Lonbox® PZM4146
Users Guide

Comfort and lightcontroller for
LonWorks Installations

Document No. 02-PZM4146-00

This manual is intended for use with the Lonbox® PZM4146 software version 1.00.

Printed in Denmark.

Prolon Control Systems
Herstedvesterstraede 56
DK-2620 Albertslund, Denmark

Contents

Tables

Figures

Abstract

This manual provides detailed technical information on the electrical and mechanical interface and operating environment characteristics for the *Prolon Lonbox PZM4146* Comfort and lightcontroller.

This document also provides guidelines for installation and management of the node in a LonWorks® network.

Introduction

The Lonbox® PZM4146 Comfort and lightcontroller, is a building automation device for LonWorks installation. The PZM4146 control sunblind, light systems including pendant and HVAC system with CAV, VAV, cool and heat.

The Lonbox® PZM4146 Comfort and lightcontroller is mounted in a box with possibility to use different cable gland plate, or knock-outs plates for mounting of PG.

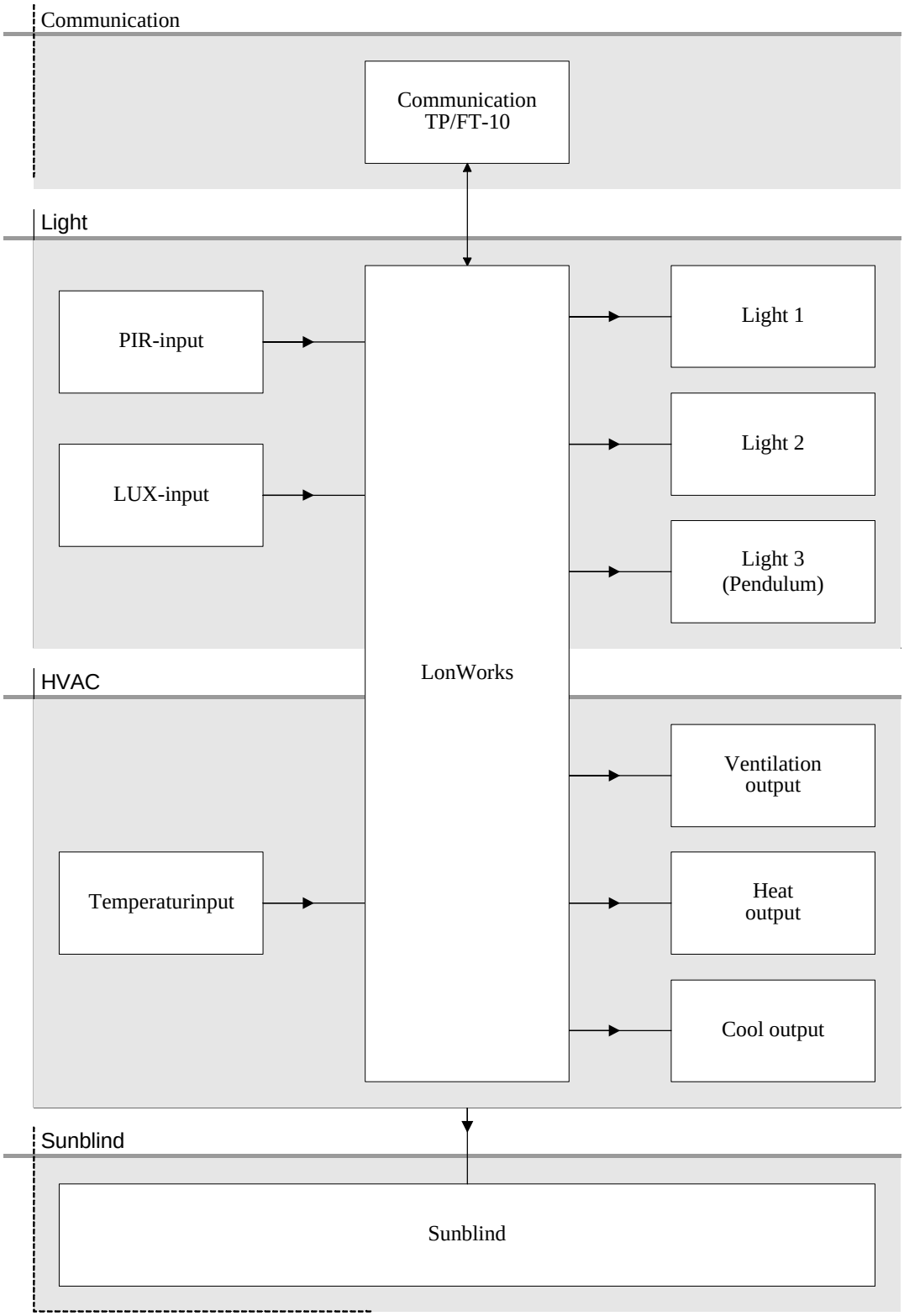
The Lonbox® PZM4146 Comfort and lightcontroller only need 230Vac supply and generate power for connected input sensor and power for connected valves and motors.

The controller box contains connection terminals for each core there are suppose to be connected to the controller, so there won't be any need for loop connections.

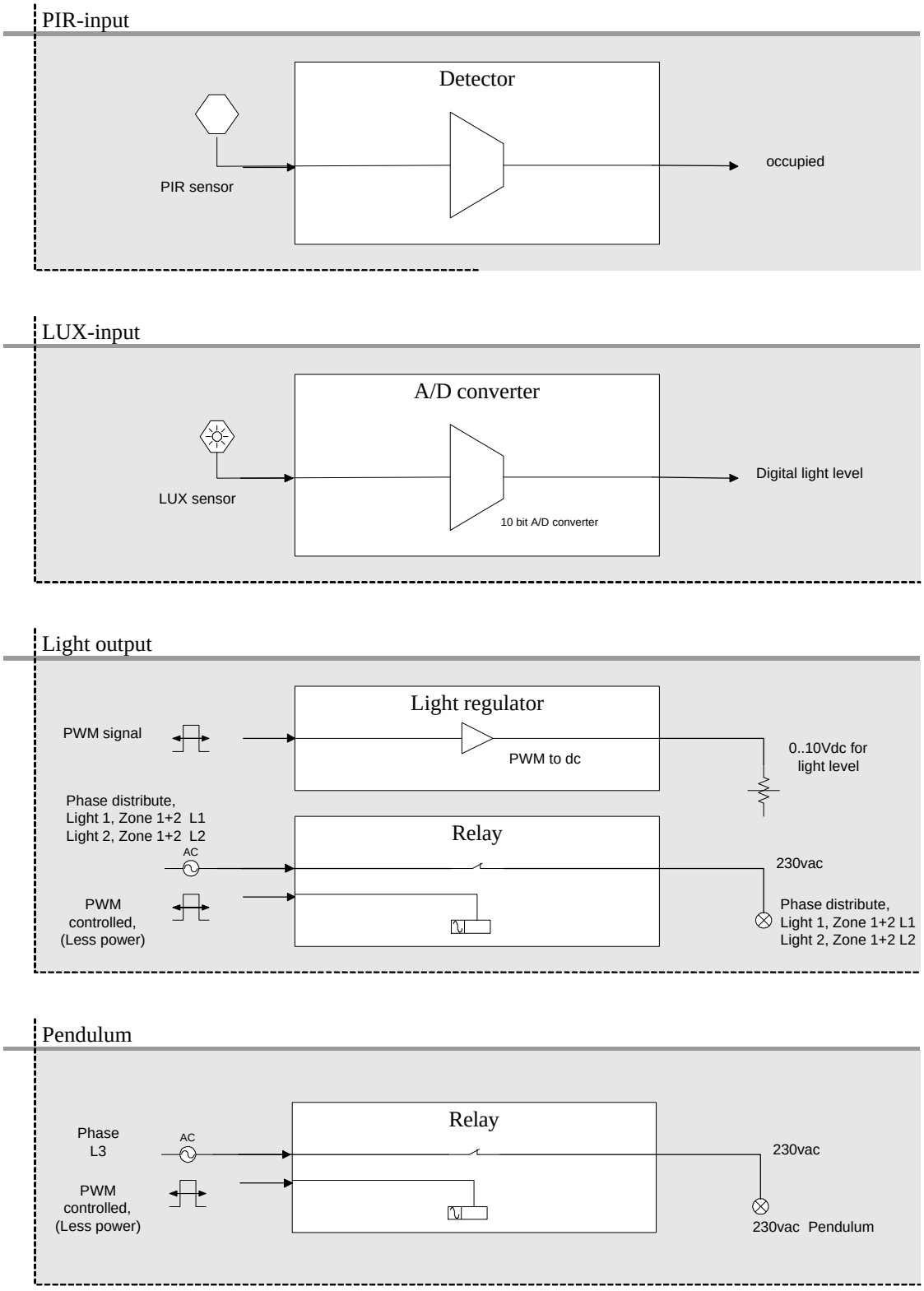
Functionality

See software description.

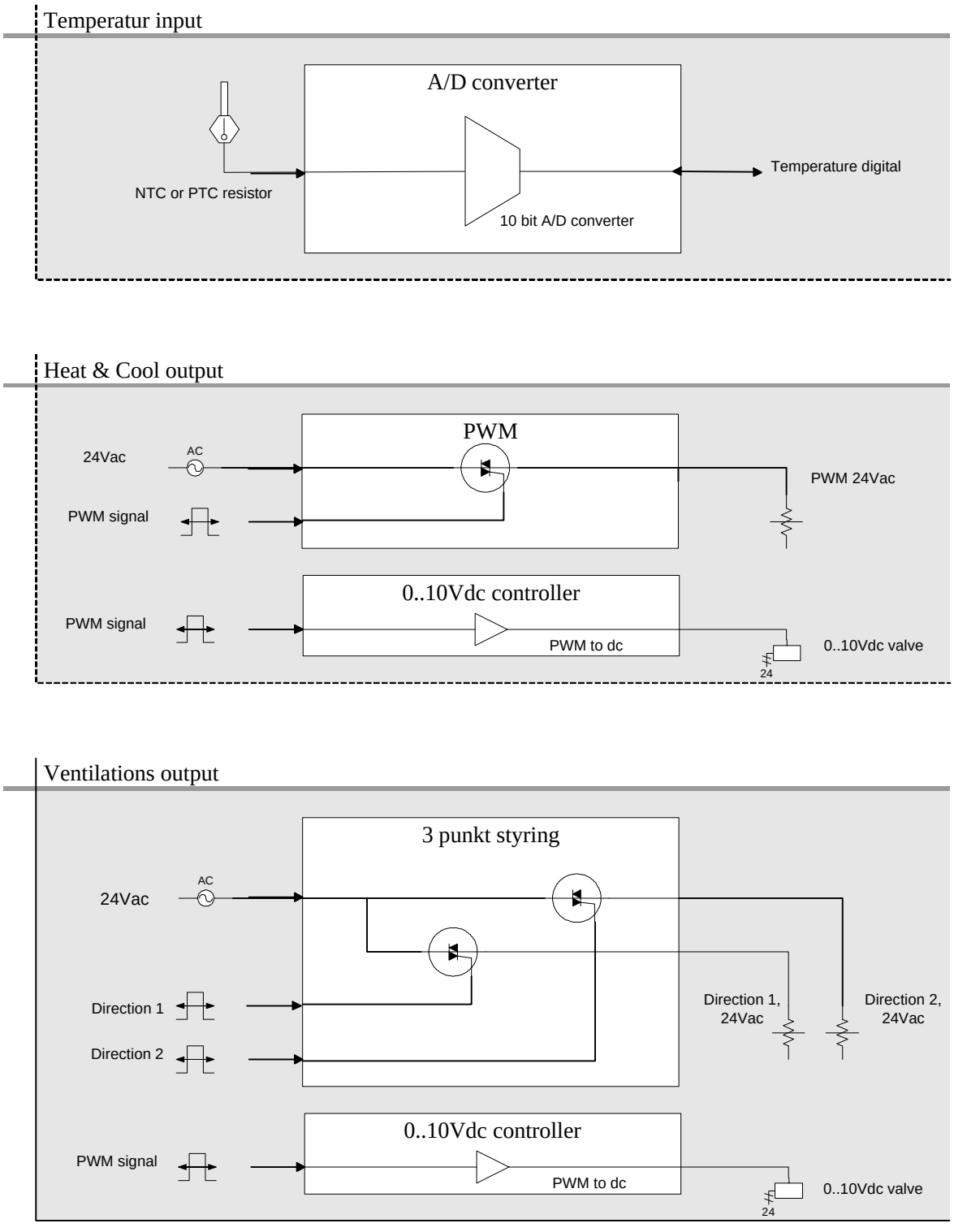
Main block diagram:



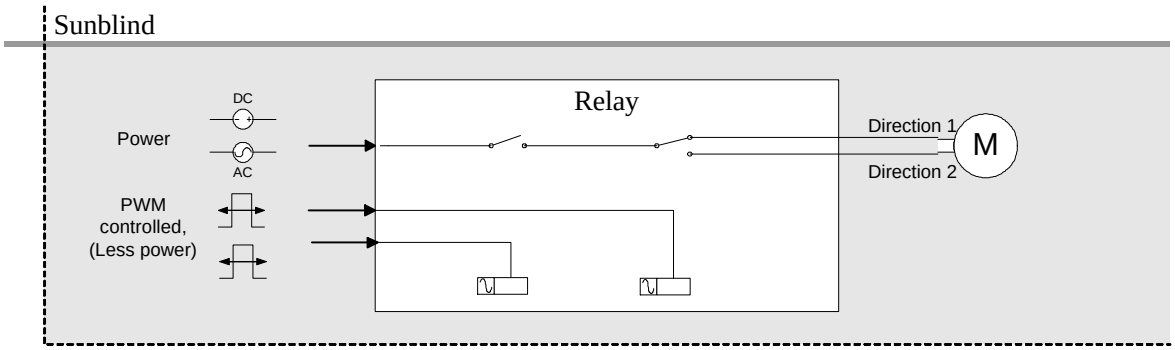
Block diagram light:



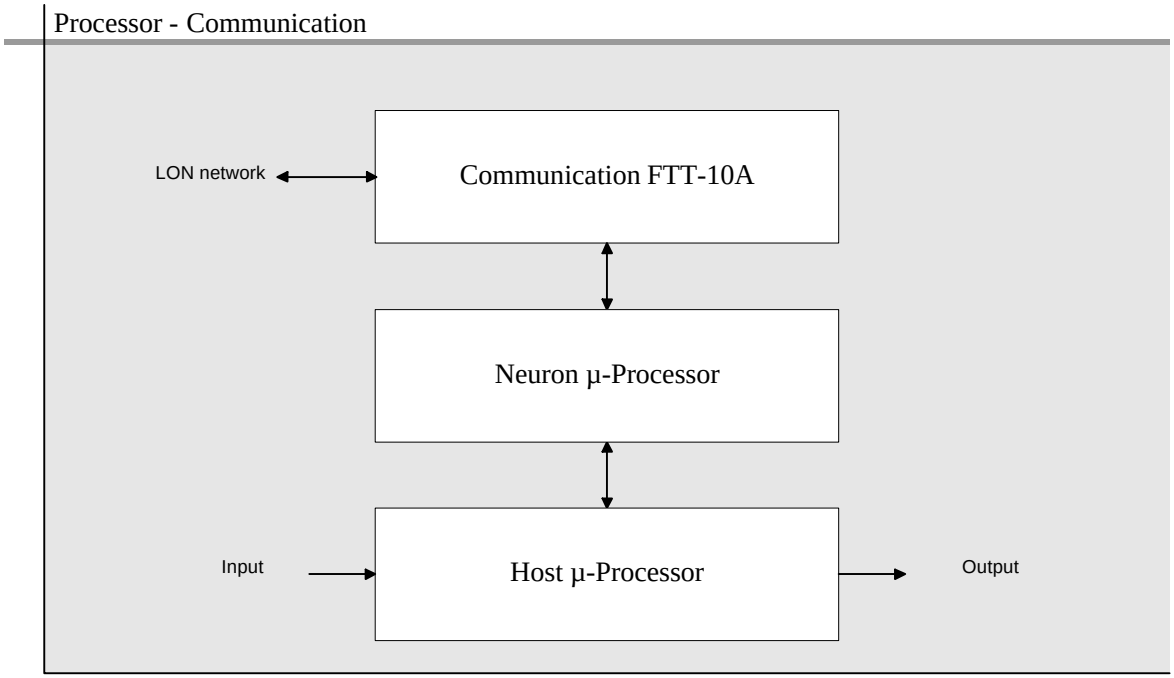
Block diagram comfort (HVAC):



Block diagram sunblind:



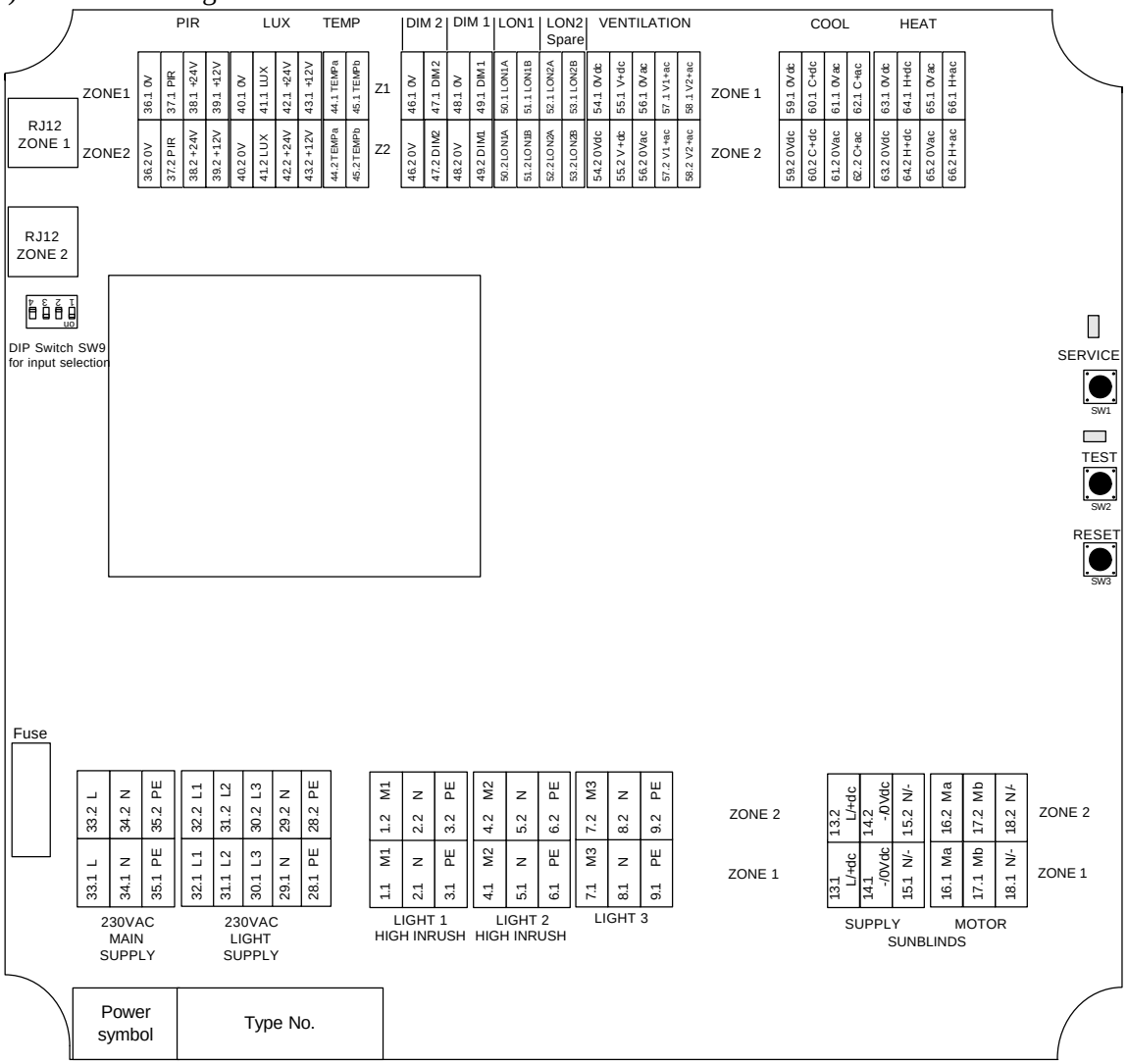
Block diagram processor - communication:



Mounting

Connection

The PZM4146 Comfort and lightcontroller module contains a printed circuit (See figure 5). In the following each terminal will be described.



Pin description.

Term.	Short	Description	Block
1.1	M1	230Vac Phase	ZONE 1, LIGHT 1
1.2	M1	230Vac Phase	ZONE 2. LIGHT 1
2.1	N	Neutral	ZONE 1. LIGHT 1
2.2	N	Neutral	ZONE 2, LIGHT 1
3.1	PE	Protection Earth	ZONE 1, LIGHT 1
3.2	PE	Protection Earth	ZONE 2. LIGHT 1
4.1	M2	230Vac Phase	ZONE 1, LIGHT 2
4.2	M2	230Vac Phase	ZONE 2, LIGHT 2
5.1	N	Neutral	ZONE 1, LIGHT 2
5.2	N	Neutral	ZONE 2. LIGHT 2
6.1	PE	Protection Earth	ZONE 1, LIGHT 2
6.2	PE	Protection Earth	ZONE 2, LIGHT 2
7.1	M3	230Vac Phase	ZONE 1, LIGHT 3
7.2	M3	230Vac Phase	ZONE 2. LIGHT 3
8.1	N	Neutral	ZONE 1, LIGHT 3
8.2	N	Neutral	ZONE 2, LIGHT 3
9.1	PE	Protection Earth	ZONE 1, LIGHT 3
9.2	PE	Protection Earth	ZONE 2. LIGHT 3
13.1	L/+dc	Supply Phase / +DC	ZONE 1, SUNBLIND
13.2	L/+dc	Supply Phase / +DC	ZONE 2, SUNBLIND
14.1	-	Supply - / 0V DC	ZONE 1, SUNBLIND
14.2	-	Supply - / 0V DC	ZONE 2. SUNBLIND
15.1	N/-	Supply Neutral / -	ZONE 1, SUNBLIND
15.2	N/-	Supply Neutral / -	ZONE 2, SUNBLIND
16.1	Ma	Motor a	ZONE 1, SUNBLIND
16.2	Ma	Motor a	ZONE 2, SUNBLIND
17.1	Mb	Motor b	ZONE 1, SUNBLIND
17.2	Mb	Motor b	ZONE 2, SUNBLIND
18.1	N/-	Motor Neutral	ZONE 1, SUNBLIND
18.2	N/-	Motor Neutral	ZONE 2, SUNBLIND
28.1	PE	Protection Earth	LIGHT SUPPLY
28.2	PE	Protection Earth	LIGHT SUPPLY, LOOP
29.1	N	Neutral	LIGHT SUPPLY
29.2	N	Neutral	LIGHT SUPPLY, LOOP
30.1	L3	Phase 3	LIGHT SUPPLY
30.2	L3	Phase 3	LIGHT SUPPLY, LOOP
31.1	L2	Phase 2	LIGHT SUPPLY
31.2	L2	Phase 2	LIGHT SUPPLY, LOOP
32.1	L1	Phase 1	LIGHT SUPPLY
32.2	L1	Phase 1	LIGHT SUPPLY, LOOP
33.1	L	Phase	MAIN SUPPLY
33.2	L	Phase	MAIN SUPPLY, LOOP
34.1	N	Neutral	MAIN SUPPLY
34.2	N	Neutral	MAIN SUPPLY, LOOP
35.1	PE	Protection Earth	MAIN SUPPLY
35.2	PE	Protection Earth	MAIN SUPPLY, LOOP
36.1	0V	0V DC	ZONE 1, PIR
36.2	0V	0V DC	ZONE 2. PIR
37.1	PIR	PIR input	ZONE 1, PIR
37.2	PIR	PIR input	ZONE 2, PIR
38.1	+24V	+24Vdc out	ZONE 1, PIR
38.2	+24V	+24Vdc out	ZONE 2. PIR
39.1	+12V	+12Vdc out	ZONE 1. PIR
39.2	+12V	+12Vdc out	ZONE 2, PIR
Term.	Short	Description	Block
40.1	0V	0V DC	ZONE 1, LUX
41.1	LUX	LUX input	ZONE 1, LUX
41.2	LUX	LUX input	ZONE 2, LUX
42.1	+24V	+24Vdc out	ZONE 1. LUX
42.2	+24V	+24Vdc out	ZONE 2. LUX
43.1	+12V	+12Vdc out	ZONE 1, LUX
43.1	+12V	+12Vdc out	ZONE 2, LUX
44.1	TEMP	Sensor a	ZONE 1. TEMP
44.2	TEMP	Sensor a	ZONE 2, TEMP
45.1	TEMP	Sensor b	ZONE 1, TEMP
45.2	TEMP	Sensor b	ZONE 2, TEMP
46.1	0V	0V DC	ZONE 1. DIMMER 2
46.2	0V	0V DC	ZONE 2, DIMMER 2
47.1	DIM2	0-10V Output	ZONE 1, DIMMER 2
47.2	DIM2	0-10V Output	ZONE 2, DIMMER 2
48.1	0V	0V DC	ZONE 1. DIMMER 1
48.2	0V	0V DC	ZONE 2, DIMMER 1
49.1	DIM1	0-10V Output	ZONE 1, DIMMER 1
49.2	DIM1	0-10V Output	ZONE 2, DIMMER 1
50.1	LON1	TP/FT-10 a	LON1a (In)
50.2	LON1	TP/FT-10 a	LON1a (Out)
51.1	LON1	TP/FT-10 b	LON1b (In)
51.2	LON1	TP/FT-10 b	LON1b (Out)
52.1	LON2	Spare a	LON2a (In)
52.2	LON2	Spare a	LON2a (Out)
53.1	LON2	Spare b	LON2b (In)
53.2	LON2	Spare b	LON2b (Out)
54.1	0Vdc	0V DC	ZONE 1, VENTILATION
54.2	0Vdc	0V DC	ZONE 2, VENTILATION
55.1	V+dc	0-10V Vent. Output	ZONE 1, VENTILATION
55.2	V+dc	0-10V Vent. Output	ZONE 2, VENTILATION
56.1	0Vac	0Vac	ZONE 1, VENTILATION
56.2	0Vac	0Vac	ZONE 2, VENTILATION
57.1	V1+a	+24Vac Vent. Open.1	ZONE 1, VENTILATION
57.2	V1+a	+24Vac Vent. Open.1	ZONE 2, VENTILATION
58.1	V2+a	+24Vac Vent. Close.2	ZONE 1, VENTILATION
58.2	V2+a	+24Vac Vent. Close.2	ZONE 2, VENTILATION
59.1	0Vdc	0Vdc	ZONE 1, COOL
59.1	0Vdc	0Vdc	ZONE 2, COOL
60.1	C+dc	0-10V Cool Output	ZONE 1, COOL
60.2	C+dc	0-10V Cool Output	ZONE 2, COOL
61.1	0Vac	0Vac	ZONE 1, COOL
61.2	0Vac	0Vac	ZONE 2, COOL
62.1	C+ac	+24Vac Cool Open	ZONE 1, COOL
62.2	C+ac	+24Vac Cool Open	ZONE 2, COOL
63.1	0Vdc	0Vdc	ZONE 1, HEAT
63.2	0Vdc	0Vdc	ZONE 2, HEAT
64.1	H+dc	0-10V Heat Output	ZONE 1, HEAT
64.2	H+dc	0-10V Heat Output	ZONE 2, HEAT
65.1	0Vac	0Vac	ZONE 1, HEAT
65.2	0Vac	0Vac	ZONE 2, HEAT
66.1	H+ac	+24Vac Heat Open	ZONE 1, HEAT
66.2	H+ac	+24Vac Heat Open	ZONE 2, HEAT

Figure 1 PZM4146 Comfort and lightcontroller terminals

1: Mains supply terminal.

The product has two power terminal blocks, main and light power, all terminal in these blocks doubled so the power can be loop through the PZM4146 Comfort and light controller.

Main supply, supplies the micro controller and all the electronic in the unit, and is also supply for the different output, apart from the 230VAC to the light 1-6. The mains supply should always be earthed.

Light supply, supplies the 230VAC light output 1-6
Light 1 and 2 are supplied from the L1 phase
Light 3 and 4 are supplied from the L2 phase
Light 5 and 6 are supplied from the L3 phase

PE	N	L
Protection Earth (Yellow/green)	Neutral (Blue)	Phase (Brown or black)

Table 1 Mains supply connections

PE	N	L1	L2	L3
Protection Earth (Yellow/green)	Neutral (Blue)	Phase (Brown or black)	Phase (Brown or black)	Phase (Brown or black)

Table 2 Light supply connections

There are many ways to supply the product, depending how the light system are supplied and fused. The following will describe some way to supplied the product

- 1 Group, 1 Phase see
- 1 Group, 3 Phase
- 2 Group, 1 Phase + 3 Phase
- 1 Group, 3 Phase with loop through

If plenty of PZM4146 Comfort and light controller are connected to 1 group with 3 phases the main supply can be connected to one of the 3 phases to make sure that there are the same load of each phase.

Figure 2 Mains supply connections 1 phase

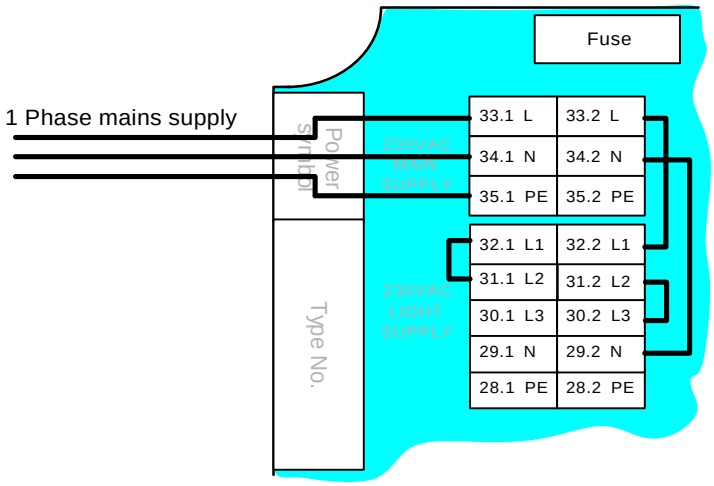


Figure 3 Mains supply connection 3 phases

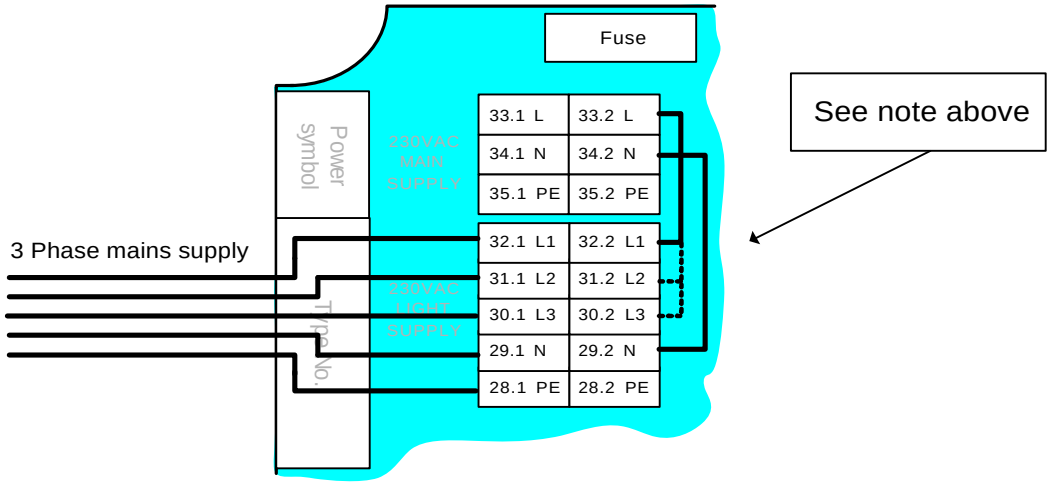


Figure 4 Mains supply1 phase and Light supply 3 phases connection

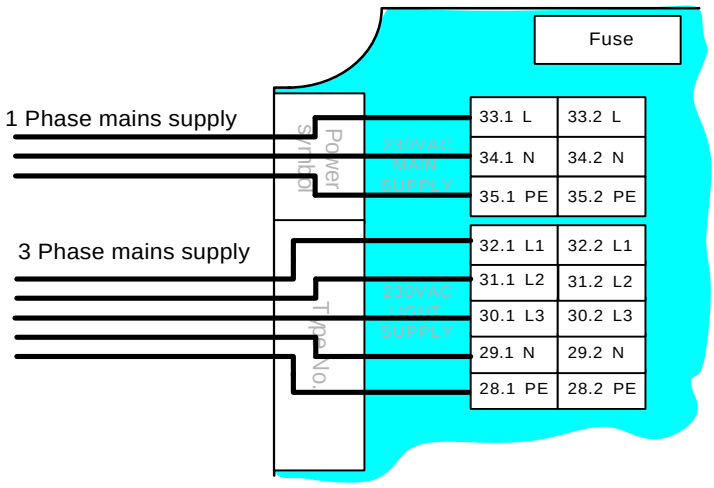
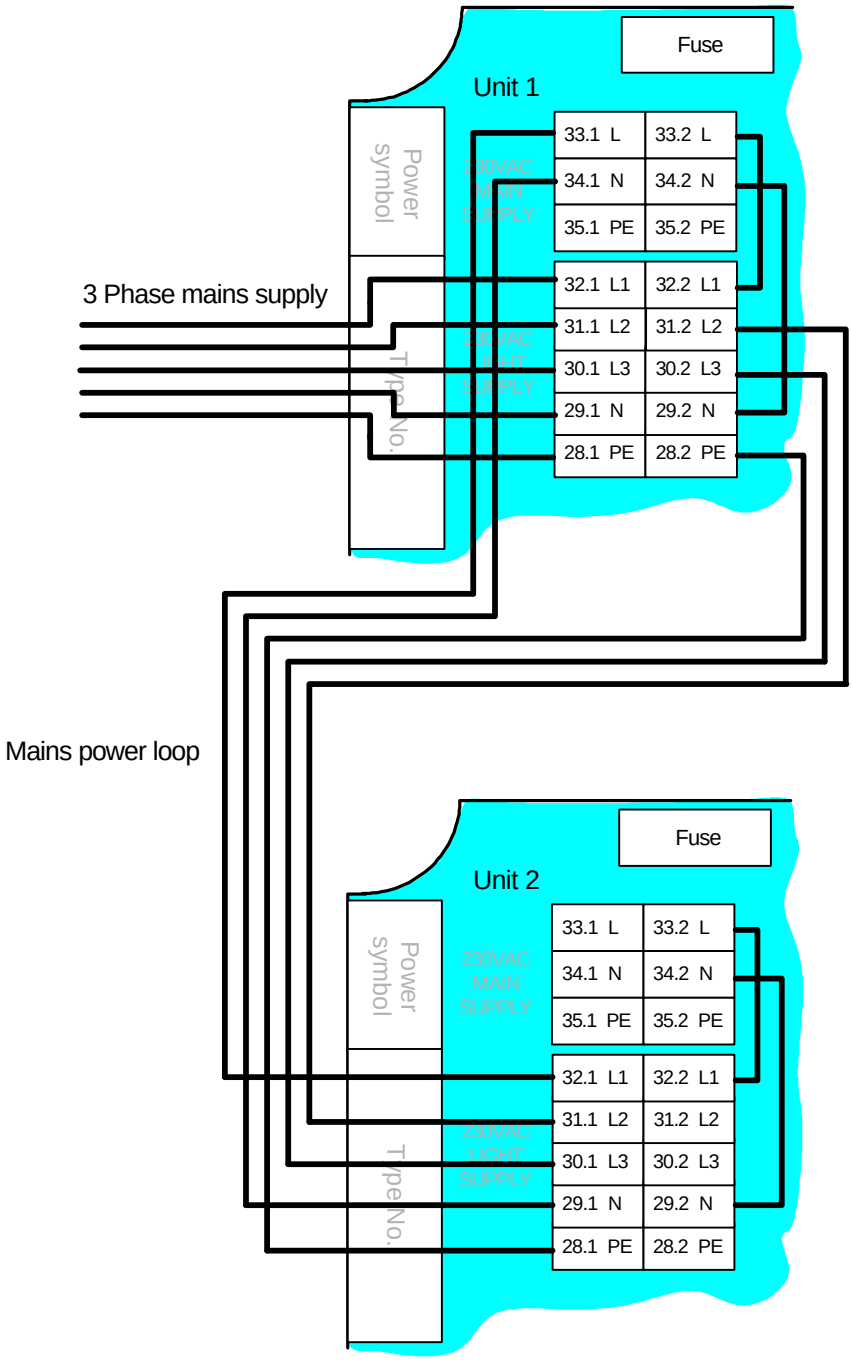


Figure 5 Mains supply connection 3 phases loop through



2: Light 1 to light 6 out terminals.

These terminals are for light connections, and can together with one of the dimmer output also regulate the light (See description below).

Light 1 and Dimmer 1 output in Zone 1 and Light 1 and Dimmer 1 output in Zone 2, are as pair, prepared for regulate light and are supplied from L1. See dimmer connection below.

Light 2 and Dimmer 1 in Zone 2 and Light 2 and Dimmer 2 in Zone 2, are as pair, prepared for regulate light and are supplied from L2. See dimmer connection below.

Light 3 in Zone 1 and Light 3 in Zone 2, are supplied from L3 and are for pendant lamp and can not supply high start current.

For connection see "Figure 6 Light output connections for regulated light"

PE	N	ZONE 1 M1,M2,M3 ZONE 2, M1,M2,M3 Switched
Protection Earth (Yellow/green)	Neutral (Blue)	Phase (Brown or black)

Table 3 Light output connections

If a light output is used to drive an external relay, there should be placed a decoupling RC over the external relay, to reduce the electricity noise when the relay bounce. The value of this RC could be 0,1uF and 100 ohm.

3: Dimmer terminals.

These terminals are for light attenuation, and are a 0 to 10 voltage output.

These control output are only a low voltage output and must be isolated from the 230V power in the light module.

For connection see "Figure 6 Light output connections for regulated light"

46.1 , 46.2 , 48.1 , 48.2	47.1 , 47.2 , 49.1 , 49.2
0V for output	0-10V Output

Table 4 Dimmer connections

Figure 6 Light output connections for regulated light

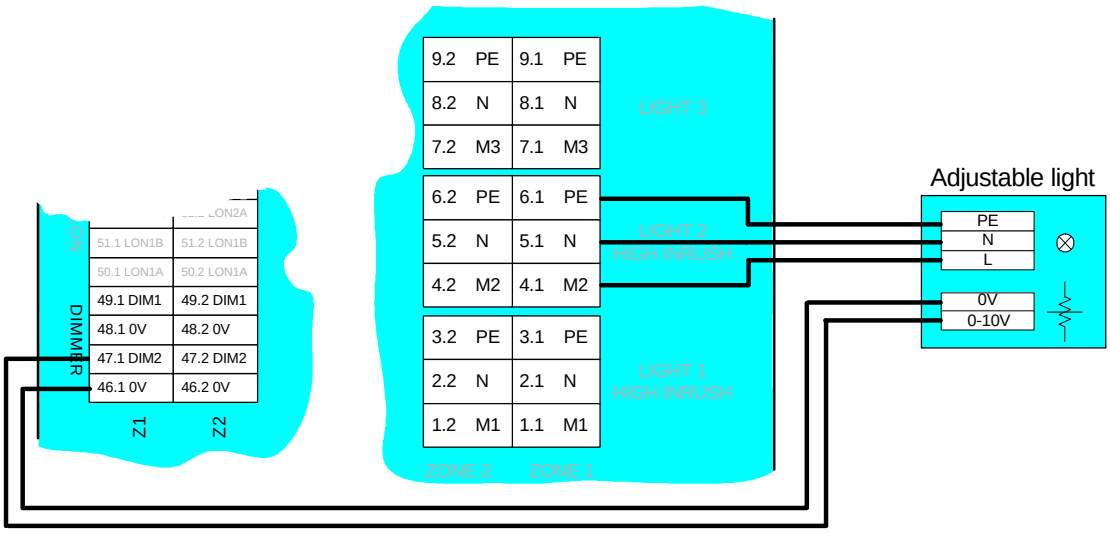
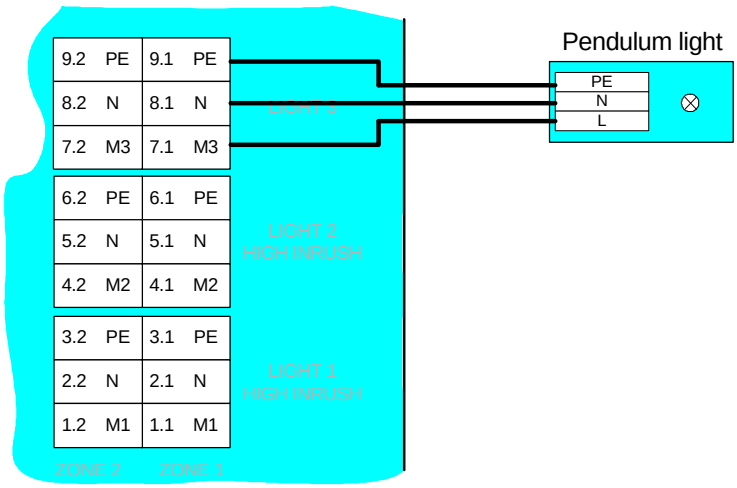


Figure 7 Light output connections for pendulum or similar



4: Sunblind.

These terminals are for sunblind use, and can drive a motor. Two different kinds of motors can be connected, a DC motor where the polarities of the power, control the direction of the motor, or an AC or DC motor with a common connector and a connector for each direction can be connected.

It is very important that the two sunblinds are connected to the same supply because off the distance between the terminals.

	Supply		
Marking Zone 1 Zone 2	13.1 13.2	14.1 14.2	15.1 15.2
Polarity controlled motor	DC+	DC-	(Not used)
Direction controlled motor	Phase L	(Not used)	Neutral N

Table 5 Sunblind supply connections

	Motor		
Marking Zone 1 Zone 2	16.1 16.2	17.1 17.2	18.1 18.2
Polarity controlled motor	DC+ or DC-	DC+ or DC-	(Not used)
Direction controlled motor	Phase L1	Phase L2	Neutral N

Table 6 Sunblind motor connections

If the one of the outputs is used to drive an external relay, there should be placed a decoupling RC over the external relay, to reduce the electricity noise when the relay bounce. The value of this RC could be 0,1uF and 100 ohm.

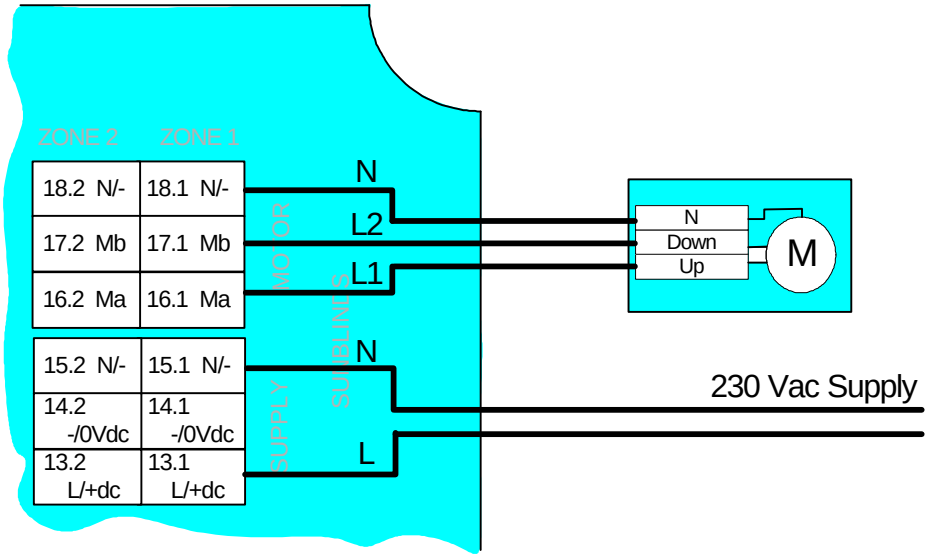


Figure 8 Sunblind for 2 core motor connections

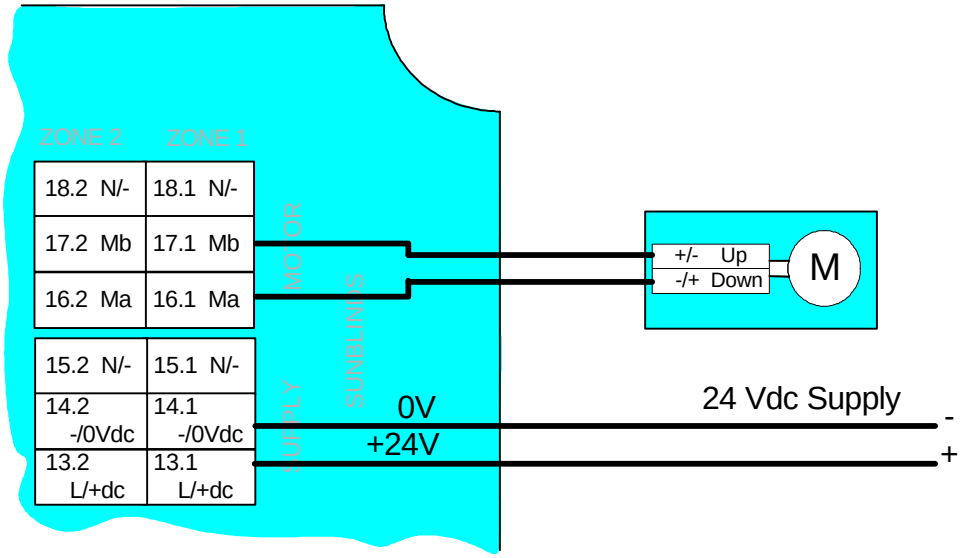


Figure 9 Sunblind for 3 core motor connections

5: Input 1 - 4 terminals.

These terminals are for input sensors and switches. The PZM4146 Comfort and light controller generate power for the sensors, and can supply +12Vdc or +24Vdc to the sensors.

Sensors with analog output or a voltage output are connected to IN, and the switch behind the connecter must be “Off”.

Sensors with a potential free switch or an open collector output must be connected between IN and 0V, and the switch behind the connector must be “On”.

Two different kind of adjustable resistor can be used. If a 3 wire adjustable resistor is used, the adjustable pin must be connected to IN and the two other must be connected to +12V and 0V. If a 2 wire adjustable resistor is used, the adjustable pin must be connected to IN and the other must be connected to 0V, The switch must be “On”.

	Switch	0V	IN	+24V	+12V
Analog input	Off	0V for signal and power.	Analog input	Can be used	Can be used
Switch	On	Switch-A	Switch-B	(Not used)	(Not used)
Open collector	On	0V for power.	Input	Can be used	Can be used
Adjustable resistor, 3 wire	Off	Bottom pin of the resistor	Adjustable pin	(Not used)	Top pin of the resistor
Adjustable resistor, 2 wire	On	Bottom pin of the resistor	Adjustable pin	(Not used)	(Not used)

Table 7 Input connections

Figure 10 Input connections for PIR sensor

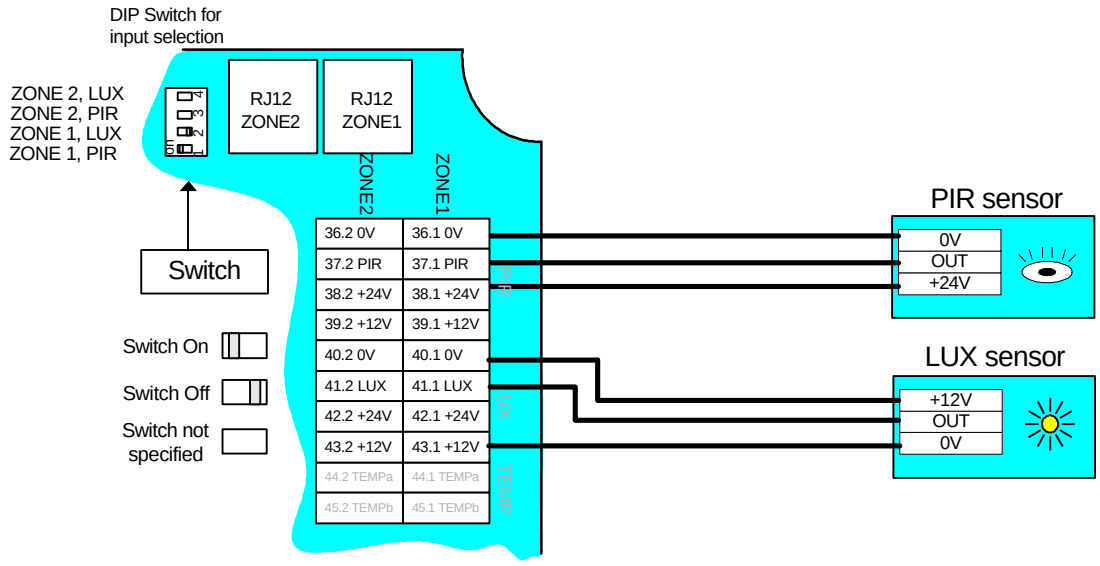


Figure 11 Input connections for LUX sensor

Figure 12 Input connections for switch

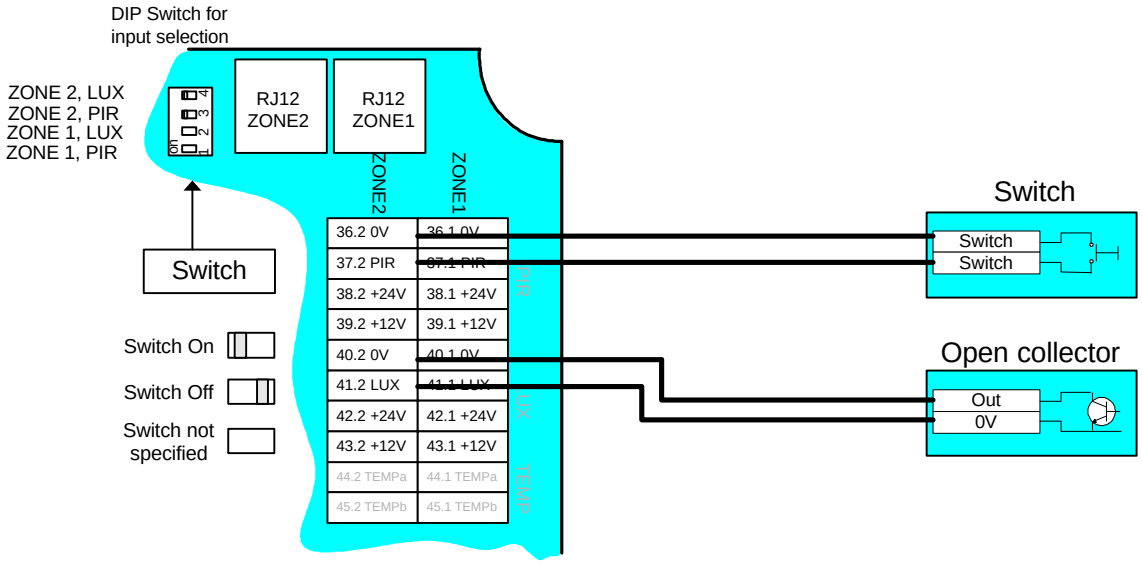


Figure 13 Input connections for open collector

Figure 14 Input connections for 2-wire set point resistor

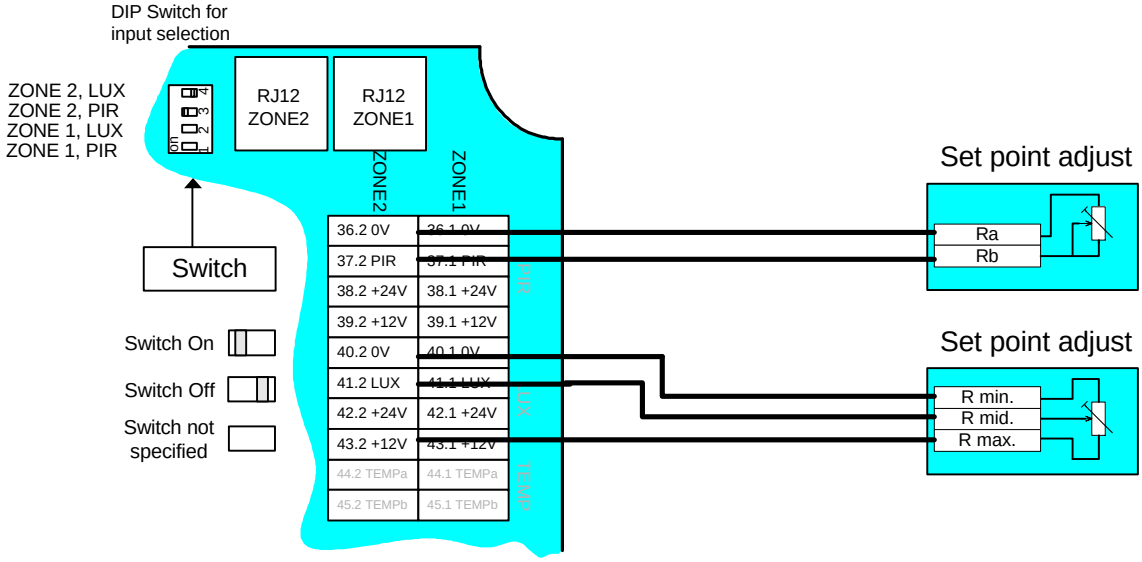


Figure 15 Input connections for 3-wire set point resistor

It is also possible to connect PIR and LUX sensors through a RJ12 connector, there are a connector for each zone. See pin configuration below.

Table 8 RJ12 connections

Pin no.	Description
1	+12Vdc
2	0V
3	(+5Vdc)
4	LUX
5	(IR)
6	PIR

Texts in brackets are option.

6: Temperature terminals.

These terminals are for a simple temperature NTC 5K @ 25ºC, NTC 1K8 @ 25ºC, NTC 10-15K sensors or PT-1000 sensors.

Mount the sensor between the two terminals.

44	45
Temperature sensor -	Temperature sensor +

Table 9 Temperature sensor connections

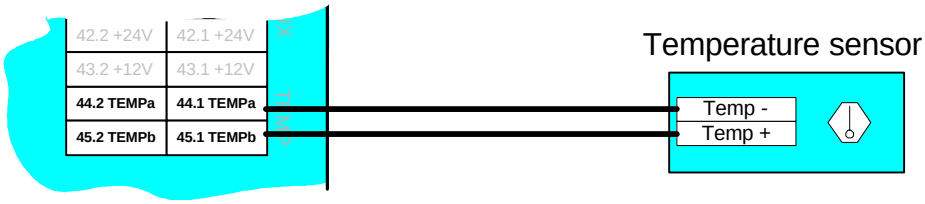


Figure 16 Temperature sensor connections

7: LonWorks communication terminal.

Connection to the LonWorks network using the TP/FT-10 transceiver.

There are two connections for each core so the LONWORKS net can be loop through the PZM2114 Zone Controller. The PZM4146 Comfort and light controller are connected to the LON1

50.1	51.1	50.2	51.2	52.1	53.1	52.2	53.2
LON1		LON1		LON2		LON2	
a	b	a	b	a	b	a	b

Table 10 LonWorks connections

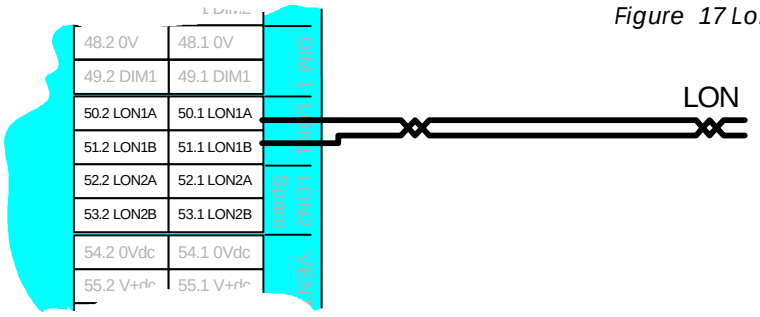


Figure 17 LonWorks connections

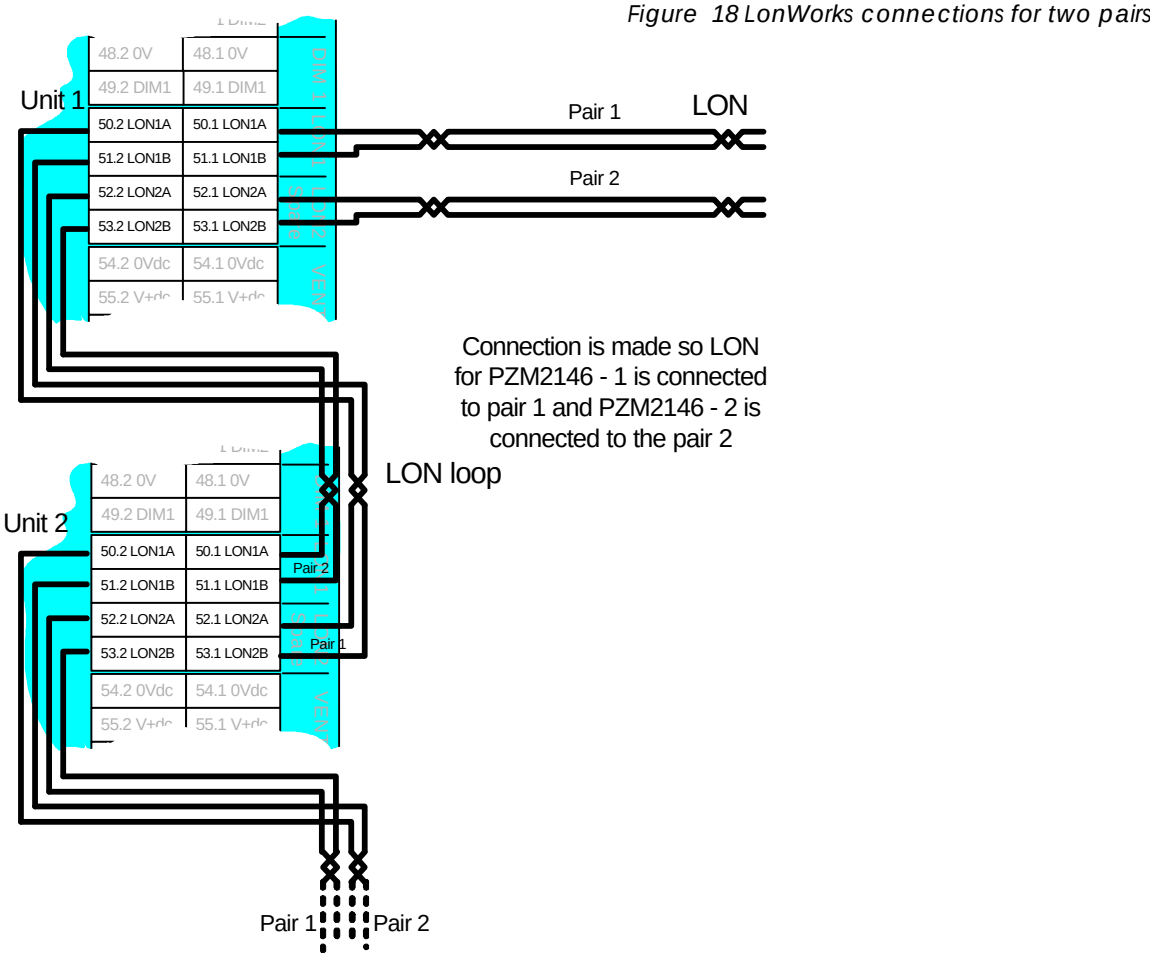
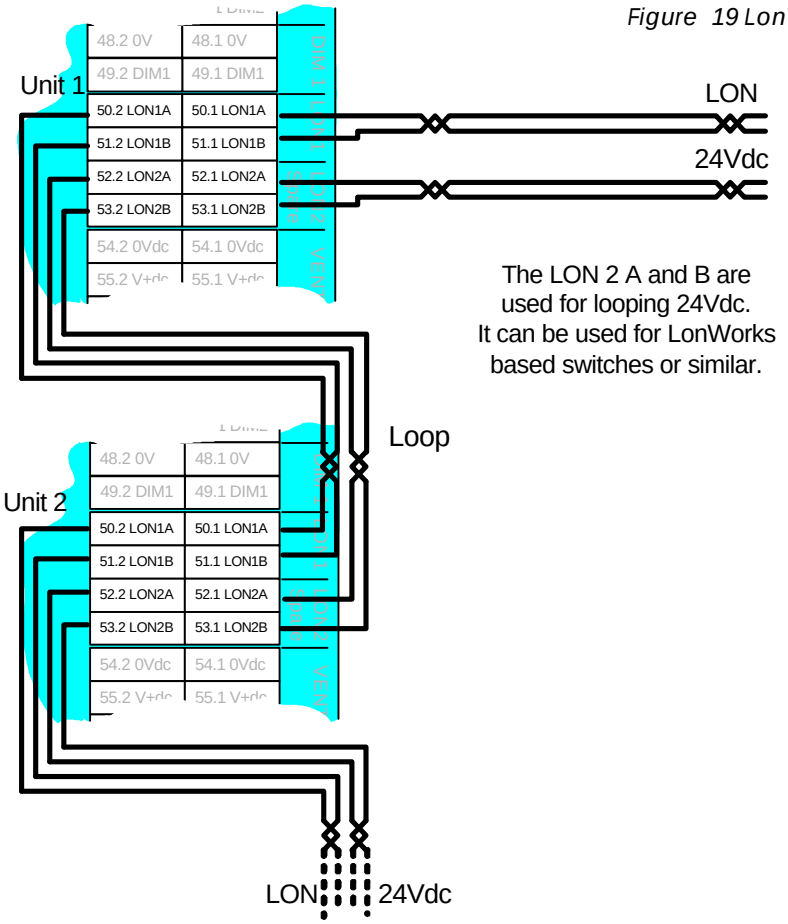


Figure 18 LonWorks connections for two pairs

Figure 19 LonWorks connections with looped



8: Ventilations terminals.

These terminals are for the HVAC system and can control 0 to 10 voltage valve or 3 point actuator. In “Figure 20 VAV connections” is a 0-10V valve connected, the supply for the valve 24Vac is connected to terminal 56 and 57. The supply is 24Vac.

In “Figure 21 CAV connections” is 3 point actuator connected, note that it is 24Vac.

54.1 54.2	55.1 55.2	56.1 56.2	57.1 57.2	58.1 58.2
0Vdc for 0-10V output	0-10V output	0Vac	Open (24Vac supply)	Close

Table 11 Ventilation connections

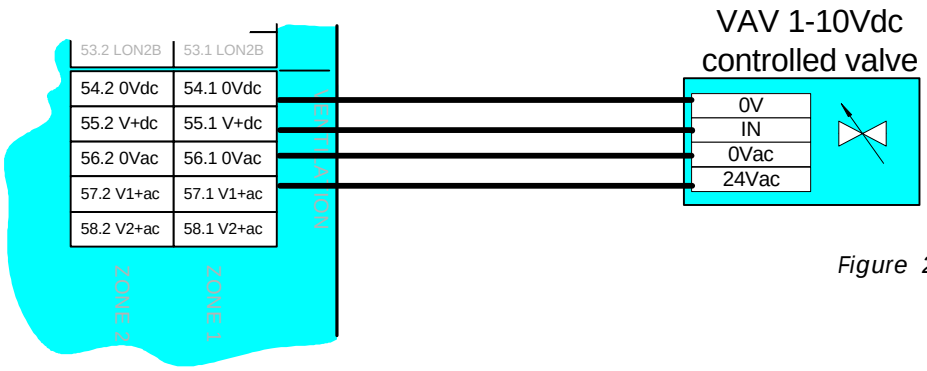


Figure 22 VAV connection

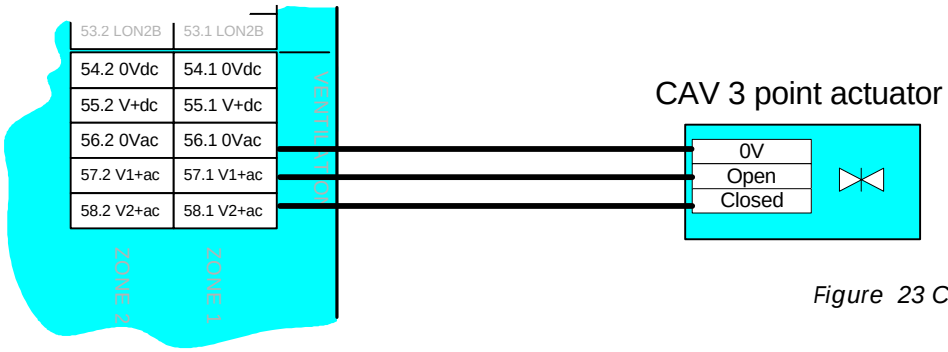


Figure 23 CAV connections

9: Cool and heat terminals.

These terminals are for the HVAC system.

These terminals are for heating or cooling valve in the HVAC system and can control 0 to 10 voltage valve or 24Vac valve. In "Figure 24 Cool connections" is a 0-10V valve connected, to the cool terminals. The 24VaC supply for the valve is connected to terminal 61 and 62. In "Figure 25 Heat terminals" is 24Vac valve connected to the heat terminals, note that it's 24Vac.

59.1 59.2	60.1 60.2	61.1 61.2	62.1 62.2
0Vdc for 0-10V output	0-10V output	0Vac	Open (24Vac supply)

Table 12 Heat connections

63.1 63.2	64.1 64.2	65.1 65.2	66.1 66.2
0Vdc for 0-10V output	0-10V output	0Vac	Open (24Vac supply)

Table 13 Cool connections

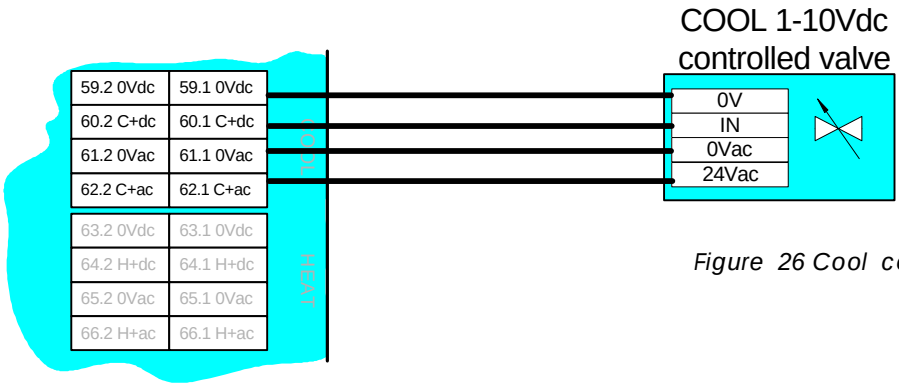


Figure 26 Cool connections

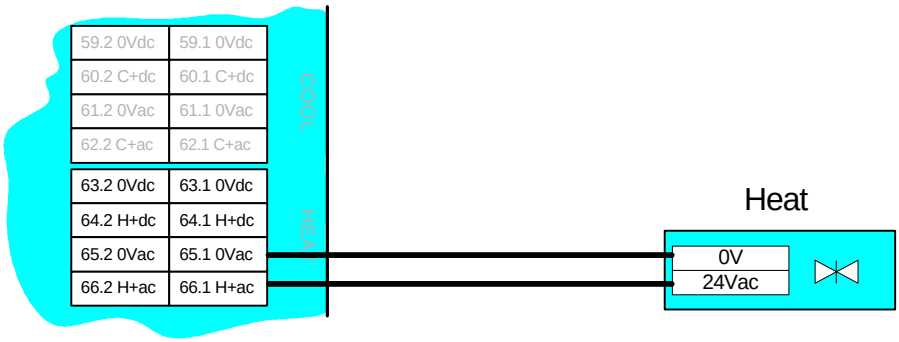


Figure 27 Heat terminals

Mechanical
The PZM4146 Comfort and lightcontroller is mount in a Fibox SP2828 box and can be mounted on the wall or ceiling by using the four screw holes in the corner of the box. The front cover has to be removed to access these mounting holes. The box has possibility to use different cable gland plate, or knock-outs plates for mounting of PG

Network Interface

See software description.

Electrical Specifications

Supply	
Operating voltage	230Vac ±10%
Frequency	50 Hz
Fuse for PZM4146	T 315 mA
Power consumption for PZM4146	Typical __ W
Power consumption peripheral	Max. __ W
Total Power consumption	Max. __ W

Temperature	
Operating	5 °C to + 45 °C
Storage	-0 °C to + 50 °C
Humidity	80% @temp.<31°C 50% @31-40°C

Mechanical Data	
Mounting box	Fibox
- Dimension (LxWxH)	280x280x130 mm
- Weight	__ Kg
- Material	ABS/PC
Protection Class	IP __
Housing	Fibox SP2828, 280 * 280 * 130 mm
Mounting	4 screws 254 * 254 mm
Terminals	Cage clamp
- Core dimension	0,08 - 2,5 mm^2
- Isolation removal	5-6 mm
- Ratings	250 Vac / 16A

EMC	
Immunity	According to EN 50082-2
Emission	According to EN 50081-1

Input Data	
Number	4
Input voltage maximum	12V
Over voltage protection	15V
Input impedance	39,8 K ohm
Digital conversion	D = Vin*8,2/39,8*1024/2,5
Puls width	Min. ___mS
Supply out	24Vdc ±10%
	12Vdc ±10%
Current out	100mA@24Vdc ***see note 1***
	100mA@12Vdc ***see note 2***

Temperature Input ***see note 3***	
Sensor type	NTC 1K8 @ 25 °C, 5K5 @ 25 °C, 10K-15K and PT1000
Measuring range	-10 to +50 °C
Temperature / bit	0,1 °C /bit
Accuracy	±0,5°C

Light 1-4 Output	
Contact	Normally open (Make)
Max switching voltage	250 Vac
Max. current	16 A
Start current	950A@200µS, 900A@220µS, 800A@300µS, 500A@1mS, 150A@1S,
Switching voltage	230 Vac
Mechanical life	1 mil.

Light 5-6 Output	
Contact	Normally open (Make)
Max switching voltage	250 Vac
Max. current	16 A
Mechanical life	1 mil.

Dimmer output	
Number	4
Output voltage	0 – 10 Vdc
Over voltage protection	15V
Output impedance	100O
Voltage / bit	1 mV/bit
Output current	±20 mA

Ventilation output	
Number	2
Output voltage	0 – 10 Vdc
Over voltage protection	15V
Output impedance	100O
Voltage / bit	1 mV/bit
Output current	±20 mA
Output voltage	24V ac±20%
Contact	Change over
Output current (24Vac)	700 mA ***see note 4***

Cool output	
Number	2
Output voltage	0 – 10 Vdc
Over voltage protection	15V
Output impedance	100O
Voltage / bit	1 mV/bit
Output voltage	±20 mA
Output voltage	24V ac±20%
Output current (24Vac)	700 mA ***see note 4***

Heat output	
Number	2
Output voltage	0 – 10 Vdc
Over voltage protection	15V
Output impedance	100O
Voltage / bit	1 mV/bit
Output voltage	±20 mA
Output voltage	24V ac±20%
Output current (24Vac)	700 mA ***see note 4***

Relay for Sunblind	
Number	2 (3 relay/sunblind)
Contact	Change over
Max switching voltage	250 VAC
Max switching current	16 A
Max switching power	4000 VA AC
Switching voltage	230 VAC
Mechanical life	1 mil.

LONWORKS Communication Port	
Type	Local Operating Network
Communication protocol	LonTalk
Physical channel	TP/FT-10, 78Kbps

Control Circuit	
Microprocessor	Atmel AT91
Crystal Oscillator Frequency	16 MHz

Indicators			
Power indicator led's	24 V Ext. power on, green 12 V PWM power on, green 12 V Ext. power on, green 12 V Ana. power on, green 5 V power on, green 3,3 V power on, green		
Service indicator	Yellow LED	Applicationless: Unconfigured: Configured:	On Flashing Off
Test indicator	Yellow LED		

Note

1. Max. outgoing current on all 24 Vdc is 200 mA.
2. Max. outgoing current on all 12 Vdc is 150 mA.
3. Different kind of temperature sensor can be used etc. NTC 1K8 @ 25ºC, Invensys 5K @ 25ºC and PT-1000.
4. Max. outgoing current on all 24 Vac is 1,5 A.

References

See software description.