

Operating instructions

FOCUS compressor control for screw compressors





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1.1 The BOGE control concept

Installation

FOCUS is a compressor control unit.

It is installed into the switch cabinet as part of the compressor and serves as a compressor control device.

Prior to commissioning and before accomplishing any kind of maintenance or servicing work please read the functional descriptions of both control and compressor carefully. First and foremost observe the **Safety notes** in Chapter 1 of the functional description of the compressor.

Power input

Terminals A1 and A2 for 24 V AC/DC

Rating: 24 V $\pm 10\%$ 50/60Hz 15 W
24 V DC $\pm 10\%$ 0.4 A

An interruption of the power supply is effected by means of the mains disconnector of the compressor.

Modules

The basic equipment of the FOCUS consists of a basic module and a keypad/display unit (TAN).

Amongst others the following modules are optionally available:

- for frequency regulated compressors
- with a 4...20 mA-output for master controls, suitable for frequency regulated compressors
- with a (second) RS485 interface for the connection of additional compressors if the first interface is used otherwise
- for compressors with built-in dryers
- with changeover contact relay; function can be selected by rotary switch
- system pressure module for a system pressure transmitter on the master compressor

Interconnection of the modules may only be completed using the provided leads supplied with the equipment.

Control unit

The display unit comprises a graphic display and 3 indicator lamps (LEDs) for an additional illustration of the operating modes.

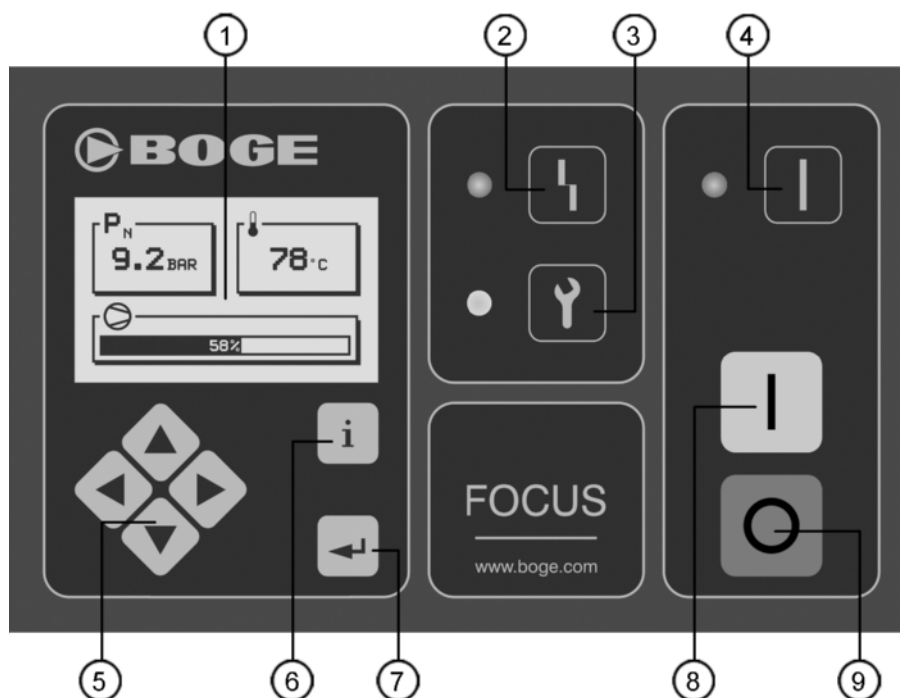


Fig. 1.1: FOCUS operating panel

- 1 LC display
- 2 Indicator lamp – Fault (red)
- 3 Indicator lamp – Warning (yellow)
- 4 Indicator lamp – Ready (green)
- 5 Navigation keys
- 6 **INFO key**
- 7 **ENTER key**
- 8 **ON key**
- 9 **OFF key**

Operating/control element	Designation	Function
	Navigation keys	Navigation in the menu, scrolling the displays, scrolling of pages in the parameter display.
	Navigation keys	Navigation in the menu, displays, dryer status, navigation in the the parameter display, setting of values.
	INFO key	Display of faults, warnings or maintenance messages, log book, quitting of settings.

Operating/control element	Designation	Function
	ENTER key	Confirmation of inputs, selection of parameters, forced idling, setting of FC (frequency converter) parameters.
	OFF key	Acknowledging when switching on the control, switching off the compressor, switching off forced idling.
	ON key	Switching on the compressor, forced idling.
• 	Warning/ Maintenance (LED - yellow)	Flashing: Pending warning; compressor is working – as yet. Lit: Warning already acknowledged; compressor is working – as yet.
• 	Fault (LED - red)	Flashing: Upcoming fault, compressor is switched off. Lit: Fault already acknowledged; compressor remains switched off and cannot be restarted until the fault has been rectified.
• 	Operation (LED - green)	Flashing: Compressor in idling operation. Lit: Compressor is switched on.
	Emergency Stop button	The Emergency Stop button interrupts the power supply for the contactor coil. The control is still energized and generates a corresponding display.

1.2 Operation



CAUTION: Risk of injury!

If the compressor is not closed there is a risk of injury due to rotating or projecting parts resp. a crushing hazard because of flaps or doors standing open!

The compressor may only be operated with all flaps and doors closed!

Prerequisite

The compressor must be electrically and pneumatically connected, the power supply voltage must be turned on and the ball valves and/or balanced disc stop valves between compressor and compressed air receiver must be opened.

Switch on the control

Having connected the compressor to the power supply and having switched on the main switch, if applicable, the version is displayed (if neither Auto Restart nor Remote control are parameterized) on which the name of the control, the name of the manufacturer and the version number are shown.

First a parameter adjustment between basic module and TAN is performed resp. and if applicable the registration of connected and not yet registered additional modules.

When this procedure has been finished the symbol for the **OFF key**  is flashing. Press **OFF key**  to acknowledge and exit the display.

Otherwise – Auto restart and/or Remote-On-Off is activated:

After the recurrence of the power supply (net power failure) the display shows a countdown, starting with the set Auto Restart time [s]. When this time is expired the compressor switches to Ready status and starts automatically, as soon as the prerequisites are fulfilled.

In case faults occur when the compressor is powered up they are displayed immediately after the parameter reconciliation. The fault has to be acknowledged to get to the main display (see also section „1.7 Warning message/Fault message“, page 30).

Switch on the compressor



CAUTION: Risk of injury!

If the compressor is not closed there is a risk of injury due to rotating or projecting parts resp. a crushing hazard because of flaps or doors standing open!

The compressor may only be operated with all flaps and doors closed!

At first *OFF* should be displayed in the bottom frame – the status display of the compressor.

If *EMERGENCY STOP* is displayed for the compressor status the Emergency-Stop button has to be unlocked first.

If the status display shows *Fault*, the control is faulty and the malfunction has to be corrected first (see also section „1.7 Warning message/Fault message“, page 30).

Once this has been accomplished and the display shows the *OFF* status the compressor can be put into the *Ready* status by pressing the **ON key** .

A green LED signals that the compressor is ready for operation and the pressure control is active – as long as no "Timer-Off" is due or an external pressure control was parameterized.

Ready

If the compressor status *Ready* is displayed, the compressor is in the "ready-for-operation" status. That means that the compressor automatically (re)starts pressure and/or time controlled – as long as the conditions to do so are fulfilled.

Run-up phase

The compressor motor is started and run up as already described under „Ready“. The status display changes from *Ready* to *Run-up*.

To be able to do so, the system pressure at the compressor must be decreased and the motor spinning time finished. Furthermore no limitation of the motor switching cycles is allowed.

Otherwise the display *Ready* is shown in the motor status display!

For the star/delta contactor combination applies: First the star contactor and 20 ms later the mains contactor is switched on. The display *Run-up* signals the corresponding status of the control.

Load operation

The Run-up resp. Star phase is finished after termination of the run-up time by switching of the control into the Load run status.

When changing into the Load run the control switches on the delivery valve.

Compressors which are controlled accordingly now change into the delta switching.

Frequency controlled machines display the percentage workload of the frequency converter as a bar diagram.

Idling

If the set maximum pressure of the compressor is reached in the load run the control switches to Idling. Accordingly Idling is shown in the status display. As a result an automatic system pressure decrease is effectuated. If no after-running time is set (default: 0 sec) the Idling phase is finished as soon as the system pressure value drops below 1.3 bar (if applicable + parameterized max. booster pressure) – provided the automatic limitation of start numbers allows it – and the compressor changes into the Ready status.

If the compressor is switched off via the maximum pressure and the net pressure drops below the set minimum pressure (p_{min}) during the idling time, the compressor control automatically switches from Idling to Load run – and the compressor continues with the output.

If the compressor is switched off however during a load run or idling phase by means of the **OFF key**  resp. Remote-Off it waits with a flashing green LED in the idling phase as described above until the system pressure is decreased before it changes into the Off status.

Switch off the compressor

With the **OFF key**  or via Remote-Off the compressor is switched off. The pressure control is deactivated. If this happens when the motor stands still or is just operating in the Run-up phase, Off is displayed at once in the compressor status display and the green LED goes out. Otherwise an idling phase with flashing green LED is completed beforehand, as already described in the chapter 'Idling' – last passage.

Maintenance

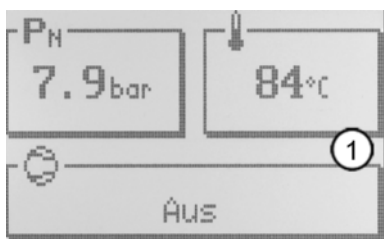
When operating the control the battery voltage has to be checked from time to time. If the voltage drops too far a warning message is created. In this case the battery has to be replaced.

The display of the TAN has to be cleaned with a dampened yet not wet cloth from time to time. As cleaning agents customary household detergents for greasy surfaces can be used. No further maintenance is required for the control.

1.3 Display information

Main display

This is the main display in the control menu. Here the net pressure, the final compression temperature and the compressor status are displayed (display ①). By pressing the **key**  the system pressure is displayed instead of the final compression temperature (display ②)!

	Net pressure p_N	Shows the current net pressure.
	System pressure p_S	Shows the current system pressure.
	Final compression temperature °C	Shows the current final compression temperature.
	Compressor status	Meaning
	Off	Compressor is switched off.
	Ready	Compressor is Ready and starts automatically as soon as the conditions are fulfilled.
	Run-up	Compressor is in star phase.
	Load operation	Compressor runs in delta phase, the solenoid valve is closed.
	% Converter workload	Display of the workload of frequency controlled compressors. The solenoid valve is closed.
	Idling	Compressor runs in delta phase, the solenoid valve is opened.
	Fault	A fault has occurred on the compressor / compressed air treatment, the compressor is switched off. The fault has to be rectified prior to a restart.
	Emergency Stop	The Emergency Stop button has been actuated.

If a dryer module is connected, the actuation of the **keys**  /  in display ① or display ② of the main display effectuates that instead of the compressor status the tendency display of the dryer is displayed.

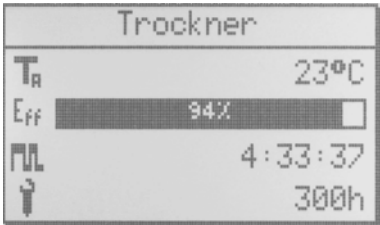
With a relative humidity of 25% the display is exactly in the centre. If the cooling temperature drops to $\leq 0^\circ\text{C}$ it is entered into the calculation. The display then moves to the left with decreasing temperatures (into direction LO).

If the **key**  is pressed, the compressor status is displayed again.

Pressing the **keys**  /  leads to the next display.

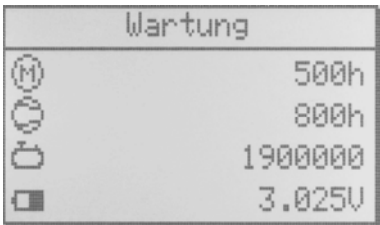
Dryer

When connecting the dryer module to the control, an additional page with the headline "Dryer" is displayed in the menu sequence. On this page the operating data of the dryer are displayed.

	Room temperature	Current ambient temperature.
	Dryer efficiency display	Ratio between load time and total running time in %.
	Operating hours	Shows the operating hours of the dryer.
	Service interval counter	Shows the operating hours until the next servicing.

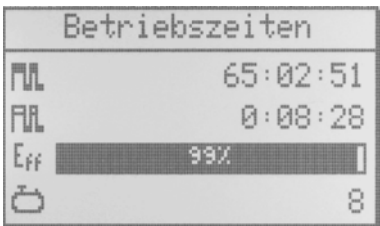
Maintenance

With the next actuation of the **key**  you get to the maintenance display. Here the information concerning the maintenance times are displayed.

	Next motor servicing (h)	Shows the operating hours until the next motor servicing.
	Next compressor servicing (h)	Shows the operating hours until the next compressor servicing.
	Next receiver servicing	Shows the number of load changes until the next receiver servicing.
	Current battery voltage	Shows the current voltage of the battery for the real-time clock in the main module.

Operating times

With the next actuation of the **key**  you get to the operating times display, on this menu page the operating times of the compressor are displayed.

	Motor running time	Shows the total operating time of the compressor motor in hours, minutes and seconds.
	Idling	Shows the share of time in which the compressor was idling in hours, minutes and seconds.
	Efficiency display	Shows the ratio of load energy compared to total operating time energy since the preceding Reset.
	Load cycles of internal receiver	Counts the effected load cycles of the internal combination receiver. (One cycle consists of 1 x output and 1 x no output each).

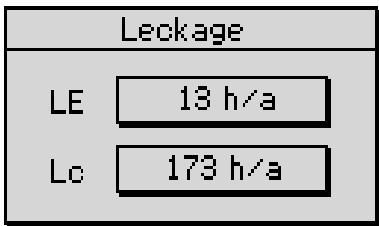
Leakage monitor

Pressing the key  in the operating hours display causes the control display to show "leakage". The display serves to enable you to determine the energy loss resulting from any potential leaks in your compressed air network.

To this purpose, the control unit measures the time period duration of the operating loads during which, under normal circumstances, no production of compressed air takes place, as for example over night or operation down-times.

This, however, is conditioned on the fact that operational compressed air production be discontinued for a protracted period of time and that the compressor be set into the "ready" mode by means of the control system. In case of a potential pressure reduction below the preset minimum pressure value resulting from leaks in the compressed air network, this compressor automatically switches into the operating mode in order to recover the set pressure range. The leakage measurement serves to record the duration of the operating load times and to extrapolate them for the whole year. This allows you to quantify any leakages and to easily determine their portion of additional costs due to any energy losses.

A potential leakage is either measured by a **single (LE)** or **continuous (Lc) value measurement**:

	Single leakage measurement (LE)	The abbreviation LE stands for "single leakage measurement". The displayed value shows the annual operating load times due to leakage.
	Continuous leakage measurement (Lc/LC)	The abbreviation Lc stands for "continuous leakage measurement". The displayed value shows the annual operating load times due to leakage. When the abbreviation LC is displayed, continuous measurement has been carried out for more than a week.

In case of **single leakage measurement** a **single** measurement operation over six hours serves to determine the hourly operating load times per year due to leakage.

In order to obtain a precise value it is imperative that no operational compressed air consumption take place during measurement, resp. production is to be shut off for at least six hours. If measurement is actuated by means of the control system, measurement will be deferred by six hours. This allows you to activate the leakage function already in the afternoon causing the measuring operation to start in the evening (six hours later) to continue over night.

Unlike continuous value measurement, single value measurement is also possible if several compressors are being operated in the basic load mode at the same time. Starting separate single value measurement of each compressor enables you, after a six-hour measurement period, to read and to add up all of the single values of the compressor control units. Their total value corresponds to the annual number of hours of operating load times as a result of leakage in your compressed air networks.

Continuous leakage measurement is designed to **continuously** calculate operating load values at six-hour intervals.

Unlike single leakage measurement, continuous leakage measurement can also be started during current daily production with measurement starting at once. The first value obtained after a six-hour period will probably be distorted since any operational compressed air production will be added to any potential leakage related operating load. Most probably, however, no operational production will be in effect during any subsequent value measurement. The then obtained value, which is exclusively due to leakage, will be smaller than the first obtained value. The control system is designed to always display the smallest value of all measurements, in this case, however, the last obtained value. This means that any distorted calculation of production operating loads will be excluded.

In order to determine exact leakage measurement values make sure that, during a time frame of 12 hours, there will in all probability be no operational compressed air production.

Start leakage measurement

After editing "leakage" in the control display, please proceed as follows in order to start either of the available measurement methods.

Start single measurement

Single leakage measurement will not start but six hours after actuation of this process. Your are herefore requested to make sure,

- that, after the deferred start of the measurement process no operational compressed air production will take place over a period of six hours.
- that the compressor be set into the "ready" mode by means of the control unit and that the green LED of the control be lit.
- that, when using the "external flow release" the external flow release may not be shut off neither manually nor by the switch clock.

In order to start single measurement:

1. Keep **ENTER key**  pressed for three seconds.
The value next to LE starts blinking.
2. Press **ENTER key**  again for three seconds.
The number **9999** appears and single value measurement will start in six hours. After a period of twelve hours, the single measurement value will be displayed. This value will be saved until a new measurement process is carried out.

If, during measurement, a power failure takes place the number **9980** will be displayed. In such case it is recommended to repeat the measurement process at a later stage.

If, during measurement, the compressor is put out of operation the number **9990** will be displayed, i.e. the compressor is switched off and the energy loss due to leakage could not be properly determined during said measurement. In this case, too, the measurement process should be repeated at a later stage while making sure that the compressor be switched off during measurement.

If the value next to LE starts blinking and no measurement is to be carried out:

- Press **INFO key** .

The value will stop blinking, and the measurement process is not started. Pressing the **key** , enables you to access the operating hours display.

Starting continuous measurement

Continuous leakage measurement will start immediately. Make sure,

- that during the following days, at least for once during a time frame of 12 hours, no operational compressed air production takes place.
- that the compressor be set into the "ready" mode by means of the control unit and that the green LED of the control be lit.

In order to start continuous measurement:

1. Press the **ENTER key**  for three seconds.
The value next to LE starts blinking.
2. Press the **key** .
3. Press the **ENTER key**  for three seconds.
The number **9999** appears next to Lc. Continuous measurement will start immediately and keep being carried out. After the twelve-hour time frame, during which no operational production has taken place, has been exceeded a sound measurement value is obtained.

The control system will always save the lowest value. A search for the lowest value – as a background process – will be restarted once a week. This allows, after expiry of another week, a higher value compared to the one of the previous week to be displayed if the measured minimum value has increased during that period. Any potential increase of leakages in the compressed air network will therefore also be possible to be determined.

Any power failures during measurement will not be indicated by a sequence of digits because new values will be calculated every six hours and because any such power failure during measurement will not prevent the values of the subsequent measurement to be displayed.

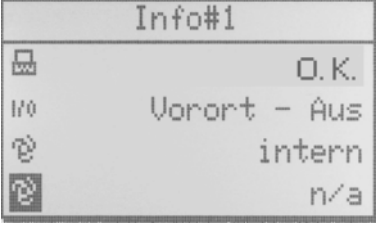
If the value next to Lc is blinking and no measurement is intended to be carried out:

- Press **INFO key** 

The value will stop blinking, and the measurement process is not started. Pressing the **key** , enables you to access the operating hours display.

Info # 1

Pressing the **key**  in the operating times display causes the control display to show „Info # 1“. This display serves to show information on the compressor set-up.

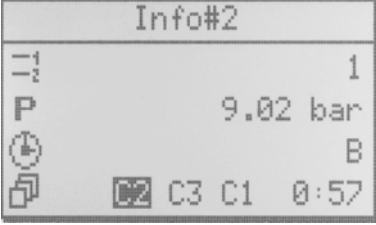
	Status RS485	1:19200;8N1	The RS485 interface is parameterized as a slave: Address: baud rate, data bits parity stop bits – no communication has taken place as yet.
		O.K.	The last communication has taken place less than 1 minute ago.
		Time:	This serves to indicate when the last – valid communication has taken place (up to 7 days).
		C2 (C3 C4)	When parameterized as a master and master control this serves to display which of the compressors are in communication. Blinking of the combination indicates defective communication.
	On/Off	Local:	via keyboard.
		Remote:	via contact and/or Bus.
		On:	Compressor is switched on.
		Off:	Compressor is switched off.
	Output release	Internal:	via internal pressure sensor.
		External:	Output release via contact and/or Bus.
		Yes:	Output release enabled.
		No:	Output lock is active.
	Auto Restart	n/a:	No Auto Restart after (control) power failure.
		Time:	Auto Restart active, Auto Restart time.

**Note!**

Changes to the displayed settings have to be accomplished by means of the parameter settings, if applicable, (see also section „1.4 Settings“, page 13) or by changing the automatically registered configuration.

Info # 2

The information to the control settings as master control resp. the current status of the integrated switch clock are displayed here.

	Pressure range	Activated pressure range
	System pressure / net pressure	Shows the current system pressure / net pressure.
	Switch clock	– A-Z active switch clock channel – n/a no channel active
	Priority sequence (time until change of priority)	Set priority sequence, active compressors and time in h and min until next change of priority.

The priority sequence is only displayed if the number of compressors in the base load switch control is set to a value above 1. In case the number of compressors is set to 1, n/a is displayed here.

The display of the priority sequence shows the currently effective sequence for selecting the compressors. Depending on the setting the priority sequence is changed cyclically (base load switch control) or selected by means of the switch clock.

For each parameterized compressor the current output signal status, the current priority level and the time until the next priority change, with switched-on base load switch control, is displayed. If only the switch clock is active (cyclic changing time set to 0) no time is displayed.

Meaning:

C1 C2 C3 means, that the compressors 1–3 are connected and the sequence 1, 2, 3 is chosen – in this case none of the compressors receives an output signal.

C1 C3 C2 means as in the first example, that the compressors 1–3 are parameterized although they are selected in the sequence 1, 3 und 2 and furthermore compressor 1 receives an output signal in this case.

The output signal status is shown by means of a black background in the graphical presentation of the compressors in the display.



Note!

Changes to the displayed data have to be accomplished by means of the Basic Load Switching Control (see also chapter „1.4 Settings“, page 13) or switch clock settings.

Date/Time

This menu page shows the current setting of the real-time-clock.

The time is displayed in hours, minutes and seconds and the date with day of the week, day, month and year.

In case of a switched-off power supply the real-time-clock is operated by its battery – provided the plug-in jumper contacts arranged next to it are connected and their voltage is sufficient (see also chapter maintenance).

Set date/time

In order to set both time and date, keep the **ENTER key**  on the menu page "date/time" for three seconds.

The cursor jumps to the time display and the digits of the hour display start blinking.

Use **keys** / to set digits.

With the **ENTER key**  the input is acknowledged and the cursor moves to the next field. Proceed the same way with all other place values until all values are correctly adjusted. In case a value has to remain unchanged just actuate the **ENTER key**  to jump to the next value.

To leave the time adjustment, actuate the **ENTER key**  until none of the place values is blinking any longer. Actuate **key**  to reach the previous page or actuate **key**  to go to the next page.

If the **INFO key**  is actuated while adjustments are made to the real-time-clock, this setting is left without accepting the effectuated changes.

Display of version

The version display can be reached in the menu by pressing the **keys**  / . Here the name of the control, the software number and the manufacturer are displayed.

If the **key**  is pressed now you get to the *Module Info* display.

Here the addresses and the installed software versions of the connected modules are shown. The first display refers to the basic module (Address: 0), all other connected modules can be displayed by actuating the **keys**  / .

Module	Address	Position of rotary switch
Basic module	0	--
TAN	1	--
FC (frequency converter) module	10	0
FC module for connection of soft starters	11	1
System pressure module	12	2
Dryer module	20	--
RS485 module	30	0
Analogue output module	50	0



Note!

Relay modules are not displayed.

If the display of a module is flashing the communication with this module is faulty.

You can leave Module Info by actuating the **INFO key** .

1.4 Settings

Entering of codes in general

1. Actuating the **key**  leads from the main display 1 to the *version display*.
2. If now the **ENTER key**  is actuated, a display is shown asking you to enter a 5-digit code (see code list).
3. The first place value of the code is blinking. By means of the **keys**  /  a digit can now be changed.
4. By actuating the **ENTER key**  or **key**  the cursor jumps to the next value and the value can be changed accordingly.
5. Once the last digit has been set the code is acknowledged by actuating the **ENTER key** . According to the entered code either windows for various settings or a parameter list opens. When entering the second ... fifth digit actuating the **INFO key**  causes an erasing of the previous digit, so that it can be entered again.
Actuating the **INFO key**  when entering the first digit the code setting is left and you return to the version display.

CODE	Meaning
17391	User code / parameter list
00000	Parameter display / access previous code
00111	Setting/Resetting servicing intervals
00988	Parameter restoring
00798	Switch clock settings
00356	View input status

**Note!**

If the USER code, SERVICE code or BOGE code is entered it is possible to return to the previously left parameter list within 30 minutes after having left this list, without having to enter the **code** once more by entering **Code 00000**.

Parameter list

Einstellungen	
→P001:	0
P010:	16.0 bar
P011:	1.0 bar
P012:	10.0 bar
P013:	9.0 bar

If one of the codes for the parameter list is entered (USER code, SERVICE code, BOGE code) it depends on the entered code which of the parameters can be processed.

An arrow at the beginning of the line shows where the cursor is currently positioned and if a value under this code can be changed.

If only the outline of the arrow ⇨ is displayed, the value under this code cannot be changed, if the arrow is completely filled ➔, the value can be changed.

In the parameter setting actuating the **keys** ⬆ / ⬇ makes the cursor move one parameter forwards or backwards. Use **keys** ⬅ / ➡ to scroll to the previous/next page.

To leave the parameter list actuate **INFO key** ⓘ and you get back to the main display.

If you are in the adjustment range of a parameter, it can be left again by actuating the **INFO key** ⓘ. You have to actuate the **INFO key** ⓘ once more to close the list.

Set parameters

1. Opening of the parameter list by means of the desired code (USER code, SERVICE code, BOGE Code).
2. If the cursor points at the parameter which is to be changed, e.g. maximum pressure in the pressure range 1 (P012), this selection is acknowledged by actuating the **ENTER key** ↵.
3. If a digit (e.g. 9 bar) is blinking on the right side of the parameter, the desired value can be set (e.g. 10 bar) by actuating the **keys** ⬆ / ⬇.
4. By actuating the **ENTER key** ↵ this input is acknowledged and stored! Actuating the **INFO key** ⓘ at this place causes a leaving of the setting without accepting the changes.
You can proceed with every parameter in the same way.

Parameters

The setting of the parameters can be accomplished as described above.

P001 Language

The following display languages are available:

German (DE), English (GB), Italian (IT), Russian (RU), Finnish (FI), Danish (DK), Lithuanian (LT), Swedish (SE), Polish (PL), Spanish (ES), Portuguese (PT), French (FR), Dutch (NL), Latvian (LV), Turkish (TR), Czech (CZ), Hungarian (HU).

P012 $p_{\max}$ Pressure range 1

Pressure range 1 is the default pressure setting for the compressor.

Here the upper pressure target value for pressure range 1 is set. As soon as the net pressure has reached $p_{\max}$ the compressor changes from load run to idling.

P013 $p_{\min}$ Pressure range 1

Pressure range 1 is the default pressure setting for the compressor.

Here the bottom pressure target value for pressure range 1 is set. If the compressor is in the Ready state and the net pressure drops below $p_{\min}$, the compressor starts with the output.



Note!

If the pressure range selection is effectuated by a master control or the external contact you have to observe when setting the pressure ranges, that in case of a power failure or fault of the master control, the compressor control eventually falls back on this pressure range.

P014 $p_{\max}$ Pressure range 2

Pressure range 2 offers the possibility for pressure decreases – the value must not be set above that of pressure range 1.

Here the upper pressure target value for pressure range 2 is set. As soon as the net pressure has reached $p_{\max}$ the compressor changes from load run to idling.

Pressure range 2 is only active if corresponding adjustments of the switch clock have been made and/or the external contact for the pressure range selection is active.

P015 $p_{\min}$ Pressure range 2

Pressure range 2 offers the possibility for pressure decreases – the value must not be set above that of pressure range 1.

Here the lower pressure target value for pressure range 2 is set. As soon as the net pressure drops below $p_{\min}$, the compressor starts with the output.

Pressure range 2 is only active if corresponding adjustments of the switch clock have been made and/or the external contact for the pressure range selection is active.

P020 Auto Restart

Switching On/Off of the Auto Restart function (network independent on-off memory).

Normally the version display is shown after a power failure, which must be acknowledged by actuating the **OFF key**  before the control displays the Off-status and the alarm relay returns to the status "no fault".

If the Auto Restart function is active and the compressor was previously switched-on an adjustable count down is started after power recovery (Auto Restart time P021).

When this time is elapsed the compressor automatically returns to the Ready status. The pressure control is active and on demand the compressor resumes the output.

If P020 is set to the value 1 and Auto Restart is activated. If the value 0 is set the Auto Restart is deactivated.

When switching-off the compressors with the Emergency-Off button the Auto Restart function is not active.

P021 Auto Restart time

The time set in seconds is the time that elapses after a power failure, before the compressor starts again with activated Auto Restart or Remote On/Off.

P022 Short stop time limiting value

The time set in seconds is the time that should elapse at least after a motor stop before the switch-on pressure value of the air supply network is reached or dropped below again.

To be able to do so the FOCUS control constantly monitors the air supply network and "learns" the necessary data. Thus these data are automatically kept in case of net structure changes.



Note!

The default value should only be changed in consultation with BOGE Service.

P031 After-running time

Interval during which the compressor remains at least in the idling phase after a load run, before it switches to Ready or Off status. This value is normally set to zero. Under special circumstances increased after-running times may be necessary, which can be set at this place.

P032 Anti freeze protection

Here the automatic anti freeze protection can be rendered inoperative.

If the compressor is in Ready status and the oil temperature (final compression temperature) drops below 5°C, the compressor starts automatically and runs in idling until the oil temperature reaches 20°C again.

If P032 is set to the value 1 the automatic anti freeze protection is deactivated, if the value 0 is set the anti freeze operation is active. The value 0 is given as default value.

P034 Continuous operation

If pressure losses have to be avoided at any cost in case of relatively small receivers or compressed air net volumes, a continuous operation can be activated here.

In case of an activated continuous operation the control never switches back to the Ready status. The compressor constantly runs in Idling if it is not delivering compressed air. The value 1 means that the continuous operation is active, 0 means that the continuous operation is deactivated.

P042 Maximum booster pressure

This parameter serves to adjust the booster pressure fed to the compressor. In case of any potential fluctuations the peak value of the fluctuations is to be set.

As for compressors that do not additionally compress any pre-compressed air supplied from an existing compressed air network, the atmospheric pressure (1 bar, absolute) is to be set as booster pressure. For compressors using booster pressure from a compressed air network, the existing booster pressure from the control is to be added to the pressure limit values of the rotation direction and ventilation monitoring systems.

As regards rotation direction monitoring the current system pressure value is registered during motor start-up and fitted with an adjustable offset.

With regard to the system pressure relief, monitoring, switch-off and restart lock functions a 1.3 bar pressure threshold along with the booster pressure max. value is provided.

P044 Message type for oil filter

By this parameter it can be declared whether a pending message of the oil filter monitoring is defined as a warning or as a fault. This adjustment has effects on the properties of the control. Whereas for a warning only a message is created, the compressor is additionally cut off at once as soon as the parameter is defined as a fault.

For this parameter setting 1 means Fault and setting 0 Warning!

P050 Modbus address

The set value 0...248 indicates the Bus address of the RS485 interface on the basic module for the communication with an external Bus system – e.g. a master control.

For the settings of the integrated base load switch control the value 0 is available for the master. Additionally connected compressors have to be specified with the values 2...4.

For other applications the address can be matched with the requirements. All addresses from 1...248 are possible.

**Note!**

The address must be unique in the Bus system.

P051 Modbus baud rate

The value shown here indicates the data signalling rate [Bits/s] of the RS485-interface of the main board for the communication with an external Bus system – e.g. a master control.

**Note!**

For all units within the Bus system this value must be the same.

P052 Modbus frame

The protocol frame of the RS485 interface is determined here. 8 data bits are transmitted and the parity can be selected (O = Odd ; E = Even ; N = None), as well as the number of stop bits (1 or 2).

**Note!**

For all units within the Bus system this value must be the same.

P053 Modbus address (module)

The set value 0...248 indicates the Bus address of the RS485 interface on the basic module for the communication with an external Bus system – e.g. a master control.

0 stands for master, additionally connected compressors have to be specified with the values 2...4.

**Note!**

The address must be unique in the Bus system.

P054 Modbus baud rate (module)

The value shown here indicates the data signalling rate [Bits/s] of the RS485-interface of the module for the communication with additional compressors.

**Note!**

For all units within the Bus system this value must be the same.

P055 Modbus frame (module)

The protocol frame is determined here. 8 data bits are transmitted and the parity can be selected (O = Odd ; E = Even ; N = None), as well as the number of stop bits (1 or 2).

**Note!**

For all units within the Bus system this value must be the same.

P060 Contact type for compressed air treatment

By this parameter it can be declared whether the signalling contact for the compressed air treatment is a break contact or a make contact.

0: Break contact

1: Make contact

P061 Message type for compressed air processing

With this parameter it is determined whether the pending message of the compressed air processing is defined as a warning or as a fault. This setting has an influence on the performance of the control. Whereas in case of a warning only a message is released, the compressor is additionally switched off at once when this parameter is defined as a fault.

In this case setting 1 means fault and setting 0 warning!

P063 External release

The kind of external release is set by this parameter.

Setting	Meaning
0	Internal release
1	Release via contact
2	Release via contact and an external BUS

If a RS485 module is used and parameterized to an address above 0 – its rotary switch must point to zero in any case – it serves automatically as an external output release.

P064 Monitoring of an external release appliance

The parameter P064 is relevant if the pressure control is effectuated externally via the digital input and compressed air has to be available continuously – i.e. no switch-off during the night or on weekends seems to be sensible.

If the parameter P064 is set to the value 0 the monitoring of external output release is deactivated, if the value 1 is set, the monitoring is active.

In case of activated monitoring the FOCUS automatically switches to internal pressure control and outputs an appropriate warning message as soon as a fault of the external control is registered.

P065 Remote Start-Stop

This parameter determines the ON/Off switching function of the control via TAN, a potential-free contact or the Bus. In case the parameter is selected unequal 0, a switching On or Off via TAN of the FOCUS is no longer possible.

Setting	Meaning
0	The On/Off switching is effectuated solely by the control keyboard (local).
1	The On/Off switching is effectuated solely by the input Remote-Start-Stop-switch (continuous contact).
2	The On/Off switching is effectuated solely by the BUS interface.
3	The On/Off switching is effectuated solely by the continuous contact – release function – and via the BUS interface, however not via the control keyboard.

In case of Remote-On-Off the Auto Restart time (P021) after a power failure is used for an automatic start delay.

P066 Key switch

The function of the key switch is set here:

Setting	Meaning
0	The key switch has no function, it is deactivated.
1	When actuating the key switch, the function Remote-Start-Stop is activated.
2	When actuating the key switch the external output release is activated.
3	When actuating the key switch both the external output release as well as the Remote-Start-Stop function are enabled.

The settings for external output release (P064) and Remote-Start-Stop (P065) have to be effectuated separately under the corresponding parameter numbers.

P067 Function of input 42

Normally there are three possibilities for a pressure range switch:

1. via integrated switch clock,
2. via data Bus and
3. via (external) switch contact at input 42, if P067 shows the value 0.

If P067 is set to 1, point 3 is no longer valid.

Input 42 serves as compressor switch off by means of an optional monitoring device when its contact is opened - fault message 91 is shown.

P070 Base load switching: determine number of involved compressors

The base load switch control (see „Base load switch control with additional compressors“, page 27) allows several linked compressors in turns to produce the required quantity of compressed air. This parameter serves to determine the number of compressors which are to be controlled by a master FOCUS in the base load switching mode. The base load switch control is designed for compressors of the same size.

Calling parameter P070 enables you to set a value between 1 and 4 by means of the **keys**  / .

Setting	Meaning
1	The basic load mode function is deactivated because only one compressor is involved.
2	Two compressors are to be involved in the base load switching mode.
3	Three compressors are to be involved in the base load switching mode.
4	Four compressors are to be involved in the base load switching mode.

After setting the required value, press the **ENTER key** , in order to confirm data entry. Then use parameter 071 to determine the base load switching interval time (Exception: the value is set at 1 while the base load switching function is deactivated.).

P071 Setting base load switching interval time

Calling parameter P070 enables you to determine the time interval serving to change compressor priorities. The **keys**  /  allow you to set a value between 0 and 250 hour. No cyclic change will take place if the value is set at 0. In such a case, the priority sequences can be controlled by a switch clock (Siehe "Switch clock" on page 23.).

After setting the required value, press the **ENTER key** , in order to confirm data entry.

P075 Base load switching: $p_{\max}$ Pressure range 1

Pressure range 1 of the BLS is the default pressure setting for the base load switch control. By parameter P075 the top pressure setpoint for pressure range 1 is set.

P076 Base load switching: $p_{\min}$ Pressure range 1

Pressure range 1 of the BLS is the default pressure setting for the base load switch control. By parameter P076 the bottom pressure setpoint for pressure range 1 is set.

P077 Base load switching: $p_{\max}$ Pressure range 2

Pressure range 2 of the BLS offers the possibility for pressure decreases – the value must not be set above that of pressure range 1. By parameter P077 the top pressure setpoint for pressure range 2 is set.

**Note!**

Pressure range 2 of the BLS is only active if corresponding adjustments of the switch clock have been made and/or the external contact for the pressure range selection is active.

P078 Base load switching: $p_{\min}$ Pressure range 2

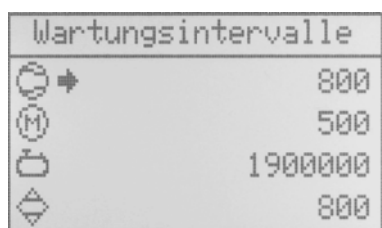
By parameter P078 the bottom pressure setpoint for pressure range 2 is set.

**Note!**

Pressure range 2 of the BLS is only active if corresponding adjustments of the switch clock have been made and/or the external contact for the pressure range selection is active.

1.5 Group parameters / Parameter management

Servicing interval



If the **Code 00111** is entered, a display for the servicing intervals is opened. The servicing intervals for the compressor, the motor and the receiver are set here. If a dryer module is connected the servicing interval for the dryer can be set here as well.

The servicing intervals for compressor, motor and dryer are specified in hours, for the receiver the load cycles of the internal receiver are counted (One cycle consists of 1 x output and 1 x no output each).

With the **keys** $\blacktriangle$ / $\blacktriangledown$ the corresponding servicing interval is selected and acknowledged by means of the **ENTER key** $\blacksquare$. Now the digit starts blinking and can be changed using the **keys** $\blacktriangle$ / $\blacktriangledown$. Only after having acknowledged and entered the value by means of the **ENTER keys** $\blacksquare$ the new servicing interval is accepted and the corresponding down counter restarted.

By means of the **INFO key** i this setting can be left without saving the changes or the counter reading.

The display of the servicing intervals can also be left by means of the **INFO key** i . With the setting of 2.000.000 receiver load cycles this down counter is deactivated.

Parameter factory setting

In case somebody has changed any parameters and wants to recover a functionally safe status the factory setting resp. commissioning setting can be restored.

To do this the compressor must be in the OFF status. Only then **Code 00988** can be entered.

In the displayed window you can read: Restore and you can select either Yes or No.

Should the saved parameters be restored, you can use the **keys** $\blacktriangle$ / $\blacktriangledown$ to select Yes and acknowledge by means of the **ENTER key** $\blacksquare$.

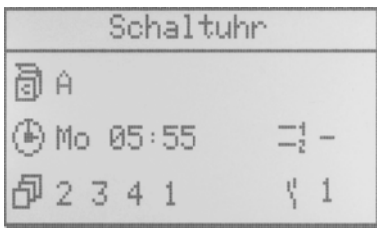
Now the current data on the basic module are overwritten with the factory-set values.

Base load switch control

As of version 1.11 setting of the base load switch control (BLS) is effected by Parameter P070 „Number of compressors" and P071 „Interval time base load switching", see also „Base load switch control with additional compressors", page 27.

As of version 1.18 parameters P075 to P078 ($p_{\max}$ and $p_{\min}$ of BLS pressure ranges 1 and 2) are added. These parameters regulate the output release of the base load switch control via pressure measurement.

Switch clock



By entering **Code 00798** the switch clock can be adjusted.

1. Having entered the code you get to the selection of the switch channels. This is shown by the blinking of the first letter in the top line. 26 channels from A...Z are available.
The channel can be selected using the **keys** / .
2. First the weekday starts blinking. The desired weekday can be selected using the **keys** / . One switch clock channel is deactivated, if two dashes (– –) are set instead a weekday.
3. By pressing the **ENTER key** the input is acknowledged and the cursor jumps to the display of the hours. Using the **keys** / this value can now be set as well and acknowledged by means of the **ENTER key** . The same applies to the minutes.
4. Next the priority sequence of the compressors (see also „Base load switch control with additional compressors“, page 27) can be selected. Each combination of the numbers 1...4 is possible.
The priority sequence '0000' effectuates that from the corresponding point of time the output signal is cancelled for all compressors, until a new priority sequence is generated by another switch clock channel.
The display '– –' effectuates that the switch clock with this channel does not influence the priority sequence but only accomplishes other functions (see below). Thus it can be used with other cyclic changes according to the section „Base load switch control with additional compressors“, page 27.
5. By actuating the **ENTER key** the cursor now jumps to the selection of the pressure range. 1, 2 or "–" ranges are available and the selection can be acknowledged pressing the **ENTER key** .
The pressure ranges 1 and 2 can be set by means of the parameter P012...15, '–' means that no pressure range is changed by this switch clock channel. Either the pressure range of the previously active channel is kept or a new channel is selected via an external contact.
6. Last the potential-free contact of the basic module terminals '14/15' can be switched. Available are: 1 (contact closed) or 0 (contact open).
By actuating the **ENTER key** the display for the channel starts blinking again and by using the **keys** / another channel can be selected and adjusted as described above.
If during the setting of a channel the **INFO key** is actuated, this setting is left without accepting the changes.
In the mode 'Selection of the switching channel' the actuation of the **INFO key** , brings you back to the main display.

Unplanned compressed air requirement

If compressed air is needed when the priority sequence 0000 is active:

1. The compressor can be started by actuating the **ON key**  – in case of multiple systems the complete plant at the Master control (Parameter P070 must be set to more than one compressor). The control accesses the priority sequence of channel A and pressure range 1. For this reason the priority sequences ,0000' and – – – – must not be saved under channel A. This status will be canceled by actuating the **OFF key**  or the next switch clock channel by means of an active priority sequence. Pressing the -**key** once causes the operating readiness of the master to be restored. The green LED is lit.
2. Alternatively the switch clock channel A and the saved kind of remote control (contact or data bus) can be selected by the corresponding setting of parameter P063. In case of an external control the priority sequence of channel A stays active until the external signal is cancelled. In case of active base load switch control only the master must receive this signal (see also „Base load switch control with additional compressors“, page 27).



Note!

This function is valid even if channel A (weekday – –) is not activated.



Note!

If the function „Remote On/Off“ is used, only the second variant is possible.

View input status

Entering **Code 00356** enables the display of the various digital inputs of the control in the form of boxes. As regards allocation, the respective terminal numbers of the basic module are shown underneath.

The inputs having closed contacts are marked with a check in the respective boxes. Thus the boxes without a check stand for opened contacts.

Press the **INFO key**  to quit the display.

1.6 Functions

Motor switching limitation

Motor switching limitation is only active when the air requirement makes it necessary, i.e. after the "Motor start count per time base" is reached before time.

Only then does it switch from intermittent to a limited continuous operation or an automatic or remote restart after a power failure is delayed correspondingly. The control unit calculates the through time so that on the one hand the maximum allowed switch count per hour can not be exceeded, and unnecessary idling times can be saved as well.

The minimum time base is 12 minutes. It is created automatically by the control unit according to the given maximum switch cycle rate per hour.

Power failure cycle protection

If the function "Auto-Restart" or "Remote-On-Off" is activated it is registered after an automatic motor restart following a short power failure (control voltage), if the motor start number would be too high after another start at the current moment and a possible start would probably be delayed. For the calculation the power failure times – provided the real-time-clock is connected (via plug-in jumper of the basic module) and its voltage (see also chapter maintenance) is sufficient – are considered.

This is shown in the Countdown display by means of a once increased Auto Restart time.

Motor spinning time

For motors with less than 15 switching cycles per hour the control unit reserves a spinning time of 20 s during contactor operation after switching off the motor contactors. A switching-on of the motor is disabled within this period of time.

Star phase time control

To reduce starting current when starting the motor by contactors it is first operated load-free in star phase control and after a short time in delta control. The star time is fixed for each compressor type and stored in the control unit. It can be changed using parameter P033.

Pressure range selection

The following table refers to links (see also section „Switch clock“, page 23):

Contact	Switch clock	Standard bus	Optional bus	Pressure range
not used	not used	determines pressure range Bit 3 = 0 switches to range 1 Bit 3 = 1 switches to range 2 – live bit not necessary –	non-existent or Master (more than 1 compressor parameterized)	acc. to standard bus
not used	not used	w/o influence	determines pressure range Bit 3 as with standard bus	acc. to optional bus
closed	not used	no change of live bit	non-existent or Master	2
closed	not used	change of live bit	non-existent or Master	1
opened	w/o influence	w/o influence	w/o influence	1
closed or not used	Range 2	no change of live bit	non-existent	2
closed or not used	Range 1	not used	non-existent	1

Besides the selection of the pressure range via the timer the digital input of the basic module terminal '42' (common inputs – reference terminal: 31) is available to select the pressure range. In case the contact for the external selection of the pressure range has never been active before, an influence on the selection of the pressure range is not given. The input is only considered if it has been closed once.

After that the open contact always means the selection of the first pressure range, and a closed contact the selection resp. release of the second pressure range.

In case the switch clock and the external contact (if registered by the control) require different pressure ranges, pressure range 1 is active.

Pressure range 2 becomes active if selected by the external contact and the switch clock or if the external contact is closed and no pressure range selection is made by the time.

Parameterization of frequency converter

As soon as the **ON key**  is pressed, the frequency converter is energized and the compressor motor starts.

If the frequency converter is to be parameterized during an absolute motor standstill the **ENTER key**  has to be actuated for three seconds when the compressor is in the OFF status, with view of the main display. The converter supply contactor picks up but the motor remains switched-off – the green LED is off.

This status is illustrated as FC (frequency converter) Parameter in the status display.

By actuating the **OFF key**  the converter supply contactor drops out.

TAN test

If the **key**  is pressed for three seconds during the display of the boot image you get to the display *TAN test*.

A test is selected by means of the **keys**  /  and by actuating the **ENTER key** . The TAN test can be left by pressing 'back' or by actuating the **INFO key** .

The TAN test offers a selection of three tests:

- **Screen:** The screen becomes dark and is continuously set up again by means of dark vertical stripes, so that all pixels are activated and deactivated. Leave the Screen-Test by pressing the **INFO key** .
- **Keys:** A display is shown where all keys of the TAN are displayed. If a key is actuated it gets a dark background. After all keys have been pressed the display goes back to the selection display.
In case one of the keys is defective a count down of 30 seconds is started. When this time is elapsed the display changes automatically back to the selection display.
- **LED:** If this option is chosen the LEDs are activated and deactivated in a variable sequence. As an additional control the symbols of the three LEDs are displayed and shown with a black background when activated, so that it is clear which of the LEDs should be illuminated. You leave the LED-Test by pressing the **INFO key** .

Base load switch control with additional compressors

The control contains a master control function for a total of up to four compressors. This means that a maximum of three additional compressor controls can be connected - either by means of the integrated or optional serial RS485 interface (Modbus RTU) or also by means of optional relay modules (one relay module per compressor) to the master parameterized FOCUS control.

The serial connection is only suitable for compressors with FOCUS or RATIO control.

The relay modules are suited for machines equipped with BASIC control, all other BOGE compressor controls or controls with single-pole control pressure switch using two terminals only.

As regards any other compressor makes (e.g. with electronic controls) BOGE is unable to warrant proper connection, which may prove to be extremely expensive, too.

It is recommended not to use a star shaped connection for the serial RS485 module but to make sure to use separate connections from compressor to compressor.

All relay modules must be installed in the switch cabinet of the master compressor.

A FOCUS control is changed into a master unit by setting its parameter 70 (number of compressors) at any value above 1. This means at the same time that for any other FOCUS control equipped (slave) compressors this number must be set at 1.

Transmitter for system pressure

An additional module (rotary switch in position 2) for rail mounting with analogue input (+ = 6, signal = 7) will be available as of version 1.18 for integration of a system pressure transmitter using two-wire technology (output 4 ... 20 mA) and a shielded cable; it is for example to be pneumatically connected to a collection point such as a buffer tank. The module is snapped on directly next to the main circuit board.

As of version 1.18 parameters 075 to 078 are used as pressure setpoints for both BLS pressure ranges.

Addresses and output releases

The addresses and output releases of the compressors equipped with serial connection (Modbus RTU) or relay modules have to be set according to the following table:

Compressor	Address	Relay module rotary switch	Output release
1 (Master)	0	n/a	Internal *
2	2	2	External
3	3	3	External
4	4	4	External

* As regards shut-off or reduction (on pressure band 2) by means of integrated real time clock please see Chapter Unplanned Air Demand

The base load switching control of FOCUS can be operated either at cyclic intervals or by means of an integrated real time switch clock – also see Chapter "Switch Clock".

In case of cyclic operation use Parameter 71 to set the cycle time.

For this reason, the switch clock must either not be used (no weekday on any channel) or, in case of any other type of use, no priority sequence must be contained in the respective switch clock channel (nor the sequence 0000, but only – – – –)!

When using the switch clock for base load switching purposes, parameter 71 has to be set at zero!

26 switch clock channels (switch points) are available.

Entering a weekday causes a channel to be activated. Any priority sequence is available for selection. In addition, shut-off is possible by using the 0000 priority sequence.

Selection of the second pressure band by means of the switch clock allows temporary change to a lower pressure range.

Additionally, the switch clock is equipped with a potential free change-over contact.

Speed controlled compressors with a FOCUS control system are possible to be operated in the base load switch control mode. This requires Modbus RTU communication in order to ensure control of the max. priority (base load) compressor and unregulated mode operation (at max. speed) of the remaining compressors.

As of version 1.18 the base load switching control normally uses the pressure value of parameter P075 as the upper shut-off value and of parameter P076 as the lower switch-on value. All other necessary shut-off and switch-on pressure values are automatically calculated. All other necessary shut-off and switch-on pressure values are automatically calculated.

The proper internal pressure switch points of the connected compressors are to be selected such as to prevent such compressors from switching themselves off within the pressure band as set at the master unit. In this conjunction, possible pressure pipe losses are to be taken into account. In case of installations with system pressure transmitter this applies also for compressor 1 (Master).

If pressure reduction (parameter 77 is used as upper nominal pressure value, parameter 78 as lower value as of version 1.18) is applied, all other FOCUS controls using the RS485 interface for connection to the master unit will automatically be switched to their second pressure band. This is primarily of advantage for speed controlled compressors because their control target pressure is reduced at the same time enabling controlled operation also in pressure range 2. In this conjunction, make sure not to use the digital input "Pressure Band" of the slave compressors and that their switch clocks do not impact on their pressure band.

The control target pressure is to be set, using the correct algebraic sign, relative to the current upper pressure target value (P012 or P014) in parameter P016 of the respective compressor. In other words:

Control pressure setpoint = current top pressure setpoint + Parameter 16.

Example with monitoring and emergency operation function

Four compressors (10 bar), all of which are equipped with a FOCUS control and a frequency converter, are connected by means of RS485 interfaces. Pressure at user's facility must not completely be shut off, should however be able to be reduced. Providing sufficient receiver / network volume, the pressure values can be set according to the following table allowing pressure reduction by 1.5 bar which can be actuated by an external contact or by means of a switch clock – as regards switch clock actuated pressure reduction, also see chapter „Unplanned compressed air requirement“.

Compressor	Parameter setting in bar										Control target pressure in bar	
No.	P075	P076	P077	P078	P012	P013	P014	P015	P016	P064	Pressure range 1	Pressure range 2
1 (Master)	9.5	7.5	8.0	6.0	10	7.4	8.5	5.9	-1.3	1	8.7	7.2
2	no function				9.9	7.3	8.4	5.8	-1.2	1	8.7	7.2
3					9.8	7.2	8.3	5.7	-1.1	1	8.7	7.2
4					9.7	7.1	8.2	5.6	-1.0	1	8.7	7.2

Parameter P016 has to be set in such a way that the control target pressures of the frequency converters are identical for all compressors.

Example without monitoring and emergency operation function

Four compressors (10 bar), all of which are equipped with a FOCUS control and a frequency converter, are connected by means of RS485 interfaces. The pressure at user's facility is to be completely released over the weekend and over night and, in addition, be able to be reduced. Providing sufficient receiver / network volume, the pressure values can be set according to the following table allowing pressure reduction by 1.5 bar which can be actuated by an external contact or by means of a switch clock – as regards switch clock actuated pressure reduction, also see chapter „Unplanned compressed air requirement“.

Compressor	Parameter setting in bar										Control target pressure in bar	
No.	P075	P076	P077	P078	P012	P013	P014	P015	P016	P064	Pressure range 1	Pressure range 2
1 (Master)	9.5	7.5	8.0	6.0	10	8.9	8.5	7.4	-1.3	0	8.7	7.2
2	no function				9.9	8.8	8.4	7.3	-1.2	0	8.7	7.2
3					9.8	8.7	8.3	7.2	-1.1	0	8.7	7.2
4					9.7	8.6	8.2	7.1	-1.0	0	8.7	7.2

Parameter P016 has to be set in such a way that the control target pressures of the frequency converters are identical for all compressors.

1.7 Warning message/Fault message

Warning message/ Fault message

As far as pending messages are concerned there is a difference between warning and fault messages.

Depending whether an input is defined as fault or warning either only the warning is displayed or the compressor is switched off at once via a fault message.

All warning and fault messages are saved by the control in the LogBook together with operating states and time.

Warning message

In case of a pending warning or servicing message the compressor remains in operation and this status is visible by means of an orange coloured blinking LED on the control.

By actuating the **INFO key**  the message is displayed and by means of the message code list it can be identified.

By actuating the **INFO key**  once more the compressor states are displayed at the time of the warning.

This warning can be acknowledged by pressing the **ENTER key** . In case you are in the status display the acknowledgement can be effectuated by actuating the **ENTER key**  two times.

If various warnings are pending at the same time, they can only be displayed and acknowledged when the reason for the first warning has been eliminated. If a warning is pending when the control is powered up this is signalled at once by means of the flashing yellow-coloured LED.

In this case the boot display can be left by pressing the **OFF key**  or you can get to the main menu by displaying and acknowledging the warning.

Even if you leave the boot display via displaying the warning, nevertheless the **OFF key**  has to be actuated once before the control resumes its normal function.

Pre-acknowledgement

If a message is acknowledged and the reason for it is not(yet) eliminated, the corresponding LED remains continuously illuminated. As long as a fault or warning is signalled by the LED, the fault message can be displayed by pressing the **INFO key**  again.

Acknowledgement of message 45 (Watchdog Timer Reset)

This message must be pre-acknowledged first.

For a complete acknowledgement of the message (switch-off of the yellow-coloured LED) the control must be de-energized for a short time.

Fault messages

In case of a fault message the compressor is switched off at once – without idling phase.

A red blinking LED signals a pending fault message and the display shows the corresponding message number at once.

By actuating the **INFO key**  the operating states at the time of the fault are displayed.

Actuating of the **ENTER key**  leads to the leaving of the operating states display and pressing the key once more acknowledges the fault.

The red LED is continuously illuminated after the acknowledgement of the fault and the compressor status display shows Fault until the fault has been rectified. Only then the compressor can be started again.

1.8 Data of external connections

Basic module

Terminals	Type of terminal	Function	Description	Rating
1/2	Tension spring terminal	Relay output	Ready for operation: Make contact	2A 30V DC/250 with ohmic load V AC with ohmic load; 0.6A 250 V AC 50/60Hz with inductive load (Power factor = 0.4)
3/4/5	Tension spring terminal	Relay output	Fault-free: Grouping terminal 3, Break contact terminal 4 and make contact terminal 5	2A 30V DC/250 with ohmic load V AC with ohmic load; 0.6A 250 V AC 50/60Hz with inductive load (Power factor = 0.4)
6/7	Tension spring terminal	Relay output	Operation: Make contact	2A 30V DC/250 with ohmic load V AC with ohmic load; 0.6A 250 V AC 50/60Hz with inductive load (Power factor = 0.4)
8/9	Tension spring terminal	Relay output	Load operation: Make contact	2A 30V DC/250 with ohmic load V AC with ohmic load; 0.6A 250 V AC 50/60Hz 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 with ohmic load; 0.6A 250 V AC 50/60Hz with inductive load (Power factor = 0.4)
12/13	Tension spring terminal	Relay output	Pre-selection remote: Make contact	2A 30V DC/250 with ohmic load V AC with ohmic load; 0.6A 250 V AC 50/60Hz with inductive load (Power factor = 0.4)
14/15	Tension spring terminal	Relay output	Switch clock: Make contact	2A 30V DC/250 with ohmic load V AC with ohmic load; 0.6A 250 V AC 50/60Hz with inductive load (Power factor = 0.4)
34	Tension spring terminal	Digital input	Monitoring compressed air treatment Terminal 34 (against terminal 31 (+24V))	24...31V DC, 10mA, input resistance 3 kΩ
40	Tension spring terminal	Digital input	Output release Terminal 40 (against terminal 31 (+24 V))	24...31 V DC, 10 mA, input resistance 3 kΩ
41	Tension spring terminal	Digital input	Remote Start/stop switch Terminal 41 (against terminal 31 (+24 V))	24...31 V DC, 10 mA, input resistance 3 kΩ
42	Tension spring terminal	Digital input	Switchover pressure range Terminal 42 (against terminal 31 (+24 V))	24...31 V DC, 10 mA, input resistance 3 kΩ
51	Screw terminal	External RS485 interface	Earth (GND)	
52	Screw terminal	External RS485 interface	Signal A	Input differential voltage max -12 V
53	Screw terminal	External RS485 interface	Signal B	Input differential voltage max. +12 V

Analogue output module

Terminals	Type of terminal	Function	Description	Rating
1/2	Tension spring terminal	Analogue output	Actual frequency value: 4...20 mA (terminal 1) against terminal 2 (GND)	max. 28 mA, max. load 400 Ω

RS 485 module

Terminals	Type of terminal	Function	Description	Rating
1	Tension spring terminal	External RS485 interface	Earth (GND)	
2	Tension spring terminal	External RS485 interface	Signal A	Input differential voltage max. -12 V
3	Tension spring terminal	External RS485 interface	Signal B	Input differential voltage max. +12 V

Analogue input module

Terminals	Type of terminal	Function	Description	Rating
6/7	Tension spring terminal	Analogue input	System pressure measurement	4-20mA (terminal 7) (+24V terminal 6) max. 22mA DC, input resistance 150 Ω Separated from external supply voltage due to double insulation

Wire cross sections of external connections

For external connections the following conductor cross sections are to be used:

Screw terminals

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

Tension spring terminals

Terminal	Cross section
Capacity of terminal	0.5...1.5 mm ²
Single wire	0.5...1.5 mm ²
Stranded wire	0.5...1.5 mm ²
with ferrule	0.5...1.5 mm ²
AWG- conductor	26-14

1.9 Fault messages

List of fault messages

Fault no.	Meaning	Compressor switch-off
1	Final compression temperature too high (>110°C)	X
2	Motor temperature too high	X
3	Fan motor	X
4	Wrong rotational direction	X
5	Compressor system pressure too high	X
6	Suction filter differential pressure too high	
7	Oil filter differential pressure too high	Parameterizable (P044)
8	Oil separator differential pressure too high	
9	No output	1st warning, than fault
10	Motor servicing due	
11	Compressor servicing due	
12	System pressure decrease too slow	
13	Frequency converter signals fault (no release)	X
14	Temperature too low (<3°C)	X
15	Suction regulation / Proportional control	
16	Net pressure transmitter faulty	X
17	Sys. pressure build-up too fast/ increase too sharp	X
18	Fault of an external control	
19	Power-up phases too short, too many motor switching cycles	
20	Continuous contact of an external control	
21	Receiver servicing due	
25	Data reconciliation error	1st warning, than fault
26	Control unit OFF-key does not opent	X
27	Control unit ON-key does not open	X
28	Control unit INFO-key does not open	
29	Control unit ENTER-key does not open	

Fault no.	Meaning	Compressor switch-off
30	Control unit UP-key does not open	
31	Control unit DOWN-key does not open	
32	Net pressure transmitter wire breakage	X
33	Compressor system pressure transmitter wire breakage	X
34	Compressor system pressure transmitter faulty	X
36	Bus live bit faulty	
38	Excessive current compressor motor	X
39	Fault compressed air treatment	Parameterizable (P061)
40	FC (frequency converter) module fault	X
41	Battery voltage too low	
42	FC (frequency converter) module not calibrated	X
43	FC (frequency converter) module overflow	
44	FC (frequency converter) module underflow	
45	Watchdog timer Reset	
46	Watchdog not active	
47	f-clock resp. f-CPU discrepant (clock frequency)	
48	TAN identifies internal BUS fault	X
49	TAN misses data (from basic module)	X
50	Dryer module Fault	Parameterizable via P061
51	Pressure transmitter faulty at dryer	Parameterizable via P061
52	Cooling temperature sensor – Fault	Parameterizable via P061
53	Ambient temperature sensor faulty	Parameterizable via P061
54	Pressure at dryer too high (coolant)	Parameterizable via P061
55	Pressure dew point dryer too low	Parameterizable via P061
56	Pressure dew point dryer too high	
57	Temperature compressed air outlet	Parameterizable

Fault no.	Meaning	Compressor switch-off
58	Control unit LEFT-key does not open	
59	Control unit RIGHT-key does not open	
60	Basic module recognizes TAN error	X
61	Communication with RS485 Module faulty	
62	Communication with converter module faulty	X
63	Communication with analogue outlet module faulty	
64	Motor bearing temperture too high	X
71	Run-time memory 1	
72	Run-time memory 2	
73	Type of parameter	
74	Dryer and compressor servicing due	
75	Software version of TAN and basic module not compatible	
79	Operating data memory error	
80	Memory error of 2nd operating data memory	
81	Parameter memory error	X
82	System pressure transmitter faulty	
83	Communication with system pressure module defective	
84	Data reconciliation error in system pressure module	
91	Mainboard input 42 signals fault – see circuit diagram	X
Fault messages for special types		
90	Lack of insulation	X
92	Condensate drain of microfilter	X
93	Condensate drain of dryer	X
94	Dryer	X
95	Microfilter	X
96	Supply voltage	X
97	Side duct ventilation – excess current	X

1.10 Parameter overview


Note!

Parameters can be processed as described under Parameter Settings.

No.	Meaning	Adjustment range	Code level
P001	Language selection	DE = German; GB = English; IT = Italian; RU = Russian; FI = Finnish; DK = Danish; LT = Lithuanian; SE = Swedish; PL = Polish; ES = Spanish; PT = Portuguese; FR = French; NL = Dutch; LV = Latvian; TR = Turkish; CZ = Czech; HU = Hungarian	all
P012	Max. pressure for pressure range 1	0 bar, 4 bar... maximum system pressure limitation	USER
P013	Max. pressure for pressure range 1	3 bar... maximum P012 less min. hysteresis	USER
P014	Max. pressure for pressure range 2	0 bar, 4 bar... maximum system pressure limitation	USER
P015	Max. pressure for pressure range 2	3 bar... maximum P014 less min. hysteresis	USER
P020	Auto restart (Automatic restart after power failure)	0 = Off; 1 = On	USER
P021	Auto restart time; time until restart after power failure	30 s...3600 s	USER
P022	Short stop limiting value	0 s...3600 s	USER
P031	After-running time	0 s...600 s	USER
P032	Anti-freeze protection; Compressor starts when final compression temperature drops below 5°C and switches off as soon as 20°C are reached	0 = On; 1 = Off	USER
P034	Continuous operation; Compressor does not switch off but stays continuously in idling operation	1 = On, 0 = Off	USER
P042	Booster pressure	0...12 bar	USER
P044	Type of message oil filter	1: Fault, 0: Warning	USER
P050	Modbus address	0 for Master, 2...4 for additional compressors, 1...248 for other applications	USER
P051	Modbus baud rate	1200...115200	USER
P052	Modbus communication parameter	8Even1, 8None1, 8None2, 8Even2, 8Odd1 and 8Odd2	USER
P053	Modbus address (module)	0 for Master, 2...4 for additional compressors, 1...248 for (pure) control applications	USER
P054	Modbus baud rate (module)	1200...115200	USER

No.	Meaning	Adjustment range	Code level
P055	Modbus communication parameter (module)	8Even1, 8None1, 8None2, 8Even2, 8Odd1 and 8Odd2	USER
P060	Contact type compressed air treatment	0: Break contact, 1: Make contact	USER
P061	Type of message for compressed air treatment	1: Fault, 0: Warning	USER
P063	External output release	0...2	USER
P064	Monitoring of external output release	0...1	USER
P065	Remote/Start/Stop	0...3	USER
P066	Key switch	0...3	USER
P067	Function of input 42	0 = Pressure range, 1 = Monitoring	USER
P070	Interval time until base load switching	1...4	USER
P071	Interval time until base load switching	0...250	USER
P075	Base load switching: max. pressure for pressure range 1	0 bar, 4 bar ... max. pressure of compressor type	USER
P076	Base load switching: min. pressure for pressure range 1	3 bar ... maximum P075	USER
P077	Base load switching: max. pressure for pressure range 2	0 bar, 4 bar ... max. pressure of compressor type	USER
P078	Base load switching: min. pressure for pressure range 2	3 bar ... maximum P077	USER