distance: the pressure point up to which the interconnected compressors are scheduled to normally build up pressure.

The schematic view and the table visualise the coherencies:

(10 bar)
Upper target area limit (9.7 bar)
Width of target area (50 % = 0.5 bar)
Target bottom area limit (20% = 9.2 bar)
(9 bar)

Fig. 1.16: Coherence pressure range – width of target area – target area limits

Pressure range width	=	P _{max} – P _{min}
Width of target area	=	Upper target area limit – target bottom area distance [Part of the pressure range width, specification in %]
Bottom distance of target area	=	Target bottom area limit – P _{min} [Part of the pressure range width, specification in %]

Tab. 1.7: Definition of the values pressure range width, width of target area, bottom distance of target area

P 2.5: Gradient

The "gradient" setting enables you to define the max. admissible speed during which pressure is built up in the target area and/or the max. admissible speed during which pressure may be built up in the target area without any compressors having to be immediately switched on or shut down.

If, for example, you should notice that in the "Info" display the value for the ever measured max. net pressure by far exceeds the P_{max} value predefined by the pressure ranges, the predefined value for the gradient may be reduced accordingly.

This allows, for instance, to avoid fast switch-on and shut-down cycles of the individual compressors (in particular in case of a small volume of the compressed air receiver).



Note!

For an optimal adjustment of the gradient with specific view to our interconnected compressors please contact your BOGE dealer or BOGE service under phone number:

Telephone: +49 5206 601-140

P 3: Settings for pressure range 2

A second adjustable pressure range enables you to temporarily or remotely use lower pressure values or another gradient.

The setting for pressure range 2 correspond to those of pressure range 1 (see P 2: Pressure range 1 on page 19).



Note!

The settings for P_{min} and P_{max} in pressure range 2 are to be lower than the values of pressure range 1.

P 4: Control

P 4.1: Control mode

If your interconnected compressors include continuously adjustable as well as non-adjustable compressors, this allows you to fine tune your compressed air production between these two types of compressor.

If the control mode is activated (setting on **B**), first an invariable compressor will start production (base load) in case of air demand, even if it belongs to a lower priority group than a continuously adjustable compressor. If the invariable compressor is unable to satisfy the compressed air demand, as continuously adjustable compressor will start next in order to satisfy the remaining demand (peak load).

As soon as the compressed air demand decreases, the continuously adjustable compressor reduces its FAD to a minimum. At this point, the invariable compressor will completely shut down its compressed air production while the continuously adjustable compressor will restart producing its max. FAD.

The control mode is designed to avoid energy losses which are likely to occur in case of missing adjustment between invariable and variable compressors.



Note!

The use of this function is only possible on condition that variable and continuously adjustable compressors do not belong to the same priority group because otherwise setting P 4.5 "max. runtime difference" (p. 22) is likely to override the activated control mode if the runtime difference between the invariable and continuously adjustable compressor is too large.

P 4.2: Max. amount of concurrently working compressors

This parameter serves to determine how many of the installed compressors are to work at the same time. This is particularly useful if the available performance of the electric power network is sufficient only for a limited number of installed compressors.

Please note in this conjunction that such number may possibly not be able to satisfy the max. air demand in view of the available switched-on number of compressors.

The number of compressors that can be adjusted by means of this setting ranges between 1 (minimum) of the total number of compressors of your interconnected compressors (maximum).

P 4.3: Max. amount of concurrently regulating compressors

If there are several frequency controlled compressors among your interconnected compressors, this parameter can be used to determine the number of compressors that actually operate in the frequency controlled mode. The parameter is preset to the value 1. That means that only one compressor works frequency regulated even if several frequency-regulated compressors are available within the compressed air network. These compressors work as invariable machines. This is a factory recommendation because, in case of several simultaneously working frequency controlled compressors, adjustment resonances may occur. Thus the efficiency of the compressed air production is reduced.

Generally a value between 1 and the max. number of compressors within the network can be set.

P 4.4: Interval

If you do not use the switch clock function of the control system, however intend to use the load priorities during compressed air production at regular intervals, you can use the airtelligence plus to carry out a cyclic change of priorities.

The "interval" setting serves to activate this function by setting the cycle time for this change of priorities. The value can be set to range from 0 to 250 hours (cyclic change deactivated).

P 4.5: Max. runtime difference

The control system is designed to ensure that the runtimes of the compressors belonging to the same priority group do not differ from each other by more than the predefined value.

The value can be set between 10 hours and 14 days.



Note!

If all compressors which are allowed by setting "P4.1 max. number of parallel working compressors" are producing at the same time, and if this number is smaller than parameter "P1.3 number of compressors" an operating time related compressor change will only be carried out if the pressure is within the target zone.

The limit can be calculated as follows: P_{min} + bottom distance of target area * ($P_{max} - P_{min}$) / 100.

P 4.6: Min. runtime difference

This allows, if required, an occasional change of the selection of the operation time related compressors to another compressor. The adjustment range is from 0 to 24 hours.

P 5: Compressor 1

P 5.1: Priority group

Due to the formation of up to six priority groups (a \dots f), the control system offers the possibility to prefer a certain number of compressors over others for operation mode.

Each of the compressors is allocated to one of the priority groups – with group "a" being predefined.

If all compressors are intended to remain in group "a", the control system will take care of even operating times within the scope of the parameterized admissible runtime differences.

When using several priority groups, first the compressors of the highest priority will be charged before the other groups with the following priorities are put into operation in case of further air demand. Discharge will be effected in reverse group order.

The allocation of priorities to the different groups can be changed either cyclicly or by means of a switch clock – predefined sequence is group "a", group "b", group "c", group "d", group "e", group "f".

P 5.2: Maximum load delay

The maximum load delay serves to describe the time which is needed by the compressor in order to build up the internal pressure from the idle mode to network pressure.

P 5.3: Minimum load delay

The minimum load delay serves to describe the time which is needed by the compressor in order to build up the internal pressure from the idle-run from the smallest idle operation pressure (1.2 bar in most cases) to net pressure.



Note!

Settings P 5.3 and P 5.4 need to be set for every interconnected compressor unless the respective values were not defined during the installation of the control system.

P 5.4: Shutdown when FAD is less than

If a compressor with infinite output control is concerned and the feedback as to the workload is effected via Bus or as an analogue signal via Modbus interface module the lowest air delivery limit must be entered. Setting as percentage value.

P 5.5: Servicing interval

If a compressor is connected to the Modbus interface module the setting of the time (in hours) for the servicing interval is effected via the airtelligence plus control by means of this setting. The set time states how many working hours the compressor may run after servicing until the next servicing is due.

The value for hours can be changed in 100 increments.

P 6 to P 10: Settings for possible compressors 2 to 6

The adjustable parameters for the compressors 2 to 6 correspond to those of compressor 1 (see P 5: Compressor 1 on page 22).

Behaviour of the control unitThus the control regulates the loading/unloading of compressors in a compressor group (we refer to "Fig. 1.16:Coherence pressure range – width of target area – target area limits", page 19):

Compressors are successively loaded with a time delay if:

- the air net pressure is below P_{min}.
- the pressure decreases into the traget zone by more than 5% of the adjustable gradient of the pressure range (" P 2.5: Gradient", page 20).
- the pressure is below the target zone and does not increase.

Compressors are successively unloaded with a time delay if:

- the pressure is inside the target zone and the power increase is greater than the set gardient of the pressure range.
- the pressure exceeds the target zone and does not decrease.
- the pressure exceeds P_{max}.

airtelligence plus	1.6 Set switch clock
	1.6 Set switch clock
Set real-time clock	The real time clock can be set in the display "switch clock". In order to set the real-time clock:
	 Navigate to switch clock channel 0 by means of the functional keys below the display arrows and and ▲. → The real-time clock is displayed.
	 2. Press functional keys below the symbol
	3. Set year by means of the functional keys below the symbols — or
	 Acknowledge with functional key below the symbol → The value for "year" does not blink any longer and is thus set. Nov the value for "month" blinks which can now be set.
	5. Set month by means of the functional keys below the symbols — o
	 6. Acknowledge with functional key below the symbol → The value for "month" does not blink any longer and is thus set. No the value for "day" blinks and can be set.
	 Set values for day, seconds, minutes and hours accordingly. → Having set the value for hours and acknowleged by means of the functional keys below the symbol an o other value blink any longer. No you have reset the real time clock.
T-25	Note! The day of week is set automatically by the control
ng.	
Set/change switch clock channel	To set or change a switch clock channel it is necessary to enter the code 00798 for the change release:
	Enter modification code To enter the code:
	1. Navigate to display "Switch clock".
	 Subsequently press functional key below the symbol ♦ The code input window opens.
	 3. Enter code 00798 as described in the chapter Parameterisation (se Enter modification code on page 15). → The display "switch clock" has now the following configuration for th functional keys , , , and .
	Set/change switch clock settings Having entered the code for the change release the values for the switch cloc can now be set resp. changed. To do so:

1.6

- 4. Select switch clock channel you have opted for by means of the functional keys below the display arrows **▼** and **▲**.
- 5. Press functional key below the symbol
 → The weekday blinks.
- 6. Use functional keys below the display arrows 🔽 and 🚺 to set day of week.
- 7. Press functional key below the symbol once more.
 The time of day blinks.
- 8. Set this value according to steps 3 and 4.

→ Having accomplished this setting the values for pressure range, priority and relay output can be determined subsequently.

For the purpose of these settings we refer to chapter "Detailed description of the setting of individual switch clock values", page 25.

If the required values are set and/or changed they need to be confirmed in order to be irrevocably accepted by the control system. To do so:

9. Press functional key below the symbol 🔄

→ A confirmation prompt window (as described in section "parameterisation" opens. You will be asked whether or not all modified settings are to be accepted.

If you want to accept the settings:

- 10.Select "yes" using the functional keys below the display arrows and 1.
- 11.Acknowledge with functional key below the symbols .
 → The control has accepted the settings.

If you do **not** want to accept the settings:

- Use the functional keys underneath the display arrows and to select "no" and confirm by means of the functional key underneath the symbol
 - → The control has not accepted the settings.

Day of week

Here the day of the week is set on which the selected channel is to be active. If the setting "free" is selected and confirmed by enter function is the editing mode for this channel will be terminated, apart from that the program automatically advances to the setting of the time of day. In case of any modification and confirmation of the functional key underneath the symbol **C**, the previous setting is recovered. If there is no modification but actuation of the functional key underneath the symbol **C**, the editing mode for this channel will be terminated.

Time of day

First set the hour (0...23) and, after actuation of the enter function \blacksquare , continue with setting the minutes (in five steps). In this case, too, the actuation of the functional key underneath the symbol \bigcirc first causes the old value to be recovered and – after recovery of the old value – to go back. After setting of the time of day, continue to advance to editing the pressure range.

Detailed description of the setting of individual switch clock values

Pressure range

Selection can be made out of 3 different pressure ranges. You are also free to determine that this switch clock channel is not to be of any influence on the pressure range (setting ,unchanged'). The parameters of pressure range 1 and pressure range 2 are freely adjustable by the user. Pressure range 3 is invariably set at 0 bar. After selection of the pressure range continue to advance to editing the priority.



If during a pressure range 3 phase (0 bar) compressed air is needed contrary to expectation, you can also reactivate the master control without modification of the switch clock parameterization and start producing compressed air:

Press the "Manual" key

→ The manual compressed air production was activated. The compressors immediately start producing compressed air again maintaining the settings of pressure range 1.

If no more compressed air is needed and the manual operation is to be deactivated:

Press the "Switch clock" key [].

→ The manual compressed air production was deactivated. The control system again conforms to the settings of the pressure range 3 phase (0 bar). None of the compressors produces any compressed air.

If the manual compressed air production is not deactivated by using the "switch clock" key, the automatic operation will be deactivated automatically as soon as the following switch clock channel (with pressure range 1 or 2) becomes active.

Priority (see also " P 5.1: Priority group", page 22)

The first setting option under "priority" allows you to chose whether or not the priority in this channel is to be observed. Using the functional keys underneath the display arrows - and + allows you to chose between \times (not taken into account) and \checkmark (taken into account). If a certain priority group is not to be selected and the enter function - is actuated you will be able to proceed to the "relay output" setting. In case of selection, the priority of the priority groups will now be set.



Note!

. . .

Depending on the number of compressors the maximum permissible number of priority groups is limited.

2 compressors: max. permissible priority groups a+b.

3 compressors: max. permissible priority groups a, b, c.

6 compressors: max. permissible priority groups a, b, c, d, e, f.

The allocation of the priorities is from left to right. The group on the extreme left side has the highest priority. Use the functional keys below the arrows a priority group (group symbol blinks) prior to shifting a priority:



Fig. 1.17: View when selecting the priority group

Having pressed the Enter functional key - the priority groups are displayed in capital letters.



Fig. 1.18: View when shifting the priority group

Now the group can be shifted to the required priority using the functional keys below the arrows \square . This selection must be acknowledge using the Enter functional key \square .

In order to quit setting priorities the key \triangleright needs to be actuated as many times as to cause the value in the relay output field to flash.

Relay output

Use the functional keys underneath the display arrows and to chose whether the relay out is to be opened or closed when specified time is reached.

1.7 Warnings and faults

If the display "Station" to the left of the network pressure value shows the warning or a fault \times symbol, a number underneath the symbol will be shown at the same time (see Display "Station" on page 6), viz. the warning and/or fault code.

Listing of warnings/ faults

Each code is assigned to a specific warning/fault. For the corrsponding reason we refer to the table below:

Code	Warning	Fault	Cause
11	۲		Compressor servicing due (Warning message is shown in the display "compressor", see page 10)
16		×	Net pressure transmitter faulty
25		×	Data reconciliation faulty
32		×	Net pressure transmitter wire breakage

Code	Warning	Fault	Cause
41	۲		Battery voltage too low
48	۲		Internal BUS fault
49	۲		TAN synchronisation <-> Basic module faulty
60	۲		Communication base module <-> TAN faulty
75	۲		Software version base module/TAN not compatible
79	۲		Memory (for variable data) defective
80	۲		Memory (for Update purposes) defective
81		×	Parameter memory defective
200	۲		Short circuit functional key 1
201	۲		Short circuit functional key 2
202	۲		Short circuit functional key 3
203	۲		Short circuit functional key 4
204	۲		Short circuit functional key 5
205	۲		Short circuit "Timer" key
206	۲		Short circuit "Manual" key
210	۲		General fault of a compressor only when connected via Modbus interface module. (Fault message is shown in the display "compressor", see page 10. Compressor is shut down automatically)
241	۲		Faulty set point value compressor 1
242	۲		Faulty set point value compressor 2
243	۲		Faulty set point value compressor 3
244	۲		Faulty set point value compressor 4
245	۲		Faulty set point value compressor 5
246	۲		Faulty set point value compressor 6

Tab. 1.8: Listing of warnings/faults

Remedy warnings/faults

We refer to the following table for a list of warnings/faults together with instruction for troubleshooting and remedy. We recommend having control or compressor faults or damages repaired by BOGE service personnel.

Contact your BOGE dealer. For any other problems or questions your BOGE service is always available for you under the following phone number.

Telephone: +49 5206 601-140

Code	Cause	Rectification
11	Compressor servicing due (Warning message is shown in the display "compressor", see page 10)	Have compressor service performed by expert service personnel.
16	Net pressure transmitter faulty	Have net pressure transmitter exchanged by BOGE service per- sonnel if applicable.
25	Data reconciliation faulty	Have control exchanged by BOGE service personnel if applicable.
32	Net pressure transmitter wire breakage	Have net pressure transmitter or data line exchanged by BOGE service personnel.
41	Battery voltage too low	Have battery replaced by professional electricians.
48	Internal BUS fault	Have fault remedied by BOGE service personnel.
49	TAN synchronisation <-> Basic module faulty	Have fault remedied by BOGE service personnel.
60	Communication base module <> TAN faulty	Have fault remedied by BOGE service personnel.
75	Software version base module/TAN not compatible	Have fault remedied by BOGE service personnel.
79	Memory (for variable data) defective	Have base module of the airtelligence plus replaced by BOGE service personnel.
80	Memory (for Update purposes) defective	Have base module of the airtelligence plus replaced by BOGE service personnel.
81	Parameter memory defective	Have base module of the airtelligence plus replaced by BOGE service personnel.
200	Short circuit functional key 1	
201	Short circuit functional key 2	
202	Short circuit functional key 3	
203	Short circuit functional key 4	Have control unit repaired/replaced by BOGE service personnel.
204	Short circuit functional key 5	
205	Short circuit "Switch clock" key	
206	Short circuit "Manual" key	

Code	Cause	Rectification	
210	General fault of a compressor only when connected via Modbus interface module. (Fault message is shown in the display "compres- sor", see page 10. Compressor is switched off auto- matically)	Detailed information on the fault can be obtained from the control unit directly fitted to the compressor. Information about fault remedy can be found in the control operating instructions or the operating instructions of the respective compressor.	
241	Faulty set point value compressor 1	Reduce the pressure range values of the airtelligence plus control (using parameters under "P2: pressure range 1" and under "P3: pressure range 2").	
242	Faulty set point value compressor 2		
243	Faulty set point value compressor 3	or:	
244	Faulty set point value compressor 4	Increase the values of the pressure ranges of the compressor con- trol (in case of frequency controlled compressors) and/or increase the pressure setting directly on the compressor (for compressors with proportional performance control, see operating instructions of the compressor).	
245	Faulty set point value compressor 5		
246	Faulty set point value compressor 6		

Tab. 1.9: Remedy warnings/faults



Note!

If the control system of a compressor is not connected to the master airtelligence plus by means of the modbus-interface module (e.g. with regard to BOGE BASIC or FOCUS controls), the general fault code 210 will not appear in case of a malfunctioning compressor but a detailed fault code will be shown instead which is transmitted directly to the airtelligence plus from the control system on the compressor.

If in this case a fault code appears in the display "compressor" (page 10) which you try to remedy according to Table 1.9, "Remedy warnings/faults", on page 30, but are unable to find:

 We refer to the operating instructions of the subordinate control for a detailed description of the fault code.

1.8 Servicing the airtelligence plus

 Change of battery
 Using the airtelligence plus control requires checking of the battery voltage at regular intervals by means of "info". If the tension of the battery drops too low, a warning message (code 41) issued by the control unit will appear in the display "Station". Have battery replaced by professional electricians.
 No further maintenance is required for the control.
 Cleaning of the display
 In order to clean the display, use a moist but not too wet cloth. If the display is contaminated with oil, pour a few drops of household detergent on your cleaning cloth. Updating of software

In order to ensure that your airtelligence plus software version is kept updated at all times, your BOGE service personnel will automatically update your software during servicing if a new version is available. The BOGE service personnel will also keep you informed about any changes with regard to functions of the control system.

1.9 Appendix

Technical data of connections

Terminals

No.	Type of terminal	Function	Description	Rating
3/4/5	Tension spring terminal	Relay output	Fault-free: Grouping terminal 3, break contact terminal 4, make contact terminal 5	2A 30V DC/250 with ohmic load V AC; 0.6A 250V AC50/60Hz with inductive load (power factor = 0.4)
10/11	Tension spring terminal	Relay output	Servicing: Make contact	2A 30V DC/250 with ohmic load V AC; 0.6A 250V AC50/60Hz with inductive load (power factor = 0.4)
14/15	Tension spring terminal	Relay output	Timer: Make contact	2A 30V DC/250 with ohmic load V AC; 0.6A 250V AC50/60Hz with inductive load (power factor = 0.4)
40	Tension spring terminal	Digital input	Manual operation Terminal 40 (against terminal 31(+24V))	2431V DC, 10mA, input resistance 3K Ω
42	Tension spring terminal	Digital input	Switch-over press. range Terminal 42 (against terminal 31(+24V))	2431V DC, 10mA, input resistance 3K
43/44	Screw terminal	Analog input	Net pressure Pressure transmitter 4-20mA: no. 44 (+24V: no. 43)	Maximum 22mA DC, input resistance 150
51	Screw terminal	External RS485 interface	Earth (GND)	-
52	Screw terminal	External RS485 interface	Signal A	Input differential voltage max. +12V
53	Screw terminal	External RS485 interface	Signal B	Input differential voltage max. –12V

Tab. 1.10: Connecting terminals

Tension spring terminals-wire cross sections

Lines	Cross sections
Capacity of terminal	0.51.5 mm ²
Single wire	0.51.5 mm ²
Stranded wire	0.51.5 mm ²
With ferrule	0.51.5 mm ²
AWG- conductor	26-14

Tab. 1.11: Cross sections – tension spring terminals

Screw terminals-wire cross sections

Lines	Cross sections
Fixed / flexible min.	0.2 mm²
Fixed / flexible max.	2.5 mm²
Flexible with ferrule (with/without plastic sleeve) min.	0.25 mm ²
Flexible with ferrule (with/without plastic sleeve) max.	2.5 mm²
AWG/kcmil min.	24
AWG/kcmil max.	12
2 conductors with identical cross section fixed min.	0.2 mm²
2 conductors with identical cross section fixed max.	1 mm²
2 conductors with identical cross section flexible min.	0.2 mm²
2 conductors with identical cross section flexible max.	1.5 mm²
2 conductors with identical cross section flexible w. AEH (ferrule) without plastic sleeve min.	0.25 mm²
2 conductors with identical cross section flexible w. AEH (ferrule) without plastic sleeve max.	1 mm²
2 conductors with identical cross section flexible w. TWIN-AEH without plastic sleeve min.	0.5 mm²
2 conductors with identical cross section flexible w. TWIN-AEH without plastic sleeve max.	1.5 mm²

Tab. 1.12: Cross sections – screw terminals