

# 1 ANI-1F1

Module for process control in CO<sub>2</sub> refrigeration plants with compound and gas cooler control



Fig. 1: ANI-1F1 - front view

## 1.1 Features

- Standard compound controller with 3 compressors controlled by evaporation temperature
  - Compressor 1 constant (FC), compressors 2 and 3 directly controlled
  - Simple base load change
  - Monitoring of suction gas temperature
  - Oscillation protection function
  - Blocking time after compressor fault
  - Two-step load shedding and fast return flow
  - Operating hours counter for each compressor
- Low temperature compressor control after pump-down
- High and medium pressure control
- Gas cooling fan control
- Additional control circuits for:
  - Load shedding
  - Deheater
  - Fluid post-injection
  - Refrigerant monitoring
  - Heat recovery
  - Pressure monitoring
- Integrated relay outputs
- Bus connection by patch cable
- Fastening via top-hat rail
- Connection to the Wurm system through a Wurm CAN communication bus (C-BUS) and FRIGODATA XP

### Accessories

- Control panel (ANI-C)

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## 1.2 Safety instructions

### Writing conventions

#### CAUTION!

- Avoid the described hazard: Otherwise **minor** or **medium** bodily injury or property damage will result.



Vorsicht!

#### WARNING!

- Avoid the described hazard: Otherwise there is danger from **electric voltage** that can lead to death or **serious** bodily injury.



Warnung!

### For your safety

For safe operation and to avoid personal injury and equipment damage through operating error, always read these instructions, become familiar with the device, and follow all safety instructions on the product and in this document, as well as the safety guidelines of Wurm GmbH & Co. KG Elektronische Systeme. Keep these instructions ready to hand for quick reference and pass them on with the device if the product is sold. Wurm GmbH & Co. KG Elektronische Systeme accepts no liability in case of improper use or use for other than the intended purpose.

<b>Target group</b>	This manual is intended for "service technician" personnel.
<b>Intended use</b>	The ANI-1F1 is a process control module for CO <sub>2</sub> refrigeration plants with compound and gas cooler control

#### WARNING! DANGER TO LIFE FROM ELECTRIC SHOCK AND/OR FIRE!

- Switch off the power to the entire plant when installing, wiring or removing! Otherwise a mains voltage and/or external voltage may still be present even if the control voltage is switched off!
- The wiring of the device should be carried out only by a qualified electrician!
- Use only the correct tools for all work!
- Check all wiring after connection!
- Take note of the maximum loads on all connections!
- Never expose the device to moisture, for example due to condensation or cleaning agents!
- Take the device out of operation if it is faulty or damaged and is therefore compromising safe operation!
- Do not open the device!
- Do not repair the device yourself! If required, send it in for repair with an exact description of the fault!



Warnung!

#### CAUTION! ELECTROMAGNETIC INTERFERENCE CAN CAUSE FAULTS!

- Use only shielded data lines and place them far away from power lines!



Vorsicht!



### 1.3.1 Input circuit diagram

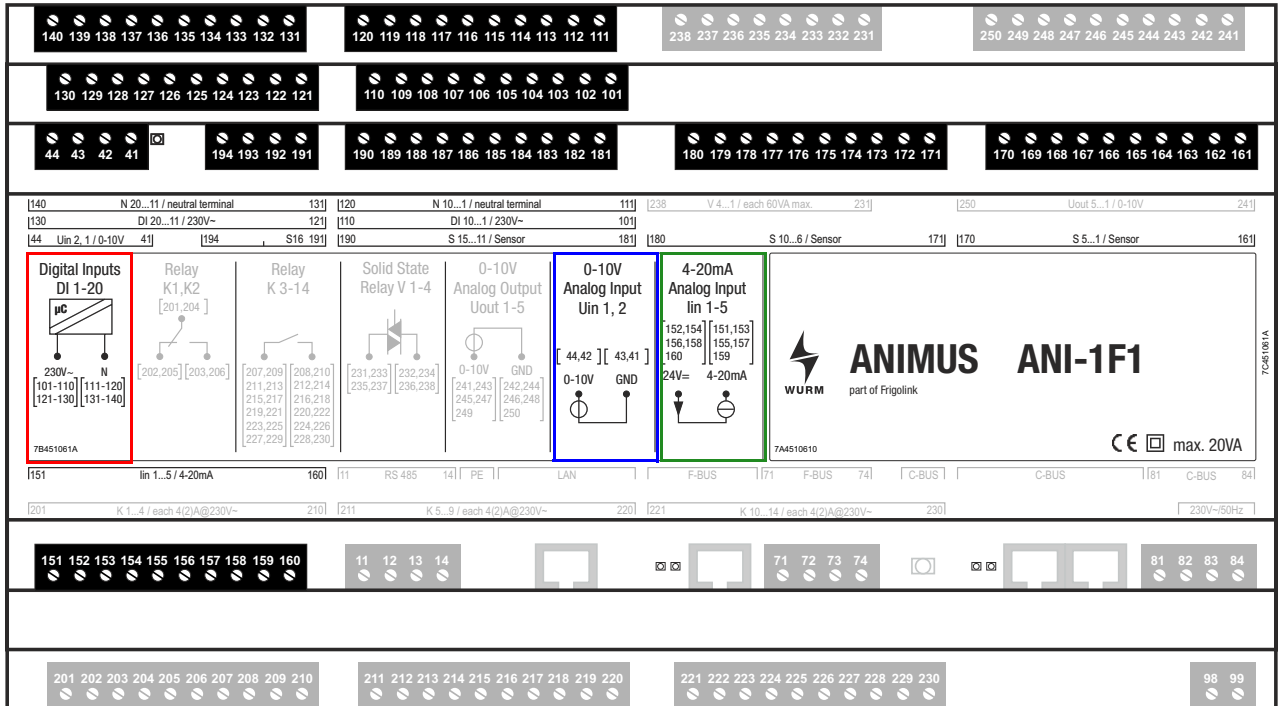


Fig. 3: ANI-1F1 - input circuit diagram

### Digital inputs DI 1 - DI 20

Terminal	Digital input	Potential	Assignment
101	DI 1	230V~	Access authorisation
111		N	
102	DI 2	230V~	Day/night signal
112		N	
103	DI 3	230V~	Load shedding (one constant run compressor)
113		N	
104	DI 4	230V~	Request HR step 1: desuperheating
114		N	
105	DI 5	230V~	Request HR step 2: pressure increase
115		N	
106	DI 6	230V~	MT compressor 1 operation
116		N	
107	DI 7	230V~	MT compressor 2 operation
117		N	
108	DI 8	230V~	MT compressor 3 operation
118		N	
109	DI 9	230V~	LT compressor operation (logging and operating hours)
119		N	
110	DI 10	230V~	Fault MT compressor 1
120		N	

Terminal	Digital input	Potential	Assignment
121	DI 11	230V~	Fault MT compressor 2
131		N	
122	DI 12	230V~	Fault MT compressor 3
132		N	
123	DI 13	230V~	Fault LT compressor
133		N	
124	DI 14	230V~	Fault LCL refrigerant underfill
134		N	
125	DI 15	230V~	Fault LCH refrigerant overfill
135		N	
126	DI 16	230V~	Fault PSL LP compound
136		N	
127	DI 17	230V~	Fault HP compound
137		N	
128	DI 18	230V~	Fault in GC fan 1
138		N	
129	DI 19	230V~	UPS fault
139		N	
130	DI 20	230V~	Fault RC protection
140		N	

### Analogue inputs Uin 1, 2

Terminal	Analogue input	Potential	Assignment
41	Uin 1	GND	Not available
42		0...10V	
43	Uin 2	GND	Not available
44		0...10V	

### Analogue inputs lin 1 - lin 5

Terminal	Analogue input	Potential	Assignment
151	lin 1	4...20mA	LP - MT compound
152		24V=	
153	lin 2	4...20mA	MP - MT compound
154		24V=	
155	lin 3	4...20mA	HP - gas cooler
156		24V=	
157	lin 4	4...20mA	LP LT compressor
158		24V=	
159	lin 5	4...20mA	Not available
160		24V=	

**Analogue inputs S 1 - S 16**

Terminal	Sensor input	Sensor type	Assignment
161/162	S 1	TRK	Suction gas temperature MT compound (logging)
163/164	S 2	DGF	Pressure gas temperature MT compound
165/166	S 3	DGF	Pressure gas temperature LT compressor / desuperheating
167/168	S 4	TRK	External temperature
169/170	S 5	DGF	Temperature gas cooler outlet / T-GK 1
171/172	S 6	DGF	Temperature gas cooler outlet / T-GK 2
173/174	S 7	DGF	HR refrigerant output / CO <sub>2</sub> OFF
175/176	S 8	DGF	HR water flow / HR OFF
177/178	S 9	DGF	HR water return / HR ON
179/180	S 10		Not available
181/182	S 11		Not available
183/184	S 12		Not available
185/186	S 13		Not available
187/188	S 14		Not available
189/190	S 15		Not available
191/192	S 16	TRK	Switch cabinet sensor

**NOTE!**

- Terminals 193/194 cannot be wired, they are empty!



### 1.3.2 Output circuit diagram

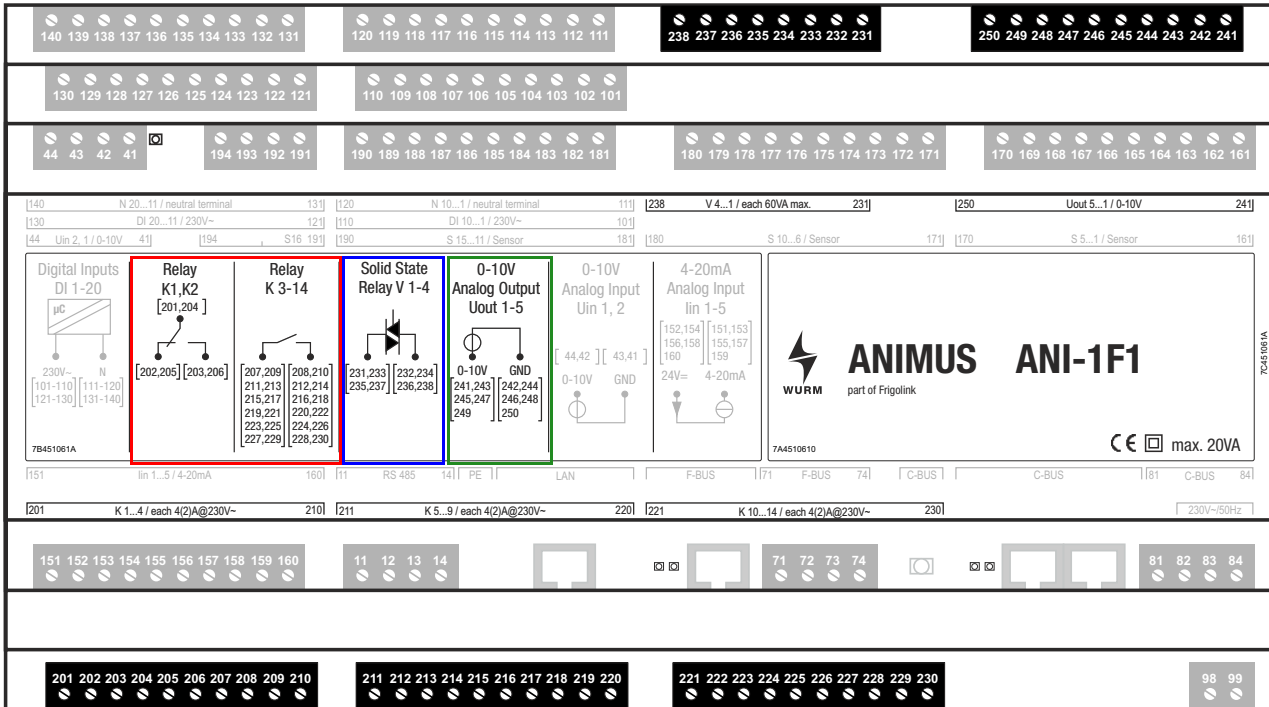


Fig. 4: ANI-1F1 - output wiring diagram

#### Digital outputs (relays) K 1 - K 14

Terminal	Digital output	Contact arrangement	Assignment
201	Changeover contact K 1 / 4(2)A@230V~	COM	Alarm output Prio 1
202		MT	
203		NO	
204	Changeover contact K 2 / 4(2)A@230V~	COM	Alarm output Prio 2
205		MT	
206		NO	
207	NO contact K 3 / 4(2)A@230V~	COM	MT compressor 1 - release FC
208		NO	
209	NO contact K 4 / 4(2)A@230V~	COM	MT compressor 2 - mains contactor
210		NO	
211	NO contact K 5 / 4(2)A@230V~	COM	MT compressor 3 - mains contactor
212		NO	
213	NO contact K 6 / 4(2)A@230V~	COM	LT compressor - enable or mains contactor (selectable)
214		NO	
215	NO contact K 7 / 4(2)A@230V~	COM	MP too low (gas cooler bypass)
216		NO	
217	NO contact K 8 / 4(2)A@230V~	COM	HR VALVE
218		NO	
219	NO contact K 9 / 4(2)A@230V~	COM	HR pump
220		NO	



Terminal	Digital output	Contact arrangement	Assignment
221	NO contact K 10 / 4(2)A@230V~	COM	Not available
222		NO	
223	NO contact K 11 / 4(2)A@230V~	COM	LT desuperheater fan
224		NO	
225	NO contact K 12 / 4(2)A@230V~	COM	Not available
226		NO	
227	NO contact K 13 / 4(2)A@230V~	COM	Not available
228		NO	
229	NO contact K 14 / 4(2)A@230V~	COM	Not available
230		NO	

### Digital outputs (SSR) V 1 - V 4

Terminal	Digital output (SSR)	Contact arrangement	Assignment
231	Semiconductor V 1 4...60VA@230V~	NO	MT HG bypass valve (suction gas monitoring)
232		COM	
233	Semiconductor V 2 4...60VA@230V~	NO	Post-injection MT
234		COM	
235	Semiconductor V 3 4...60VA@230V~	NO	Not available
236		COM	
237	Semiconductor V 4 4...60VA@230V~	NO	Not available
238		COM	

### Analogue outputs Uout 1 - Uout 5

Terminal	Analogue output	Potential	Assignment
241	UOut 1	0...10V	MT compressor 1 frequency converter
242		GND	
243	UOut 2	0...10V	Gas cooler EC motors
244		GND	
245	UOut 3	0...10V	MP valve
246		GND	
247	UOut 4	0...10V	HD valve
248		GND	
249	UOut 5	0...10V	Adjustment signal 2. MP valve
250		GND	

### 1.3.3 Communication circuit diagram

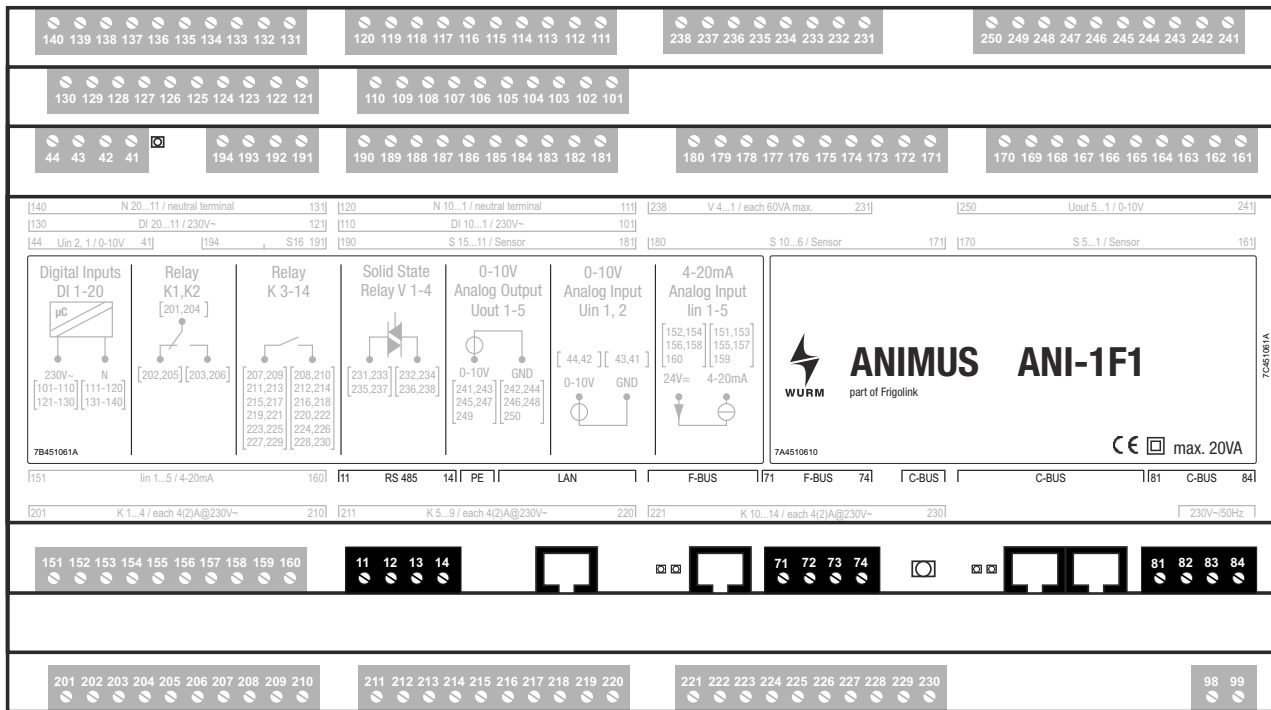


Fig. 5: ANI-1F1 - communication circuit diagram

### Communication

Terminal	Potential	Assignment
81	0V	C-BUS
82	L	
83	S	
84	H	
71	0V	F-BUS
72	L	
73	S	
74	H	
11	0V	RS 485
12	B+	
13	A-	
14	5V	

## 1.4 Installing

The module is designed for top-hat rail installation. The housing is also suitable for installation in fuse boxes or distribution switch cabinets. Modules can be positioned side by side without gaps.

### WARNING! DANGER OF DEATH FROM ELECTRIC SHOCK!

- Switch off the power to the entire plant before installing! Otherwise a mains voltage and/or external voltage may still be present even if the control voltage is switched off!



### Top-hat rail installation

1. There are 2 fastening catches located on the back of the module. **(A)** Press both catches **(a)** downward until they engage with a click.
2. There are 4 retaining lugs located on the top of the module. **(B)** Set the module with retaining lugs **(b)** on the top-hat rail **(c)**. Make sure with both hands that the module is positioned **parallel** to the top-hat rail and all retaining lugs are located behind the edge of the top-hat rail.
3. Push the module down onto the top-hat rail.
4. **(C)** Swivel the bottom of the module towards the top-hat rail.
5. **(D)** Press the fastening catches **(a)** towards the module until they engage in the top-hat rail.

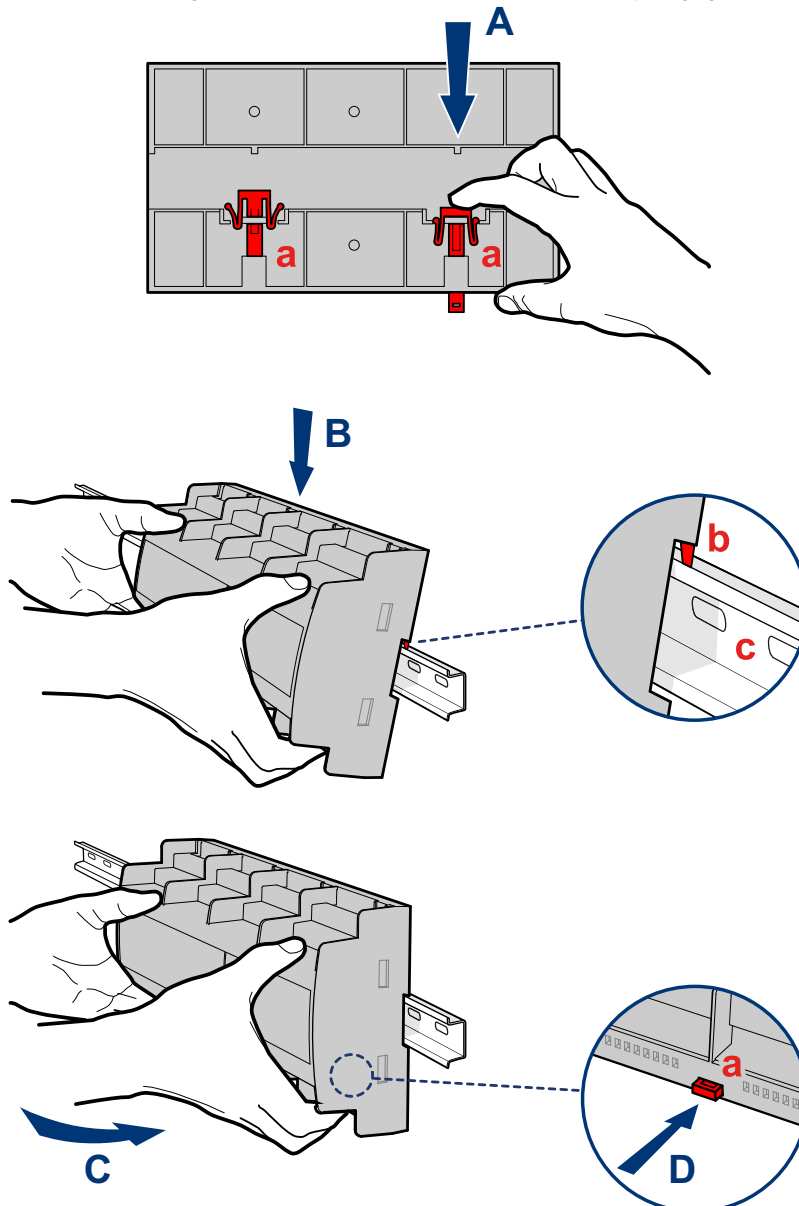


Fig. 6: ANI-1F1 top-hat rail installation

## Dismantling

1. Insert a flat-tip screwdriver in the openings in the fastening catches.
2. Pull the two fastening catches away from the housing until they are heard to click.
3. Swivel the bottom of the module gently away from the top-hat rail and towards yourself.
4. Lift the module upwards away from the top-hat rail.

## 1.5 Technical data

<b>Power supply</b>	230V~, +10% / -15%, 50Hz, max. 13VA
<b>Display</b>	Optional control element with graphic display 1 x LED (green/red), operating voltage: green, fault: red 4 x LED (green), CAN bus data traffic (CAN Tx, CAN Rx)
<b>Sensors</b>	16 x DGF/TRK
<b>Communication C-BUS</b>	3-wire CAN bus interface, shielded, galvanically isolated, screw terminals 2.5mm <sup>2</sup> and RJ45 socket
<b>Communication F-BUS</b>	3-wire CAN bus interface, shielded, galvanically isolated, screw terminals 2.5mm <sup>2</sup> and RJ45 socket
<b>Analogue inputs</b>	5 x 4...20mA, 23V=power supply 2 x 0...10V=
<b>Digital inputs</b>	20 x potential-free for 230V~ (neutral conductor N per input)
<b>Analogue outputs</b>	5 x 0...10V=, non-isolated, max. load 10mA
<b>Digital outputs</b>	2 x mechanical relays 4(2)A@230V~ (changeover contact) 12 x mechanical relays 4(2)A@230V~ (normally open contact) 4x semiconductor relays 4...60VA@230V~
<b>Dimensions</b>	(WxHxD) 270 x 80 x 165
<b>Housing</b>	Plastic
<b>Fastening</b>	Top-hat rail TH 35-15 or TH 35-7.5 (DIN EN 60715)
<b>Ambient temperature</b>	Operation: -20...+55°C, storage: -25...+70°C
<b>Weight</b>	About 1125g
<b>CE conformity</b>	EU conformity as defined in - 2014/30/EU (EMC Directive) - 2014/35/EU (Low Voltage Directive)
	RoHS II
<b>Valid from</b>	Version 2.1.4

For details of input assignments, see: Paragraph 1.3.1 "Input circuit diagram" on page 5

For details of output assignments, see: Paragraph 1.3.2 "Output circuit diagram" on page 8

For details of sensor assignments, see: Paragraph "Analogue inputs S 1 - S 16" on page 7