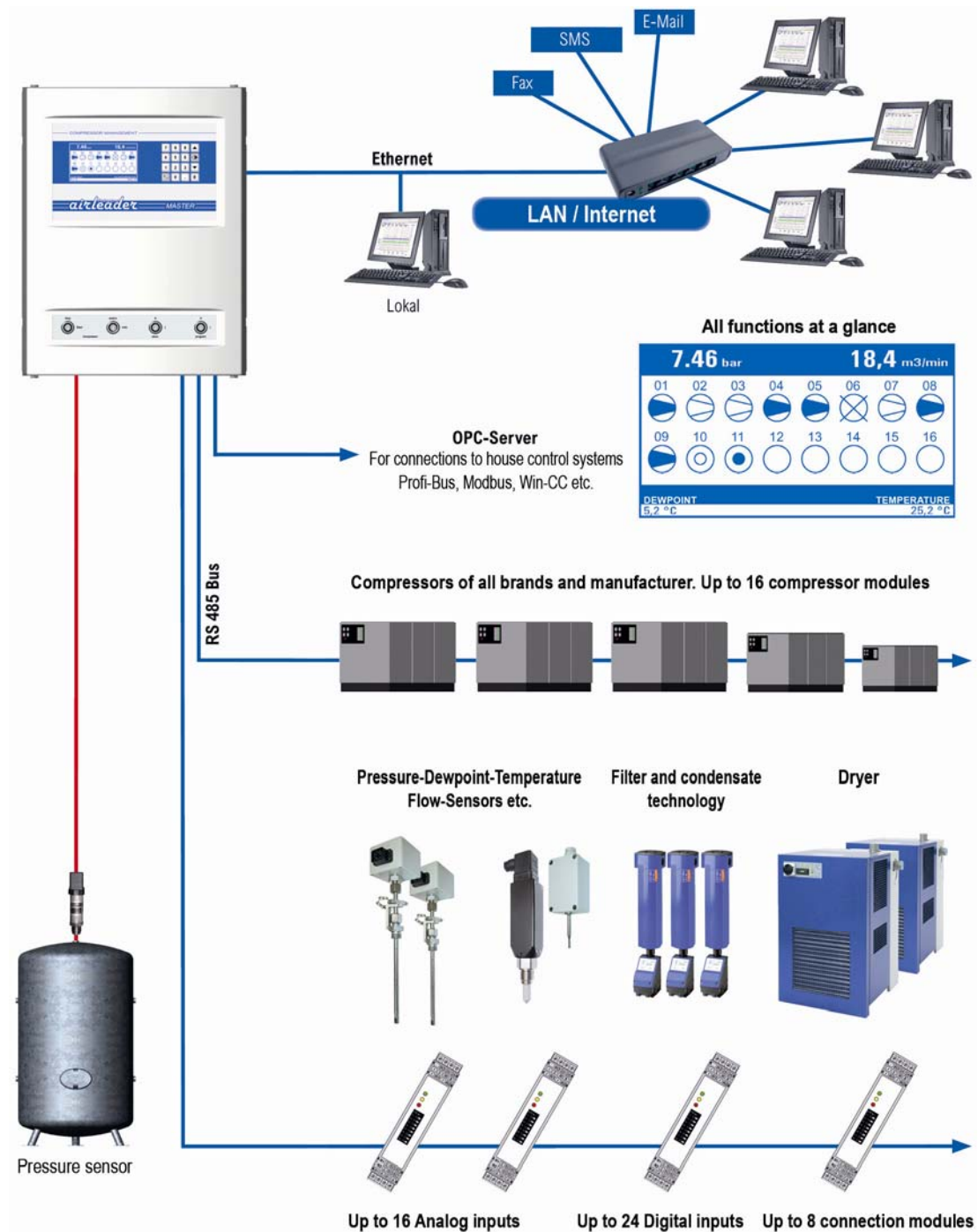


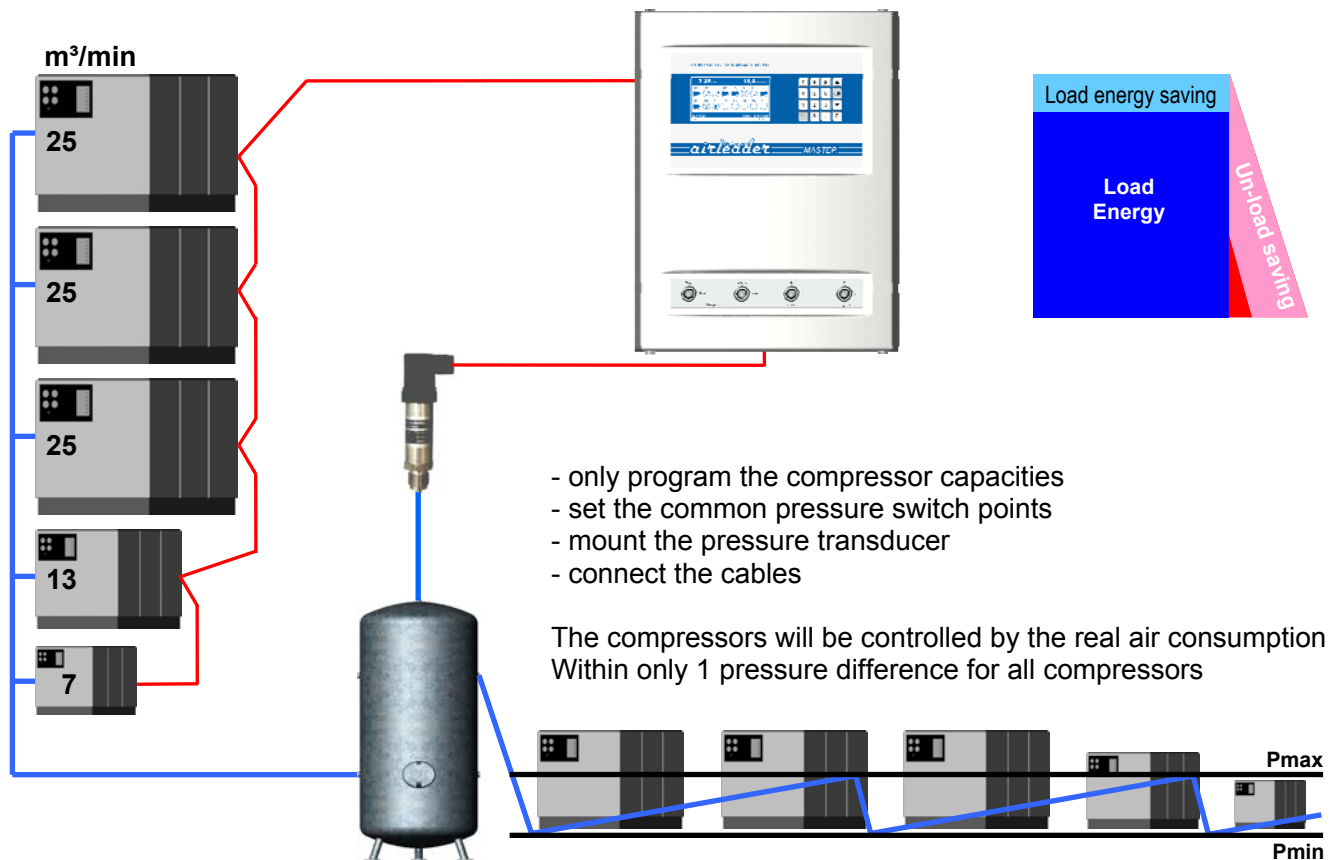
OPERATION manual for AIRLEADER Compressor-Management



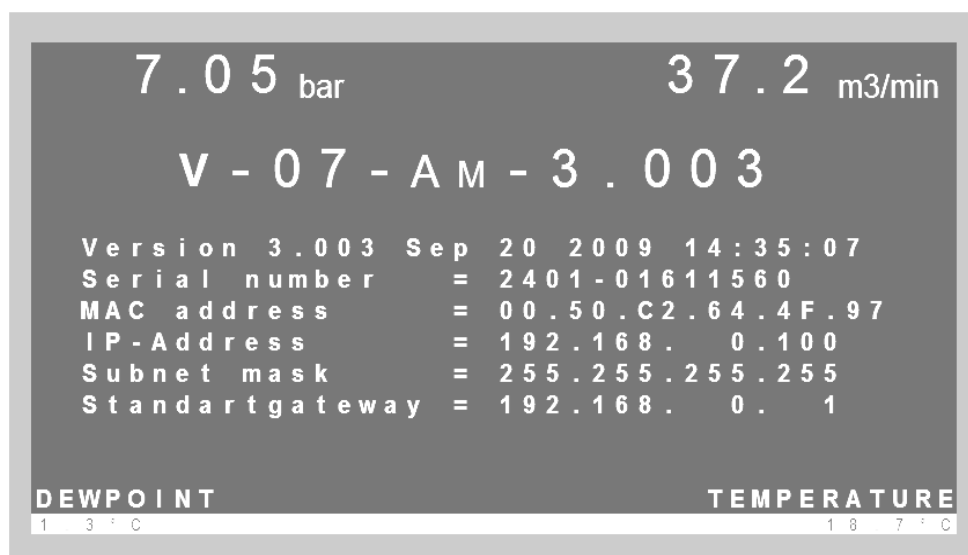
WF STEUERUNGSTECHNIK GMBH

AIRLEADER combines compressors of different sizes to an optimum unit

Almost the best strategy to save energy



For program version and serial number press



SUMMARIES

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FUNCTIONAL DESCRIPTION

AIRLEADER 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, AIRLEADER 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 hysteresis 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 DIN-rail. 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 AIRLEADER 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, AIRLEADER 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

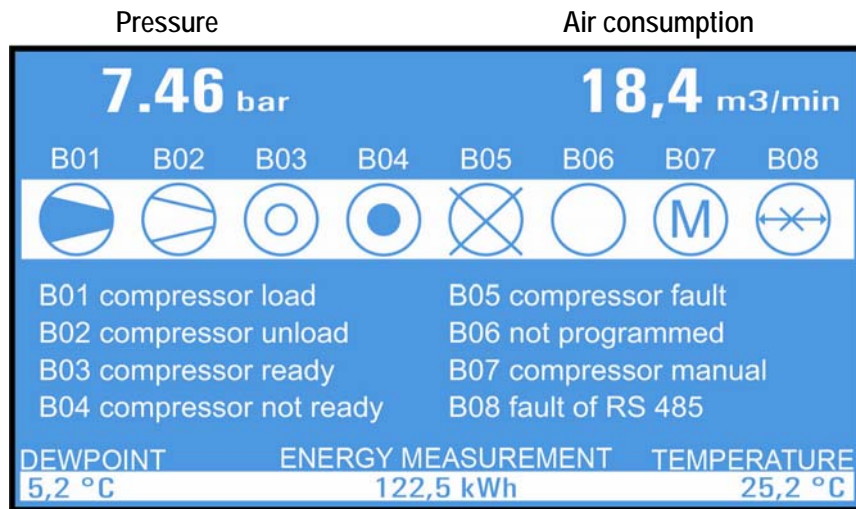
These input must be connected so that compressor management AIRLEADER recognizes the readiness of the compressors. If these input don't get connected, the compressor cannot be in operation. A fault signal isn't activated.

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



Analog input:

AE2

AE3

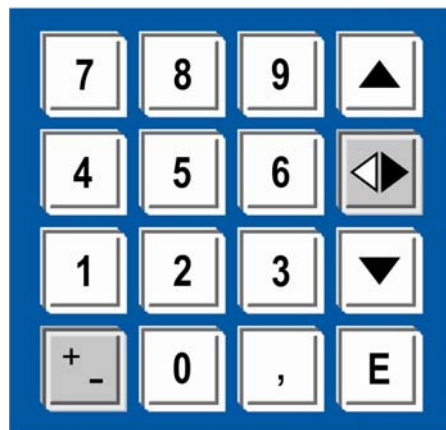
AE4

on Master Modul

For indication of compressor symbols press button



Function of analog inputs see Page 8



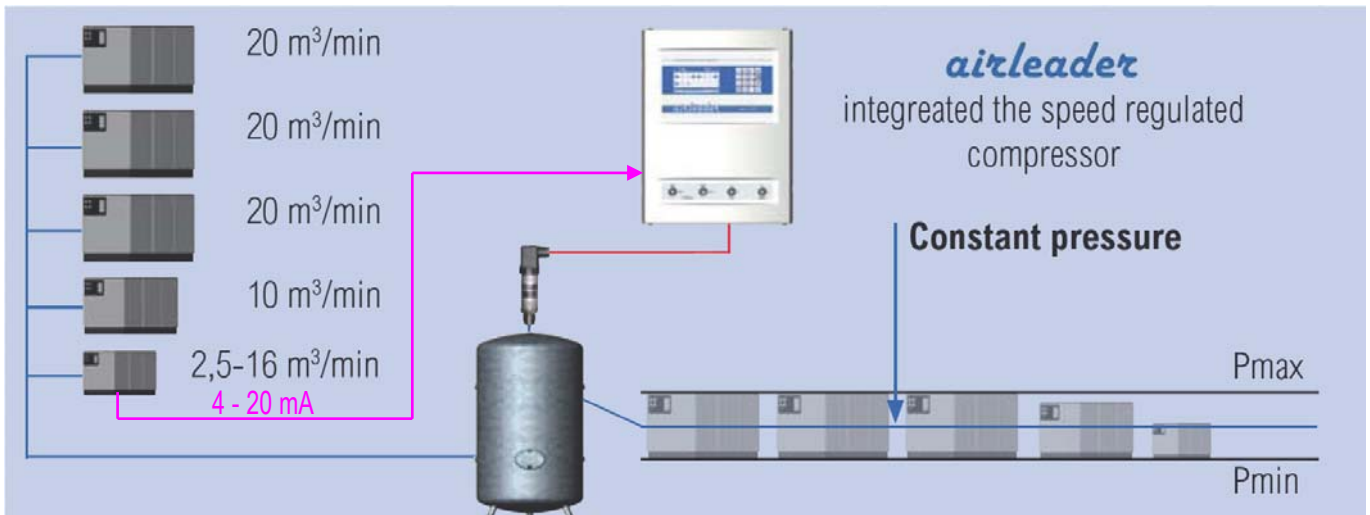
Button	Function
E	ENTER - open the Main menu
▲	Cursor upper
▼	Cursor lower
◀▶	Cursor right
+ - und ◀▶	press simultaneos = Cursor left
E und ◀▶	Back to the Main picture
4	Showing status of compressors
7	Showing status of connection modules for external equipment
1 und ▲	More contrast of display
1 und ▼	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 AIRLEADER. 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.

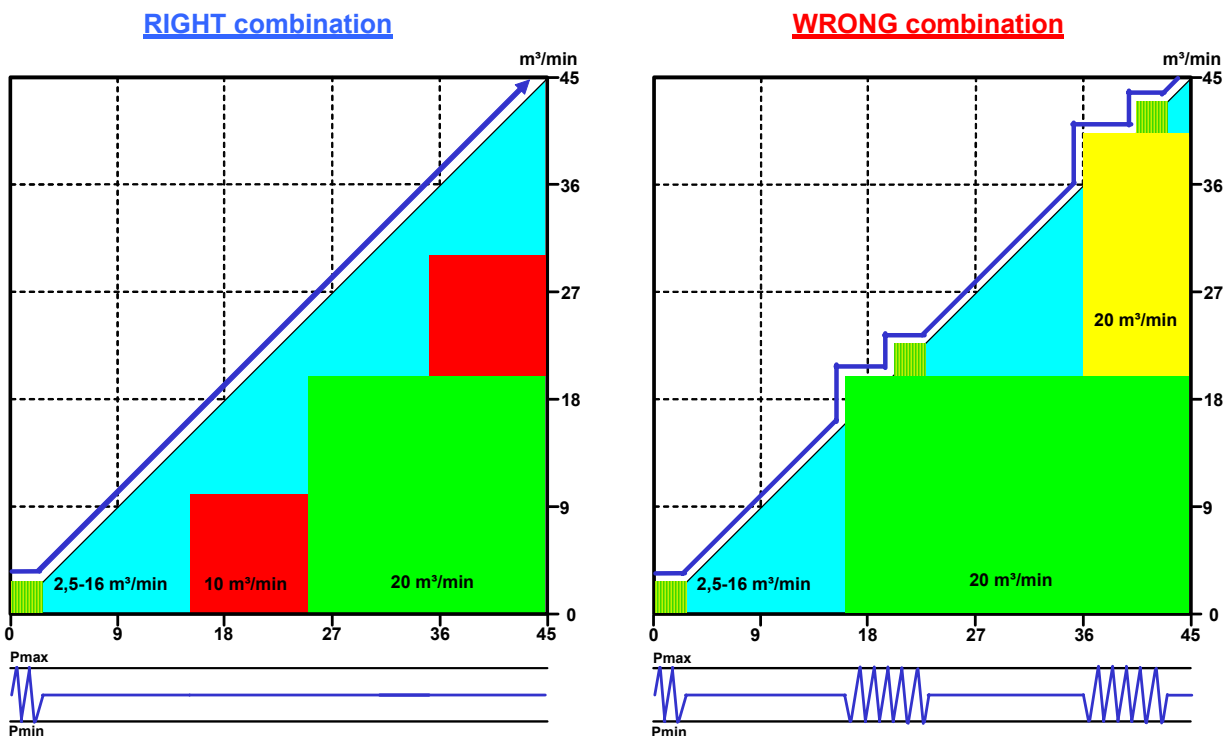
The pressure Setpoint of the VSD compressor must be centrally programmed between the AIRLEADER switch points.



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

Example with a VSD Compressor with a regulation 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 AIRLEADER. 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 m³/min. If than the compressed air consumption is going higher than 15 m³/min a time flexible trend calculation watches the compressed air consumption and switches another compressor on (10 m³/min like example). Within the pressure switch points of AIRLEADER. If the speed's regulated compressor reaches the **regulation range max** the second time together with the 10 m³/min compressor at 25 m³/min air consumption again, the 10 m³/min compressor will be replaced with the 20 m³/min compressor directly.

The 10 m³/min compressor will be switched on if air consumption reaches the **regulation range max** of the regulated compressor at 35 m³/min together with the 20 m³/min compressor.

Setting the "regulation buffer"

Example: the **regulation buffer** will be programmed to 1,5 m³/min. If the compressed air consumption is getting lower and the regulated compressor comes to the point "lower than 15 m³/min" together with the 10 and 20 m³/min compressor the regulation buffer of 1,5 m³/min will be activated. The air consumption get again 1,5 m³/min lower a time flexible trend calculation stops the 10 m³/min compressor inside the adjusted pressure switch points at the AIRLEADER. The VSD compressor regualtes to the capacity of 13,5 m³/min.

Correct setting of regulation buffer

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

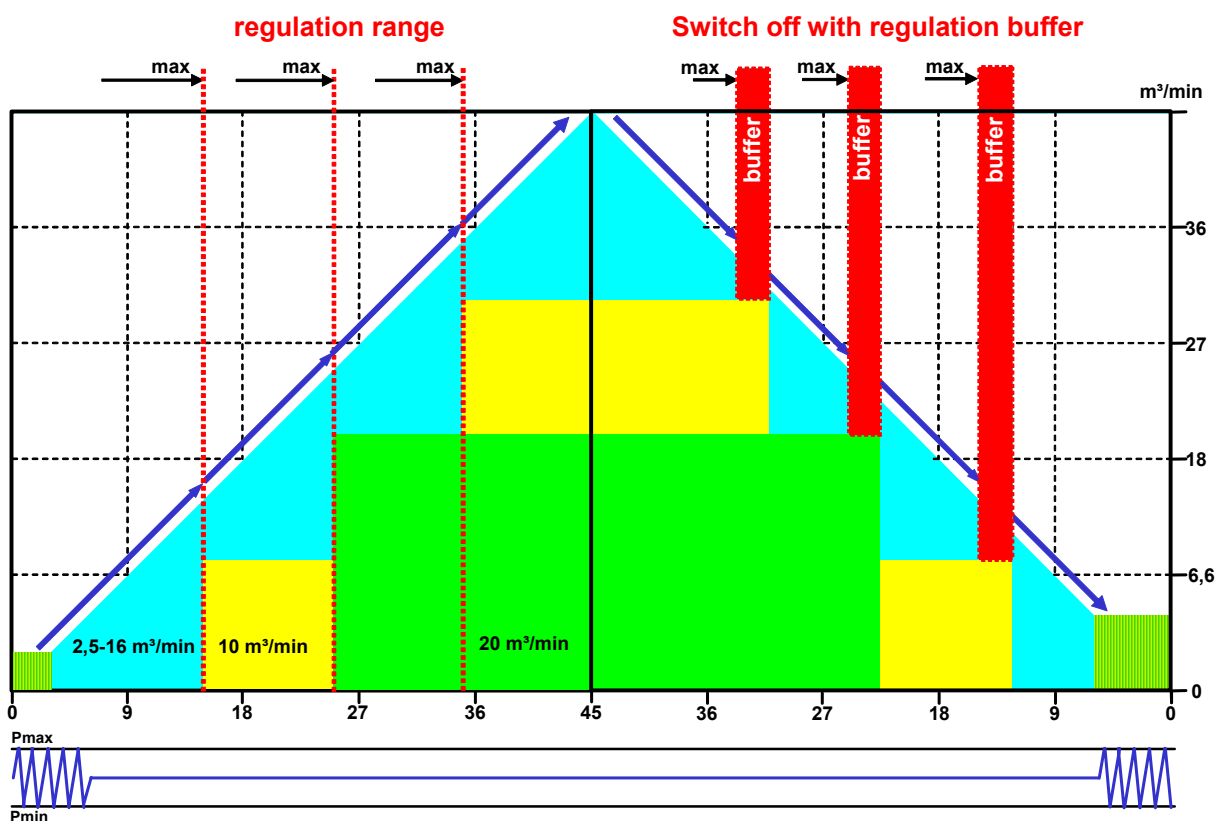
Uncorrect setting of regulation buffer

Regulation range max	=	15,0 m ³ /min
Regulation buffer	=	-3,5 m ³ /min
Min compressor capacity	=	-2,5 m ³ /min
Control sum	=	9,0 m ³ /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.

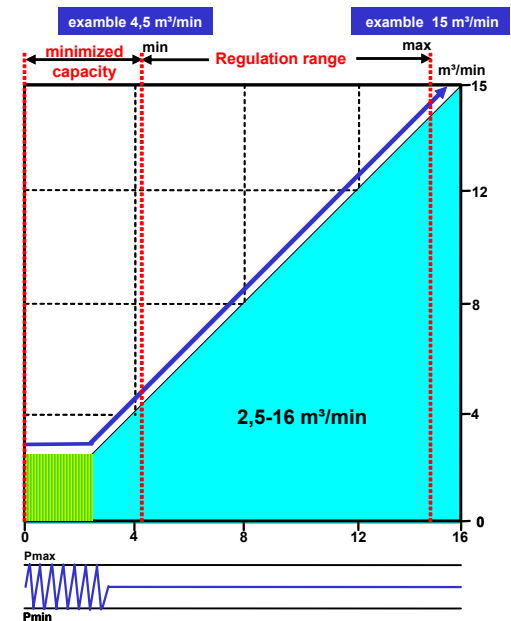
Setting the minimum flow rate of 0 m³ / min causes:

The speed controlled compressor is running in start / stop operation as long as the consumption of compressed air is from 0 to 2.5 m³ / min.

Setting the minimum flow rate of 2.5 m³ / min causes:

Below 2.5 m³/min compressed air consumption a normal 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 m³ / min is installed in addition



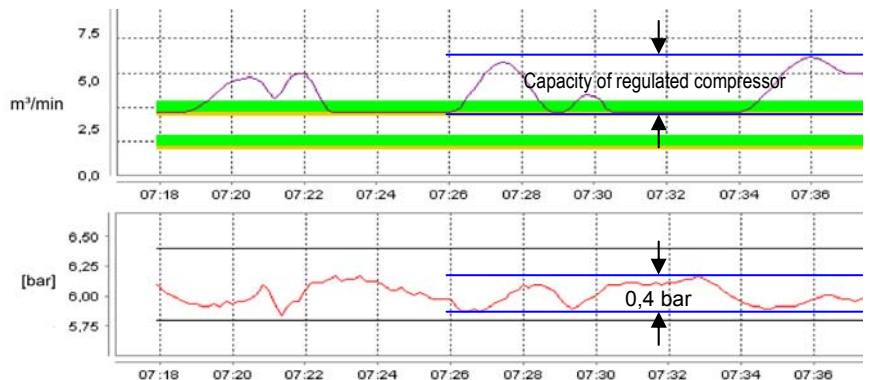
Remote pressure supply through analog output at the RS-485 connection module

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 regulated compressor)



With the remote control actual pressure value

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 AIRLEADER via 4-20 mA.

If the compressor pressure transmitter has an different range, than the output has to be adjusted accordingly.

Exemple:

AIRLEADER 0-16 bar = 4-20 mA

Compressor 1-20 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 pressure 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 AIRLEADER 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

exemple 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	-	-	-

exemple 2: 2 variable speed compressors with different capacities

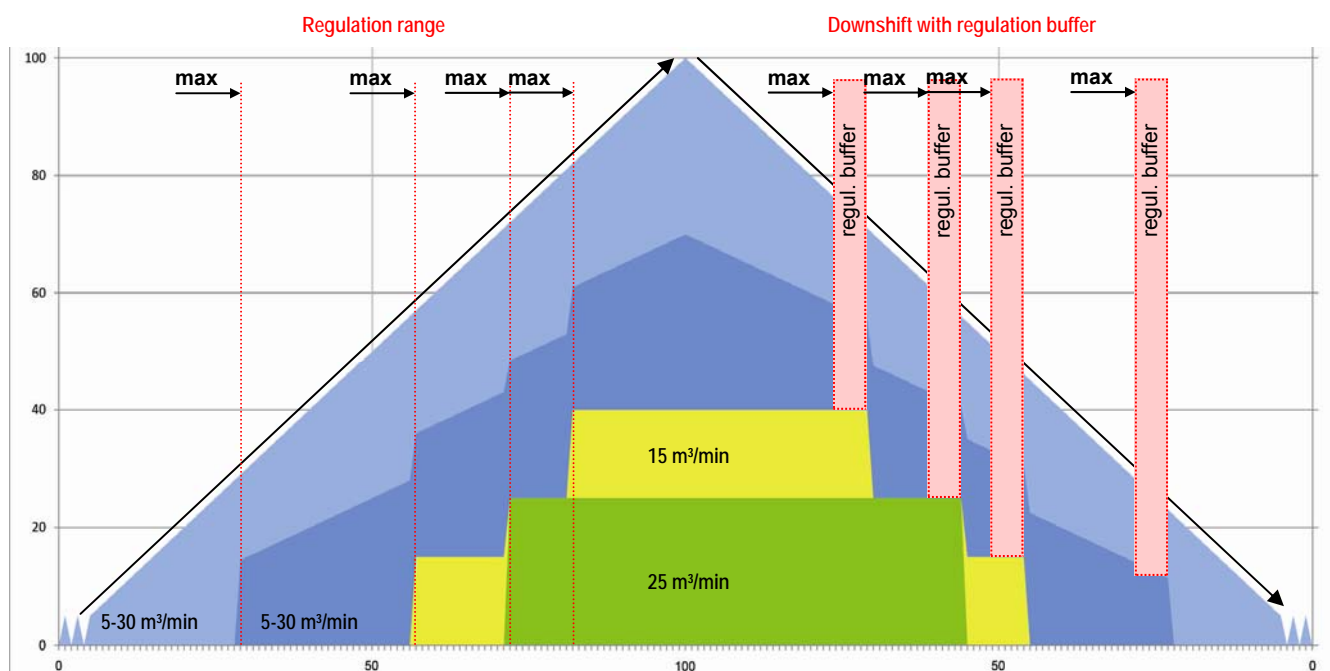
compressor	compressor type	m³/min	Regulation range max	Regulation buffer	Min. flow rate
1	Variable speed	1,5-10	9 m³/min	1,5 m³/min	0
2	Variable speed	5-20	18 m³/min	4 m³/min	0
3	load / unload	15	-	-	-
4	load / unload	25	-	-	-

In exemple 2

- if compressor 1 reach the regulation range max - it changes to compressor 2
- if compressor 2 reach the regulation range max - compressor 1 start again
- if both compressors reach the regulation range max - one of the load / unload compressor will be started
- the controller decides, dependent of air consumption that 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 variable 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.



Programming load /unload compressors

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

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 defined in m³/min.

7.05 bar 37.2 m3/min

PROGRAMMING COMPRESSOR CONTROL

COMPRESSOR MODULE

PRESSURE SWITCH POINTS

COMPRESSOR ORDER OF SEQUENCE

TIME CYCLE COMPRESSOR ORDER

CONTROL PARAMETER

DEWPOINT TEMPERATURE

1.3 °C 18.7 °C

7.05 bar 37.2 m3/min

C	NO	VS	COMPRESSOR CAPACITY
O	01	N	20,0 m3/min
M	02	N	20,0 m3/min
P	03	N	18,0 m3/min
R	04	N	18,0 m3/min
E	05	N	12,5 m3/min
S	06	N	12,5 m3/min
S	07	N	0,0 m3/min
O	08	N	0,0 m3/min

DEWPOINT TEMPERATURE

1.3 °C 18.7 °C

Analog inputs for compressors

If compressor capacity is selected,

-press „ENTER“ to go in the menu of analog inputs for the compressor

7.05 bar 37.2 m3/min

COMPRESSOR MODULE 02 PROGRAMMING

AE1: CURRENT MEASUREMENT N

ENERGY MEASUREMENT Y

Imin : 4,0 mA 0,0

Imax : 20,0 mA 200,0

AE2: TEMPERATURE MEASUREMENT Y

UNIVERSAL SENSOR N

DEWPOINT TEMPERATURE

1.3 °C 18.7 °C

Analog input AE 1

for connection of:

- CT-clamps
- kW-meter

Analog input AE 2

for connection of:

- Temperatur sensor
- Universal sensor input

Programming the variable speed compressors

7.05 bar		37.2 m3/min	
C	Nr	VS	COMPRESSOR CAPACITY
O	01	N	20,0 m3/min
M	02	N	20,0 m3/min
P	03	N	18,0 m3/min
R	04	N	18,0 m3/min
E	05	N	12,5 m3/min
S	06	N	12,5 m3/min
O	07	Y	2,5 ... 16,0 m3/min
R	08	Y	2,5 ... 16,0 m3/min
DEWPOINT		TEMPERATURE	
1.3 °C		18.7 °C	

7.05 bar		37.2 m3/min	
COMPRESSOR MODULE 07 PROGRAMMING			
AE1: SPEED CONTROL COMPRESSOR			
lmin		6.2 mA	2,5 m3/min
lmax		18,5 mA	16,0 m3/min
max regulat. range		: 15,0	m3/min
regulation buffer		: 2,0	m3/min
min comp air flow		: 0,0	m3/min
AE2: TEMPERATURE MEASUREMENT N			
CURRENT MEASUREMENT N			
ENERGY MEASUREMENT N			
DEWPOINT		TEMPERATURE	
1.3 °C		18.7 °C	

7.05 bar		37.2 m3/min	
COMPRESSOR MODULE 07 PROGRAMMING			
AE1: SPEED CONTROL COMPRESSOR			
lmin	6,2	mA	2,5 m3/min
lmax	18,5	mA	16,0 m3/min
max regulat. range		:	15,0 m3/min
regulation buffer		:	2,0 m3/min
min comp air flow		:	0,0 m3/min
AE2: TEMPERATURE MEASUREMENT Y			
Tmin	00,0	°C	Tmax 150,0 °C
Amin	05,0	°C	Amax 95,0 °C
DEWPOINT		TEMPERATURE	
1.3 °C		18.7 °C	

7.05 bar		37.2 m3/min	
COMPRESSOR MODULE 07 PROGRAMMING			
PARAMETER ANALOG OUTPUT AO:			
lmin :	4,0 mA	=	0,00 bar
lmax :	20,0 mA	=	16,00 bar
AVERAGE VALUE OUTPUT			N
OFFSET			0,10 bar
DEWPOINT		TEMPERATURE	
1.3 °C		18.7 °C	

Variable speed compressor:

Under VS (variable speed) select Y (YES) for programming an various speed compressor.

For load/unload compressors select N (NO).

Button „1“ means „J“ (YES)

Button „0“ means „N“ (NO).

- 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

Example:

minimum capacity

2,5 m³/min = 6,2 mA measured

maximum capacity

16,0m³/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.

Exemple: 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“

Example:

Follwing compressors shall be controlled

- compressor 1 with 20 m³/min
- compressor 2 with 18 m³/min
- compressor 3 with 18 m³/min
- compressor 4 with 13 m³/min
- compressor 5 with 10 m³/min
- compressor 6 with 10 m³/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 dependent 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 . 0 5 bar		3 7 . 2 m3/min		
P R E S S U R E	P P	P m i n	P m a x	P - A l a r m
	0 1	6 . 0 0	6 . 5 0	5 . 5 0 bar
	0 2	5 . 0 0	5 . 5 0	4 . 4 0 bar
	0 3	4 . 0 0	4 . 5 0	3 . 3 0 bar
	0 4	3 . 0 0	3 . 5 0	2 . 2 0 bar
DEWPOINT		TEMPERATURE		
1 . 3 ° C		1 8 . 7 ° C		

7 . 0 5 bar										3 7 . 2 m3/min									
R A N K	NR	C O M P R E S S O R																	
		0 1	0 2	0 3	0 4	0 5	0 6	0 7	0 8										
	0 1	1	2	3	2	2	1	1	1	R a n g									
	0 2	1	1	1	1	1	1	1	1	R a n g									
	0 3	1	1	1	1	1	1	1	1	R a n g									
	0 4	1	1	1	1	1	1	1	1	R a n g									
DEWPOINT										TEMPERATURE									
1 . 3 ° C										1 8 . 7 ° C									

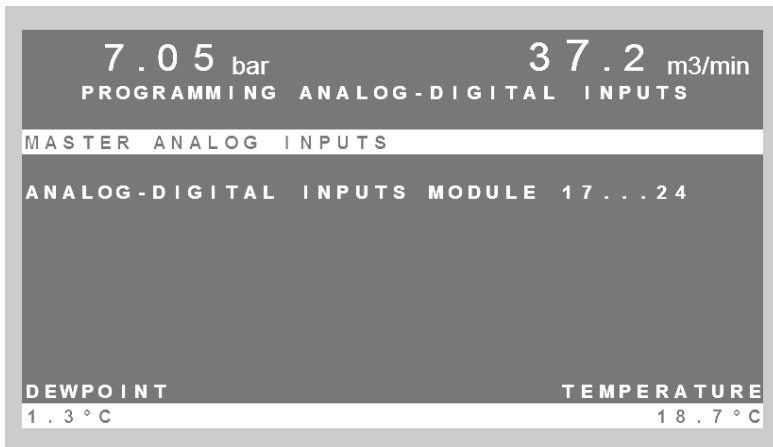
7 . 0 5 bar		3 7 . 2 m3/min	
TIME CYCLE COMPRESSOR ORDER			
COMPRESSORS		m3/min	h min
with	2 . 5 . . .	1 6 . 0	0 4 0 0
with		2 0 . 0	0 4 0 0
with		1 8 . 0	0 4 0 0
with		1 2 . 5	0 2 0 0
DEWPOINT		TEMPERATURE	
1 . 3 ° C		1 8 . 7 ° C	

7 . 0 5 bar		3 7 . 2 m3/min	
CONTROL SYSTEM PARAMETER			
DELAY TIME	min	sec	
INITIAL PERIODE	0 0	3 0	
LOW		2 0	
HIGH		2 0	
SAFETY BAND		bar	
LOW		0 , 2	
HIGH		0 , 2	
DEWPOINT		TEMPERATURE	
1 . 3 ° C		1 8 . 7 ° C	

Analog - Inputs of Master



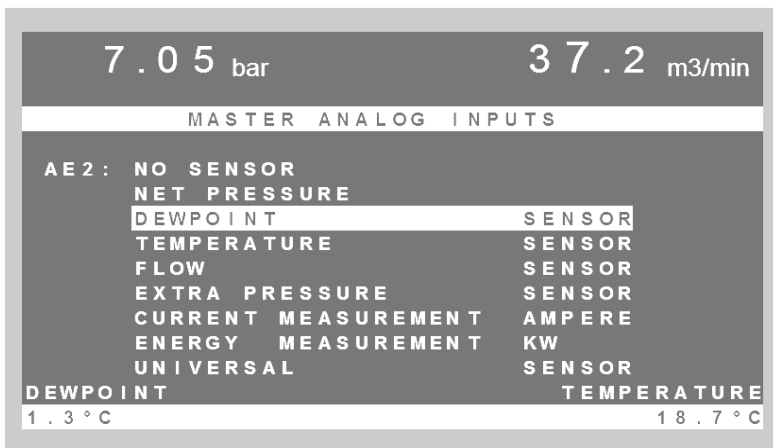
ANALOG inputs on Master Module
AIRLEADER Master has as standart
4 analog inputs



Anlog input „AE1“
only for pressure transducer. The
pressure transducer extend the supply of
AIRLEADER and is includet. No other
sensor should be connected to the
system. The pressure is displayed in the
display on the left head line.

Analog input AE2, AE3, und AE4 can
be used for following sensors:

- Dew point
- Temperature
- Flow
- Extra pressure
- Current measuring
- Energy measuring



For each analog input
is an digital output available for alarm
signals

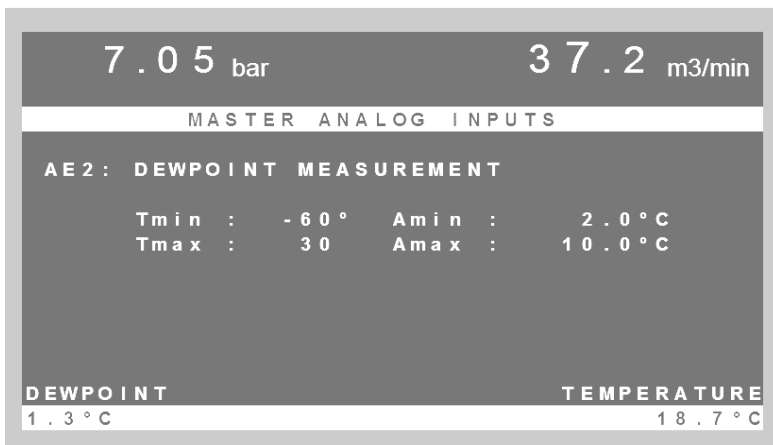
Programming of alarm signals:

- for minimum signal
 - for maximum signal
- can be programmed for each connected
analog sensor. The measurements of
these sensors are displayed permanently
in the footer line of the display.

Parameter setting of analog inputs
for example:

- 4 mA upper data (Tmin)
- 20 mA lower data (Tmax)

The window for the alarm specification is
programmable vacant within the sensor values.



ANALOG + DIGITAL-INPUTS of connection modules

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

Every connection module

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 output of connected analog sensors (alarm set points)

Possible sensors for the analog inputs:

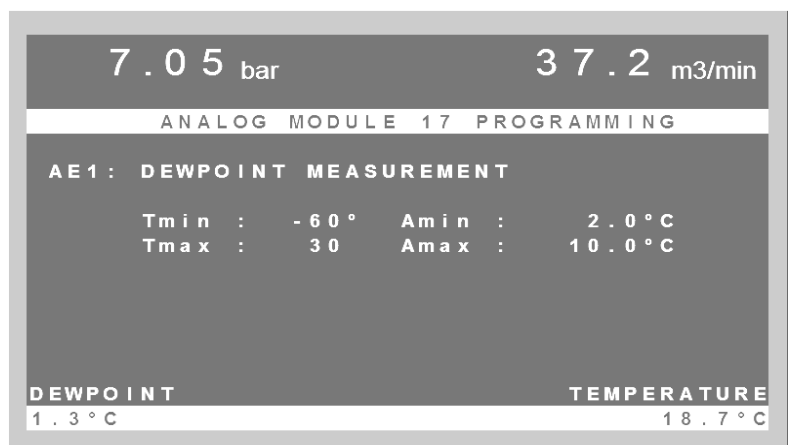
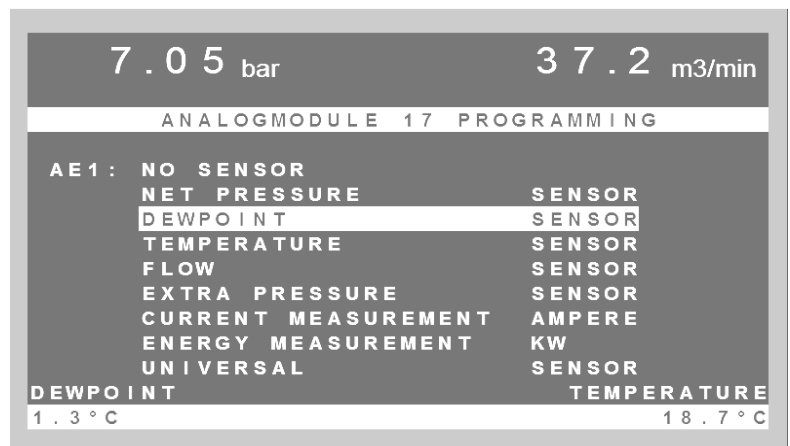
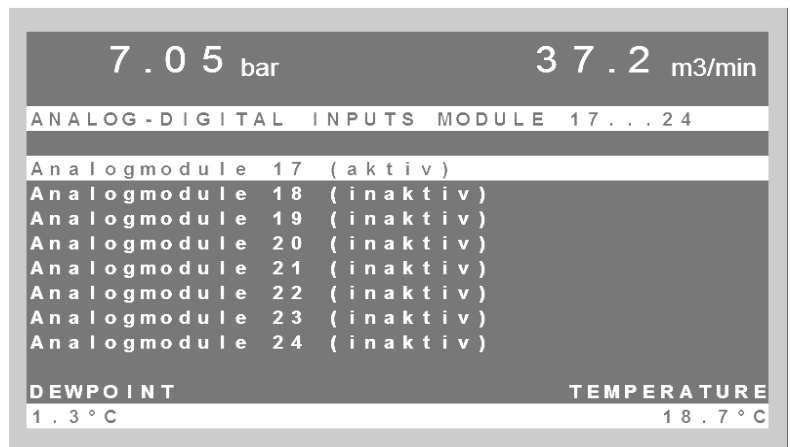
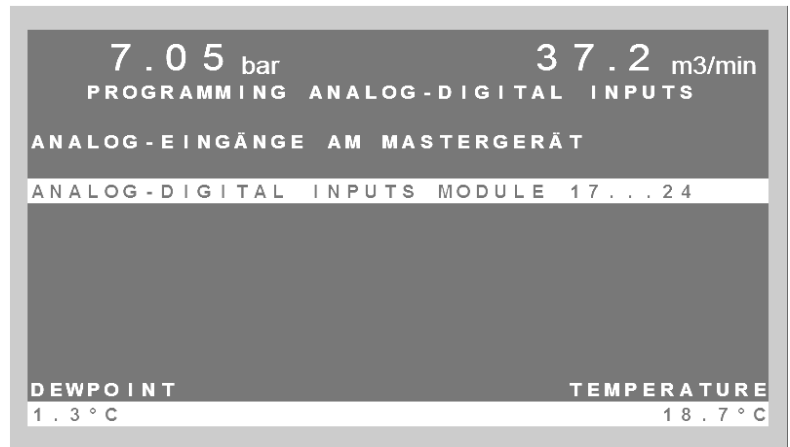
- Dewpoint
- Temperature
- Extra pressure
- Flow
- Current measurement
- Energy measurement

The 8 connection modules put up to

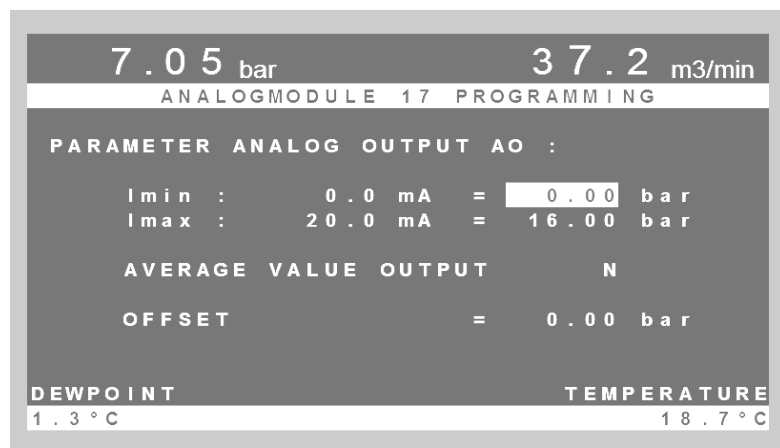
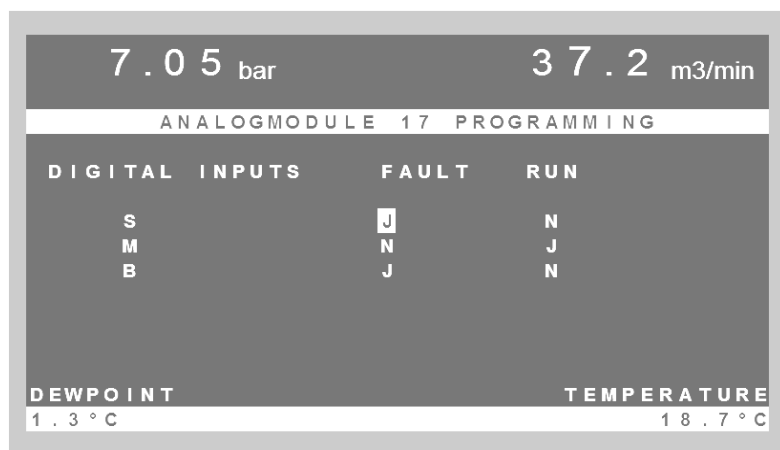
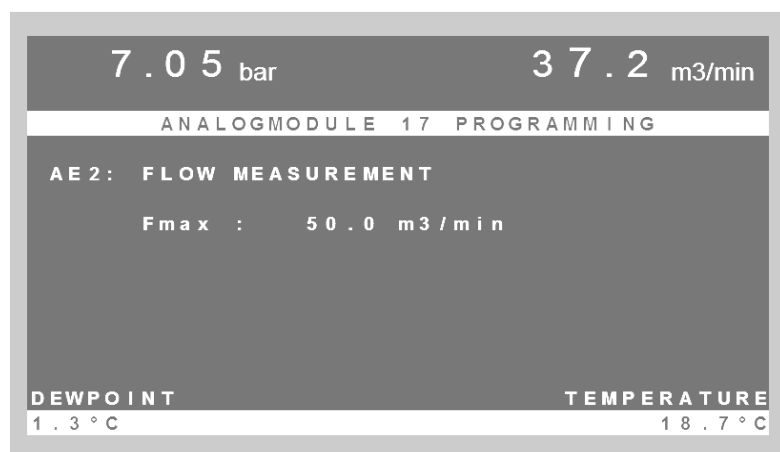
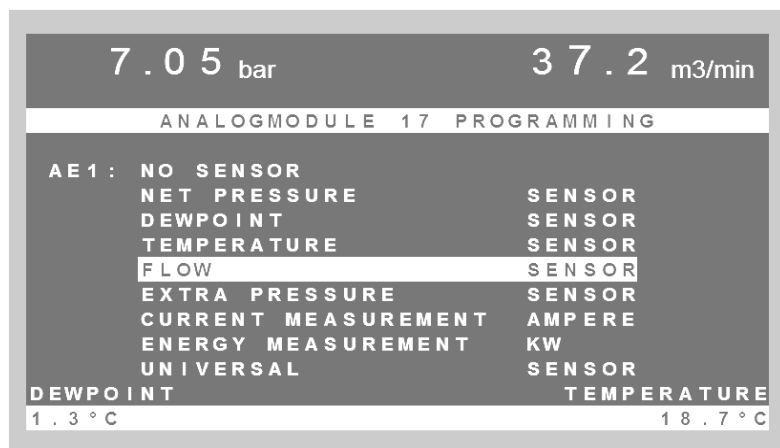
24 digital messages

and up to

16 analog inputs for sensors



Digital and Analog output on connection module



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 m³ / min flow

To the digital inputs of the connection module can be connected 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 AIRLEADER 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.

PROGRAMMING REAL TIME CLOCK

7.05 bar 37.2 m3/min

PROGRAMMING COMPRESSOR CONTROL

PROGRAMMING ANALOG-DIGITAL INPUTS

STATUS DATA

CLOCK RELAY

LANGUAGE

DEWPOINT 1.3 °C TEMPERATURE 18.7 °C

7.05 bar 37.2 m3/min

CLOCK RELAY

ADJUSTING DATE

CLOCK RELAY-PROGRAM SWITCH POINTS

DEWPOINT 1.3 °C TEMPERATURE 18.7 °C

7.05 bar 37.2 m3/min

ADJUSTING DATE

Weekday : We

Day : 03

Month : 03

Year : 2010

Hour : 12

Minute : 40

Second : 13

DEWPOINT 1.3 °C TEMPERATURE 18.7 °C

7.05 bar 37.2 m3/min

CLOCK RELAY-PROGRAM SWITCH POINTS

SP	WEEKDAY	TIME	ON/OFF	PP	RP	R1	R2
01	MTWTFss	06:00	EIN	1	1	1	0
02	MTWTFss	22:00	EIN	2	2	0	1
03	mtwtfss	00:00	AUS	1	1	0	0
04	mtwtfss	00:00	AUS	1	1	0	0
05	mtwtfss	00:00	AUS	1	1	0	0
06	mtwtfss	00:00	AUS	1	1	0	0
07	mtwtfss	00:00	AUS	1	1	0	0
08	mtwtfss	00:00	AUS	1	1	0	0

DEWPOINT 1.3 °C TEMPERATURE 18.7 °C

The clock relay

permits following time controlled functions

- Switching 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 configured 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

Example:

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 channels

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	M	T	M	T	F	S	S						
2	M	T	M	T	F	S	S						
3	M	T	M	T	F	S	S						
4	M	T	M	T	F	S	S						
5	M	T	M	T	F	S	S						
6	M	T	M	T	F	S	S						
7	M	T	M	T	F	S	S						
8	M	T	M	T	F	S	S						
9	M	T	M	T	F	S	S						
10	M	T	M	T	F	S	S						
11	M	T	M	T	F	S	S						
12	M	T	M	T	F	S	S						
13	M	T	M	T	F	S	S						
14	M	T	M	T	F	S	S						
15	M	T	M	T	F	S	S						
16	M	T	M	T	F	S	S						

SP=switching point

LS=Management Leadsystem

digital output =R1

digital output t= R2

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 AIRLEADER

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

Press button

4

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

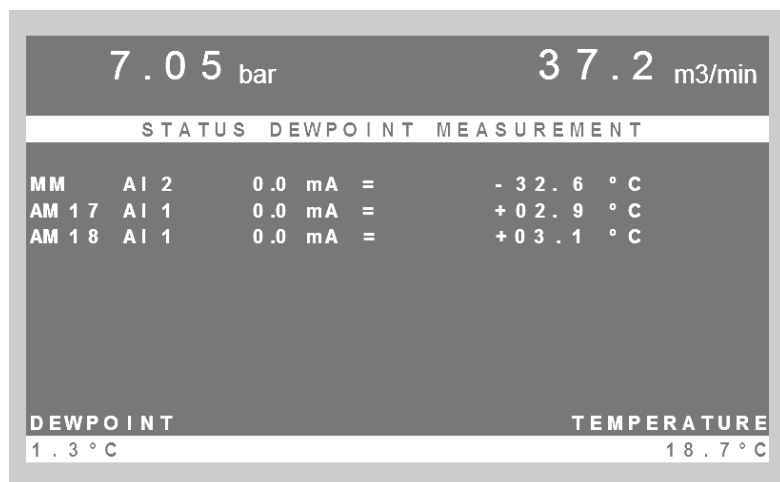
7 . 0 5 bar		3 7 . 2 m3/min	
STATUSDATEN			
COMPRESSOR RUNNING TIMES			
ERASE COMPRESSOR RUNNING TIMES			
COMPRESSOR MODULE			
ANALOG MODULE			
DEWPOINT		TEMPERATURE	
1 . 3 ° C		1 8 . 7 ° C	

7 . 0 5 bar				3 7 . 2 m3/min			
C	Nr	Load	h	min	Total	h	min
O							
M	01	7 5 2 3 1	1	6	7 5 2 4 1	5	9
P	02	2 8 3 6 4	3	2	2 8 3 7 4	2	5
R	03	4 7 9 6 5	4	3	4 7 9 6 9	1	7
E	04	2 3 6 9	6	4	2 3 7 9	4	2
S	05	3 4 8 5 0	2	1	3 4 8 5 4	6	3
S	06	2 5 8 4 1	4	5	2 5 8 4 8	3	6
O	07	5 2 1 0	1	9	5 2 1 8	2	4
R	08	1 1 0	0	7	1 1 1	5	4
R	08	1 1 0	0	7	1 1 1	5	4
DEWPOINT				TEMPERATURE			
1 . 3 ° C				1 8 . 7 ° C			

7 . 0 5 bar		3 7 . 2 m3/min	
STATUS COMPRESSOR MODULE 02			
Ready	B = Off	Relay	1 C-NO
Motor	M = Off		
Fault	S = Off	Relay	2 C-NC
AI1	12 , 4 mA =	8 , 5	m3 / min
AI2	10 , 3 mA =	75 , 4	° C
AO	11 , 6 mA		
DEWPOINT		TEMPERATURE	
1 . 3 ° C		1 8 . 7 ° C	

7 . 0 5 bar		3 7 . 2 m3/min	
STATUS ANALOG MODULE 17			
B = On	Relay	1	C-NO
M = On			
S = Off	Relay	2	C-NC
AI1	11,4 mA =	4,1 °C	DTP
AI2	18,3 mA =	25,4 °C	
AO	11,6 mA		
DEWPOINT		TEMPERATURE	
1 . 3 °C		1 8 . 7 °C	

Display features



Display function

With different keys, the values of the connected and programmed analog sensors indicated the intended purpose

State of dew point sensors

+ - **0** Press simultaneously

MM = Master Modul
AM = connection module



+ - **,** Press simultaneously



+ - **1** Press simultaneously



+ - **2** Press simultaneously



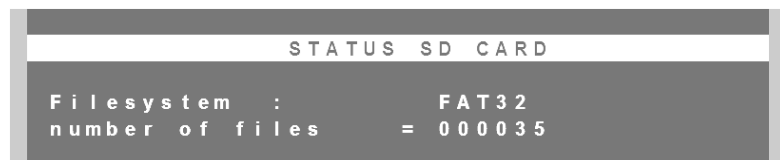
+ - **3** Press simultaneously



+ - **▼** Press simultaneously



+ - **6** Press simultaneously



+ - **9** Press simultaneously



+ - **5** Press simultaneously

IP-address and Network settings

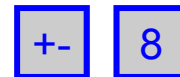


ATTENTION:

Before starting the Web-server, control the date of AIRLEADER and set the clock to the current time

Step 1 activate programming bridge

Step 2 press simultaneously



Program IP-address

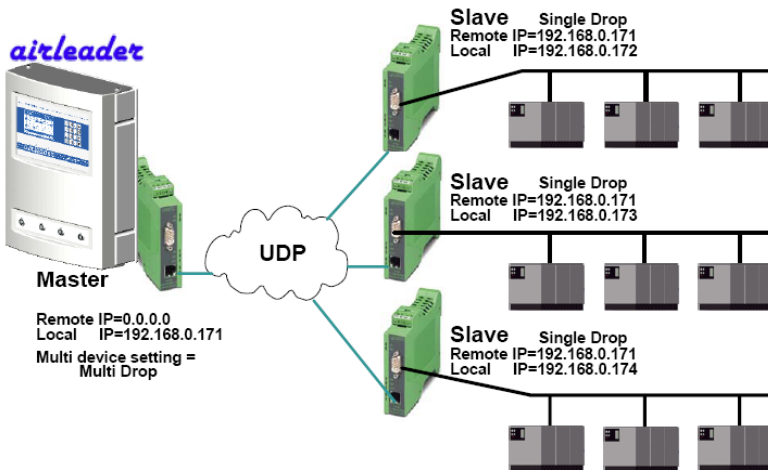
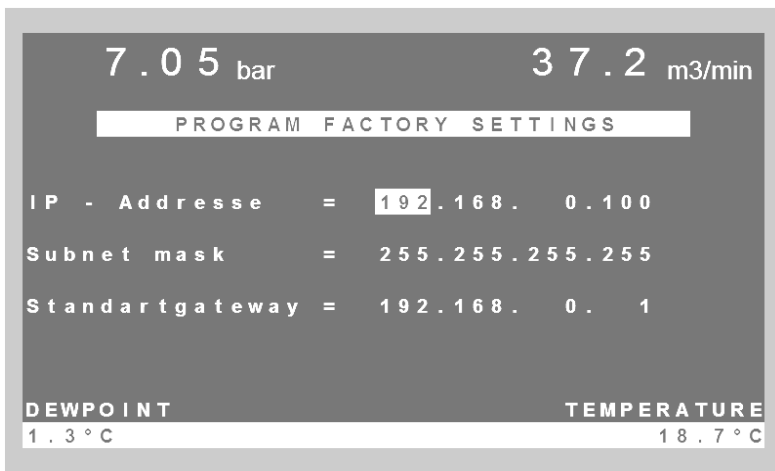
ENTER CODE

Press button enter „E“

Set Code „000000“

IP-adresse program following parameter

- IP-Adresse
- Subnetzmaske
- Standartgateway



Communication via Ethernet

The connection between AIRLEADER and the connection modules for compressors and other components can be done via the Ethernet by using the COM server.

The RS-485 interface AIRLEADER 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

Buttons: **+ -** **9** Press simultaneously

ENTER CODE „111111“

Press Enter „E“

Program waiting time „200 ms“

If necessary changeable up to 250 ms

COMMISSIONING and SWITCHING FUNCTIONS

Connecting -Modules

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

The pressure switches of the compressors now become „safety pressure switches“. Example:

Pressure setting of AIRLEADER	=	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 transducer

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 transducer.

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

Connect cable bridge **START**

with a cable or a switch. AIRLEADER 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 necessary, to program the minimal and maximum capacity of the regulated compressor (according to the manufacturer's indications) together with the mA values appropriately correctly.

Example: minimum capacity = 2,5 m³/min = 6,2 mA measured
 maximum capacity = 16,0 m³/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 AIRLEADER

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.

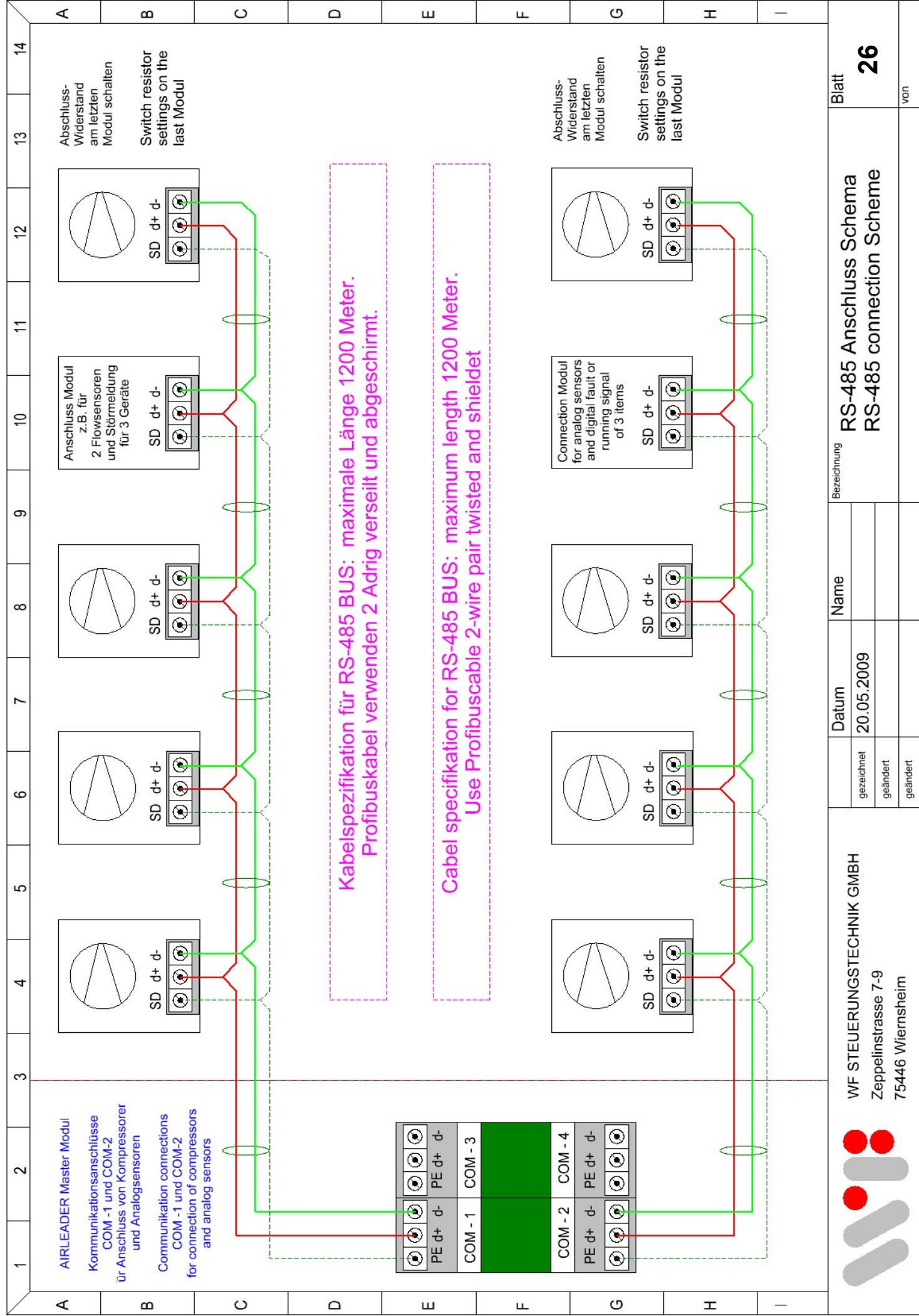
Switching bridge: **Manual**:

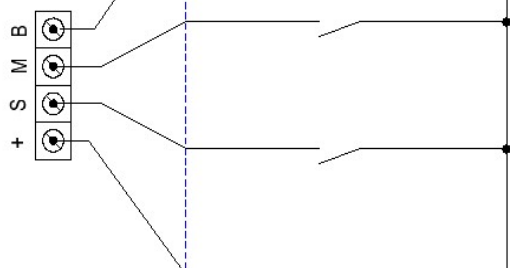
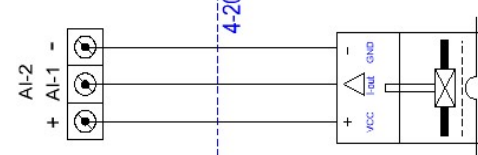
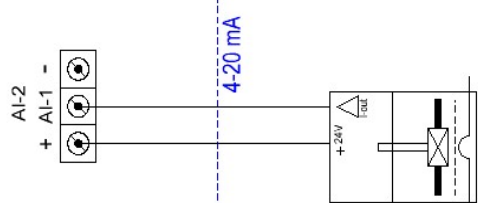
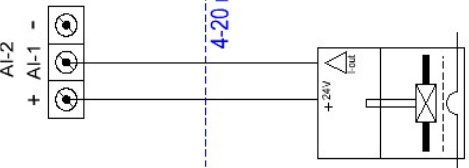
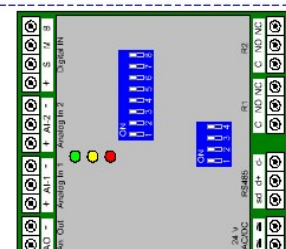
If this bridge is activated, the compressors will be switched back to their own controller and will be controlled over the pressure setting of the compressor controller.

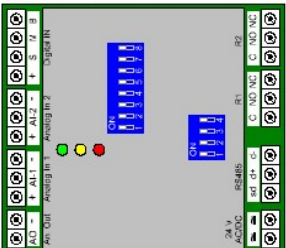
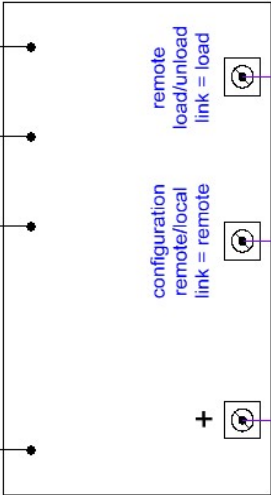




PART 2 Measurements, configuration and connection schematics

Page 22	Operating the housing
Page 23	Measurement of Master Module
Page 24	Connection and terminations 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 31	Analog inputs on connection module
Page 32	Analog output on connection module
Page 33	Digital IN and OUT on Master Modul
Page 34	Analog IN and OUT on Master Modul

A	B	C	D	E	F	G	H	I									
1	2	3	4	5	6	7	8	9	10	11	12	13	14				

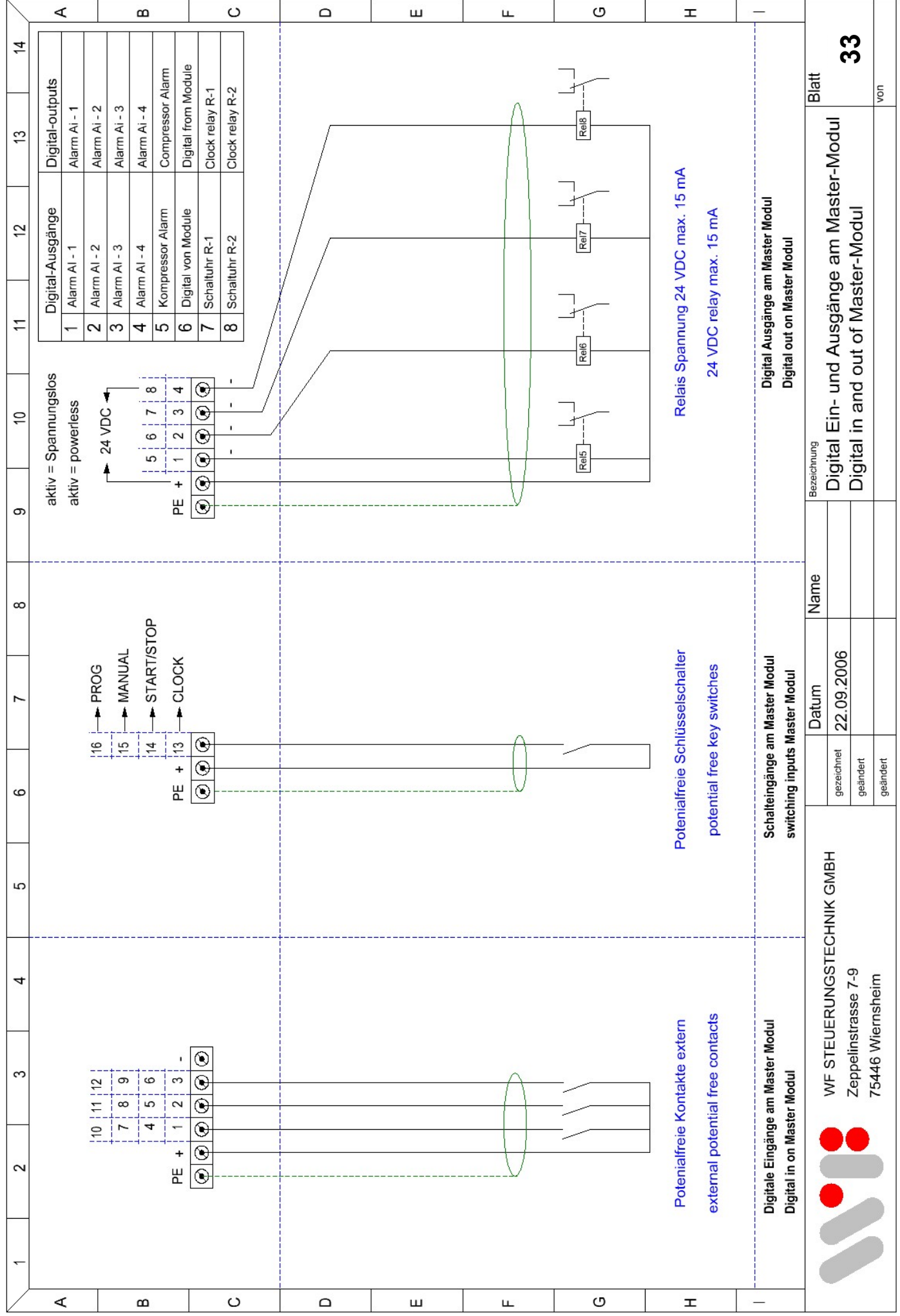


1	2	3	4	5	6	7	8	9	10	11	12	13	14				
A	S = Störung / fault M = Motorlauf / motor running B = Betriebsbereit / ready																
B																	
C																	
D																	
E																	
F																	
G																	
H																	
I																	
Digitale Eingänge am Anschlussmodul						Analogeingänge am Anschlussmodul				Analogeingang am Anschlussmodul							
 <p>Potenialfreie Kontakte im Kompressor potential free contacts in compressor housing</p>						 <p>Stromwandler für Amperé Messung current transducer for current measuring</p> <p>DHR 100 = 0 - 100 A DHR 200 = 0 - 200 A DHR 500 = 0 - 500 A DHR 1000 = 0 - 1000 A</p>				 <p>Stromwandler für Amperé Messung current transducer for current measuring</p> <p>APR 100 = 0 - 50-75-100 A APR 200 = 0 - 100-150-200 A APR 400 = 0 - 100-200-400 A AKR 750 = 0 - 375-500-750 A</p>				 <p>Temperatursensor mit Messwandler Temperature sensor with current transducer</p>			
																	
WF STEUERUNGSTECHNIK GMBH Zeppelinstrasse 7-9 75446 Wiernsheim						Datum 20.05.2009				Name							
						gezeichnet				Bezeichnung							
						geändert				Digital und Analog Eingänge am Anschluss Modul							
						geändert				Digital and Analog inputs of connection module							
										Blatt							
										28							
										von							

1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	Ansteuerung für Kompressoren mit Drucksensorsteuerung Connection for compr. with pressure transducer and rem/local func.												
B	Druckschalter mit Wechsellkontakt und Fern/Ort Schaltung Connection with remote/local function (changer)												
C	Druckschalter mit Schliesskontakt und Fern/Ort Schaltung Connection with remote/local functions												
D													
E													
F													
G													
H													
I													
WF STEUERUNGSTECHNIK GMBH Zeppelinstrasse 7-9 75446 Wiernsheim						Datum 20.05.2009		Name		Bezeichnung Kompressoranschluss mit Fern/Ort Schaltung Connection with remote/local function		Blatt 30	
						gezeichnet						von	
						geändert							
						geändert							



R1 = Fern/Ort
 R1 = remote/local
 R2 = Last/Leerlauf
 R2 = Load/Un-load



Potentialfreie Kontakte extern
external potential free contacts

Potentialfreie Schüsselschalter
potential free key switches

Relais Spannung 24 VDC max. 15 mA
24 VDC relay max. 15 mA

WF STEUERUNGSTECHNIK GMBH
Zeppelinstrasse 7-9
75446 Wiernsheim

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	DRUCKTRANSMITTER PRESSURE TRANSDUCER													
B	<div>AI - 1</div> <div><div>PE</div><div>-</div><div>+</div><div>I</div><div>I = In</div></div>													
C	<div><div>schwarz (black)</div><div>braun (brown)</div><div>weiss (white)</div></div>													
D	<div><div>Trennverstärker multi coupler</div><div>Spannungsversorgung Power supply</div><div>I out</div><div>GND</div><div>I in</div><div>4-20 mA</div><div>z.B. von Frequenzumrichter oder Flowsensor</div></div>													
E	<div><div>Trennverstärker multi coupler</div><div>Spannungsversorgung Power supply</div><div>I out</div><div>GND</div><div>I in</div><div>4-20 mA</div></div>													
F	<div><div>Trennverstärker multi coupler</div><div>Spannungsversorgung Power supply</div><div>I out</div><div>GND</div><div>I in</div><div>4-20 mA</div></div>													
G	<div><div>Trennverstärker multi coupler</div><div>Spannungsversorgung Power supply</div><div>I out</div><div>GND</div><div>I in</div><div>4-20 mA</div></div>													
H	<div><div>Trennverstärker multi coupler</div><div>Spannungsversorgung Power supply</div><div>I out</div><div>GND</div><div>I in</div><div>4-20 mA</div></div>													
I	<div><div>Passiver Anschluss Passiv connection</div><div>aktiver Anschluss nur über Trennverstärker aktiv connection only over multi coupler</div><div>Analogausgänge am Master Modul Analog outputs on Master Modul</div></div>													
<div><div>WF STEUERUNGSTECHNIK GMBH</div><div>Zeppelinstrasse 7-9</div><div>75446 Wiernsheim</div></div>														
<div><div><div></div><div></div><div></div><div></div><div></div></div><div>Blatt 34</div><div>von</div></div>														



WF STEUERUNGSTECHNIK GMBH
Zeppelinstrasse 7-9
75446 Wiernsheim

gezeichnet	Datum	Name
geändert	22.09.2006	
geändert		

Bezeichnung
Analog Ein- und Ausgänge am Master-Modul
Analog IN and OUT on Master-Modul

PART 3: **OPTION: only if AIRLEADER is built in metal housing**

Page 37	AAIRLEADER Master module 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

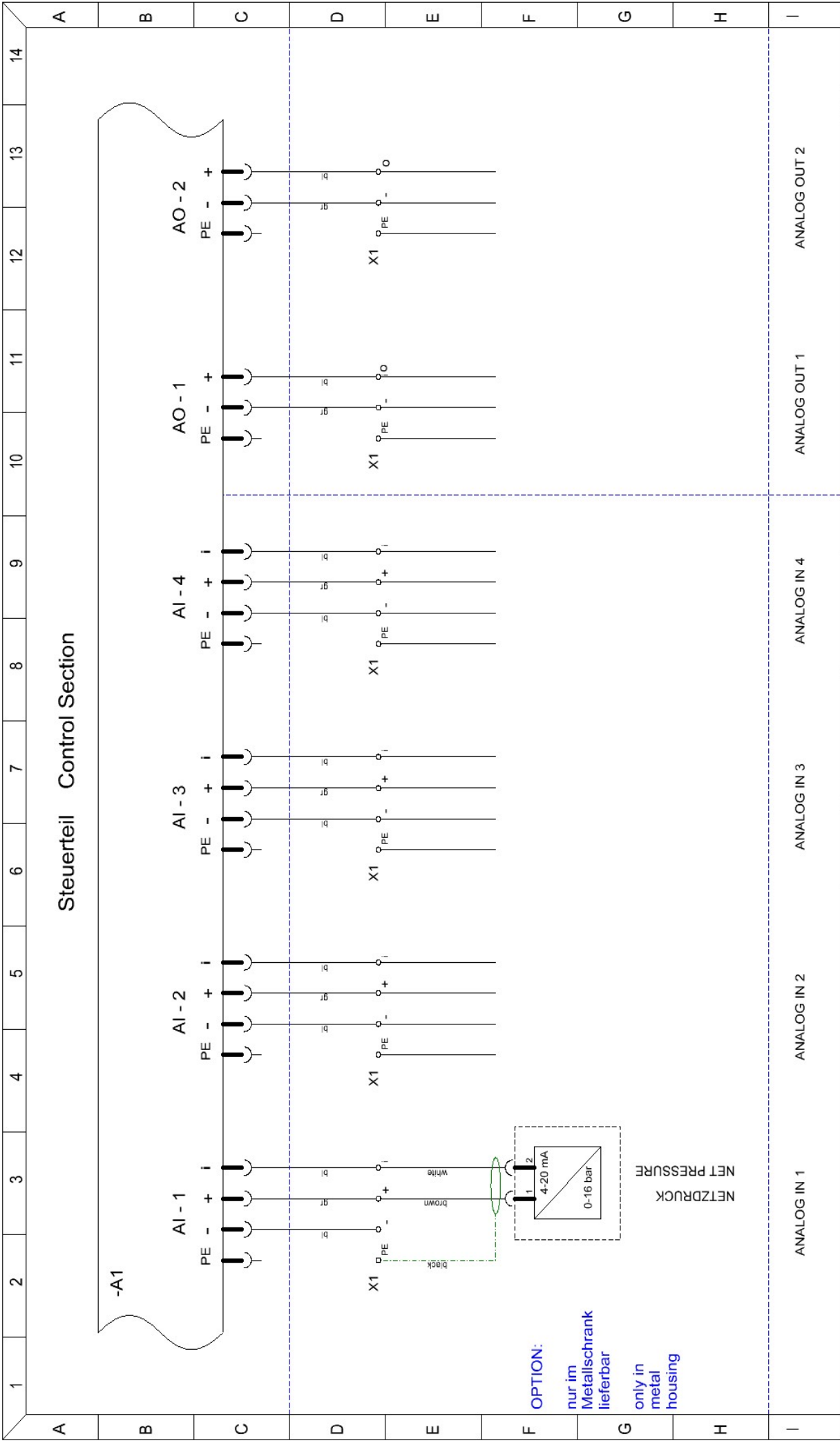
1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	Blatt Sheet	Benennung Designation											
B	2	Steuerteil											
	3	Steuerteil											
	4	Steuerteil											
	5	Steuerteil											
C	6	Geräteliste											
	7	Geräte Anordnung											
D		Arrangement Diagram											
E													
F													
G													
H													
I													
		WF STEUERUNGSTECHNIK GMBH				Datum		Name		Bezeichnung		Blatt	
		Zeppelinstrasse 7-9				gezeichnet	20.11.2009	Anders		Schaltplan		37	
		75446 Wiernsheim				geändert	29.01.2010	Weidner		Connection plan			
						geändert						von	

AIRLEADER Master Modul


im Metallschaltschrank

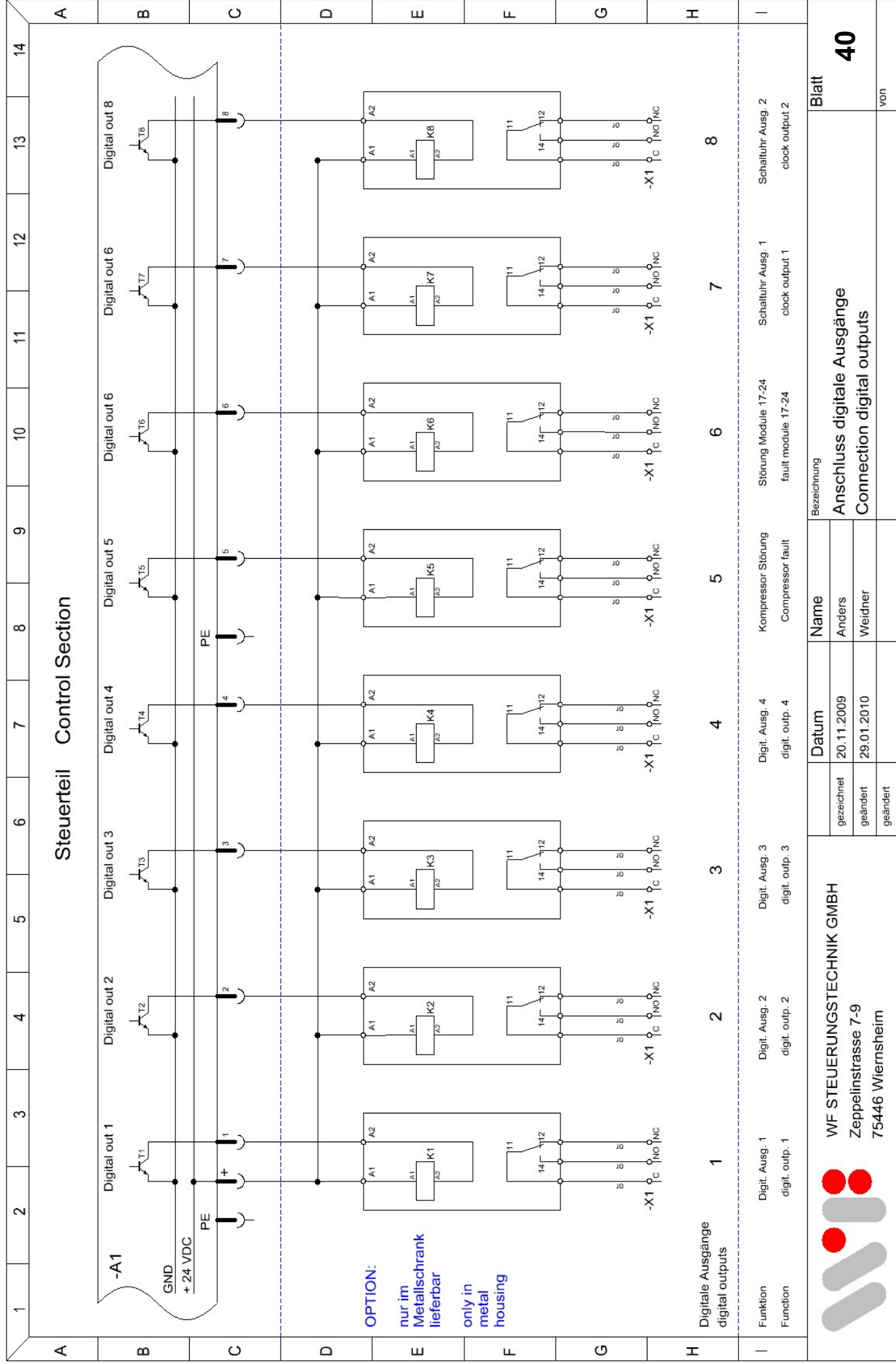
in Metall housing

	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
A	Steuerteil Control Section															
B	<div style="display: flex; justify-content: space-between;"> <div style="width: 10%;">-A1</div> <div style="width: 80%;"> <div style="display: flex; justify-content: space-around;"> <div> <p>AI - 1</p> <p>PE - + i</p> </div> <div> <p>AI - 2</p> <p>PE - + i</p> </div> <div> <p>AI - 3</p> <p>PE - + i</p> </div> <div> <p>AI - 4</p> <p>PE - + i</p> </div> <div> <p>AO - 1</p> <p>PE - +</p> </div> <div> <p>AO - 2</p> <p>PE - +</p> </div> </div> </div> </div>															
C																
D	<div style="display: flex; justify-content: space-around;"> <div> <p>X1</p> <p>PE - + i</p> </div> <div> <p>X1</p> <p>PE - + i</p> </div> <div> <p>X1</p> <p>PE - + i</p> </div> <div> <p>X1</p> <p>PE - + i</p> </div> <div> <p>X1</p> <p>PE - +</p> </div> <div> <p>X1</p> <p>PE - +</p> </div> </div>															
E																
F	<p>OPTION:</p> <p>nur im Metallschrank lieferbar</p> <p>only in metal housing</p>															
G	<div style="display: flex; align-items: center;"> <p>NETZDRUCK</p> </div>															
H																
I	ANALOG IN 1			ANALOG IN 2			ANALOG IN 3			ANALOG IN 4			ANALOG OUT 1		ANALOG OUT 2	




	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
A	Steuerteil Control Section															
B	<div style="display: flex; justify-content: space-between;"> <div style="width: 10%;">-A1</div> <div style="width: 80%;"> <div style="display: flex; justify-content: space-around;"> <div> <p>AI - 1</p> <p>PE - + i</p> </div> <div> <p>AI - 2</p> <p>PE - + i</p> </div> <div> <p>AI - 3</p> <p>PE - + i</p> </div> <div> <p>AI - 4</p> <p>PE - + i</p> </div> <div> <p>AO - 1</p> <p>PE - +</p> </div> <div> <p>AO - 2</p> <p>PE - +</p> </div> </div> </div> </div>															
C																
D	<div style="display: flex; justify-content: space-around;"> <div> <p>X1</p> <p>PE - + i</p> </div> <div> <p>X1</p> <p>PE - + i</p> </div> <div> <p>X1</p> <p>PE - + i</p> </div> <div> <p>X1</p> <p>PE - + i</p> </div> <div> <p>X1</p> <p>PE - +</p> </div> <div> <p>X1</p> <p>PE - +</p> </div> </div>															
E																
F	<p>OPTION:</p> <p>nur im Metallschrank lieferbar</p> <p>only in metal housing</p>															
G	<div style="display: flex; align-items: center;"> <p>NETZDRUCK</p> </div>															
H																
I	ANALOG IN 1			ANALOG IN 2			ANALOG IN 3			ANALOG IN 4			ANALOG OUT 1		ANALOG OUT 2	

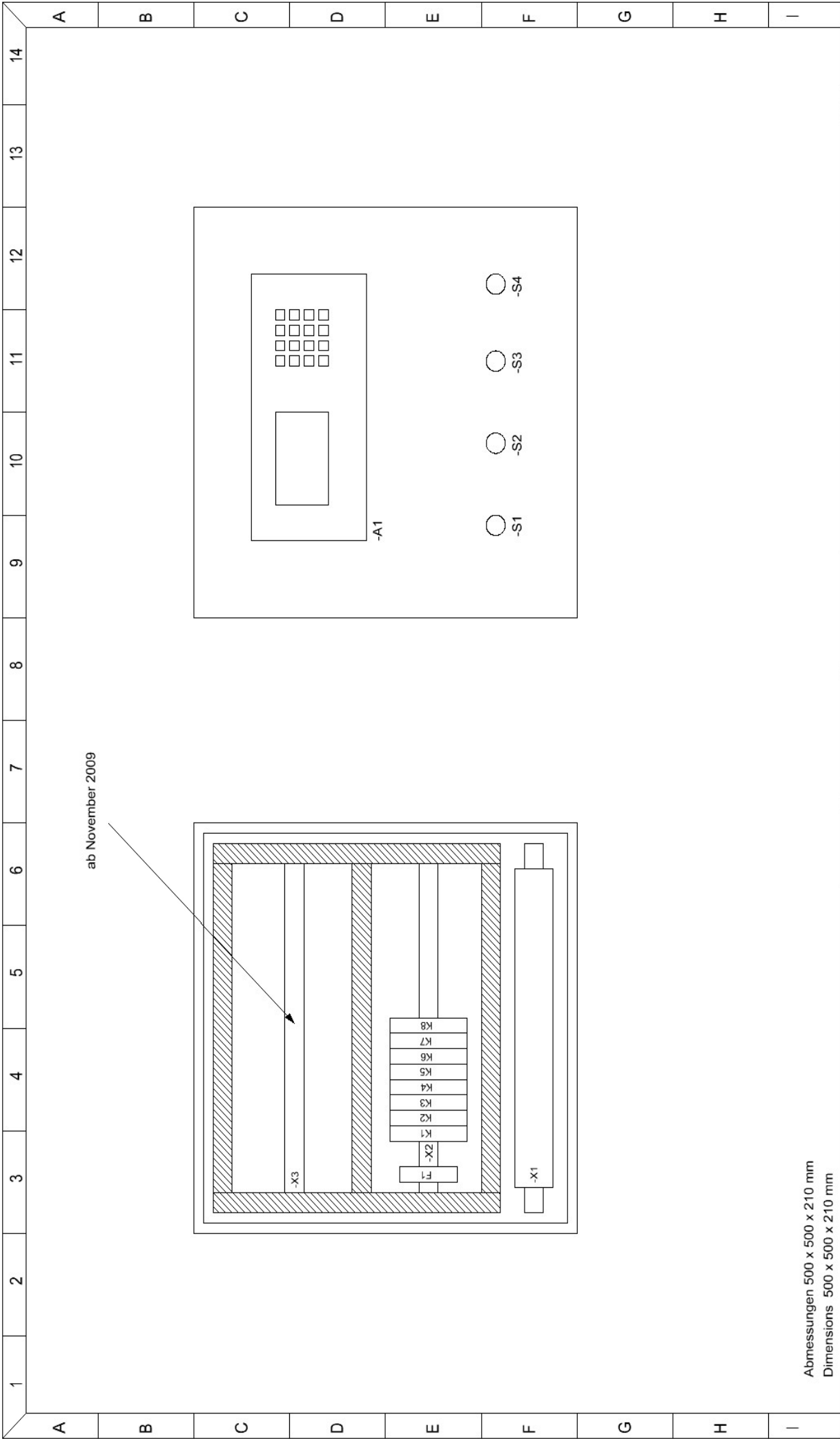
 WF STEUERUNGSTECHNIK GMBH Zepelinstrasse 7-9 75446 Wiernsheim							
	gezeichnet		Datum		Name		Bezeichnung
	geändert		20.11.2009		Anders		Analog EIN und AUSGÄNGE
	geändert		29.01.2010		Weidner		Connection analog inputs/outputs
							Blatt
							39
							von




1	2	3	4	5	6	7	8	9	10	11	12	13	14
<div style="display: flex; justify-content: space-between;"> A B C </div> <div style="text-align: center; margin-top: 10px;"> Steuerteil Control Section </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p>-A1</p> </div> <div style="text-align: center;"> <p>Digital - in</p> </div> <div style="text-align: center;"> <p>Digital - in</p> </div> </div>													
<div style="display: flex; justify-content: space-between;"> D E F G H </div> <div style="margin-top: 20px;"> <p>OPTION:</p> <p>nur im Metallschrank lieferbar</p> <p>only in metal housing</p> </div>													
<div style="display: flex; justify-content: space-between;"> I </div> <div style="margin-top: 20px;"> <p>Digitale Eingänge</p> <p>Digital inputs</p> </div>													
<div style="display: flex; justify-content: space-between;"> <div> <p>Funktion</p> <p>Function</p> </div> <div> <p>Datum</p> <p>20.11.2009</p> <p>29.01.2010</p> </div> <div> <p>Name</p> <p>Anders</p> <p>Weidner</p> </div> <div> <p>Bezeichnung</p> <p>Anschluss digitale Eingänge</p> <p>Connection digital inputs</p> </div> </div>													
<div style="display: flex; justify-content: space-between;"> <div> <p>WF STEUERUNGSTECHNIK GMBH</p> <p>Zeppelinstrasse 7-9</p> <p>75446 Wiernsheim</p> </div> <div> <p>Blatt</p> <p>41</p> </div> </div>													

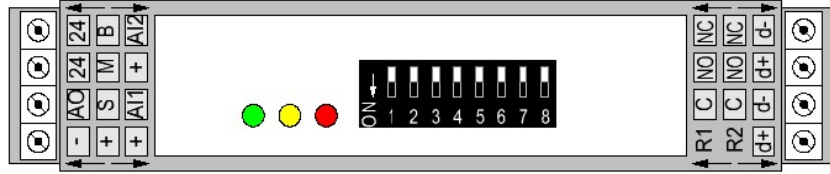
1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	Bezeichnung Designation	Gerät Device	Fabrikat Make	Gerätetyp Type	Technische Daten Technical data		Ident Nr. Ident No.						A
	-A1	Steuerelektronik Electronic Control	W/F Steuerungstechnik	AIRLEADER Master Modul			2401-MS						
B	-S1	Schlüsselschalter Key switch	Moeller	M22-WRS	Schließer		216887						
	-S2	Schlüsselschalter Key switch	Moeller	M22-WRS	Schließer		216887						B
	-S3	Schlüsselschalter Key switch	Moeller	M22-WRS	Schließer		216887						
C	-S4	Schlüsselschalter Key switch	Moeller	M22-WRS	Schließer		216887						
	-F1	Sicherung Schutzschalter Circuit breaker		Si-Klemme M4/8 SF	1 A		1SNA115657R2500						
D	-K1 - K8	Koppelrelais Auxiliary relay	Phoenix	PLC-RSC-24UC/2	24 V AC/DC		2966184						
	-X1	Reihenklamme Terminal	Entelec	DR4/6.1			1SNA110491R1700						D
	-X1	Schutzleiterklamme Terminal PE	Entelec	DR4/6P			1SNA160496R2600						
E	-X2	Dreistockklamme Terminal	Entelec	D4/6 NLP	PE - L - N		1SNA110440R0700						E
F													F
G													G
H													H
I													I
	1												
<div> <div>  <div> WF STEUERUNGSTECHNIK GMBH Zeppelinstrasse 7-9 75446 Wiernsheim </div> </div> <div> <div> <div>gezeichnet</div> <div>20.11.2009</div> </div> <div> <div>geändert</div> <div>29.01.2010</div> </div> <div> <div>geändert</div> <div></div> </div> </div> <div> <div>Bezeichnung</div> <div>Geräteliste</div> <div>Parts List</div> </div> <div> <div>Blatt</div> <div>42</div> <div>von</div> </div> </div>													




Nur für AIRLEADER im Metallschaltschrank
Only for AIRLEADER in metal housing



<div>  <div> WF STEUERUNGSTECHNIK GMBH Zeppelinstrasse 7-9 75446 Wiernsheim </div> </div>						Bezeichnung		Blatt	
						gezeichnet	Name	Geräteanordnung	
						geändert	Datum	Arrangement Diagram	
						geändert		von	
								43	

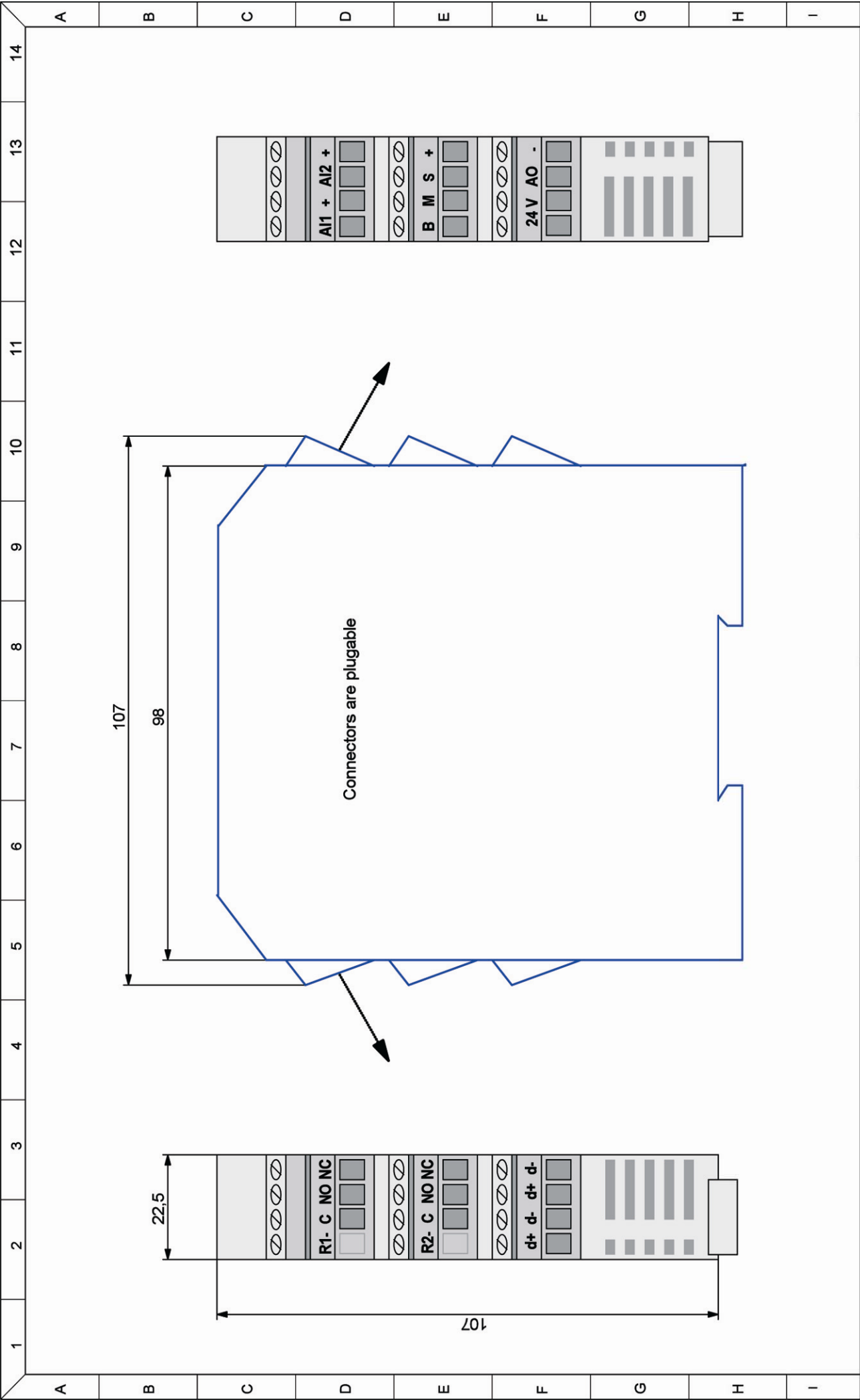
<u>PART 4:</u>	<u>Connection module Typ 4700 (grey)</u>
Page 43	Configuration connection module
Page 44	Mesurement of connection module
Page 45	RS-485 connection scheme



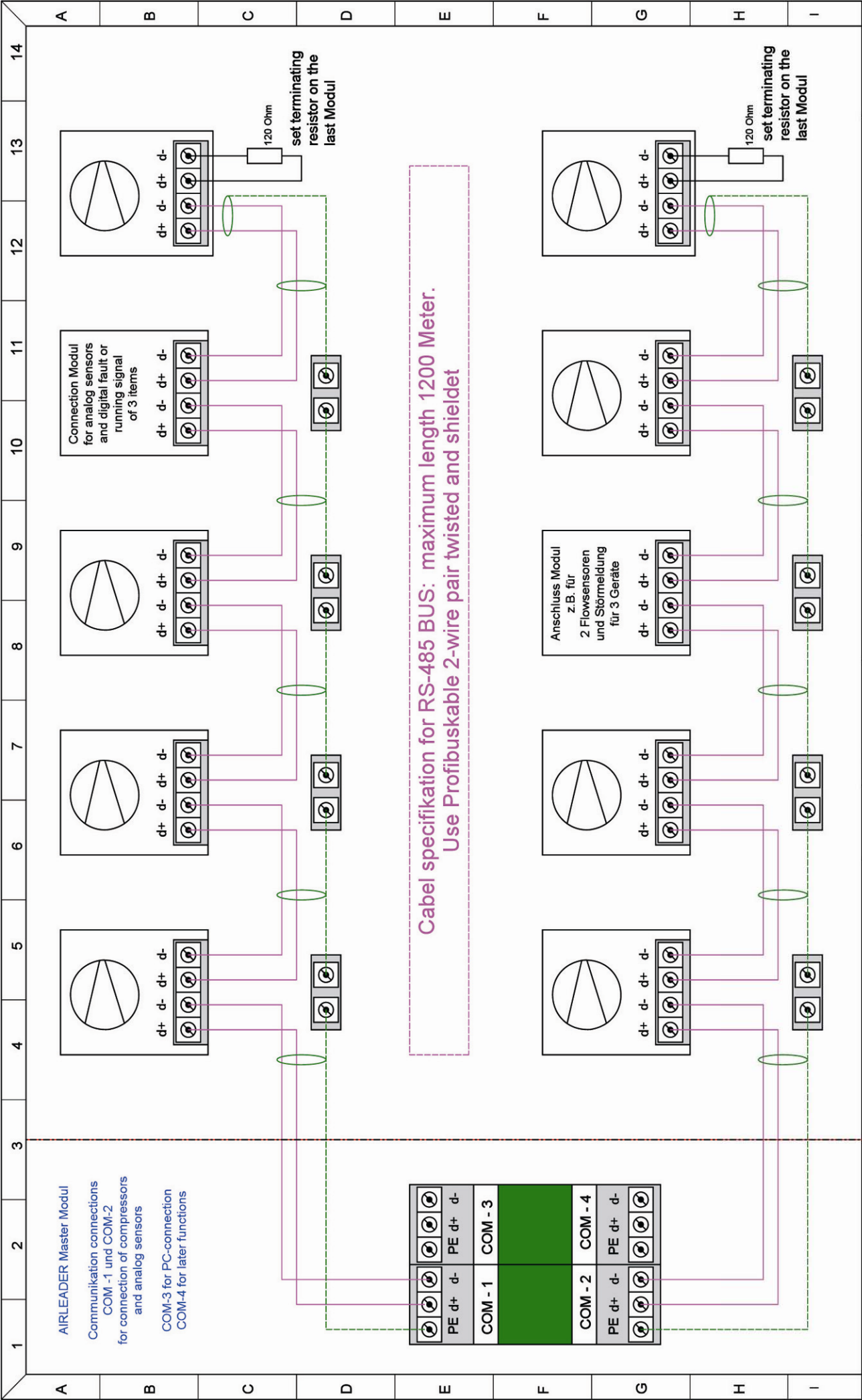
LED		Power	Motorlauf motor running	Last on load	Störung fault	RS-485 Error communication	Kompressor nicht Bereit
		ON	ON	ON	ON	ON	blinkend blinking
			ON	blinkend blinking	ON	blinkend blinking	

[illegible]

Anschluss Module 1 - 16 connection module 1 - 16	nur für Kompressoren only for compressors
Anschluss Module 17 - 24 connection module 17 - 24	für Analog Sensoren und externe Störmeldungen for analog sensors and external fault inputs



						Function	Measurement of connection module	44
			drawn of	22.09.2006				
			changed	08.06.2007				
			changed					von



RS-485 connection Scheme				45
Date		Name		Function
drawn of	22.09.2006			
changed				
changed				von

