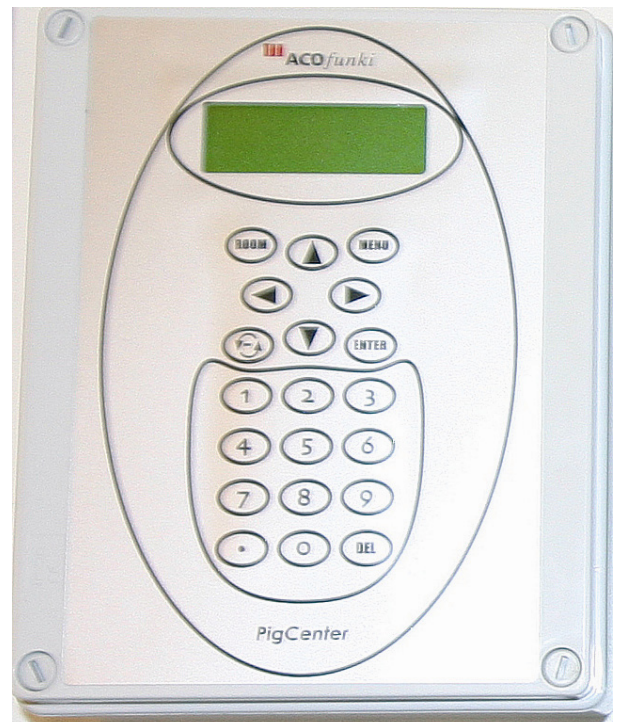
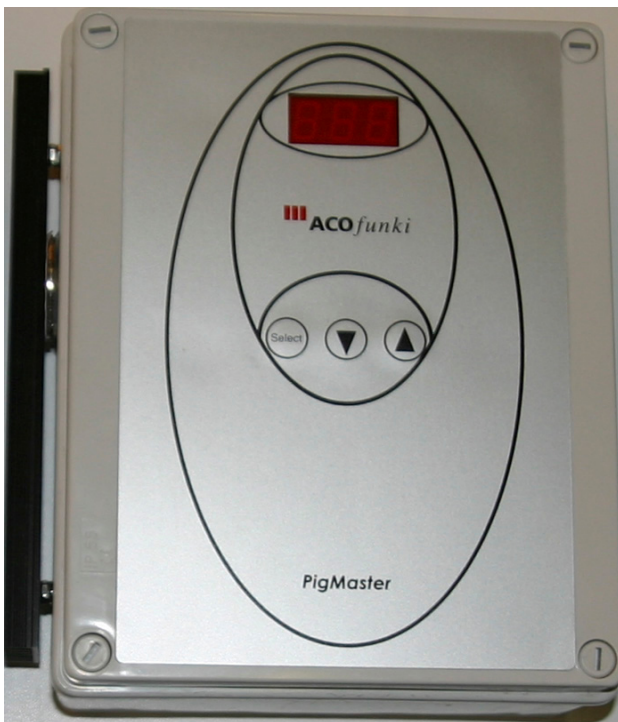


# **ACO *funki*** **MASTER / CENTER**



**No. 0950-110 PigCenter/PigMaster**

**GB**

10.05.2006

# General description

## General description

The **Master** is a stand-alone control unit for a single room. The **Master**'s RS—485 communication protocol (standard industry communication) enables the **Master** to communicate with a **Center** unit.

A.P.C communication software, PigNet, uses MUX-484 to communicate via modem, local network or cellular phone. (A Rotem Communicator can also be used).

The **Master** has a simple user interface with three 7-segment displays and 3 keys for data entry of basic settings.

The **Center** can read outside temperatures from one of the rooms and transfer these to all other rooms.

The **Center** has an LCD with 4 lines of 20 characters and a 20-key keyboard for full control of up to 10 **Master** units. The **Center** is used as a display/control/adjustment unit for each of up to 10 **Master** units that may be connected to the network. If there are more than 10 rooms, it is possible to use more **Center** units as required.

The **Center** units can be connected to a central PC through MUX—485, a communicator that can also be used with PC PigNet communications software.

The **Center** logs all historical data from up to 10 **Master** units and stores this data in its memory as well as showing the data on the display or sending it to the **PigNet** PC communications software.

The **Center** has a wealth of options for adjustment, control, display and logging of all data transmitted to and received from every room.

# Technical specifications

Master  
Center

## Technical specifications

### Master

- ❖ 3 7-segment display
- ❖ 3-key keyboard
- ❖ 2 highly accurate temperature sensors
- ❖ 6 output relays
  - 10 Amps. 220 Volt
- ❖ Comprehensive history and data acquisition in the control unit
- ❖ Integrated static pressure (option on request)
- ❖ Alarm relay
- ❖ 3 digital inputs
- ❖ 3 analogue inputs (humidity, potentiometer, other)
- ❖ 5 0-10V analogue outputs
- ❖ Built-in 10 amp variable speed with overload 2 HT 30 Amp relays
- ❖ Variable speed auto/manual overload cut-off
- ❖ Plug-in RS—485 communication card with lightning protection
- ❖ Power supply input with built-in EMI filter and lightning protection
- ❖ PID control, ventilation, cooling, heating and humidity regulation.

### Center

- ❖ Large 4-line 20-character backlit LCD screen
- ❖ 20-key keyboard with special function keys
- ❖ RS-485 communication to 10 **Master** units (rooms).
- ❖ Optional programming plug (Data Shuttle)
- ❖ Unique lightning protection
- ❖ Built-in EMI filter
- ❖ User-friendly, intuitive menus with scroll menus, symbols and Plug&Play scanning to the **Master's** functions.

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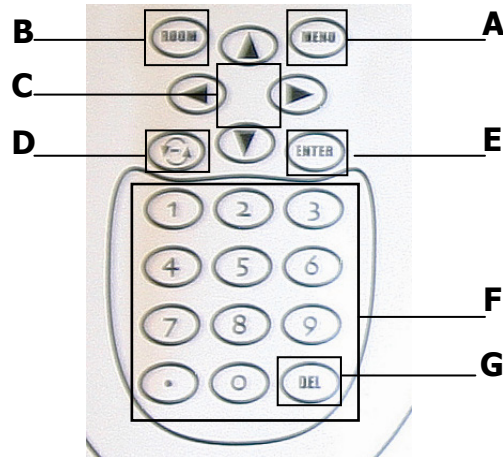
# Center

## General description

# CENTER

## General description

### Keyboard:



- A: Menu** – The Menu key helps the user to access the main menu from the main screen and otherwise back to the main menu again.
- B: Room** – The Room key is used to switch between the different rooms. This is done by pressing Room and then the number of the required room (1-10).
- C: Arrow** – The arrow keys are used to scroll the data on the screen or to switch between the rooms.  
By pressing the key once, the cursor moves one level up, down or to one side.  
By holding down the key, the screen is quickly scrolled to the end.
- D: Shift** – The Shift key is used to select the desired option, e.g. words such as Yes/No, On/Off and to switch between plus and minus.
- E: Enter** – The Enter key is the confirmation key.
- F: Numeric** – Ten digits 0-9.
- G: Delete** – Delete key.

# Center

Main screen

## Main screen

|         |       |       |     |
|---------|-------|-------|-----|
| TEMP    | 27.1  | 03:53 | #01 |
| DESIRED | 24.0  | VENT% | 100 |
| RH%     | 255.0 | HEAT% | 0   |
| RH%Ø    | 0.0   | DAY   | 1   |

The main screen displays the most important information about the rooms that the Center controls.

TEMP: Current temperature in the room.

DESIRED: Desired temperature.

RH%: Room humidity (indoor).

RH%Ø: Desired humidity.

The top line on the right indicates the time and room number.

VENT%: Ventilation level in per cent.

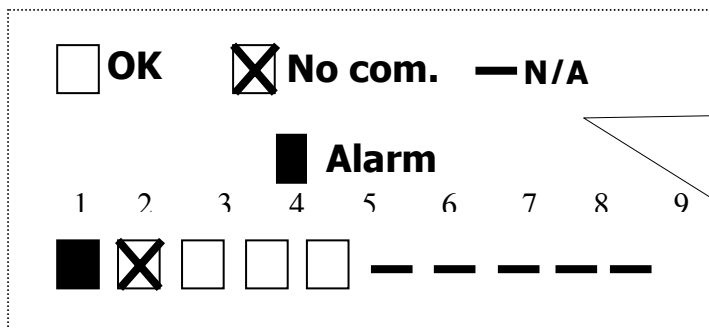
HEAT%: Heat level in per cent.

DAY: Growth day.

- In the event of an alarm, a flashing message will appear on each of the main screens, in addition to which a siren will be triggered.

If '0' is pressed on the main menu when the alarm message appears, this will direct the user towards the problem.

It is possible to reset the alarm, although this will only stop the siren, and will not cancel the message on the screen. The message will only disappear once the problem has been solved.



When 0 is pressed, the status of the room will appear on the screen

- A marked field indicates that an alarm is on.
- An **X** indicates that there is no communication with **MASTER**. (It is important to be aware that historical data concerning lack of communication is not acquired).
- A straight line indicates N/A (not available).

# Center

## Center set-up

### CENTER set-up

- In order to access the CENTER set-up screen, press **Room** and then **0** from any of the main screens.

The Center set-up is a diagram via which you can adapt the central unit to the system.

|                   |         |
|-------------------|---------|
| ==PC CONNECTION== |         |
| Center nr.        | 0       |
| Baud rate         | 4800    |
| ==STABLE==        |         |
| Total             | (0-10)  |
| C-exhaust         | 0       |
| Outdoor temp.     | (0-10)  |
| ==ENHED==         |         |
| Temp.             | C       |
| Pressure          | Pascal  |
| Wind              | M/sec   |
| ==GLOBAL==        |         |
| Language          | English |
| Time (hh:mm)      | 10:25   |

**CENTER NO.:** CENTER identity. Used if several Center units are communicating with a PC.

**BAUD RATE:** Select communication speed.

**TOTAL ROOMS:** Set the number of Master units connected to the Center.

**C-EXHAUST:** Setting number of central exhaust control units that are connected to the Center

**OUTDOOR TEMP.:** Position (Center) of the outdoor temperature sensor. This temperature is hereby sent to all Masters that are connected to the Center.

**TEMP:** Choose between Celsius and Fahrenheit.

**PRESSURE:** Choose a unit of pressure. Pascal or in.wc

**Wind:** Choose between m/sec or km/h.

**Language:** Choose language.

**TIME:** Setting of the system's internal clock.

### **Cold start of Center**

When commissioning a new Center, a cold start should be carried out, i.e. the Center unit should be reset and the factory settings used.

In order to carry out a cold start, hold down the DEL key whilst connecting the power supply to the control unit. A message will then appear in the display asking whether a cold start is required or not. Confirm this message with the arrow keys and Enter.

# Notes on table settings

## Notes on table settings

The following example explains a programming concept, which is repeated in this menu.

| # | From  | To    | on | off |
|---|-------|-------|----|-----|
| 1 | 06:00 | 22:00 | 15 | 45  |
| 2 | 09:00 | 11:00 | 25 | 45  |
| 3 | 16:00 | 18:00 | 5  | 45  |
| 4 | 08:00 | 20:00 | 0  | 0   |

The extra systems function according to this concept.

Each timeframe can be interrupted by an internal shorter timeframe with a different cycle.

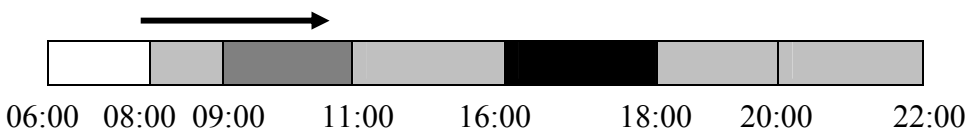
In the example shown, there is an extended timeframe from 06:00 to 22:00, a shorter timeframe from 08:00 to 20:00 and two short timeframes from 09:00 to 11:00 and from 16:00 to 18:00.

The first two hours will run according to the first program. At 08:00 the second program will start. Between 09:00 and 11:00 the third program will run, and from 11:00 to 16:00 the second program will run again, and so on.

Note: Enter 0 for both the ON and OFF times in order to ensure that no program will run for a certain time interval.

Do not enter an OFF time if continuous operation is required.

Time



Note: Enter 0 for the ON-time for no operation and set the ON time to 1 and the OFF time to 0 for constant operation.

1. **Floating Point: (format0.00)** The number of zeros after the decimal point will determine the resolution.
2. **Function switch:** Use the Shift key to switch between the different options.
3. **Scrollbar:** The scrollbar provides an indication of the user's position on the screen.

### Save settings

**Save settings**

**No**                      **→Yes**

- In order to save the settings, press the Menu key and a "Save settings" window will appear. Use the arrow keys to choose yes or no, and confirm with Enter.

# Control

Temp. graph

## Main menu

Press Menu followed by 1-6 or use the down arrow key to select the desired menu.  
Press Enter when the arrow in the display points to the desired menu.

## 1. Control

1. Temperature graph
2. Humidity graph
3. Min/Max ventilation
4. Spraying
5. Cooling
6. Pressure
7. Extra system
8. Climate-2 Zone
9. Control Mode

## Temp. graph

| TEMP GRAPH #01 |     |         | Low Alarm | High Alarm |
|----------------|-----|---------|-----------|------------|
| #              | Day | Desired |           |            |
| 1              | 1   | 24      | 15        | 30         |
| 2              | 14  | 22      | 15        | 28         |

PigMaster displays different temperature graphs for desired temperature and high/low alarm.

Set the growth day, the desired temperature, high and low alarm temperatures, and the control unit will create a graph for each of them and use this as a reference.

Up to 10 lines can be entered, although it is not necessary to complete all 10 lines.

PigMaster will use the settings entered on the last programmed line.

Limits:

|               |                           |
|---------------|---------------------------|
| Day           | 0-999                     |
| Desired temp. | 0-40° C                   |
| Alarm low     | 0-40° C (without decimal) |
| Alarm high    | 0-40° C (without decimal) |

# Control

Humidity graph  
Min/Max Vent.

## Humidity graph

| HUMIDITY GRAPH #01 |     |         |
|--------------------|-----|---------|
| #                  | Day | Desired |
| 1                  | 1   | 75%     |
| 2                  | 8   | 55%     |

Set the growth day, the desired humidity for a given day, and the control unit will then create a graph.

Up to 10 lines can be entered, although it is not necessary to complete all 10 lines.

PigMaster will use the settings entered on the last programmed line.

There are two restrictions under system parameters (menu 67) with regard to the processing of humidity:

Max. vent.: Humidity processing is stopped when this ventilation level is exceeded.

Max. heat: Maximum heat allowed by the process.

Limit on number of days: 0-999 Desired humidity: 0-100%

## Min/Max Vent.

| MIN/MAX VENT #01 |     |    |     |      |     |
|------------------|-----|----|-----|------|-----|
| #                | Day | On | Off | Vent | Max |
| 1                | 1   | 30 | 500 | 50   | 40  |
| 2                | 8   | 0  | 0   | 15   | 70  |

This is a table to set the minimum ventilation according to growth day (without graph).

The minimum level is specified by the min. vent. table, which determines the lowest ventilation level.

On/Off: Time in seconds for ventilation operation and pause duration.

Vent: Percentage of full ventilation.

Max: Maximum permissible ventilation level.

Example: As shown in the diagram, first day - 30 seconds ON and 500 seconds OFF - means that the system will operate in a cycle of 30-second operation followed by a 500-second pause. The ventilation system will ventilate at 50% capacity during the period of the 30-second ON time. Maximum ventilation level will in this example be 40% on growth day 1.

On day 8, the settings are 0 seconds ON and 0 seconds OFF, which means that the system is in constant operation and ventilation is at 15%. Here maximum ventilation level will be limited to 70.

# Control

Spraying  
Cooling

## Spraying

| Spraying #01 |         | Set% | on     | Max.Pause | Min.Pause |
|--------------|---------|------|--------|-----------|-----------|
| #            | From To |      |        |           |           |
| 1            |         | 50 % | 60 sec | 60 min.   | 30 min    |

FROM: (HH:MM) Start time.

TO: (HH:MM) End time.

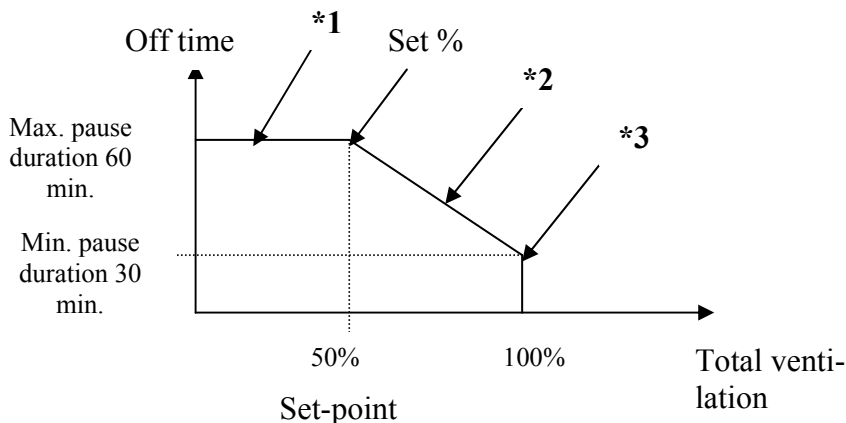
SET: (0%-100%) Set set-point in relation to ventilation.

ON: (0-999 sec) Set function according to time.

MAX. PAUSE: (0-720 m) Maximum interval between operation.

MIN. PAUSE: (0-720 m) Minimum interval between operation.

## Spraying graph



The **SET-POINT** is the point in relation to the total ventilation at which the reduction in activity events begins.

- Ventilation below the set-point will trigger fixed intervals between spraying, max pause duration. (\*1)
- Ventilation above the set-point will trigger a gradual reduction of the intervals with spraying. This is effected by reducing the pauses linearly between the set min. and max. pause duration in relation to the amount of ventilation. (\*2)
- At 100% ventilation, the system will have a fixed pause equal to the minimum pause duration. (\*3)

### **For example:**

Max. pause: 60[min.]

Min. pause: 30[min.]

Set: 50[%]

## Cooling

The cooling table creates the settings for the cooling system. There are up to 10 lines, thus enabling precise control of this system. More than one line can be entered for the same day.

FROM/TO: Time of day during which the system shall run.

DIFF.: Set a difference in relation to the desired temperature where the cooling system shall run.

# Control

Cooling  
Pressure

%RH: If the humidity exceeds this value, cooling will cease. (See figure 5)

ON/OFF: Operation time and pause duration in seconds.

Tolerance: The cooling system has a fixed tolerance with regard to temperature, which can be adjusted. The cooling system starts operation if the temperature exceeds [desired. temp.] + [Diff.], and cuts out when the temperature falls below the specified tolerance.

| cooling #01 |           |
|-------------|-----------|
| #           | From → To |
| 1           | ↓         |
| 2           | ↓         |

Diff

%RH

On

off

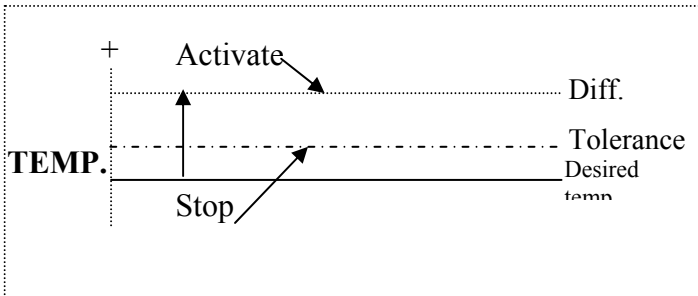


Figure 4

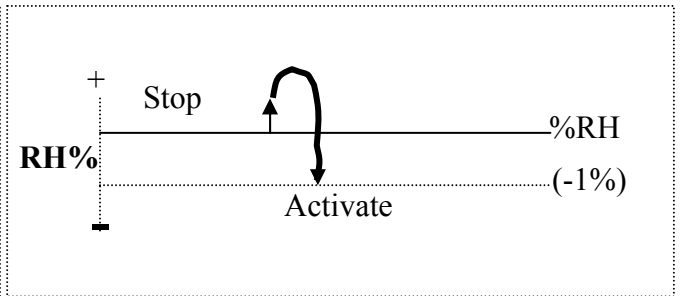


Figure 5

## Pressure

If a pressurestat RPS/1 is connected, the Master will be able to regulate the air intake according to the negative pressure in the stable. The negative pressure can thereby be optimised such that the correct negative pressure that is suitable for the temperature of the air that is taken into the stable is always obtained.

The menu contains the following:

|                    |    |
|--------------------|----|
| ==HEAT DESIRED==   |    |
| Setpoint           | 20 |
| Relative temp.     | 35 |
| ==COLD DESIRED==   |    |
| Setpoint           | 30 |
| Relative temp.     | 5  |
| ==BAND==           |    |
| Diff. from desired | 5  |
| ==OUT OF BAND==    |    |
| GUST OF WIND       | 20 |
| PID Revision%      | 5  |
| ==ALARM==          |    |
| Low                | 2  |
| High               | 37 |
| Cancel vent%       | 0  |
| ==(0-10V)==        |    |
| 0%-100%(sec)       | 30 |

# Control

Extra System  
Climate-2 Zone  
Control Mode

## Extra system

| EXTRA SYSTEM #01 |      |      |  |
|------------------|------|------|--|
| #                | From | To   |  |
| 1                | 1900 | 1915 |  |
| 2                |      |      |  |

On                      off  
1                              0

Each relay can be set as an extra system.

An extra system could be, for example, an automatic feeding unit.

The extra system(s) is/are activated in accordance with the settings in this table.

You simply set FROM/TO as the time of the day during which you wish to operate with the ON/OFF cycle in seconds.

You can set up to 10 programs in this table - see **notes on table settings** for further information.

If continuous operation is desired in the time interval “from” and “to”, ON should be set to 1 and OFF to 0.

## Climate-2 Zone

By means of an extra temperature sensor that is connected to temperature input 2, the supply of heat can be controlled separately in a heat zone other than the stable itself. This could be, for example, the supply of heat under a covered area, or a supplementary heating system that is programmed to start if the normal heating system cannot supply sufficient heat.

This function requires that 1 temperature sensor and 1 relay is preprogrammed to Climate-2 zone.

The menu contains the following:

| Climate-2 Zone |    |
|----------------|----|
| Temp. start    | 30 |
| Temp end       | 20 |
| End day        | 1  |
| Temp hyst.     | 1  |

The Master will automatically change the temperature from “Temp start” to “Temp end” during the course of the number of days entered in “End day”. In “Temp hyst.” The tolerance for the heating system can be adjusted.

## Control Mode

Under the menu Management – Active Mode, the user can switch the Master between 4 different modes: Pre-washing, Washing, Empty Stable, Heating. These modes can be adjusted individually under this menu.

The menu is divided into 4 modes and for each mode the following can be adjusted.

# Management

Number of animals  
Day & Herd

|                |        |
|----------------|--------|
| Ventilation%   | 0-100  |
| V. Speed       | On/Off |
| Heat%          | 0-100  |
| Alarm low      | 0-50   |
| Alarm high     | 0-50   |
| Alarm allowed  | Ja/Nej |
| Washing On(m)  | 0-60   |
| Washing Off(m) | 0-60   |

Ventilation, V. Speed, Heat% are all parameters that are related to the ventilation system itself.

Alarm low, Alarm high are temperature limits that activate an alarm provided that Alarm allowed is set to YES.

If Alarm allowed is set to NO, all alarms for this stable will be deactivated.

Washing On/Off determines the operational periods on the relay with the function WASHING.

## 2. Management

1. Number of animals
2. Day & herd
3. Active Mode
4. Alarm settings
5. Alarm reset

### Number of animals (menu 21)

|                       |  |
|-----------------------|--|
| Number of Animals #01 |  |
| Enter dead            |  |
| Number of new animals |  |
| Updated number        |  |

This table gives you an overview of the number of animals you have. You should just enter the number of animals that are dead and the number of new animals that have come into the stable.

### Day & Herd (Menu 22)

|                 |        |
|-----------------|--------|
| DAY & GROUP #01 |        |
| Growth day      | 2      |
| Herd no.        | 4      |
| New herd        | Yes/no |

Simply enter the herd number, and the growth day will be displayed on the screen.

**NEW HERD:** In order to start a new herd, press YES on the New herd line, and the control unit will automatically increase the herd number by one and write 1 in the growth day field.

If NO is selected, the settings will not be changed. You can exit the table by pressing MENU, and selecting YES in the SAVE SETTINGS table that will appear.

# Management

Active Mode  
Alarm setting

- Warning with regard to new herd: When a new herd is started, the historical data for the old herd will be deleted!!!

## Active Mode

The “mode” to which the ventilation control unit is set is adjusted here. If there are animals in the stable, this function must always be set to “NORMAL”. This mode can be changed by means of the rotation key. 4 different modes can be set: PRE-WASHING, WASHING, EMPTY STABLE, HEATING.

Parameters of the 4 modes can be set in the control menu (see section on the control menu).

If the control unit is set in one of the 4 modes, a bar will appear in the main display that indicates which mode the control unit is set at. The Master will also flash IDL (abbreviation of IDLE) for as long as the control unit is not in the NORMAL position.

## Alarm setting:

| ALARM SETTING                 |        |
|-------------------------------|--------|
| Alarm delay                   |        |
| Aux. related function         |        |
| Max. feeding per hour         |        |
| Max. watering per hour        |        |
| ===== <u>High Temp.</u> ===== |        |
| Outdoor compensation          |        |
| Emergency temp.               |        |
| ===== <u>Low temp.</u> =====  |        |
| V. speed stop                 | yes/no |

**ALARM DELAY:** Time (sec.) before alarm starts after a limiting value is exceeded.

**MAX. FEEDING/WATERING:** Amount per hour that if exceeded will trigger alarm.

**OUTDOOR COMPENSATION:** Set format that compensates for a high outdoor temperature.

**(Figure 6)**

If: **Outdoor temp.+comp.>Alarm**, then **Alarm limit instead=Outdoor temp.+comp.**

For example: If the preset compensation is 5°C and the outdoor temperature is 24°C, and the alarm is set at 25°C, then the control unit will add the outdoor temperature to the compensation value, and the alarm trigger will increase to 29°C. (24+5=29)

**CRITICAL HIGH TEMP:** When the critical high temp. is reached, the alarm will be set off regardless of the compensation value.

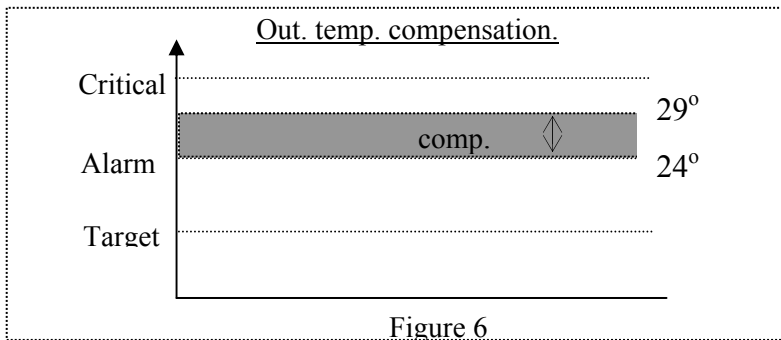
**VARIABLE SPEED (YES/NO):** In the event of low alarm, a choice must be made as to whether there should be variable speed in minimum operation or whether the function should be stopped completely.

# Management

Alarm reset

## History

Temperature



### Alarm reset

|             |      |
|-------------|------|
| ALARM RESET |      |
| Alarm Reset | ▶_NO |

When the alarm is set off for whatever reason, it can be reset. However, this will only stop the siren, and a message concerning the problem will continue to flash in the alarm history.

### 3. History

- 1. temperature
  - 2. humidity
  - 3. water
  - 4. feed
  - 5. mortality
  - 6. alarm
  - 7. actions
- Up to 100 days.
- Up to 100 actions/alarms.

The history section provides access to the history of activities for up to 100 days with normal operation and up to 100 alarms or events (on some days the alarm will not be triggered, and on other days it may be set off more than once).

### Temperature

| TEMPERATURE |      |      | #01  |
|-------------|------|------|------|
| #           | MIN. | MEAN | MAX. |
| 1           | ↓    |      |      |
| 2           |      |      |      |
| 99          |      |      |      |

Min., max. and mean temperature during the last 100 days.

# History

Humidity  
Water/Feed  
Mortality  
Alarm

## Humidity

| HUMIDITY |      |      |      |
|----------|------|------|------|
| #        | MIN. | MEAN | MAX. |
| 1        |      |      |      |
| 2        | ↓    |      |      |
| ·        |      |      |      |
| 99       |      |      |      |

Min., max. and mean humidity during the last 100 days.

## Water/Feed:

| WATER/FEED |     |       |         | #01 |
|------------|-----|-------|---------|-----|
| #          | DAY | DAILY | %CHANGE |     |
| 1          |     |       |         |     |
| 2          |     |       |         |     |
| ·          |     |       |         |     |
| 99         |     |       |         |     |

DAY: Growth day

DAILY: Same day's number

%CHANGE: Change since yesterday

## Mortality

| MORTALITY |     | #01   |       |
|-----------|-----|-------|-------|
| #         | DAY | DAILY | TOTAL |
| 1         |     |       |       |
| 2         |     |       |       |
| ·         |     |       |       |
| 100       |     |       |       |

DAY: Growth day

DAILY: Mortality rate for the day

TOTAL: Mortality since growth day 1

## Alarm:

| ALARMS                              |         |     |      |
|-------------------------------------|---------|-----|------|
| <input checked="" type="checkbox"/> | MESSAGE | DAY | TIME |
| <input type="checkbox"/>            |         |     |      |
| <input type="checkbox"/>            |         |     |      |

Status icon to indicate whether active or inactive



=NOT ACTIVE



=ACTIVE

# History

Actions

# Test

Version

Analogue sensors

## Actions:

| ACTIONS |         |     |      |  |
|---------|---------|-----|------|--|
|         | MESSAGE | DAY | TIME |  |
| 1       |         |     |      |  |
| 2       |         |     |      |  |

The table featuring actions is identical to the alarm table apart from the fact that there are no light emitting diodes.

## 4. TEST

**The menu is normally only used by service technicians.**

4.1 Version

4.2 Analogue sensor

### 4.1 Version

In order to check each of the Master versions, press the “Room” key and enter the number of the room concerned.

In order to check the version of the Center, press the “Room” key and “0”.

| CENTER VERSION |      | #01 |
|----------------|------|-----|
| SOFTWARE       | 1.10 |     |
| U5             | 1.00 |     |
| U1             | 1.00 |     |

The version number is a combination of the hardware and the software.

The main number is the hardware version

The secondary number is the software version

(1.05: 1 is hardware and 05 is software)

### 4.2 Analogue sensors

| ANALOGUE SENSORS |       | #01        |
|------------------|-------|------------|
| T1               | : 537 | RH : 395   |
| T2               | : 515 | IN-2 : 609 |
|                  |       | IN-3 : 499 |

The values indicate the uncorrected A/D values and can be used to demonstrate noise in the system.

# Service menu

Temp. calibration  
Humidity calibration  
Pressure calibration

## 5. Service menu

1. Temp. calibration
2. Humidity calibration
3. Pressure calibration
4. Hydro calibration
5. Variable speed
6. Water and feed

|                 |         |
|-----------------|---------|
| HUMIDITY CALIB. | #10     |
| Humidity        | Factor  |
| Humidity?       | 0.0 0.0 |

### Temp. calibration

If required, the calibration of the temperature sensors can be adjusted (left arrow and right arrow) in this menu. Select the sensor to be calibrated using the up arrow and down arrow.

### Humidity calibration

If required, the calibration of the humidity sensors can be adjusted (left arrow and right arrow) in this menu. Select the sensor to be calibrated using the up arrow and down arrow.

### Pressure calibration

The pressure sensor's zero point normally only has to be calibrated when commissioning the system. This is done from this menu. The screen for this menu is as follows:

|                       |   |
|-----------------------|---|
| PRESSUR CALIB         |   |
| Disconnect hoses      |   |
| A/D Read out          | 0 |
| Press Enter for start |   |

Before the calibration process is started by pressing ENTER, both hoses on the RPS/1 pressurestat should be removed.

# Service Menu

Hydro calibration  
Variable speed  
Water and feed

## Hydro calibration

|                   |        |
|-------------------|--------|
| HYDRO CALIBRATION |        |
| MIN. 0            | MAX: 0 |
| START CALIBRATION |        |
| NO←               | YES    |

|                    |           |
|--------------------|-----------|
| HYDRO CALIB.       |           |
| Min.: 0            | Max.: 112 |
| PRESS esc. to stop |           |
| □□□□□□■□□□□□□□     |           |

- **Before commencing the calibration process, make sure that the potentiometer is on input 2 or 3, and that the drive station is defined.**

## Auto calibration

By selecting Yes, the calibration procedure will commence.

The drive station will now open fully and then close completely.

The procedure is complete when a message saying Calibration OK or Poor calibration appears on the display.

## Variable speed

|                          |        |
|--------------------------|--------|
| VARIABLE SPEED           | #01    |
| Minimum speed for motor  |        |
| Min. speed               | ▶ 30%  |
| Protection against frost | Yes/No |

Protection against frost: The control unit is designed so that on start-up it will run up to 100% for 3 seconds before throttling back to the desired ventilation. This is done in order to be certain that it will start after an extended period of inactivity.

## Water and feed

|                    |     |
|--------------------|-----|
| Watering/feeding   | #01 |
| Watering per pulse | 0.1 |
| Feeding per pulse  | 1.0 |

The watering and feeding systems are registered according to a pulse counting method. Enter the quantity of feed/water per pulse that you wish the system to register.

# Installation

Relay layout  
Analogue output

## 6. Installation

### Relay layout

| Relay number | Function       | Normally open/closed |
|--------------|----------------|----------------------|
| 1            | Cycle Heat     | NO                   |
| 2            | Cont. Heat     | NO                   |
| 3            | Climate-2 Heat | NO                   |
| 4            | Vent. 1-5      | NO                   |
| 5            | Cooling        | NO                   |
| 6            | Vent Open      | NO                   |
|              | Vent Closed    | NO                   |
|              | Spraying       | NO                   |
|              | Washing        | NO                   |
|              | Extra System   | NO                   |
|              | Alarm          | NO                   |
|              | Triac          | NO                   |

Each relay can be connected to any of the functions.

You can also choose whether you want the relay to be open or closed as standard by pressing the Shift key.

### Analogue output

| ANALOG OUTPUT         | ==0%== | ==100%== |
|-----------------------|--------|----------|
| 1. Variable heat      | 0,0V   | 10,0V    |
| 2. Exhaust vent       | 0,0V   | 10,0V    |
| 3. Injection vent     | 0,0V   | 10,0V    |
| 4. Extra function 1-5 | 0,0V   | 10,0V    |
| 5. Recirculation      | 0,0V   | 10,0V    |
| 6. Triac              | 0,0V   | 10,0V    |

Everything in the analogue output list except for the variable heat and triac goes directly into the level table. (table 6 in this section) (section 6.6)

- External function 1-5 enables 5 different independent outputs in the ventilation graph.
- Triac is used, for example, if a slave regulator is connected that shall run parallel with the built-in regulator.

By means of ==0%== and ==100%== it is possible to calibrate the analogue output signal, i.e. if 2,0V is entered under 0%, 0% ventilation will give an output voltage on the output in question of 2V. The same will be the case for the 100% column

# Installation

Analogue input  
Digital input  
Combination

## Analogue input

| ANALOGUE INPUT |                              | #01 |
|----------------|------------------------------|-----|
| Temp-1         | None / In / Out / Clim-2     |     |
| Temp-2         | None / In / Out / Clim-2     |     |
| HUMIDITY       | None / Chosen                |     |
| INPUT-1        | NONE / POT. METER / PRESSURE |     |
| INPUT-2        | NONE / POT. METER / PRESSURE |     |

Analogue sensors comprise temperature and humidity sensors. The PigMaster has capacity for two temperature sensors and a humidity sensor.

The two other inputs are either a pressure sensor or a potentiometer. Choose IN or OUT for the temperature sensors depending on where they are placed. IN for indoor temperature and OUT for outdoor temperature.

## Digital input

| DIGITAL INPUT |                                   |
|---------------|-----------------------------------|
| Input-1       | None/ water / Feed / Extra Alarm. |
| Input-2       | None/ water / Feed / Extra Alarm. |
| Input-3       | None/ water / Feed / Extra Alarm. |

There are 3 digital inputs and a choice between water, feed, extra alarm or none. EXTRA ALARM: when you operate a unit, a digital input is sent to ensure that the unit is in fact switched on. If this is not the case, the alarm will be triggered.

## Combination

Combination is an operational function that corresponds to a motor that gradually changes gear. The Total column specifies the % of max. ventilation each combination (Lines) can manage.

1

| # | MIN% | TOTAL | VENT 1 | VENT 2 |
|---|------|-------|--------|--------|
| 1 | 0    | 100   | NO     | NO     |

1. In the first table we can see a situation in which the room can be ventilated by the variable speed that ranges from 0 to 100%, and as a minimum will be that to which it was programmed under variable speed calibration.

2

| # | MIN% | TOTAL | VENT 1 | VENT 2 |
|---|------|-------|--------|--------|
| 1 | 0    | 50    | NO     | NO     |
| 2 | 15   | 100   | YES    | NO     |

2. In this example we added a fan, and programmed it to run at minimum 15%. The control unit automatically alters the total column to a linear table.

# Installation

## Combination Level System

Now, where the variable speed reaches the total limit of 50, fan 1 begins to run at full speed, and the variable speed increases gradually from 15% to full speed (similar to a car)

3

| # | MIN% | TOTAL | VENT 1 | VENT 2 |
|---|------|-------|--------|--------|
| 1 | 0    | 33    | NO     | NO     |
| 2 | 15   | 66    | YES    | NO     |
| 3 | 20   | 100   | NO     | YES    |

3. In the third example fan 2 has been switched on, and we programmed the variable fan to start at min. 20%, and the control unit updated the table once again.

The value that is assigned to the first column (min. variable speed) is the minimum speed that prevents the motor from rotating backwards.

- When you have finished filling out the combination table, you can still make a fine adjustment to the total column, but if you adjust anything else, the control unit will alter the entire table.

### 6.6 Level

| Level | Ex.% | Hydro | Injection | Exhaust | Extra function1-5 | Recirculation |
|-------|------|-------|-----------|---------|-------------------|---------------|
| 1     | 10   | 10    | 10        | 10      | 10                | 10            |
| 2     | 20   | 20    | 20        | 20      | 20                | 20            |
| 3     | 30   | 30    | 30        | 30      | 30                | 30            |
| ...   | ...  | ...   | ...       | ...     | ...               | ...           |
| 10    | 100  | 100   | 100       | 100     | 100               | 100           |

Ex.: exhaust capacity for each level is defined in the level menu.

The combination diagram runs in accordance with Ex.%

The other functions are set as required and will also run according to the set levels.

### System:

#### **Humidity**

Max Heat.(%) (0-100%): Maximum permissible heat consumption due to humidity level too high.

Max Vent.(%) (0-100%): If ventilation is in excess of the value set in this parameter, the control unit will stop heat supply due to humidity.

#### **Cooling**

Permissible from day: The cooling function is only effective from this growth day.

Hysteresis: Tolerance for the cooling system.

#### **Heat**

Min. On time: If the heating system is started, it will remain on for at least this period.

# Installation

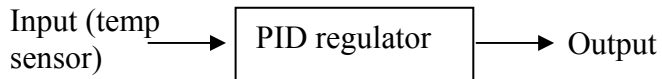
## System PID

Cycle time: Used in the event of Cycle heat.

Offset: This value will offset the starting point for the use of heat in relation to the desired temperature, e.g. a value of 2° here will mean that heat will not be supplied until the temperature is 2 degrees below the desired temperature.

### 6.7 PID

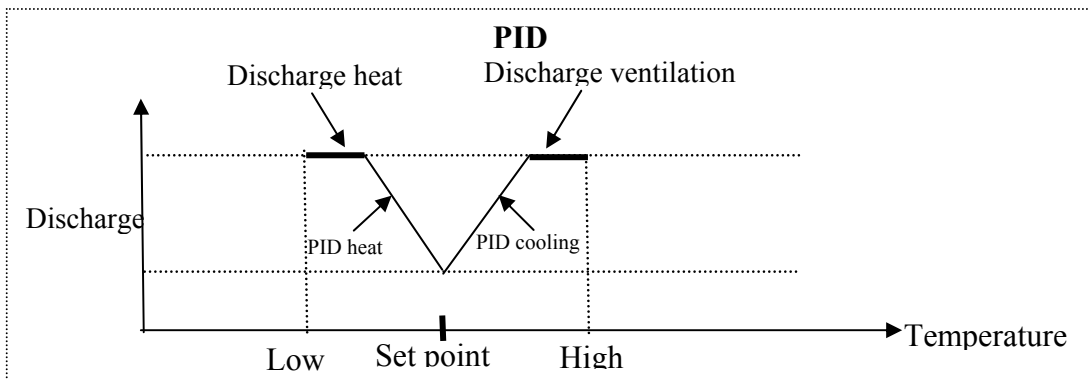
|                          |               |
|--------------------------|---------------|
| XP band (2[c]→10[c])     | Standard: 10  |
| I Factor (0%→50%)        | Standard: 40% |
| D Factor (0%→10%)        | Standard: 2%  |
| I Time (10→600 [second]) | Standard: 60  |



PID control means proportional, integral and derivative control.

The temperature control system sends input to the PID control.

The input signal represents the difference between the temperature actually measured in the room, and the desired temperature to the PID.



The elements are always active so they can ensure immediate action, and are linear functions of the error signal assessed on the basis of changes and time.

The PID setting parameters must be optimised for each individual system.

- Contact your service dealer if the PID regulator is not functioning properly.

# Installation

## PID

### Explanation

The PID defines the ON time for the heating unit. If, for example, the PID demands 20% operation, the variable heating unit will operate at 20%, and the relay for the heating unit will operate 20% ON from the total cycle time that is set here.

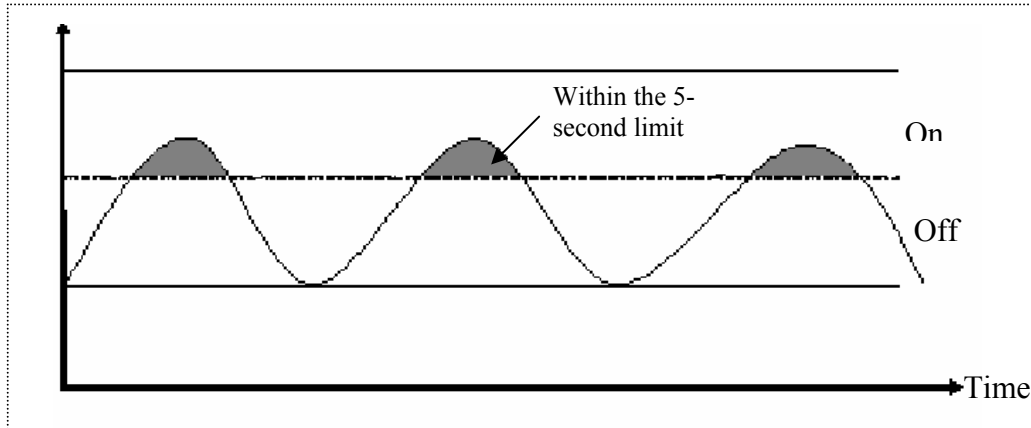
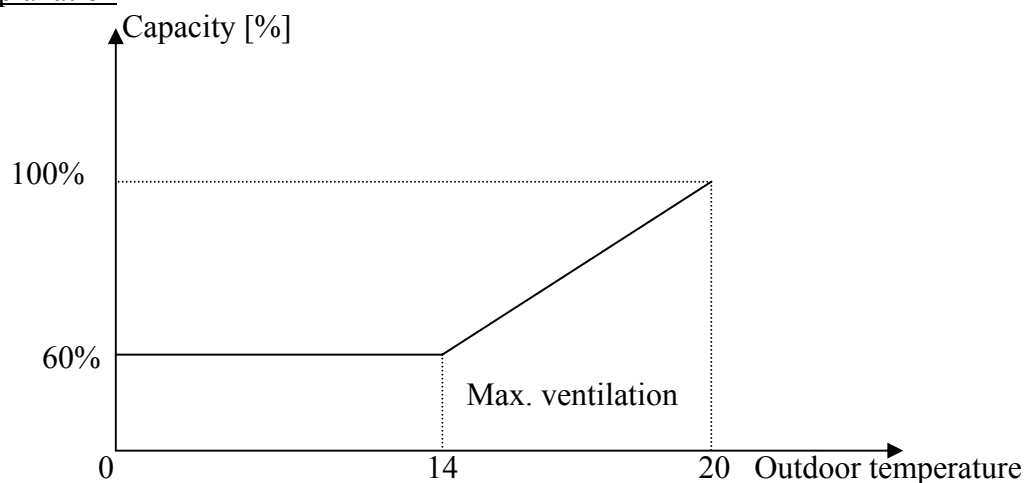


Figure 8

### **Outdoor temperature**

Xp  
Set-point  
Max. ventilation %

### Explanation



Outdoor temperature set-point = 14  
Outdoor temperature limit = 6  
Max. ventilation = 60

The values in the example are also the standard values (cold start)

Limits:

Outdoor temperature set-point 0 → 30  
Outdoor temperature limit 2 → 10  
Max. ventilation 0 → 10

The setting of these parameters is the setting of the limits for ventilation (level) with respect to outdoor temperature.

# Master

Cold start  
Calibration

## MASTER

### COLD START

In order to carry out a cold start, all 3 of the Master buttons must be pressed simultaneously, and they must be held down whilst the mains power is connected, after which the following will appear:



When this screen image appears, the control unit has successfully carried out a cold start.

### Stable number

Each Master must be assigned a stable number from 1 to 10. Two Master units with the same stable number may not be connected to the same Center unit. The stable number is set by pressing both arrow keys at the same time. The Master will then write NO in the display. The stable number can then be set on the Master in question, and the operation completed by pressing Select.

### Main menu

When you start the Master, the main screen image will appear and display the rooms' average indoor temperature. By pressing the Select button, you can browse the information contained in the main screen image.

t r g : Desired temperature for the stable, which can only be altered by the Master itself if a graph has been defined.

r H : The stable's humidity level.

r H . t : Desired humidity level.

d a y : Growth day for the stable.

**The display switches between the name of the value and the figure itself.**

### Calibration

#### Temperature sensor calibration

When a Master program is installed and/or a sensor replaced, a calibration procedure must be carried out in the following manner:

- Use an accurate thermometer.
- Place it close to the temperature sensor.
- Make sure that the indoor temperature is stable.
- Calibrate the temperature sensor immediately after reading it off.

#### Calibration procedure

1. To access the calibration menu, press Select and the up arrow key simultaneously and keep them depressed for approx. two seconds.
2. The display switches between the sensor number and the temperature that the sensor measures.
3. Use the arrow keys to change the temperature.
4. Press Select to switch between the sensors and use the arrow keys to change temperatures.

**NOTE:** Calibration of the humidity sensor should be carried out in exactly the same manner. The only difference is that the humidity is measured by an external humidity sensor.

# Master

## Test

### Test

The test option is primarily used in connection with the installation procedure in order to check that all systems are functioning correctly. To access this test menu, press Select and the down arrow key simultaneously and keep them depressed for approx. two seconds.

The display switches between the name of the I/O and an ON/OFF symbol, and by using the arrow keys, you can switch between on and off.

rL . 0 : Full speed triac relay.

rL . 1-6 : Relay, one to six.

SPd : Variable speed. (Check 30 to 100 A/D by using the arrow keys)

AO1-5 : Analogue outputs 1 to 5.

Ai1-3 : Analogue inputs 1 to 3.

t1, t2 : Temperature sensors with the temperature flashing on the screen.

DG1-3 : Digital input 1 to 3.

PID : Used to override the control unit when the vent settings are to be tested. If this is set to, for example, 50%, the vents and fans will adjust themselves in relation to the settings in level 5.

# Technical specifications for Master

Power supply  
Analogue inputs  
Digital inputs  
Relay outputs  
Housing  
Ambient climate

## Technical specifications for Master

### Power supply

---

|  |          |
|--|----------|
| Mains voltage.....single phase 230V alternating current / single phase 110V alternating current (USA & CANADA) |          |
| Mains frequency.....   | 50/60 Hz |
| Maximum power consumption.....   | 10VA     |

### Available power for external units

#### Analogue inputs

---

|   |                    |
|---|--------------------|
| 2 analogue inputs for temperature sensors | RTS-2 (THERMISTOR) |
| 5 analogue outputs                        | 20mA 0-10V         |
| 1 humidity sensor input                   | 0-3V               |
| 2 analogue inputs                         | 0-5V               |

#### Digital inputs

---

|                  |             |          |
|------------------|-------------|----------|
| 3 digital inputs | dry contact | 5V/2mAmp |
|------------------|-------------|----------|

#### Relay outputs

---

|                          |       |
|--------------------------|-------|
| 6 N.O. current relay     | 5Amps |
| 250V alternating current |       |

#### Housing

---

|                                       |            |
|---------------------------------------|------------|
| Plastic housing with a screw-on cover | IP 56      |
| Dimensions (LxWxH)                    | 235x185x93 |

#### Ambient climate

---

|                             |                   |
|-----------------------------|-------------------|
| Operating temperature range | 0° C to + 50° C   |
| Storage temperature range   | -10° C to + 70° C |

# Master Installation Guide

Sensors and shielded cable  
Installation and electrical connections

## Master Installation Guide.



### Sensors and shielded cable

1. In the event of long cable lengths, the shielding should only be connected to ground at one end.
2. From the ground terminal a heavy-duty cable should be led directly to the earthing rod. If necessary, however, a heavy-duty earth cable can be connected to the electrical installation.
3. Do not use thin cables for these ground connections. The cables must be able to withstand large currents from, for example, lightning. Such currents can momentarily exceed thousands of amperes. In no circumstances should shielding from sensors or other low voltage cables be used for this purpose.
4. Check that all ground connections are routed to a central point. If there is a lightning strike, earthing points one or two metres from each other will have a large potential difference. If you have several electronic control units with individual earthing, these must be connected to a common point. This point must continue to an earthing rod. In no circumstances should shielding be used as ground connections.
5. Do not use shielding to create a path for lightning strikes. On long shielded cables such as those that run between buildings, only ONE END of the shielding must be connected to ground. This is done to reduce the risk of bridging the mains networks in the buildings.
6. When the sensors are connected with long cables, make sure that the connection is WATERPROOF. Use shrink tubing with a hot adhesive membrane (certified for maritime use) to make waterproof connections.
7. Use a good crimp assembly joint for connections. This is better than soldering. It is not sufficient to just twist the wires together and cover the connection with insulation tape.
8. Keep the sensor wires separate from the mains network and high-voltage lines. Make sure that lightning strikes on other networks do not affect the sensors.
9. Install the outdoor temperature sensor on the north side of the building so that there is no risk of direct sunlight affecting its function.

### Installation and electrical connections

1. Install electronic control units at least 1 metre from sources of electrical noise such as high-voltage cables for motors, speed regulators, dimmers, contactors, etc.
2. Install electronic control units in ventilated rooms protected against extreme temperature and dirty surroundings. Place the control unit such that the user can easily operate the unit and read off the display.
3. Give the installation a professional appearance. Keep the low-voltage cables/wires separate from high-voltage lines.
4. Use shielded cables for low-voltage signals. Multi-core cables (that run between buildings) must be waterproof, gel-filled cables of high quality.
5. Cable inlets must be sealed in order to prevent contamination/corrosion of the electrical circuits. If silicone is used for sealing the cable inlets, the control unit must be opened until it has dried out, since the vapour emitted by the acetic acid can attack metal components, including the electronic circuitry.

# Mechanical Installation Guide

6. Cable inlets must only be located at the bottom of the cabinet. Leading cables in through the top or sides of the cabinet will void the warranty.

## Mechanical Installation Guide



The **Master** must be installed by an authorised electrician. The power supply must be cut off before installation is commenced in order to avoid electric shocks or otherwise damage the equipment.

It is recommended that the **Master** be installed in a service room/antechamber so that the control unit is not exposed to harmful gases or high humidity.

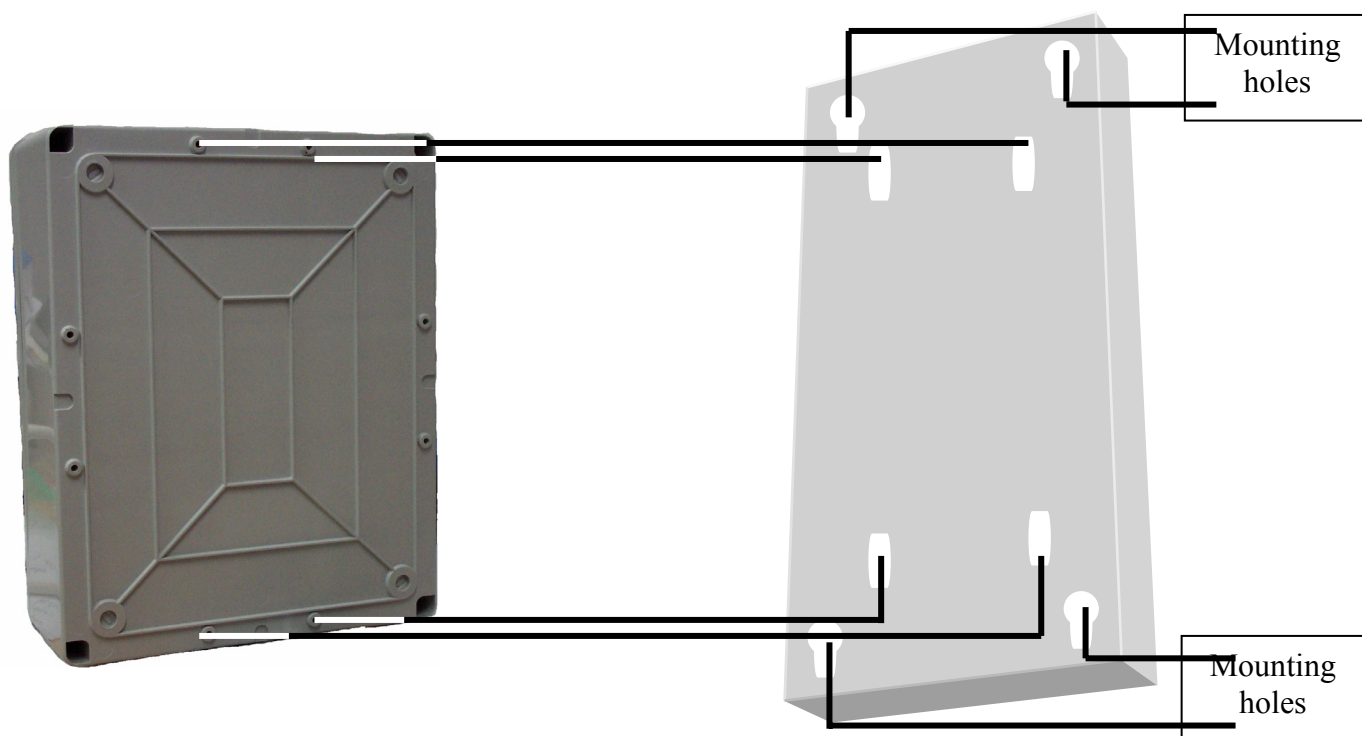
Installation category (overload category) II

The power supply to the control unit must be protected by a 30A circuit breaker.

1. Mount the metal plate on the rear face of the control unit by means of the enclosed screws. Then mount the control unit on the wall (see next page).
2. Remove the cover on the control unit by loosening the four screws.
3. Drill the required holes in the bottom of the control unit and fit the screwed connections for cables. Connect the cables in accordance with the diagrams.
4. Use cable dimensions that correspond to the power consumption.
5. Use shielded two-core or four-core 0.5-mm<sup>2</sup> gauge cable to connect the temperature and humidity sensors. Connect the shielding to the earthed metal rail. Do not connect the shielding to more than one point, since this may result in earth current loops.
6. Carefully close the MASTER's enclosure cover and tighten. Seal the cable holders with RTV silicone or a similar sealant.
7. When installation is complete, use the MASTER for a few hours, after which the correct function can be verified.

# Attachment of mounting plate

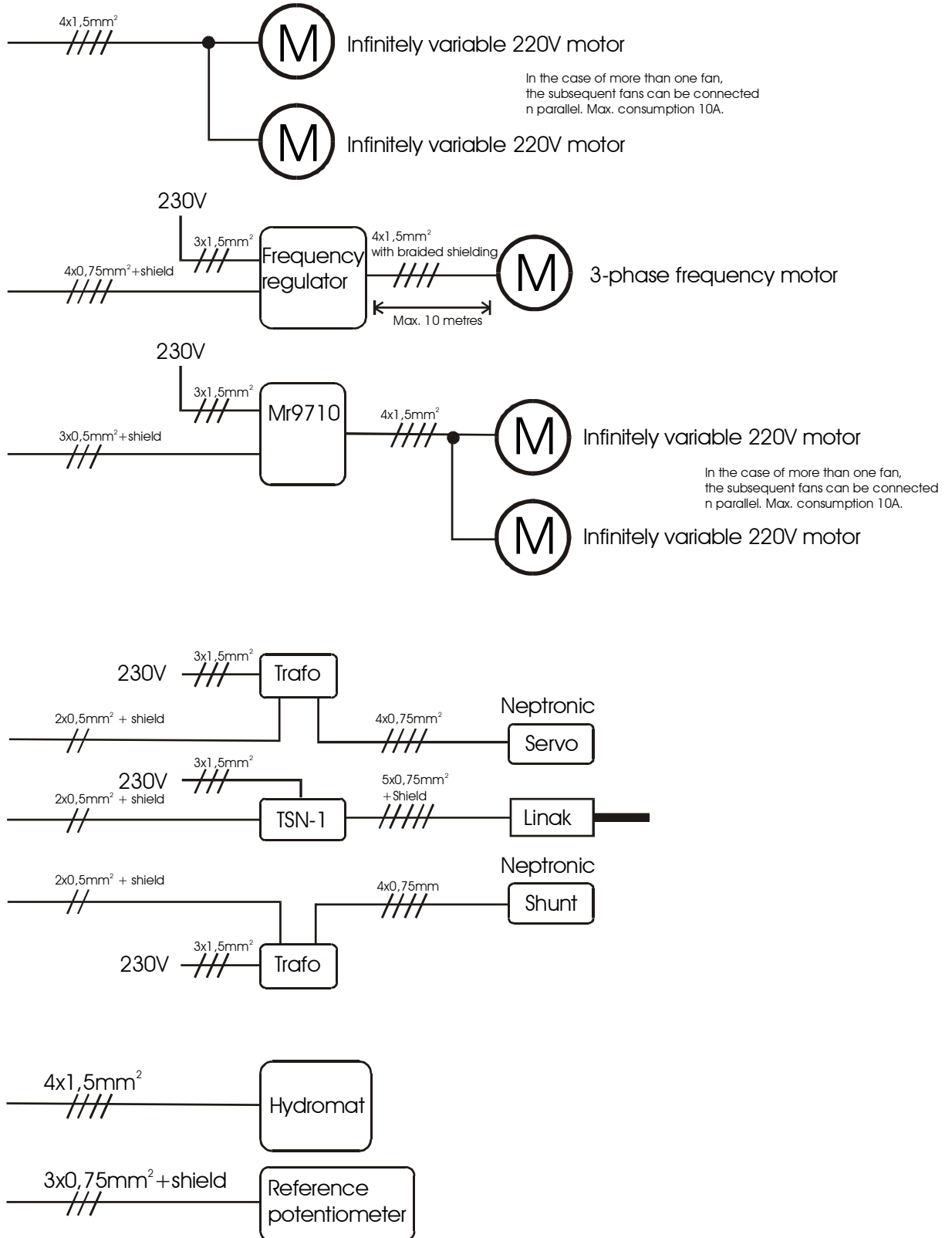
## Attachment of mounting plate



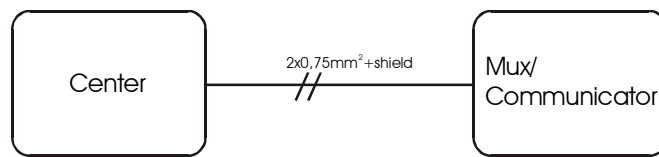
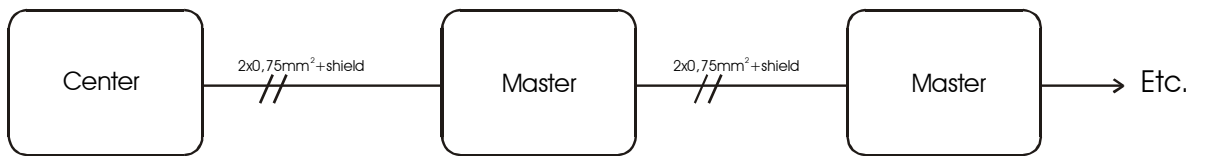
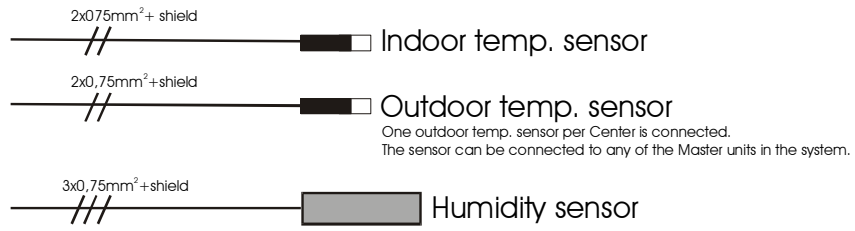
### Instructions

1. Screw the metal plate onto the back of the control unit with the enclosed screws. (The clear side should face the control unit).
2. Mark the outer mounting holes of the metal plate and drill mounting screws into these holes.
3. Mount the control unit onto the wall.

# Cable diagram

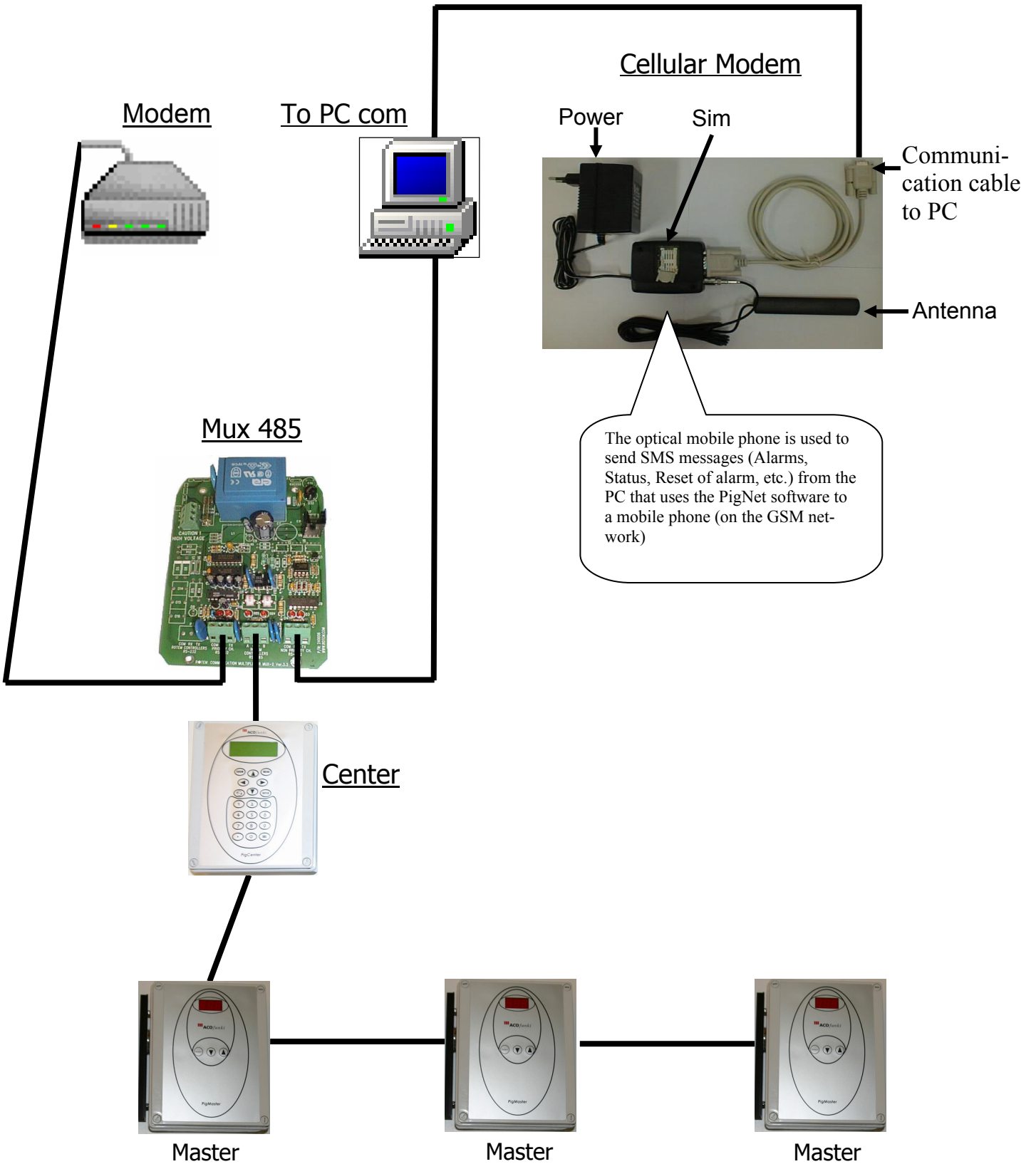


# Cable diagram



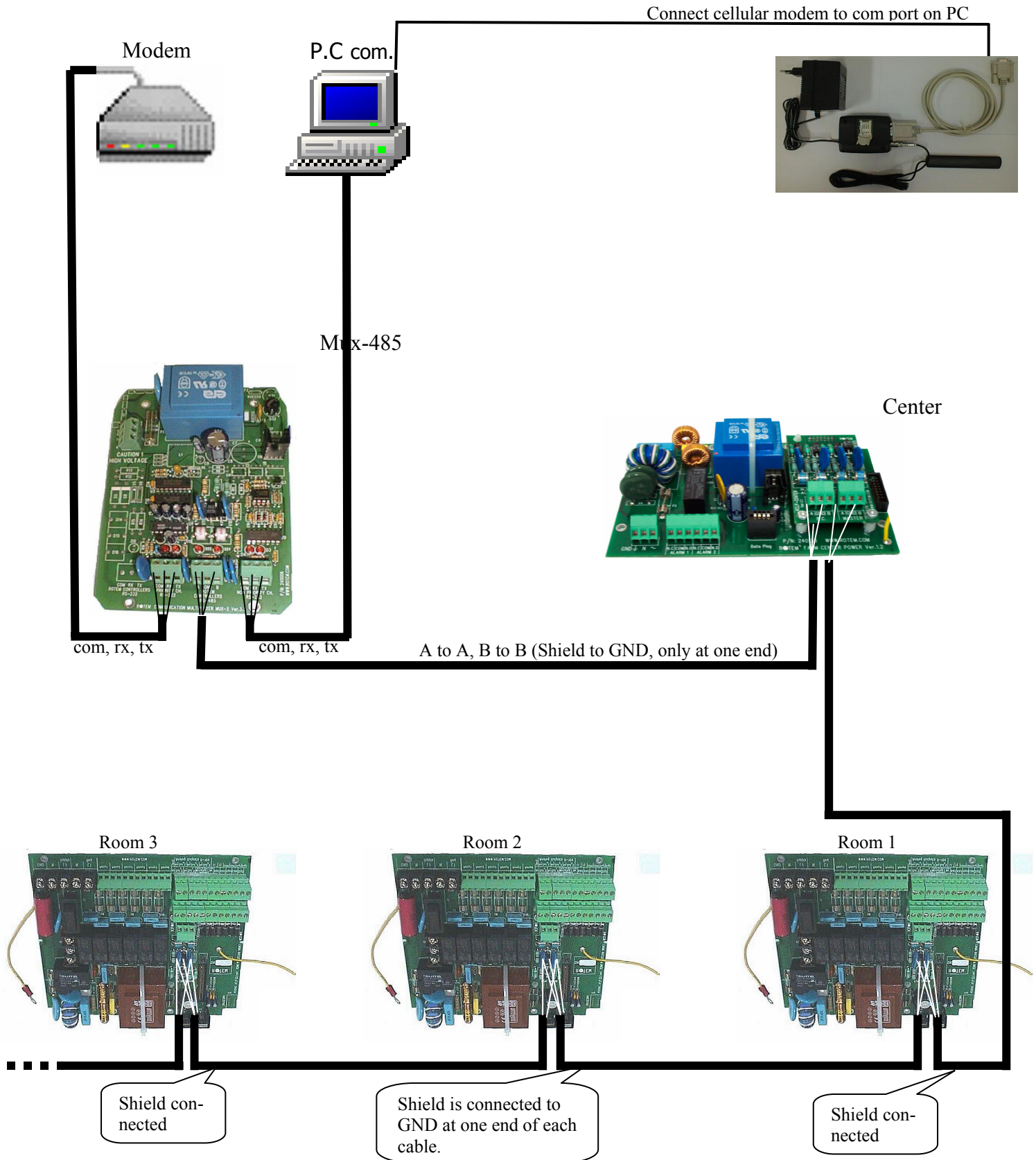
# MasterCenter network connection

## MasterCenter network connection

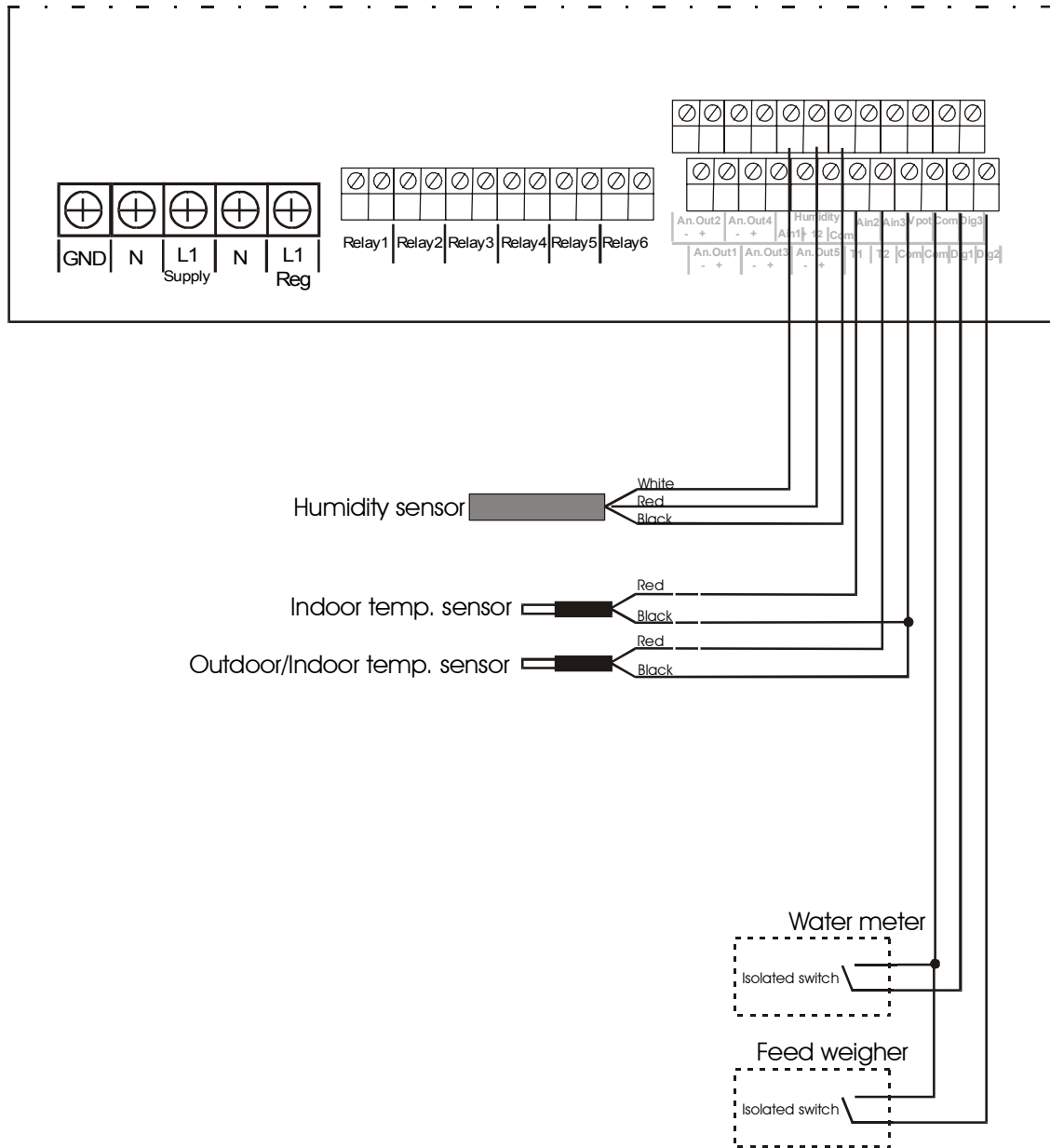


# Connection - Communication

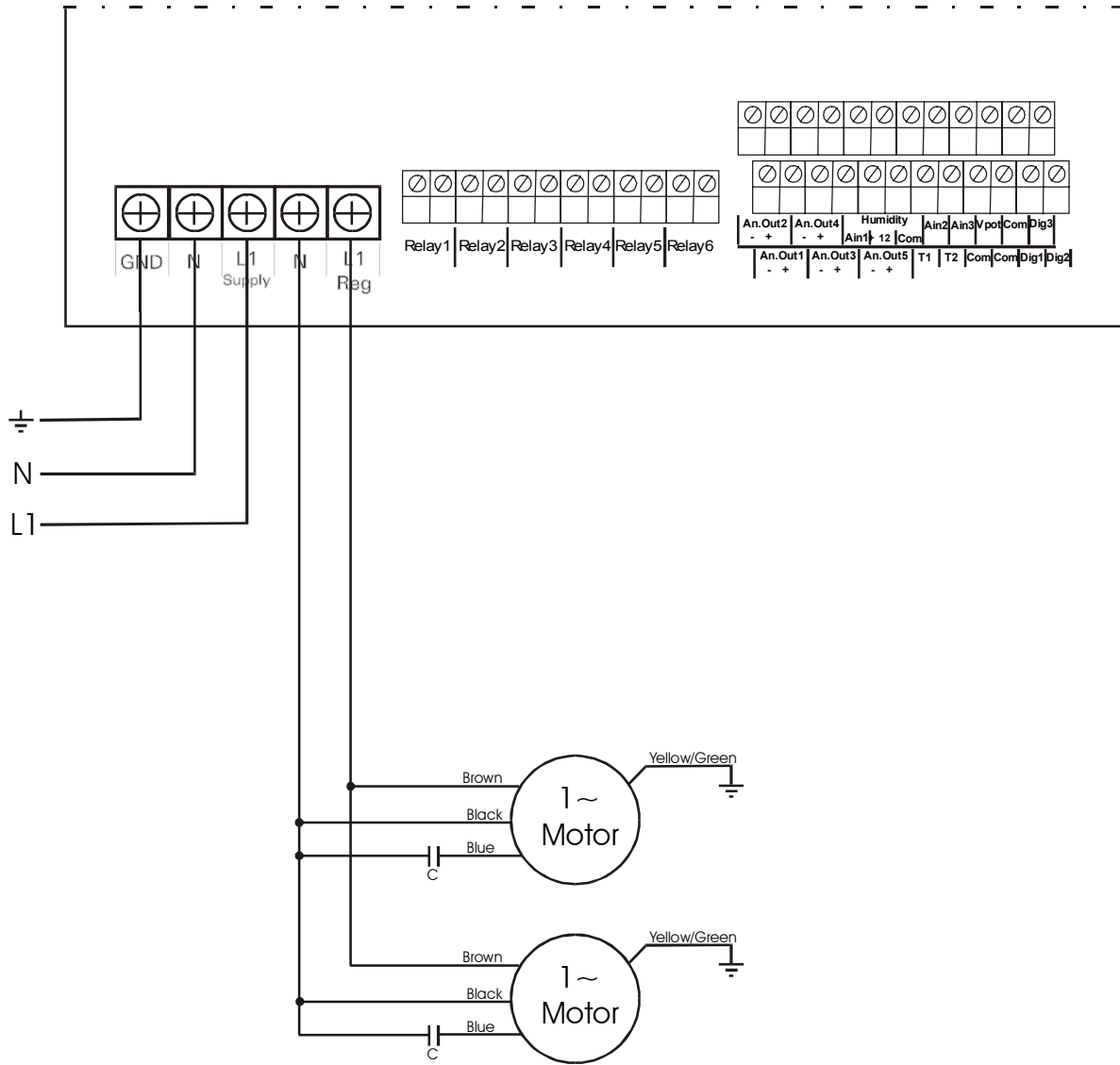
## Connection - Communication



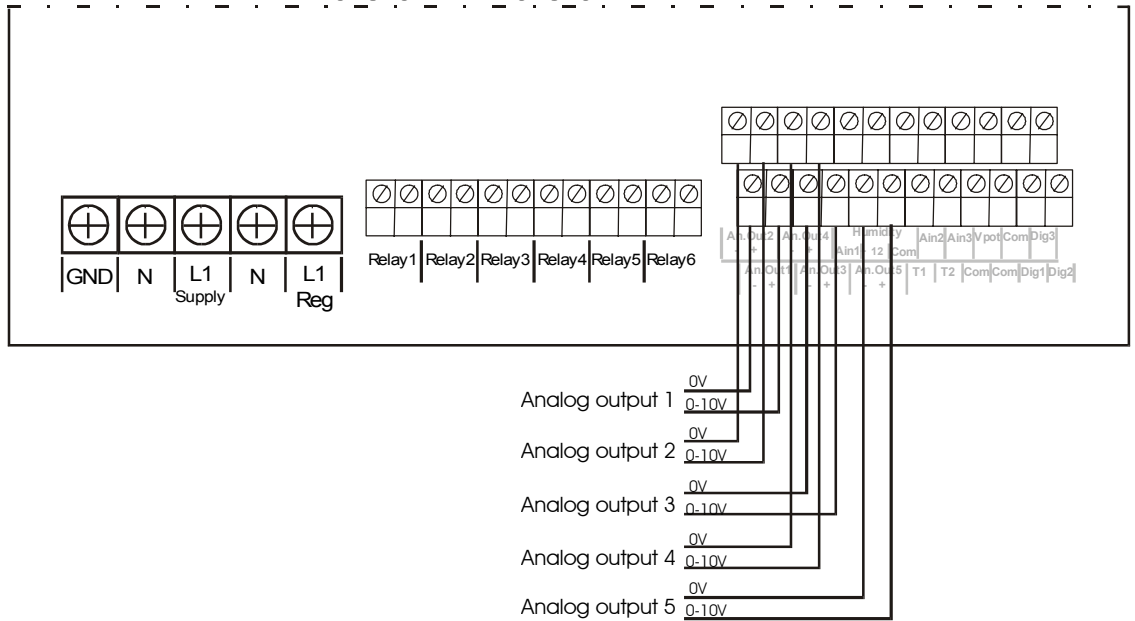
# Electrical connection - sensors



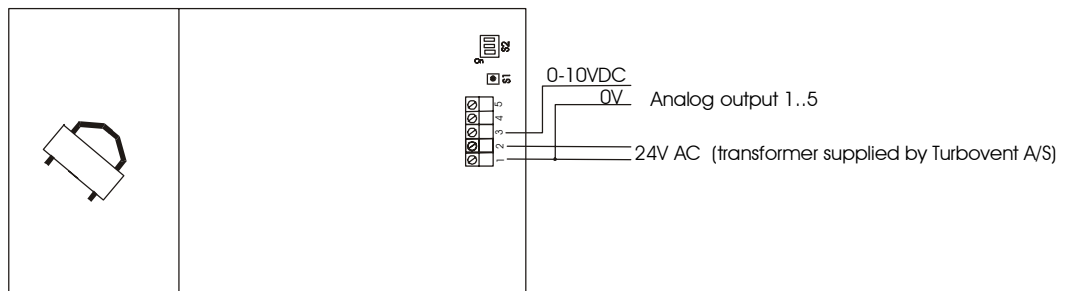
# Electrical connection - fan motors



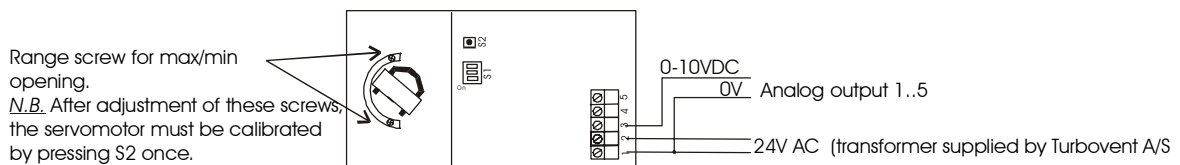
# Electrical connection - Neptronic 2060 - 4060



## Neptronic LDM 4060A



## Neptronic BBM 2060A



S1: Calibration switch. When electrical connection and S2 have been set, press S1 once (the power must be connected at least 20 seconds prior to this), after which the servo runs to the outer positions and saves these settings.

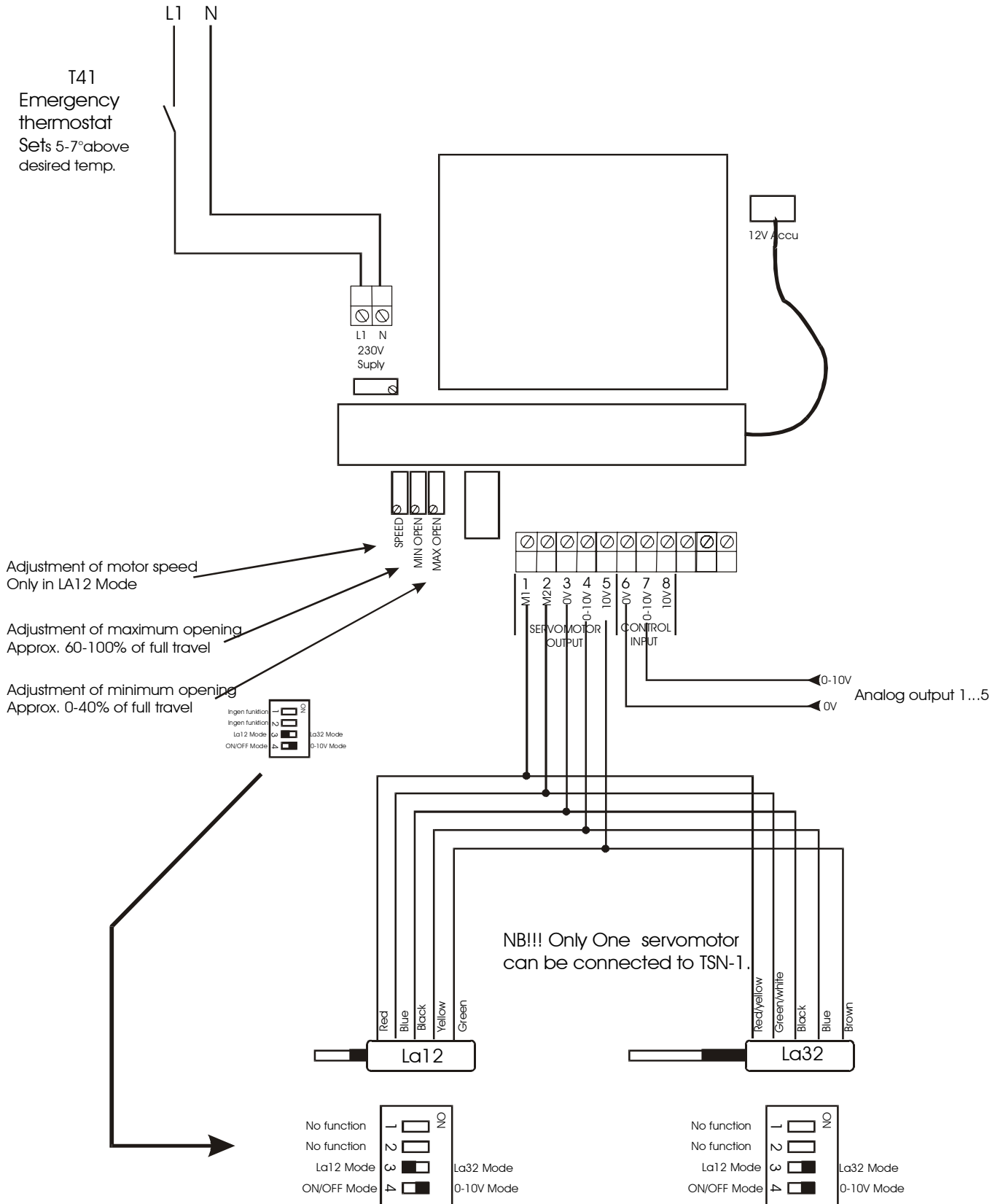
S2: 1 Direction of rotation  
2 Emergency opening (Direction)  
3 Not used

OPS: On Neptronic 2060 the designation of S1 and S2 is opposite of the other types.

Temperature emergency opening can be installed by placing T41 in series with the power supply.

# Electrical connection – TSN1 - Linak

## Electrical connection - TSN1 / Linak



# TSN1V2 Functional description

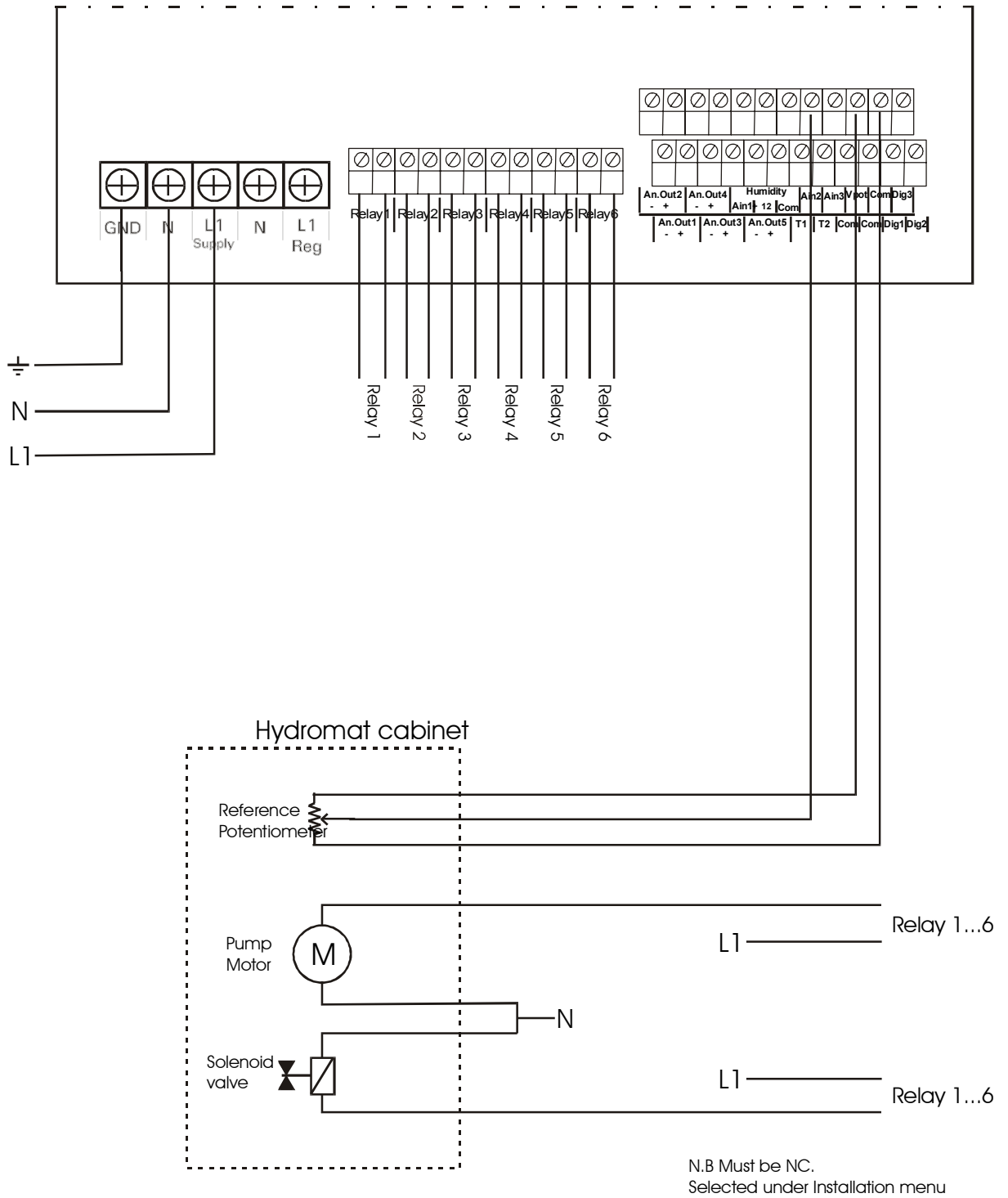
## TSN1V2 FUNCTIONAL DESCRIPTION

- \* TSN1 V2 is a modern automatic control unit used to control LINAK actuators. Using an actuator, the control unit will set a damper at a position corresponding to the input voltage 0-10V. This voltage can come from a DIGITRON or other temperature regulator.
- \* The damper position is determined from the input voltage, measured reference position and Max and Min set on the trimmers in the automatic control unit. 2 types of actuators, LA12 or LA32 can be used. LA12 is a high-speed servo with a current limit of 1.4A, LA 32 is a slow servo with greater torque and a current limit of approx. 4A.
- \* Emergency opening on built-in battery and charging circuit for the battery. Automatic stop at limits, also on battery back-up.
- \* Light-emitting diode indication of operating condition, including faulty connection and failure at current limits.
- \* Battery monitor indicates visually and audibly that the battery must be replaced.
- \* Option for slave operation, On/Off function from external automatic control unit determines open/close function.
- \* Automatic detection of interrupted control signal, opens if cable connections are broken.
- \* Adjustment of speed to motor with LA12 operation, enables more precise regulation around set point.
- \* Dip switch sets function and motor type, see wiring diagram.
- \* T41 thermostat in series with power supply 230V will ensure emergency opening in the event of circuit being broken.
- \* Technical specifications:
 

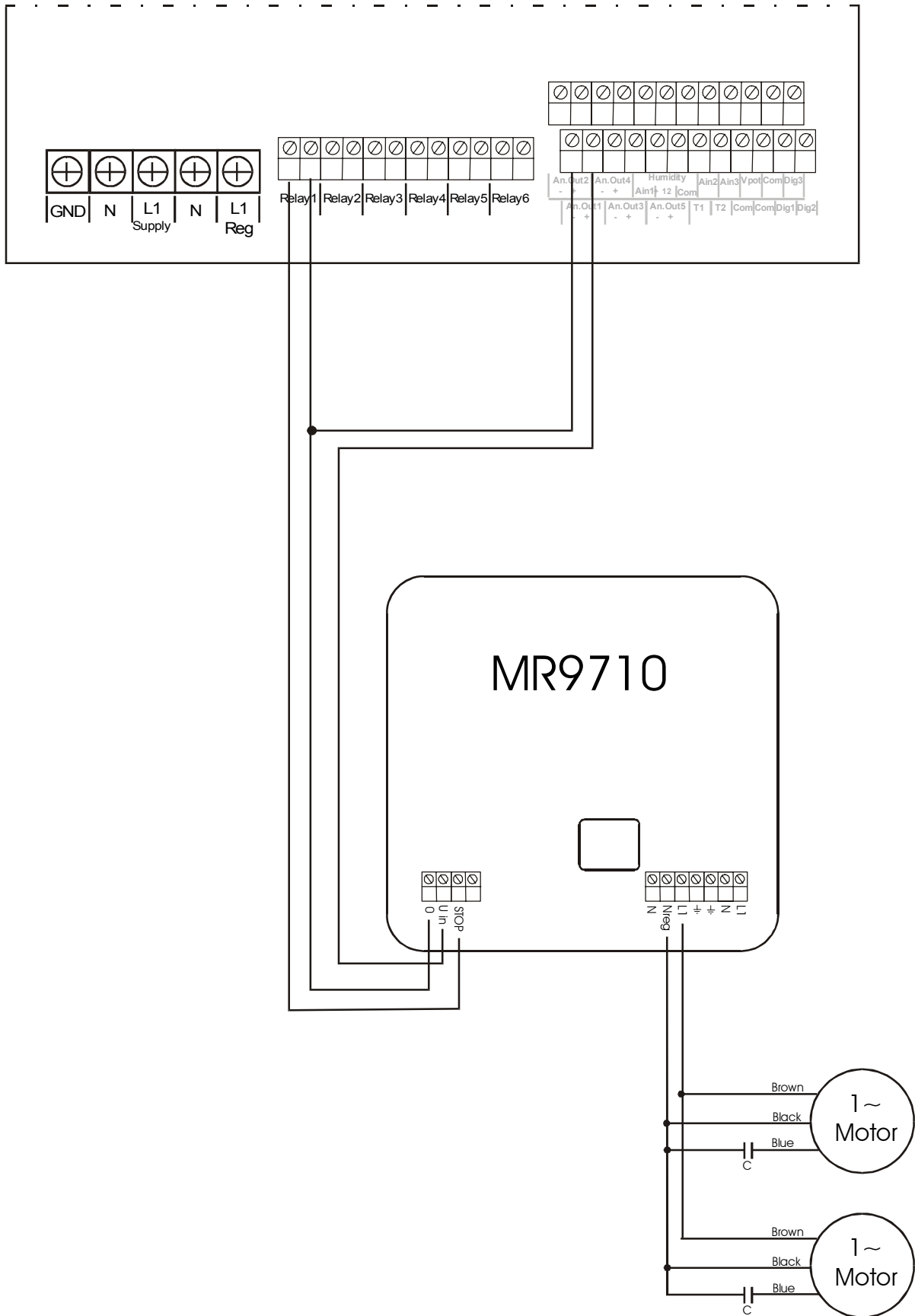
|                   |   |
|-------------------|---|
| Input             | 230V AC +/- 10%   |
| Output            | 5-24V DC max 4A   |
| Battery           | 12V / 0.7AH   |
| Charging          | Fixed 13.8V   |
| Emergency opening | Relay/Battery, stops in the event of excessive current.             |
| Control           | 0-10V DC  |
| Current limit     | 1.5A for LA12, 4A for LA32  |
| Audio             | Built-in beeper in the event of failure, etc. (see table)           |
| Lamp              | Built-in light-emitting diodes for open/close/failure               |
| Certification     | CE marked   |
| Settings          | Motor speed, Max opening, Min opening, actuator type, control mode. |
- \* Visual and audio indicators in various situations:

| Situation                  | Light-emitting diodes | Beeper     | Remarks  |
|----------------------------|-----------------------|------------|--|
| Motor stopped              | off                   | off        | normal situation   |
| Emergency opening          | off                   | off        | electronics off  |
| Short-circuit              | rapid push-pull       | rapid beep | must be switched off before new operation !                        |
| Interrupted control signal | rapid push-pull       | rapid beep | automatic reclosing  |
| Battery flat               | slow push-pull        | slow beep  | wait until recharging is complete<br>If continues, replace battery |
| Current limit              | medium push-pull      | off        | direction change resets failure                                    |

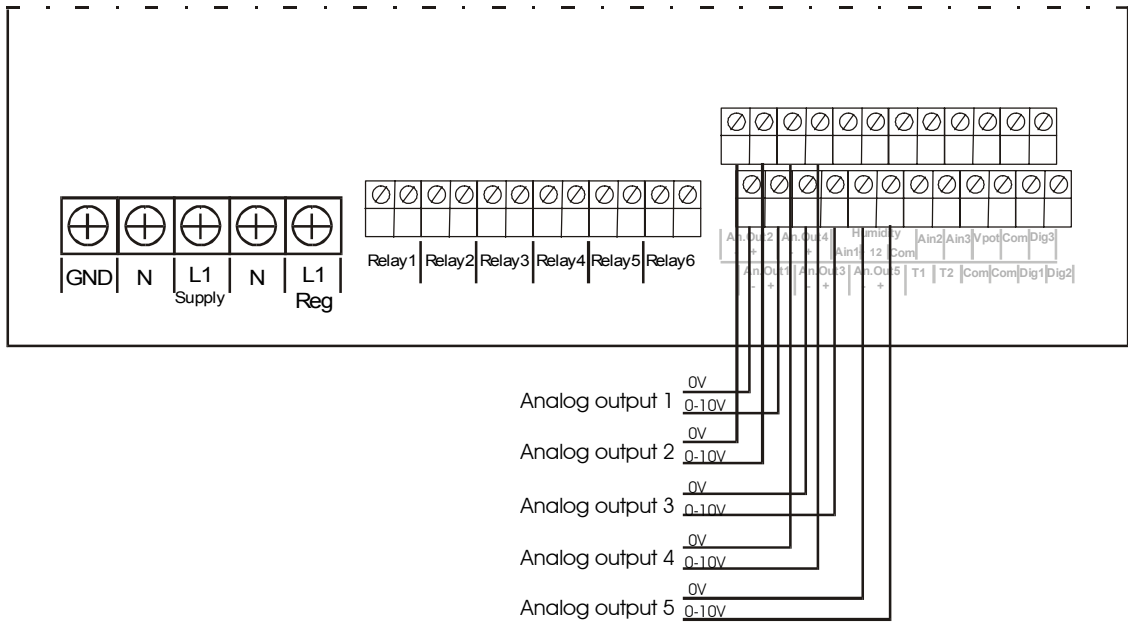
# Electrical connection – Oil hydromat



# Electrical connection – Extra Motor regulator 9710

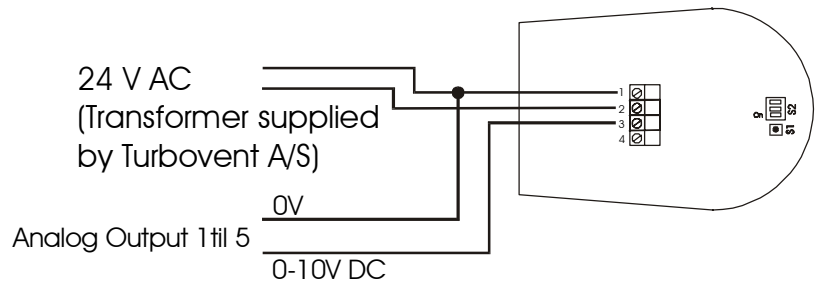


# Electrical connection – Shunt valve – On/Off heat



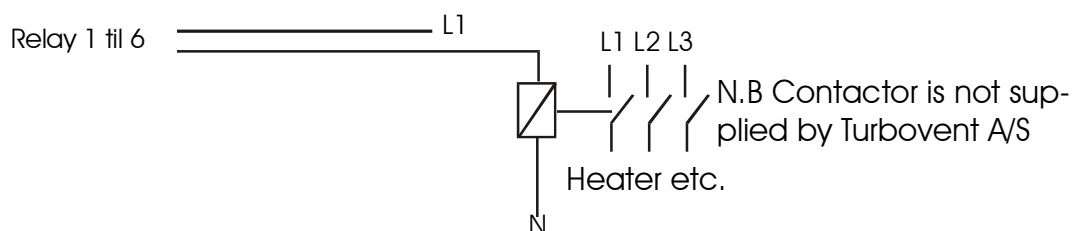
## Heat shunt

Neptronic AQM24-05-S Shunt

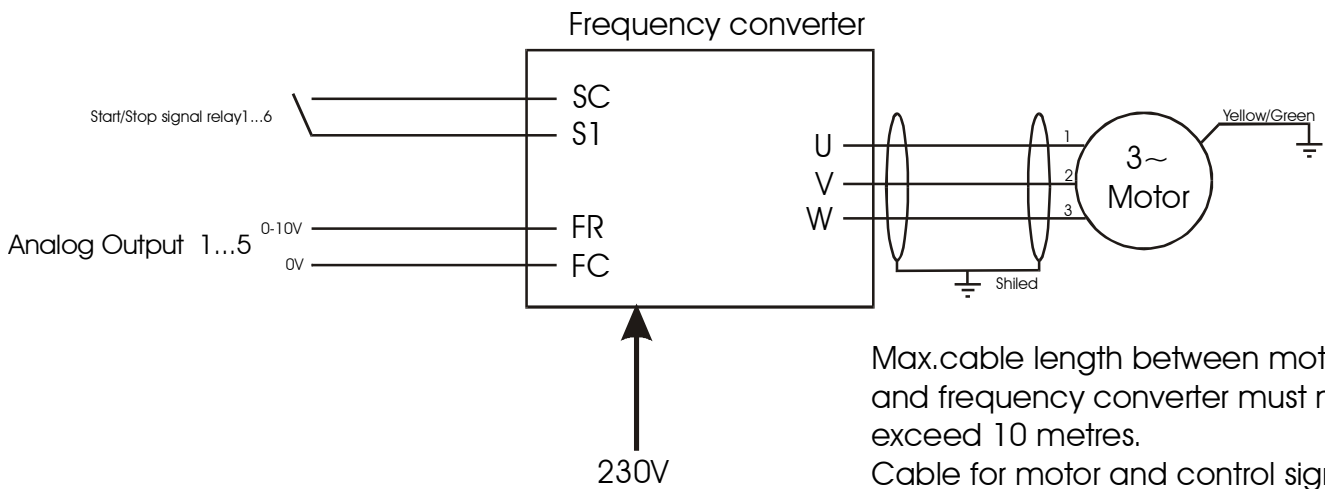
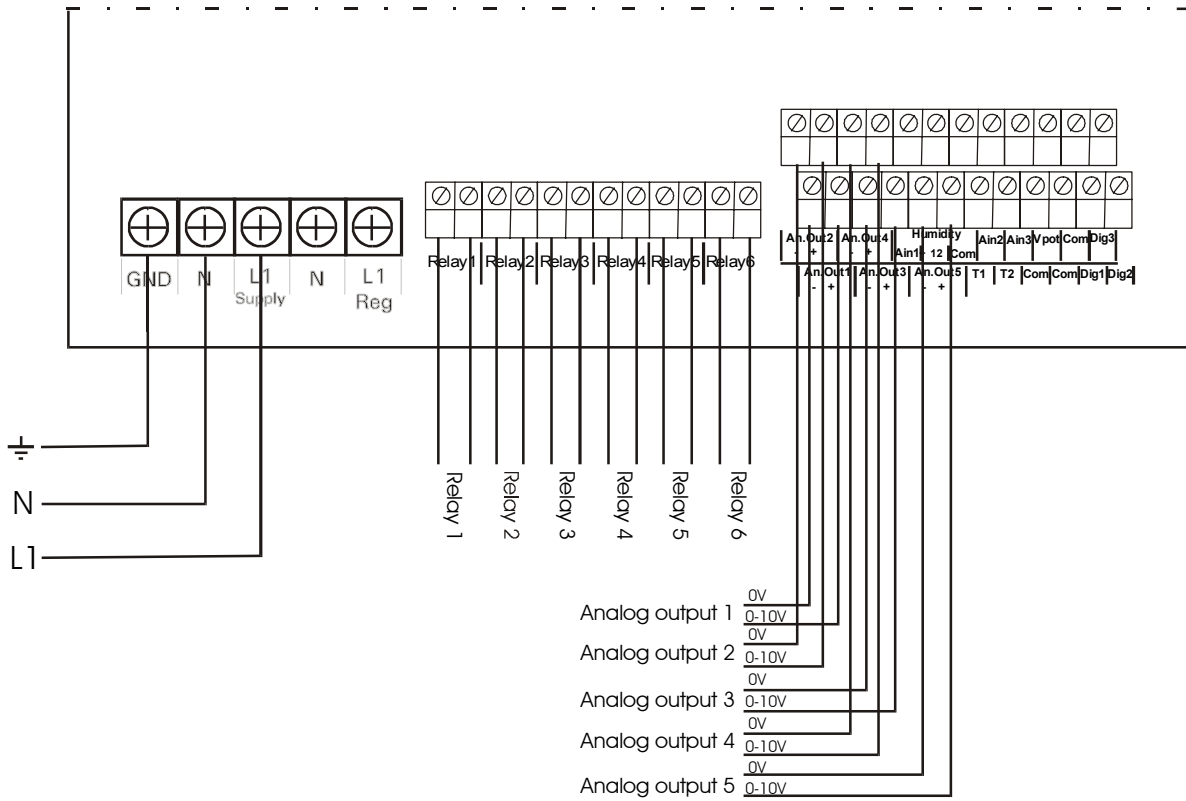


- S2: 1 Direction of rotation  
2 Not used  
3 Not used

## ON/OFF Heat

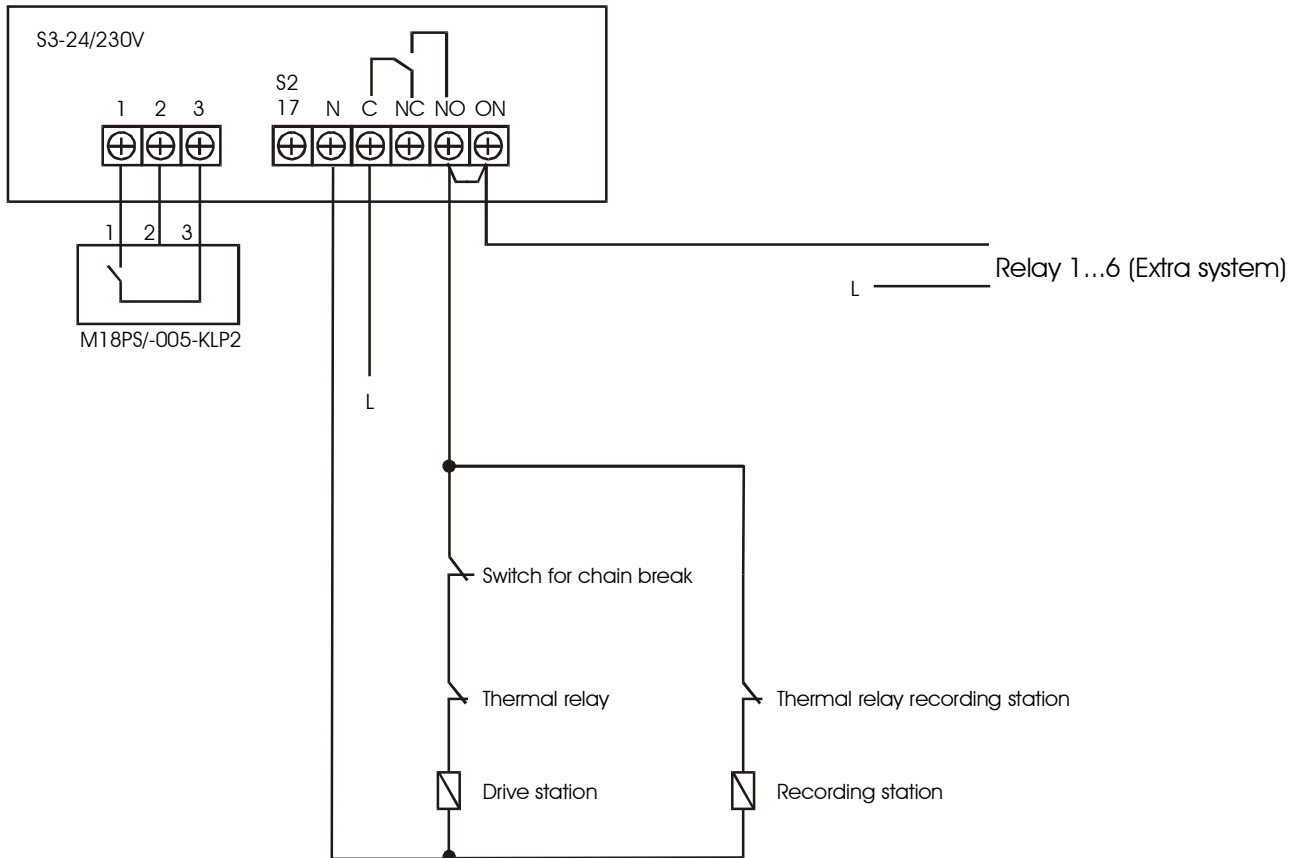
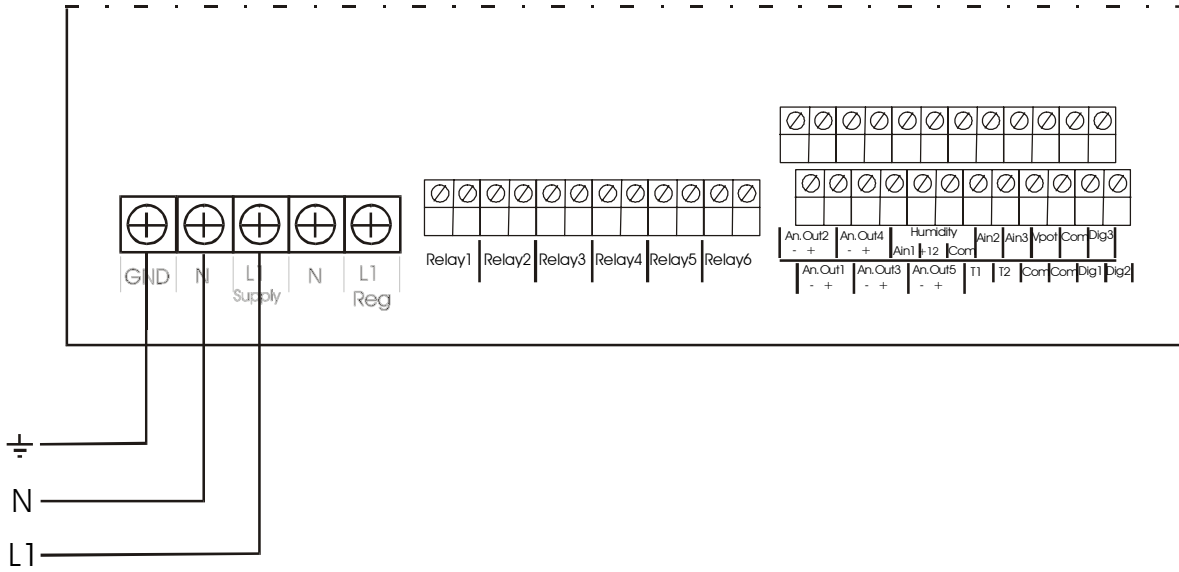


# Electrical connection – Frequency converter

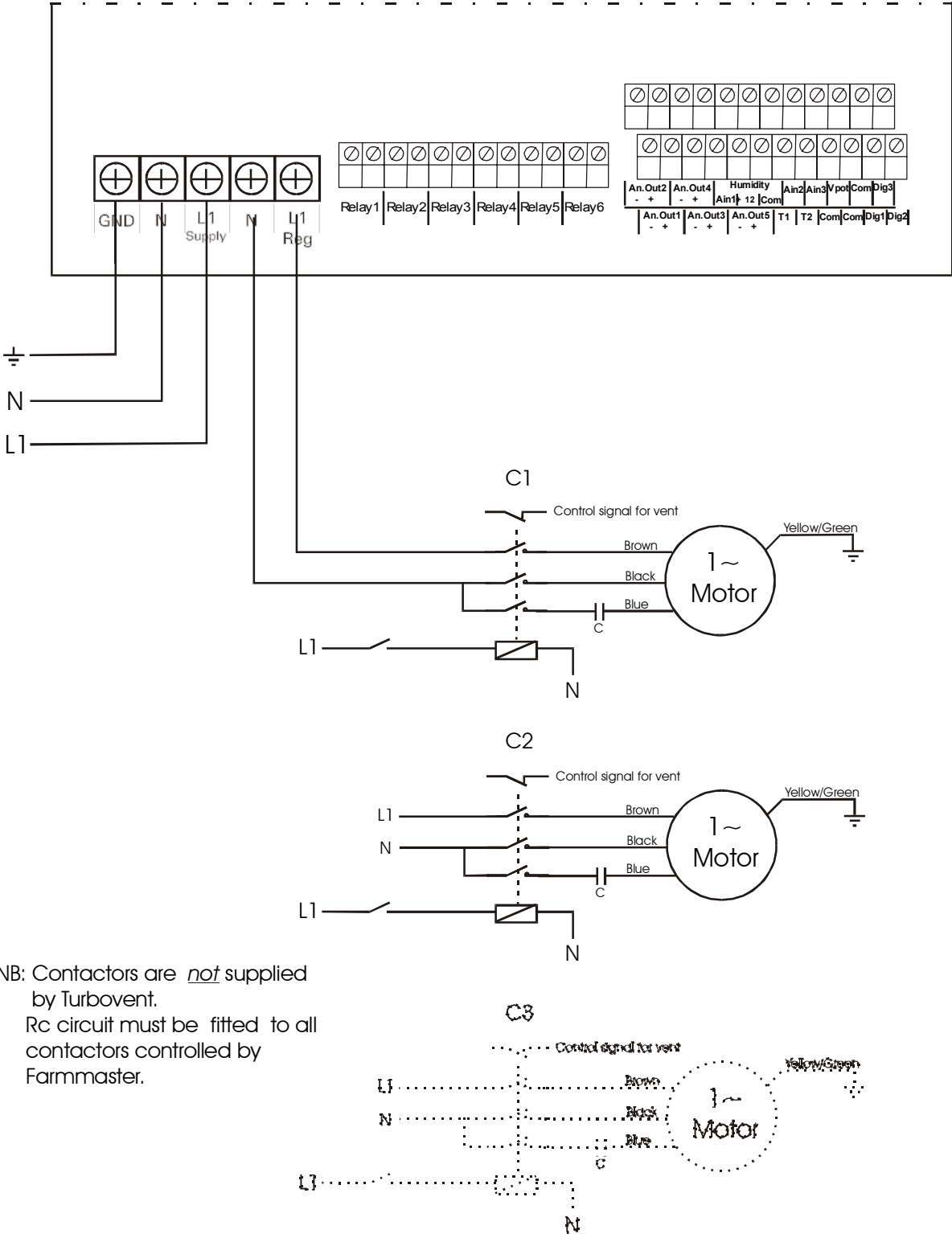


Max.cable length between motor and frequency converter must not exceed 10 metres.  
Cable for motor and control signals must be shielded by braided copper wire.

# Electrical connection – Extra system



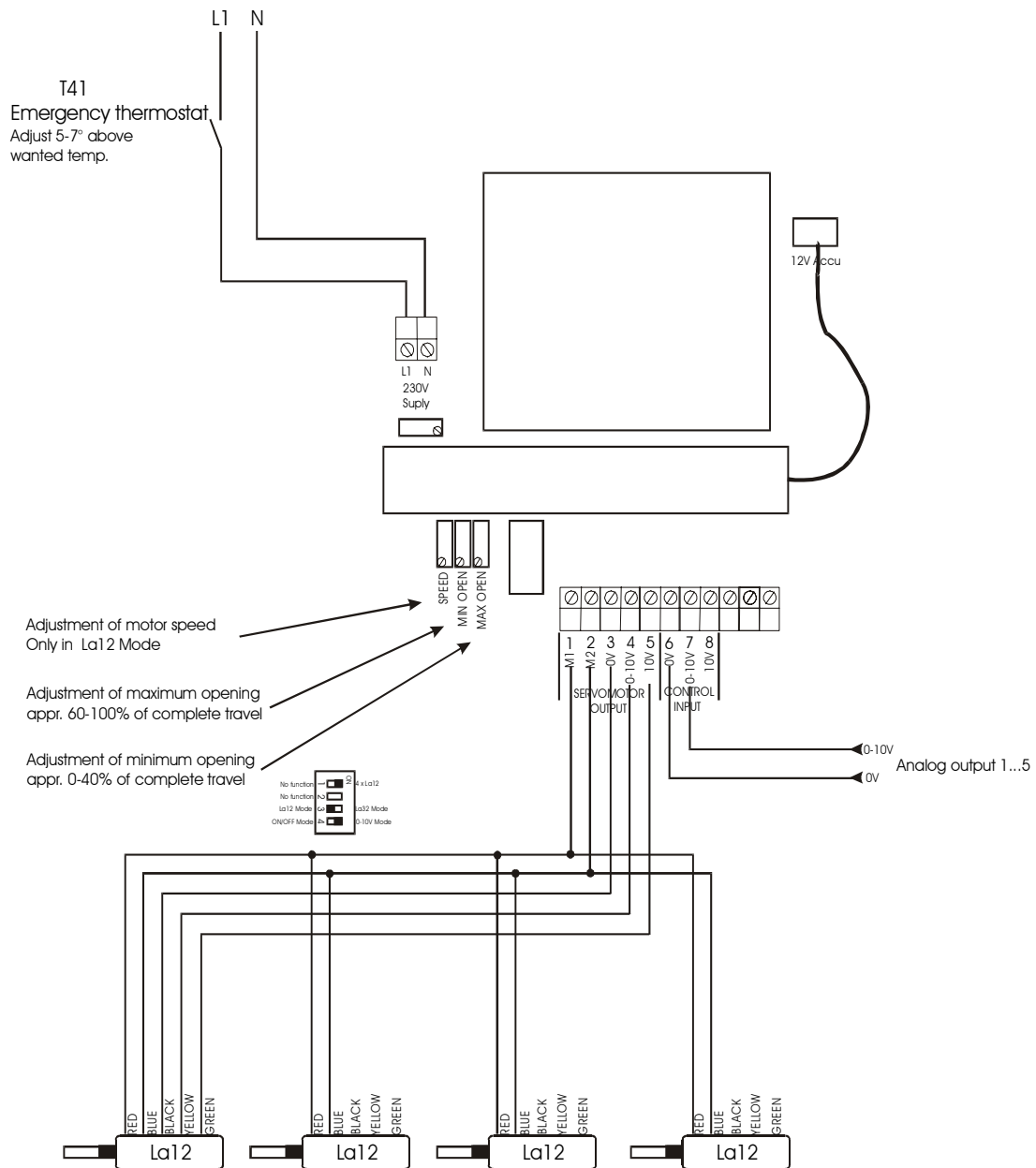
# Electrical connection – Step control



NB: Contactors are not supplied by Turbovent.  
 Rc circuit must be fitted to all contactors controlled by Farmmaster.

# Electrical connection for Linak

## Electrical connection - TSN1 / Linak



NB! Only one La12 must be connected to all 5 wires.