

## **Operating instructions**

### airtelligence PROVIS control for several compressors





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# Operating instructions airtelligence PROVIS

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#### 1.1 General safety instructions

#### Attention! Nonobserv

Nonobservance of the following safety instructions may lead to injuries and damage to the control. Also observe the generally valid safety and accident prevention regulations in addition to the information in these operating instructions!

### Safety instructions for compressor operation

- 1. Ensure that no commissioning and maintenance work on the controlis undertaken until these operating instructions are understood.
- 2. Only use the control for its intended use, as described in these operating instructions.
- 3. The owner must ensure:
  - that only appropriately trained and authorized personnel work on this control,
  - that the operating, maintenance and repair personnel has been made fully familiar with all safety instructions, and that they are being observed,
  - that the control is only operated in a safe operating condition.
- 4. Only operate the compressor using the additional equipment (options) recommended or authorized by the manufacturer.
- 5. Never start the control when one or serveral parts (e.g. cable, plug) are damaged, when not in perfect working order, when damage is detected or suspected.

#### Safety instructions for maintenance and repair of the compressor

- 1. Ensure that maintenance work is only carried out by appropriately trained persons.
- Ensure that setting work, malfunction rectification and repair is only carried out by qualified electricians (see DIN VDE 0100 or DIN EN 60204-1 / VDE 0113-1:2007).
- 3. Prior to maintenance or repair work:
  - Switch off the main switch.
  - Check that no parts are under voltage.
- 4. Work on voltage carrying parts and devices are not permitted. Exceptions are governed by the appropriate regulations, e.g. DIN VDE 0105.
- 5. Only use original spare parts, compressor oils and operating materials released by BOGE during repair or maintenance.

General	1.1	General safety instructions			
Introduction	The purpo function a	The purpose of these operating instructions is to familiarize the user with the function and all application possibilities of the control.			
	These op several co the aid of	erating instructions contain important information on how to operate oppressors safely, economically and according to intended use, with an MCS control.			
	Observing duce repa	g these operating instructions will assist in avoiding danger, to re- ir costs and down times and to increase the reliability and service life			
	It contains tings, and	s important information concerning the required parameters and set- l assists in case of malfunctions.			
	The opera erating pe The opera	ating instructions must be available to the control and compressor op- ersonnel at the place of operation, at all times. ating instructions must be carefully read and applied by all persons to undertake the following work on the compressor:			
	– Opera	ation, including fault rectification,			
	– Comr	nissioning.			
Intended use	This BOG control of It may on	E multiple system control including its options is intended for the several screw and piston compressors. Iy be operated and adjusted by trained and authorised people.			
	Requiren	nents for compressors to be controlled:			
	If the mas compress installed, These are	ter control is ordered with compressors, we install the interface in the cors in the factory (forced option). If the compressors are already it will be necessary to meet the requirements for the master control.			
	1. A pote	ential-free contact "Ready" (2 terminals).			
	2. Two t sor.	erminals in series with the pressure switch installed in the compres-			
	3. A pote	ential-free contact "Operation" (2 terminals).			
	4. A pote For co tact B	ential-free contact "Fault" (2 terminals). ompressors with proportional control or frequency control please con- OGE.			
	Attentior	1!			
	Care mustory.	t be taken with other makes; always obtain approval from the fac-			

General	1.1 General safety instructions
Inadmissible use	This BOGE control is not explosion protected. Do not operate in explosive areas!
	Attention!
	The following is not permitted:
	- Exceeding or going below the specified operating voltages.
	<ul> <li>Operation of the control by unauthorized or untrained persons.</li> </ul>
	- Connection of unsuitable compressors.
	- Excessive room temperatures > 45°C.
Iransport damage	BOGE does not accept any liability for breakage or transport damage. Please inspect the compressor immediately after delivery and direct damage claims to the last haulier - even when the packing is not damaged! To safeguard claims against the haulier we recommend leaving the machine, devices and packing material in the same condition as they were in when the damage was detected.
	In the event of any other complaints, please inform us within six days after arrival of the delivery.
Customer service	The BOGE customer service is, of course, at your disposal. Please contact us on:
	Telephone: +49 52 06 / 6 01-0
	To avoid delays, always specify the following details about your control: 1. Software version
	2. Circuit diagram number
	3. Job humber 4. Machina number
	6. Year of manufacture
	Attention!
	Only BOGE service technicians or persons authorized by BOGE in writing may repair or alter the control during the warranty period. Otherwise all warranty claims will expire!

Only BOGE service technicians or persons authorized by BOGE in writing may repair or alter the control during the warranty period. Otherwise all war-ranty claims will expire!

General	1.1 General safety instructions			
Installation and adjustment	<ul> <li>The electronic pressure sensor must always be fitted verticaly (plug upwards) on the common receiver or pipelines and free of condensate water.</li> <li>If the air is damp (e.g. system without dryer), it will be necessary to vertically install between the muff and pressure sensor a 150 mm pipe.</li> <li>The cutout point of the pressure switches of the individual compressors must be set at least 0.2 bar higher that the upper cutout point of the master control.</li> </ul>			
	Attention!			
	The maximum operating pressure of the individual compressors may not be exceeded.			
	<ul> <li>The pressure switches of the compressors are only used to allow opera- tion in the event the master control fails.</li> </ul>			
	Attention!			
<u></u>	In the adjustment sequence the sub-menu "Pressure thresholds" must first be checked and adjusted; thereafter the sub-menus general parameters; "Compressor data" must be adjusted in this order.			
	<ul> <li>These operating instructions are only valid in conjunction with the appro- priate circuit diagram.</li> </ul>			
	<ul> <li>Instructions for making adjustments are given in the individual chapters.</li> </ul>			



#### Caution: High voltage!

Commissioning, adjustment, troubleshoorting and repairs may only be performed by qualified electricians (see DIN VDE 0100, DIN EN 60204-1 / VDE 0113-1:2007 and DIN VDE 105).

### airtelligence PROVIS

### **Operation manual**



#### a irtelligence PROVIS - combines compressors of different sizes to an optimum unit



#### Almost the best strategy to save energy

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### **FUNCTIONAL DESCRIPTION**

#### AIRTELLIGENCE PROVIS combines compressors of different sizes

to an optimum unit which automatically adapts to the production based on the current compressed air consumption. It is made sure that it is always the most efficient compressor combination which generates the compressed air necessary for production, independent of the manufacturer and the performance. The system pressure remains within the smallest limits. It is seen that the costs are kept as low as possible. The compressor performances and a common pressure difference are programmed in for all the compressors. Based on this information, AIRTELLIGENCE PROVIS permanently calculates the current compressed air consumption and the volume of the compressed air system. The self-learning 8-fold calculation depth makes it possible to adapt the compressors to the changes in consumption in a dynamic way.

#### Automatic compressor change as per compressed air consumption

If all the compressors are on the same rank, they are working fully automatically and based on real air consumption. The priority of the compressors is adapted to the production process in real time with a useful hysterisis calculation. It is always the compressor combination with the lowest cycle rates which is running and thus with the lowest idle times. Big compressors are only running when needed. The smaller compressors are running under load instead of idling the big compressors. The compressors auto-regulate the motor start limitations.

#### The status of the compressors is constantly monitored.

If a running compressor displays a malfunction within the pressure range or is switched off for service, its performance is taken over by other compressors. If several compressors are needed to do this, addition is made time-delayed. Load and total running times are stored for the individual compressors. The operating hours are deleted, if required.

#### Connecting of compressors

is effected using the connecting moduls this being installed in the electrical housing of the compressor on the DINrail. The connection to the Master control is made over the industry us RS 485 bus. The operating voltage of 24 volts AC/DC can be attached to the tension supply of the compressor. **If a power supply of 24V AC or DC is available from the compressor electric.** 

#### Compressor fault

If a compressor goes on fault the display shows a symbolic cross. On fault of reported compressor the performance gets the compressed air consumption the most favorable compressors combination replaces through this one. The fault report for the compressors is activated at the AIRTELLIGENCE PROVIS an common fault signal. Faults from the connection modules will be given out over the digital output "General fault of external equipment."

#### Compressor motor running

If these inputs get connected, AIRTELLIGENCE PROVIS receives the motor running time. The total hours are also stored as the load hours. The advertisement of the hours can be retrieved over the display. The running time compensation provides equally running times of compressors with same capacity.

#### Compressor ready input

These input must be connected so that compressor management AIRTELLIGENCE PROVIS recognizes the readiness of the compressors. If these input don't get connected, the compressor cannot be in operation. A fault signal isn't activated.

der Kompressor nicht bereit und kann nicht angewählt werden. Eine Störmeldung wird nicht aktiviert.

#### If the fault input is not connected

and one of the compressors stops due to a malfunction, the display will show a wrong compressed air consumption (too high = by the value of the faulty compressor). For this reason it is advisable to connect the malfunction signal inputs, so that the compressed air consumption is always shown correctly and the capacity is also corrected and immediately after reaching the P min.

### **DISPLAY and KEY CONTROL**





Button	Function
Ш	ENTER - open the Main menu
	Coursor upper
▼	Coursor lower
•	Cursor right
+- und	press simultaneos = Cursor left
E und	Back to the Main picture
4	Showing status of compressors
7	Showing status of connection modules for external equipment
<b>1</b> und <b>▲</b>	More contrast of display
<b>1</b> und <b>V</b>	Less contrast of display
1	Means YES (Y)
0	Means NO (N)

### Control and interpretation of regulated compressors

#### The various speed regulated compressor is integrated actively

The VSD compressor send the information about the motor speed over an analog output to AIRTELLIGENCE PROVIS. This parameter must be programmed to the minimal and maximum capacity of the delivered compressed air. The analog output of the VSD compressor have to be 4-20 mA. VSD Compressors with an analog output of 0-10 VDC must be changed from 0-10 VDC with a receiving multicoupler to 4-20 mA.

#### The pressure Setpoint of the VSD compressor must be centrically programmed between the AIRTELLIGENCE PROVIS switch points.



#### The right combination of compressor capacities

together with speed regulated and normal compressors with a firm performance is decisive for good results in regulation. Is the various speed regulated compressor the smallest in combination with only bigger compressors there are only small section regulated by the various speed compressor. Big mechanical hurdle cannot be regulated directly.

#### Example of the right interpretation of the performances:





### Configuration of regulation range and regulation buffer

#### Examble with a VSD Compresor with a regaulation range between 2,5 - 16 m³/min -

#### The free definable regulation range max

switches load/unload compressors ON and OFF within the pressure settings of AIRTELLIGENCE PROVIS. The regulation limits are defined with the regulation range max and the regulation buffer. Is the regulation range max adjusted lower than the maximum capacity of the VSD, the regulation range max and the regulation buffer will be activated.

#### Setting the "regulation range max"

Example: the regulation range max will be programmed to 15 m of m<sup>3</sup>/min. If than the compressed air consumption is going higher than 15 m<sup>3</sup>/min a time flexible trend calculation watches the compressed air consumption and switches another compressor on (10 m <sup>3</sup>/min like example). Within the pressure switch points of AIRTELLIGENCE PROVIS. If the speed's regulated compressor reaches the regulation range max the second time together with the 10 m <sup>3</sup>/min compressor at 25 m <sup>3</sup>/min air consumption again, the 10 m <sup>2</sup>/min compressor will be replaced with the 20 m <sup>3</sup>/min compressor directly. The 10 m <sup>3</sup>/min compressor will be switched on if air consumption reaches the regulation range max of the regulated compressor at 35 m of <sup>3</sup>/min together with the 20 m <sup>3</sup>/min compressor.

#### Setting the "regulation buffer"

Example: the regulation buffer will be programmed to 1,5 m<sup>3</sup>/min. If the compressed air consumption is getting lower and the regulated compressor comes to the point "lower than 15 m<sup>3</sup>/min" together with the 10 and 20 m<sup>3</sup>/min compressor the regulation buffer of 1,5 m<sup>3</sup>/min will be activated. The air consumption get again 1,5 m<sup>3</sup>/min lower a time flexible trend calculation stops the 10 m<sup>3</sup>/min compressor inside the adjusted pressure switch points at the AIRTELLIGENCE PROVIS. The VSD compressor regulates to the capacity of 13,5 m<sup>3</sup>/min.

ouncor setting of regulation saller
-------------------------------------

Regulation range max	=	15,0 m³/min	
Regulation buffer	=	-1,5 m³/min	
Min compressor capacity	=	-2,5 m <sup>3</sup> /min	
Control sum	=	11,0 m³/min	

 Uncorrect setting of regulation buffer

 Regulation range max
 =
 15,0 m³/min

 Regulation buffer
 =
 -3,5 m³/min

 Min compressor capacity
 =
 -2,5 m³/min

 Control sum
 =
 9,0 m³/min

#### Note:

- the regulation range max will be activ if the control sum is smaller than the capacity of the load/unload compressor

- the regualtion buffer is active if the controll sum is higher than the capacity of the load/unload compressor

The VSD compressor will be run in his best specific range.



### Minimum flow rate and remote pressure supply

#### Settings "minimum flow rate" of variable speed compressor

By setting the minimum capacity in the menu of the speed regulated compressor can be determined whether or below the minimum delivery amount of a normal compressor compressor in load / idle to run mode.

Setting the minimum flow rate of 0 m / min causes: The speed controlled compressor is running in start / stop operation as long as the consumption of compressed air is from 0 to  $2.5 \text{ m}^3$  / min.

Setting the minimum flow rate of 2.5 m<sup>3</sup> / min causes: Below 2.5 m<sup>3</sup>/min compressed air consumption a normall compressor is running in a load / unload mode. The downshift is receding in consumption with a hysteresis

This mode is only economic if the air station with a small compressor as 2.5 to 4 m / min is installed in addition



#### Remote pressure supply through analog output at the RS-485 connection module

#### Pressure differences by dryers and filters

cause may be between the pressure transmitter of the controlled compressor, and the master control rule up to 0.4 bar difference.

A precise control of pressure within very close limits is not possible. The pressure difference at the higher level control must be expanded by the pressure value can be set. This results in a pressure differential of 0.7 bar. (More than at a station without a regula-



#### With the remote control actual pressure value

ted compressor)

ensure that the regulated compressor can be operated in conjunction with the master control in a narrow pressure limit. The analog output of the connection module, deliver the current actual pressure of AIRTELLIGENCE PROVIS via 4-20 mA. If the compressor pressure transmitter has an different range, than the output has to be adjusted accordingly.

#### Exemble:

AIRTELLIGENCE PROVIS0-16 bar = 4-20 mACompressor1-20 bar = 4-20 mA or Compressor-1-15 bar = 4-20 mA

An offset value setting for remote actual pressure

can be programmed via the menu of regulated compressor to the pressure setpoint of the controlled compressor to adjust the pres sure difference.

This is especially important when more than 1 controlled compressor is installed in the compressed air network and the analog values do not match the individual compressors

### Station with 2 variable speed compressors

#### In a station with 2 regulated compressors

the pressure transducer of regulated compressors in the same place as the pressure transmitter of the AIRTELLIGENCE PROVIS feel, because differences in pressure of compressed air dryers and filters, the control behavior can influence each other greatly. The configuration is described on page 4.

#### Settings "regulation range max" und regulation buffer

exemble	1: 2 variable speed	compressors with	same capacity
•			

compressor	compressor type	m³/min	Regulation range max	Regulation buffer	Min. flow rate
1	Variable speed	5-30	28 m³/min	5 m³/min	0
2	Variable speed	5-30	28 m³/min	5 m³/min	0
3	load / unload	15	-	-	-
4	load / unload	25	-	-	-

exemble 2: 2 variable speed compressors with different capacities

compressor	compressor type	m³/min	Regulation range max	Regulation buffer	Min. flow rate
1	Variable speed	1,5-10	9 m³/min	1,5 m³/min	0
2	Variable speed	5-20	18 m³/min	4 m³/min	0
3	load / unload	15	-	-	-
4	load / unload	25	-	-	-

#### In exemble 2

- if compressor 1 reach the regualation range max - it changes to compressor 2

- if compressor 2 reach the regualation range max compressor 1 start again
- if both compressors reach the regulation gange max one of th load / unload compressor will be started

- the controller decides, dependent of air consumption tha one of the regulated compressor can be switched off

#### The regulation range max

ensure that regulated compressors are always in the correct specific area. If an varaiable speed compressor delivers more air than the setting of the regulation range max, the control started a flexible trend calculation to start the next load/unload compressor. Dependent of the compressed air consumption.



#### 8

### **Programming load /unload compressors**





	7.	0 5 <sub>bar</sub>	37.2 <sub>m3/min</sub>
С	NO	vs	COMPRESSOR CAPACITY
0			
M	01	N	20,0 m3/min
Р	02	N	20,0 m3/min
R	03	N	18,0 m3/min
E	04	N	18,0 m3/min
S	05	N	12,5 m3/min
S	06	N	12,5 m3/min
0	07	N	0,0 m3/min
R	08	N	0,0 m3/min
DEW	POINT	г	TEMPERATURE
1.3	°C		18.7°C

	7.0	5 <sub>bar</sub>		37.2 m3/min
	COMPR	ESSOR	MODULE 02	PROGRAMMING
A E 1 :	CURR ENER Imin Imax	ENT ME GY ME : : 2	ASUREMENT ASUREMENT 4,0 mA 20,0 mA	N 9,0 200,0
A E 2 : D E W P		ERATUR	E MEASUREI SENSOR	MENT Y N TEMPERATURE

#### Programming the compressor capacities

Press **"E**" (Enter) to open the main menu. Select the menu "programming compressor control" to program:

- Compressor module (capacities)
- Pressure switch points
- Compressor order of sequence
- Time cycle compressor order
- Control system parameter

Store data with "E" (ENTER)

#### The compressor capacities

will be programmed in the menu "Compressor Module". The capacities are definied in m<sup>3</sup>/min.

#### Analog inputs for compressors

If compressor capacity is selected, -press "ENTER" to go in the menu of analog inputs for the compressor

#### Analog input AE 1

- for connection of:
- CT-clamps
- kW-meter

#### Analog input AE 2

- for connection of:
- Temperatur sonsor
- Universal sensor input

### Programming the variable speed compressors

	7.	05 <sub>bar</sub>	37.2 <sub>m3/min</sub>
С	Nr	vs	COMPRESSOR CAPACITY
0			
M	01	N	20,0 m3/min
Р	02	N	20,0 m3/min
R	03	N	18,0 m3/min
E	04	N	18,0 m3/min
s	05	N	12,5 m3/min
s	06	N	12,5 m3/min
0	07	Y	2,5 <u>16,0</u> m3/min
R	08	Y	2,5 <u>16,0</u> m3/min
DEW	POIN	г	TEMPERATURE
1.3	°C		18.7°C

7	05. 27.2	
· · ·	UJ bar JI.Z	m3/min
CO	IPRESSOR MODULE 07 PROGRAMMI	NG
AE1:	SPEED CONTROL COMPRESSOR	
	lmin <u>6,2</u> mA 2,5 m	3/min
	Imax 18,5 mA 16,0 m	3/min
	max regulat, range : 15,0 m	3/min
	regulation buffer : 2.0 m	3 / m i n
	min compair flow : 0.0 m	3 / m i n
AF2 ·	TEMPERATUE MEASUREMENT N	
	CURRENT MEASUREMENT N	
DEWBOL	TEMPE	
1 0 0 0	IEMPE	KATURE
1,3°C		18,7°C

	7 0 5 .		3	7 2
	.031	bar	<u> </u>	r .∠ m3/min
С	OMPRESS	OR MODU	LE 07 PROG	RAMMING
AE1:	SPEED	CONTRO	L COMPRESS	OR
	Imin	6	2 m A	2.5 m3/min
	Imax	4.9	5 m A 1	6 0 m <sup>2</sup> /min
		10,	J IIIA I	
	max r	eguiat.	range : 1	s, u marmin
	regul	ation b	uffer :	2,0 m3/min
	min c	omp air	flow :	0,0 m3/min
AE2:	TEMPE	RATURE	MEASUREMEN	ТΥ
	Tmin	00.0 °	C Tmax 15	0.0°C
	Amin	05 0 *	C Amax 9	5 0 ° C
DEWDO		00,0	C Amax a	TEMPERATURE
DEWPO				TEMPERATURE
1.3°C				18.7°C



#### Variable speed compressor:

Under VS (variable speed) select <b>Y</b> (YES)
for programming an various speed
compressor.
For load/unload compressors select N (NO).
Button "1" means "J" (YES)
Button "0" means "N" (NO).
Butteri "e incune "it (ite).

- Set minimum capacity
- Set maximum capacity
- Press "E" for confirmation

#### Press "E" (ENTER) for configuration of

- analog output signal of inverter
- Regulation range
- Regulation buffer
- Minimum air flow

#### The minimum and maximum

- Capacity of various speed compressor must be the same as from the compressor manufacturer given data
- The **mA** of the inverter must be programmed as it is in the minimum and maximum speed of the compressor

#### Examble:

minimum capacity 2,5 m<sup>3</sup>/min = 6,2 mA measured maximum capacity 16,0m<sup>3</sup>/min = 17,2 mA measured

#### Regulation range and regulation buffer

see Page 4+5

#### Analog input AE2:

- programmable for following sensors
- Temperature
- CT-clamp
- kW-Meter

#### Analog output of connection module

Deliver the pressure signal of the master control (see page 6) if average value output setting is "N".

#### Average output of pressure signal

If setting is programmed "Y" the output send the average pressure signal od pressure settings. Exemble: Pmin 6,0 bar, Pmax 7,0 bar Average output = 6,5 bar **Note:** If average value output is programmed to "Y" it belongs an another connection module for the pressure signal of the control.

### **Programming - pressure and rank profiles**

#### PRESSURE PROFILE

Menu "pressure switch points". 4 different pressure profile can be programmed. The pressure profile 2, 3, and 4 can be selected over:

- real time clock
- digital input 1, 2 and 3

#### RANK PROFILES

Menu "compressor order of sequence"

#### Examble:

Follwing compressors shall be controlled

- compressor 1 with 20 m³/min
- compressor 2 with 18 m³/min
- compressor 3 with 18 m<sup>3</sup>/min
- compressor 4 with 13 m<sup>3</sup>/min
- compressor 5 with 10 m<sup>3</sup>/min
- compressor 6 with 10 m<sup>3</sup>/min

#### Special request

- Compressor 1 + 6 is connected to an heat recovery
- Compressor 3 is very old, only for using as standby compressor

#### Recommended programming

- compressor 1+6 rank 1
- compressor 2+4+5 rank 2
- compressor 3 rank 3

#### Compressors in the rank stage 1

will be controlled denpendent on air consumption. If this is not enough, the compressors of the rank 2 helps rank 1

#### Time cycle compressor order

In this menu equal hour for compressors with the same capacity can be programmed.

#### Control system parameter:

changing of this settings only with coordination by the manufacturer.

#### ATTENTION:

Only compressor on the same rank stage will be controlled automaically by the dependent airconsumption.

	7.05 <sub>bar</sub>		3 7	. 2 <sub>m3/min</sub>
Р	PP	Pmin	Pmax	P-Alarm
E	0 1	6.00	6.50	5.50 bar
S U	0 2	5.00	5.50	4.40 bar
R	03	4.00	4.50	3.30 bar
ler.	04	3.00	3,50	2.20 bar
DEW	POINT		те	MPERATURE
1.3	°C			18.7°C



7.05 <sub>bar</sub>	37.2 <sub>m3/min</sub>
TIME CYCLE	COMPRESSOR ORDER
COMPRESSORS	m3∕min hmin 25 480 ozlon
with	
with	12.5 02 00
	TEMPERATURE
1.3°C	18.7°C



### Analog - Inputs of Master

7.05 bar 37.2 m3/min PROGRAMMING COMPRESSOR CONTROL PROGRAMMING ANALOG-DIGITAL INPUTS STATUS DATA CLOCK RELAY LANGUAGE DEWPOINT TEMPERATURE 1.3°C 18.7°C	ANALOG inputs on AIRTELLIGENCE PROVIS AIRTELLIGENCE PROVIS has as standart 4 analog inputs
7.05 bar       37.2 m3/min         PROGRAMMING ANALOG-DIGITAL INPUTS         MASTER ANALOG INPUTS         ANALOG-DIGITAL INPUTS MODULE 1724         DEWPOINT       TEMPERATURE         1.3°C       18.7°C	<ul> <li>Anlog input "AE1"</li> <li>only for pressure transducer. The pressure transducer extend the supply of AIRTELLIGENCE PROVIS and is includet. No other sensor should be connected to the system. The pressure is displayed in the display on the left head line.</li> <li>Analog input AE2, AE3, und AE4 can be used for following sensors:</li> <li>Dew point</li> <li>Temperature</li> <li>Flow</li> </ul>
7.05 bar 37.2 m3/min MASTER ANALOG INPUTS	<ul> <li>Extra pressure</li> <li>Current measuring</li> <li>Energy measuring</li> </ul>
AE2: NO SENSOR NET PRESSURE DEWPOINT SENSOR TEMPERATURE SENSOR FLOW SENSOR EXTRA PRESSURE SENSOR CURRENT MEASUREMENT AMPERE ENERGY MEASUREMENT KW UNIVERSAL SENSOR DEWPOINT TEMPERATURE 1.3°C 18.7°C	<ul> <li>For each analog input is an digital output available for alarm signals</li> <li>Programming of alarm signals: <ul> <li>for minimum signal</li> <li>for maximum signal</li> <li>can be programmed for each connected analog sensor. The measurements of these sensors are displayed permapently.</li> </ul> </li> </ul>
7.05 bar 37.2 m3/min MASTER ANALOG INPUTS AE2: DEWPOINT MEASUREMENT Tmin : -60° Amin : 2.0°C Tmax : 30 Amax : 10.0°C	<ul> <li>The window for the alarm specification is programmable vacant within the sensor values.</li> <li>Parameter setting of analog inputs for example: <ul> <li>4 mA upper data (Tmin)</li> <li>20 mA lower data (Tmax)</li> </ul> </li> </ul>
DEWPOINT         TEMPERATURE           1.3°C         18.7°C	

### **ANALOG INPUTS of connection modules**

DEWPOINT

1.3°C

#### ANALOG and DIGITAL inputs

Up to 8 connection modules can be connected for external analog sensors and digital potential free contacts of dryers, condensate drains etc. The digital signals can be used as fault or running signals.

These modules get the number 17-24. Address settings by the 8 DIP switches



has following out and inputs:

- 2 analog inputs for analog sensors with 4-20 mA Signal
- 3 digital inputs for fault an running signal of external equipment
- **1** analog output 4-20 mA over the range of the connected net pressure transducer
- 2 digital outputs (C-NO-NC 230VAC 2A) for signal outputof connected analog sensors (alarm set points)

#### Possible sensors for the analog inputs:

- Dewpoint
- Temperature
- Extra pressure
- Flow
- Current measurement
- Energy measurement

#### The 8 connection modules put up to

24 digital messages

and up to

16 analog inputs for sensors



TEMPERATURE

18.7°C

### **Digital input and Analog output on connection module**





7.05 <sub>bar</sub>		37.2 <sub>m3/min</sub>
ANALOGMODU	JLE 17 PRO	GRAMMING
DIGITAL INPUTS	FAULT	RUN
S	J	N
B	J	N
DEWPOINT		TEMPERATURE
1.3°C		18.7°C



#### **Configuration Flow Sensor**

If a flow sensor connected to the analog input, the value of Fmax is the maximum measurable flow at 20 mA

The measurement of a flow sensor is, the measured air speed in the compressed air pipeline.

The definition is meters / second.

At the maximum air speed e.g. 185 m / sec is applied to the analog output of flow sensor 20 mA.

With a pipe diameter of 100mm are approximately 73 m<sup>3</sup> / min flow

#### To the digital inputs of the connection module

can be connectted malfunction of refrigerant dryers, filters, steam traps, oil-water separators, booster compressors, etc.

These inputs are defined as SMB disorder (Y).

At fault is a fault signal to digital output 6 of the master module is issued.

In the Web-server visualization an alert is generated.

If these inputs are used as an operations report must be programmed on that channel on "Operation" with (J).

#### Analog output at the connection module

It is the actual pressure signal from the AIRTELLIGENCE PROVIS as long as the average output is in No (N) position. . (See page 6)

Note: If average value output is programmed to "Y" it belongs an another connection module for the pressure signal of the control.

14

### **PROGRAMMING REAL TIME CLOCK**



TEMPERATURE DEWPOINT 18.7°C 1.3°C

	7.05	bar	37.2 <sub>m3/min</sub>
		ADJUSTING	DATE
Wee Day Mon Yea Hou Min Sec	kday th r ute ond	: We : 03 : 2010 : 12 : 40 : 13	
DEWP 1.3°	C		TEMPERATURE 18.7°C

	7.0	5	bar						3	7	. 2	m3/	min
	CLOCK	R E	LAY	- F	° R	0	GRAM	SW	/ ГТС	н	POI	NTS	
S P	WEEKD	AY		ΤI	М	Е	ON	10	FF	PΡ	RP	R 1	R 2
0 1	MTWTF	SS	0	6 :	0	0	E	I N		1	1	1	0
0 2	MTWTF	SS	2	2:	0	0	E	IN		2	2	0	
03	mtwtf	SS	0	0:	0	0	A	US		1	1	0	
04	mtwtf	SS	0	0 :	0	0	A	US		1	1	0	
0 5	mtwtf	SS	0	0:	0	0	A	US		1	1	0	0
06	mtwtf	SS	0	0:	0	0	A	US		1	1	0	
07	mtwtf	SS	0	0:	0	0	A	US		1	1	0	
08	mtwtf	SS	0	0:	0	0	A	US		1	1	0	0
DEW	POINT									TE	MPE	RAT	URE
1.3	°C											18.	7 ° C
	-												

#### The clock relay

- permits following time controlled functions
- Switchung compressors ON/OFF
- 4 pressure profiles
- 4 rank profiles
- 2 digital outputs for relays to switch ON/OFF additional equipment like (Dryer, ball valves, etc.)

#### The dates for the 2nd, 3rd. and 4th

pressure profil and rank profil must be configurated in the main menu

#### Note down all attitudes

for all program switching functions so that no being missing programming arise

#### Switching bridge "CLOCK"

The real time clock is only activated over the switching bridge generally. Up to 16 switching points can be programmed in the menu clock

#### Examble:

#### 1. Monday to Friday from 6:00-22:00h

- Control system ON
- Pressure profil 1
- Rank profil 1
- Digital output R1 ON for dryer

#### 2. Monday to Friday from 22:00-24:00 h

- Lower pressure with pressure profil 2 and rang profil 2
- At the same time switching to a smaller dryer switched by digital output R2

#### 3. At 00:00 h

The compressed air equipment is switched OFF by the clock relay

#### Selected days with CAPITAL LETTERS

will be switched by the real time clock

#### Removing the switching bridge "CLOCK"

- deactivated the clock relay functions. The compressors management is switching the compressors to the 1st pressure profile
- 1st rank profile
  - that is programmed in the basic menu over the data of the 1st pressure and 1st rank profile.

### CLOCK - PROGRAMMING - NOTES

### **Compressor chanels**

Nr.	1	2	3	4	5	6	7	8					
Name													
Nr.	9	10	11	12	13	14	15	16					
Name													

#### **Pressure profile = PP**

Nr.	P min	P max	P Alarm
1	bar	bar	bar
2	bar	bar	bar
3	bar	bar	bar
4	bar	bar	bar

#### Compressor rank profile = RP

Kompr.	1	2	3	4	5	6	7	8
1.RF								
2.RF								
3.RF								
4.RF								

### **Clock relay switching times and functions**

SP		Day of the week						Time	LS	PP	RP	R1	R2
1	М	Т	М	Т	F	S	S						
2	М	Т	М	Т	F	S	S						
3	М	Т	М	Т	F	S	S						
4	М	Т	М	Т	F	S	S						
5	М	Т	М	Т	F	S	S						
6	М	Т	М	Т	F	S	S						
7	М	Т	М	Т	F	S	S						
8	М	Т	М	Т	F	S	S						
9	М	Т	М	Т	F	S	S						
10	М	Т	М	Т	F	S	S						
11	М	Т	М	Т	F	S	S						
12	М	Т	М	Т	F	S	S						
13	М	Т	М	Т	F	S	S						
14	М	Т	М	Т	F	S	S						
15	М	Т	М	Т	F	S	S						
16	М	Т	М	Т	F	S	S						

### STATUS DATA

#### Status data

The following status data can be selected in this menu:

- Compressor running times
- Deleting compressor running times
- Status of compressor modules
- Status of connecting modules for external equipment



#### The running times of the compressors

- Load hours
- Total hours
  - The running hours are stored from the time of operation with AIRTELLIGENCE PROVIS

#### **Delete running times**

It is possible to delete the running times of all compressors. If the compressor running times shall be deleted, put the value on "Y" with the button "1" (YES) and confirm this with "E" (Enter)

#### Status of Compressor modules shows

- status of digital inputs
- Digital outputs
- Analog inputs
- Analog output





#### Status of connected analog modules shows

- fault or running signal of dryer, filter, condensate drain etc.
- Analog value of connected sensors like dewpoint, temperature etc.

**Press button** 



	7.0	5 <sub>bar</sub>			37.2	m3/r	nin
c o	Nr	Load	h	min	Total	h mi	in
M	01	752	31	16	7524	1 :	59
P	02	283	64	32	2837	4 2	25
R	03	479	65	43	4796	9 1	17
E	04	23	69	64	237	9 4	12
S	05	348	50	2 1	3485	4 (	53
S	06	258	41	45	2584	8 3	36
0	07	5 2	10	19	521	8 2	24
R	08	1 1	10	07	11	1 8	54
R	08	1 1	10	07	11	1 :	54
DEW	POINT				ТЕМРЕ	RATU	JRE
1.3	°C					18.7	7 ° C

7.0	5 <sub>bar</sub>		37.2	m3/min
S T	ATUS COMP	PRESSOR 1	MODULE 02	
Ready Motor	B = Off M = Off	f f	Relay 1	C - NO
Fault	S = Of 1	f	Relay 2	C - N C
AI1	12,4 mA =	= 8,5	m 3/m in	
A I 2	10,3 mA =	= 75,4	°C	
AO	11,6 mA			
DEWPOINT			TEMPE	RATURE
1.3°C				18.7°C



### **Display features**



### **IP-address and Network settings**



#### **ATTENTION:**

Before starting the Web-server, control the date of AIRTELLIGENCE PROVIS and set the clock to the current time Step 1 activate programming bridge Step 2 press simultaneously



#### Program IP-address

#### ENTER CODE

•

Press button enter "E"

Set Code "000000"

IP-addresse program following parameter

- IP-Adresse
- Subnetzmaske
- Standartgateway

#### Communikation via Ethernet

The connection between AIRTELLIGENCE PRO-VIS and the connection modules for compressors and other components can be done via the Ethernet by using the COM server. The RS-485 interface AIRTELLIGENCE PROVIS is

connected to a COM server. The COM server gets an IP address that matches the IP address range.

More COM-server can be connected to the Ethernet with different IP addresses.

#### Program waiting time for slave response



If necessary changeable up to 250 ms

#### 19

### **COMMISSIONING and SWITCHING FUNCTIONS**

#### **Connecting -Modules**

for compressors has to mounted on a DIN-rail in the electrical housing in of the compressor

#### The pressure switches of the compressors now become "safety pressure switches". Examble:

Pressure setting of AIRTELLIGENCE PROVIS	=	6,0 - 7,0 bar
Setting of compressor pressure switched	=	6,5 - 7,5 bar

In case of absence of current, the contact's of the connecting module are closed. The compressors are controlled by their installed pressure switches

Check the pressure connection of the pressure tranducer

#### ATTENTION:

It is absolutely necessary to install the transducer at a calm part of the compressed air line. As an optimum we recommend a separate  $1/2^{"}$  line leading from the receiver to the tranducer.

Switching ON delay time is 30 sec (default by manufacturer).

#### Connect cable bridge START

with an cable or a switch. AIRTELLIGENCE PROVIS will start your compressed air station. From now on your compressors are energy saving controlled and depending on your real consumption of compressed air.

#### Programming the various capacity of the various speed compressor

it is absolutely necessarily, to program the minimal and maximum capacity of the regulated compressor (according to the manufacturer's indications) together with the mA values appropriately correctly.

#### Examble: minimum capacity = 2,5 m<sup>3</sup>/min = 6,2 mA measured maximum capacity = 16,0 m<sup>3</sup>/min = 17,2 mA measured

please see the programming instructions

#### 12. Switching functional description

#### Switching bridge: START

With this switching bridge the compressors will be switched ON / OFF.

Bridge activated = The compressors will be controlled by AIRTELLIGENCE PROVIS

Bridge deactivated = The compressors turn OFF

#### Switching bridge: PROG

If this is activated, all program parts can be programmed. To programming the compressor capacities the switching bridge **START** may not be activated.

#### Switching bridge: CLOCK:

If this bridge is activated, the CLOCK will be activated. If this bridge is deactivated the compressor management is switching the compressors now over the 1st pressure rank profile that is programmed in the basic menu.

#### Switching bridge: Manual:

If this bridge is activated, the compressors will be switched back to their own controller and will be controlled over the pressure setting of the compressor controller.



#### PART 2 Measurements, configuration and connection schematics

- Page 22 Operating the housing
- Page 23 Measurement of airtelligence PROVIS
- Page 24 Connection and termina plan
- Page 25 Connection scheme
- Page 26 RS-485 connection scheme
- Page 27 Connection module configuration and measurement
- Page 28 Digital and analog inputs of connection module
- Page 29
   Compressor connection load / unload
- Page 30 Compressor connection with remote / local function
- Page 31Analog inputs on connection module
- Page 32 Analog output on connection module
- Page 33 Digital IN and OUT on airtelligence PROVIS
- Page 34 Analog IN and OUT on airtelligence PROVIS













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A	S = Störung M = Motorla	g / fault suf / motor running shared / madu			+ S I	и в D 💿		Al-2 + Al-1	•	. [	AI-2 + AI-1 -		Al- + Al-	2		A
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с									- ND		+ I-out		+244			С
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#### PART 3: OPTION: only if AIRTELLIGENCE PROVIS is built in metal housing

- Page 37 AIRTELLIGENCE PROVIS in metal housing
- Page 38 Power supply, key switches, RS-485
- Page 39 Connection of analog inputs / outputs
- Page 40 Connection digital outputs
- Page 41 Connection digital inputs
- Page 42 Part List
- Page 43 Arrangement Diagram



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	-S1			Schlüsselschalt Key switch	er		Moeller			M22-WRS				Schließer			216887		_
6	-S2			Schlüsselschalt Key switch	er		Moeller			M22-WRS				Schließer			216887		
F	-53			Schlüsselschalt Key switch	er		Moeller			M22-WRS				Schließer			216887		1
С	-S4			Schlüsselschalt Key switch	er		Moeller			M22-WRS				Schließer			216887		C
	-F1			Sicherung Schu Circuit braker	itzschalter					Si-Klemme	M4/8	SF	_	1A			1SNA115657	R2500	1_
	-K1	- K8		Koppelrelais Auxiliary relay			Phoenix			PLC-RSC-	24UC	2		24 V AC/DC			2966184		
	-X1			Reihenklemme			Entrelec		DR4/6.1							1SNA110491	R1700		
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E	-X2	X2 Dreistockklemme Terminal				Entrelec		D4/6 NLP			PE - L - N		1SNA110440R0700		E				
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<u> PART 4:</u> (	Connection mod	ule Typ	4700 (	grey	)
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- Page 43 Page 44 Page 45 Configuration connection module Mesurement of connection module
- **RS-485** connection scheme

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